Report of the 40th Meeting

of the Coordination Group for Meteorological Satellites

5-8 November 2012, Lugano, Switzerland

CGMS

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MeteoSwiss, Director Christian Plüss, officially opened the CGMS-40 plenary session at 11:00 on 7 November 2012 in Lugano, Switzerland. The meeting was jointly organised by WMO and the Swiss confederation through the Federal Department of Foreign Affairs FDFA, and the Federal Department of Home Affairs FDHA specifically the Federal Office of Meteorology and Climatology MeteoSwiss. He welcomed participants of the 40th Session of CGMS to the town of Lugano and congratulated CGMS on its 40th Anniversary.

The meeting Chairman, Wenjian Zhang, Director - Observing and Information Systems Department, WMO, welcomed participants to the meeting on behalf of WMO.

Paul Counet, Head of Strategy and International Relations, EUMETSAT outlined the objectives of the meeting and explained the background of the revised plenary agenda and the 3-5 year High-Level Priority Plan which was to be presented to CGMS-40 plenary for discussion and ultimately endorsement.

CGMS-40 adopted the Agenda proposed by the CGMS Secretariat.

I SETTING THE SCENE

Wenjian Zhang, WMO noted that international coordination and cooperation provided by CGMS is essential to maximise the contribution of satellite observations to socio-economic development and reducing disasters. He urged meeting participants to use the 40th meeting to harness past experience and expertise to devise a high-level priority plan to meet future challenges. He underlined the important contribution that CGMS had to make to the Global Framework for Climate Services.

I.1 Statements by high-level speakers on expectations from CGMS

China - Xiofeng Xu, Deputy Administrator , CMA
On behalf of the China Meteorological Administration (CMA) Xiofeng Xu congratulated CGMS on its 40th anniversary and remarked on the significant achievements made by CGMS during this time. He highlighted the benefits CMA had gained from being a member of CGMS, for example, calibration of FY-2 was significantly improved through GSICS activities.

Looking to the future he informed CGMS that CMA is implementing a 5-year development plan for meteorological satellite applications. This plan covers 21 tasks in 6 thematic application areas, namely, NWP, weather analysis, climate and climate change, assessment of environmental and natural disasters, agricultural service, validation and utilisation tools. He called upon CGMS to play an even bigger role in promoting satellite applications, especially in addressing the needs of users at different levels and improving their capacity development.

Europe - Alain Ratier, Director-General, EUMETSAT

EUMETSAT Director-General, Alain Ratier addressed CGMS on behalf of the European members of CGMS – CNES, ESA and EUMETSAT. He focused on the 3-5 year perspective for CGMS from a European standpoint.

Mr. Ratier highlighted that coordination is required to secure continuity and global coverage of satellite observations and emphasised the need to coordinate CGMS contributions to the realisation of the Vision for the GOS in 2025. The necessity of coordination was noted in order to expand the scope of deliverables of CGMS to new observations of the ocean, the cryosphere and atmospheric composition. Mr. Ratier underlined the importance of demonstrating higher return on investment to governments to leverage sustained public investment in future satellite systems.

The need for CGMS to keep close links with user communities and applications through WMO and its programmes was noted, in order to be in a position to respond to evolving requirements and to get feedback. Technical focus with strong science support is important to keep the user and scientific communities interested in and committed to supporting satellite programmes and CGMS activities.

In summary, it was emphasised that only if CGMS is able to preserve and further develop these specific strengths, will it remain flexible enough to address new challenges, in particular the one of climate monitoring. Climate monitoring from space is highly dependent on coordinated extraction of Climate Records of Essential Climate Variables from operational meteorological systems of CGMS members. He highlighted the unique opportunity CGMS has to join forces with CEOS in the next 3-5 years to co-own and implement the architecture.

INDIA – Ashok Sharma, Deputy Director-General of Satellite Meteorology, India Meteorological Department (IMD)

Ashok Sharma, Deputy Director-General of Satellite Meteorology, (IMD) made a statement on behalf of India. He noted the achievements of CGMS in the past 40 years. Mr. Sharma stressed the importance of keeping technical, as well as scientific, focus in CGMS discussions. He also urged CGMS to recognise standard algorithms for various parameters and encourage satellite operators to adopt them for the sake of uniformity in derivation of products.

JAPAN – Toshiyuki Kurino, Director, Data Processing Department, MSC/JMA

Toshiyuki Kurino, Director of Data Processing Department, Meteorological Satellite Center of JMA delivered a statement on behalf of the Japan Aerospace Exploration Agency (JAXA) and the Japan Meteorological Agency (JMA). He recapped the history of operational data utilisation of meteorological satellites in Japan which started in 1968 and noted that since Japan's first geostationary satellite was launched in 1977, the Himawari series of satellites have been observing the East Asia and Western Pacific regions from the space for over 35 years.

He highlighted the importance of contributing to climate monitoring activities such as SCOPE-CM and the Global Framework for Climate Services (GFCS) and underlined JMA and JAXA's commitment to support and cooperate with CGMS activities in this field.

Mr. Kurino introduced the future satellite programmes of Japan, including Himawari-8 and -9, which will be launched in 2014 and 2016 respectively, and the polar orbiting satellites, ALOS-2, GPM core satellite, EarthCARE and GCOM-C1 which are planned to be launched in the 2014-2016 timeframe. The GPM is the TRMM follow-on jointly developed with the US, while the EarthCARE is the first joint mission with Europe.

He confirmed that JAXA and JMA are looking forward hosting the 41st CGMS meeting in 2013.

REPUBLIC OF KOREA – Hee-Sang Lee, Director-General, NMSC/KMA

Hee-Sang Lee delivered an address on behalf of the Korean delegation. Previously working in the area of NWP for many years, as a user of satellite observation data, Mr. Lee was recently transferred to manage satellite business in KMA.

He reported that the COMS satellite is working well since the beginning of the official start of operations on 1 April 2011. KMA is working on expanding the data service to provide COMS MI data for more users and successfully accomplished a project to support a COMS receiving, processing systems and education programme with Korea International Cooperation Agency (KOICA) this year and finished specific training courses for Sri Lankan users which are expected to be rolled out to other user countries in the future.

He updated CGMS on Korea's plans for the COMS follow-on, GeoKOMPSAT-2A and -2B which are scheduled to be launched in 2017 and 2018, respectively. Looking ahead to the future he noted that more investment from the government is expected in this area of satellite meteorology in the future.

RUSSIA – Vasily Asmus, Director, SRC Planeta/ROSHYDROMET

Vasily Asmus, Director of SRC Planeta/ ROSHYDROMET, made a statement to CGMS on behalf of Russia. He noted that the most important achievements of CGMS in the last 40 years from a Russian perspective are:

- The establishment of a global baseline for geostationary coverage, with five fixed locations (135°W, 75°W, 0°, 76°E, 140°E) implemented by the USA, Europe, Russia, and Japan respectively.
- Establishment of global back-up framework-contingency planning.
- Standardisation of data dissemination formats.
- Development of a common standard for the International Data Collection System (IDCS).
- Coordination of Radio Frequency Allocation, and protection of Radio Frequencies.
- Development of a coordinated approach to calibration and intercalibration. Russia is planning to participate in GSICS in a more active manner with the forthcoming meteorological satellite launches.
- Development of a framework for improving the quality of sounding products and Atmospheric Motion Vectors.

Regarding the CGMS plans for the next 3-5 years, Dr. Asmus underlined Russian support for the High Level Priority Plan (HLPP). Russia expects significant achievements in item A (Coordination/Optimization of observing systems) regarding optimization of the distribution of Low Earth Orbit (LEO) sun-synchronous orbits to ensure efficient temporal sampling of the atmosphere. Item B (Coordination/ Optimization of data Collection systems) is also very important for Roshydromet, especially in regard to the National DCS deployment. Item C (Satellite Products) is considered as one of exceptional importance to Russia, in establishing within GSICS a fully coherent calibration of relevant satellite instruments for LEO and GEO satellites (IR and MW spectral ranges). Item E (Data dissemination, direct read out services and contribution to the WIS) is supported by Roshydromet. In particular, regarding participation in the EARS/RARS initiative with plans to extend the data coverage to the entire Russian territory. The activities related to Item G (Preparation for new generation of operational satellites) are relevant with regard to the innovative HEO constellation of meteorological satellites "Arctica", that are being developed by Russia.

USA – Mary Kicza, Assistant Administrator Satellite and Information Service, NOAA/NESDIS

Mary Kicza, Assistant Administrator Satellite and Information Service, NOAA/NESDIS, made a statement on behalf of the USA. She acknowledged the significant work that was undertaken by the Restructuring Task Force since CGMS-39 and applauded the development of the proposed CGMS High Level Priority Plan.

She noted that CGMS has been tremendously important to the United States with its solid record of achievements and that the ongoing technical coordination, planning, and optimization that take place under the aegis of CGMS have benefitted the US directly and tangibly.

Looking ahead to the next 3-5 years, Ms. Kicza highlighted the following points bearing in mind the current environment of continued fiscal pressure:

- CGMS will remain critical for contingency planning and back-up arrangements for NOAA core weather missions. NOAA encourage collective consideration by CGMS of the impact that constrained budgets faced by NOAA and other satellite agencies may have on observational capabilities over the next few years.

- Increasing importance of access to/exchange of datasets.

- NOAA and NASA also endorse active participation of research agencies in CGMS.

- The role of CGMS in the Global Framework for Climate Services, and the importance of coordinated implementation of the Global Architecture for Climate Monitoring from Space.

- Importance of clearly defining the role of CGMS relative to other organisations/entities (e.g. CEOS, GEO, WMO Space Programme) to avoid unnecessary duplication.

USER COMMUNITY – Michel Jarraud, Secretary-General, WMO

Michel Jarraud, Secretary-General, WMO, delivered a statement on behalf of the User Community noting that satellite observations underpin most, if not all, WMO programmes but that the future development of space activities requires careful attention.

He noted that the International Scientific Working Groups sponsored by CGMS and WMO have an essential role to play in developing science and applications to enhance the use of satellite data, and stressed the importance of CGMS, together with WMO, continuing to support their successful work. He highlighted the importance of training, particularly in least developed countries (LDCs) and recommended that satellite operators in CGMS continue the successful practice of organising user conferences and fora in all regions of the world as a very important user interaction mechanism.

He also stressed the importance of worldwide technical harmonisation and integration for maximum usefulness of satellite data to WMO users, from common data formats, to quality standards, integrated global satellite data distribution, or instrument intercomparison and calibration. The WMO Integrated Global Observing System (WIGOS) framework is being developed to facilitate this process.

Mr. Jarraud talked about the double challenge facing satellite operators: to optimize the costs of the new missions and to demonstrate their benefit to society, or the risk of not operating these missions and the role CGMS has to play in communicating this message.

He reported that at its Extraordinary Session, held in Geneva from 29-31 October, the WMO Congress adopted the Implementation Plan of the GFCS and a Governance Mechanism, including an Intergovernmental Board on Climate Services. He noted that space observation has an important role to play in the implementation of the GFCS.

I.2 Action review (from CGMS-39)

The CGMS Secretariat reviewed the outstanding actions from previous meetings, taking into account inputs provided in Working Papers by the Members, as well as by other means of correspondence, including e-mail. Related Working Papers: CGMS-40-EUMETSAT-WP-13 and corresponding viewgraph, CGMS-40-JMA-WP-01, CGMS-40-NOAA-WP-01, CGMS-40-ROSHYDROMET/ROSCOSMOS-WP-05.

CGMS-40-EUMETSAT-WP-63.ppt summarised the action status at the start of the plenary session:

- 2 actions remaining open (with new deadlines agreed) from CGMS-37/-38;

- all permanent actions were closed since they will be treated as part of the CGMS agenda;

- 9 open actions and 8 with new deadlines agreed from CGMS-39.

- Recommendations are on a best effort basis, and are closed at the end of each CGMS meeting.

The final status of the list of actions resulting from CGMS-39 and discussions at CGMS-40, is provided on the next pages.

ACTIONS OPEN FROM CGMS-37 AND CGMS-38 (AT CGMS-39)

Actionee	Action	Description	Action feedback/closing document	Deadline	Status
WMO	37.14	Action 37.14: WMO to continue dialogue with ISRO regarding the establishment of an Indian CoE and the co-sponsoring of the CoE in Oman. Deadline: CGMS-39	CGMS-39 WMO-WP-14; CGMS-39 NOAA-WP-13 IMD sent letter of interest on Vlab to WMO in Jan 2012; WMO responded with detailed instructions on application procedure; dialogue continues; Action closed. New action proposed: WMO, CGMS and IMD to conclude accession of IMD in VLab; deadline CGMS-42. Closed following discussions in WGII at CGMS-40.	(CGMS-38) New Deadline: CGMS-40	CLOSED
ESA	WGII 37.28	Action 37.28: ESA to provide a working paper on the long-term monitoring of MERIS as a reference calibration instrument. Deadline: CGMS-39	Closed with ESA-WP-01	(CGMS-38) New Deadline: CGMS-40	CLOSED
NOAA and IMD	WGII 38.36	Action 38.36: NOAA and IMD to better understand differences in TC intensity estimations and to inform CGMS members on the outcome. Deadline: CGMS-39	Remains open. Action by NOAA and IMD needed related to resolving algorithm differences	(CGMS-38) New Deadline: CGMS-42	OPEN
WMO	WGIII 38.40	Action 38.40: WMO in collaboration with the atmospheric composition community and satellite experts to further refine the requirements for atmospheric composition requirements and the optimal way to address these in the revised baseline.	Remains open. No progress; Ad-hoc task team to review the needs for GAW (atmospheric composition) regarding satellite measurements and the 2004 IGACO recommendations has not yet been formed;	(CGMS-38) New Deadline: CGMS-41	OPEN
WMO	WGIII 38.42	Action 38.42: WMO to take into account the revised CGMS baseline for the space-based component of the GOS in the updating process of relevant WMO Manuals and Guides, with a view of its endorsement by CBS-XV in September 2012.	An update of the manual on the GOS was reviewed by ET-SAT submitted to and approved by CBS-XV	(CGMS-39) New deadline: Sept 2012	CLOSED

CGMS-39 PERMANENT ACTIONS

Actionee	Action	Description	Action feedback/closing document	Deadline	Status
CGMS Members	Permanent 01	All CGMS Members to inform the Secretariat of any change in the status or plans of their satellites to allow the updating of the CGMS Tables of Satellites (tables 1-6 of the plenary report). The Secretariat to publish this updated information in the CGMS report and, via WMO, in the WMO CGMS satellite status web pages.	EUM-WP-01 CMA-WP-01 This will be addressed under the relevant agenda item in plenary and it is therefore proposed to close the action.	CGMS-40	CLOSED
CGMS satellite operators	Permanent 02	CGMS Members to report to CGMS plenary on their activities and plans related to space weather including: (i) impact of solar events and space radiation on satellites, protective measures, (ii) space weather observations, and (iii) space weather warning services.	CMA-WP-08, i) will be covered in the report under agenda session III; ii) and iii) will be addressed in WGII It is therefore proposed to close this action.	CGMS-40	CLOSED
CGMS Members	Permanent 03	CGMS Members to review the list of available list servers used by CGMS groups and update as appropriate.	This is made on a continuous basis and annually at the plenary meeting. It is proposed to close this action.	CGMS-40	CLOSED
IOC/CGMS Members	Permanent 04	CGMS satellite operators to consider the IOC satellite requirements, especially the data dissemination methods, bearing in mind the ongoing formations of GOOS Regional Alliances (GRAs).	This will be addressed under agenda session II in particular, and it is therefore proposed to close the action.	CGMS-40	CLOSED
CGMS Members	Permanent 05	CGMS should develop a coordinated approach for direct broadcast services of future polar orbiting meteorological satellite systems.	This matter will be discussed in WGI and WGIV and be reported to plenary as/if necessary (part of the WG agenda). It was discussed in WGIV and it is addressed in the HLPP. It is therefore proposed to close this action.	CGMS-40	CLOSED
CGMS Members	Permanent 06	All CGMS satellite operators to regularly include user statistics in their reports on current satellite systems. Deadline: CGMS-39	CMA-WP-01 It is proposed to close the action since a chapter on user statistics is included in the template of the WP on satellite status.	CGMS-40	CLOSED
WMO	Permanent 07	WMO to maintain the Dossier on the Space-based GOS, with review by the relevant Expert Teams, and inform CGMS of major updates.	This will be addressed in WGII, and it is therefore proposed to close the action. If deemed necessary by WGII it will be reported to plenary under agenda IV session	CGMS-40	CLOSED

CGMS-39 PERMANENT ACTIONS

Actionee	Action	Description	Action feedback/closing document	Deadline	Status
WMO	Permanent 07	WMO to maintain the Dossier on the Space-based GOS, with review by the relevant Expert Teams, and inform CGMS of major updates.	This will be addressed in WGII, and it is therefore proposed to close the action. If deemed necessary by WGII it will be reported to plenary under agenda IV session	CGMS-40	CLOSED
CGMS Members	Permanent 08	CGMS Members to provide WMO with the update of their programmes for the dossier on the space-based GOS.	This will be addressed in WGII, and it is therefore proposed to close the action. If deemed necessary by WGII it will be reported to plenary under agenda session IV	CGMS-40	CLOSED
EUMETSAT	Permanent 09	EUMETSAT, as CGMS Secretariat, to provide a yearly report to WG-I on the annual SFCG meeting.	Closed with EUM-WP-06	CGMS-40	CLOSED
CGMS Members	Permanent 10	CGMS Members to provide at every CGMS meeting a list of frequencies used by their current and future systems in the format provided in WG I report-39 (Annex 1).	Closed with NOAA-WP-12, CMA-WP-02, EUM-WP-04	CGMS-40	CLOSED
WMO	Permanent 11	WMO to report on coordination efforts between Radio Occultation data providers and NWP agencies to establish long term continuity plans for the use of both operational and research RO data in Numerical Weather Prediction and climate models. (From Action 38.30: WMO stressed that it was a long-term action, initiated through participation in NAEDEX-APSDEU meetings. CGMS-39 agreed to convert in a permanent action to report on such coordination).	This will be addressed in WGII/7, and it is therefore proposed to close the action. If deemed necessary by WGII it will be reported to plenary under agenda session IV	CGMS-40	CLOSED

CGMS-39 ACTIONS - PLENARY

Actionee	Action	Description	Action feedback/closing document	Deadline	Status
CGMS Members	39.01	Action 39.01: Interested CGMS members to contact NOAA for assistance in obtaining conjunction warning support from the U.S. Joint Space Operations Center (JSpOC). Deadline: CGMS-40	EUMETSAT: Already in place.	CGMS-40	CLOSED
WMO	39.02	Action 39.02: WMO, through ICTSW, to propose a template in advance of CGMS-40 in order to facilitate harmonised reporting on spacecraft anomalies related to space weather. Deadline: 1 May 2012	WMO provide feedback end Aug '12. S/C anomalies will be reported on under agenda item C. Agenda item B.4 will discuss space weather excluding S/C impact.	01-May-12	CLOSED
IROWG	39.03	Action 39.03: IROWG to review the status of the global RO system and report to CGMS-40. Deadline: CGMS-40	EUM-WP-02 (on behalf of IROWG)	CGMS-40	CLOSED
IMD and ROSH	39.04	Action 39.04: IMD and ROSHYDROMET to present papers at CGMS-40 on progress towards implementing GEO to LEO corrections and instrument bias monitoring as established by NOAA, EUMETSAT, KMA, JMA and CMA. Deadline: CGMS-40	Will be reported directly to GSICS.	CGMS-40	CLOSED
CGMS Members	39.05	Action 39.05: CGMS Members to report at CGMS-40 on activities to implement a web-accessible instrument monitoring website. Deadline: CGMS-40	EUM-WP-09 (cal events WG); Recommendation to CGMS Members;. Action closed following discussions in WGII at CGMS-40	CGMS-40	CLOSED
CGMS Members	39.06	Action 39.06: CGMS Members to send nominations for vice chairmanship for GS ICS. Deadline: 28 Feb 2012		28-Feb-12	CLOSED
CGMS Members	39.07	Action 39.07: CGMS Members to consider hosting GSICS EP-12 meeting in Spring 2012 and send proposal to WMO Secretariat. Deadline: 31 Dec 2011		31-Dec-11	CLOSED

CGMS-39 ACTIONS - PLENARY

Actionee	Action	Description	Action feedback/closing document	Deadline	Status
CGMS Members	39.08	Action 39.08: CGMS Members to provide a contact point to WMO to coordinate their potential contributions to SWFDP (Severe Weather Forecasting Demonstration Project). Deadline: CGMS-40	JMA-WP-02 EUMETSAT: marianne.koenig@eumetsat.int NOAA: James Gurka, GOES-R Project Office, and Anthony (Tony) Mostek (ref CGMS-39 NOAA-WP-13).	CGMS-40	CLOSED
CGMS Members	39.09	Action 39.09: CGMS Secretariat to request the Architecture Writing Team provide a template to be used by CGMS Members to provide elements/activities which might contribute to the physical global architecture for Climate Monitoring. Deadline: end of Q1 2012	CGMSSEC provided via the CGMS list server.	31-Mar-12	CLOSED
CGMS Members	39.10	Action 39.10: CGMS Members to provide a detailed review of current and future plans to contribute to the global architecture for Climate Monitoring at CGMS-40 Deadline: CGMS-40	AGN item V.2 (and WGIII/4) Mark Dowell will provide a status presentation on the Global Architecture for Climate Monitoring	CGMS-40	CLOSED
CGMS Members	39.11	Action 39.11: CGMS Members who are interested in joining the Writing Team on global architecture for climate monitoring to nominate participants by end of November 2011.	No further input provided by CGMS Members.	30-Nov-11	CLOSED
CGMS Members/ CGMS Secretariat	39.12	Action 39.12: CGMS Members are invited to send comments on the global architecture for climate monitoring to the Secretariat and CGMS Secretariat to send an official CGMS response on the Writing Team Report to the Writing Team Chair prior to the CEOS Plenary by end of October 2011. Deadline: 31 October 2011.	No further input provided by CGMS Members.	31-Oct-11	CLOSED
IOC	39.13	Action 39.13: IOC is invited to prepare a paper on guidance to CGMS members on ocean wind measurements. Deadline: CGMS-40	CGMS-40-IOC-UNESCO-WP-01	CGMS-40	CLOSED

CGMS-39 ACTIONS - PLENARY

Actionee	Action	Description	Action feedback/closing document	Deadline	Status
CGMS Satellite Operators	39.14	Action 39.14: CGMS Satellite Operators to update their web pages to include the VLab logo and to more clearly show their support to VLab activities and CoEs. Deadline: CGMS-40	EUMETSAT: http://www.eumetsat.int/Home/Main/DataProducts/HowtoUseOurProducts/index.htm?l=en To be addressed within the Vlab Management Group. NOAA-WP-11	CGMS-40	CLOSED
CGMS Satellite Operators	39.15	Action 39.15: CGMS Satellite Operators, in their areas of responsibilities, should be ready to make a contribution towards funding of VLab Management Group (VLMG) members to attend the VLMG-6 in Brazil in September 2012. Deadline: CGMS-40 Aug 2012	Contributions have been provided by EUM and NOAA. NOAA-WP-11	~~CGMS-40~~ Aug 2012	CLOSED
CGMS Satellite Operators	39.16	Action 39.16: CGMS Satellite Operators to report to WMO Space Programme and CGMS Secretariat within 2 weeks, regarding the possibility to financially support the continuity of employment of the VLab Technical Support Officer (TSO). Deadline: 31 October 2011.	Contributions have been provided by EUM, NOAA and KMA.	31-Oct-11	CLOSED
CGMS Satellite Operators	39.17	Action 39.17: CGMS Satellite Operators are invited to note GOS-2011-September edition of the dossier and to forward to WMO (bibizzar@tinn.it) any update or missing information concerning their programmes for inclusion in GOS-2012-January		31-Jan-12	CLOSED
CGMS Members	39.18	Action 39.18: Interested CGMS Members to nominate a participant in the CGMS Internal Study Task Force in charge of reviewing CGMS structure, meetings and practices for next meeting Deadline: 31 October 2011	JMA, KMA, NOAA, WMO and EUMETSAT/CGMS Secretariat	31-Oct-11	CLOSED
CGMS Members	39.19	Action 39.19: CGMS Members to review and approve the report of the CGMS Internal Study Task Force by April 2012 so that it could be implemented for CGMS-40.	By August 2012 only positive comments have been received and the recommendations have been implemented accordingly.	15-Apr-12	CLOSED

CGMS-39 ACTIONS - WORKING GROUP I - TELECOMMUNICATIONS

Actionee	Action	Description	Action feedback/closing document	Deadline	Status
CGMS Members	WGI 39.20	Action 39.20: CGMS Members to report on their plans for the utilisation of the band 7750-7850/7900 MHz for their existing and future LEO systems (including the detailed list of frequencies used in the band, associated bandwidth and signal characteristics - together with the orbital parameters). Deadline: 31.12.2011	Closed with CMA-WP-03, NOAA-WP-12 and EUM-WP-04	31-Dec-11	CLOSED
CGMS Members	WGI 39.21	Action 39.21: Based on the inputs of the previous action, CGMS members to analyse potential interference issues, reporting results of analysis back to CGMS WG-I by next CGMS meeting. Deadline: CGMS-40	Remains open - new deadline proposed end Q1 2013 for specific follow up e-meeting of WG-I activities. Linked to HLPP: EESS X-Band congestion and interference assessments.	(CGMS-40) New deadline: 31/03/2013	OPEN
WGI Chairman	WGI 39.22	Action 39.22: WGI Chairman to report to plenary (under agenda item I/1) to confirm CGMS Secretariat as coordinated representative of CGMS vis-à-vis SFCG for future meetings. Deadline: 7.10.2011	Closed at CGMS-39.	07-Oct-11	CLOSED
EUMETSAT	WGI 39.23	Action 39.23: EUMETSAT (as CGMS Secretariat) to represent CGMS in the ad-hoc workshop proposed by WMO on of the future International Forum of Users of Satellite Data Telecommunication Systems (to ensure that there is at least one representative of CGMS). Deadline: CGMS-40.	CGMS Secretariat (EUMETSAT) has agreed to represent CGMS in these fora until further notice.	CGMS-40	CLOSED

CGMS-39 ACTIONS - WORKING GROUP II - DATTA AND PRODUCTS

Actionee	Action	Description	Action feedback/closing document	Deadline	Status
NASA and NOAA	WGII 39.24	Action 39.24: NASA and NOAA to report on cal/val results from the NPP instruments, including comparisons of NPP sensors with EOS sensors and with airborne instruments. Deadline: CGMS-40	NASA-WP-02/03; NOAA-WP-14,15,19; CLOSED	CGMS-40	CLOSED
NASA	WGII 39.25	Action 39.25: NASA to discuss with GSICS the use of COVE tool to facilitate sensor calibration and validation activities. Deadline: CGMS-40	NASA-WP-02/03; NOAA-WP-14,15,19	(CGMS-40) New deadline: CGMS-41	OPEN
NASA	WGII 39.26	Action 39.26: NASA to ask GPM-XCAL team to review and consider use of GSICS Product Acceptance Procedure. Deadline CGMS-40	GPM current intercalibration efforts are not at the final state where a submission to the GSICS intercalibration process will yield useful results. It is vital that GPM first obtains data from the GMI/DPR instruments to verify its double-difference intercalibration results. At the point where the intercalibration process has been verified, NASA will reexamine use of the GSICS process. Pending launch of GPM currently planned for February 2014.	(CGMS-40) New deadline: CGMS-42	OPEN
WMO Space Programme	WGII 39.27	Action 39.27: The WMO Space Programme to contact the South African Weather Service (SAWS) to inform them about the interest of NOAA and EUMETSAT to closely cooperate with SAWS on satellite product validation, especially for precipitation products. Deadline: CGMS-40.	Closed (21 August 2012); Estelle deConing, SAWS (Estelle.deConing@weathersa.co.za) willing to serve as CGMS focal point	CGMS-40	CLOSED
CGMS Satellite Operators	WGII 39.28	Action 39.28: Satellite operators are requested to provide funding for participants of the 6th IPWG Workshop which will take place in Fortaleza, Brazil (tentatively 15-19 October 2012). Deadline: 30 June 2012.	Contributors: EUMETSAT, NOAA, WMO	30-Jun-12	CLOSED

CGMS-39 ACTIONS - WORKING GROUP II - DATTA AND PRODUCTS

Actionee	Action	Description	Action feedback/closing document	Deadline	Status
All AMV Providers	WGII 39.29	Action 39.29: All AMV providers to make efforts to have the quality of their products tested by NWP centers. The slicing into specific AMV products (e.g. from WV or IR channels) and segregation into vertical levels is advised. Deadline: CGMS-40	EUM-WP- (on behalf of IWWG) A.I. WGII/6; NOAA-WP-21; WMO-WP-09 (Sedona WS). Closed following discussions in WGII at CGMS-40.	CGMS-40	CLOSED
IWWG Co-Chairs and Rapporteurs	WGII 39.30	Action 39.30: The co-chairs of IWWG and the rapporteur are requested to discuss the results from NWP impact studies at IWW11, and to synthesize general observations on performance. Due date: IWW11 in February 2012 and report to CGMS-40.	NOAA-WP-21; WMO-WP-09 (Sedona WS); Closed	Feb 2012 and report to CGMS-40	CLOSED
IWWG Co-Chairs and Rapporteurs	WGII 39.31	Action 39.31: IWWG co-chairs and the rapporteur are requested to report to CGMS 40 on the 2nd AMV intercomparison campaign. Deadline: CGMS-40	NOAA-WP-21; Closed	CGMS-40	CLOSED
CGMS Members	WGII 39.32	Action 39.32: CGMS agencies are encouraged to participate in the next International Radio Occultation Working Group (IROWG) Workshop to be held in Estes Park, Colorado 28 March - 3 April, 2012. Details can be found at www.irowg.org. Deadline: 01 March 2012	EUM-WP-01 (on behalf of IROWG)	01-Mar-12	CLOSED
CGMS Members	WGII 39.33	Action 39.33: CGMS agencies are encouraged to report scientific progress on use of Radio-occultation, opportunities to provide increased coverage by RO sensors as well as to report on data gap issues to the IROWG, and directly to CGMS. Deadline: CGMS-40	EUM-WP-02 (on behalf of IROWG), EUM-WP-03, JMA-WP-08, NASA-WP-05 CLOSED	CGMS-40	CLOSED

CGMS-39 ACTIONS - WORKING GROUP II - DATTA AND PRODUCTS

Actionee	Action	Description	Action feedback/closing document	Deadline	Status
CSA and EC	WGII 39.34	Action 39.34:CSA and Environment Canada to discuss volcanic ash detection and composition products from PCW, and plans to provide rapid transmission of volcanic eruption alerts to the Northern Hemisphere VAACs. Deadline: CGMS-40	PCW still in conceptual stage. Action closed following discussions in WGII at CGMS-40. Canada will continue to report on the PCW programme and related products to CGMS in future.	CGMS-40	CLOSED
JMA	WGII 39.35	Action 39.35: JMA is invited to present an intercomparison of the new MTSAT SST product with other (similar) products. Deadline: CGMS-40	JMA-WP-10 CLOSED	CGMS-40	CLOSED
Vlab co-chairs	WGII 39.36	Action 39.36: VLab co-chairs to address the potential of training support with the SWFDP responsible in WMO. Deadline: CGMS-40.	Vlab support to SWFDP established; CLOSED	CGMS-40	CLOSED
CGMS Satellite Operators	WGII 39.37	Action 39.37: CGMS Satellite Operators to consider the requirements of satellite information for coastal applications that are described in WMO-WP-30, and provide comments to WMO (blee@wmo.int). Deadline: 31 December 2011	Following discussions in WGII at CGMS-40 the action will be referred to CGMS-41.	(CGMS-39 31/12/2011) New deadline CGMS-41	OPEN
CGMS Members	WGII 39.38	Action 39.38: CGMS members to liaise with WMO (blee@wmo.int) to coordinate training activities on forecasting and warning for storm surges and coastal inundation. Deadline: 31 December 2011	WMO collaboration on marine training with EUM ongoing, and emerging with ESA (through eSurge project). Closed following the discussions at CGMS-40 in WGII.	CGMS-40	CLOSED
NOAA	WGII 39.39	Action 39.39: NOAA to report to SCOPE-CM on the progress of extending SSMI precipitable water products with SSMIS. Deadline: Next SCOPE-CM meeting that will take place in August 2012 in Berlin. Deadline: 31 August 2012.	Meeting took place in August 2012.	31-Aug-12	CLOSED

CGMS-39 ACTIONS - WORKING GROUP II - DATTA AND PRODUCTS

Actionee	Action	Description	Action feedback/closing document	Deadline	Status
Rapporteurs of International CGMS Science Working Groups	WGII 39.40	Action 39.40: GCOS Secretariat to clarify the request formulated in the GCOS/ WCRP letter (dated 12 May 2010) and to ask for an adequate response as further spelled out in WMO-WP-23. Rapporteurs of the four CGMS Working Groups (IROWG, IPWG, ITWG and IWWG) are requested to put this on the agenda of the upcoming meetings of the four Working Groups and to report back to CGMS40 and the GCOS Secretariat. Deadline: CGMS-40	EUM-WP-01 (for IROWG) EUM-WP-14 (for IPWG) NOAA-WP-21 (for IWWG) NOAA-WP-18 (for ITWG). Action closed following discussions in WGII.	31-Aug-12	CLOSED
CGMS Rapporteurs	WGII 39.41	Action 39.41: CGMS requests the Rapporteurs to discuss, at the upcoming International Scientific Working Group meetings, the WG contributions to ECV production and reprocessing activities, and other relevant climate work. Deadline: CGMS-40	ISWG matters will be reported on in WGII and plenary F.2. Climate discussed in all ISWGs; CLOSED	CGMS-40	CLOSED

CGMS-39 ACTIONS - WORKING GROUP IV - GLOBAL DATA DISSEMINATION

Actionee	Action	Description	Action feedback/closing document	Deadline	Status
NOAA	WGIV 39.42	Action 39.42: NOAA to provide more information on the content of LRD broadcasts in due course. Deadline: CGMS-40	NOAA-WP-28. Discussed in WGIV/3.	CGMS-40	CLOSED
EUMETSAT and NOAA	WGIV 39.43	Action 39.43: EUMETSAT and NOAA to prepare a new global specification for LEO high rate broadcast services and present it for consideration at the next meeting of CGMS. Deadline: CGMS-40	Closed with EUM-WP-07, EUM-WP-08. Discussed in WGIV/3	CGMS-40	CLOSED

CGMS-39 ACTIONS - WORKING GROUP IV - GLOBAL DATA DISSEMINATION

Actionee	Action	Description	Action feedback/closing document	Deadline	Status
CMA	WGIV 39.44	Action 39.44: CMA to nominate a Point of Contact to follow the evolution of the new global specification for LEO high rate broadcast services and to comment accordingly at CGMS 40. Deadline: CGMS-40	Dongfeng LUO luodf@cma.gov.cn	CGMS-40	CLOSED
WMO	WGIV 39.45	Action 39.45: WMO to consult WMO Members on the requirement for a "Low Data Rate" service in L-Band on future generation polar-orbiting systems, and on the expected contents of such a service. Deadline: CGMS-40	WMO-WP-01	CGMS-40	CLOSED
EUMETSAT	WGIV 39.46	Action 39.46: EUMETSAT to re-assess the European user requirement for a L-band service from its LEO satellites, bearing in mind the ongoing broader consultation process of WMO, and report to CGMS accordingly. Deadline: CGMS-40	Ongoing.	(CGMS-40) New deadline: CGMS-41	OPEN
CGMS Secretariat	WGIV 39.47	Action 39.47: The CGMS Secretariat to prepare an amendment of the CGMS HRIT/LRIT Global Specification (CGMS 03) with effect to adopt the geographical reference system of the World Geodetic System (WGS84) and Earth Geodetic Model (EGM-96) as described in CGMS-39 WMO-WP-25. Deadline: CGMS-40	Closed with EUM-WP-16 (2 papers). Discussed in WGIV/3.	CGMS-40	CLOSED
CMA	WGIV 39.48	Action 39.48: CMA to prepare a CMACast fact sheet, including the process for user registration, and to provide this to CGMS Members and to WMO for further distribution to potential users in the Asia-Pacific region. Deadline: 31 March 2012	Action closed with CMA-WP-09. Discussed in WGIV/4	31-Mar-12	CLOSED

CGMS-39 ACTIONS - WORKING GROUP IV - GLOBAL DATA DISSEMINATION

Actionee	Action	Description	Action feedback/closing document	Deadline	Status
CGMS Members and WMO	WGIV 39.49	Action 39.49: CGMS Members to nominate Points of Contact who can assist WMO with the development of common guidelines for long term data preservation. Deadline for nominations 31 December 2011. WMO to prepare a report on the guidelines to be presented to CGMS-40. Deadline:CGMS-40	EUM: Harald.rothfuss@eumetsat.int WMO: nhettich@wmo.int Other members to nominate their points of contact.	(CGMS-40) New deadline CGMS-41	OPEN
CGMS Secretariat	WGIV 39.50	Action 39.50: The CGMS Secretariat to distribute to CGMS Members the Report on European Long-Term Data Preservation Guidelines, for information, once this has been finalised. Deadline: CGMS-40	Distributed to CGMS plenary by e-mail on 10 May 2012.	CGMS-40	CLOSED
CGMS Members	WGIV 39.51	Action 39.51: All CGMS Members to propose using interoperability standards for providing and sharing of climate data records and report on their efforts at the next meeting of CGMS Deadline: CGMS-40	EUMETSAT: No further developments since CGMS-39. EUMETSAT is prepared to revisit this following an input from other CGMS members. NOAA has provided inputs which were circulated via the CGMS list server on 02/11/12. Other CGMS members to provide their input.	(CGMS-40) New deadline CGMS-41	OPEN
EUMETSAT and NOAA	WGIV 39.52	Action 39.52: EUMETSAT and NOAA to report on their progress on sharing climate data records and using common interoperability standards for providing the data. Deadline: CGMS-40	EUMETSAT: Regular exchanges take place with NOAA. Progress reporting is expected to be available around CGMS-42 considering that production of the climate data records has not yet started in EUMETSAT NOAA has provided inputs which were circulated via the CGMS list server on 02/11/12, activities have taken place within SCOPE-CM and NOAA-EUMETSAT Bilaterals and continued regular exchanges are planned.	CGMS-40	CLOSED
WMO	WGIV 39.53	Action 39.53: WMO to further refine the web-based Product Access Guide for satellite products, within the WMO Space Programme website, in collaboration with CGMS satellite operators. Deadline: CGMS-40	WMO provided the link to the Product Access Guide: http://www.wmo.int/pages/prog/sat/product-access-guide_en.php Status: Open. Ongoing activity, link to be provided by WMO and to be added to this report.	(CGMS-40) New deadline CGMS-41	OPEN
CGMS Members	WGIV 39.54	Action 39.54: All CGMS Members to report at the next CGMS meeting on their progress with the implementation of WIS Deadline: CGMS-40	Closed with EUM-WP-15, CMA-WP-10. Discussed in WGIV/6.	CGMS-40	CLOSED

CGMS-39 RECOMMENDATIONS - PLENARY

Actionee	Recommendation	Description	Action feedback/closing document	Deadline	Status
CGMS Members	Recommendation 39.01	Recommendation 39.01: CGMS agencies are invited to assess the possibility of implementing an IR Sounding in early morning orbit.	covered by US/Europe/China study presentation	CGMS-40	CLOSED
CGMS Satellite Operators	Recommendation 39.02	Recommendation 39.02: CGMS Satellite Operators are invited to support the strategy for improving the use of satellite data in SWFDP regional subprojects.		CGMS-40	CLOSED
CGMS Satellite Operators	Recommendation 39.03	Recommendation 39.03: Satellite operators are asked to strive to harmonise the spectral characteristics of future Visible and Infrared imager channels in order to enable seamless application of differential absorption methods to data acquired from different platforms.	Discussed in WGII.	CGMS-40	CLOSED
CGMS Satellite Operators	Recommendation 39.04	Recommendation 39.04: CGMS Satellite operators are asked to ensure the earliest possible deployment of next generation geostationary platforms with enhanced multi-spectral VIS-IR capabilities.		CGMS-40	CLOSED
CGMS Satellite Operators	Recommendation 39.05	Recommendation 39.05: CGMS Satellite operators are asked to consider the deployment of operational LIDAR sensors in Low Earth Orbit to provide multi-daily coverage over global air routes.		CGMS-40	CLOSED
CGMS Members	Recommendation 39.06	Recommendation 39.06: CGMS members are invited to ensure, as appropriate, their involvement in the Polar Space Task Group in support of the WMO Global Cryosphere Watch (List of invitees to first meeting 13-14 October 2011 in Geneva, Switzerland:	http://www.wmo.int/pages/prog/sat/meetings/documents/PSTG-1_Inf_02_%20Invitees.pdf)	CGMS-40	CLOSED
CGMS Members	Recommendation 39.07	Recommendation 39.07: CGMS is invited to note the outcome of the 2011 WOAP workshop, in particular in the context of the development of an architecture for climate monitoring from space.	Available at http://www.wcrp-climate.org/documents/ECV_Wksp_WCRP_Report.pdf CGMS members informed via e-mail on 16 Feb 2012.	CGMS-40	CLOSED
CGMS Members	Recommendation 39.08	Recommendation 39.08: CGMS Members are invited to include links to the VLab Calendar of Events and the ESRC.		CGMS-40	CLOSED

CGMS-39 RECOMMENDATIONS - WGI TELECOMMUNICATION

Actionee	Recommendation	Description	Action feedback/closing document	Deadline	Status
CGMS Members	Recommendation 39.09 WGI	Recommendation 39.09: CGMS Members are encouraged to participate in the ad-hoc workshop and subsequent activities of the future International Forum of Users of Satellite Data Telecommunication Systems. This is adopted with the understanding that the Terms of Reference (ToR) of this forum are still draft and will be subject to consolidation by the participants in the group.		CGMS-40	CLOSED

CGMS-39 RECOMMENDATIONS - WGII DATA AND PRODUCTS

Actionee	Recommendation	Description	Action feedback/closing document	Deadline	Status
All AMV and CSR Product providers	Recommendation 39.10 WGII	Recommendation 39.10: All AMV and CSR product providers are invited to continue or start the regular reprocessing of those products with state-of-the-art algorithms.		CGMS-40	CLOSED
CGMS Members	Recommendation 39.11 WGII	Recommendation 39.11: CGMS agencies are encouraged to provide instrument monitoring results at CGMS-40.	EUMETSAT: EUM-WP-09	CGMS-40	CLOSED
CGMS Satellite Operators	Recommendation 39.12 WGII	Recommendation 39.12: CGMS Satellite Operators to provide regular information on satellite/instruments events affecting calibration and establish corresponding websites.	EUMETSAT: EUM-WP-09	CGMS-40	CLOSED
CGMS Satellite Operators	Recommendation 39.13 WGII	Recommendation 39.13: CGMS Satellite Operators to provide Instrument Performance Monitoring information routinely on their respective websites.	EUMETSAT: EUM-WP-09	CGMS-40	CLOSED
CGMS Members	Recommendation 39.14 WGII	Recommendation 39.14: CGMS Members participating in GSICS to provide a representative in the GDWG.	EUMETSAT: Peter.Miu@eumetsat.int KMA: GDWG member attended the GRWG/GDWG joint meeting in March 2012	CGMS-40	CLOSED

CGMS-39 RECOMMENDATIONS - WGII DATA AND PRODUCTS

Actionee	Recommendation	Description	Action feedback/closing document	Deadline	Status
CGMS Members	Recommendation 39.15 WGII	Recommendation 39.15: CGMS to support the development of guidelines by WMO for the design of future instruments with a view of harmonizing some spectral characteristics (e.g. central λ) of at least some core geostationary imager channels.		CGMS-40	CLOSED
CGMS Members	Recommendation 39.16 WGII	Recommendation 39.16: CGMS Members that are not currently participating to consider an active role in the future progress of GSICS, enabling their sensors to be used for inter-calibration and to benefit from the experience collected in GSICS.		CGMS-40	CLOSED
CGMS Members	Recommendation 39.17 WGII	Recommendation 39.17: CGMS agencies are encouraged to support scientists to attend the next ITWG.	KMA: Representative from KMA staff attended the 18th ITSC in March 2012	CGMS-40	CLOSED
R&D Agencies	Recommendation 39.18 WGII	Recommendation 39.18: The snowfall community is confident in the capabilities of Space-borne multi-frequency Doppler radar for global snowfall measurement and requests space research agencies to plan future missions that implement double-frequency capability as a minimum.		CGMS-40	CLOSED
Space Agencies	Recommendation 39.19 WGII	Recommendation 39.19: Space agencies should continue to favour integrated science teams that encompass the measurement, modelling and data assimilation communities through proposals, campaigns and free dataflow.		CGMS-40	CLOSED
CGMS Members	Recommendation 39.20 WGII	Recommendation 39.20: CGMS agencies are encouraged to follow NASA's example of comprehensive and sustaining science support for satellite missions, including comprehensive validation campaigns.		CGMS-40	CLOSED
CGMS Members	Recommendation 39.21 WGII	Recommendation 39.21: CGMS members are invited to assist the funding of a training event which is planned to be held concurrently with IPWG-6.	EUMETSAT, NOAA	CGMS-40	CLOSED
AMV Providers	Recommendation 39.22 WGII	Recommendation 39.22: All AMV providers should make an effort to have the quality of their products tested by NWP centers. It is recommended to present such results already at the 11th International Winds Workshop in February 2012.	See report from IWWG 11 (NOAA-WP- 21)	31 January 2012	CLOSED

CGMS-39 RECOMMENDATIONS - WGII DATA AND PRODUCTS

Actionee	Recommendation	Description	Action feedback/closing document	Deadline	Status
IWWG	Recommendation 39.23 WGII	Recommendation 39.23: CGMS-39 advised IWWG 11 to further address the salient issues and topics listed in CGMS-39 EUM-WP-27.	See report from IWWG 11 (NOAA-WP- 21)	CGMS-40	CLOSED
CGMS Members	Recommendation 39.24 WGII	Recommendation 39.24: CGMS agencies are encouraged to support scientists to attend the next IWWG meeting.	See report from IWWG 11 (NOAA-WP- 21)	CGMS-40	CLOSED
CGMS Members	Recommendation 39.25 WGII	Recommendation 39.25: CGMS Agencies are invited to: i) further test the performance of the NWCSAF AMV software package by testing the products in a NWP data monitoring/assimilation system, and ii) extend the current software to clear-sky WV AMVs.	EUM-WP-11	CGMS-40	CLOSED
AMV Providers	Recommendation 39.26 WGII	Recommendation 39.26: Satellite AMV providers are invited to examine the stand-alone AMV software package from the NWCSAF and to report back to CGMS 40.	EUM-WP-11	CGMS-40	CLOSED
EUMETSAT NWC SAF	Recommendation 39.27 WGII	Recommendation 39.27:EUMETSAT NWC SAF to consider a version of the NWC SAF AMV software that allows running of alternative AMV algorithms. This would support algorithm intercomparisons studies (see also NOAA-WP-34 at CGMS-39).	EUM-WP-11	CGMS-40	CLOSED
NOAA/CIMSS	Recommendation 39.28 WGII	Recommendation 39.28: NOAA/CIMSS to report on additional case study results using NearCasting, and, if practical, to include collaboration with the Severe Weather Forecasting Demonstration Project (SWFDP) for the Lake Victoria region. Deadline CGMS-40.		CGMS-40	CLOSED
CGMS Satellite Operators	Recommendation 39.29 WGII	Recommendation 39.29: CGMS Satellite Operators are invited to advise on satellite products that could be made available in response to the needs of the SWFDP – Eastern Africa, to facilitate the timely provision of such satellite-related information, and to consider the SWFDP needs for the Lake Victoria Basin region in future product development activities.		CGMS-40	CLOSED
CGMS Members	Recommendation 39.30 WGII	Recommendation 39.30: CGMS Members are encouraged to identify opportunities to develop and improve products and services contributing to CIFDP (JCOMM inundaction, coastal).		CGMS-40	CLOSED

CGMS-39 RECOMMENDATIONS – WGIII CONTINGENCY AND CONTINUITY

Actionee	Recommendation	Description	Action feedback/closing document	Deadline	Status
CGMS Members	Recommendation 39.31 WGIII	Recommendation 39.31: WGIII recommended that the baseline be submitted to and endorsed by the plenary with the amendments and clarifications brought by the session, as included in Annex 1 to the WG-III report.	(Baseline was endorsed by CGMS-39 plenary).	CGMS-40	CLOSED
CGMS Members	Recommendation 39.32 WGIII	Recommendation 39.32: R&D or operational satellite operators should consider the provision of some high-accuracy and stable reference instruments as anchors for operational instruments, in particular, for climate purposes.	Reformulated as a new recommendation for CGMS-40.	CGMS-40	CLOSED
CGMS Members	Recommendation 39.33 WGIII	Recommendation 39.33: CGMS Satellite Operators to address the anticipated or potential gaps identified in the WMO Gap Analysis, in particular: • infrared and microwave sounding on the early morning orbit, • hyperspectral sounding missing in some geostationary sectors, • long-term follow-on of radio-occultation constellation, • global precipitation measurement precipitation radar follow-on mission, • long-term Earth Radiation Budget monitoring • limb sounding for high-vertical resolution observations in the stratosphere and mesophere (of temperature, humidity, wind, aerosol, ozone, and other trace gases).	WMO-WP-08 This was reassessed by ET-SAT-7 in April 2012. Progress is recorded on Radio occultation. The five other issues are still outstanding as discussed in WMO-WP-08. It is proposed to review this recommendation after discussion of WMO-WP-08	CGMS-40	CLOSED

CGMS-39 RECOMMENDATIONS – WGIV GLOBAL DATA DISSEMINATION

Actionee	Recommendation	Description	Action feedback/closing document	Deadline	Status
CGMS Members	Recommendation 39.34 WGIV	Recommendation 39.34:CGMS satellite operators to adopt the World Geodetic System (WGS84) and Earth Geodetic Model (EGM-96) geographical reference systems for the normalised geostationary projections in all future geostationary systems and related products, and inform the users accordingly.	EUM-WP-16 (same as for WGIV39.47). Discussed in WGIV.	CGMS-40	CLOSED

II USER REQUIREMENTS

II.1GFCS

Wenjian Zhang (WMO) described the **Global Framework for Climate Services** and recent resolutions on its governance as a result of the WMO Extraordinary Congress in October 2012 (background is provided in **WMO-WP-17**). GFCS provides an excellent opportunity for enabling the structured, coordinated and sustained provision of quality-controlled climate services in response to user needs (initial priority sectors: water, health, food security, disaster risk reduction), globally and at all levels. Zhang stressed that GFCS also posed a tremendous challenge which required anunprecedented level of collaboration between all partners and stakeholders, including CEOS, CGMS, GEO and UN agencies. In 2011, 16th World Meteorological Congress adopted Resolution 19 on the development of an Architecture for Climate Monitoring from Space as the space-based pillar of the GFCS Observations and Monitoring component.

II.2 WIGOS

WMO, through Wenjian Zhang, elaborated on steps toward implementation of the **WMO Integrated Global Observing System** (WIGOS; see also WMO-WP-12), approved by Resolution 50 of the 16th World Meteorological Congress. Although the main challenge of WIGOS is to integrate surface-based observations, improved integration of the space-based observing systems is also required, particularly in the areas of planning of a robust and comprehensive system supporting all WMO application areas, interoperability of instruments, improved consistency of products, standardised data discovery and access, and improved integration of surface and space-based systems. Consistent definition of user requirements through the Rolling Review of Requirements process, and their documentation in the WMO Observing Systems Capability Analysis and Review Tool are further essential building blocks of WIGOS. He called upon CGMS members to support WMO in these efforts. The WMO Executive Council approved the first version of the WIGOS Framework Implementation Plan (WIP v1.0) in May 2012. See also **WMO-WP-12**.

II.3 WCRP

The director of **WCRP**, Ghassem Asrar, briefed CGMS on the role of observations and research in the development of climate services. He stressed the important contribution of satellites to climate research, which improved the degree of certainty in assessing global change among other benefits. He called upon CGMS agencies to maintain and evolve the existing observational foundation by systematic reprocessing, support to reanalysis, and easier data access and utilisation. More research on observing system design to optimally underpin research and applications was needed in times of fiscal pressure. Furthermore, through WMO-WP-16, WCRP sought confirmation by CGMS whether the EUMETSAT representative on the newly-created WCRP Data Advisory Council could also serve as CGMS representative, and whether CGMS supported the provision of satellite-based observational datasets to the Earth System Grid.

The paper recommended CGMS Members to consider contributing global and regional observational data sets to the Earth System Grid (ESG) so as to further facilitate model-data comparisons for climate monitoring, modelling and assessment.

Other climate data record-related recommendations suggested by WCRP were considered well-addressed by other CGMS-40 Actions as well as by the CGMS 3-5 Year High-Level Priority Plan.

II.4 GCOS

WMO-WP-15 reported on the implementation activities for the Global Climate Observing System (GCOS), which is continuing to engage actively with the space-based Earth observation community through feedback between its three technical expert panels for atmosphere, oceans and land and the respective space-based climate observation initiatives. The update of the satellite-based component provides a basis for implementing activities related to climate observations. GCOS is coordinating its activities mainly with the following groups: CGMS, CEOS, and the CEOS Working Group on Climate, and the WMO Space Programme, and in the past couple of years in particular with the ESA Climate Change Initiative and EUMETSAT activities related to Africa and climate services.

Carolin Richter, the director of the **GCOS** Secretariat presented GCOS implementation activities in 2012. Looking back at 20 years of the Programme and its concept, she stressed the successful definition of climate observation user requirements under the aegis of GCOS. This had led to a number of coordinated responses on the part of CGMS agencies, including that of EUMETSAT and ESA. Developing the Architecture for Climate Monitoring from Space was a key activity that GCOS supported. Looking ahead to the next four years, the GCOS Programme plans to review data needs for adaptation and service provision, carry out an assessment of progress and adequacy, and develop a new implementation plan. Richter recommended an ECV inventory supported by agencies, access to climate data records, and emphasis on long-term data preservation. She also stressed the need for a "single voice" response by the EO satellite community to GCOS requirements.

II.5 IOC

IOC-WP-01, on Ocean Surface Vector Wind (OSVW): Research Challenges and Operational Opportunities, described meteorological and oceanographic requirements for OSVW data products; and provided an inventory of unique data products to illustrate that the challenge is not the production of individual data products, but the generation of harmonised datasets for analysis and synthesis of data products. A vision for JCOMM was outlined, with partnership with other international groups as a key element, to assemble an international network to share ideas, data, tools, strategies, and deliverables to improve utilisation of satellite OSVW data products for research and operational applications.

On behalf of IOC, David Halpern presented research challenges and operational opportunities related to ocean surface vector winds. Recognizing the importance of wind speed and direction over oceans for numerical weather prediction and oceanography, he emphasised the need to develop capacity and capability for delivering and utilizing harmonised ocean surface vector wind data products for research and operational oceanography and marine meteorological applications. CGMS members should support action to this effect in coordination with existing activities within JCOMM and its Task Team on Satellites, IWWG, CEOS, and other groups.

Following the presentation, IOC was requested to prepare a guidance paper for CGMS at the next plenary session.

III REPORTS FROM THE SPACE AGENCIES

III.1 Reports on the status of current and future satellite systems by operational Space Agencies

CMA reported on the status of its current at future satellite systems in **CMA-WP-01**. CMA operates the FY geostationary and polar-orbiting systems. The polar orbit observation is carried out by FY-3A in AM orbit, and FY-3B in the PM orbit. Four identical FY geostationary satellites (FY-2C/D/E/F) are currently in orbit. FY-2F was launched in early 2012. It is stored in orbit for future replacement of FY-2D (or FY-2E). CMA is currently developing FY-4 - its next generation of geostationary meteorological satellites, with the launch of the first FY-4 spacecraft scheduled for 2015.

EUMETSAT reported on the status of its current and future satellite systems in **EUM-WP-17**. EUMETSAT operates a fleet of meteorological satellites, and their related ground systems, to deliver reliable and cost-efficient data, images and products. These, in turn, serve requirements for weather and climate monitoring of the national meteorological services in the 26 Member and 5 Cooperating States, and of global partners. The present system includes two generations of geostationary Meteosat satellites. Their global view is complemented by the detailed observations provided by the polar orbiting Metop satellite and the marine observer, Jason-2 - a joint project of space agencies in Europe and the United States.

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
IOC	Plen II.5	40.01	IOC to provide a paper on guidance to CGMS members on sea surface topography. Deadline: CGMS-41		CGMS-41	OPEN	HLPP#3

The IOC expressed particular appreciation to EUMETSAT for the plan to operate Metop-A and -B satellites in parallel during 4 years, which will enhance the coverage of scatterometer observations.

IMD reported on the status of its current and future Indian satellites in **IMD-WP-51**. The currently operational INSAT series of satellites used by India Meteorological Department includes KALPANA-1, INSAT-3A, INSAT-3C (for satellite data communications), Oceansat-II (ocean winds, sun-synchronous), Megha-Tropiques (at 20° inclination, for which the products are under validation).

JMA reported on its current and future satellite systems in **JMA-WP-03**. MTSAT-2 (145°E) is now operational imaging over the West Pacific region with MTSAT-1R (140°E) as backup. MTSAT-1R has continuously performed the same imagery dissemination and data collection services as MTSAT-2 even since the switchover of the imaging function on 1 July, 2010. Its DCS (Data Collection System) has been functioning properly since the satellite began operation. JMA plans to launch Himawari-8 in summer 2014 and commence its operation in 2015, when MTSAT-2 is scheduled to complete its period of operation. JMA also plans to launch Himawari-9 in 2016. As for the manufacturing of Himawari-8 and -9, production is currently in the parts manufacture phase. The imagery data of Himawari-8 and -9 will primarily be disseminated through the internet. JMA has also started a feasibility study on data dissemination using a commercial telecommunication satellite. JMA Web information on Himawari-8 and -9 are available at http://mscweb.kishou.go.jp/himawari89/index.html.

CGMS welcomed the progress made towards the forthcoming launch of Himawari-8 and noted the recent developments of data dissemination plans through a telecommunication satellite, and related provisions to ensure a smooth transition for the users.

KMA-WP-02 summarised the current status of the KMA Communication, Ocean and Meteorological Satellite (COMS) which has been operating at a longitude of 128.2°E since 1 April 2011. Korea Meteorological Administration (KMA) manages the Meteorological Imager operation and data distribution and Korea Ocean Satellite Center (KOSC) has responsibility for ocean observations. Tentative plans for COMS follow-on were also reported, GEO-KOMPSAT-2A (meteorological mission) and -2B (ocean and environmental mission) which are scheduled to be launched in 2017 and 2018, respectively.

CGMS highlighted the interministerial cooperation established between KMA, KARI and the Korean Ocean Research and Development Institute (KORDI) for GEO-Kompsat 2B. Noting the forthcoming launch of Kompsat-5 with a SAR instrument (COSI), WMO wished that KARI could join the Polar Space Task Group (PSTG) and its SAR Coordination Working Group to participate in the international effort on cryosphere monitoring.

NOAA reported on the status of its current and future programmes in **NOAA-WP-33**. NOAA manages a constellation of four geostationary and eleven polar orbiting meteorological spacecraft, including six military satellites, from the Satellite Operations Control Center (SOCC) in Suitland, Maryland. These satellites provide continuous observations of weather conditions and environmental features of the western hemisphere, monitor global climate change, verify ozone depletion and land surface change, monitor the critical space environmental parameters, and support search and rescue efforts across the globe. The Working Paper addressed the status of the geosynchronous and low-earth-orbiting spacecraft constellations as of 12 October 2012.
In **ROSH-WP-04**, ROSHYDROMET and ROSCOSMOS presented the current status of polar-orbiting meteorological satellite Meteor-M N°1 (launched in 2009) and geostationary meteorological satellite Electro-L N°1 (launched in 2011). It is expected that by 2015, there should be three meteorological satellites and one oceanographical satellite launched. The future Russian geostationary constellation will consist of three Electro-L series satellites by the year 2015. A constellation of highly-elliptical orbit satellites Arctica-M is now under development. These two satellites will provide continuous observations over the Arctic region. The launches are planned for the years 2015 and 2016.

IOC expressed interest in the planned scatterometer mission aboard Meteor-M3 and invited Roshydromet to provide an update on this mission at the International Ocean Vector Wind Science Team (IOVWST) Meeting in Hawaii in May 2013. CGMS noted the planned constellation for Electro-L and M with three positions, 76°E (primary location in the CGMS baseline), 14°W and 166°E. It was indicated that the imaging payload of the Arctica satellites would be similar to the Electro-L2 payload, however with enhanced electromagnetic protection.

The information provided by CGMS satellite operators in their reports above was included by WMO in the OSCAR database (http://www.wmo-sat.info/oscar/spacecapabilities) from which the summarised "satellite status" pages reproduced below is generated on behalf of CGMS. This reflects the status at the time of editing the CGMS-40 report. For updated information, please visit: http://www.wmo.int/pages/prog/sat/satellitestatus.php

CURRENT GEOSTATIONARY SATELLITES

Sector	Long	Name	Operator	Launch	Instruments	Details
East Pacific	135 ° W	GOES-15 (Operational)	NOAA	2010-03-04	DCIS GEOS&R IMAGER (GOES 12-15) SEM/EPS SEM/HEPAD SEM/MAG SEM/XRS SOUNDER SXI	• Initially stored in stand-by position at 89.5°W. • Moved to 135°W in December 2011 to replace GOES-11 as GOES-W.
West Atlantic	105 ° W	GOES-14 (Operational)	NOAA	2009-06-27	DCIS GEOS&R IMAGER (GOES 12-15) SEM/EPS SEM/HEPAD SEM/MAG SEM/XRS SOUNDER SXI	• Initially stored in back-up position at 105°W • From 23 Sept to 19 Oct 2012, moved at towards 75°W to back-up GOES-13, stopped at 89.5°W after GOES-13 service recovery • From 19 Dec 2012 to 6 Feb 2013, moved back towards 105°W at 0.34 degrees/day. • Activated as back-up for GOES-13 on 23 May 2013
	75 ° W	GOES-13 (Degraded)	NOAA	2006-05-24	DCIS GEOS&R IMAGER (GOES 12-15) SEM/EPS SEM/HEPAD SEM/MAG SEM/XRS SOUNDER SXI	• Initially stored in back-up position at 105°W. • Moved to 75°W in January 2009 to replace GOES-12 as GOES-E. • IMAGER and SOUNDER operations interrupted from 23 Sept to 18 Oct 2012. • SXI and the XRS are not nominal. • In storage following an anomaly occurred on 22 May 2013
	60 ° W	GOES-12 (S-America) (Operational)	NOAA	2010-05-10	DCIS GEOS&R IMAGER (GOES 12-15) SEM/EPS SEM/HEPAD SEM/MAG SOUNDER	• Re-location of GOES-12 for South America coverage (launch date should be understood as the start of the South America service). • No fuel remaining for inclination control. • SXI and X-Ray positioner failed in 2007.
East Atlantic	0 °	Meteosat-10 (Operational)	EUMETSAT	2012-07-05	DCS (Meteosat) GEOS&R GERB SEVIRI	• Initially placed at 3.4°, it has replaced Meteosat-9 at 0° as of 21 January 2013.

CURRENT GEOSTATIONARY SATELLITES

Sector	Long	Name	Operator	Launch	Instruments	Details
East Atlantic	3.6 ° E	Meteosat-8 (Operational)	EUMETSAT	2002-08-28	DCS (Meteosat) GEOS&R GERB SEVIRI	• HRIT and LRIT transponders failed shortly after launch, data disseminated by EUMETCast. • In April 2007, moved to 9.5°E for Rapid Scan Service (RSS) of the European sector at 5 min intervals; RSS became operational on 13 May 2008.
		Meteosat-9 (Stand-by)	EUMETSAT	2005-12-21	DCS (Meteosat) GEOS&R GERB SEVIRI	• Primary operational satellite at 0° as of 11 April 2007. Replaced by Meteosat-10 as of 21 January 2013. To take over the RSS service from Meteosat-8 in April 2013. • HRIT not activated. High Rate Information is disseminated in near-real-time by EUMETCast
Indian Ocean	55 ° E	INSAT-3E (Operational)	ISRO	2003-09-08		
	57.3 ° E	Meteosat-7 (IODC) (Operational)	EUMETSAT	2006-12-05	DCS (Meteosat) MVIRI	• Re-location of Meteosat-7 over the Indian Ocean. • The launch date should be understood as the start of the IODC service. • WEFAX used only for internal purposes.
	74 ° E	INSAT-3C (Operational)	ISRO	2002-01-24		
	74 ° E	Kalpana-1 (Operational)	ISRO	2002-09-12	DCS (INSAT) VHRR (INSAT)	

CURRENT GEOSTATIONARY SATELLITES

Sector	Long	Name	Operator	Launch	Instruments	Details
Indian Ocean	76 ° E	Electro-L N1 (Operational)	RosHydroMet	2011-01-20	DCS (Electro) GEOS&R (Electro) GGAK-E/DIR-E GGAK-E/FM-E GGAK-E/GALS-E GGAK-E/ISP-2M GGAK-E/SKIF-6 GGAK-E/SKL-E GGAK-E/VUSS-E MSU-GS	• MSU-GS: calibration issues and excessive noise in some IR channels. • GGAK: significant limitations.
	86.5 ° E	FY-2D (Operational)	CMA	2006-11-15	DCS (FY) S-VISSR (FY-2C/D/E) SEM (FY 2&4)	• Secondary operational position • Scanning schedules of the primary and secondary spacecraft are interleaved.
	93.5 ° E	INSAT-3A (Operational)	ISRO	2003-04-10	CCD DCS (INSAT) SAS&R VHRR (INSAT)	
	105 ° E	FY-2E (Operational)	CMA	2004-10-19	DCS (FY) S-VISSR (FY-2C/D/E) SEM (FY 2&4)	• Primary operational position. • Scanning schedules of the primary and secondary spacecraft are interleaved
West Pacific	112.5 ° E	FY-2F (Stand-by)	CMA	2012-01-14	DCS (FY) S-VISSR (FY-2F/G/H) SEM (FY 2&4)	
	128.2 ° E	COMS-1 (Operational)	KMA	2010-06-26	GOCI MI	
	140 ° E	Himawari-6 (MTSAT-1R) (Operational)	JMA	2005-02-26	DCS (Himawari) JAMI	• Imagery mission taken up by MTSAT-2 on 1st July 2010. • Provision of HRIT and LRIT service for MTSAT-2 data • DCP service.
	145 ° E	Himawari-7 (MTSAT-2) (Operational)	JMA	2006-02-18	DCS (Himawari) IMAGER (MTSAT-2)	• Primary operational spacecraft replacing MTSAT-1R as of 1st July 2010. • Data dissemination performed by MTSAT-1R. • DCP mission performed by MTSAT-1R.

FUTURE GEOSTATIONARY SATELLITES

Sector	Long	Name	Operator	Launch	Instruments	Details
East Pacific	137 ° W	GOES-R (Planned)	NOAA	≥2015	ABI DCIS EXIS GEOS&R GLM SEISS/EHIS SEISS/MPS SEISS/SGPS SEM/MAG SUVI	• Longitude (137°W or 75°W) to be confirmed in due time.
	137 ° W	GOES-T (Planned)	NOAA	≥2019	ABI DCIS EXIS GEOS&R GLM SEISS/EHIS SEISS/MPS SEISS/SGPS SEM/MAG SUVI	• Longitude (137°W or 75°W) to be confirmed in due time.
West Atlantic	75 ° W	GOES-S (Planned)	NOAA	≥2017	ABI DCIS EXIS GEOS&R GLM SEISS/EHIS SEISS/MPS SEISS/SGPS SEM/MAG SUVI	• Longitude (137°W or 75°W) to be confirmed in due time.
	75 ° W	GOES-U (Planned)	NOAA	≥2024	ABI DCIS EXIS GEOS&R GLM SEISS/EHIS SEISS/MPS SEISS/SGPS SEM/MAG SUVI	• Longitude (137°W or 75°W) to be confirmed in due time.

FUTURE GEOSTATIONARY SATELLITES

Sector	Long	Name	Operator	Launch	Instruments	Details
East Atlantic	14.5 ° W	Electro-L N2 (Planned)	RosHydroMet	≥2013	DCS (Electro) GEOS&R (Electro) GGAK-E/DIR-E GGAK-E/FM-E GGAK-E/GALS-E GGAK-E/ISP-2M GGAK-E/SKIF-6 GGAK-E/SKL-E GGAK-E/VUSS-E MSU-GS	
	14.5 ° W	Electro-M N2 (Considered)	RosHydroMet	≥2017	DCS (Electro) ERBR GEOS&R (Electro) GGAK-E/DIR-E GGAK-E/FM-E GGAK-E/GALS-E GGAK-E/ISP-2M GGAK-E/SKIF-6 GGAK-E/SKL-E GGAK-E/VUSS-E HIS LM MSU-GSM	
	0 °	MTG-S1 (Planned)	EUMETSAT	≥2020	DCS (Meteosat) GEOS&R IRS Sentinel-4	
	0 °	MTG-S2 (Planned)	EUMETSAT	≥2028	DCS (Meteosat) GEOS&R IRS Sentinel-4	
	0 °	Meteosat-11 (Planned)	EUMETSAT	≥2015	DCS (Meteosat) GEOS&R GERB SEVIRI	
	9.5 ° E	MTG-I1 (Planned)	EUMETSAT	≥2018	DCS (Meteosat) FCI GEOS&R LI	

FUTURE GEOSTATIONARY SATELLITES

Sector	Long	Name	Operator	Launch	Instruments	Details
Indian Ocean	9.5 ° E	MTG-I2 (Planned)	EUMETSAT	≥2023	DCS (Meteosat) FCI GEOS&R LI	
	9.5 ° E	MTG-I3 (Planned)	EUMETSAT	≥2026	DCS (Meteosat) FCI GEOS&R LI	
	9.5 ° E	MTG-I4 (Planned)	EUMETSAT	≥2031	DCS (Meteosat) FCI GEOS&R LI	
	74 ° E	INSAT-3D-prime (Planned)	ISRO	≥2014	DCS (INSAT) IMAGER (INSAT-3D) SAS&R SOUNDER (INSAT-3D)	
	76 ° E	Electro-M N1 (Considered)	RosHydroMet	≥2016	DCS (Electro) ERBR GEOS&R (Electro) GGAK-E/DIR-E GGAK-E/FM-E GGAK-E/GALS-E GGAK-E/ISP-2M GGAK-E/SKIF-6 GGAK-E/SKL-E GGAK-E/VUSS-E HIS LM MSU-GSM	
	82 ° E	INSAT-3D (Planned)	ISRO	≥2013	DCS (INSAT) IMAGER (INSAT-3D) SAS&R SOUNDER (INSAT-3D)	
	86.5 ° E	FY-2H (Planned)	CMA	≥2015	DCS (FY) S-VISSR (FY-2F/G/H) SEM (FY 2&4)	

FUTURE GEOSTATIONARY SATELLITES

Sector	Long	Name	Operator	Launch	Instruments	Details
Indian Ocean	86.5 ° E	FY-4A (Planned)	CMA	≥2015	AGRI DCS (FY) GIIRS LMI SEP	
	86.5 ° E	FY-4C (Planned)	CMA	≥2019	AGRI DCS (FY) GIIRS LMI SEP SXEUV	
	86.5 ° E	FY-4E (Planned)	CMA	≥2025	AGRI DCS (FY) GIIRS LMI SEP SXEUV	
	86.5 ° E	FY-4G (Planned)	CMA	≥2031	AGRI DCS (FY) GIIRS LMI SEP SXEUV	
	105 ° E	FY-2G (Planned)	CMA	≥2013	DCS (FY) S-VISSR (FY-2F/G/H) SEM (FY 2&4)	
	105 ° E	FY-4B (Planned)	CMA	≥2017	AGRI DCS (FY) GIIRS LMI SEP SXEUV	
	105 ° E	FY-4D (Planned)	CMA	≥2021	AGRI DCS (FY) GIIRS LMI SEP SXEUV	

FUTURE GEOSTATIONARY SATELLITES

Sector	Long	Name	Operator	Launch	Instruments	Details
Indian Ocean	105 ° E	FY-4F (Planned)	CMA	≥2028	AGRI DCS (FY) GIIRS LMI SEP SXEUV	
West Pacific	128.2 ° E	GEO-KOMPSAT-2A (Planned)	KMA	≥2017	AMI	• Longitude (128.2°E or 116.2°E) to be confirmed in due time
	128.2 ° E	GEO-KOMPSAT-2B (Planned)	KMA	≥2018	GEMS GOCI-II	
	140 ° E	Himawari-8 (Planned)	JMA	≥2014	AHI DCS (Himawari)	
	140 ° E	Himawari-9 (Planned)	JMA	≥2016	AHI DCS (Himawari)	
	166 ° E	Electro-L N3 (Planned)	RosHydroMet	≥2015	DCS (Electro) GEOS&R (Electro) GGAK-E/DIR-E GGAK-E/FM-E GGAK-E/GALS-E GGAK-E/ISP-2M GGAK-E/SKIF-6 GGAK-E/SKL-E GGAK-E/VUSS-E MSU-GS	
	166 ° E	Electro-M N3 (Considered)	RosHydroMet	≥2021	DCS (Electro) ERBR GEOS&R (Electro) GGAK-E/DIR-E GGAK-E/FM-E GGAK-E/GALS-E GGAK-E/ISP-2M GGAK-E/SKIF-6 GGAK-E/SKL-E GGAK-E/VUSS-E HIS LM MSU-GSM	

FUTURE HIGHLY ELLIPTICAL ORBIT SATELLITES

Orbit	Inclination	Name	Operator	Launch	Instruments	Details
Molniya	63.4°	Arctica-M N1 (Planned)	RosHydroMet	≥2015	DCS/A GGAK-E/DIR-E GGAK-E/FM-E GGAK-E/GALS-E GGAK-E/ISP-2M GGAK-E/SKIF-6 GGAK-E/SKL-E GGAK-E/VUSS-E MSU-GS/A	
Molniya	63.4°	Arctica-M N2 (Planned)	RosHydroMet	≥2016	DCS/A GGAK-E/DIR-E GGAK-E/FM-E GGAK-E/GALS-E GGAK-E/ISP-2M GGAK-E/SKIF-6 GGAK-E/SKL-E GGAK-E/VUSS-E MSU-GS/A	

CURRENT SUN-SYNCHRONOUS LEO SATELLITES

Sector	ECT	Altitude	Name	Operator	Launch	Instruments	Details
Early Morning Orbit	05:06 desc	850 km	DMSP-F15 (Degraded)	DoD	1999-12-12	OLS SEM (DMSP) SSM/I SSM/T SSM/T-2	• SSM/I 23 GHz channel unusable. • SSM-T2 failed
	05:37 desc	850 km	DMSP-F17 (Operational)	DoD	2006-11-04	OLS SESS/SSI/ES-2 SESS/SSJ5 SESS/SSM SESS/SSULI SESS/SSUSI SSMIS	
	06:05 desc	850 km	DMSP-F13 (Degraded)	DoD	1995-03-24	OLS SEM (DMSP) SSM/I SSM/T	• Tape recorder failed 19th Nov 2009, thus no global data.
	06:25 desc	850 km	DMSP-F16 (Operational)	DoD	2003-10-18	OLS SESS/SSI/ES-2 SESS/SSJ5 SESS/SSM SESS/SSULI SESS/SSUSI SSMIS	
Morning Orbit	07:03 desc	810 km	NOAA-17 (Degraded)	NOAA	2002-06-24	AMSU-A AMSU-B AVHRR/3 DCS/2 HIRS/3 S&RSAT SBUV/2 SEM/MEPED SEM/TED	• LAC failed soon after launch. • AMSU-A turned off on October 2003. • The 3 channels at 183 GHz of AMSU-B failed on December 2009. • AVHRR/3 turned off on October 2010. • The ECT, initially 10:00 desc, is drifting at a rate of -4.62 min/month. • Decommissioning foreseen on 10 April 2013.
	08:08 desc	850 km	DMSP-F18 (Operational)	DoD	2009-10-18	OLS SESS/SSI/ES-2 SESS/SSJ5 SESS/SSM SESS/SSULI SESS/SSUSI SSMIS	

CURRENT SUN-SYNCHRONOUS LEO SATELLITES

Sector	ECT	Altitude	Name	Operator	Launch	Instruments	Details
Morning Orbit	08:37 desc	849 km	NOAA-16 (Degraded)	NOAA	2000-09-21	AMSU-A AMSU-B AVHRR/3 DCS/2 HIRS/3 S&RSAT SBUV/2 SEM/MEPED SEM/TED	• LAC and APT failed soon after launch. • AMSU-A, AVHRR/3, HIRS/3, SBUV and S&RSAT not nominal. • The ECT, initially 14:00 asc, is drifting at a rate of 3.47 min/ month.
Morning Orbit	09:10 desc	826 km	Meteor-M N1 (Degraded)	RosHydroMet	2009-09-17	GGAK-M/KGI-4C GGAK-M/MSGI-MKA KMSS MSU-MR MTVZA-GY SSPD Severjanin-M	• MSU-MR instrument is functional with limitations (calibration issues and higher noise level in the IR channels). • MTVZA instrument non-operational. • Severjanin instrument non-operational; • DCS non-operational. • GGAK-M is operational with significant limitations. • LRPT non-operational.
	09:30 desc	817 km	Metop-A (Operational)	EUMETSAT	2006-10-19	A-DCS AMSU-A ASCAT AVHRR/3 GOME-2 GRAS HIRS/4 IASI MHS S&RSAT SEM/MEPED SEM/TED	• LRPT failed soon after launch, one AHRPT transmitter failed 6 months later. • Global data disseminated by EUMETCast became the primary dissemination system. • As of Sept 2008 the redundant AHRPT unit is utilised for a partial coverage, enabling the reception and retransmission of NRT data by EARS. • Since June 2011 the latency of global data is reduced by the use of the Antarctic Data Acquisition station (ADA) at McMurdo. • The AMSU-A channel 54.95 GHz failed in 2009.
	09:30 desc	817 km	Metop-B (Operational)	EUMETSAT	2012-09-17	A-DCS AMSU-A ASCAT AVHRR/3 GOME-2 GRAS HIRS/4 IASI MHS S&RSAT SEM/MEPED SEM/TED	• Commissioning phase lasting until April 2013, then replacing MetOp-A for operations.

CURRENT SUN-SYNCHRONOUS LEO SATELLITES

Sector	ECT	Altitude	Name	Operator	Launch	Instruments	Details
	10:15 desc	836 km	FY-3A (Degraded)	CMA	2008-05-27	ERM-1 IRAS MERSI-1 MWHS-1 MWRI MWTS-1 SBUS SEM (FY 1&3A/B) SIM-1 TOU VIRR (FY-3)	• SBUS, MWRI, ERM and IRAS no longer operable.
Afternoon orbit	13:25 asc	834 km	Suomi-NPP (Operational)	NASA	2011-10-28	ATMS CERES CrIS OMPS-limb OMPS-nadir VIIRS	
	13:34 asc	870 km	NOAA-19 (Operational)	NOAA	2009-02-06	A-DCS AMSU-A AVHRR/3 HIRS/4 MHS S&RSAT SBUV/2 SEM/MEPED SEM/TED	• MHS channel 183.311 ± 1.0 GHz noisy since December 2009. • AMSU-A channel 55.5 GHz noisy since December 2009 • The ECT, initially 14:00 asc, is drifting at a rate of 0.35 min/ month.
	13:40 asc	836 km	FY-3B (Operational)	CMA	2010-11-04	ERM-1 IRAS MERSI-1 MWHS-1 MWRI MWTS-1 SBUS SEM (FY 1&3A/B) SIM-1 TOU VIRR (FY-3)	• ERM no longer operable.

CURRENT SUN-SYNCHRONOUS LEO SATELLITES

Sector	ECT	Altitude	Name	Operator	Launch	Instruments	Details
	14:58 asc	854 km	NOAA-18 (Operational)	NOAA	2005-05-20	AMSU-A AVHRR/3 DCS/2 HIRS/4 MHS S&RSAT SBUV/2 SEM/MEPED SEM/TED	• HIRS/4 noisy since launch, finally declared unusable on May 2009. • The ECT, initially 13:30 asc, is drifting at a rate of 2.98 min/month.
Afternoon orbit	15:47 asc	852 km	DMSP-F14 (Degraded)	DoD	1997-04-04	OLS SEM (DMSP) SSM/I SSM/T SSM/T-2	• F-14 tape recorder failed Aug 2008, thus no global data. • SSM/I, SSM/T and SSM/T2 no longer operable.
	16:44 asc	807 km	NOAA-15 (Degraded)	NOAA	1998-05-13	AMSU-A AMSU-B AVHRR/3 DCS/2 HIRS/3 S&RSAT SEM/MEPED SEM/TED	• LAC failed soon after launch. • HIRS/3 turned off in June 2009. • AMSU-B turned off in March 2011. • AMSU-A and AVHRR/3 not nominal. • The ECT, initially 07:30 desc, is drifting at a rate of 0.72 min/month.

FUTURE SUN-SYNCHRONOUS LEO SATELLITES

Sector	ECT	Altitude	Name	Operator	Launch	Instruments	Details
To be defined			Meteor-M N3 (Planned)	RosHydroMet	≥2015	OCS Radiomet SAR-X (Meteor-M N3) SCAT (Meteor-M N3) SZS	
			Meteor-MP N3 (Planned)	RosHydroMet	≥2019	MMIS OCS SAR-X (Meteor-M N3) SCAT (Meteor-M N3) SZS	
Early Morning Orbit	05:30 desc	850 km	DMSP-S19 (Planned)	DoD	≥2014	OLS SESS/SSI/ES-2 SESS/SSJ5 SESS/SSM SESS/SSULI SESS/SSUSI SSMIS	
	05:30 desc	850 km	DMSP-S20 (Planned)	DoD	≥2020	OLS SESS/SSI/ES-2 SESS/SSJ5 SESS/SSM SESS/SSULI SESS/SSUSI SSMIS	
Morning Orbit	09:30 desc	817 km	Metop-SG-A1 (Considered)	EUMETSAT	≥2021	3MI IASI-NG MWS MetImage RO Sentinel-5	
	09:30 desc	817 km	Metop-SG-A2 (Considered)	EUMETSAT	≥2028	3MI IASI-NG MWS MetImage RO Sentinel-5	

FUTURE SUN-SYNCHRONOUS LEO SATELLITES

Sector	ECT	Altitude	Name	Operator	Launch	Instruments	Details
	09:30 desc	817 km	Metop-SG-A3 (Considered)	EUMETSAT	≥2035	3MI IASI-NG MWS MetImage RO Sentinel-5	
	09:30 desc	817 km	Metop-SG-B1 (Considered)	EUMETSAT	≥2022	A-DCS ICI MWI (MetOp-SG) RO SCA (Scatterometer)	
	09:30 desc	817 km	Metop-SG-B2 (Considered)	EUMETSAT	≥2029	A-DCS ICI MWI (MetOp-SG) RO SCA (Scatterometer)	
Morning Orbit	09:30 desc	817 km	Metop-SG-B3 (Considered)	EUMETSAT	≥2036	A-DCS ICI MWI (MetOp-SG) RO SCA (Scatterometer)	
	09:30 desc	836 km	Meteor-M N2 (Planned)	RosHydroMet	≥2013	GGAK-M/KGI-4C GGAK-M/MSGI-MKA IKFS KMSS MSU-MR MTVZA-GY SSPD Severjanin-M	
	09:30 desc	830 km	Meteor-MP N1 (Planned)	RosHydroMet	≥2017	ACS-limb ACS-nadir BRLK “Briz” GGAK-M/KGI-4C GGAK-M/MSGI-MKA IKFS-2 MSU-MR-MP MTVZA-GY-MP Radiomet	

FUTURE SUN-SYNCHRONOUS LEO SATELLITES

Sector	ECT	Altitude	Name	Operator	Launch	Instruments	Details
	09:30 desc	817 km	Metop-C (Planned)	EUMETSAT	≥2017	A-DCS AMSU-A ASCAT AVHRR/3 GOME-2 GRAS IASI MHS	
	09:30 desc	820 km	Meteor-M N2-1 (Planned)	RosHydroMet	≥2014	GGAK-M/KGI-4C GGAK-M/MSGI-MKA IKFS KMSS MSU-MR MTVZA-GY SSPD Severjanin-M	
	10:00 desc	836 km	FY-3C (Planned)	CMA	≥2013	ERM-1 GNOS IRAS MERSI-1 MWHS-2 MWRI MWTS-2 SBUS SES/IPM SES/SEM SES/WAI SIM-1 TOU VIRR (FY-3)	
Morning Orbit	10:00 desc	836 km	FY-3E (Planned)	CMA	≥2016	ERM-2 GNOS HIRAS MERSI-2 MWHS-2 MWTS-2 OMS-limb OMS-nadir SES/IPM SES/SEM SES/WAI SIM-2 WindRAD	

FUTURE SUN-SYNCHRONOUS LEO SATELLITES

Sector	ECT	Altitude	Name	Operator	Launch	Instruments	Details
	10:00 desc	836 km	FY-3G (Planned)	CMA	≥2020	ERM-2 GNOS HIRAS MERSI-2 MWHS-2 MWTS-2 OMS-limb OMS-nadir SES/IPM SES/SEM SES/WAI SIM-2 WindRAD	
Afternoon orbit	13:30 asc	833 km	JPSS-1 (Planned)	NOAA	≥2017	ATMS CERES CrIS OMPS-nadir SEM-N/EPS SEM-N/HES SEM-N/SSJ5 VIIRS	
	13:30 asc	833 km	JPSS-2 (Planned)	NOAA	≥2022	ATMS CERES-FO CrIS OMPS-limb OMPS-nadir SEM-N/EPS SEM-N/HES SEM-N/SSJ5 VIIRS	
	13:30 asc	TBD km	JPSS-FF-1 (Planned)	NOAA	≥2016	A-DCS S&RSAT TSIS	
	13:30 asc	TBD km	JPSS-FF-2 (Planned)	NOAA	≥2021	A-DCS S&RSAT TSIS	

FUTURE SUN-SYNCHRONOUS LEO SATELLITES

Sector	ECT	Altitude	Name	Operator	Launch	Instruments	Details
Afternoon orbit	14:00 asc	836 km	FY-3D (Planned)	CMA	≥2014	GAS GNOS HIRAS MERSI-2 MWHS-2 MWRI MWTS-2 SES/IPM SES/SEM SES/WAI	
	14:00 asc	836 km	FY-3F (Planned)	CMA	≥2018	GAS GNOS HIRAS MERSI-2 MWHS-2 MWRI MWTS-2 SES/IPM SES/SEM SES/WAI	
	15:30 asc	830 km	Meteor-MP N2 (Planned)	RosHydroMet	≥2018	ACS-limb ACS-nadir BRLK “Briz” GGAK-M/KGI-4C GGAK-M/MSGI-MKA IKFS-2 MSU-MR-MP MTVZA-GY-MP Radiomet	
	15:30 asc	820 km	Meteor-M N2-2 (Planned)	RosHydroMet	≥2015	GGAK-M/KGI-4C GGAK-M/MSGI-MKA IKFS KMSS MSU-MR MTVZA-GY SSPD Severjanin-M	

CURRENT DRIFTING LEO SATELLITES

Inclination	Altitude	Name	Operator	Launch	Instruments	Details
66°	1324 km	JASON-1 (Operational)	NASA	2001-12-07	• DORIS • JMR • LRA (NASA) • Poseidon-2 • TRSR	• TRSR no longer functional. • Orbit lowered to 1324 km from the original 1336 km in April-May 2012 to perform a geodetic mission.
66°	1336 km	JASON-2 (Operational)	NASA	2008-06-20	AMR DORIS LRA (NASA) Poseidon-3 TRSR	

FUTURE DRIFTING LEO SATELLITES

Inclination	Altitude	Name	Operator	Launch	Instruments	Details
		FY-3RM-1 (Considered)	CMA	≥2015	• Ku/KaPR • MWHS-2 • MWRI • MWTS-2	
		FY-3RM-2 (Considered)	CMA	≥2020	Ku/KaPR MWHS-2 MWRI MWTS-2	
66°	1336 km	JASON-3 (Planned)	NASA	≥2014	AMR DORIS LRA (NASA) Poseidon-3B TRSR	

III.2 Reports on the status of current and future satellite systems by R&D Space Agencies

CGMS was informed of the status of Earth Observing System of CNSA in Working Paper **CNSA-WP-01**. Currently, the system is comprised of the FY satellite series, HY-1B/-2, HJ-1A/1B, and ZY-3 satellites. In the future, China plans to launch several satellite systems, including FY-4 (in 2015), CFOSAT (in 2014), CBERS 03/04, and HJ-1C (in 2012). **CNSA-WP-02** provided a dedicated update on the HY-2 satellite.

WMO encouraged CNSA to support open data exchange. CNSA recalled that its role was to develop new systems and to support the transition from research to operational applications. The HY-2A mission is operated by the National Satellite Ocean Application Service (NSOAS); detailed information on HY-2A data is provided on the NSOAS homepage (www.nsoas.gov.cn/NSOAS_En /index.html). CGMS noted the imminent launch of the HJ-1C with a SAR and its potential contribution to ice monitoring. (HJ-1C was launched on 18 November 2012).

Canada Space Agency informed CGMS about the status of its current and future satellites in **CSA-WP-51**. Currently CSA operates the two LEO satellites Radarsat-1 & 2 and the R&D satellites MOPITT, OSIRIS and SCISAT. CSA plans to launch a Radarsat constellation mission to ensure continuity of SAR-C data in the future and a HEO Polar Communications and Weather mission (PCW) which will provide GEO like imagery, high rate communications services and continuously collected space weather data.

CGMS noted the ongoing developments by CSA regarding atmospheric composition including limb sounding, arctic imagery from highly elliptical orbit, SAR monitoring, and space weather. CSA confirmed that, in the Private-Public-Partnership scenarios currently under investigation, the public operator would guarantee the support to the WMO policy for meteorological data exchange as a central principle.

CGMS was informed of the status of the current ESA Earth Observation (EO) missions in **ESA-WP-02**. Two of them, MSG and MetOp are in cooperation with EUMETSAT. ERS-2, the second ESA EO mission, launched in 1995, was switched off in July 2011 after thirteen years of data acquisition. The Envisat mission, launched in 2002, was terminated on 8 April 2012, after over ten years of successful operation, following a sudden, unexplained loss of communication with the satellite. The Gravity field and steady-state Ocean Circulation Explorer, GOCE, the first Explorer satellite launched on 17 March 2009, completed its nominal mission in April 2011. GOCE continues to provide top-quality gravity field data. The CryoSat-2 satellite was launched on 8 April 2010. The first CryoSat Arctic sea-ice thickness map was presented in June 2011. Release of systematic CryoSat products (Level 1b and 2) to the scientific community is ongoing. The SMOS satellite was launched on 2 November 2009. SMOS Level 2 data products were released at the end of October 2010. All reprocessed Level 1 and 2 data are available from the ESA Cal/Val portal since mid-March 2012. About 4000 data user projects worldwide use data from the ESA EO missions and this number is on the increase. The total volume of ESA EO mission data exceeds 100 Terabytes per year. CGMS was further informed of the status of the future ESA Earth Observation missions. Two of them, MTG and Post EPS (now EPS SG) are in cooperation with EUMETSAT. The Living Planet Programme has three lines of implementation: Earth Explorer satellites, Earth Watch satellites plus services and applications demonstration. A 7th Core Explorer is under selection out of 3 pre-selected. Progress in the preparation of the forthcoming Explorer missions ADM-AEOLUS, Swarm and EarthCARE was also described. GMES represents the major new initiative of European efforts in Earth Observation. The start of the GMES pre-operational services took place in 2008, with the provision of the relevant data. The first of the GMES dedicated satellites (the "Sentinels") will be launched in 2013. Related activities are under way at all stages within the Agency, the EC and at Member States level. CGMS was also informed of the status of the Earthwatch Programme Element, Global Monitoring of Essential Climate Variables (also known as the 'ESA Climate Change Initiative' or CCI). The CCI Programme has continued to progress well and the Programme remains on target to achieve its phase 1 objectives, with a mid-term review held on 27 September 2012.

JAXA reported on its current and future satellite systems in **JAXA-WP-01**. JAXA currently operates GOSAT, Ibuki and GCOM-W1, Shizuku. GOSAT was launched on 23 January 2009. The data products are distributed through the GOSAT User Interface Gateway (GUIG). GCOM-W1 was launched on 18 May 2012. The initial calibration and checkout are being performed, and the observation results are being released through JAXA press releases and its website. The developments of the future satellites ALOS-2, GPM/DPR, EarthCARE/CPR and GCOM-C1 are under way. Both ALOS-2 and the GPM core satellite will be launched in JFY2013. EarthCARE will be launched in JFY2015. GCOM-C1 will be launched in JFY2015 or later.

NASA reported on its 15 Earth Science missions in **NASA-WP-01**. Although all missions were conceived as research missions, it has turned out that the efficiency of the communications and ground data handling systems has supported operational and near-real-time applications. All missions are currently producing data, but several also show

signs of aging. NASA's Earth Science Programme is implementing a balanced and robust plan to accomplish a broad set of critical Earth observation measurements from space. The programme advances knowledge of the integrated Earth system, the global atmosphere, oceans (including sea ice), land surfaces, ecosystems and interactions between all elements, including the impacts of humans. A balance of satellite measurements, science research, technology development and applications are needed to address a complex global Earth system. NASA plans for the launch of 14 missions and 2 instruments in the future.

The status of ROSCOSMOS satellite systems was covered in **ROSH-WP-04** (see section III.1).

The information provided by CGMS satellite operators in their reports above was included by WMO in the OSCAR database (http://www.wmo-sat.info/oscar/spacecapabilities) from which the summarised "satellite status" pages reproduced below is generated on behalf of CGMS. This reflects the status at the time of editing the CGMS-40 report. For updated information, please visit: http://www.wmo.int/pages/prog/sat/satellitestatus.php

CURRENT R&D SATELLITES (ORDERED BY LAUNCH DATE)

Acronym	Operator	ECT / Incl.	Launch	Instruments	Details
TRMM (Operational)	NASA	35°	1997-11-27	CERES LIS PR TMI VIRS	• CERES failed 9 months after launch. • In August 2001 the orbit was moved from the original 350 km to 402 km to extend lifetime and instrument swath.
SPOT-4 (Operational)	CNES	10:30 desc	1998-03-24	DORIS HRVIR PASTEC POAM Végétation	• POAM inactive since 1st May 2006. • PASTEC defective since 2007 and finally deactived on end 2011.
EOS-Terra (Operational)	NASA	10:30 desc	1999-12-18	ASTER CERES MISR MODIS MOPITT	ASTER short-wave channels not funtional since 2008.
ACRIMSat (Operational)	NASA	10:50 desc	1999-12-20	ACRIM-III	
NMP-EO-1 (Operational)	NASA	09:45 desc	2000-11-21	ALI Hyperion LAC	• LAC failed soon after launch. • Operations extended beyond the originally envisaged lifetime to support design and preparation of the Landsat Data Continuity Mission.
SAC-C (Operational)	CONAE	10:20 desc	2000-11-21	DCS (SAC) GOLPE HRTC HSTC IST MMC/Ørsted-2 MMRS	
PROBA-1 (Operational)	ESA	08:30 desc	2001-10-22	CHRIS SREM	• The orbit is drifting from the original 10:30 desc ECT.
GRACE (2 sats) (Operational)	NASA	89°	2002-03-17	BlackJack (GRACE) HAIRS LRR (DLR) SCA (Star Camera Assembly) SuperSTAR	• The orbital height, initially 485 km, slowly decreases due to atmospheric drag.

CURRENT R&D SATELLITES (ORDERED BY LAUNCH DATE)

Acronym	Operator	ECT / Incl.	Launch	Instruments	Details
EOS-Aqua (Degraded)	NASA	13:30 asc	2002-05-04	AIRS AMSR-E AMSU-A CERES HSB MODIS	• HSB instrument ceased operation on 5 February 2003. • AMSR-E antenna stopped rotating on 4 October 2011. • AMSU-A channel 52.8 GHz not functional.
SPOT-5 (Operational)	CNES	10:30 desc	2002-05-04	DORIS HRG HRS Végétation	
Coriolis (Operational)	DoD	06:00 desc	2003-01-06	SMEI WindSat	• SMEI turned off on 28 September 2011 because of electrical power limitations.
SORCE (Operational)	NASA	40°	2003-01-25	SIM SOLSTICE TIM XPS	• Battery degraded. Instruments turned off during orbit night.
ResourceSat-1 (IRS-P6) (Operational)	ISRO	10:30 desc	2003-10-17	AWiFS LISS-3 (ResourceSat) LISS-4	
EOS-Aura (Operational)	NASA	13:45 asc	2004-07-15	HIRDLS MLS (EOS-Aura) OMI TES-limb TES-nadir	• HIRDLS had reduced capability soon after launch, then failure of the azimuth scanning mechanism, and in practice is no longer used. • TES has reduced scanning capability.
PARASOL (Operational)	CNES	15:20 asc	2004-12-18	POLDER	• Orbit altitude lowered from the original 705 km (in the A-Train) in two steps, in December 2009 and November 2011, respectively.
CartoSat-1 (IRS-P5) (Operational)	ISRO	10:30 desc	2005-05-05	PAN (CartoSat-1)	
CALIPSO (Operational)	NASA	13:30 asc	2006-04-28	CALIOP IIR WFC	
CloudSat (Operational)	NASA	13:30 asc	2006-04-28	CPR (CloudSat)	• Battery degraded since April 2011. Instrument turned off during orbit night.

CURRENT R&D SATELLITES (ORDERED BY LAUNCH DATE)

Acronym	Operator	ECT / Incl.	Launch	Instruments	Details
Resurs-DK (Operational)	Roscosmos	70.4°	2006-06-15	ARINA Geoton-1 PAMELA	• The original elliptical orbit of 355 km x 573 km was brought to the current circular of 570 km in September 2010.
CartoSat-2 (Operational)	ISRO	09:30 desc	2007-01-10	PAN (CartoSat-2)	
HY-1B (Operational)	NSOAS	10:30 desc	2007-04-11	COCTS CZI	
C/NOFS (Operational)	DoD	13°	2008-04-16	CERTO CINDI CORISS DIDM PLP VEFI	
CartoSat-2A (Operational)	ISRO	09:30 desc	2008-04-28	PAN (CartoSat-2)	
HJ-1A (Operational)	CAST	10:00 desc	2008-09-06	HSI WVC	
HJ-1B (Operational)	CAST	10:00 desc	2008-09-06	IRMSS WVC	
GOSAT (Operational)	JAXA	13:00 desc	2009-01-23	TANSO-CAI TANSO-FTS	
GOCE (Operational)	ESA	06:00 asc	2009-03-17	EGG LRR (ESA) SSTI	
OceanSat-2 (Operational)	ISRO	12:00 desc	2009-09-23	OCM (OceanSat-2) OSCAT ROSA (OceanSat)	
SMOS (Operational)	ESA	06:00 asc	2009-11-02	GPS (ESA) MIRAS STA	

CURRENT R&D SATELLITES (ORDERED BY LAUNCH DATE)

Acronym	Operator	ECT / Incl.	Launch	Instruments	Details
PROBA-2 (Operational)	ESA	06:00 asc	2009-11-02	DSLP LYRA SWAP TPMU	
CryoSat-2 (Operational)	ESA	92°	2010-07-12	PAN (CartoSat-2)	
CartoSat-2B (Operational)	ISRO	09:30 desc	2010-11-20	ODTML	
STPSat-2 (Operational)	DoD	72°	2010-11-20	ODTML	
ResourceSat-2 (Operational)	ISRO	10:30 desc	2011-04-20	AWiFS LISS-3 (ResourceSat) LISS-4	
SAC-D (Operational)	CONAE	06:00 desc	2011-06-10	Aquarius DCS (SAC) HSC MWR (SAC-D) NIRST ROSA	
HY-2A (Operational)	NSOAS	06:00 desc	2011-08-15	ALT (HY-2A) DORIS LRA (NASA) MWI (HY-2A) SCAT (HY-2A)	
Megha-Tropiques (Operational)	ISRO	20°	2011-10-12	MADRAS ROSA SAPHIR ScaRaB	
GCOM-W1 (Operational)	JAXA	13:30 asc	2012-05-17	AMSR-2	
KANOPUS-V1 (Operational)		10:30 asc	2012-07-22	MSS (KANOPUS) MSU-200 PSS	

CURRENT R&D SATELLITES (ORDERED BY LAUNCH DATE)

Acronym	Operator	ECT / Incl.	Launch	Instruments	Details
HJ-1C (Operational)	CAST	06:00 desc	2012-11-18	SAR-S	
Landsat-8 (Commissioning)	USGS	10:00 desc	2013-02-11	OLI TIRS	
SARAL (Commissioning)	CNES	06:00 asc	2013-02-25	A-DCS AltiKa DORIS LRA (CNES)	
PROBA-V (Commissioning)	ESA	10:30 desc	2013-05-07	Végétation-P	

FUTURE R&D SATELLITES (ORDERED BY LAUNCH DATE, SHOWING ONLY FIRMLY PLANNED SATELLITES)

Acronym	Operator	ECT / Incl.	Launch	Instruments	Details
ALOS-2 (Planned)	JAXA	12:00 desc	≥2013	CIRC PALSAR-2	
CBERS-3 (Planned)	CAST	10:30 desc	≥2013	DCS (CBERS) IRMSS MUXCAM PANMUX WFI-2	
HY-1C (Planned)	NSOAS	10:30 desc	≥2013	COCTS CZI	
HY-1D (Planned)	NSOAS	13:30 asc	≥2013	COCTS CZI	
KANOPUS-V2 (Planned)	Roscosmos	10:30 asc	≥2013	MSS (KANOPUS) MSU-200 PSS	
Sentinel-1A (Planned)	ESA	06:00 desc	≥2013	SAR-C (Sentinel-1)	
SWARM-A&B (Planned)	ESA	87.4°	≥2013	ACC ASM EFI (SWARM) GPS (ESA) LRR (DLR) STR (SWARM) VFM	
SWARM-C (Planned)	ESA	88°	≥2013	ACC ASM EFI (SWARM) GPS (ESA) LRR (DLR) STR (SWARM) VFM	
Resurs-P1 (Planned)	Roscosmos	70.4°	≥2013	ARINA Geoton-2 PAMELA	

FUTURE R&D SATELLITES (ORDERED BY LAUNCH DATE, SHOWING ONLY FIRMLY PLANNED SATELLITES)

Acronym	Operator	ECT / Incl.	Launch	Instruments	Details
STPSat-3 (Planned)	DoD	40.5°	2013-02-25	IMESA-R SWATS TSIS	
HY-2B (Planned)	NSOAS	06:00 desc	2013-05-07	ALT (HY-2A) DORIS LRA (NASA) MWI (HY-2A) SCAT (HY-2A)	
CBERS-4 (Planned)	CAST	10:30 desc	≥2014	DCS (CBERS) IRMSS MUXCAM PANMUX WFI-2	
GPM Core Observatory (Planned)	NASA	65°	≥2014	DPR GMI (core)	
OceanSat-3 (Planned)	ISRO	12:00 desc	≥2014	OCM (OceanSat-3) OSCAT	
OCO-2 (Planned)	NASA	13:15 asc	≥2014	OCO	
Sentinel-2A (Planned)	ESA	10:30 desc	≥2014	MSI (Sentinel-2A)	
Sentinel-3A (Planned)	ESA	10:00 desc	≥2014	DORIS GPS (ESA) LRR (ESA) MWR (Sentinel-3) OLCI SLSTR SRAL	
SMAP (Planned)	NASA	06:00 desc	≥2014	SMAP	
VENμS (Planned)	CNES	10:30 desc	≥2014	VSSC	

FUTURE R&D SATELLITES (ORDERED BY LAUNCH DATE, SHOWING ONLY FIRMLY PLANNED SATELLITES)

Acronym	Operator	ECT / Incl.	Launch	Instruments	Details
ISS (Planned)	NASA	51.6°	≥2014	RapidScat SAGE-III	
CFOSAT (Planned)	CNSA	07:00 desc	≥2014	SCAT (CFOSAT) SWIM	
ADM-Aeolus (Planned)	ESA	06:00 desc	≥2015	ALADIN	
ALOS-3 (Planned)	JAXA	13:30 desc	≥2015	HISUI PSC	
CartoSat-3 (Planned)	ISRO	09:30 desc	≥2015	PAN (CartoSat-3)	
EarthCARE (Planned)	ESA	13:30 desc	≥2015	ATLID BBR CPR (Earth-CARE) MSI	
GCOM-C1 (Planned)	JAXA	10:30 desc	≥2015	SGLI	
Sentinel-1B (Planned)	ESA	06:00 desc	≥2015	SAR-C (Sentinel-1)	
Sentinel-2B (Planned)	ESA	10:30 desc	≥2015	MSI (Sentinel-2A)	
Sentinel-3B (Planned)	ESA	10:00 desc	≥2015	DORIS GPS (ESA) LRR (ESA) MWR (Sentinel-3) OLCI SLSTR SRAL	

FUTURE R&D SATELLITES (ORDERED BY LAUNCH DATE, SHOWING ONLY FIRMLY PLANNED SATELLITES)

Acronym	Operator	ECT / Incl.	Launch	Instruments	Details
Sentinel-5P (Planned)	ESA	13:30 asc	≥2015	TROPOMI	
Resurs-P2 (Planned)	Roscosmos	70.4°	≥2015	ARINA Geoton-2 PAMELA	
GCOM-W2 (Planned)	JAXA	13:30 asc	≥2016	AMSR-2	
GPM-Brazil (Planned)	NASA	30°	≥2016	DCS (CBERS) GMI (constellation)	
ICESat-2 (Planned)	NASA	94°	≥2016	ATLAS GPS (NASA) LRA (NASA)	
HY-2C (Planned)	NSOAS	06:00 desc	≥2016	ALT (HY-2A) DORIS LRA (NASA) MWI (HY-2A) SCAT (HY-2A)	
GRACE-FO (2 sats) (Planned)	NASA	89°	≥2017	HAIRS LRR (DLR) SCA (Star Camera Assembly) SuperSTAR Tri-G (GRACE-FO)	
GCOM-C2 (Planned)	JAXA	10:30 desc	≥2018	SGLI	
HY-2D (Planned)	NSOAS	06:00 desc	≥2019	ALT (HY-2A) DORIS LRA (NASA) MWI (HY-2A) SCAT (HY-2A)	
GCOM-W3 (Planned)	JAXA	13:30 asc	≥2020	AMSR-2	
GCOM-C3 (Planned)	JAXA	10:30 desc	≥2022	SGLI	

ROUNDTABLE DISCUSSIONS WITH CGMS "FOREFATHERS"

Following the first day of plenary, a roundtable discussion took place with invited panellists, the so-called CGMS Forefathers.

Moderator:
Alain Ratier, EUMETSAT Director-General, Head of the CGMS Secretariat

Panellists:
"The Forefathers"
Mr. John Morgan
Dr. Nobuo Sato
Prof. Jianmin Xu
Dr. Donald Ernest Hinsman
Dr. Tillmann Mohr
Mr. Gregory Withee
In addition, Mr. Michel Jarraud, Secretary-General of WMO participated as panellist.

Scope of the roundtable:
Following a short introduction by Mr. Ratier on past achievements of CGMS and on the context in which CGMS will have to operate in the years to come, the panellists were each invited to provide a 5-10 minute contribution reflecting on how CGMS could increase its efficiency and deliver more benefits to the global meteorological user community in the future particularly in view of the CGMS 3-5 year High Level Priority Plan. The table below summarises the points made during the roundtable discussions.

Summary outcome of the round-table:

The table below provides a summary of the issues raised by each round-table participant together with reference to relevant parts of the CGMS 3-5 year High-Level Priority Plan (HLPP) and an identification of possible ways forward.

"Forefather"	Point made	Impact on HLPP	Summary	Possible way forward
Morgan	Keep annual face to face meetings, involving senior officials and scientists/ engineers. Share simple vision, driven by user perspective. Focus on core activities.	Introduction	Vision driven by user perspective. Support to restructuring of CGMS	Policy statement/ introduction to HLPP (link to users and applications), response to WMO
Sato	In the next decade, try to extrapolate success story of NWP to nowcasting, climate monitoring and environment applications	Introduction	Weather, climate and environment applications driving	Idem
	Long term preservation of satellite data required in support of climate monitoring/ reprocessing and reanalysis.	No	Long term data conservation	Addressed under Climate Monitoring (D)
Xu	Data distribution/sharing as a key factor to attract users and develop applications: disseminate new data without delay, even if not fully validated, to get feedback and engage users	Introduction plus E (marginally)	Address all system functions, end to end, including dissemination. Early dissemination for new systems. Data sharing essential	Policy statement/ introduction to HLPP: end to end system coordination including support to users. Dissemination addressed in HLPP (E). Early dissemination under new programmes (G)
Withee	Full open communication, face-to-face builds trust among leaders and creates foundation for collaborative problem solving	No	Support to restructuring of CGMS	
	Contingency planning will be increasingly valuable. More to be done in the future. Interact to assess best possible use of residual assets	No	Contingency planning and coordination of systems	Contingency addressed as a key topic of HLPP, extended to coordination of systems (under A)
	Nurturing emerging satellite agencies, to bring them in.	No	Membership policy. Mechanisms in place	

"Forefather"	Point made	Impact on HLPP	Summary	Possible way forward
	Common standards, formats critical to engage users, to be defined through dialogue with users. Full and open data sharing	Introduction	Technical coordination policy. End to end down to users. Dialogue to users (policy)	Policy statement/ introduction to HLPP: end to end system coordination including support to users.
	Need to have high resolution imagery on board to address climate (land use change impact). Bring relevant operators to CGMS. Move to CGMS ?	No. Issue to be discussed under climate agenda item	Link with CEOS to be discussed for climate	Cooperation policy, not HLPP issue
	Feed back at national level on benefits of coordination	No/marginal	Impact studies already support assessment of benefits	Reference to coordinated impact studies could be added in HLPP A
Hinsman & Mohr	Shared vision and trust as a key success factor. Involvement of space agency leaders as well, in inspiring face to face meetings	No	Support to CGMS restructuring	
	Shared vision and trust as a key success factor. Involvement of space agency leaders as well, in inspiring face to face meetings	No	Support to CGMS restructuring	
	Global system coordination, data systems/sharing essential. See overall system as one capacity. Cal/val, products and training (with regional focus, also critical	Introduction	Coordination on end to end system (as Pr Xu) including support to users (training)	Policy statement/ introduction to HLPP: end to end system coordination including support to users.
	WMO/user perspective driving: from WMO requirements to CGMS response/plan (case of Contingency)	Introduction	Response to WMO requirements	Policy statement/ introduction to HLPP (link to users and applications), response to WMO

"Forefather"	Point made	Impact on HLPP	Summary	Possible way forward
	Support to weather monitoring and climate monitoring are two top level priorities.	introduction	Policy: CGMS focus/goals. Coordination on end to end system (as Pr Xu) including support to users (training)	Top level goals/ priorities to be reflected upfront in HLPP
	Need to have a hierarchy of rolling plans (5 years, 5-10 and 25 years) with the requirements review process at WMO, and have priorities reflected in HLPP	Yes	Reflect priorities and make HLPP a 5 year rolling plan.	Make HLPP a 5 year plan and restructure content to address priorities: i) ed to end system coordination (A, B, E), ii) protection of systems (F, I), iii) preparation of new generation of systems (G), iv) Products and support to users (C and H) v)Climate as a special challenge (D). V) Outreach (to be added, focus)
	Climate monitoring is new, major challenge for the next decades, and needs to be addressed end to end, including training. The Architecture is the framework, the governance for its implementation needs to be defined with CEOS. (Joint WG on Climate ?) Need to move from pilot to preoperational service, deliver more ECV	Introduction/Yes	Reflect Climate priority in HLPP. CEOS – CGMS link, joint Climate WG to be discussed	See above
	Need to prepare for new satellite systems also in support of climate services (look at ECV)	Yes (marginal)	Prepare for new satellite systems	Refer to preparation for ECV in G
	Look at new focus Groups	No (not a HLPP issue)		

In his concluding remarks, the WMO Secretary-General Jarraud recalled the value of satellite missions in support to WMO programmes and the important achievements of CGMS over the last 40 years. He highlighted a few major challenges for the years to come: Bridging the gap between satellite capabilities and the user community, building up an Architecture for Climate Monitoring from Space, further optimising the space-based observing system and demonstrating its immense socio-economic benefit which justifies the resources required for its development and continuous operation. Mr. Jarraud emphasised the role of CGMS in this respect and therefore encouraged all members to pursue and further strengthen their collaboration through CGMS.

The issues raised were then considered in view of the discussions on the HLPP (see also chapter V.1 CGMS 3-5 year High-Level Priority Plan).

IV WORKING GROUP REPORTS

Operational Continuity and Contingency Planning (WGIII)

IV.1: Presentation on scientific benefits of LEO orbit coordination

The baseline configuration of the core LEO operational constellation has evolved from a two-orbit system (am, pm) towards a three-orbit system (am/mid-morning, pm, early morning) in accordance with the Vision developed by WMO. Meanwhile the latest plans of Europe, the US and China are expected to provide robust components for the am and pm orbits but anticipate a gap on the early morning orbit beyond the current DMSP programme. This critical situation had been highlighted on several occasions by CGMS (Recommendation 39.33) and WMO (CBS-15). CGMS-40 therefore dedicated particular attention to this issue. The meeting was briefed first on studies to evaluate the importance of ensuring a three-orbit coverage, then on investigations of options for redeploying a mission from either am or pm orbit to the early morning.

Presentations were given on the scientific evaluation of the impact of optimizing the LEO core constellation over three orbits. Data denial experiments conducted in the US by the JCSDA on severe weather events cases have shown the forecast skills of particular storms being degraded when the sounding capability from one orbit was removed. Average skill scores over different periods show consistently that evolving from 1 to 3 sounders adds about 8 hours forecasting range skill to a 5-6 day forecast, which is a considerable impact. While these results clearly show the key contribution brought by a complete, well distributed sounding capability, more focused studies are planned in order to quantify the specific impact of the early morning orbit sounding both at the global and regional levels. Independent studies pursued in Europe show similar results. Moreover, a conceptual experiment conducted by the Met Offices demonstrates that a shorter refresh cycle of observations had a particularly large impact in situations where the forecast error is rapidly increasing, which is a way to characterize rapidly evolving, severe weather situations. This highlights the fact that the benefit of optimizing the temporal sampling is smoothed and only partly reflected in average model skill statistics: The practical benefit is thought to be particularly important in severe weather situations, which are the situations having major societal impact.

In response to an action from CGMS-39, a presentation was then given by CMA on a preliminary feasibility analysis of redeploying an FY-3 mission from e.g. a mid-morning orbit to the early morning. The analysis addressed both the expected benefits and the engineering impacts. While the FY-3C and FY-3D satellites are being manufactured, there is still a window of opportunity to reconsider the design of FY-3E or FY-3F if both the benefit and the feasibility of such a change are rapidly confirmed.

CGMS expressed its high appreciation to CMA for this preliminary analysis. It was underlined that the optimization of the core LEO constellation was central to the mission of CGMS and required active collaboration among all parties involved. Given the relative urgency, every effort should be made to support CMA through studies or other relevant information, if needed, in order for CMA to evaluate the scientific, technical and programmatic aspects and to make a well informed decision.

CGMS thus agreed the following actions proposed by WGIII:

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
WMO	Plen IV.1	40.02	WMO Secretary General to send a letter to CMA inviting them to consider redeploying the FY-3 to an early morning orbit and offering international support to reach this objective.		30-Nov-12	OPEN	HLPP#1
WMO	Plen IV.1	40.03	WMO to convene a CGMS tiger team to coordinate the technical evaluation of the global and regional impact of flying a FY-3 satellite in early morning orbit, in order to support CMA in the assessment process.		31-Dec-12	OPEN	HLPP#1

IV.2 Operational continuity and contingency planning - Report from WGIII

The discussions on orbit coordination were followed by a report from WGIII presented by the WG chair (S. Hilding) focusing on continuity and contingency aspects. It covered contingency on core meteorological missions; mapping of satellite plans against the CGMS baseline; gap analysis and risk review (LEO early morning orbit; LEO afternoon orbit; and impact of delayed programme decisions and governmental constraints). It also addressed the optimization of the space-based observing system and indicated that it will support CMA in further investigations of the benefit and technical consequences of potential move of a mid morning mission to an early morning mission. WGIII also addressed the space-based segment for the purpose of the architecture for climate monitoring and space weather. The actions and recommendations from WGIII were endorsed by plenary.

Following the discussions the following action was raised:

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS WGIII	Plen IV.2	40.04	WGIII to establish a CGMS tiger team on assessing the impact and socio-economic benefits of satellite missions who would collaborate with e.g. the WMO CBS and other partners and would report at CGMS-41.		CGMS-41	OPEN	HLPP#4.1

IV.3 Global issues on satellite systems and telecommunication coordination - Report from WGI

The WGI report was presented to plenary by the WG chair (M. Perkins) which included the horizon for the next 15-30 years of the group's activities. It covered the provision of a forum to coordinate the use of the frequency band and make recommendations on frequency expansion and interference mitigation; to continue to inform CGMS members of radio frequency management activities that could possibly affect frequencies used by meteorological satellites and coordinate standardisation of satellite communication systems; to facilitate an effective preparation of national WRC positions favorable for the CGMS related issues and to continue to support the availability of sufficient and well-protected frequency spectrum for telemetry/telecommand as well as for satellite downlink of the collected data.

WMO added that the WMO Steering Group on Radio Frequency Coordination (SG-RFC) played an active role and requested the continuation of the excellent relationship between WMO SG-RFC and the frequency managers of the CGMS space agencies for ensuring a coordinated approach for issues of interest in the area of protection and coordination of frequency bands relevant to meteorology and Earth Observation missions (either passive or active sensors and radio communications).

EUMETSAT recalled the increasing complexity of the future systems, which is also to be reflected on in the frequency plans if they have to accommodate up to 5 bands for space to ground I/F (Ka-Band, X-Band, S-Band, L-Band, UHF) plus all relevant bands for the instruments. This is building up on the technical complexity to be managed at platform and instrument level regarding Electromagnetic Compatibility (EMC) and the need to keep a balance between the technical risks and the design solutions.

Noting that future missions are placing, or planning to place some of their data downlinks in Ka-Band, the plenary chairman requested all CGMS space agencies to continue gathering and exchanging technical information on the impacts on system performance because of atmospheric/weather conditions when using this frequency band.

IV.4 Presentations by the International Science Working Groups

In Plenary session IV on satellite data and products, co-chairs of the International Scientific Working Groups sponsored by CGMS (IPWG – precipitation, IWWG – winds, ITWG – sounding, IROWG – radio occultation) presented the activities, accomplishments and plans of their Groups. This included clear statements on the expertise residing within each Group, success stories, and the Groups' expectations from CGMS members as well as their contribution to future CGMS high-level priorities.

All actions and recommendations provided by the ISWGs were discussed in detail in WGII (Satellite data and products) and led to formal Actions and Recommendations from CGMS-40. In this session, ISWG co-chairs presented only a high-level subset of these, for attention by Heads of Agencies and with the aim to steer CGMS priorities in the next 3-5 years.

IV.4.1 International Precipitation Working Group – IPWG

The International Precipitation Working Group (IPWG) was initiated as a permanent CGMS International Science Working Group in order to focus the scientific community on satellite-based quantitative precipitation measurement issues and challenges by promoting standard operational procedures and common software for deriving precipitation estimates from satellites, fostering the exchange of data on inter-comparisons of operational precipitation estimates from satellites and stimulating increased international scientific research and development in this field. IPWG also provides significant ground validation efforts of these products over Australia, the United States, Western Europe, Japan and South America using gauge network and radar data.

For **IPWG**, Bozena Lapeta highlighted recent accomplishments and future directions in terms of research, intercomparison and harmonisation of data and products, and training. She informed Plenary about the successful October 2012 6th workshop of IPWG hosted and sponsored by CPTEC/INPE in Brazil, with 55 participants from 14 countries, including a training event. As for future priorities, she stressed the importance of validation activities for assessing the quality of satellite-derived precipitation estimates, and further emphasis on facilitated product access and analysis, and reaching out to the user community (e.g., hydrologists). Plenary noted that precipitation should be one of the themes under SCOPE-CM.

The recent IPWG accomplishments included: Conducting a survey on applications of satellite-derived precipitation products and publishing the list of adequate datasets; a survey of different sources of validation rainfall data; publishing at the IPWG web page the lists of publicly available, quasi-operational and quasi-global precipitation data sets; leadership of the Group on Earth Observations (GEO) precipitation subtask; and interactions with the Working Group on Numerical Experimentation (WGNE) on satellite precipitation validation using NWP generated precipitation estimates.
The IPWG 6th Workshop thematically covered international projects and satellite programmes, IPWG programmatic activities, algorithms, applications, validation, modelling, and new technology. The coinciding training session focused on "New and Emerging Technologies, Sensors, and Datasets for Precipitation" and was arranged with NOAA, WMO and EUMETSAT.

Finally, IPWG recommendations to CGMS were presented including the need to ensure:

- the long-term continuity of conically
- scanning microwave imagers;
- the coordination of satellite overpass times including non sun-synchronous platforms with a minimum temporal resolution of 3 hours; and
- the active participation at international meetings and training events.

IV.4.2 International Winds Working Group – IWWG

The International Winds Working Group (IWWG) was established in 1991 and became a formal working group of CGMS in 1994. The IWWG serves as a forum to discuss and coordinate operational and research developments in satellite-derived wind data production, verification/validation procedures, and assimilation techniques for a variety of operational and future instruments. It strives for commonality in products for the benefit of NWP users. The IWWG meets biennially and supports its own web site that houses information on retrieval algorithms, activities, collaborative projects, and workshop proceedings.

The **IWWG** co-chair, Jaime Daniels, reported on a coordinated study of Atmospheric Motion Vector (AMV) impact on NWP, and other highlights. The related importance of AMVs could be clearly demonstrated through data denial studies and by assessing forecast sensitivity to observations. His presentation also took stock of the present level of satellite-based wind observations globally, at all levels, revealing good coverage but data gaps around 60N/S.

The current efforts of the IWWG are focused on improving the temporal and spatial coverage of satellite derived winds, developing improved wind derivation schemes from current and future instruments, pursuing the generation and application of high resolution (e.g. mesoscale) winds to improve forecasts of high impact weather events, and investigating the potential to derive wind information from the synergistic use of geostationary and polar imagery.

He anticipated future work by IWWG on intercomparisons, error characterisation studies, and reprocessing of AMVs, high-resolution wind datasets and software distribution, in all of which support by CGMS agencies would be highly desirable.

It was also noted that all CGMS recommendations related to the IWWG are captured within the WGII report and that there is a regular exchange of ideas and on progress of actions between CGMS (through the rapporteur) and the co-chairs of IWWG. The biennial meetings of the IWWG provide the forum to connect CGMS with the wider science community working on AMVs.

The discussion by Plenary appreciated the IWWG accomplishments and it was further emphasised that appropriate linkage between IWWG and the CEOS Ocean surface vector winds Virtual Constellation should be sought.

IV.4.3 International TOVS Working Group - ITWG

The ITWG was formed in 1983 as a working group of the International Radiation Commission (IRC) of the International Association of Meteorology and Atmospheric Physics (IAMAP). The ITWG provides a forum where operational and research users of primarily atmospheric infrared and microwave sounders exchange information on sensor status, derived products, and the impacts of radiances and inferred atmospheric temperature, moisture and cloud fields on numerical weather prediction (NWP) and climate studies. Prior to CGMS-40 and through WGII discussions, it was strongly recommended that the ITWG be formally recognised as a CGMS International Science Working Group and measures were taken to formalise this. The IRC endorsed the proposal recognising ITWG as a formal working group within both IRC and CGMS. CGMS-40 unanimously endorsed the formalisation of ITWG as a CGMS International Science Working Group.

On behalf of **ITWG**, Mitch Goldberg recalled the critical importance of sounders to numerical weather prediction, for example improved forecasts of tropical cyclone tracks (citing the 2012 Hurricane Sandy as a striking example), as well as for ascertaining climate trends. He cited ITWG as the expert group on sounding applications and elaborated on the different thematic sub-working groups maintained by ITWG addressing specific sounding-related issues including rapid data access and exchange. It was recommended that ITWG be formally recognised as co-sponsored by CGMS. The next ITWG meeting will be held on Jeju Island, Korea, in April 2014.

Related specifically to a recommendation from ITWG on the implications of funding mechanisms for space-based observing systems including public-private partnerships, CGMS responded in the following way:

It is essential for CGMS to preserve global coordination and open data exchange in support of WMO programmes, which is achieved through agreements among agencies having a national or international responsibility for satellite programmes. Therefore CGMS Members are governmental or intergovernmental entities, notwithstanding the possible partnership that these CGMS Members may maintain, at the individual level, with the private sector.

The ITWG will continue to provide expert opinions and recommendations to CGMS as required. Over the next five years ITWG will conduct Observing System Studies to better optimize data utilisation and to demonstrate impacts of improved data latency, improved global coverage and improved spatial, spectral, radiometric performance, including the use of cloud-contaminated radiances. It will extend the use of operational polar orbiting data through direct broadcast (DB) software – providing application software to generate consistent products by different DB users and continue to demonstrate the use of polar orbiting data to derive climate data records for monitoring and understanding of climate trends and variability. Finally it will support education and training through the WMO Virtual Laboratory.

Subgroups with the ITWG include:
- Radiative Transfer
- Climate
- Data Assimilation and NWP
- Advanced Sounders
- International Issues and Future Systems
- Products and Software

The ITWG website provides access to all ITWG reports and recommendations.

The most recent reports are from the ITWG study conference in 2012 in Toulouse France.

Some of the key recommendations from the 2012 meeting include:
- Emphasising the constellation of at least three orbits (early morning, morning, and afternoon), each with full sounding capabilities (IR and MW), should be maintained (provided). The overpass times of operational satellites with sounding capability (IR and MW) should be coordinated between agencies to maximise their value. ITWG encourages CMA to consider an early morning orbit.

- Meteor-M mission should be a fully contributing component of the Global Observing System (GOS) by providing the global data sets from this mission in a timely manner with all necessary ancillary information.

- Better plan the sequence of satellite launches into the polar orbit to minimise the risk of instrument failures and gaps in the time series of observations. Space agencies should consider this for the further planning of the space-based architecture for climate monitoring

- Conduct studies to trade off benefits of spectral, radiometric, and spatial resolutions of infrared sounders and to pursue the development of next generation sounders.

- All CGMS agencies to provide i) continuous direct broadcast capabilities on future polar orbiting satellites, ii) the required software to generate level 1b calibrated radiances, and iii) to support fast delivery initiatives using direct broadcast.

The next ITWG meeting will be at Jeju Island in South Korea, 26 March – 1 April 2014, hosted by KMA.

CGMS-40 Plenary noted the outstanding contributions of the outgoing chairs – Drs. Stephen English and Allen Huang, and welcomed the incoming chairs Drs. Mitch Goldberg and Niels Bormann.

CGMS Plenary also noted with pleasure that the President of the IRC, Dr. Robert Cahalan, had sent a letter formally confirming that the ITWG is also a group under CGMS.

IV.4.4 International Radio-Occultation Working Group – IROWG

The IROWG co-chair, Axel von Engeln, presented accomplishments and plans of the IROWG. The significant impact of radio-occultation (RO) on NWP, reanalysis and tentatively on climate has already been demonstrated, benefiting from the highly accurate, stable, instrument-independent characteristics of the measurement. The high vertical resolution, owing to the limb sounding geometry, is a further asset of RO. Dr. von Engeln highlighted several priority recommendations of IROWG related to issues with the near and long-term continuity of the RO constellation. There is an urgent need for filling the data gap opening up for the next 3-4 years using instruments flying on research missions. There is however also an urgent need to generate an operational continuity plan, to build up a constellation that provides at least 10,000 occultations per day. The value of RO for inferring on space weather events was also recognised, as well as timely reprocessing of archived data to further maximise the impact of RO in climate re-analysis runs. Only three years into its existence, the IROWG has been accepted as the community focal point for RO matters, and its next workshop is planned for September 2013.

It was questioned whether the 10,000 radio occultations per day from the recent ECMWF study could be taken as a reference for the WIGOS or whether it needed to be further studied. The question at which number of radio occultations an observing system would saturate cannot be answered today; this study found that saturation does not occur even when assimilating more than 50,000 occultations. This is expected in an assimilation system, which makes use of all available observations. A convergence can however be observed, where the forecast error reduction per added observation decreases. The recommendation of 10,000 occultations was based on an assessment of this convergence. The study was based on an idealised radio occultation observing system, where all occultations are randomly distributed in space and time. How the current and future satellite constellation can be optimized to provide such an occultation distribution, and whether more occultations are required to achieve a similar forecast error reduction requires more investigation.

As a consequence, the following action was agreed:

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
WMO	Plen IV.4	40.06	WMO to coordinate impact studies, through the CBS, in order to update and refine its requirements for GNSS radio-occultation (e.g. number of occultations/day, distribution in space)		CGMS-41	OPEN	HLPP#1.1

IV.4.5 ISWGs and CGMS

In addition to the actions and recommendations resulting from WGII discussions, the following plenary action was agreed:

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS agencies	Plen IV.4	40.05	WGII to identify in consultation with the ISWGs the priority ECV climate data records and communicate these priorities to the SCOPE-CM Secretariat for consideration in the call for proposal of January 2013. [WGII]		31-Dec-12	OPEN	HLPP#5.1

IV.5 Satellite data and products - Report from WGII

The WGII rapporteurs Mitch Goldberg and Johannes Schmetz presented the report on WGII. WGII is the forum where aspects of technical and scientific nature related to instrument calibration, and satellite data and products are discussed. WGII emphasised the overall need to keep a technical and scientific focus in CGMS discussions and to coordinate with other international programmes and activities, such as CEOS and WCRP. Regarding the GSICS initiative, it needs to achieve fully consistent calibration of relevant satellite instruments across operational CGMS agencies, using the high-quality calibration of satellite instruments from research agencies. WGII also highlighted the need for continuous improvement of satellite products through validation and intercomparison, through international working groups such as the CGMS ISWGs and SCOPE-type mechanisms (including SCOPE-CM and SCOPE-Nowcasting).

IV.6 Global data dissemination - Report from WGIV

WGIV on global data dissemination provides a forum for the discussion and distribution of information on satellite data dissemination from CGMS members' current and future satellite missions, data exchange and retransmission. Furthermore, the Working Group strives to standardise tools and equipment that will enable any authorised user to receive data from any satellite operator. Topics which are currently discussed include direct readout and direct dissemination; other satellite-based dissemination services; internet-based services; global data exchange; consolidation of user requirements for data to be disseminated and coordination of formats and code forms for satellite data.

Plenary took note of the WGIV discussions.

V SHAPING THE FUTURE

V.1 CGMS 3-5 year High-Level Priority Plan

The CGMS Secretariat provided an overview of the process undertaken for in order to arrive at the draft CGMS 3-5 year High Level Priority Plan and presented the current draft version to plenary for discussion and ultimately endorsement.

From the previuos roundtable discussions the following had been highlighted: The introduction needs to clearly state the top level priorities of CGMS covering end-to-end system coordination; protection of existing systems; preparation of new generation of systems; provision of products/applications and support to users; the addition of climate as a special challenge including preparation of ECVs; outreach activities; and the need to respond to WMO requirements.

IOC-UNESCO added that it was important that all meteorological and climatological data collected needed to be distributed as fast as possible and that for climate it was crucial that space agencies collaborated in reprocessing of the data. These aspects also needed to be incorporated in the HLPP.

Following the discussions, the CGMS Secretariat agreed to revise the HLPP accordingly and to circulate it to the CGMS-40 participants by 16 November 2012.

V.2 Climate architecture

In light of the high priority of climate monitoring for the High Level Priority Plan and its significance supporting GFCS, Mark Dowell, Chairman of the Writing Team for the Strategy for Architecture for Climate Monitoring from Space, was invited to brief CGMS-40. Mr. Dowell briefed the status of the climate monitoring architecture and the ECV inventory. At this point the level of definition of the architecture is necessarily high level and the approach is intentionally open and inclusive to gain maximum amount of consensus. The strategy is designed so that all relevant entities can identify their potential contributions even if this may be beyond their existing capabilities and programmatic operations.

He encouraged CGMS members to continue their efforts until the end of the year to populate the ECV inventory undertaken jointly by CEOS, CGMS, and WMO as the first concrete step in implementing the architecture strategy. Additional CGMS involvement for the analysis phase of ECV inventory was welcomed and in this regard Mr. Dowell noted the importance of CGMS engagement in the Climate and Space Week in February 2013 in Geneva.

He further raised the issue that action is required on mechanisms of interaction/ governance. It was also noted that the GFCS Observations and Monitoring pillar and the Climate Services pillar should be engaged in continuing activity on the development of the architecture.

Noting the success of the non-logo joint CGMS, CEOS, WMO Team, EUMETSAT emphasised that it was important to quickly begin to engage CEOS on what comes next and proposed CGMS and CEOS consider a joint effort to carry forward the implementation of the architecture. In a tour de table, the Chairman asked member agencies if they support exploring with CEOS a joint working group that would be responsible for carrying on the work of implementation of the architecture. Member agencies agreed that the CGMS Secretariat should initiate this exploration with CEOS in a timely manner.

V.2 Climate architecture (continued)

The following action was raised as a result.

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS Secretariat	Plen V.2	40.07	CGMS Secretariat to explore the possibility to coordinate Climate related activities with CEOS in line with the work done for the preparation of the Architecture for Climate Monitoring from Space and to report at CGMS-41		CGMS-41	OPEN	HLPP#5.1

VI EDUCATION AND OUTREACH

WMO-WP-13 reported on the outcome of the fifteenth session of the Commission for Basic Systems (CBS-15) regarding the uptake satellite of data by users.

Of particular importance is the timely preparation of the user community for the new generation of satellites. This is particularly relevant in the perspective of upcoming new geostationary systems (INSAT-3D, Himawari-8, FY-4A, GOES-R, MTG-I1, GEO-KOMPSAT-2A) in the coming years. The CBS therefore adopted a "CBS Guideline for Ensuring User Readiness for New Generation Satellites" contained in the Annex to the Working Paper.

Preliminary results of the WMO 2012 survey on the access and use of satellite data by WMO Members, including their training needs, were also presented.

Figure 1:
Use of LEO satellites by operational/research users (all regions)

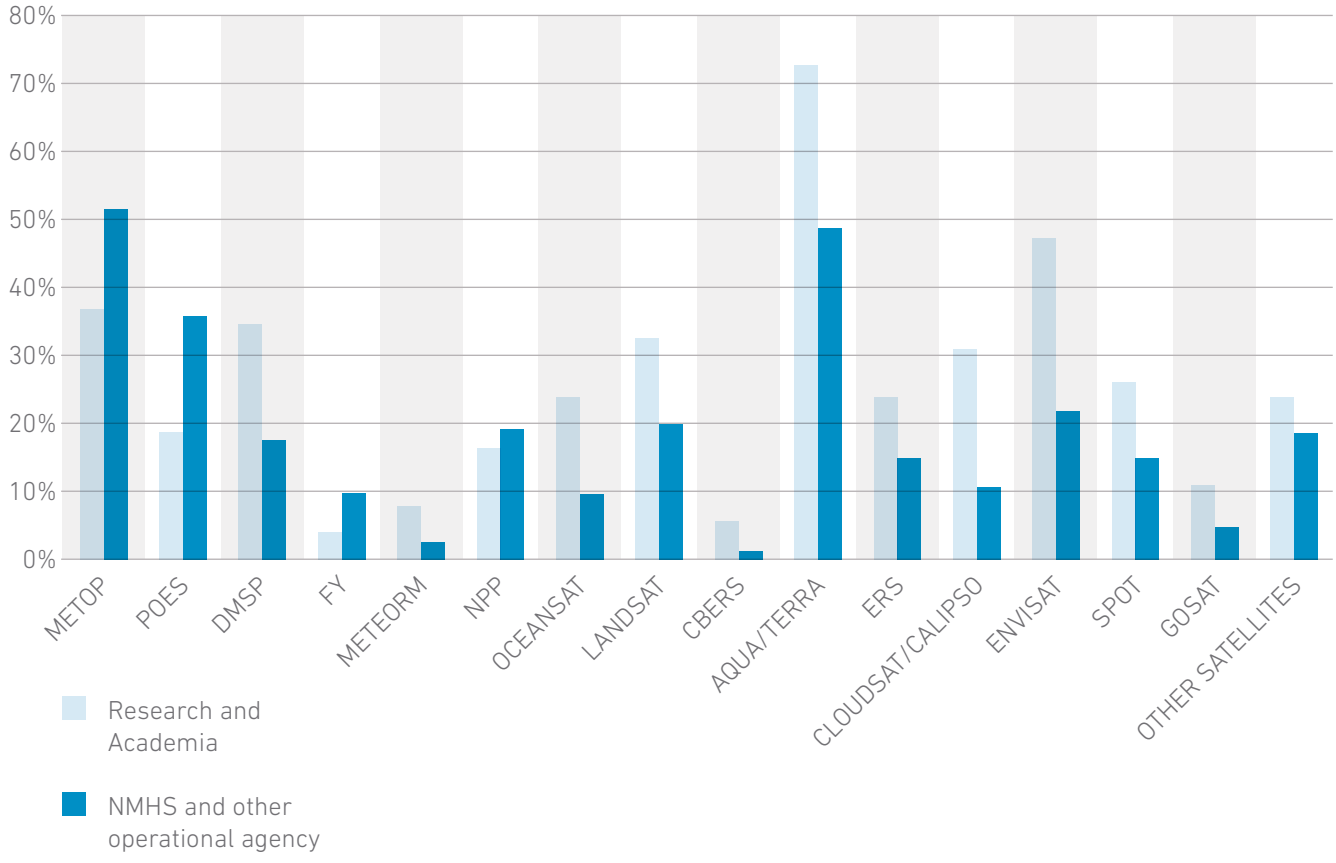

Figure 2:
Challenges in the use of satellite data (all regions)

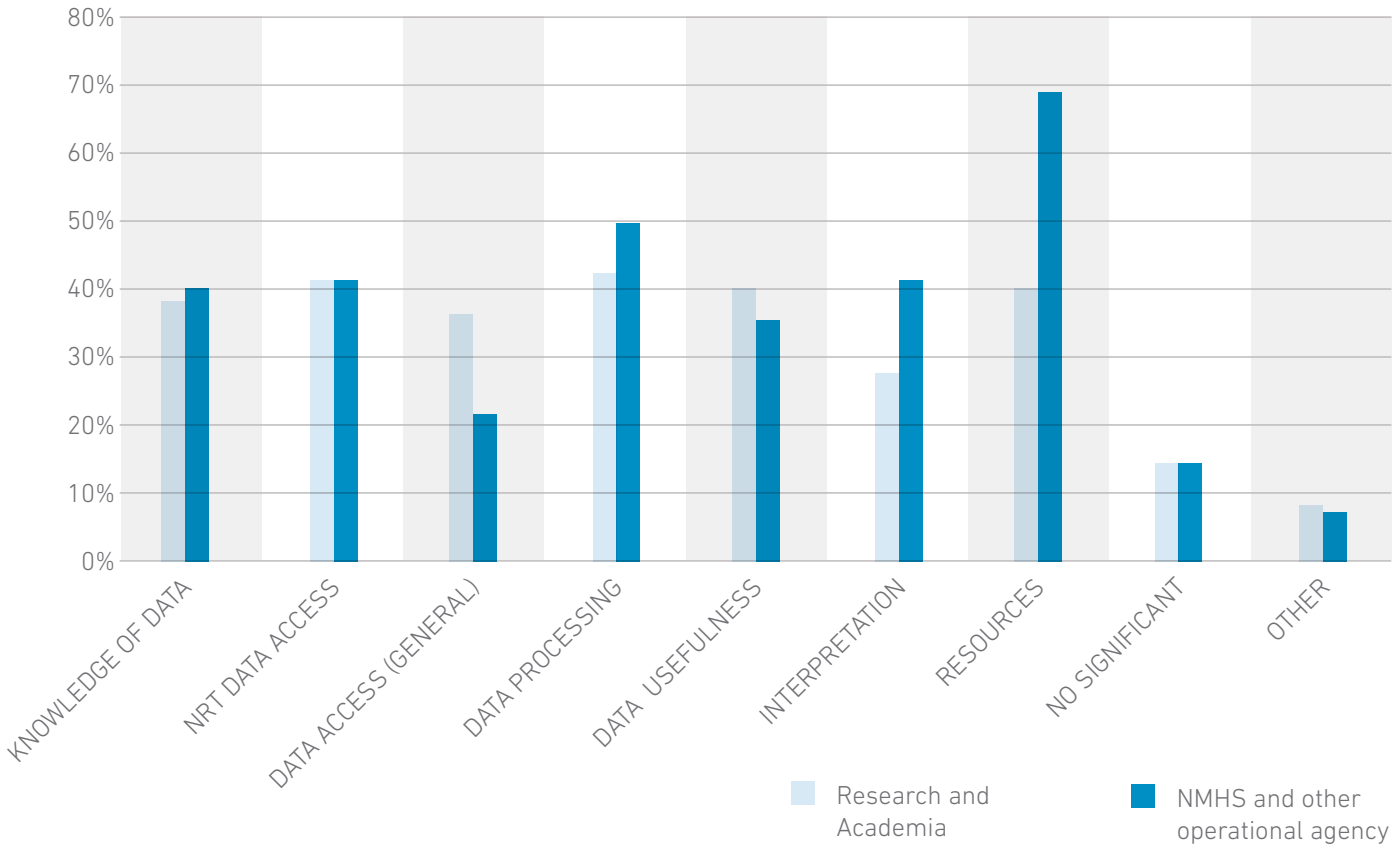

Table 1:
Areas where NMHSs and other operational users indicate that training is needed but not delivered (regional breakdown; absolute number of responses)

WMO Region	NMHs and other operational agencies						
	Total responses	Equipment operation & maintenance	Image interpretation	Use of software tools	Product utilization and interpretation	Physical basis for remote sensing	Preparation for new generation satellites
RA I	32	11	7	15	14	14	17
RA II	27	5	3	8	6	7	13
RA III	10	4	5	6	7	4	6
RA IV	21	4	5	8	6	5	8
RA V	16	9	6	11	10	10	13
RA VI	53	13	9	16	15	14	19
All	159	46	35	64	58	54	76

WMO also recalled the commitments to the VLab by CGMS operators active in VLab, as per the agreed framework defined in "Expectations from Satellite Operators" (available at http://www.wmo-sat.info/vlab/governance-documents/).

VI.1 Education and Training

KMA-WP-03 presented an update of the project for development of COMS data receiving/analysis system in Sri Lanka. KMA will expand support to Asia-Pacific countries with weather analysis systems as well as COMS data receiving systems. The Working Paper summarised the WMO-KMA RA II Pilot Project VLab High Profile Training Event on 4-6 October 2012, in Jincheon, Republic of Korea.

In **NOAA-WP-11**, NOAA provided a brief summary of its support provided to the WMO Space Programme's Virtual Laboratory for Training and Education in Satellite Meteorology (VLab). Some of the VLab activities supported by NOAA are monthly Regional Focus Group discussions for Caribbean and Americas, Environmental Satellite Resource Library (ESRC), and distance training on environmental satellites available from Cooperative program for Operational Meteorological Education Training (COMET) MetEd (https://www.meted.ucar.edu/) and Virtual Institute for Satellite Integration Training (VISIT) online libraries. NOAA also sends some of its training materials over GEONETCast for the Americas using the VLab training channel.

NOAA has also coordinated with the COMET programme to include the VLab logo with a web link to the VLab site on the Environmental Satellite Resource Center (ESRC) web site.

WMO-WP-18 reported on activities within the Virtual Laboratory for Education and Training in Satellite Meteorology (VLab) along with future plans and directions. Since September 2011, VLab Training Centres of Excellence has offered a total of 48 courses, 31 regional focus group sessions and two event weeks on the topic of aviation using both online and classroom resources. This shows a slight increase in the number of training opportunities compared to last year's reporting period.

Furthermore, important developments have taken place since CGMS-39, including the CBS endorsement of the application by DMN Casablanca to become a VLab Centre of Excellence (CoE), the establishment of the WMO VLab Trust Fund to collect funds for the continuation of the employment of the VLab Technical Support Officer (TSO), and the 6th Virtual Laboratory Management Group meeting (VLMG-6) in October 2012 in São José dos Campos, Brazil. A summary of the annual reports from the CoEs for the period from September 2011 to August 2012 is also provided in the Working Paper.

Following the presentation, CGMS-40 unanimously confirmed the CBS-endorsed new Centre of Excellence at DMN Casablanca, Morocco.

The following CGMS-40 actions and recommendations were made:

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
WMO/ Vlab co-chairs	Plen VI.1	40.08	WMO in cooperation with the VLab co-chairs to continue facilitate the integration of ISRO and IMD into the VLab		CGMS-41	OPEN	HLPP#4.2
CGMS/ VLab co-chairs	Plen VI.1	40.09	CGMS to investigate the possibility to provide funding to the VLab CoEs in Argentina, Australia, Brazil and South Africa, to establish a project for generation of conceptual models for the Southern Hemisphere.		CGMS-41	OPEN	HLPP#4.2

The following CGMS-40 actions and recommendations were made:

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	Plen R VI.1	40.01	Satellite operators to provide regular, annual contributions into the WMO VLab Trust Fund to ensure the continuation of the post of the VLab TSO		CGMS-41	OPEN	HLPP#4.2
CGMS members	Plen R VI.1	40.02	Satellite operators and WMO to provide necessary resources for the translation of relevant training materials (websites, modules and related) into other WMO languages		CGMS-41	OPEN	HLPP#4.2
CGMS members	Plen R VI.1	40.03	Satellite operators and trainers to take note of the new "CBS Guideline for ensuring user readiness for new generation satellites" and plan appropriate projects to ensure user readiness		CGMS-41	OPEN	HLPP#4.2
CGMS members	Plen R VI.1	40.04	CGMS agencies are encouraged to exploit opportunities for education, outreach and training through the WMO-CGMS Virtual Laboratory for enhanced utilisation of observations and products for marine forecasting, especially of high winds in coastal areas.		CGMS-41	OPEN	HLPP#4.2
CGMS members	Plen R VI.1	40.05	CGMS agencies to support widening of VLab scope (marine, land applications, agricultural meteorology).		CGMS-41	OPEN	HLPP#4.2

VI.2 Outreach activities

In **JMA-WP-04** and **KMA-WP-04** progress was reported on the RA II Pilot Project to develop support for NMHSs in satellite data, products and training The papers outlined the background and mission of the Pilot Project together with the accomplishments of the third phase (September 2011 - August 2012) and plans for the Fourth Phase (September 2012 - August 2013). The papers also included a report on the Second Meeting of the Coordinating Group of this pilot project held on 9-12 October 2012 on Jeju Island, Republic of Korea. KMA also reported in more detail on the Third Asia/Oceania Meteorological Satellite Users' conference in **KMA-WP-05**. The conference was a follow-on to the first and second Asia/Oceania Meteorological Satellite Users' Conference hosted by CMA in November 2010 in Beijing, and JMA in December 2011 in Tokyo, Japan, respectively. The purpose of the users' conference is to further enhance exchanges on application techniques among satellite data users, to advance satellite observation technologies, and to promote synergetic development in the field of meteorological satellites.

NOAA-WP-31 referred to the CGMS Restructuring Task Force discussions at the beginning of 2012, and the need for strengthened outreach activities (communication/public relations activities) and the necessity for a dedicated CGMS plenary agenda item. The paper examined possible outreach activities, including the need to articulate soci-economic benefits of meteorological satellites, and noting that CGMS members may be requested by the CGMS Secretariat to provide assistance for these efforts.

VII CLOSING SESSION

VII.1 Any other business

Following an enquiry by the CGMS Secretariat, CGMS plenary agreed that all CGMS Working Papers could be made publicly available on the CGMS web-site (www.cgms-info.org).

There was no other business discussed.

ACTIONS OPEN FROM CGMS-38 AND -39 (AT CGMS-40)

Actionee	Action	#	Description	Action feedback/closing document	Deadline	Status	HLPP ref
NOAA and IMD	WGII	38.36	Action 38.36: NOAA and IMD to better understand differences in TC intensity estimations and to inform CGMS members on the outcome. Deadline: CGMS-39	Remains open. Action by NOAA and IMD needed related to resolving algorithm differences	(CGMS-38)	OPEN	HLPP#3
WMO	WGIII	38.40	Action 38.40: WMO in collaboration with the atmospheric composition community and satellite experts to further refine the requirements for atmospheric composition requirements and the optimal way to address these in the revised baseline.	Remains open. No progress; Ad-hoc task team to review the needs for GAW (atmospheric composition) regarding satellite measurements and the 2004 IGACO recommendations has not yet been formed.	(CGMS-38) New deadline CGMS-41	OPEN	HLPP#1.1
CGMS Members	WGI	39.21	Action 39.21: Based on the inputs of action CGMS-39 39.20 (CGMS Members to report on their plans for the utilisation of the band 7750-7850/7900 MHz for their existing and future LEO systems [including the detailed list of frequencies used in the band, associated bandwidth and signal characteristics - together with the orbital parameters], CGMS members to analyse potential interference issues, reporting results of analysis back to CGMS WG-I by next CGMS meeting. Deadline: CGMS-40	Remains open - new deadline proposed end Q1 2013 for specific follow up e-meeting of WG-I activities. Linked to HLPP: EESS X-Band congestion and interference assessments.	(CGMS-40) New deadline: 31/03/2013	OPEN	HLPP#1.3
NASA	WGII	39.25	Action 39.25: NASA to discuss with GSICS the use of COVE tool to facilitate sensor calibration and validation activities. Deadline: CGMS-40	NASA-WP-02/03; NOAA-WP-14,15,19	(CGMS-40)	OPEN	HLPP#3
NASA	WGII	39.26	Action 39.26: NASA to ask GPM-XCAL team to review and consider use of GSICS Product Acceptance Procedure. Deadline CGMS-40	GPM current intercalibration efforts are not at the final state where a submission to the GSICS intercalibration process will yield useful		OPEN	HLPP#3
CGMS Satellite Operators	WGII	39.37	Action 39.37: CGMS Satellite Operators to consider the requirements of satellite information for coastal applications that are described in WMO-WP-30, and provide comments to WMO (blee@wmo.int). Deadline: 31 December 2011	Following discussions in WGII at CGMS-40 the action will be referred to CGMS-41.	(CGMS-39 31/12/2011) New deadline CGMS-41	OPEN	HLPP#3

ACTIONS OPEN FROM CGMS-38 AND -39 (AT CGMS-40)

Actionee	Action	#	Description	Action feedback/closing document	Deadline	Status	HLPP ref
EUMETSAT	WGIV	39.46	Action 39.46: EUMETSAT to re-assess the European user requirement for a L-band service from its LEO satellites, bearing in mind the ongoing broader consultation process of WMO, and report to CGMS accordingly. Deadline: CGMS-40	Ongoing.	(CGMS-40) New deadline: CGMS-41	OPEN	HLPP#2
CGMS Members and WMO	WGIV	39.49	Action 39.49: CGMS Members to nominate Points of Contact who can assist WMO with the development of common guidelines for long term data preservation. Deadline for nominations 31 December 2011. WMO to prepare a report on the guidelines to be presented to CGMS-40. Deadline:CGMS-40	EUM: Harald.rothfuss@eumetsat.int WMO: nhettich@wmo.int Other members to nominate their points of contact.	(CGMS-40) New deadline CGMS-41	OPEN	HLPP#5.1
CGMS Members	WGIV	39.51	Action 39.51: All CGMS Members to propose using interoperability standards for providing and sharing of climate data records and report on their efforts at the next meeting of CGMS Deadline: CGMS-40	EUMETSAT: No further developments since CGMS-39. EUMETSAT is prepared to revisit this following an input from other CGMS membersNOAA has provided inputs which were circulated via the CGMS list server on 02/11/12. Other CGMS members to provide their input.	(CGMS-40) New deadline CGMS-41	OPEN	HLPP#5.1

CGMS-40 ACTIONS - PLENARY

Actionee	Action	#	Description	Action feedback/closing document	Deadline	Status	HLPP ref
IOC	Plen II.5	40.01	IOC to provide a paper on guidance to CGMS members on sea surface topography. Deadline: CGMS-41		CGMS-41	OPEN	HLPP#3
WMO	Plen IV.1	40.02	WMO Secretary General to send a letter to CMA inviting them to consider redeploying the FY-3 to an early morning orbit and offering international support to reach this objective.		30-Nov-12	OPEN	HLPP#1
WMO	Plen IV.1	40.03	WMO to convene a CGMS tiger team to coordinate the technical evaluation of the global and regional impact of flying a FY-3 satellite in early morning orbit, in order to support CMA in the assessment process.		31-Dec-12	OPEN	HLPP#1
CGMS WGIII	Plen IV.2	40.04	WGIII to establish a CGMS tiger team on assessing the impact and socio-economic benefits of satellite missions who would collaborate with e.g. the WMO CBS and other partners and would report at CGMS-41.		CGMS-41	OPEN	HLPP#4.1
CGMS agencies	Plen IV.4	40.05	WGII to identify in consultation with the ISWGs the priority ECV climate data records and communicate these priorities to the SCOPE-CM Secretariat for consideration in the call for proposal of January 2013. [WGII]		31-Dec-12	OPEN	HLPP#5.1
WMO	Plen IV.4	40.06	WMO to coordinate impact studies, through the CBS, in order to update and refine its requirements for GNSS radio-occultation (e.g. number of occultations/day, distribution in space)		CGMS-41	OPEN	HLPP#1.1
CGMS Secretariat	Plen V.2	40.07	CGMS Secretariat to explore the possibility to coordinate Climate related activities with CEOS in line with the work done for the preparation of the Architecture for Climate Monitoring from Space and to report at CGMS-41		CGMS-41	OPEN	HLPP#5.1
WMO/Vlab co-chairs	Plen VI.1	40.08	WMO in cooperation with the VLab co-chairs to continue facilitate the integration of ISRO and IMD into the Vlab		CGMS-41	OPEN	HLPP#4.2
CGMS/VLab co-chairs	Plen VI.1	40.09	CGMS to investigate the possibility to provide funding to the VLab CoEs in Argentina, Australia, Brazil and South Africa, to establish a project for generation of conceptual models for the Southern Hemisphere.		CGMS-41	OPEN	HLPP#4.2

WGI - TELECOMMUNICATIONS

Actionee	Action	#	Description	Action feedback/closing document	Deadline	Status	HLPP ref
CGMS satellite operators	WGI	40.10	Interested satellite operators to inform WMO if they identify/designate a representative to be invited to the Satcom forum (WMO point of contact is Etienne Charpentier, Echarpentier@wmo.int)		31-Dec-12	OPEN	HLPP#2.0
CGMS members	WGI	40.11	CGMS members to provide comments to the draft ToR of the Users of Satellite Data Telecommunication Systems (Satcom) Forum, included in annex to CGMS-40 WMO-WP-02, by the end of December 2012.		31-Dec-12	OPEN	HLPP#2.0
CGMS members	WGI	40.12	CGMS members to complete and review interference assessment (in response to action 39.21) by end Q1 2013 (e-meeting).		31-Mar-13	OPEN	HLPP#1.3
CGMS members	WGI	40.13	Round table for comments review to proposed update to CGMS Global Specification 04 (by end of Q1 2013 – same e-meeting as for action 40.12).		31-Mar-13	OPEN	HLPP#1.3

CGMS-40 ACTIONS - WGII – DATA AND PRODUCTS

Actionee	Action	#	Description	Action feedback/closing document	Deadline	Status	HLPP ref
CGMS Secretariat	WGII	40.14	CGMS Secretariat to modify agenda item WGII/2 "Image processing techniques" to "Image processing techniques and satellite imagery for nowcasting" for CGMS-41)		15 May 2013 (for CGMS-41)	OPEN	HLPP#3
EUM and NOAA	WGII	40.15	NOAA and EUMETSAT are invited to present a consensus concept and realisation of a calibrations events logging system with emphasis on issues and lessons learned. Due date: CGMS-41.		CGMS-41	OPEN	HLPP#3
CGMS members	WGII	40.16	CGMS members to complete the GSICS vision questionnaire. Deadline: January 2013		31-Jan-13	OPEN	HLPP#3
NASA	WGII	40.17	NASA to report on optimization of polar orbits of ocean color missions using the COVE Tool, especially those that are planning mid morning orbits, to provide maximum daily coverage from sensors with orbit swath of less than 1500 km.		CGMS-41	OPEN	HLPP#1.1
IMD	WGII	40.18	IMD with GSICS assistance to employ GSICS Satellite Intercalibration tools to intercompare geostationary imager to IASI and/or AIRS. IMD to identify a focal point, and to present findings at CGMS-41		31 Dec 2012; CGMS-41	OPEN	HLPP#3
ROSH	WGII	40.19	Roshydromet with GSICS assistance to employ GSICS Satellite Intercalibration tools to intercompare geostationary imager to IASI and/or AIRS. Roshydromet to identify a focal point, and to present findings at CGMS-41.		31 Dec 2012; CGMS-41	OPEN	HLPP#3
ITWG	WGII	40.20	ITWG co-chairs to initiate updating of the ITWG website and relevant documentation in order to reflect sponsorship by CGMS. By: CGMS-41		CGMS-41	OPEN	HLPP#4
CGMS members	WGII	40.21	CGMS members and WMO to provide adequate support to ensure active participation at international meetings, and training events by developing and LDCs, e.g. for the IPWG-7 workshop in Japan in Oct 2014.		CGMS-41	OPEN	HLPP#4.3
CGMS members	WGII	40.22	All CGMS members that have committed to participate in the second AMV derivation intercomparison project are invited to carry out the study on the basis of the guidance provided by IWWG and the Meteosat data set provided by EUMETSAT. All CGMS members to report on preliminary results at CGMS-41. Final results should be presented at IWW12 in 2014.		CGMS-41	OPEN	HLPP#3

CGMS-40 ACTIONS - WGII – DATA AND PRODUCTS

Actionee	Action	#	Description	Action feedback/closing document	Deadline	Status	HLPP ref
CGMS members	WGII	40.23	CGMS to convene through the IROWG an ad-hoc meeting on the global GNSS-RO constellation, inviting all interested CEOS agencies.		CGMS-41	OPEN	HLPP#1.1
EUM, JMA, NOAA	WGII	40.24	EUMETSAT, JMA and NOAA are invited to report on their development toward common and consistent volcanic ash products from Meteosat and MTSAT-2 and GOES, respectively. Due date CGMS-41		CGMS-41	OPEN	HLPP#3
EUM	WGII	40.25	EUMETSAT to invite Dr. Fred Prata to make a presentation on volcanic ash products science and applications at CGMS-41.		CGMS-41	OPEN	HLPP#3
CGMS Secretariat	WGII	40.26	To request CREW to develop a proposal related to establishment of a new International Science WG, involving all CGMS members and WMO, WCRP and GCOS, including the proposed focus of the group, an account of ongoing activities in other fora (a "gap analysis"), and financial implications, for discussion at CGMS-41.		CGMS-41	OPEN	HLPP#3
CGMS members	WGII	40.27	CGMS members to provide additional comments to the SCOPE-Nowcasting concept and confirm their participation in pilot projects as delineated in Annex I of WMO-WP-04.		15-Dec-12	OPEN	HLPP#3
CGMS members	WGII	40.28	CGMS members participating in SCOPE-Nowcasting to nominate a focal point to the ad hoc SCOPE-Nowcasting Working Group, to meet in Q2/Q3 2013 (cf. Annex II).		15-Dec-12	OPEN	HLPP#3
ROSH	WGII	40.29	ROSHYDROMET to report at CGMS-41 on the technical modalities for the near-real time provision of Meteor-M global data sets and associated ancillary information, as needed to fully contribute to the GOS.	It was agreed at the CGMS-40 debriefing on 9 November 2012 to move this action to WGIV, the action no. is now WGIV 40.38, and this line has been closed as a result.		CLOSED	HLPP#2
CGMSSEC	WGII	40.30	CGMS Secretariat to respond to the letter of the IRC President Dr Robert Cahalan (in which the IRC agrees that the ITWG becomes also formally a CGMS working group) and to express its appreciation on behalf of all CGMS members. Deadline: 1 December 2012.		01-Dec-12	OPEN	HLPP#3
CGMS members	WGII	40.31	CGMS members to evaluate the requirement by IPWG for 3-hourly global temporal sampling of satellites (including non sun- synchronous platforms).		CGMS-41	OPEN	HLPP#3

CGMS-40 ACTIONS - WGIII – CONTINGENCY AND CONTINUITY

Actionee	Action	#	Description	Action feedback/closing document	Deadline	Status	HLPP ref
NOAA	WGIII	40.32	NOAA, in consultation with South America users and WMO, to investigate options for a follow-on to GOES-12 mission for South America, in order to develop a transition plan, involving GOES or other geostationary satellites, until the availability of the GOES next generation, which is expected to provide full coverage of both North and South America.		15-Apr-13	OPEN	HLPP#1.1
EUMETSAT	WGIII	40.33	EUMETSAT to report at CGMS-41 on its plans for Indian Ocean coverage beyond 2013.		31-Dec-12	OPEN	HLPP#1.1
CGMS members	WGIII	40.34	All CGMS Members to review and update their contribution to the mapping of CGMS mission plans against the CGMS baseline, and inform WMO accordingly. (5 December 2012)		05-Dec-12	OPEN	HLPP#1.1
CGMS members	WGIII	40.35	CGMS Members to consider opportunities for partnership with NOAA on COSMIC-2 ground segment and DSCOVR follow-on mission and report to CGMS-41. (July 2013)		CGMS-41	OPEN	HLPP#1.1
CGMS satellite operators	WGIII	40.36	CGMS satellite operators to inform the ICTSW via the WMO Secretariat (jlafeuille@wmo.int) on their needs for space weather data and warning products.		CGMS-41	OPEN	HLPP#5.2

CGMS-40 ACTIONS - WGIV – GLOBAL DATA DISSEMINATION

Actionee	Action	#	Description	Action feedback/closing document	Deadline	Status	HLPP ref
ROSH	WGIV	40.38	ROSHYDROMET to report at CGMS-41 on the technical modalities for the near-real time provision of Meteor-M global data sets and associated ancillary information, as needed to fully contribute to the GOS.	This action was previously WGII 40.29. Following the CGMS-40 debriefing on 9 November 2012 it was decided to allocate it to WGIV.	CGMS-41	OPEN	HLPP#2
CMA and NOAA	WGIV	40.39	CMA and NOAA to review the draft revised Global Specification 04 and provide comments by April 2013, with the goal to provide a revised version for CGMS-41.		31 Mar 2013; CGMS-41	OPEN	HLPP#2
WMO and NOAA	WGIV	40.40	WMO and NOAA to discuss future possibility of NOAA disseminating via GEONETCast-Americas certain environmental data to users in Central and South America.		CGMS-41	OPEN	HLPP#2
CGMS members	WGIV	40.41	CGMS members to propose experts for a CGMS-WMO Task Force on Metadata implementation, for the purpose of interfacing with the WMO IPET-MDRD in the context of the revision of the WMO core metadata profile.		CGMS-41	OPEN	HLPP#2
CGMS Secretariat and WMO	WGIV	40.42	The CGMS Secretariat to draft, in consultation with the WMO secretariat and the Co-Chair of the IPET-MDRD, the terms of reference for the CGMS-WMO Task Force on meta data implementation.		31-Dec-12	OPEN	HLPP#2
CGMS members	WGIV	40.43	JMA, CMA, KMA, NOAA and other CGMS agencies, as appropriate, to nominate focal points to the Task Team on Satellite User Requirements recently established in RA V (South-West Pacific) (Lead: Russell Stringer, Bureau of Meteorology Australia, r.stringer@bom.gov.au);			OPEN	HLPP#2
CGMS members	WGIV	40.44	CGMS Members to support the RA V Task Team in organising a workshop in late 2013 to advance its work plan, in conjunction with the 4th Asia/Oceania Meteorological Satellites Users' Conference in Australia.		30-Sep-13	OPEN	HLPP#2

CGMS-40 RECOMMENDATIONS - PLENARY

Actionee	Rec	#	Description	Action feedback/closing document	Deadline	Status	HLPP ref
CGMS members	Plen R VI.1	40.01	Satellite operators to provide regular, annual contributions into the WMO VLab Trust Fund to ensure the continuation of the post of the VLab TSO		CGMS-41	OPEN	HLPP#4.2
CGMS members	Plen R VI.1	40.02	Satellite operators and WMO to provide necessary resources for the translation of relevant training materials (websites, modules and related) into other WMO languages		CGMS-41	OPEN	HLPP#4.2
CGMS members	Plen R VI.1	40.03	Satellite operators and trainers to take note of the new "CBS Guideline for ensuring user readiness for new generation satellites" and plan appropriate projects to ensure user readiness		CGMS-41	OPEN	HLPP#4.2
CGMS members	Plen R VI.1	40.04	CGMS agencies are encouraged to exploit opportunities for education, outreach and training through the WMO-CGMS Virtual Laboratory for enhanced utilisation of observations and products for marine forecasting, especially of high winds in coastal areas.		CGMS-41	OPEN	HLPP#4.2
CGMS members [Vlab]	Plen R VI.1	40.05	CGMS agencies to support widening of VLab scope (marine, land applications, agricultural meteorology).		CGMS-41	OPEN	HLPP#4.2

CGMS-40 RECOMMENDATIONS - WGI - TELECOMMUNICATIONS

Actionee	Action	#	Description	Action feedback/closing document	Deadline	Status	HLPP ref
CGMS satellite operators	WGI R	40.06	Description CGMS satellite operators are invited to note the CBS-XV recommendations and the resulting WMO requirements for Direct Broadcast from polar-orbiting meteorological satellites in both X-Band and L-Band.		CGMS-41	OPEN	HLPP#2
CGMS members	WGI R	40.07	The establishment of the Satcom Forum has been discussed in WG-I who confirmed that CGMS representation is proposed to be maintained by the CGMS secretariat (currently S. Burns) and also encouraged additional CGMS members (specially satellite operators having an interest in data collection and related issues) to identify themselves as potential participants.		CGMS-41	OPEN	HLPP#1.2

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

Actionee	Action	#	Description	Action feedback/closing document	Deadline	Status	HLPP ref
CGMS members	WGII R	40.08	CGMS agencies are invited to present working papers at CGMS-41 working group II on image processing tools for enabling the integration of various datasets for promote decision support efforts.		CGMS-41	OPEN	HLPP#4.1
EUM	WGII R	40.09	EUMETSAT to continue to provide secretariat support to the SCOPE-CM initiative.		CGMS-41	OPEN	HLPP#5.1
CGMS satellite operators	WGII R	40.10	CGMS operators are encouraged to provide instrument performance monitoring information routinely on their respective websites.		CGMS-41	OPEN	HLPP#3
CGMS members [GSCIS]	WGII R	40.11	All CGMS members participating in GSICS should consider nominating candidates for the positions of Chair and vice-chairs of the working groups and the Executive Panel; they should also provide representatives to the GRWG and GDWG.		CGMS-41	OPEN	HLPP#3
CGMS members	WGII R	40.12	CGMS members that are not currently participating in GSICS to consider an active role in the future progress of GSICS.		CGMS-41	OPEN	HLPP#3
ITWG	WGII R	40.13	CGMS requests that ITWG consider changing its name to better reflect the substantial evolution of sounding technology and science.		CGMS-41	OPEN	HLPP#3
CGMS satellite operators	WGII R	40.14	CGMS members to plan the sequence of satellite launches into the polar orbit to minimise the risk of instrument failures and gaps in the time series of observations, in accordance with the GCOS Climate Monitoring Principles. Space agencies should consider this for the further planning of the Architecture for Climate Monitoring from Space.		CGMS-41	OPEN	HLPP#1.1
CGMS members	WGII R	40.15	CGMS members to conduct studies to trade off benefits of spectral, radiometric, and spatial resolutions of infra-red sounders and to pursue the development of next generation sounders.		CGMS-41	OPEN	HLPP#1.1
CGMS members	WGII R	40.16	Support for line-by-line (LBL) reference model development is of paramount importance and should be continued to ensure that users (in both operational and non-operational institutions) have access to the latest updates in LBL forward modelling.		CGMS-41	OPEN	HLPP#3

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

Actionee	Action	#	Description	Action feedback/closing document	Deadline	Status	HLPP ref
CGMS members	WGII R	40.17	CGMS members should set up the archives of historical data necessary for CDR generation, together with the relevant algorithm versions for products, and other metadata (e.g., spectral response functions) derived by operational and quasi-operational satellite algorithms. This should include the preservation of pre-1979 records. Access mechanisms need to enable CDR generation by users. All archived records should be registered in the ECV Inventory.		CGMS-41	OPEN	HLPP#5.1
CGMS satellite operators	WGII R	40.18	CGMS agencies to support fast delivery initiatives using direct broadcast with extensions wherever possible (e.g., IASI, METOP-B, NPP), including on future polar orbiting satellites.		CGMS-41	OPEN	HLPP#2
CGMS members	WGII R	40.19	CGMS agencies to work with EUMETSAT to extend Regional ATOVS Retransmission Services (RARS) with Direct Readout stations receiving NPP.		CGMS-41	OPEN	HLPP#2
IWWG	WGII R	40.20	IWWG co-chairs to provide a state-of-the-art overview on the research on high resolution wind production and usage and to encourage increased focus on this theme at IWW12. This will involve input from NWP centres (to investigate need for this data in high resolution models and how best to assimilate) and data producers (how best to adapt the derivation).		CGMS-41	OPEN	HLPP#3
CGMS satellite operators	WGII R	40.21	Satellite providers should investigate the potential of global AMVs from tandem satellites: e.g. dual Metop, MODIS/VIIRS and the future Sentinel 3A/B. First assessments are invited for CGMS-41 as a basis for more detailed discussions at IWW12 in 2014.		31-Jul-13	OPEN	HLPP#3
CGMS members	WGII R	40.22	CGMS members are invited to participate in the 3rd workshop of the International Radio Occultation Working Group, taking place near Graz, Austria from 5 - 11 September 2013. In particular, colleagues from China, India, Russia are invited to report on their radio occultation activities.		CGMS-41	OPEN	HLPP#3
CGMS members	WGII R	40.23	CGMS agencies should engage in reprocessing of radio/occultation data to maximize their utility in anchoring climate reanalyses.		CGMS-41	OPEN	HLPP#5.1

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

Actionee	Action	#	Description	Action feedback/closing document	Deadline	Status	HLPP ref
WMO	WGII R	40.24	The scientific evolution of volcanic ash products should be considered as a pilot activity of SCOPE-Nowcasting.		CGMS-41	OPEN	HLPP#3
WMO	WGII R	40.25	WMO in consultation with ICAO to refine the requirement for volcanic ash monitoring and to devise a way forward towards evaluation and operational use of a consistent volcanic ash product from current geostationary satellites.		02-Apr-13	OPEN	HLPP#3
CGMS satellite operators	WGII R	40.26	All operators are invited to consider also the implementation of a common volcanic ash product. Implementation in parallel to existing products would help the evaluation.		CGMS-41	OPEN	HLPP#3
EUM, JMA, NOAA	WGII R	40.27	The scientific development (EUM, JMA, NOAA joint development of common/consistent volcanic ash products) should be considered as a pilot activity of SCOPE-Nowcasting. Due date CGMS-41 (ref. action WGII 40.24)		CGMS-41	OPEN	HLPP#3
CGMS members	WGII R	40.28	CGMS recommended that new sea surface temperature datasets be compared with other satellite and in-situ sea surface temperature datasets under the auspices of the Group on High Resolution Sea Surface Temperature (GHRSST), which was described in CGMS-39 IOC-WP-01.		CGMS-41	OPEN	HLPP#3
ESA, NASA, CGMS members	WGII R	40.29	CGMS recommended that ESA, NASA and other agencies interested in understanding the water cycle continue to coordinate infrastructure development to calibrate and validate Aquarius and SMOS sea surface salinity satellite observations.		CGMS-41	OPEN	HLPP#3
NOAA, CGMS members	WGII R	40.30	CGMS recommended that NOAA and other agencies interested in understanding the carbon cycle continue to coordinate infrastructure development to calibrate and validate the Suomi NPP ocean colour satellite observations.		CGMS-41	OPEN	HLPP#3

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

Actionee	Action	#	Description	Action feedback/closing document	Deadline	Status	HLPP ref
CGMS members [Vlab]	WGII R	40.31	Marine forecasters training activities should be widened with input and participation by other CGMS operators.		CGMS-41	OPEN	HLPP#4.2
CNSA, ROSC	WGII R	40.32	CNSA (HJ-1A/B), ROSCOSMOS (Severyanin-M SAR) to report on their provisions to make data available to users, to CGMS-41.		CGMS-41	OPEN	HLPP#1.1
CGMS members	WGII R	40.33	Interested CGMS Members are invited to report by CGMS-41 on their respective processes for elaboration of user requirements for future marine and atmosphere services, and the status of their evaluation.		CGMS-41	OPEN	HLPP#3/4
CGMS satellite operators	WGII R	40.34	CGMS agencies to provide reports on ground- and space-based space weather observing systems to CGMS-41.		CGMS-41	OPEN	HLPP#5.2
CGMS members	WGII R	40.47	CGMS members to support active participation of their nominated member agency representatives in the Polar Space Task Group		CGMS-41	OPEN	
KMA	WGII R	40.48	KMA to consider joining PSTG and to liaise with WMO Secretariat to discuss further steps.		CGMS-41	OPEN	

CGMS-40 RECOMMENDATIONS - WGIII – CONTINGENCY AND CONTINUITY

Actionee	Action	#	Description	Action feedback/closing document	Deadline	Status	HLPP ref
CGMS satellite operators	WGIII R	40.35	R & D or operational satellite operators should consider the provision of some high-accuracy, SI-traceable and stable reference instruments as anchors for operational instruments, in particular, for climate purposes.		CGMS-41	OPEN	HLPP#5.1
CGMS satellite operators	WGIII R	40.36	CGMS Satellite Operators to address the anticipated or potential gaps identified in the WMO Gap Analysis, in particular: • infrared and microwave sounding on the early morning orbit, • hyperspectral sounding missing in some geostationary sectors, • long-term follow-on of radio-occultation constellation, • global precipitation measurement precipitation radar follow-on mission, • long-term Earth Radiation Budget monitoring • limb sounding for high-vertical resolution observations in the stratosphere and mesosphere (of temperature, humidity, wind, aerosol, ozone and other trace gases).		CGMS-41	OPEN	HLPP#1.1
CGMS members	WGIII R	40.37	All CGMS Members to provide updates on satellite programmes to be included in OSCAR, through their annual reports to CGMS and by other means as appropriate.		CGMS-41	OPEN	HLPP#4.1
CGMS members	WGIII R	40.38	CGMS satellite operators to support NWP centres to perform Observing System Experiments (OSEs) on the regional impact of a potential gap of sounding from the early morning orbit.		CGMS-41	OPEN	HLPP#1.1
CGMS members	WGIII R	40.39	CGMS Members to support CMA in further investigations of the benefit and technical consequences of potential move of a mid morning mission to an early morning mission.		CGMS-41	OPEN	HLPP#1.1
CGMS members	WGIII R	40.40	CGMS Members, through WG III, to evaluate the CGMS baseline in the light of the climate architecture strategy with a view to populate the space segment part of the initial physical view of the architecture and identify gaps and scenarios to address them.		CGMS-41	OPEN	HLPP#5.1

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

Actionee	Action	#	Description	Action feedback/closing document	Deadline	Status	HLPP ref
CGMS members [IROWG]	WGIII R	40.41	CGMS, via the IROWG, to support the development and use of GNSS radio-occultation for ionospheric monitoring.		CGMS-41	OPEN	HLPP#1.1
CGMS members	WGIII R	40.42	CGMS members operating dual-frequency altimeter missions to support the use of altimeter measurements for ionospheric monitoring.		CGMS-41	OPEN	HLPP#1.1
CGMSSEC	WGIII R	40.43	CGMS Secretariat to review the organisation of space weather matters in the agenda of CGMS meetings.		CGMS-41	OPEN	HLPP#5.2

CGMS-40 RECOMMENDATIONS - WGIV – GLOBAL DATA DISSEMINATION

Actionee	Action	#	Description	Action feedback/closing document	Deadline	Status	HLPP ref
CGMS satellite operators	WGIV R	40.44	CGMS satellite operators to actively support user readiness projects as part of the implementation of their new generation satellite systems, following best practices recommended in the "CBS Guideline for Ensuring User Readiness for New Generation Satellites".		CGMS-41	OPEN	HLPP#4.2
CGMS members	WGIV R	40.45	CGMS members are highly encouraged to utilise the operational infrastructure of WIS in particular for the description, inclusion and provision of their satellite meta data to WIS GISCs such that satellite data becomes discoverable within WIS and also consider using WIS in the context of provision of their satellite data.		CGMS-41	OPEN	HLPP#2
CGMS members	WGIV R	40.46	CGMS members are encouraged to support the expansion of RARS to advanced sounder data and the broader IGDDS initiatives in order to further expand the access to and use of satellite data and products.		CGMS-41	OPEN	HLPP#2

VII.3 Nominations

Nomination of chairs and rapporteurs of the CGMS Working Groups for CGMS-41 were made as follows:

- **Working Group I on Telecommunications** will be chaired by Marlin O Perkins, NOAA, with Joaquin Gonzalez, EUMETSAT, as Rapporteur;

- **Working Group II on Satellite Products** will be co-chaired by Stephan Bojinski, WMO and Toshiyuki Kurino, JMA with Johannes Schmetz, EUMETSAT and Mitch Goldberg, NOAA, as rapporteurs;

- **Working Group III on CGMS Global Contingency Planning** will be chaired by Suzanne Hilding, NOAA, and a representative from CMA (TBC), with Jérôme Lafeuille, WMO, as Rapporteur;

- **Working Group IV on Global Data Dissemination** will be chaired by Mikael Rattenborg and Hyunjong Oh (TBC), KMA, with Klaus Peter Renner, EUMETSAT, as Rapporteur.

VII.4 Date and place of next CGMS plenary sessions

The next plenary sessions of CGMS will be hosted by JMA and JAXA and will take place on 8-12 July 2013 in Japan.

Thereafter the plenary sessions might rotate as follows:

- 2014 China
- 2015 USA
- 2016 Europe
- 2017 Korea
- 2018 India
- 2019 Russia
- 2020 WMO

VII.5 Closing

The chair thanked all participants for their active and fruitful participation in CGMS-40, highlighting it had been a very special meeting spanning from the 40th anniversary of CGMS to the endorsement of the first CGMS High-Level Priority Plan.

All participants warmly thanked WMO and the Federal Department of Foreign Affairs of Switzerland for the excellent hosting and organisation of the meeting in Lugano.

The meeting adjourned at 17:50 on 8 November 2012.

WGI REPORT

Working Group I: Global Issues on Satellite Systems and Telecommunication Coordination

WGI/0 Introduction

As agreed at the beginning of the plenary session of CGMS-39, Mr Marlin O. Perkins (NOAA) and Mr. Joaquin Gonzalez (EUMETSAT) were elected as Chairperson and Rapporteur, respectively, of Working Group I (WGI) on Telecommunications. WGI is comprised of representatives of the satellite operators from CMA, JMA, KMA, NOAA, IMD, ROSHYDROMET, ROSCOSMOS and EUMETSAT together with WMO (see Annex 4 for full list of participants).

The Agenda proposed by the CGMS Secretariat prior to the meeting, was adopted with the following modifications:

- WMO presentation on the capabilities of O.S.C.A.R. (Observing System Capability Analysis and Review Tool) and its relevance and potential for WGI was included under agenda item I/2
- CMS-WP-03 was moved from original agenda item I/4 to agenda item I/2.

WGI/1 Review of actions from the Previous Meeting

Actions from previous meetings were discussed at the beginning of the working group meeting as summarised below.

Permanent Action 10. CGMS Members to provide at every CGMS meeting a list of frequencies used by their current and future systems in the format provided in WG I report-39 (Annex 1).
Deadline: CGMS-40
Status: NOAA-WP-12, CMA-WP-02, EUM-WP-04, Closed.

Action 39.20. CGMS Members to report on their plans of utilisation for the band 7750-7850/7900 MHz for their existing and future LEO systems (including the detailed list of frequencies used in the band, associated bandwidth and signal characteristics -together with the orbital parameters).
Deadline: 31.12.2011
Status: CMA-WP-03, NOAA WP-12, EUM-WP-04. Closed

Action 39.21. Based on the inputs of action CGMS-39 39.20 (CGMS Members to report on their plans for the utilisation of the band 7750-7850/7900 MHz for their existing and future LEO systems [including the detailed list of frequencies used in the band, associated bandwidth and signal characteristics - together with the orbital parameters], CGMS members to analyse potential interference issues, reporting results of analysis back to CGMS WGI by next CGMS meeting. Deadline: CGMS -40
Status: Open. New deadline proposed end Q1 2013 for specific follow up e-meeting of WGI activities.

Action 39.22. WGI Chairman to report to plenary (under agenda item I/1) to confirm CGMS Secretariat as coordinated representative of CGMS vis-à-vis SFCG for future meetings.
Deadline: 7.10.2011
Status: Closed.

Permanent Action 09. EUMETSAT (as CGMS Secretariat) to provide a yearly report to WGI on SFCG yearly meeting.
Deadline: CGMS -40
Status: EUM-WP-06. Closed

Action 39.23. EUMETSAT (as CGMS Secretariat) to represent CGMS in the ad-hoc workshop proposed by WMO on of the future International Forum of Users of Satellite Data Telecommunication Systems (to ensure that there is at least one representative of CGMS).
Deadline: CGMS-40
Status: Closed.

WGI/2 Frequency management matters: SFCG, ITU and WRC activities

EUM-WP-05 provides a summary of the results of World Radiocommunication Conference 2012 (WRC-12), held in Geneva, 23 January to 17 February, for the most important issues related to the MetSat service and the Earth Exploration Satellite Service (EESS) and provides an outlook to the WRC-15 topics of interest and concern to the MetSat operators. WRC-12 agenda items with relevance to the METSAT and EESS services were:

- Agenda Item 1.6 - Identification of frequency bands for passive sensing between 275 GHz and 3000 GHz;
- Agenda Item 1.8 - Fixed service in the range 71- 238 GHz - Protection of the passive band at 86 – 92 GHz;
- Agenda Item 1.24 - Extension of the existing primary allocation for non-geostationary Meteorological Satellite Service (MetSat) at 7750 - 7850 MHz into the band 7850 - 7900 MHz;
- Agenda Item 8.1.1 (Issue C) - Resolution 673 (WRC-07) - Improve the recognition of the essential role and global importance of Earth observation radiocommunication applications;
- Agenda Item 8.2 – Proposals for agenda items for WRC-15.

WRC-12 Agenda Item 1.6 regarding frequency allocations for EESS (passive) in bands above 275 GHz

WRC-12 Agenda Item 1.6 called for the review of footnote 5.565 of the Radio Regulations (RR) in which in its old form a number of outdated frequency bands were identified for use by passive sensors. The aim of this agenda item was to update the list of frequency bands for spectrum use by the passive services between 275 GHz and 3000 GHz in order to better reflect the current and future planned use of passive sensors.

In preparation for this agenda item investigations were performed within ITU-R and SFCG, with full involvement of a number CGMS MetSat operators, to identify the most up-to-date and relevant frequency bands for passive sensing above 275 GHz. These bands were well reflected in the relevant documentation, namely within SFCG (SFCG Resolution 29-1 "Passive bands of interest above 275 GHz") and the ITU-R Report ITUR RS.2194 on passive bands of interest to EESS/SRS from 275 to 3000 GHz. WRC-12 revised the relevant footnote 5.565 in the Radio Regulations in-line with the list of frequency bands as identified by SFCG and ITU-R, thus well reflecting the required frequency bands for future passive sensing in bands above 275 GHz. In this context it should be noted that the listing of frequency bands above 275 GHz for passive sensing are not to be considered as frequency allocations, they are currently just an identification of spectrum use. Since there is a lack of knowledge of the spectrum requirements for active users of the spectrum, frequency bands above 275 GHz will not be allocated to different radiocommunication services (including passive services) until an appropriate time in future.

Although the identification of frequency bands for passive sensing are not formal frequency allocations to the Earth Exploration Satellite Service (passive), administrations are urged in this footnote to take all practicable steps to protect these passive services from harmful interference. This result constitutes the best possible regulatory status until "real" frequency allocations (not subject of this agenda item at this WRC) to radiocommunication services as defined by the Radio Regulations will be agreed at a future WRC.

WRC-12 Agenda Item 1.8 (Fixed service in the range 71 – 238 GHz)

Under WRC-12 Agenda Item 1.8 technical and regulatory issues related to the fixed service between 71 and 238 GHz including sharing and adjacent band compatibility with passive services under Resolution 731 (WRC-2000) were under consideration. This frequency range 71 to 238 GHz covers a number of important EESS (passive) frequency bands, such as 86 - 92 GHz, 100-102 GHz, 114.25-122.25 GHz, 148.5-151.5 GHz, 155.5-158.5 GHz, 174.8-191.8 GHz, 226-231.5 GHz and 235-238 GHz already in use by a number of instruments.

Fortunately, there were no proposals for fixed service regulations proposed at WRC-12 that would negatively influence the passive sensing bands in the range 71 – 238 GHz. The European group, CEPT, and China took this agenda item as an opportunity to propose mandatory out-of-band emission limits on the fixed service allocations neighbouring the passive sensing band 86 – 92 GHz to ensure the protection of sensors in this band from out-of-band emissions of the fixed service in bands operating below and above.

Against initial strong opposition from five regional groups, WRC-12 finally decided to include in Resolution 750 of the Radio Regulations recommended out-of-band emission levels for the fixed service in the bands directly below and above the passive band 86 – 92 GHz. With this inclusion of recommended out-of-band emission levels in the Radio Regulations global recognition of the need for protecting the 89 GHz passive band has been achieved.

WRC-12 Agenda Item 1.24 (Extension of the MetSat allocation at 7750 – 7850 MHz by 50 MHz into the band 7850 – 7900 MHz)

WRC-12 Agenda Item 1.24 called for consideration of extension of the existing allocation to the MetSat service in the band 7750 - 7850 MHz by 50 MHz to cover also the band 7850 - 7900 MHz, limited to non-geostationary meteorological satellites in the space-to-Earth direction.

The mission requirements for next generation non-GSO meteorological satellites in terms of observations, instruments and user-services clearly show a need to transmit higher data rates compared to current systems.

EUMETSAT supported the extension of the existing allocation of the 7750 – 7850 MHz band to the MetSat service (space-to-Earth) for use by non-geostationary satellites into the 7850-7900 MHz band and performed and introduced the necessary sharing studies in the relevant ITU-R Working Party 7B resulting in ITU-R Report SA.2164 on "Compatibility between the meteorological satellite and the fixed service in the band 7850 - 7900 MHz".

From the results of the sharing studies which were taking into account the use of the band by MetSat for raw data dump and/or direct readout applications it can be concluded that the sharing scenarios in the frequency band 7850 - 7900 MHz are similar to the ones in the frequency band 7750 - 7850 MHz, thus

MetSat could be operated under the same regulatory conditions as in the existing MetSat band. As a consequence of the good preparation of this agenda item, all 6 regional groups proposed to WRC-12 such an extension of the existing primary allocation to the MetSat service in the band 7750 - 7850 MHz by 50 MHz.

As expected, WRC-12 concluded the extension of the existing primary allocation to the MetSat service in the band 7750 - 7850 MHz by 50 MHz to cover also the band 7850 - 7900 MHz under the same regulatory conditions as in the already allocated band.

With this extension, the direct read-out services of Suomi NPP/JPSS, FY-3 and EPS-SG can now be placed side-by-side to each other in the band 7750 – 7900 MHz without the need of any frequency overlap, thus without mutual interference.

In order to ensure the long-term usability of this frequency band for current and future polar-orbiting MetSat systems (to the extent possible) without mutual interference, a coordinated approach for planning the long term use of the entire band 7750 – 7900 MHz would be necessary in the framework of SFCG.

WRC-12 Agenda Item 8.1.1, Issue C (Improve the recognition of the essential role and global importance of Earth observation radiocommunication applications (Resolution 673 (WRC-07))

Not least because of the increasing number of extreme and hazardous weather and climatic phenomena, ITU-R and its member countries recognised the essential role and global importance of radio spectrum use for Earth observations and for related applications. Therefore, WRC-07 adopted Resolution 673 (WRC-07) to this effect which called for studies on possible means of improving this recognition and of increasing the knowledge and understanding of administrations regarding the utilisation and benefits of these applications.

This Resolution 673 (WRC-07) instructed the Director of the Radiocommunication Bureau to report to WRC-12 on these studies and was, to this respect, considered under WRC-12 agenda item 8.1.1 (Issue C). In response to Resolution 673 ITU-R Working Party 7C developed ITU-R Report RS.2178 on "The essential role and global importance of radio spectrum use for Earth observations and for related applications", focusing in particular on Earth Observation.

WRC-12 decided to add a new Article 29A to the Radio Regulations pointing to a revised Resolution 673, thus highlighting in the best possible way the recognition of the global importance of radio spectrum use for Earth observations. Resolution 673 resolves:

1. to continue to recognize that the use of spectrum by Earth observation applications has a considerable societal and economic value;

2. to urge administrations to take into account Earth observation radiofrequency requirements and in particular protection of the Earth observation systems in the related frequency bands;

3. to encourage administrations to consider the importance of the use and availability of spectrum for Earth observation applications prior to taking decisions that would negatively impact the operation of these applications.

WRC-12 Agenda Item 8.2 (Proposals for agenda items for WRC-15)

One of the outputs of a WRC is the agenda for the following conference (WRC-15). After considerable discussions, WRC-12 agreed on the agenda for WRC-15 proposing some 20 items. One can note that there are a number of items that could potentially negatively impact the future use and availability of frequency bands used or planned to be used by MetSat operators. The following WRC-15 agenda items will require careful consideration:
1.1 to consider additional spectrum allocations to the mobile service on a primary basis and identification of additional frequency bands for International Mobile Telecommunications (IMT) and related regulatory provisions, to facilitate the development of terrestrial mobile broadband applications, in accordance with Resolution COM6/8 (WRC-12);

The main frequency bands at risk for CGMS member agencies are expected to be:

- the 1675 – 1710 MHz bands used for meteorological satellite applications;

- the bands 2025 – 2110 MHz and 2200 – 2290 MHz used for Earth exploration satellite and space operation (TM/TC and ranging) services. While these bands have been secured in the past by application of RR No. 5.391, the agenda item asks specifically for a review of studies conductedin the past;

- the C-band (3.4 - 4.2 GHz), used for dissemination of meteorological data in the framework of GEONETCast;

- the active remote sensing band 5250-5570 MHz used for SARs, scatterometers and altimeters;

- In addition, frequency bands adjacent to passive allocations may also be targeted, in particular both sides of the 1400-1427 MHz band used for EESS (passive).

1.6 to consider possible additional primary allocations:

1.6.1 to the fixed-satellite service (Earth-to-space and space-to-Earth) of 250 MHz in the range between 10 GHz and 17 GHz in Region 1;

1.6.2 to the fixed-satellite service (Earth-to-space) of 250 MHz in Region 2 and 300 MHz in Region 3 within the range 13-17 GHz;

and review the regulatory provisions on the current allocations to the fixed-satellite service within each range, taking into account the results of ITU-R studies, in accordance with Resolutions COM6/4 (WRC-12) and COM6/5 (WRC-12), respectively;

One of the targeted frequency bands for a possible allocation of FSS (Earth-to-space) is 13.25 – 13.75 GHz, which raises particular concerns with regard to the allocation of this band to EESS (active). This band is used for active remote sensing (altimeters and scatterometers) by missions such as Cryosat, Jason-2, -3, Jason-CS, Sentinel-3, and HY-2. Prior studies have shown incompatibility between these services. Therefore, a new allocation to FSS (E-s) in the band 13.25-13.75 GHz would be detrimental to the long term usability of this band for active sensors.

1.9.2 the possibility of allocating the bands 7375-7750 MHz and 8025-8400 MHz to the maritime-mobile satellite service (MMSS) and additional regulatory measures, depending on the results of appropriate studies;

The potentially affected space science service bands under this agenda item are 7450-7550 MHz MetSat (s-E, GSO) and 8025-8400 MHz EESS (s-E). Thus no new allocations to the MMSS should be made in these frequency bands unless acceptable sharing criteria with the science services are developed. Of particular concern is the potential interference to EESS (s-E) operations in 8025-8400 MHz at high latitudes from ships operating in closer proximity. Large exclusion zones may be needed to avoid interference to EESS earth stations. Many EESS earth stations are located near coastal areas (e.g., Svalbard, McMurdo, Maspalomas, Lannion, Wallops) and could be seriously affected by emissions from vessels navigating in the area.

1.10 to consider spectrum requirements and possible additional spectrum allocations for the mobile-satellite service in the Earth-to-space and space-to-Earth directions, including the satellite component for broadband applications, including International Mobile Telecommunications (IMT), within the frequency range from 22 GHz to 26 GHz, in accordance with Resolution COM6/16 (WRC-12);

The main frequency bands at risk for CGMS member agencies are:

- The EESS (passive) band 23.6-24 GHz (purely passive, but to be protected against unwanted emissions taking into account interference apportionment and the levels contained in ITU Resolution 750 (rev. WRC-12));

- The first 500 MHz of the EESS/SRS space-to-Earth band 25.5 – 27.0 GHz.

1.11 to consider a primary allocation for the Earth exploration-satellite service (Earth-to-space) in the 7-8 GHz range, in accordance with Resolution COM6/17 (WRC-12);

Initially proposed by ESA through CEPT, this agenda item calls for the identification of a suitable frequency band for an EESS (Earth-to-space) allocation in the 7-8 GHz range for telecommand operations in order to complement telemetry operations of EESS (space-to-Earth) in the 8 025-8 400 MHz band.

1.12 to consider an extension of the current worldwide allocation to the Earth exploration-satellite (active) service in the frequency band 9 300-9 900 MHz by up to 600 MHz within the frequency bands 8 700-9 300 MHz and/or 9 900-10 500 MHz, in accordance with Resolution COM6/18 (WRC-12);

This issue is related to the spectrum requirements of TerraSAR-X2 and does not concern or impact current or future frequency usage of MetSat systems.

9.1 on the activities of the Radiocommunication Sector since WRC-12;
9.1.1 RESOLUTION 205 (REV.WRC 12) - Protection of the systems operating in the mobile-satellite service in the band 406-406.1 MHz;

Cospas-Sarsat space segment providers have developed protection criteria for the Cospas-Sarsat search and rescue instruments and local user terminals in the 406.0-406.1 MHz band in order to protect them against broadband out-of-band emissions and against narrow-band spurious emissions. These protection criteria have been recognised at the ITU level through ITU-R M.1478-1. However, they do not provide protection against emissions in adjacent bands which could hinder the Cospas-Sarsat system's ability to detect and/or relay signal from beacons. Thus Cospas-Sarsat, with the support of its space segment providers, will develop the relevant protection criteria for submission to the relevant ITU-R groups and translation into an ITU-R recommendation.

SFCG Successes at WRC-12

EUM-WP-06 provides a summary of issues discussed at the 32st meeting of the Space Frequency
Coordination Group (SFCG), held 12 – 20 June 2012, which could be of potential interest to CGMS

Based on the results of the World Radiocommunication Conference 2012 (WRC-12) held in Geneva, Switzerland, from 23 January through 17 February 2012, under the auspices of the International Telecommunication Union (ITU), the world space science community has secured the future of passive remote sensing above 275 GHz, gained a new primary allocation in the band 22.55-23.15 GHz for space research service (Earth-to-space) operations, protected the space research service (space-to-Earth) operations in the 37-38 GHz band from possible interference from aeronautical mobile systems, and gained considerable recognition for the essential role and global importance of Earth observation radiocommunication applications throughout the world. Additionally, through the efforts of SFCG members, passive remote sensing systems using the 86-92 GHz passive band are now better protected, and the meteorological community now has access to an additional 50 MHz of downlink spectrum for non-geostationary meteorological satellites in the 7850 - 7900 MHz band for a total of 150 MHz of contiguous downlink spectrum.

The requirements and the technical foundations upon which the new allocations and protections were based had been established in the technical groups of the ITU-R during the 2007-2011 Study Period since the previous WRC held in Geneva in 2007. The space agencies of the world have also worked diligently to refine the technical and operational requirements within the Space Frequency Coordination Group (SFCG). Overall, the results of WRC-12 are considered largely successful for SFCG members. SFCG members were instrumental through their efforts in achieving outcomes that enable the increasingly challenging, important and responsible obligations of the science service community to continue to provide an outcome that serves the interests of mankind. In many cases, SFCG members took a very active role within their own administrations or Regional Groups thereby having a very direct and large impact on the deliberations at WRC-12 on key agenda items for the SFCG.

Considering the short time period to WRC-15, SFCG already developed their preliminary objectives for WRC-15 and beyond as outlined in Resolution SFCG 32-1.

MetSat characteristics for new ITU-R Recommendation

CMA introduced a planned input document to the forthcoming meeting of Working Party 7B in September 2012 regarding the working document toward a Preliminary Draft New Recommendation ITU-R SA.[EES/MET CHAR], providing updated and additional characteristics of CMA satellite systems to be used for assessing interference to systems operating in the Earth exploration-satellite and meteorological-satellite services and for conducting sharing studies.

DLR, NOAA and EUMETSAT announced at SFCG-32 similar inputs to the September 2012 meeting of Working Party 7B. However, in order to have a complete set of parameters of existing and planned MetSat systems (GSO and NGSO), inputs from further MetSat operators to this ITU-R Recommendation under development will be necessary.

Passive Sensor Filter Characteristics

Following the latest interference events to passive sensors (AMSR-E, JASON, SMOS), SFCG is compiling information on passive sensors filter characteristics to ease the task of SFCG members in future discussions pursuant to solving these interference cases with their national radiocommunication authorities.

The limited response of SFCG members to corresponding actions in the last two years has proven the difficulty to get hold of the sensor filter characteristics from manufacturers due to their data policies or legal issues. So far only characteristics for SMOS, MHS and AMSU (on Metop) and MWR (on ENVISAT) were made available which is not sufficient to have a representative set of filter characteristics for the different frequency bands available for passive sensing.

Nevertheless, SFCG-32 has decided to adopt SFCG Report 32-1 (Passive sensor filter characteristics) which is considered to be a living document which will be updated as further information on passive sensor filter characteristics are available.

Therefore, SFCG members were still invited to gather information related to their sensors in response to a corresponding agenda item for SFCG-33. Since it appears that there are sometimes difficulties to get the measured filters characteristics from industry, it was agreed that in those cases at least filter design specification should be made available.

1400-1427 MHz RFI

ESA provided an updated worldwide overview of the interference environment in the 1400-1427 MHz passive band as observed by SMOS mission.

SMOS satellite carries a single payload on board, MIRAS, a Microwave Imaging Radiometer with Aperture Synthesis, which operates within the Earth Exploration Satellite Service (EESS) passive band at 1400-1427 MHz. Since its launch in November 2009, SMOS images have been strongly impacted by radio frequency interference (RFI) either from out-of-band emissions mainly of radars operating in neighbouring frequency bands or from illegal transmissions within the passive band.

RFI jeopardizes part of SMOS scientific retrievals in certain areas of the world, especially over continental areas in Europe, Southern Asia and the Middle-East. Areas affected by RFI might experience data loss or underestimation of soil moisture and ocean salinity retrieval values. To alleviate this situation the SMOS team has put in place strategies that, one year after launch, have already improved the RFI situation, mainly over Europe where half of the sources have been successfully localised and switched off.

So far approximately 500 RFI sources distributed worldwide have been detected. Some of the strongest RFI sources might mask other weaker RFI underneath, hence it is expected the total number of RFI detected may increase as strong ones are progressively located and switched off. Most RFIs are located in Asia and Europe (59% of RFIs eliminated, 41% RFIs still remaining), which together hold approximately 80% of the active sources and more than 90% of the strongest interference.

The SMOS RFI issue has led to the adoption of mandatory out-of-band emission limits on the neighbouring service within CEPT (ECC/DEC(11)01) to protect the passive band 1400-1427 MHz in line with the recommended levels as adopted at WRC-07.

Inter-member cooperation in resolving interference

Triggered by the interference caused to the band 1400 – 1427 MHz band, SFCG-32 adopted a new SFCG-Resolution A32-1 dealing with inter-member cooperation in resolving interference to EESS (passive) and EESS (active) operations.

This resolution is aimed to provide support to SFCG Members experiencing unacceptable interference to either their active or passive sensors operations from emissions originating from another SFCG Member's administration.

Protection of the band 406 – 406.1 MHz (WRC-15 Agenda Item 9.1.1)

SFCG addressed WRC-15 Agenda items 9.1.1: Res. 205 (Rev.WRC-12) regarding the protection of systems operating Search and Rescue (i.e. Cospas-Sarsat) applications in the mobile-satellite service in the band 406 - 406.1 MHz.

While this protection criterion as defined in Recommendation ITU-R M1478-2 provides allowable power flux-density requirements against broadband out-of band and narrow band spurious emissions for the frequency bands used by the Cospas-Sarsat systems, they do not provide protection against emissions in adjacent bands.

Emissions in adjacent bands, if not adequately controlled, could raise the level of noise captured by the Cospas-Sarsat systems and hinder their abilities to detect and/or relay signal from beacons.

In order to be in the position to properly assess the interference potential of mobile service systems in the band 406.1 – 420 MHz, SFCG members were invited to contact their Radiocommunication Authorities to ensure that the required information of the concerned services (in particular of the mobile service in the band 406.1 – 420 MHz) is made available.

EESS (active) in the 13.25-13.75 GHz band

SFCG-32 considered and reviewed characteristics of current and future EESS (active) sensors in the band 13.25 - 13.75 GHz. Sharing studies performed in preparation for WARC-92 have shown that compatibility with FSS is not feasible, nevertheless leading to the loss of the 13.25 - 14 GHz band at WARC-92.

Work is ongoing with the respective group within ITU-R (Working Party 7C) to revise Preliminary Draft New Revision to Report ITU-R RS.2068 on "Current and future use of the band 13.5 GHz by spaceborne active sensors" with a view to update information about the current use, the feasibility of using other EESS (active) bands for corresponding measurements as well as future requirements in these bands.

All SFCG members were invited to provide detailed information on their current and planned active sensors in this band within the ITU-R process. All SFCG members were strongly encouraged to support these initiatives at their national levels and within WRC- 15 preparation with a view to avoiding any FSS allocation in the 13.25-13.75 GHz band.

JMA-WP-03 reported on the status of current and future JMA satellite systems. MTSAT-2 (145°E) is now operational in imaging over the West Pacific region with MTSAT-1R (140°E) as backup. MTSAT-1R has continuously performed the same imagery dissemination and data collection services as MTSAT-2 even since the switchover of the imaging function on 1 July, 2010. Its DCS (Data Collection System) has been functioning properly since the satellite began operation.

Regarding future satellite systems, JMA plans to launch Himawari-8 in summer 2014 and commence its operation in 2015, when MTSAT-2 is scheduled to complete its period of operation. The Agency also plans to launch Himawari-9 in 2016. As to the manufacture of Himawari-8 and -9, production is currently in the parts manufacture phase. The imagery data of Himawari-8 and -9 will be delivered mainly via the Internet. JMA has also started a feasibility study on data dissemination using a commercial telecommunication satellite. JMA opened web pages of Himawari-8 and -9, whose address is http://mscweb.kishou.go.jp/himawari89/index.html.

CMA-WP-03 discussed the FY-3 utilisation of 7750-7900MHz frequency band and was provided by CMA in response to action 39.20. The FY-3 satellite is capable of X-band MPT format direct broadcast service. At the present, FY-3 is programmed to transmit MPT format data within China area to avoid interference with other facilities. In this circumstance, the MPT DB service open for outside of China area is only possible on specific bilateral arrangement.

The MPT data stream contains the raw data of MERSI instrument measurement. With this report CMA hopes to bring the attention to the utilisation of band 7750-7900MHz by FY polar-orbiting system for X-band DB service that covers the duration from 2008 to 2020 or beyond (ref:CGMS40-CMA-WP-02).

FY-3 orbital parameters:

Nominal orbit height:	836.4 Km
Inclination:	98.753 °
Eccentricity:	0.0025
Half long-axis:	7207.63 Km
Apogee:	854.42 Km
Perigee:	818.38 Km
Period:	101.603 minutes
Daily flight circles:	14.1728
Time at descending node:	10:20 am
Shift Nodal time maintained:	10 min (2 years)

Frequency and signal characteristics (as of 20 October, 2012)

Satellite Name	Transmission	Point Frequency (MHZ)	EIRP	Polarization	Modulation	Date Rate	Direction
FY-3A/-3B	MPT	7775.00	46dBw (EL=5°)	RHC	QPSK	18.7Mbps	S-E
FY-3C	MPT	7780	46dBw (EL=5°)	LHC	QPSK	37.4Mbps	S-E
FY-3B	MPT	7820	46dBw (EL=5°)	RHC	QPSK	60Mbps	S-E

CMA-WP-02, EUM-WP-04, JMA-WP-03 (LRIT will also use in the future commercial satellites –still TBC which one) and **NOAA WP-12** provide lists of the frequencies used by current and future satellite systems. These reports were prepared in response to CGMS permanent action 10.

ACTIONS OPEN FROM CGMS-38 AND -39 (AT CGMS-40)

Actionee	Action	#	Description	Action feedback/closing document	Deadline	Status	HLPP ref
CGMS Members	WGI	39.21	Action 39.21: Based on the inputs of action CGMS-39 39.20 (CGMS Members to report on their plans for the utilisation of the band 7750-7850/7900 MHz for their existing and future LEO systems [including the detailed list of frequencies used in the band, associated bandwidth and signal characteristics - together with the orbital parameters], CGMS members to analyse potential interference issues, reporting results of analysis back to CGMS WG-I by next CGMS meeting. Deadline: CGMS-40	Remains open - new deadline proposed end Q1 2013 for specific follow up e-meeting of WG-I activities. Linked to HLPP: EESS X-Band congestion and interference assessments.	(CGMS-40) New deadline: 31/03/2013	OPEN	HLPP#1.3

Action 39.21 is not closed to evaluate interference issues and new due date is proposed to allow time to perform the interference assessments (end Q1 2013)

CGMS-40 ACTIONS - WGI TELECOMMUNICATIONS

Actionee	Action	#	Description	Action feedback/closing document	Deadline	Status	HLPP ref
CGMS members	WGI	40.12	CGMS members to complete and review interference assessment (in response to action 39.21) by end Q1 2013 (e-meeting).	Inter-sessional activity	31-Mar-13	OPEN	HLPP#1.3

During the discussions related to this action item. WMO presented the Observing System Capability Analysis and Review Tool (OSCAR) described in WMO-WP-07. OSCAR is a web based tool containing characteristics of over 700 instruments and 500 satellites. A proposed new functionality is to store and display the frequency information in accordance with the CGMS WGI standard template, with filtering possibility in support of frequency management activities. The Working Group agreed that such information should be made public as it could be useful for the users of satellite systems. Furthermore, the group discussed the possible utilisation of OSCAR by the Working Group members and it was found of interest as a repository of the frequency information for CGMS. The Working Group invited WMO to complete and to publicly release the frequency information section of OSCAR and encouraged WGI Members to provide WMO with updated frequency information for OSCAR in accordance with the CGMS agreed template.

NOAA-WP-30 provides an update on the implementation of the 2010 President's Broadband Initiative which remains a U.S. government priority. The U.S. National Telecommunications and Information Administration (NTIA) established a government-industry working group to revalidate assumptions and conclusions in the NTIA Fast Track Report, which identified the 1695-1710 MHz band for sharing between POES, MetOp and commercial broadband providers. The working group results will be vetted through U.S. Government stakeholders for an official coordination cycle extending through February 2013. Industry representatives provided details about their planned operations which are currently being analysed for impacts to exclusion zones and previously-predicted interference levels. Interference at critical locations and at hundreds of unprotected POES and MetOp High-Resolution Picture Transmission (HRPT) direct broadcast locations outside exclusion zones remain NOAA issues that we are working on with our operations personnel and customers.

There are other spectrum sharing ideas originating with U.S. industry that have required technical analysis and coordination domestically and abroad. For example, LightSquared has expressed a desire to share the 1675-1680 MHz band with current GOES back-up operations and NOAA radiosondes. Analysis is in the preliminary stage.

Finally, NOAA spectrum specialists have continued to work routine domestic and ITU filings for current and future NOAA spacecraft.

WGI/3 Advances in telecommunication techniques
No papers were presented in this session.
WGI/4 Direct broadcast services
WGI/4.1 Direct Read-out Stations
JMA-WP-05 informed CGMS that JMA receives NOAA-16, NOAA-18, NOAA-19 and Metop-A direct readouts and disseminates ATOVS data via the Global Telecommunication System (GTS) for the Asia-Pacific RARS (AP-RARS).
JMA began receiving and processing Suomi NPP/HRD direct readout at Kiyose Station with the upgrading of the ground system to receive X-band in March 2012.

Suomi NPP/HRD data are processed by applying RT-STPS (NASA), CSPP (University of Wisconsin) and AAPP (NWP SAF) in real time. A summary of the direct readout data processed at Kiyose Station is shown in Table 1. JMA plans to assess the impact of ATMS and CrIS data on JMA NWP systems.

Table 1. Summary of direct readout data processed at Kiyose Station

Satellite	Software	Usage
NOAA-16 NOAA-18 NOAA-19 Metop-A	Metopizer* (EUMETSAT) AAPP	Clour (AVHRR) Sea Ice (AVHRR, AMSU-B/MHS) SST (AVHRR) Volcanic ash (AVHRR) Aerosol (AVHRR) Ozone (HIRS) L1C data (HIRS, AMUS-A, AMSU-B/MHS) T.B.D. (IASI*) *Metop only
Suomi-NPP	RT-STPS CSPP AAPP	L1C data (ATMS, CrIS) T.B.D. (VIIRS)

WGI/4.2 Coordination and Global Standards

WMO-WP-01 provides a report to CGMS of the WMO survey on L-Band / X-Band Direct Broadcast in response to action 39.45. The survey was performed among WMO Members in order to reassess the need for low-data rate services in L-band in addition to future high data rate services in X-band.

As of 15 October 2012, the results of the survey were the following:

- 36 WMO Members have responded, reporting on 46 receiving stations;
- 23 of these Members (24 stations) have stated a need of both L-Band and X-Band.

While X-Band will be required on future LEO systems to achieve sufficient data throughput for full resolution data, replies to the survey confirmed a need of low data rate stream in L-Band, which has better weather resilience than X-Band, and is currently free of other uses.

The Commission for Basic Systems (CBS-XV) therefore recommended:

- To WMO Members to prepare for receiving Direct Broadcast of full resolution data from future polar-orbiting satellites in X-Band and to register their receiving stations with national authorities;
- To satellite operators to implement Direct Broadcast in both X-Band, for full resolution data, and L-Band, for a subset of data, since L-Band will provide independent, weather resilient, and more affordable low rate data access;
- To satellite operators to supplement the Direct Broadcast service with near real time retransmission of key data sets on regional broadcast services (such as EUMETCast or CMACast) where appropriate.

CGMS-40 RECOMMENDATIONS - WGI TELECOMMUNICATIONS

"Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS satellite operators	WGI R	40.06	CGMS satellite operators are invited to note the CBS-XV recommendations and the resulting WMO requirements for Direct Broadcast from polar-orbiting meteorological satellites in both X-Band and L-Band.		CGMS-41	OPEN	HLPP#2

NOAA-WP-35 (ppt) presented a preliminary response to a NOAA questionnaire for LRD/HRD on JPSS (provided to NOAA users only). Seven stations at four sites responded positively to a continuation of the Low Rate Data (LRD) service in L-band. They also addressed the interest and possibility to acquire data via other dissemination methods, but stressed the importance of the LRD L-Band service to their operations.

Regarding the question of considering upgrading to a High Rate Data (HRD) service in X-Band (or higher) whilst maintaining LRD in L-Band, two sites answered positively and two sites were unsure. Not all stations/sites identified real operational alternatives (e.g. Guam/Salomon Island)).

EUM-WP-07 provides the analysis performed by EUMETSAT to answer CGMS action 39.43 regarding the suitability of the existing CGMS Global Specification CGMS 04 (Direct Broadcast Services: LRPT/AHRPT Global Specification) to support these services in future missions.

The analysis performed concludes that the existing Global Specification is not suitable for specifying Direct Broadcast Services for future missions and that a major update of the CGMS Global Specification (CGMS 04) needs to be performed. This document also evaluates modelling methods and proposes a suitable one to specify the Direct Broadcast Services for future missions.

Building upon this rational, a draft for the revised Global Specification 04 is provided to WGI and WGIV of CGMS-40 for consideration and review by CGMS members (as separated WP).

In light of the study performed by the EUMETSAT expert team, the current LRPT/AHRPT Global Specification is too rigidly defined (especially in the physical layer) and not enough generic to support all existing missions with Direct Broadcast Services.

If the specifications stay as they are, none of the future missions will be compliant with it, as for instance EPS-SG and JPSS will transmit data on different transmission frequency bands.

The current specification document has to be redefined to allow current and future missions adhering to this standard, while not being unnecessarily prescriptive in areas that might impact system performance (e.g. modulation or FEC types).

Consequently, the new standard should be more generic, granting each mission the right to define their mission specific extensions (within the boundaries of the standard). The new standard should be defined as a component framework allowing reception system constructors to realize they can develop a set of software and hardware components that could be reused (or tailored) for building reception stations for different programs. Ideally the same reception station should be able to receive data transmissions from different mission satellites thus reducing the cost on the user's side.

Multiple modelling standards have been studied and the CCSDS component model is considered the best candidate to define an open and flexible reviewed Global specification for CGMS Direct Broadcast Services. It is based on a well-known set of recommendations already widely used in the Earth Science Spacecraft community (and by spacecraft manufacturers) which enables full capture of the Direct Broadcast Services domain. It will help defining a new set of specifications that can support existing and future missions while lasting for a long period and expected to necessitate very few revisions (and of minor nature) over time.

EUM-WP-08 makes a proposal to CGMS for a new Global Specification of the Direct Broadcast Services (previously LRPT and AHRPT). It is based on the outcome of CGMS action 39.43 where EUMETSAT has performed an analysis and evaluation of the suitability of the existing CGMS Global Specification CGMS 04 (Direct Broadcast Services: LRPT/AHRPT Global Specification) to support these services in future missions.

The analysis performed concludes that the existing Global Specification is not suitable for specifying Direct Broadcast Services for future missions and that a major update of the CGMS Global Specification (CGMS 04) needs to be performed.

Building upon this rational, a draft for the revised Global Specification 04 is provided to WGI and WGIV of CGMS-40 for consideration and review by CGMS members and covered by specific action in WGIV to review and comment the proposed revision of the global specification 04.

In discussing the proposal, WMO welcomed the initiative taken to develop such a global specification and explained the need for manufacturers of receiving stations to have a clear message indicating which features are defined in the global specification, and which are left as mission specific and therefore subject to differ from one mission to another. This was debated by the working group who considered the need for new satellite system specifications to have sufficient flexibility when designing the link budget and associated system performance parameters in order to avoid limiting the design options to alternatives implying sub-optimal solutions at overall system level or too demanding in resources at satellite level (e.g. power budget). Therefore enabling freedom for mission specific implementations at the link and physical layer is considered necessary for the update to the Global Specification 04. This will also align this global specification with the level of details provided in Global Specification 03 (HRIT/LRIT) which is also not including the mission specific details.

CGMS-40 ACTION - WGI TELECOMMUNICATIONS

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	WGI	40.13	Round table for comments review to proposed update to CGMS Global Specification 04 (by end of Q1 2013 – same e-meeting as for action 40.12).		31-Mar-13	OPEN	HLPP#1.3

WGI/5 International Data Collection & Distribution

ROSHYDROMET-WP-03 provided a status and main technical specifications of the Russian data collection system (Electro-L N°1).

The main purpose of Russian data collection system (DCS) is to provide satellite channels for meteorological data transmission from DCPs. DCP signals are transmitted via Electro-L N°1 dedicated channels. Main technical specifications of DCS are as follows:

- Total of 300 channels, with 33 international, bandwidth of each channel – 3 KHz;
- Channel rate – 100 or 1200 bit/s;
- Frequency range 401.5-402.5 MHz (ground-space) and 1696.5-1697.5 MHz (space-ground);
- Frequency range for international channels - 402.0-402.1 MHz;
- Message size – 5192 bit (100 bit/s channel) and 15000 bit (1200 bit/s channel);
- Data format for 100 bit/s channel is similar to those of Meteosat.

Messages received from DCPs onboard Electro-L N°1 are retransmitted to the ground on 1696.5-1697.5 MHz. Those signals are acquired in SRC Planeta, Dolgoprudny, via 9 meter antenna system. The system is comprised of six receivers, each capable of receiving messages from 40 DCPs simultaneously (20 messages from 100 bit/s channel and 20 messages from 1200 bit/s channel).

Now there are about 20 DCP in Roshydromet transmitting messages via Electro-L N°1 channels each 4 hours (standard synoptic times). It is also possible to send storm warnings at any time. For the last 9 months there was more than 22000 messages successfully received (with 99.6 % reliability).

According to the deployment plans, there should be about 800 DCP installed by the end of 2013. In 2014 is expected that the system will enter into full operations. The 100 bps system is based on the international standard of CGMS and the HR DCP in the Electro-L system are defined according to a Roshydromet specification based on the Russian National Data Protocol that will be made available before end of 2012.

WMO-WP-02 presented the outcome of the Preparatory Workshop for the Establishment of an International Forum of Users of Satellite Data Telecommunication Systems (Satcom Forum). The workshop was held in the international conference centre of Météo France in Toulouse, France, from 23 to 27 April 2012. Following CGMS action 39.23, CGMS Secretariat participated in the workshop representing CGMS.

The workshop reviewed the WMO and IOC user requirements for the collection of meteorological data from remote areas (including Automatic Weather Stations, Polar Observations, Buoys and Floats, Ships, Sea Level, etc.). It reviewed satellite data telecommunication systems that are currently being used for the collection of environmental data from remote areas, and discussed the role that they could play in the future Forum. The meeting noted that the future Forum is meant to provide guidance to the WMO and IOC users on the use of Satcom systems, including guiding them on how to make the best arrangements for the purchase of airtime. The Forum will provide detailed information on satellite systems telecommunication capabilities so that users will be able to make informed decisions on what system to use. The meeting agreed that discussions will have to take place regarding the need for a centralised system (One-Stop Shop) for data processing, quality control, formatting of collected observations in WMO & IOC formats, and distribution to end users (e.g. GTS). The workshop acknowledged the value of the One-Stop Shop proposal, and agreed that this should eventually be a matter of discussion for the future Forum.

The future Forum is meant to provide an international mechanism, covering the wide user basis that exists within the co-sponsoring Organisations, to address remote data communication requirements – including tariff negotiations as needed – for automatic environment observing systems using satellite data telecommunication systems (Satcom systems).

The workshop reviewed, discussed, and updated the work plan leading to the formal establishment of the Forum by the co-sponsoring Organisations. The work plan is provided in Annex V of the final report of the workshop. This includes in particular the timing of, and planning for, the first [informal] ad hoc Forum workshop in 2013, including agenda, and invited participants. The workshop established an organizing committee for the [informal] ad hoc Forum workshop. Terms of Reference and Membership of the Organizing Committee are provided in Annex VII of the final report of the workshop (http://www.wmo.int/pages/prog/www/ISS/Meetings/Satcom1_Toulouse2012/Satcom-Prep-Final-Report.doc). CGMS is represented by Mr Sean Burns in the Organizing Committee.

CGMS-40 ACTIONS - WGI TELECOMMUNICATIONS

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS satellite operators	WGI	40.10	Interested satellite operators to inform WMO if they identify/ designate a representative to be invited to the Satcom forum (WMO point of contact is Etienne Charpentier, Echarpentier@wmo.int)		31-Dec-12	OPEN	HLPP#2.0
CGMS members	WGI	40.11	CGMS members to provide comments to the draft ToR of the Users of Satellite Data Telecommunication Systems (Satcom) Forum, included in annex to CGMS-40 WMO-WP-02, by the end of December 2012.		31-Dec-12	OPEN	HLPP#2.0

CGMS-40 RECOMMENDATIONS - WGI TELECOMMUNICATIONS

"Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	WGI R	40.07	The establishment of the Satcom Forum has been discussed in WG-I who confirmed that CGMS representation is proposed to be maintained by the CGMS secretariat (currently S. Burns) and also encouraged additional CGMS members (specially satellite operators having an interest in data collection and related issues) to identify themselves as potential participants.		CGMS-41	OPEN	HLPP#1.2

NOAA-WP-13 provides a status report on the performance of the International Data Collection System (IDCS) and NOAA's domestic DCS. NOAA's DCS Automated Processing System (DAPS) was replaced by the DCS Administration and Data Distribution System (DADDS) in October 2009. NOAA has continued with populating user and platform tables, and registering and training the community to use the system. NOAA has deployed transmitters certified under new standards, which allow transmitters to use smaller channels, has certified multiple manufacturers to this standard and has configured our receive systems to allow those transmitters to operate. The transition to high data rate (HDR) continues, with less than 1300 of the 23,999 platforms that are active reporting at 100 bits/sec. NOAA plans to continue to investigate the use of two way communications to better command and control platforms but has made little progress this year due to conflicting priorities. NOAA is proceeding slowly with this project, since most resources are being committed to DADDS and to the Version 2 HDR transmitter implementation. Use of the international channels is minimal. NOAA has begun fully using the channels assigned to us for our domestic use by CGMS, and has already made assignments on all of them. A fully redundant backup system has been located in Suitland, Maryland since 2010, and is being fully utilised by users and by developers who continue to roll out enhancements to DADDS by testing them at the Suitland site first. Use of the GOES DCS continues to flourish in the U.S.

WGI/5.1 Future Distribution
No papers were presented in this session.

WGI/5.2 Coordination
No papers were presented in this session.

WGI/6 WGI contributions to the HLPP

1. Review and address concerns on satellite systems and telecommunication issues for meteorological satellites including direct readout services

2. EESS X-band congestion and interference assessments
   a. Interference assessments will be performed on a regular basis and as necessary.

3. DCP and A-DCS status and evolution including International channels, Tsunami alert systems and buoys
   a. CGMS to share lessons learnt and share experiences on certification of DCS platforms (especially HR platforms) for CGMS 41.
   b. CGMS members to share information on the development of their HRD platforms and share lessons learned on mitigating interference between DCPs

4. Sharing of the Ka-band (LEO and GEO systems)
   a.Establish coordination mechanisms for sharing and using this band (both GEO and LEO systems and inter-agencies)

5. CGMS Direct Broadcast Global Specification
   a. Evaluate the set of applicable (or TBD) standards for direct and other dissemination mechanisms in use by CGMS members and assess if there is a need, in view of future systems, to amend, modify or revise such standards (or to derive new ones).

Other emerging themes

6. Alternatives to direct read-out
   a. CGMS members to work together to define a set of recommendations seeking affordable future receiving stations or alternatives to direct read-out solutions.

7. Other
   a. To confirm user requirements for sharing data/information delivered using DCS (outside the regional area). Data mechanisms to share DCP data.

WGI/7Any other business

WGI/8 Review of actions, conclusions, preparation of WG report for plenary and planning of inter-sessional activities

WGI agreed on the actions and recommendations identified during the meeting (a summary list is available in section VII.1)

It was agreed that the inter-sessional WGI activities would take place as follows:

- Complete and review interference assessment (in response to action 39.21) by end Q1 2013 (e-meeting); and

- Round table for comments review to proposed update to CGMS Global Specification 04 (by end of Q1 2013 –same e-meeting).

(See also actions 40.12 and 40.13).

WGII REPORT

WGII/0 Introduction

The Working Group II on Satellite Data and Products was chaired jointly by Mr. A. K. Sharma, IMD, and Dr. S. Bojinski, WMO, with Dr. Mitch Goldberg, NOAA, and Dr. Johannes Schmetz, EUMETSAT, as rapporteurs. 53 working papers and four additional talks were presented by 12 different CGMS members, and discussed by the 32 participants.

In this report the papers are still recorded and referred to in the sequence of the original agenda (except for item WGII/10 where all space weather-related papers are combined). Relevant discussions, action and recommendations are added to the usual summary of a paper.

WGII/1 Review of actions from the previous meeting

WGII updated the status of related Actions and Recommendations from previous sessions of CGMS.

The following actions from plenary sessions prior to CGMS-40 remained open:

ACTIONS OPEN FROM CGMS-38 AND -39 (AT CGMS-40)

"Actionee"	Rec	#	Description	Action feedback/closing document	Deadline	Status	HLPP ref
NOAA and IMD	WGII	38.36	Action 38.36: NOAA and IMD to better understand differences in TC intensity estimations and to inform CGMS members on the outcome. Deadline: CGMS-39	Remains open. Action by NOAA and IMD needed related to resolving algorithm differences	(CGMS-38)	OPEN	HLPP#3
NASA	WGII	39.25	Action 39.25: NASA to discuss with GSICS the use of COVE tool to facilitate sensor calibration and validation activities. Deadline: CGMS-40	NASA-WP-02/03; NOAA-WP-14,15,19	(CGMS-40) New deadline: CGMS-41	OPEN	HLPP#3
NASA	WGII	39.26	Action 39.26: NASA to ask GPM-XCAL team to review and consider use of GSICS Product Acceptance Procedure. Deadline CGMS-40	GPM current intercalibration efforts are not at the final state where a submission to the GSICS intercalibration process will yield useful results. It is vital that GPM first obtains data from the GMI/DPR instruments to verify its double-difference intercalibration results. At the point where the intercalibration process has been verified, NASA will re-examine use of the GSICS process. Pending launch of GPM currently planned for February 2014	(CGMS-40) New deadline: CGMS-42		
CGMS Satellite Operators	WGII	39.37	Action 39.37: CGMS Satellite Operators to consider the requirements of satellite information for coastal applications that are described in WMO-WP-30, and provide comments to WMO (blee@wmo.int). Deadline: 31 December 2011	Following discussions in WGII at CGMS-40 the action will be referred to CGMS-41.	(CGMS-39 31/12/2011) New deadline CGMS-41	OPEN	HLPP#3

WGII/2 Image processing techniques

NOAA-WP-14 presented Image Processing and Applications from the Suomi NPP VIIRS instrument, in response to CGMS Action 39.24. Since late 2011, VIIRS imagery has been available from Suomi NPP. The imagery from VIIRS has proven to be of excellent quality, surpassing the imagery from heritage systems upon which it was based. Rigorous imagery checkout revealed several issues, however many have already been resolved. VIIRS imagery has been declared "Beta" and is available to all users from NOAA's CLASS data stewardship system.

VIIRS Imagery is proving to meet or exceed specifications. Visible and infrared imagery are now available at higher spatial resolution than from previous operational systems. In addition, VIIRS provides imagery that does not degrade spatially by more than a factor of two at higher scan angles, allowing nearly constant spatial resolution across the scan swath, unlike operational systems that preceded Suomi NPP VIIRS.

Day-night-band imagery is proving to be particularly useful, in its first operational application from a non-military satellite. This imagery provides nearly constant contrast regardless of illumination conditions and is designed with no reduction in spatial resolution across the scan swath.

The current long latency of VIIRS to end users is an obstacle that NOAA is actively seeking to overcome, in order to make the imagery useful to forecasters. VIIRS Imagery and derived products will continue to be assessed, leading to further/higher maturity levels as remaining issues are addressed. Feedback from the analyses of VIIRS imagery will help determine the follow-on instrumentation planned for JPSS-1 and 2.

ROSC-WP-01 provided a detailed description of technologies for Data Stream Processing of the Russian Remote Sensing Systems Operator. The implementation of Russian data stream processing technology is organised within the framework of the Federal Space Program of Russia, aimed at creation and operation both of particular space complexes and remote sensing data product banks. The software and hardware complex supporting stream processing of data from the KMSS sensor of METEOR-M1 satellite has been developed and is being operated now by the Russian remote sensing system Operator - Research Center for Earth Operative Monitoring (NTs OMZ of JSC Russian Space Systems). The principle of automated stream processing also formed the basis of the technologies for generating the basic Earth remote sensing products for interdepartmental use which are subject to multipurpose value-added interpretation in expert information systems allowing for heterogeneous data, including in-situ observations. In the Operator's general information structure, the satellite data processing is realised on a level/modular approach that facilitates the processing of data received from other satellite sensors. In the future, with the development of the Russian orbital constellation, such technology will enable a multi-stream, multi-mission processing of large amounts of remote sensing data from multiple space systems in real time.

The website (in English) for accessing products based on Russian and non-Russian spacecraft provided by NTs OMZ is http://eng.ntsomz.ru

In the concluding discussion, the Working Group recommended to include discussions on imagery for nowcasting applications under this agenda item, and to modify its title accordingly.

The Working Group further recommended that to inform CGMS on tools enabling enhanced integration of diverse data sources, CGMS members should provide details on image processing tools under their purview to the Working Group at future sessions.

CGMS-40 ACTIONS - WGII – DATA AND PRODUCTS

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS Secretariat	WGII	40.14	CGMS Secretariat to modify agenda item WGII/2 "Image processing techniques" to "Image processing techniques and satellite imagery for nowcasting" for CGMS-41)		15 May 2013 (for CGMS-41)	OPEN	HLPP#3

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

"Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	WGII R	40.08	CGMS agencies are invited to present working papers at CGMS-41 working group II on image processing tools for enabling the integration of various datasets for promote decision support efforts.		CGMS-41	OPEN	HLPP#4.1

WGII/3 Satellite data calibration and validation including climate related aspects

CMA-WP-04 discussed the operational Inter-calibration for IR channels of FY-2D/E and informed CGMS that the FY-2 operational calibration system has been upgraded. In January and April, the operational calibration began using IASI of METOP-A as reference for the FY-2D and FY-2E IR channels. It proved that the new approach significantly improved the calibration for FY-2. In the discussion the Working Group II commended CMA for their operational calibration system of FY-2 being fully based on GSICS.

ESA-WP-01 presented the Long Term Monitoring of MERIS as a Reference Calibration Instrument. The working paper summarised the principles, methodologies and results for the MERIS calibration and provided a detailed technical report as annex. A 10-year archive of MERIS data was now available, as a result of reprocessing, with access through the ESA Earthnet website (https://earth.esa.int/web/guest/home). The paper has been prepared in response to the CGMS Working Group II Action item 37.28 and closed that Action.

EUM-WP-09 described EUMETSAT's Calibration Events Working Group in response to CGMS Recommendation 39.12. The logging of satellite events is an activity undertaken by the individual space agencies, however until now performed with little interaction between the space agencies, or even between the different missions operated by a single space agency. In addition, the aim of existing satellite event logging systems is not primarily to register events affecting the calibration of the satellites and/or the instruments operated on these satellites. The recommendation made at the 39th meeting of Coordination Group for Meteorological Satellites (CGMS): "CGMS Satellite Operators to provide regular information on satellite/ instruments events affecting calibration and establish corresponding websites", poses a challenge on satellite operators to go a step further and organize the logging of satellite and instrument events from a user's point of view. This recommendation coincides with the recommendation of the Global Space-based Inter-Calibration System (GSICS) working group, which recommended that "Satellite operators to provide "a log of satellite / instrument events" to support the identification of "spurious" events/trends in calibrated data sets".

In response to recommendations defined by CGMS and GSICS, EUMETSAT established in 2012 the Calibration Events Working Group. This internal working group would propose guidelines and methods for developing a common approach within EUMETSAT to log satellite and instrument events impacting calibration and data quality, and will propose how to coordinate the adoption of a common approach among satellite operators worldwide. These events comprise Mission Information, Irregular

Events and Processing Changes that affect the radiometric and geometric quality of level-1, level-1.5 (geostationary satellites) and level- 1b/1c (polar orbiting satellites) data, and Data Outages.
The working paper summarised the actions taken at EUMETSAT to address the recommendation of CGMS, including terms of reference high-level requirements, guidelines for a Satellite Events Logging System, and requirements for a web interface.

In its discussion, the Working Group elaborated on whether an events logging system should focus on the near-real time horizon, or whether it should also include historical events (identified at the time of occurrence, or added aposteriori). It stressed that information on events impacting the past record is important for climate users to understand breakpoints in the time series. The limitation of such a database in explaining data trends was also recognised, however, CGMS members should strive to provide as much information as possible on instrument performance and other system changes (including ATBDs) to users.

CGMS-40 ACTIONS - WGII – DATA AND PRODUCTS

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
EUM and NOAA	WGII	40.15	NOAA and EUMETSAT are invited to present a consensus concept and realisation of a calibrations events logging system with emphasis on issues and lessons learned. Due date: CGMS-41.		CGMS-41	OPEN	HLPP#3

JMA-WP-06 reported in response to CGMS Action 39.10 on activities of the Japan Meteorological Agency (JMA) regarding the Global Space-based Inter-Calibration System (GSICS) and the Sustained, Coordinated Processing of Environmental Satellite Data for Climate Monitoring (SCOPE-CM). In 2008, JMA began operation of the MTSAT-1R infrared (IR) inter-calibration system on GSICS. The Re-Analysis Correction (RAC) for the MTSAT IR channels was released in a demonstration phase. The Near Real Time Correction (NRTC) product of MTSAT IR has also been provided since February 2012. Visible channels of GMS-5, MTSAT-1R and MTSAT-2 have been re-calibrated in collaboration with the University of Tokyo, and Deep Convective Clouds (DCC) has been selected and investigated as a new target for vicarious calibration in the Visible. As a contribution to SCOPE-CM, JMA provides (re)processed historical AMV and CSR datasets to the re-analysis community. A study regarding the impact of using GMS AMV on the Japanese 55-year Re-analysis Project (JRA-55) was carried out, and an apparent positive effect over the Southern Hemisphere was recognised.

JMA confirmed its contribution to the next phase of SCOPE-CM starting in 2013, with the expectation that the satellite climate data records thus generated will benefit model reanalysis and climate modelling.

The discussion also briefly addressed the need for a coordinating body of SCOPE-CM activities in the future.

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

"Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
EUM	WGII R	40.09	EUMETSAT to continue to provide secretariat support to the SCOPE-CM initiative.		CGMS-41	OPEN	HLPP#5.1

KMA-WP-06 provided an update on GSICS activities by KMA. The report included the following intercomparisons performed using COMS imagers: 4 IR channels with IASI; vicarious calibration of VIS channel using ocean, desert, cloud and DCC targets, and preliminary results from the moon target. Further investigations in the GSICS research working group were ongoing regarding the differences established in the intercomparison.

In the discussion, the Working Group was pleased about the progress at JMA and KMA on GSICS.

NASA-WP-02 reported in response to CGMS Action 39.25 on their development on behalf of CEOS of an analysis and visualisation tool for calibration and inter-calibration of satellite instruments. The Committee on Earth Observation Satellites Visualization Environment (COVE) is a free and open browser-based application that uses Google Earth to display past, present, and future satellite instrument coverage areas and coincident calibration opportunities. This forecasting and ground coverage analysis and visualisation capability greatly benefits the remote sensing calibration community in preparation for multi-satellite ground calibration campaigns or individual satellite calibration studies. COVE has been developed for use by a broad international community to improve the efficiency and efficacy of such calibration planning efforts. Reference COVE: http://www.ceos-cove.org

CGMS-40 ACTIONS - WGII – DATA AND PRODUCTS

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
NASA	WGII	40.17	NASA to report on optimization of polar orbits of ocean colour missions using the COVE Tool, especially those that are planning mid morning orbits, to provide maximum daily coverage from sensors with orbit swath of less than 1500 km.		CGMS-41	OPEN	HLPP#1.1

NASA-WP-03, in response to CGMS Action 39.24, described satellite and instrument calibration and validation activities of interest to the meteorological remote sensing community including the following: (1) measurement and determination of total solar irradiance (TSI), (2) comparisons of brightness temperatures determined from the Atmospheric Infrared Sounder (AIRS) and the Infrared Atmospheric Sounding Interferometer (IASI), (3) improvements in MODerate resolution Imaging Spectroradiometer (MODIS) Terra and Aqua Level 1B reflectance/radiance processing and validation, (4) a multi-method approach for the intercalibration of Geostationary (GEO) sensors with MODIS, (5) support in Suomi National Polar-orbiting Partnership (Suomi NPP) Visible Infrared Imaging Radiometer Suite (VIIRS) sensor data record (SDR) production, (6) successful performance of on-orbit manoeuvres of the Suomi NPP spacecraft in support of instrument calibration and characterisation, (7) status and deployment plans for the enhanced MODIS Airborne Simulator (eMAS) instrument, (8) status of the development of the Ocean Radiometer for Carbon Assessment (ORCA) candidate instrument for NASA's Pre-Aerosol, Cloud, and ocean Ecosystems (PACE) mission, and (9) status of the development of the calibration demonstration instruments for the Climate Absolute Radiance and Refractivity Observatory (CLARREO).

NOAA-WP-15 reported on NOAA Suomi NPP Calibration and Validation Results, in response to CGMS Action 39.24.

The Suomi NPP satellite was launched successfully on 28 October 2011 as a pathfinder for the future US Joint Polar Satellite System (JPSS) operational satellite series. The primary objectives of the Suomi NPP mission provide a continuation of the group of Earth system observations initiated by the Earth Observing System Terra, Aqua, and Aura missions; and prepare the operational forecasting community with pre-operational risk reduction, demonstration, and validation for selected JPSS instruments and ground processing data systems. The Suomi NPP satellite flies with the following five instruments: Visible/Infrared Imager/Radiometer Suite (VIIRS), Cross-track Infrared Sounder (CrIS), Advanced Technology Microwave Sounder (ATMS), Ozone Mapping and Profiler Suite (OMPS) and Cloud and Earth Radiant Energy System (CERES). The Suomi NPP instruments are currently undergoing a period of intensive calibration and validation, with the instrument on-orbit performances stable and the post-launch results all meeting or exceeding specifications. Satellite data records (SDR) are categorised according to their maturity: "beta" (precursor), "provisional", and "validated".

The Suomi NPP SDR products have reached the beta version and are close to the provisional level at which users can order the data from NOAA archival and perform in-depth scientific research. Also, ATMS data have been operationally assimilated into global and regional forecast models and a suite of EDR products are generated from the Suomi NPP ground system and NOAA processing system. During the intensive calibration and validation phase, the SDR teams have developed many innovative techniques for characterizing the instrument performance and improving bias corrections. Numerous SDR processing bugs are fixed and the data quality flags are corrected and monitored at NOAA instrument long-term monitoring system. The critical Suomi NPP calibration and validation tasks have been completed and the most recent results are reported in this paper.

In a presentation supported by slides, ROSHYDROMET reported on intercalibration of the geostationary MSU-GS instrument onboard Electro-L and the Meteosat-9/SEVIRI as part of GSICS activities. Comparison was enabled using forward radiative transfer modelling, given the different spectral response functions of the shortwave IR channels of MSU-GS and SEVIRI. Work needs to continue to obtain consistent biases across scenes for different viewing angles. Additional cross-calibration is performed for other channels, and GEO-to-LEO intercomparisons in the GSICS framework are also planned. This work is considered preparatory for the impending launch of MSU-GS on Electro-L N2 in 2013.

CGMS-40 ACTIONS - WGII – DATA AND PRODUCTS

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
ROSH	WGII	40.19	Roshydromet with GSICS assistance to employ GSICS Satellite Intercalibration tools to intercompare geostationary imager to IASI and/or AIRS. Roshydromet to identify a focal point, and to present findings at CGMS-41.		31 Dec 2012; CGMS-41	OPEN	HLPP#3
ROSH	WGII	40.29	ROSHYDROMET to report at CGMS-41 on the technical modalities for the near-real time provision of Meteor-M global data sets and associated ancillary information, as needed to fully contribute to the GOS.	It was agreed at the CGMS-40 debriefing on 9 November 2012 to move this action to WGIV, the action no. is now WGIV 40.38, and this line has been closed.	CGMS-41	CLOSED	HLPP#2

The Working Group II looked forward to the Meteor-M mission's full contribution to the Global Observing System (GOS) by providing the global data sets from this mission in a timely manner with all necessary ancillary information.

NOAA-WP-16 reported on Satellite Calibration Anomalies and Instrument Performance Monitoring using the NOAA Integrated Calibration and Validation System (ICVS). ICVS has continually evolved for the monitoring of instrument performance and radiance quality of the NOAA operational satellite instruments. It continues playing a key role in detecting the calibration anomaly, diagnosing the root cause and assessing the impacts of anomalous events (such as erroneous spectral response functions; imager shutdown; sounder filter wheel anomaly). The report summarised the calibration anomalous events detected and assessed with the NOAA ICVS in the past one year.

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

"Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS satellite operators	WGII R	40.10	CGMS operators are encouraged to provide instrument performance monitoring information routinely on their respective websites.		CGMS-41	OPEN	HLPP#3

NOAA-WP-17 was removed.

In a presentation supported by slides, IMD reported on plans for INSAT-3D calibration and validation, and the preparation of a stable desert reference site in Rajasthan, India (Jaisalmer). The techniques and criteria applied in the selection of a suitable site location were presented. IMD announced that the new reference site will be submitted to the CEOS Working Group on Calibration and Validation (WGCV) for registration as an official CEOS calibration site. The following action was agreed

CGMS-40 ACTIONS - WGII – DATA AND PRODUCTS

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
IMD	WGII	40.18	IMD with GSICS assistance to employ GSICS Satellite Intercalibration tools to intercompare geostationary imager to IASI and/or AIRS. IMD to identify a focal point, and to present findings at CGMS-41		31 Dec 2012; CGMS-41	OPEN	HLPP#3

WMO-WP-23 reported on the overall progress of the Global Space-based Inter-Calibration System (GSICS). GSICS corrections are routinely generated for geostationary infrared imagers from EUMETSAT, JMA, NOAA, and shortly CMA and KMA, against EUMETSAT IASI and NASA AIRS hyperspectral infrared sounders as references. These corrections are available for download from GSICS data servers; they are accessible via an online catalogue on the GSICS portal http://gsics.wmo.int, with comprehensive metadata. Correction products for solar channels are being developed. A microwave intercomparison product is under evaluation. It was agreed, as a principle, that the GSICS production centres should use the corrections to compute corrected calibration information to be distributed in near-real time as part of the L1 data.

For GSICS activities to be fully operational it is important that they be recognised by satellite operators as an integral part of the operational tasks. GSICS is one dimension of the integration of observation systems, pursued by WIGOS, and is of particular relevance for climate monitoring.

A reflection is starting about the Vision of GSICS, including questions about extending its scope to a wider range of sensors; CGMS Members are invited to submit ideas. A 4th Users' Workshop was held on 5 September 2012, the 5th User's Workshop will be in April 2013 in College Park, MD, USA. More engagement of satellite operators from all regions is required, the principle was adopted to have a rotation in GSICS leadership, CGMS Members are invited to propose their representatives to step in as Chairs or vice-chairs at all levels.
The Working Group stressed the need for effective collaboration between GSICS and the CEOS Working Group on Calibration and Validation (WGCV) in developing and applying best practices in sensor pre-launch characterisation and reference site-based calibration/validation.

CGMS-40 ACTIONS - WGII – DATA AND PRODUCTS

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	WGII	40.16	CGMS members to complete the GSICS vision questionnaire. Deadline: January 2013		31-Jan-13	OPEN	HLPP#3

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

"Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members [GSCIS]	WGII R	40.11	All CGMS members participating in GSICS should consider nominating candidates for the positions of Chair and vice-chairs of the working groups and the Executive Panel; they should also provide representatives to the GRWG and GDWG.		CGMS-41	OPEN	HLPP#3
CGMS members	WGII R	40.12	CGMS members that are not currently participating in GSICS to consider an active role in the future progress of GSICS.		CGMS-41	OPEN	HLPP#3

WGII/4 Infrared/Microwave Sounding and ITWG matters

CMA-WP-05 reported on the initial assessment of FY-3B data for Numerical Weather Prediction. The paper presented the results of data assessment for the FY- 3B MWTS, MWHS, MWRI and IRAS instruments, based on a data sample covering 1st June - 30th September 2011. The data quality is assessed relative to FY-3A and equivalent AMSU-A/-B, MHS, HIRS and AMSR-E channels. Observing system experiments are underway which adds the data of FY-3B instruments, both individually and collectively, to an ECMWF full system. Early indication shows that the overall impact is neutral.

NOAA-WP-18 provided the report from the International TOVS Working Group (ITWG). The ITWG is convened as a sub group of the International Radiation Commission (IRC) of the International Association of Meteorology and Atmospheric Physics (IAMAP). The ITWG continues to organize International TOVS Study Conferences (ITSCs) which have met approximately every 18 months since 1983. Through this forum, operational and research users of TIROS Operational Vertical Sounder (TOVS), Advanced TOVS (ATOVS) and other atmospheric sounding data have exchanged information on data processing methods, derived products, and the impacts of radiances and inferred atmospheric temperature, moisture, and cloud fields on numerical weather prediction (NWP) and climate studies. The IRC has recommended for ITWG to also be formally recognised as a sub-group of CGMS.

Co-sponsorship of ITWG by CGMS should from now on be reflected in the public domain, i.e. on the ITWG website and in all relevant documentation. The Working Group also suggested that ITWG ("TOVS") consider changing its name to better reflect the evolution of sounding technology and science.

CGMS-40 ACTIONS - WGII – DATA AND PRODUCTS

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMSSEC	WGII	40.30	CGMS Secretariat to respond to the letter of the IRC President Dr Robert Cahalan (in which the IRC agrees that the ITWG becomes also formally a CGMS working group) and to express its appreciation on behalf of all CGMS members. Deadline: 1 December 2012.		01-Dec-12	OPEN	HLPP#3
ITWG	WGII	40.20	ITWG co-chairs to initiate updating of the ITWG website and relevant documentation in order to reflect sponsorship by CGMS. By: CGMS-41		CGMS-41	OPEN	HLPP#4

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

"Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
ITWG	WGII R	40.13	CGMS requests that ITWG consider changing its name to better reflect the substantial evolution of sounding technology and science.		CGMS-41	OPEN	HLPP#3

At the 2012 18th International TOVS Study Conference (ITSC), ITWG developed a number of recommendations, some of which were discussed by Working Group II (Responses by WGII are given in [brackets]):

- [ITSC-18] CGMS members to maintain the constellation of at least three orbits (early morning, morning, and afternoon), each with full sounding capabilities (IR and MW). The overpass times of operational satellites with sounding capability (IR and MW) should be coordinated between agencies to maximize their value.

> *[Comment by WGII: maintaining the sounding constellation is an element of the CGMS Baseline for the Operational Contribution to the GOS ("CGMS Baseline", adopted by CGMS-39 in 2011) and part of the standing CGMS mandate for contingency planning (addressed by its Working Group III). This means that CGMS is cognizant of this requirement and addresses it on an annual basis.]*

- [ITSC-18] CGMS to consider the potential implications of various funding schemes and public-private partnership with respect to the global technical coordination of the space-based observing system pursued by CGMS, and with respect to data policy, and to establish an appropriate mechanism to ensure that such initiatives can be globally coordinated by CGMS and open data accessibility is guaranteed.

> *[This item was discussed in Plenary.]*

- [ITSC-18] CGMS members to better plan the sequence of satellite launches into the polar orbit to minimise the risk of instrument failures and gaps in the time series of observations. Space agencies should consider this for the further planning of the space-based architecture for climate monitoring.

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

"Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS satellite operators	WGII R	40.14	CGMS members to plan the sequence of satellite launches into the polar orbit to minimise the risk of instrument failures and gaps in the time series of observations, in accordance with the GCOS Climate Monitoring Principles. Space agencies should consider this for the further planning of the Architecture for Climate Monitoring from Space.		CGMS-41	OPEN	HLPP#1.1

- [ITSC-18] Conduct studies to trade off benefits of spectral, radiometric, and spatial resolutions of infra-red sounders and to pursue the development of next generation sounders.

> *[Comment by WGII: accepted as CGMS Recommendation:]*

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

"Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	WGII R	40.15	CGMS members to conduct studies to trade off benefits of spectral, radiometric, and spatial resolutions of infra-red sounders and to pursue the development of next generation sounders.		CGMS-41	OPEN	HLPP#1.1

- [ITSC-18]: It is recommended that for future instruments to be used as calibration reference such as IASI-NG an onboard SI traceability of the calibration shall be realised. Highly accurate black body calibration as established by the CLARREO program can be employed.

> *[Comment by WGII: covered by a Recommendation by WG III]*

- [ITSC-18]: Support for line-by-line (LBL) reference model development is of paramount importance and should be continued to ensure that users (in both operational and non-operational institutions) have access to the latest updates in LBL forward modelling.

> *[Comment by WGII: accepted as CGMS Recommendation:]*

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

"Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	WGII R	40.16	Support for line-by-line (LBL) reference model development is of paramount importance and should be continued to ensure that users (in both operational and non-operational institutions) have access to the latest updates in LBL forward modelling.		CGMS-41	OPEN	HLPP#3

- [ITSC-18]: Agencies to assess the availability of pre-1979 data records and to make an effort to preserve and provide available data records and associated metadata, in particular spectral response functions, to users.

> [Comment by WGII: accepted as a general Recommendation to agencies; item reflected in CGMS High-Level Priority Plan 2013-2017 as important element of Architecture for Climate Monitoring from Space;]

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

"Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	WGII R	40.17	CGMS members should set up the archives of historical data necessary for CDR generation, together with the relevant algorithm versions for products, and other metadata (e.g., spectral response functions) derived by operational and quasi-operational satellite algorithms. This should include the preservation of pre-1979 records. Access mechanisms need to enable CDR generation by users. All archived records should be registered in the ECV Inventory.		CGMS-41	OPEN	HLPP#5.1

- [ITSC-18]: Satellite agencies to support fast delivery initiatives (RARS) with extensions wherever possible (e.g. IASI, METOP-B, Suomi NPP). The working group believes that the system should continue to be low cost.

Further extension of the RARS network towards global coverage is encouraged until the point is reached where further improvements are no longer cost effective.

> [Comment by WGII: accepted as two CGMS Recommendations:]

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

"Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS satellite operators	WGII R	40.18	CGMS agencies to support fast delivery initiatives using direct broadcast with extensions wherever possible (e.g., IASI, METOP-B, NPP), including on future polar orbiting satellites.		CGMS-41	OPEN	HLPP#2
CGMS members	WGII R	40.19	CGMS agencies to work with EUMETSAT to extend Regional ATOVS Retransmission Services (RARS) with Direct Readout stations receiving NPP.		CGMS-41	OPEN	HLPP#2

NOAA-WP-19 reported on early sounding performance from the Suomi NPP CrIS and ATMS instruments. Launched on board the Joint Polar Satellite System (JPSS) Suomi National Polar-orbiting Partnership (Suomi NPP) platform on 28 October 2011, the Cross-track Infrared Sounder (CrIS) and the Advanced Technology Microwave Sounder (ATMS) represent the US next generation of polar-orbiting operational hyperspectral sounders. The paper focused on global temperature and water vapour retrieval results from the NOAA Unique CrIS/ATMS Processing Systems (NUCAPS). A comparison with respect to collocated ECMWF analysis and AIRS/AMSU retrieval profiles showed comparable results and a general good stability in the NUCAPS retrieval performance statistics already at this early stage (one year after launch) of the Suomi NPP mission.

ROSH-WP-02 reported on new developments of satellite data and products provided by Roshydromet/SRC Planeta. The objective of operational and research activity in Roshydromet is to use satellite data and derived products in various application areas, including operational meteorology, NWP, hydrology, agrometeorology, hazards (fires, floods), pollution monitoring (e.g., ozone) and climate research. Examples of some products developed by SRC Planeta and comparison with products derived from other sensors (e.g., ozone products from Electro-L and OMI) were presented.

The Working Group was pleased with the results presented by ROSHYDROMET and encouraged further product intercomparison studies. It also emphasised the need for easy access to the products, e.g. via internet.

WGII/5 Precipitation and IPWG Matters

CMA-WP-06 covered rain rate estimation using the FY-3 Microwave Radiation Imager. The result was compared with that of the AQUA (Advanced Microwave Scanning Radiometer [AMSR-E]) in the cases of typhoon and strong rainstorm on land. The comparisons showed that the rain rates from the two sensors are comparable for the intensity and distribution. The monthly-average precipitation from FY-3B/MWRI is also comparable with MWMOD and PR. Currently, the FY- 3B/MWRI rain rate is used to improve the operational rain estimation that uses FY-2 data as the main input.

The Working Group welcomed the work presented by CMA. It raised the question how emissivity variability over land and topographic effect were taken into account in the results presented.

EUM-WP-14 reported on the outcome of IPWG-6: written by the two co-chairs of the International Precipitation Working Group (IPWG), Dr. Bozena Lapeta and Dr. Paul Kucera, the paper reported on the outcome of the recent IPWG-6 meeting which was held on INPE premises in São José dos Campos (Brazil). Furthermore it highlighted recent achievements of IPWG and provided an outlook for planned activities for the next years to come. As most salient recommendations, IPWG brought the following to the attention of CGMS, some of which were considered by the Working Group (comments by Working Group II added in [brackets]):

- [IPWG-6] IPWG recommends the long-term continuity of conically-scanning microwave imagers as well as space based radars. Particularly, for future operational NOAA/DoD polar platforms conically-scanning microwave imagers are critical.

- [IPWG-6] IPWG strongly recommends to CGMS members to continue the constellation of PMW imagers, consistent with the CGMS baseline and the WMO Vision for the Global Observing System in 2025.

> *[Comment by WGII: maintaining microwave imagers (including conical scanners) is an element of the CGMS Baseline for the Operational Contribution to the GOS ("CGMS Baseline", adopted by CGMS-39 in 2011) and part of the standing CGMS mandate for contingency planning (addressed by its Working Group III). This means that CGMS is cognisant of this requirement and addresses it on an annual basis. Space-based radars such as on GPM are considered R&D missions recognised by CGMS as an important contribution, but with no Agency commitment for continuity.]*

- [IPWG-6] Furthermore, the coordination of satellite overpass times has to be ensured including non sun-synchronous platforms with a minimum temporal resolution of 3h.

> *[Comment by WGII: this is understood as to ensure that revisit times for the constellation of satellites with IR/MW/PR capability in support of precipitation retrievals for any point on Earth should not exceed 3 hours; coordination of the orbital constellation is part of CGMS contingency planning performed by its Working Group III and an Action has been formulated.]*

CGMS-40 ACTIONS - WGII – DATA AND PRODUCTS

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	WGII	40.31	CGMS members to evaluate the requirement by IPWG for 3-hourly global temporal sampling of satellites (including non sun-synchronous platforms).		CGMS-41	OPEN	HLPP#3

- [IPWG-6] The IPWG continues to recommend that CGMS members support reprocessing for all relevant satellite product archives as algorithms or user requirements advance. When reprocessing occurs we recommend that the existing version be kept in the archive for at least 2 years to facilitate intercomparison and graceful user transitions.

- [IPWG-6] The IPWG recommends to CGMS members that:

- For quasi-operational satellite algorithms based on multiple platforms and channels (VIS, IR, WV), CGMS members should set up the necessary archives of historical data, and the infrastructure to enable the routine access to and assembly of channels from GEO and LEO satellites. IPWG will provide expertise as necessary for channel selection, data formatting, etc.

- CGMS members support projects dedicated to consistent generation of multichannel satellite records supporting a range of applications, following the excellent examples of the CPC 4-Km Global IR Tb data set and the NCDC GridSat-B1, for example through the Sustained Coordinated Processing of Environmental Satellite Records for Climate Monitoring initiative (SCOPE-CM).

> *[Comment by WGII: access to and reprocessing of archives, and SCOPE-CM are reflected in CGMS High-Level Priority Plan 2013-2017 as important elements of the Architecture for Climate Monitoring from Space; a general CGMS-40 Recommendation recognizes the importance of access to data archives; in addition, there is an Action on WGII to engage all ISWGs in identifying priority ECV records for SCOPE-CM]*

- [IPWG-6] CGMS members and WMO should provide adequate support to ensure active participation at meetings

> *[Comment by WGII: accepted as CGMS Action]*

CGMS-40 ACTIONS - WGII – DATA AND PRODUCTS

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	WGII	40.21	CGMS members and WMO to provide adequate support to ensure active participation at international meetings, and training events by developing and LDCs, e.g. for the IPWG-7 workshop in Japan in Oct 2014.		CGMS-41	OPEN	HLPP#4.3

Working Group II expressed its appreciation for the results accomplished by the outgoing IPWG co-chairs Drs Lapeta and Kucera during their tenure. It stressed the value of IPWG's growing contribution to training and recommended continuation of this support. Recognizing progress in accessibility of satellite-derived and combined precipitation products through the IPWG website, the Working Group called for the development of concise (1-page) product descriptions and tools for converting products into standard file formats, for the benefit of users.

The Working Group welcomed the new IPWG co-chairs Dr Nai-Yu Wang (ESSIC, University of Maryland, USA) and Dr Kazumasa Aonashi (Meteorological Research Institute, JMA) in their function.

NOAA-WP-20 in response to CGMS Recommendation 39.21 described NOAA's contribution to global precipitation missions. The remote sensing of precipitation is a vital component to the integrated observing of precipitation on the Earth. While weather radars and rain gauges are the primary source of precipitation estimation in many areas, they are typically restricted to populated areas on the Earth and can only extend out a short distance over oceans. Satellites, therefore, provide crucial information to fill in these huge data voids, especially over unpopulated regions and oceans.

In this brief paper, a summary of NOAA's contributions to global precipitation is described. This includes the operation of geostationary and low-earth orbiting satellites, and the generation of regional and global satellite products and related data sets. NOAA also continues to look forward through the exploitation of satellite assets from other CGMS partners to provide precipitation products to in-house and external users to meet the demands of the weather forecasting and climate communities. NOAA future satellite programs such as GOES-R and JPSS will offer enhanced remote sensing capabilities to generate greatly improved products.

Finally, the paper described NOAA responses to some of the higher priority International Precipitation Working Group (IPWG) requests from CGMS-38 and -39.

WGII/6 Atmospheric Motion Vectors and IWWG Matters

CMA-WP-07 reported on the AMV derivation from the infrared (IR) and water vapour (WV) channels from the CMA geostationary satellites FY-2E (105°E) and FY-2D (86.5°E). For FY-2E, the AMVs are derived at 0000, 0600, 1200, 1800 GMT; for FY-2D at 0300, 0900, 1500, 2100 GMT. The same algorithm is used to derive AMV from the two satellites. Since September 2011, the WV algorithm has been improved. The AMVs that passed the quality control are transmitted through GTS in BUFR code.

The Working Group acknowledged the progress made by CMA in deriving AMVs from its geostationary satellites.

EUMETSAT-WP-11 presented the discussion held during the 11th International Winds Workshop on the use of the "NWC SAF/High Resolution Winds (HRW) software" as portable standalone AMV calculation software, the recommendations derived from this discussion, and the process defined by EUMETSAT and the NWC SAF to achieve the goals defined by these recommendations. It was agreed that the NWC SAF/HRW software fulfils the requirements due to its easy installation and usability, and that a continuous exchange of information about usability and improvements of the software exists through the NWC SAF Helpdesk. The IWWG recalled that although alternatives as portable standalone AMV calculation software package exist, they are not as advanced in terms of documentation and do not have an existing Helpdesk. Two recommendations were derived from the IWWG discussion, based on the need to define procedures to: (i) integrate improvements suggested by external users in the baseline NWC SAF/HRW calculation-software; (ii) and expand this software to other satellites than MSG, which are positively solved by specific processes defined inside the current CDOP2 phase plan.

The Working Group expressed appreciation to the EUMETSAT Nowcasting (NWC) Satellite Application Facility (SAF) for preparing standalone AMV software, in particular thanks to the work of chief developer Javier Pereira (AEMET). The Group commended the NWC SAF for helping overcome obstacles in the use of winds by both operational and research users, and for its contribution to the harmonisation of winds products. The software has been successfully adapted by other CGMS members (JMA, KMA) and serves as an important tool for capacity development.

IMD-WP-06 reported on the validation of Kalpana-1 derived water vapour winds and its impacts on NWP model. It was noted that data had a useful impact. The Working Group commended IMD for sustained development and progress in this area.

KMA-WP-07 provided the current status of atmospheric motion vectors at KMA. The paper inspected the errors of AMVs derived from COMS/MI data according to changes in operational algorithm related to sizes of target area and vector grid and a target selection method. The errors were analysed spatially in terms of speed and direction with respect to the changes during January and July 2012. These results are very helpful to understand the characteristics of AMV errors as one source of observation data used for NWP data assimilation as well as to improve the AMV estimation algorithm. In addition, the paper discussed a comparison between the operational AMVs and high resolution wind (HRW) of EUMETSAT/NWCSAF. KMA derives the 1km VIS AMV and 4km IR AMV using this software package. KMA stated again that the NWC SAF HRW software was modular, well documented and well suited as "stand-alone AMV software".

KMA-WP-09 reported on the current status of data assimilation at KMA. KMA started to use hourly COMS AMVs in December 2011 in operation in addition to other AMVs from geostationary satellites including MTSAT, as well as AMVs from polar orbit satellites. The forecast sensitivity to observation tools shows that the impact of total AMVs covers around 11% of total impact of data assimilation; COMS accounts for 10% of total AMV impact in June 2012.

JMA-WP-07 provided an update on atmospheric motion vectors from JMA. The paper reported on the recent status of JMA AMVs from MTSAT-2 and MTSAT-1R. In accordance with WMO CBS-XIII Recommendation 4 "Amendments to the Manual on Codes (WMO-No. 306) Volume I.2,", JMA plans to switch the MTSAT-AMV BUFR format from FM-94 BUFR edition 3 to edition 4 by 6 November 2012. Rapid-scan images taken at five-minute intervals by MTSAT-1R are utilised to derive rapid-scan AMVs. JMA is currently considering the use of these AMVs in typhoon analysis as an ancillary dataset, and is also conducting observing system experiments for such AMVs using its mesoscale NWP system. JMA/MSC develops AMV software for the current MTSAT-1R and MTSAT-2 operational satellites and their follow-on units, Himawari-8 and Himawari-9. Recent activities have included work on improving cloud tracking based on small target boxes with sizes of 5 x 5 pixels. The results of an AMV derivation experiment based on maximum likelihood estimation have shown that wind speed values are pushed up and IR negative wind speed bias values are mitigated using this method. In response to CGMS recommendation 39.26, JMA also presented their activity and plan to introduce the stand-alone portable AMV software developed by the NWCSAF.

The following discussion noted the continuous progress on AMV development and AMV utilisation. It highlighted the beneficial impact of AMVs on NWP which had been demonstrated recently at the 5th WMO Workshop on the 'Impact of Various Observing Systems on Numerical Weather Prediction' held in Sedona, USA, 22 – 25 May 2012. The report is available from WMO.

NOAA-WP-21 summarised the outcomes of the 11th International Winds Workshop (IWW11). The workshop was hosted by the University of Auckland and took place in Auckland, New Zealand from 20-24 February 2012. There was a good cross-spectrum of attendance (56 participants) from a wide range of satellite producers, NWP centres, and research centres. The paper invited CGMS-40 to discuss the outcome and recommendations from IWW11. It also provided the following priority actions/recommendations that were discussed and taken up by Working Group II. The recommendation on the participation in the 2nd AMV intercomparison campaign was elevated into an Action.

All CGMS agencies producing AMVs are encouraged to investigate situation-dependent error estimates of wind vectors and their pressure levels with new derivation techniques. NWP centres are encouraged to work with producers on the evaluation.

CGMS-40 ACTIONS - WGII – DATA AND PRODUCTS

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	WGII	40.22	All CGMS members that have committed to participate in the second AMV derivation intercomparison project are invited to carry out the study on the basis of the guidance provided by IWWG and the Meteosat data set provided by EUMETSAT. All CGMS members to report on preliminary results at CGMS-41. Final results should be presented at IWW12 in 2014.		CGMS-41	OPEN	HLPP#3

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

"Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
IWWG	WGII R	40.20	IWWG co-chairs to provide a state-of-the-art overview on the research on high resolution wind production and usage and to encourage increased focus on this theme at IWW12. This will involve input from NWP centres (to investigate need for this data in high resolution models and how best to assimilate) and data producers (how best to adapt the derivation).		CGMS-41	OPEN	HLPP#3
CGMS satellite operators	WGII R	40.21	Satellite providers should investigate the potential of global AMVs from tandem satellites: e.g. dual Metop, MODIS/VIIRS and the future Sentinel 3A/B. First assessments are invited for CGMS-41 as a basis for more detailed discussions at IWW12 in 2014.		CGMS-41	OPEN	HLPP#3

WGII/7 Radio Occultation and IROWG Matters

EUM-WP-01 summarised the outcome of the 2nd International Radio Occultation (RO) Working Group Workshop (IROWG-2). The workshop was organised by the University Corporation for Atmospheric Research (UCAR), the UCAR Joint Office for Science Support (JOSS), NOAA, and EUMETSAT. The meeting was held in Estes Park, Colorado, US, from 28 March to 3 April 2012. The IROWG developed a number of recommendations, three of which were brought to the attention of CGMS as a matter of priority. The IROWG will hold its 3rd workshop on 5-11 September 2013 in Seggau Castle, Leibnitz, near Graz (Austria).

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

"Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	WGII R	40.22	CGMS members are invited to participate in the 3rd workshop of the International Radio Occultation Working Group, taking place near Graz, Austria from 5 - 11 September 2013. In particular, colleagues from China, India, Russia are invited to report on their radio occultation activities.		31-Jul-13	OPEN	HLPP#3

EUM-WP-02 provided the status of the current Radio Occultation (RO) observing system and related plans focussing on the period up to the year 2027. There are about 2100 occultations per day available for assimilation (July 2012), where more than 650 come from an operational satellite (Metop- A), and the remainder are provided primarily by the COSMIC-1/FORMOSAT-3 constellation (about 950). The occultations provided by COSMIC-1/ FORMOSAT-3 are decreasing, with current levels about 60% below peak level, temporarily this has even gone down to about 700 occultations per day over the last months.

An observational data gap is identified between about 2012/13 (COSMIC-1/FORMOSAT- 3 assumed ceased) and at least 2016 (earliest date when the approved COSMIC- 2/FORMOSAT-7 mission can provide low latitude data). There will likely be 2 Metop satellites providing about 1300 occultations per day in this period - but these will not have full diurnal coverage since they are in a sun-synchronous orbit with a 09:30 Equator crossing time.

There are no other operational mission planned which would cover this gap. For that reason efforts should be made to bridge it with available research or commercial missions. In the longer term however, a fully operational observing system is needed, providing at least 10000 occultations per day.

Several options exist to fill the data gap, one is to provide data from the ROSA (Radio Occultation Sounder for Atmosphere) instrument in NRT (Near Real Time), since three instruments are already flying on different research missions. Two of the three missions have already some NRT support available. The three ROSA receivers could provide up to 1300 occultations per day, however some issues with the tracking of the second GPS frequency need to be addressed urgently. Additionally, there are (a) the Chinese FY-3C satellite with a potential of about 500 occultations per day (RO is included for research purposes), and (b) the planned commercial CICERO constellation, offering data-buy options (assuming it is launched on time and governmental funding is available for purchase).

EUM-WP-03 discussed the climate related processing and potential of radio occultation data. The paper recalled that radio occultation (RO) data offer a unique opportunity for climate studies and for "anchoring" analysis, re-analysis, and climate model runs since they require no calibration. Pre-requisite for such data use are (1) consistently processed long-term data sets from RO instruments; (2) assessment of the trends derived from RO data, including the impact of processing by different centres. RO offers continuous data from 2001 onwards and first re-processing activities and trend estimates have been performed; results have already been / are about to be published in peer-review journals. The initial focus was on the CHAMP mission, which provided data from 2001 to 2008. Many more observations have been provided by COSMIC, from April 2006 onwards. RO instruments offer at the various processing levels (1) bending angles, (2) refractivity, (3) temperature and water vapour profiles. Recent studies show that although the derived variables including bending angle, refractivity, pressure, geopotential height, and temperature are not readily traceable to SI units of time, the high precision nature of the raw RO observables is preserved in the inversion chain. This demonstrates the usefulness of all these RO derived variables from bending angle to temperature for climate studies.

The Working Group II discussed in depth the recommendations made by IROWG related to the sustainability of the satellite observing system in the near and long term, the number of occultations needed, and the use of RO data for climate studies. The main recommendations are given in the following (comments by Working Group II added in [brackets]). IROWG identified

- [IROWG-2] A need for an operational continuity plan for RO – including troposphere and ionosphere – to provide a daily availability of at least 10000 occultations.

> *[Comment by WGII: maintaining Radio-occultation sounding is an element of the CGMS Baseline for the Operational Contribution to the GOS ("CGMS Baseline", adopted by CGMS-39 in 2011) and part of the standing CGMS mandate for contingency planning (addressed by its Working Group III). This means that CGMS is cognisant of this requirement and addresses it on an annual basis. However, the target of 10000 occultations per day needs to be substantiated through additional impact studies (on NWP), e.g. based on Observing System Simulation Experiments. CGMS agreed on a related Action in Plenary.]*

- [IROWG-2] An urgent need for data gap filling using research / opportunity satellites, or commercial sources (if available) is required for the near term, but this is not a replacement for a long-term continuity plan to provide operational GNSS RO data;

> ***[Comment by WGII: some space agencies operating GNSS receivers on their satellites are not members of CGMS, but of CEOS (ASI, DLR, ISRO, CONAE); the need to approach these agencies with the request for RO data access was recognised in an Action:]***

CGMS-40 ACTIONS - WGII – DATA AND PRODUCTS

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	WGII	40.23	CGMS to convene through the IROWG an ad-hoc meeting on the global GNSS-RO constellation, inviting all interested CEOS agencies.		CGMS-41	OPEN	HLPP#1.1

- [IROWG-2] The potential of GNSS RO for anchoring climate re-analysis that needed to be further addressed, this also requires updated laboratory measurements of refractivity coefficients.

> *[Comment by WGII: Studies to investigate the structural uncertainty in RO data involving different processing centres are important for assessing their impact on climate reanalyses and climate studies more generally. Reprocessing of past records by CGMS members is a precondition for this work.]*

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

Actionee	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	WGII R	40.23	CGMS agencies should engage in reprocessing of radio/occultation data to maximize their utility in anchoring climate reanalyses.		CGMS-41	OPEN	HLPP#5.1

JMA-WP-08 described the assimilation of GNSS RO refractivity data into the JMA global NWP system. JMA has been assimilating GNSS RO refractivity data into its global NWP system since March 2007. Metop-A and COSMIC data are used at present. Revisions have been evaluated and tested in the pre-processing of RO data for implementation in JMA's operational assimilation system. Observation system experiments for the new assimilation configuration showed improvement in analysis and forecast fields, especially in the Southern Hemisphere. The document reported on recent progress with the assimilation of GNSS RO refractivity data into the JMA global NWP system.

NASA-WP-05 provided a report on radio occultation activities at NASA. NASA maintains an active program in radio occultation that supports the operational and climate communities. An update was provided of NASA's radio occultation related activities over the past year. NASA has provided instrument expertise to the COSMIC mission and developed new firmware that improves the quantity and quality of data being supplied to operational centres. A NASA centre (JPL) is working with the United States Air Force on the COSMIC-2/FORMOSAT-7 follow-on mission, to realize the benefits of NASA's TriG radio occultation instrument development. Flight models based on TriG are planned for delivery in late 2013.

NASA actively participates in activities of the International Radio Occultation Working Group, a scientific working group of CGMS, supporting the climate, space weather, and payload technology sub-groups. NASA supports climate related processing of radio occultation data by the algorithms group at JPL, primarily through three activities: 1) the generation of Radio Occultation Climate Records as a research activity under the Earth System Data Records program; 2) participation in the RO Trends Intercomparison Working Group; and 3) participation on the CLARREO science team. The RO Trends group has quantified uncertainties that can arise due to processing approach by comparing retrievals between different processing centres. Work is underway to gain insight into processing algorithms that can create retrieval differences. Additional progress is expected over the coming year in this and other areas.

NOAA-WP-05 reported on the current status of the FORMOSAT-7/COSMIC-2 GNSS RO Constellation Mission and plans to increase GPS-RO global coverage. The paper recalled that the COSMIC mission was the world's first operational GPS radio occultation (GPS-RO) mission for global Earth weather forecast; climate monitoring; atmospheric, ionospheric, and geodetic research. The GPS-RO data from COSMIC has been extremely valuable to the climate, meteorology, and space weather communities, including real-time forecasting users as well as U.S. and international research communities. Unfortunately, COSMIC reached the end of its design life in 2011 and the critical real-time satellite observing capability has begun to significantly degrade as satellites become no longer operational. The United States and Taiwan, through an Agreement signed in May 2010, have agreed to jointly develop a satellite programme to deliver next-generation global navigation satellite system (GNSS) radio occultation (RO) data to users around the world. This programme, known as FORMOSAT-7/COSMIC-2, is a follow-on to the FORMOSAT-3/COSMIC mission, which was a joint US-Taiwan 6-satellite constellation demonstration mission launched in April 2006.

The Working Group recognised the importance of continuing the COSMIC mission, in line with a recommendation made by IROWG (see above), and supported the efforts to in providing a follow-on to COSMIC.

WGII/8 Cloud and ash/dust related matters

CNSA-WP-04 was reported under agenda item WGII/10.

EUM-WP-10 presented the cloud retrieval evaluation working group (CREW). It recalled that accurate measurements of global distributions of cloud parameters and their diurnal, seasonal, and inter-annual variations are needed to improve our understanding of the role of clouds in the weather and climate system. Cloud properties retrievals from satellite observations, such as cloud vertical placement, cloud water path and cloud particle size, play a key role in the analysis of cloud parameterisations in the weather and climate models, and may serve as input to the assimilation schemes of these models. In order to give weather and climate researchers more confidence in the quality of these retrievals their validity needs to be determined and their error characteristics need to be quantified. Hereto, our knowledge on state-of-art cloud properties retrievals from passive imaging satellites needs to be enhanced, and the usefulness of these retrievals for both near real–time users as well as for weather model analysis and data assimilation needs to be assessed and promoted. The working paper also presented the draft Terms of Reference for the Coordinated Group for Meteorological Satellites (CGMS) Cloud Retrieval Evaluation working group (CGMS-CRE). This working group intends to serve as a forum for operational and research users of passive imager observations to exchange knowledge on level-2 and level-3 cloud parameter retrievals to support the use of these retrievals in numerical weather prediction and in climate studies.

Following a detailed discussion by Working Group II on the conditions to be met for creating a CGMS working group in general (e.g., strong commitment from a representative number of CGMS members globally; support by related international programmes; identified need through a 'gap analysis'), and in particular whether CREW should become a fifth CGMS working group, the following action was placed:

CGMS-40 ACTIONS - WGII – DATA AND PRODUCTS

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS Secretariat	WGII	40.26	To request CREW to develop a proposal related to establishment of a new International Science WG, involving all CGMS members and WMO, WCRP and GCOS, including the proposed focus of the group, an account of ongoing activities in other fora (a "gap analysis"), and financial implications, for discussion at CGMS-41.		CGMS-41	OPEN	HLPP#3

WMO-WP-05 reported on a workshop investigating the effects of biomass burning on aerosols, atmospheric chemistry and climate. Since studying biomass burning and its effects on atmospheric chemistry and climate is one of the GAW scientific objectives (as per GAW Strategic Plan 2008- 2015), WMO co-organised and hosted the IGAC1/iLEAPS2/WMO Workshop on Biomass Burning (5-6 July 2012, WMO, Geneva, Switzerland) to enhance the coordination of research activities on all aspects of biomass burning in order to better quantify its impact on atmospheric chemistry and climate.

Satellite observations provide an important means for inferring on biomass burning through monitoring of active fires and burnt areas, and for the measurement of fire radiative power. Satellite retrievals of trace gases and aerosols are also used in inverse modelling e.g. to estimate carbon, aerosols and trace gases emitted by fires.

The workshop developed a number of recommendations addressed to the satellite community related to generation and assessment of fire-related datasets (burnt area, active fires, fire radiated power).

CGMS agencies are invited to contribute to development of satellite-based methods to better identify fire parameters, and to collaborate more closely with atmospheric modelling centres in ensuring the seamless use of satellite datasets in the estimation of biomass burning-related emissions.

In the discussion, NOAA pointed out that its operational fire products were used by the US Environmental Protection Agency and US Forest Service.

NOAA-WP-22 reported on VIIRS cloud products and performance. Clouds are the dominant feature of the Earth when viewed from space at most frequencies in the visible through the infrared spectrum. Knowledge of the properties of clouds is critical to understanding the transfer of energy through the atmosphere and provides insight into precipitation, convection and many dynamical processes. The Suomi National Polar Orbiting Partnership (Suomi NPP) represents the next generation of American polar orbiting meteorological satellites. The prime instrument for the observation of clouds on Suomi NPP is the Visible Infrared Imaging Radiometer Suite (VIIRS).

VIIRS offers a large upgrade from the AVHRR for cloud remote sensing. Though missing spectral information relative to MODIS, VIIRS offers unprecedented spatial resolution. VIIRS also includes a low-light channel that offers great potential in the improvement of night-time cloud properties. The NOAA PATMOS-x algorithms applied to VIIRS were shown to generate products similar to those from NASA MODIS. This indicates that the VIIRS SDRs appear to be high quality and the potential remains for the VIIRS IDPS cloud products to achieve a high level of maturity. The potential also exists for VIIRS to achieve or surpass the quality from MODIS if the VIIRS is used synergistically with the other instruments on Suomi NPP.

JMA-WP-09 reported on JMA's cloud and volcanic ash product. In 2012, JMA started providing convective clouds information as a nowcasting product to support aviation safety in addition to three rapid scan imagery products provided since 2011.

JMA started developing an advanced cloud product, and a volcanic ash product, in preparation for product

generation from the Himawari-8/9 geostationary platforms. The Working Group II thanked JMA for their briefing on recent product developments in this area. At the end of the session on 'Clouds and ash/dust related matters' EUMETSAT presented, through slides, a proposal to develop consistent volcanic ash products from all geostationary satellites. The proposal had been coordinated and jointly prepared with JMA. The presentation recalled the major volcanic eruptions in recent years (e.g. Icelandic volcanoes) which have reinforced the interest in monitoring volcanic ash clouds. It had become evident that the satellite data and products to support the users (e.g. the Volcanic Ash Advisory Centers [VAAC]) are not optimal. In particular, the development of consistent satellite products would benefit VAACs because interpretation, use of products and the feedback to the product providers would be on a common ground. This goal is also by and large achievable with existing split-window (10.8 µm and 12 µm channels) which are available on most current (though not all) geostationary imagers.

EUMETSAT recalled an existing 'two-channel algorithm' for quantitative applications (method by Dr F. Prata of NILU, Norway) and offered its use with other current geostationary satellites. JMA had expressed interest to implement that algorithm in their operational ground segment for MTSAT-2. Furthermore, EUMETSAT had contacted ICAO (Mr. Greg Brock, Chief of Meteorology, Air Navigation Bureau) who expressed support to this activity. Similar positive responses have been obtained from WMO (Dr Herbert Pümpel, Chief of Aeronautical Meteorology Division and Mr. J. Lafeuille from the Space Programme).

EUMETSAT offered to share the existing scientific prototype software with JMA and other agencies with reference to Recommendation 37.25 from CGMS-37 (which reads: On the basis of existing scientific prototype software for product retrievals, NOAA and EUMETSAT offer to other satellite operators existing prototype algorithm software for testing and further development').

It was recalled that the future perspective is to enhance the science and the application software to make use of the higher potential of the multi-channel imagers on Himawari-8/9, GOES-R, FY-4, and MTG. Again this objective appears to be easily achievable because an advanced volcanic ash product demonstration has been done already by NOAA/NESDIS in preparation for GOES-R on the basis of data from MSG/Meteosat (e.g. the advanced algorithm developed by M. Pavolonis, NOAA, for GOES-R and using Meteosat SEVIRI data for testing).

The presentation was followed by a very lively discussion of the Working Group, with agreed actions and recommendations. An additional important outcome of the discussion was the idea to address further scientific development as an activity within the new SCOPE-Nowcasting.

The discussion concluded with the following actions and recommendations:

CGMS-40 ACTIONS - WGII – DATA AND PRODUCTS

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
EUM, JMA, NOAA	WGII	40.24	EUMETSAT, JMA and NOAA are invited to report on their development toward common and consistent volcanic ash products from Meteosat and MTSAT-2 and GOES, respectively. Due date CGMS-41		CGMS-41	OPEN	HLPP#3
EUM	WGII	40.25	EUMETSAT to invite Dr. Fred Prata to make a presentation on volcanic ash products science and applications at CGMS-41.		CGMS-41	OPEN	HLPP#3

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

"Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
EUM, JMA, NOAA	WGII R	40.27	The scientific development (EUM, JMA, NOAA joint development of common/consistent volcanic ash products) should be considered as a pilot activity of SCOPE-Nowcasting. Due date CGMS-41 (ref. action WGII 40.24)		CGMS-41	OPEN	HLPP#3
WMO	WGII R	40.24	The scientific evolution of volcanic ash products should be considered as a pilot activity of SCOPE-Nowcasting.		CGMS-41	OPEN	HLPP#3
WMO	WGII R	40.25	WMO in consultation with ICAO to refine the requirement for volcanic ash monitoring and to devise a way forward towards evaluation and operational use of a consistent volcanic ash product from current geostationary satellites.		02-Apr-13	OPEN	HLPP#3
CGMS satellite operators	WGII R	40.26	All operators are invited to consider also the implementation of a common volcanic ash product. Implementation in parallel to existing products would help the evaluation.		CGMS-41	OPEN	HLPP#3

WGII/9 Ocean parameters

JMA-WP-10 reported on JMA's validation of a multi-channel sea surface temperature (SST) algorithm. The Agency reported the new algorithm at CGMS-39 in 2011 (JMA-WP-10) and subsequently applied it to data from MTSAT-2. It was then tuned using MTSAT-2 matchup data and buoy data covering the period from July 2010 to June 2011. Using this algorithm, SSTs were retrieved from July 2011 – June 2012 data and compared with buoy-based measurements and daily SSTs analysed by JMA. The results showed generally close agreement between retrieved SSTs and buoy-based measurements, but also exhibited seasonal bias and contamination in summer.

The Working Group welcomed the development of SST products by JMA and noted that linkage with the Group for High-Resolution SST (GHRSST) should be sought for discussions on algorithm development, product intercomparison and application of SST.

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

"Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	WGII R	40.28	CGMS recommended that new sea surface temperature datasets be compared with other satellite and in-situ sea surface temperature datasets under the auspices of the Group on High Resolution Sea Surface Temperature (GHRSST), which was described in CGMS-39 IOC-WP-01.		CGMS-41	OPEN	HLPP#3

NASA-WP-04 described NASA perspectives on sea-surface salinity research challenges and opportunities. Sea surface salinity (SSS) can be important in regulating sea surface temperature (SST). Two technological breakthrough satellite SSS missions, Aquarius and Soil Moisture and Ocean Salinity (SMOS), are currently producing high-quality SSS data. The paper provides an overview of the importance of SSS for weather and climate applications and describes the Aquarius and SMOS missions. The newness of adequately sampled SSS data prompted a first-time at-sea field campaign devoted to improved understanding of SSS variations.

The Working Group very much appreciated the presentation by NASA on this topic. It commended NASA for supporting studies devoted to validation and intercomparison of SSS maps and welcomed the overall good agreement between SMOS and Aquarius-derived products (although regionally, significant differences remain to be explained).

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

"Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
ESA, NASA, CGMS members	WGII R	40.29	CGMS recommended that ESA, NASA and other agencies interested in understanding the water cycle continue to coordinate infrastructure development to calibrate and validate Aquarius and SMOS sea surface salinity satellite observations.		CGMS-41	OPEN	HLPP#3

NOAA-WP-23 provided a report on NOAA VIIRS ocean colour product accuracy and preparations for user readiness. In the paper, NOAA discussed the concept evolution, readiness and initial Suomi NPP/JPSS VIIRS Ocean Color independent quality assessment. In mid-2012, work started to improve readiness levels of selected NOAA end users for Suomi NPP ocean colour products produced in NOAA. Major elements of this work include: Independent Quality Assessment, Next Generation VIIRS Distribution Portal, Develop and Deploy New User Requested Products, and Expansion of the Operational Ocean Color User Base in NOAA. Existing ocean colour end users are being surveyed to verify expectations and monitor readiness. Three new operational user requests from the National Weather Service have been received and are being considered for global ocean colour products. Considerable progress has been made in the area of Independent Quality Assessment.

The Working Group discussed the benefits and drawbacks of developing community consensus algorithms, for example when inferring on dissolved organic matter using ocean colour radiances. While some stressed the value of consensus products for facilitating user guidance when selecting a product, there was general consensus that in addition to the routine, operational generation of products, the continuing scientific discussion through algorithm intercomparisons, product validation, and participation in international scientific working group meetings (such as those sponsored by CGMS) was essential to the continuing improvement of products, ultimately for the benefit of all users.

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

"Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
NOAA, CGMS members	WGII R	40.30	CGMS recommended that NOAA and other agencies interested in understanding the carbon cycle continue to coordinate infrastructure development to calibrate and validate the Suomi NPP ocean colour satellite observations.		CGMS-41	OPEN	HLPP#3

WMO-WP-06 described issues with ocean surface winds products using the example of a tropical storm off the coast of Sri Lanka in 2011. The paper highlighted a critical issue facing marine weather forecasters working in areas where in situ data are sparse and satellite data are the principal source of information. The particular event that led to a close examination of scatterometer ocean surface winds for the 25 November 2011 in the vicinity of Sri Lanka was the death of at least 28 persons, mostly fishermen off the country's south coast, during an unusual period of high seas and severe weather.

The Metop/ASCAT-based ocean surface winds product provided by NOAA/NESDIS and used by the forecasters during the event resolved the directional ambiguity differently than the EUMETSAT OSI SAF surface winds product based on the same instrument, as post-event analysis showed. This led to misinterpretation of the wind direction in the most critical area of the wind field near the coastline.

The case at hand demonstrated the need for operational forecasters to be able to critically compare various datasets, including quality indicators, when dealing with observations received in real time during extreme weather events. It therefore calls for both adequate training of marine forecasters in the use of scatterometer winds, more efforts to quality-check and harmonize ocean surface wind products, as well as for the availability of integrated, multi-source display systems on forecaster desks that enable the rapid comparison of datasets from different sources.

The Working Group II stressed the need for adequate training of marine forecasters in using and interpreting scatterometer wind products. It noted the important training activity undertaken by IOC/JCOMM in this regard and called for support by CGMS members for its continuation and expansion.

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

"Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members [Vlab]	WGII R	40.31	Marine forecasters training activities should be widened with input and participation by other CGMS operators.		CGMS-41	OPEN	HLPP#4.2

WGII/10 Other parameters and products (space weather, other)

CNSA-WP-03 reported on application and development of the environment and disaster small satellite constellation HJ-1 for environmental protection. Since the environment and disaster small satellite constellation (HJ-1 A/B) was launched on 6 Sep 2008, they have played an important role in application of environmental protection. As the management and application institute of HJ-1A/B satellite for environmental protection, the Satellite Environment Center (SEC), China Ministry of Environmental Protection has established the satellite environmental application system, fulfilled the operational application, and carried out much application of environment remote sensing. Presently, the application of environmental remote sensing has merged into the key fields of environmental protection and management, such as environment monitoring, environmental enforcement, environment emergency, ecological protection, etc. The SEC has provided for the Ministry of Environmental Protection more than 1500 working bulletins, offering important technology support and information service for the monitoring and management.

Although HJ-1 A/B satellites spectral bands are very limited, in combination with American MODIS data, they have achieved operational application in environmental protection. However, faced with the current rigorous environmental situation of severe pollution and ecological safety, the high spatial, temporal and spectral resolution in environmental monitoring and management are urgently required, for instance, for the monitoring requirement of pollution gas , greenhouse gas, water pollution and biodiversity. Meanwhile, the HJ-1 A/B satellites have exceeded the designed life of three years, therefore the subsequent satellite constellation with special payloads for monitoring pollution gas, greenhouse gas, water pollution are needed, so as to construct the environment monitoring system, and improve the monitoring and management capacity of environmental protection.

CNSA-WP-04 provided a brief on application and development of the HJ-1 environmental and disaster small satellite constellation for aerosol optical depth retrieval. The environment and disaster small satellite constellation (HJ-1 A/B) is designed for environmental monitoring and disaster mitigation. It plays an important role for rapid and real-time capturing environment and disaster information. In this report, CNSA introduced the method for aerosol optical depth retrieval using HJ-1A/1B CCD cameras.

ROSCOSMOS provided, supported by slides, information on calibration of the "Severjanin-M" SAR instrument deployed on spacecraft "Meteor-M", developed by the OJSC Research Institute for Precision Instruments. A comparison with SARs on other platforms (Radarsat, Envisat/ASAR) in terms of technical specifications was made (strip width, spatial resolution), and example products covering polar regions including the Arctic. Working Group II welcomed the useful briefing on the capabilities of the SAR on Meteor-M and recommended further use of the data by the user community.

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

"Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CNSA, ROSC	WGII R	40.32	CNSA (HJ-1A/B), ROSCOSMOS (Severyanin-M SAR) to report on their provisions to make data available to users, to CGMS-41.		CGMS-41	OPEN	HLPP#1.1

EUM-WP-18 presented the GMES-PURE processes for user requirement evaluation for future marine and atmosphere services of GMES. This activity supports the establishment of user requirements for the operational GMES services (starting 2014) and their translation into service requirements and specifications for the evolution of the GMES observation infrastructure. The European Commission selected the FP7 project GMES-PURE (Partnership for Use Requirements Evaluation) as a Coordination and Support Action. The GMES-PURE project aims at the definition and documentation of a process for the involvement of users in a transparent and coherent definition of user requirements for the GMES services and their translation into service specifications, service data requirements and technical requirements; and the exemplary application of such a process for the marine and atmosphere thematic domains.

Interactions with CGMS members are welcome to harmonize the user requirements processes and to relate the respective requirements with GMES-PURE.

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

"Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	WGII R	40.33	Interested CGMS Members are invited to report by CGMS-41 on their respective processes for elaboration of user requirements for future marine and atmosphere services, and the status of their evaluation.		CGMS-41	OPEN	HLPP#3/#4

JMA-WP-02 reported on JMA's contribution to the WMO CBS Severe Weather Forecasting Demonstration Project (SWFDP). It includes JMA's responses to Action 39.08 and Recommendation 39.02 and introduced some of the products and services provided by JMA to Project partners in Southeast Asia and the South Pacific Islands, such as MTSAT imagery with heavy rainfall potential areas.

The Working Group suggested that JMA seek feedback on the products disseminated to users. It was furthermore pleased to note the nomination of MSC/JMA's contact point (Mr Yasushi Izumikawa) for SWFDP activities.

KMA-WP-08 reported on recent activities to implement the satellite-based nowcasting system of KMA/NMSC. In order to support severe weather forecasting, convective related products such as convective rainfall rate and automatic satellite image interpretation were optimized and validated. This work was discussed with EUMETSAT experts through the 2012 EUMETSAT-KMA workshop on NWCSAF and FCI which was held in EUMETSAT headquarters, and some comparison results were presented.

NOAA-WP-24 reported on demonstrations of "NearCasting" in the Lake Victoria Region. The process of adapting the NearCasting system to the Lake Victoria region is underway. The system has already been successfully adapted to use SEVIRI data over Europe as part of the GOES-R Risk Reduction and has been run for 2 case studies using data provided by EUMETSAT. The results show that the NearCasting system is capable of transporting moisture products to future locations at least 5-7 hours into the future into areas where convection forms and later SEVIRI products may be unavailable due to cloud cover. Plans for continue future developments and coordination with EUMETSAT, CGMS and WMO were also outlined.

In the coming years, it is planned 1) to implement and test the generation of SEVIRI retrievals at CIMSS, 2) to determine the optimal Stability parameters to be used in this tropical environment (e.g., K-Index, TPW, etc.), 3) to modify the system to run in a terrain-following coordinate in order to improve treatment of upwind flow of moisture around/over Mount Kenya, and 4) to run the retrieval and NearCasting systems system in real-time during the year-long evaluation period.

WMO-WP-04 described the new WMO initiative "Sustained Coordinated Processing of Environmental Satellite Data for Nowcasting (SCOPE-NWC)". The aim of the SCOPE-NWC initiative is to enable continuous and sustained provision of consistent, well-characterised satellite products for nowcasting and severe weather impact mitigation. The initiative is expected to develop best practices to the generation, dissemination and use of satellite-based nowcasting products, to be used to complement or supplement radar and surface observations.

Modelled partly on the SCOPE-CM example and developed by the WMO Expert Team on Satellite Utilization and Products (ET-SUP), SCOPE-NWC will be a collaborative network among experts, user institutions and satellite operators, that will help sustain product dissemination and facilitate user uptake.

The value of SCOPE-NWC should be demonstrated particularly in areas where:
- ground-based observations are limited or non-existent, and
- satellite-based nowcasting products from several providers cannot be used in a consistent manner due to lack of harmonisation.

SCOPE-NWC will be carried out in initially five pilot projects. Appropriate linkages to the SWFDP, the WWRP Working Group on Nowcasting Research, International Scientific Working Groups and IGDDS/ WIS will be sought. The initiative will be supported by WMO.

Working Group II stressed that good linkage of SCOPE-NWC to expertise in leading scientific and operational institutions should be ensured. A clear commitment by CGMS members willing to participate in SCOPE-NWC was necessary, and comments on the concept and scope were still possible. Commitment by JMA, CMA and KMA was considered particularly critical since the focus of the initial pilot projects is on Asia. The Group agreed on two actions:

CGMS-40 ACTIONS - WGII – DATA AND PRODUCTS

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	WGII	40.27	CGMS members to provide additional comments to the SCOPE-Nowcasting concept and confirm their participation in pilot projects as delineated in Annex I of WMO-WP-04.		15-Dec-12	OPEN	HLPP#3
CGMS members	WGII	40.28	CGMS members participating in SCOPE-Nowcasting to nominate a focal point to the ad hoc SCOPE-Nowcasting Working Group, to meet in Q2/Q3 2013 (cf. Annex II).		15-Dec-12	OPEN	HLPP#3

WMO-WP-14 provided an update on the Polar Space Task Group. The Polar Space Task Group (PSTG) of the WMO Executive Council Panel of Experts on Polar Observations, Research and Services (EC-PORS) now has membership by representatives from 13 Space Agencies and agreed Terms of Reference. At its second session, PSTG started assessing the current state of satellite user requirements, as a first step in ensuring a prioritised, coordinated Space Agency response to cryosphere-related user requirements, including those in support of the GCW.

PSTG also reviewed current cryosphere-related space agency priorities and plans, especially those related to large-scale interferometric SAR coverage of the ice sheets which is currently insufficient. The Group is engaging with CSA and the operators of RADARSAT-2 to mitigate the current gap in capability, through a subsidiary working group on SAR coordination.

PSTG relies on continuing and broad Space Agency support and active engagement, for which globally representative membership is essential. CGMS satellite operators are therefore invited to join/ confirm (as appropriate) PSTG in case they have not yet done so, KMA, ROSHYDROMET/SRC PLANETA and NASA in particular.

Through its work, PSTG will directly contribute to the space-based polar and cryospheric component of the WIGOS and the GEOSS. The Working Group II identified two Recommendations:

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

"Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	WGII R	40.47	CGMS members to support active participation of their nominated member agency representatives in the Polar Space Task Group		CGMS-41	OPEN	
KMA	WGII R	40.48	KMA to consider joining PSTG and to liaise with WMO Secretariat to discuss further steps.		CGMS-41	OPEN	

WMO-WP-22 reported on satellite-related activities within the WMO Agricultural Meteorology Programme. Remote sensing applications, including e.g. land surface analysis, vegetation monitoring, soil moisture, precipitation and surface radiation balance, are major components of agro meteorology and of drought information delivery systems, which include monitoring and early warning systems. One of the main activities of the WMO Agricultural Meteorology Programme (AGMP) is to provide coordination and training for WMO Members including on remote sensing applications for agriculture and drought. Recently there have been several training and project activities related to satellite products and their use, such as:

- WMO/EUMETSAT/AGRHYMET Land SAF/Satellite Products Training Course for Western/Central Africa on Applications in Agro Meteorology in Niamey, Niger, 19-23 Nov 2012);

- Agricultural Meteorology and Soil Moisture Applications Pilot Projects in Africa based on MODIS products. The project will focus on several African countries including South Africa, Mozambique, and Ethiopia; and

- Participation in the IIASA/ZAMG project "Farm Support: Demonstrating the Potential of EO-derived Soil Moisture and Weather Forecasts in Farmer Decision Support and Crop Modelling".

Furthermore, WMO along with the United Nations Convention to Combat Desertification and FAO are organising a High Level Meeting on National Drought Policies (HMNDP) to be held in Geneva, Switzerland from 11 to 15 March 2013. The HMNDP will provide practical insight into useful, science-based actions to address the key drought issues being considered by governments and the private sector under the UNCCD and the various strategies to cope with drought. National governments must adopt policies that engender cooperation and coordination at all levels of government in order to increase their capacity to cope with extended periods of water scarcity. A particular emphasis is put on these vital issues in the broad context of the Global Framework for Climate Services (GFCS).

See also **plenary recommendation 40.05**: CGMS agencies to support widening of VLab scope (marine, land applications, agricultural meteorology)

WGII/11 Space Weather

CMA-WP-08 described the space weather activities of CMA. The National Center for Space Weather (NCSW) of CMA was established in 2002 as part of the responsibility of the National Satellite Meteorology Center of CMA. The NCSW provides space weather monitoring and warning services in China. A space-based and ground-based space weather monitoring network has been setup, able to conduct systematic investigation on the solar, the space environment, the ionosphere and the upper atmosphere. The NCSW also routinely provides nowcasts, forecasts, and alerts on the space weather condition as well as related service to users. Typical products include short-term forecasts, nowcasts and warnings, the weekly bulletin, the monthly bulletin, the annual bulletin, and the special event bulletin. Certain key parameters for space weather are also issued every day. Space weather operational products are daily released on the webpage (http://www.spaceweather.gov.cn). NCSW also issues space weather information to general public, special users and decision makers through hard-copy bulletins, mobile phone, message, e-mail, special column of the China Meteorological Newspaper, and TV, etc.

KMA-WP-10 described the space weather service of KMA. Since September 2011, KMA has responsibility for space weather operations, and in April 2012, the space weather forecasting and warning service of KMA started. KMA is currently developing a prediction model for such forecasts, a system of national preparedness related to COMS and the potential hazard of space weather due to the impending solar maximum. KMA is also developing a basic plan of space weather operations, and undertaking research for a space weather payload on a geosynchronous meteorological satellite. The report outlined the space weather service implementation plan.

NASA-WP-07 reported on NASA space weather activities. Applied Heliophysics or NASA Space Weather activities has as its goals: to provide space weather relevant data to NASA assets and other governmental agencies; to transition Heliophysics science to operational space weather knowledge and products; and to support NASA missions with relevant tools and understanding. Its activities can be broadly grouped into three areas: space weather observing systems and services, space weather research and research to operations, Inter & Intra- Agency Coordination. The paper provided further details on these aspects.

The Working Group II welcomed the reports by all CGMS members on their space weather activities covering both technical and planning aspects of systems, products and services. These were considered valuable information for this emerging field of CGMS activity.

CGMS-40 RECOMMENDATIONS - WGII – DATA AND PRODUCTS

"Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS satellite operators	WGII R	40.34	CGMS agencies to provide reports on ground- and space-based space weather observing systems to CGMS-41.		CGMS-41	OPEN	HLPP#5.2

WGII/12 Conclusion and Preparation of WG Report

The Chairmen presented a first draft of the Actions and Recommendations made by the Group during its session, and participants gave their immediate feedback. Due to limitations on time, it was agreed to finalize the list and the session report after the end of CGMS-40 by correspondence.

Finally the Chairmen thanked all participants for good and focussed discussions. WGII returned the thanks to Mr. Sharma and Dr. Bojinski for their Chairmanship and keeping the Working Group on schedule (the Working Group completed its discussion well within the allocated time of 1.5 days).

In concluding, Working Group II did address a broad range of activities and the discussions benefitted from a new format of presentations of the papers which were often combined into a single presentation supported by slides. This clearly helped the understanding of the papers and led to some enhanced discussions among participants. However, some further tuning of the way papers/presentations are combined is needed, and this discussion should occur in the inter-sessional period.

It was also recognised that sufficient time shall be allowed in the week of CGMS sessions to finalize the formulations of actions and recommendations in near-real time, i.e. shortly after the meeting of WGII. Furthermore one should strive to work as much as possible during the CGMS meeting on the WGII report as it had been done at all previous meetings.

No inter-sessional activities were identified.

The WGII session was closed at 14:30 on Tuesday 6 November 2012.

WGIII REPORT

Report of the CGMS Working Group III on Operational Continuity and Contingency Planning

WGIII/0 Introduction

The Working Group III was chaired by Ms Suzanne Hilding (NOAA), Mr Jérôme Lafeuille (WMO) serving as Rapporteur. The participants are listed in Annex 1.
WGIII/1 Review of Actions
Action 38.40 remains open:

ACTIONS OPEN FROM CGMS-38 AND -39 (AT CGMS-40)

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
WMO	WGIII	38.40	Action 38.40: WMO in collaboration with the atmospheric composition community and satellite experts to further refine the requirements for atmospheric composition requirements and the optimal way to address these in the revised baseline.	Remains open. No progress; Ad-hoc task team to review the needs for GAW (atmospheric composition) regarding satellite measurements and the 2004 IGACO recommendations has not yet been formed.	(CGMS-38) New deadline CGMS-41	OPEN	HLPP#1.1

Within the GAW programme, WMO intends to establish an ad-hoc task team to review and update the atmospheric composition requirements initially formulated in the IGACO report on 2004.

Action 38.42 was completed as planned. (WMO to take into account the revised CGMS baseline for the space-based component of the GOS in the updating process of relevant WMO Manuals and Guides, with a view of its endorsement by CBS-XV in 2012.)

The CGMS baseline for contributing to the GOS has been taken into account in an update of the Manual on the Global Observing System, which was approved by the Commission for Basic Systems (CBS-15) in September 2012. It will evolve into a dedicated chapter of the future Manual on WIGOS, part of the WMO Technical Regulations.

Recommendation 39.31 to adopt the baseline was completed at CGMS-39 already.

Recommendation 39.32 was updated and renumbered to Recommendation 40.35 and Recommendation 39.33 was confirmed by WGIII and renumbered to Recommendation 40.36 .

CGMS-40 RECOMMENDATIONS - WGIII – CONTINGENCY AND CONTINUITY

"Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS satellite operators	WGIII R	40.35	R & D or operational satellite operators should consider the provision of some high-accuracy, SI-traceable and stable reference instruments as anchors for operational instruments, in particular, for climate purposes. (Ref. recommendation 39.32)		CGMS-41	OPEN	HLPP#5.1
CGMS satellite operators	WGIII R	40.36	CGMS Satellite Operators to address the anticipated or potential gaps identified in the WMO Gap Analysis, in particular: infrared and microwave sounding on the early morning orbit, • hyperspectral sounding missing in some geostationary sectors, • long-term follow-on of radio-occultation constellation, • global precipitation measurement precipitation radar follow-on mission, • long-term Earth Radiation Budget monitoring • limb sounding for high-vertical resolution observations in the stratosphere and mesosphere (of temperature, humidity, wind, aerosol, ozone and other trace gases). (Ref. recommendation 39.33)				

WGIII/2 Implementation of the new baseline

WGIII/2.1Contingency on core meteorological missions

GOES-14 back-up activation

WMO thanked NOAA for the detailed information to users during the activation of GOES-14 as a back-up to GOES-13. Indian Ocean and South-America coverage

WMO recalled the benefit of the 15-minute coverage of South America by NOAA through relocation of GOES-10 then GOES-12 at 60°W. NOAA indicated that GOES-12 operations were planned until May 2013.

CGMS-40 ACTIONS - WGIII – CONTINGENCY AND CONTINUITY

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
NOAA	WGIII	40.32	NOAA, in consultation with South America users and WMO, to investigate options for a follow-on to GOES-12 mission for South America, in order to develop a transition plan, involving GOES or other geostationary satellites, until the availability of the GOES next generation, which is expected to provide full coverage of both North and South America.		15-Apr-13	OPEN	HLPP#1.1

As concerns the Indian Ocean coverage provided by EUMETSAT through relocation of a Meteosat spacecraft at 57.5°E, EUMETSAT indicated that IODC was planned until the end of 2013, and that a plan was being prepared for possible extension until 2016. Further extension would depend in particular on the overall status of the Meteosat programme and the availability of other geostationary satellites over the region.

CGMS-40 ACTIONS - WGIII –CONTINGENCY AND CONTINUITY

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
EUMETSAT	WGIII	40.33	EUMETSAT to report at CGMS-41 on its plans for Indian Ocean coverage beyond 2013.		31-Dec-12	OPEN	HLPP#1.1

WGIII/2.2 Recall of gaps identified at CGMS-39

Introduction to OSCAR tool and gap analysis
WMO introduced the Observing System Capability Analysis and Review Tool (OSCAR). Built around a database of satellite missions and instruments, OSCAR records an indication of the potential usability of instruments for the various measurable variables, as well as the contribution of these instruments to implement the Vision of WMO Global Observing Systems. OSCAR is updated on the basis of agencies' reports to CGMS and complementary information provide bilaterally. OSCAR enables the generation of timelines of availability of particular classes of instruments in order to document a gap analysis, which was done for the five potential gaps identified by the WMO CBS.

WGIII acknowledged it was a very useful tool that should be carefully updated in collaboration between CGMS Members and the WMO Secretariat.

In the light of these timelines, WGIII agreed that the main gap with respect to the CGMS baseline was the lack of plan for imagery and sounding from the early morning orbit. Furthermore the WGIII noted that geostationary IR hyperspectral sounding were planned in the coming years on some of the geostationary slots only, the TOA upward radiative measurements for Earth radiation budget was planned on one mission only, no path was defined yet towards an operational follow-on to the planned Global Precipitation Mission, and there is no plan yet for limb sounding of stratospheric ozone and greenhouse gases beyond the current research missions.

CGMS-40 RECOMMENDATIONS - WGIII – CONTINGENCY AND CONTINUITY

Actionee	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	WGIII R	40.37	All CGMS Members to provide updates on satellite programmes to be included in OSCAR, through their annual reports to CGMS and by other means as appropriate.		CGMS-41	OPEN	HLPP#4.1

WGIII/2.3 Mapping of satellite plans against the CGMS baseline

It was recalled that when the new CGMS baseline had been agreed by CGMS-39, the implementation of the baseline was documented by a "mapping" included on pages 90-92 of the Final Report of CGMS-39.

The Working Group agreed that this mapping should be maintained in order to monitor the implementation of the baseline. Input had been provided by NOAA-WP-10 in this respect.

CGMS-40 ACTIONS - WGIII – CONTINGENCY AND CONTINUITY

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	WGIII	40.34	All CGMS Members to review and update their contribution to the mapping of CGMS mission plans against the CGMS baseline, and inform WMO accordingly. (5 December 2012)		05-Dec-12	OPEN	HLPP#1.1

ROSCOSMOS provided an update on Russian Federation's plans in LEO (Meteor-M series), GEO (Electro-L series) and HEO (Arctica series). It was clarified that while 76°E was the primary operational geostationary location, additional Electro-L satellites were planned to be located at 14°E and 166°W.

NOAA reported on its approach to manage the risk of gaps between the current Suomi NPP mission and the availability of JPSS-1.

WGIII/2.4 Monitoring the risk of delayed programme decisions

NOAA introduced an analysis of the risk of delayed programme decisions due to government budget constraints. In this briefing, NOAA encouraged all CGMS Members to consider the fiscal benefit of partnering with other Agencies to meet its observation requirements. In particular, NOAA called for partnership for the COSMIC-2 ground segment, for the follow-on DSCOVR solar wind monitoring mission at L1, and is investigating options for the COSMIC-2 follow-on programme.

CGMS-40 ACTIONS - WGIII – CONTINGENCY AND CONTINUITY

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	WGIII	40.35	CGMS Members to consider opportunities for partnership with NOAA on COSMIC-2 ground segment and DSCOVR follow-on mission and report to CGMS-41. (July 2013)		CGMS-41	OPEN	HLPP#1.1

NOAA shared its experience on the Data Exploitation Initiative which aims at reviewing and streamlining the ground segment activities of its various satellite activities in a cross-cutting approach based on the analysis of data requirements, the analysis of current infrastructure capabilities, IT security requirements with a systematic approach to quality assurance, and taking maximum advantage of interagency and international collaboration. The Working Group welcomed this report and considered such an approach as a "best practice" that should be encouraged, and which was enabled by the longstanding cooperation developed within CGMS.

WGIII/3 Optimization of the Space Based Observing System

WGIII/3.1 Outcome of the Sedona workshop

WGIII noted the dominant role of satellites in the observing system, and the particular importance of: MW sounding, IR sounding, and AMV.

The Working Group considered that such an impact evaluation was of great value to support the optimization of the system and to document the benefit of these investments, which is needed to support well informed budgetary decisions.

It furthermore highlighted that the progress in the capability to use satellite data was leveraging the overall benefit of satellite missions, therefore CGMS Members should not hesitate to pursue or increase their support to International Science Working Groups and other initiatives contributing to improve the exploitation of satellite data.

It was recalled that while NWP provides precise and objective metrics to evaluate the impact of observing components in assimilation, which is particularly valuable, it should not overshadow the other benefits of direct use of specific capabilities such as scatterometer data for marine services, imagery for nowcasting, etc.

WGIII/3.2 Optimization of LEO orbital planes

The Working Group reviewed the results of studies conducted in Europe, United States and China about the optimization of Low Earth Orbit sun-synchronous meteorological missions.

There is evidence that three sounding missions provide significant benefit with respect to only two of such missions, and this benefit is larger when the sampling of the atmosphere is distributed over time, thus providing a complete and consistent coverage over time. A theoretical simulation showed that this temporal distribution is particularly beneficial in the case of a short "forecast error variance doubling time". This could be interpreted by the fact that a shorter observation refresh cycle was needed in case of unstable and rapidly evolving meteorological situations, such as severe storms. Several case studies supported this conclusion, while suggesting the need for detailed OSEs.

On its side, CMA has investigated the potential impact of adapting its LEO mission plans with a view to move a mid-morning mission to the early morning. Such a scenario would improve the overall coverage while providing local early morning observation that are useful in daily meteorological operations. In the same time, it would justify reviewing the payload, and have an impact on the platform and overall mission definition.

The Working Group considered that the optimization of LEO mission configurations was an important issue that should be investigated in detail by further impact studies. In order to be representative of the operational benefit, such impact studies should involve regional verification, several forecast runs at different times, and should not be limited to the average impact but should examine severe weather situations, which are where the weather forecast plays the most crucial role, and are highly dependent on observation.

The Working Group expressed appreciation to the NWP centres that had performed impact studies and to CMA for its feasibility analysis of an early morning orbit mission scenario. On one hand, it was noted that several options could be investigated, including e.g. maintaining a regular temporal distribution of ca 3 hours (ECT) but shifting all nominal ECTs by e.g. one hour in order to avoid the particular conditions of a dawn-dusk orbit. On the other hand, the WGIII noted the potential advantage of a dawn-dusk mission for solar monitoring.

CGMS-40 RECOMMENDATIONS - WGIII – CONTINGENCY AND CONTINUITY

Actionee	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	WGIII R	40.38	CGMS satellite operators to support NWP centres to perform Observing System Experiments (OSEs) on the regional impact of a potential gap of sounding from the early morning orbit.		CGMS-41	OPEN	HLPP#1.1
CGMS members	WGIII R	40.39	CGMS Members to support CMA in further investigations of the benefit and technical consequences of potential move of a mid morning mission to an early morning mission.	NOAA: Mitch. Goldberg@noaa.gov, Lars.Riishojgaard@noaa.gov (Letter to WMO 7 Feb 2013)	CGMS-41	OPEN	HLPP#1.1

WGIII/4 Architecture for Climate Monitoring

The Working Group recalled the roadmap defined in the strategy document for an Architecture for Climate Monitoring from Space, which includes the definition of a Logical View, an Inventory of ECV holdings, an initial physical view of the architecture including existing and planned elements, and a gap analysis leading to an action plan for enhancing the initial architecture towards meeting the functional requirements identified through the logical view.

It was acknowledged that while the inventory focuses on ECV datasets generation and preservation, the scope of the Working Group's contribution should be on the space-segment enabling such ECV production: sensors, missions, and related procedures and standards or best practices (e.g. for interoperability). The current inventory of ECV products would inform on which sensors are used, but a wider analysis might be needed to investigate whether gaps in ECV products are due to unavailability/ inadequacy of Satellite Data Records, or to the fact that these SDRs are not fully exploited.

The following course of actions was suggested:

- to evaluate the « CGMS baseline » in the light of the logical view of the architecture, in order characterize its contribution to climate monitoring, which would yield a significant part of the initial physical architecture;
- to identify climate sensor gaps; and
- to consider possible scenarios to address these gaps (including e.g. demonstration or transition missions, or additions to the baseline once missions are mature enough) in order to progress towards a complete version of the architecture.

The Working Group proposed to establish a team to advance these topics. It was underlined that previous gap analyses discussed at CGMS-38 and CGMS-39 should be updated but already provided a strong basis for this exercise, which would be also facilitated with the use of the OSCAR resource. This effort should be discussed in the context of the architecture definition team, in particular at the forthcoming "climate week" in February 2013. It was underlined that the architecture should be seen as a major component.

CGMS-40 RECOMMENDATIONS - WGIII – CONTINGENCY AND CONTINUITY

Actionee	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	WGIII R	40.40	CGMS Members, through WG III, to evaluate the CGMS baseline in the light of the climate architecture strategy with a view to populate the space segment part of the initial physical view of the architecture and identify gaps and scenarios to address them.		CGMS-41	OPEN	HLPP#5.1

WGIII/5 Integration of R&D missions

NASA reported on the status of the Suomi-NPP satellite currently about to complete its commissioning phase and has already provided data of promising quality. Although the mission was initially designed as a risk reduction demonstrator of innovative payload elements for the NPOESS programme, it is expected to play an important role as the primary operational afternoon satellite after NOAA-19 and until JPSS-1. Pre-processing software has been developed and is freely available.

WGIII/6 Space weather

NOAA presented (in NOAA-WP-07) a suite of data and products generated by its Space Weather Prediction Center (SWPC) for predicting and monitoring the space radiation environment and its potential impacts to satellites. This included new space weather products under development, the progression and prediction of the solar cycle. The report provided a summary of recent significant space weather events, and discussed the growth of space weather services and international cooperation.

WMO reported on the space weather activities coordinated by WMO through the Inter-programme Coordination Team on Space Weather (ICTSW) that involved experts from 19 countries and 7 international organisations. Activities included a review of observation requirements and capabilities, the establishment of a product portal, discussion with ICAO on the future concept of services to aviation, and data exchange through the WMO Information System. There is scope for valuable cooperation between ICTSW and CGMS on two aspects in particular: (1) space-based observations for space weather and space environment monitoring, including the dual use of certain missions such as radio-occultation and radar altimetry; (2) the potential support of space weather services to spacecraft, telecommunications and data collection operations. It was underlined that this activity was rapidly progressing and that its coordination would benefit of additional resources within WMO Secretariat. The current CGMS agenda addresses space weather in Working Groups II and III and in the plenary session III, which should probably be streamlined.

CGMS-40 RECOMMENDATIONS - WGIII – CONTINGENCY AND CONTINUITY

Actionee	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members [IROWG]	WGIII R	40.41	CGMS, via the IROWG, to support the development and use of GNSS radio-occultation for ionospheric monitoring.		CGMS-41	OPEN	HLPP#1.1
CGMS members	WGIII R	40.42	CGMS members operating dual-frequency altimeter missions to support the use of altimeter measurements for ionospheric monitoring.		CGMS-41	OPEN	HLPP#1.1

CGMS-40 ACTIONS - WGIII – CONTINGENCY AND CONTINUITY

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS satellite operators	WGIII	40.36	CGMS satellite operators to inform the ICTSW via the WMO Secretariat (jlafeuille@wmo.int) on their needs for space weather data and warning products.		CGMS-41	OPEN	HLPP#5.2

CGMS-40 RECOMMENDATIONS - WGIII – CONTINGENCY AND CONTINUITY

Actionee	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMSSEC	WGIII R	40.43	CGMS Secretariat to review the organisation of space weather matters in the agenda of CGMS meetings.		CGMS-41	OPEN	HLPP#5.2

WGIII/7 Contribution to the HLPP

In the light of these discussions, the Working Group III reviewed the High Level Priority Plan (HLPP). It welcomed the description of the "Changing landscape" and the past achievements of CGMS, which showed the unique value of this technical coordination and cooperation body. The following comments were made on the list of high-priority tasks, focusing on the aspects of direct relevance to the mandate of Working Group III:

First of all, an additional heading should be dedicated to demonstrating/advocating the benefit of investing in EO satellite missions. This should include developing a credible methodology for socio-economic benefit assessment, establishing a CGMS Tiger Team on this issue who would collaborate with e.g. the WMO CBS and other partners and would report at CGMS-41. This would enable communication and outreach activities to promote EO benefits.

See also plenary IV.1 action 40.04 (CGMS WGIII to establish a Tiger Team on assessing the impact and socio-economic benefits of satellite missions who would collaborate with e.g. the WMO CBS and other partners and would report at CGMS-41).

The coordination and optimization of observing systems is the main area of attention of WGIII. The Working Group III proposed to make the tasks more specific as follows.

- Coordinate the implementation of the CGMS baseline missions (updated nominal locations/ orbits, operators), including optimization of the distribution of Low Earth Orbit (LEO) sun-synchronous orbits to ensure efficient temporal sampling of the atmosphere:
  - support satellite impact studies including regional verification;
  - support CMA in technical evaluation of impact of adapting LEO plans to cover early morning orbit.
- Facilitate the evolution of demonstration missions to an operational status (where appropriate e.g. HEO missions):
  - Investigate - through IROWG - how a coordinated and optimized system could be set up for radio occultation observations for atmosphere and ionosphere monitoring.
- Identifying partnership opportunities on space and ground segments:
  - CGMS Members to assist NOAA in identifying potential sharing of ground assets in support of COSMIC-2;
  - Establish a CGMS coordinated mechanisms for hosted payloads, e.g. for solar wind monitoring.
- Identify potential gaps and ensure appropriate contingency measures are in place, including analysis of budget constraints and associated risk assessment.

The "Climate monitoring" high-level task should be reworded as an action e.g. "Advancing the architecture for climate monitoring", and should be more precise in mentioning "Evaluate the CGMS baseline in the light of the logical view of the architecture".

The "Satellite products" high-level task should be reworded as an action e.g. "Expanding the quality of satellite-derived products".

The Space Weather task should include an action to assess how CGMS is organised to address space weather matters.

WGIII/8 Conclusions

The Chairperson and the Rapporteur summarised the conclusions and actions agreed by the Working Group and highlighted the main points to be reported to the Plenary.

WGIII Report – Annex

WGIII Revision of the HLPP

CGMS HIGH LEVEL PRIORITY TASKS (ordered by theme)

XX. Demonstrate and advocate the benefit of EO satellite missions.

- Develop a credible methodology for assessing the socio-economic benefit of investment in EO satellite missions.
  - Establish a CGMS Tiger Team on this issue who would collaborate with e.g. the WMO CBS and other partners and would report at CGMS-41.
- Engage in communication and outreach activities to promote EO benefits.

A. Coordination/Optimization of Observing Systems

- Coordinate the implementation of the CGMS baseline missions (updated nominal locations/ orbits, operators), including optimization of the distribution of Low Earth Orbit (LEO) sun-synchronous orbits to ensure efficient temporal sampling of the atmosphere;

- support satellite impact studies including regional verification;
- support CMA in technical evaluation of impact of adapting LEO plans to cover early morning orbit.

- Facilitate the evolution of demonstration missions to an operational status (where appropriate e.g. HEO missions);

  - Investigate through IROWG how a coordinated and optimized system could be set up for radio occultation observations for atmosphere and ionosphere monitoring.

- Identifying partnership opportunities on space and ground segments
  - CGMS Members to assist NOAA in identifying potential sharing of ground assets in support of COSMIC-2.
  - Establish a CGMS coordinated mechanisms for hosted payloads, e.g. for solar wind monitoring.

- Identify potential gaps and ensure appropriate contingency measures are in place including analysis of budget constraints and associated risk assessment.

B. Coordination/Optimization of data Collection systems

C. Expanding the quality of Satellite-derived Products

D. Advancing the architecture for Climate Monitoring

- Assess how CGMS can optimally contribute to the implementation of the GFCS by taking an active role in the construction of the Architecture for Monitoring Climate from Space:

- Evaluate the CGMS baseline in the light of the logical view of the architecture.
- Extend the use of the Global Space-based Inter-Calibration System (GSICS) and the Sustained Co-Ordinated Processing of Environmental satellite data for Climate Monitoring (SCOPE-CM) frameworks.
- Provide an analysis of data for specific phenomena (e.g. evolution of convection in the tropical belt based on 35 years of GEOstationary (GEO) observations);

- Ensure the data holdings of CGMS members are appropriately reflected in the Architecture for Climate Monitoring from Space (physical view) through their systematic contributions to the Essential Climate Variable (ECV) Inventory;

- Establish an integrated approach for accessing climate data records produced by CGMS members;

- Promote a common approach to the long-term preservation of data through the exchange of information and the establishment of a coordinated consensus on best practice.

E. Data Dissemination, direct readout services, contribution to the WIS

F. Radio Frequency (RF) Protection

G. Preparation for new generations of operational satellites

H. Training

I. Space Weather

- Establish a coordinated approach to the monitoring of space weather and the reporting of space weather-related spacecraft anomalies
- Assess how CGMS is organised to address space weather matters.

WGIV REPORT

WGIV/0 Introduction

Working Group IV (WGIV) on Global Data Dissemination was convened on Monday 5 November 2012 at 14:00. As agreed at CGMS-39, Mr Mikael Rattenborg from EUMETSAT was elected Chairperson of WGIV, with Mr Klaus-Peter Renner, also from EUMETSAT, serving as Rapporteur. WGIV was comprised of representatives of the following satellite operators: CMA, CNSA, EUMETSAT, JMA, KMA, NOAA, ROSCOSMOS, ROSHYDROMET and WMO, and from CSA as an Observer (see the list of participants in Annex 4).

The agenda proposed by the CGMS Secretariat was adopted with the following modifications:

Agenda item WGIV/2 was discussed after agenda item WGIV/8, as proposed by the Chairperson and agreed by the Working Group.

WMO-WP-13 was presented under agenda item WGIV/3, focussing on the user readiness for data access.

JMA-WP-03 was also presented under agenda item WGIV/7, focussing on the data formats aspect of the paper.

WGIV/1 Review of actions from the previous meeting

Permanent 05 CGMS should develop a coordinated approach for direct broadcast services of future polar orbiting meteorological satellite systems.

This matter will be discussed in WGI and WGIV as part of the WG agenda, and be reported to plenary as/if necessary. This item is also addressed in the HLPP. WGIV agreed to close it.
Action 39.42: NOAA to provide more information on the content of LRD broadcasts in due course. Deadline: CGMS-40

Status: Closed with NOAA-WP-28. Discussed in WGIV/3,

Action 39.43: EUMETSAT and NOAA to prepare a new global specification for LEO high rate broadcast services and present it for consideration at the next meeting of CGMS. Deadline: CGMS-40

Status: Closed with EUM-WP-07, EUM-WP-08. Discussed in WGIV/3

Action 39.44: CMA to nominate a Point of Contact to follow the evolution of the new global specification for LEO high rate broadcast services and to comment accordingly at CGMS 40. Deadline: CGMS-40

The point of contact provided in the meeting is Dongfeng LUO luodf@cma.gov.cn

Status: Closed with input.

Action 39.45: WMO to consult WMO Members on the requirement for a "Low Data Rate" service in L-Band on future generation polar-orbiting systems, and on the expected contents of such a service. Deadline: CGMS-40

Status: Closed with WMO-WP-01 (not presented in this Working Group)

Action 39.46: EUMETSAT to re-assess the European user requirement for a L-band service from its LEO satellites, bearing in mind the ongoing broader consultation process of WMO, and report to CGMS accordingly. Deadline: CGMS-40

Status: No change.

Action 39.47: The CGMS Secretariat to prepare an amendment of the CGMS HRIT/LRIT Global Specification (CGMS 03) with effect to adopt the geographical reference system of the World Geodetic System (WGS84) and Earth Geodetic Model (EGM-96) as described in CGMS-39 WMO-WP-25. Deadline: CGMS-40

Status: Closed with EUM-WP-16 (2 papers). Discussed in WGIV/3

Action 39.48: CMA to prepare a CMACast fact sheet, including the process for user registration, and to provide this to CGMS Members and to WMO for further distribution to potential users in the Asia-Pacific region. Deadline: 31 March 2012

Status: Closed with CMA-WP-09. Discussed in WGIV/4

Action 39.49: CGMS Members to nominate Points of Contact who can assist WMO with the development of common guidelines for long term data preservation. Deadline for nominations 31 December 2011. WMO to prepare a report on the guidelines to be presented to CGMS-40.
Deadline: CGMS-40

The points of contact provided are:
EUMETSAT: Harald.rothfuss@eumetsat.int
WMO: Nils Hettich, nhettich@wmo.int

All remaining CGMS members are asked to nominate Points of Contact.

Status: Open

Action 39.50: The CGMS Secretariat to distribute to CGMS Members the Report on European Long-Term Data Preservation Guidelines, for information, once this has been finalised. Deadline: CGMS-40

Status: Closed. Distributed to CGMS plenary by e-mail on 10 May 2012.

Action 39.51: All CGMS Members to propose using interoperability standards for providing and sharing of climate data records and report on their efforts at the next meeting of CGMS. Deadline: CGMS-40

EUMETSAT: No further developments since CGMS-39. EUMETSAT is prepared to revisit this following an input from other CGMS members.
NOAA has provided the following input which was circulated via the CGMS list server on 02/11/12:

Major progress has been made in proposed interoperability standards through international, national, and ad hoc individual activities. At the international level, a joint writing group composed of representatives from CEOS, CGMS, and WMO finalized the "Strategy Towards an Architecture for Climate Monitoring from Space" document. The document lays out the broad outline for interoperability amongst Space Agencies at the high level via adoption of concept for a logical and physical architecture.

Most importantly, the Strategy document lays out a pathway forward for next step activities for achieving interoperability, including to:

- *Achieve consensus on the general approach engaging first in an ongoing manner with the relevant coordination bodies and their subsidiary groups (including, but not restricted to, CEOS, CGMS and WMO);*
- *Involve further the scientific community in reviewing the proposed approach as a second step in the consensus building process;*
- *Verify that the proposed logical architecture adequately supports, in a top-down context, the depiction of the required information flows from the decision making process back to the sensing capacity/requirements,*
- *Design a physical architecture that captures the current and planned implementation strategies on an Essential Climate Variable (ECV)-by-ECV basis*
- *Define an optimum "macroscale" space system configuration and its components (in the form of sub-constellations for each ECV or groups of ECVs), as well as the respective ground systems from the combined perspective of the logical and physical architectures,*

- *Develop the physical architecture as an iterative process with continuous/periodic updates as new observational capabilities become available or existing ones mature so that gaps and shortfalls can be addressed, and*

- *Verify the overall robustness of the structure of the architecture to new applications, and the continued maintenance with a clear view of the end-to-end information flows as the architecture matures and the development of climate services becomes further defined.*

At the national level, NCDC has been engaged with NASA and DOE on the development of standards to facilitate interoperability of satellite Climate Data Records (CDRs) with climate model output via the ad hoc observations for model Intercomparison studies (Obs4MIPS) group. The objective of this group is to adopt the interoperability standards of the Coupled Model Intercomparison Project 5 (CMIP-5) for a select set of satellite CDRs. A set of CDRs has been converted to this standard and is now accessible via the Earth System Grid (ESG). The Obs4MIPS group has approached the newly formed WCRP Data Advisory Council (WDAC) about that group taking over the lead for adoption of interoperability standards amongst observational and climate model data sets in the future.

Within NCDC, the framework of the maturity matrix for assessing the completeness of CDRs has been formalized in a peer review journal article. Both the CEOS WGClimate and WMO SCOPE-CM had urged formal publication of the maturity matrix prior to adoption so that a clear trace to a peer-reviewed journal article could be established. The paper "A Maturity Model for Assessing the Completeness of Climate Data Records" by John Bates and Jeff Privette has recently been accepted for publication in EOS Transactions American Geophysical Union and will appear in an issue in Fall 2012.

Status: Open. Awaiting input from other members.
Action 39.52: EUMETSAT and NOAA to report on their progress on sharing climate data records and using common interoperability standards for providing the data. Deadline: CGMS-40

EUMETSAT: Regular exchanges take place with NOAA. Progress reporting is expected to be available around CGMS-42.

NOAA has provided the following input which was circulated via the CGMS list server on 02/11/12:

Activities between EUMETSAT and NOAA regarding sharing of climate data records (CDRs) using interoperability standards have taken place within the SCOPE-CM and during bi-lateral meetings. Within the SCOPE-CM, EUMETSAT, NOAA and JMA have exchanged CDR processing code and CDR data sets for developing a geostationary surface albedo (GSA) product. This work has culminated in a journal article, "Land Surface Albedo from Geostationary Satellites: a multi-agency collaboration within SCOPE-CM" by Alessio Lattanzio; Jörg Schulz; Jessica Matthews; Arata Okuyama; Bertrand Theodore; John J. Bates; Kenneth R. Knapp; Yuki Kosaka; and Lothar Schüller, being accepted for publication in the Bulletin of the American Meteorological Society.

Quarterly telecons are held between EUMETSAT and NOAA/NCDC to discuss opportunities for data sharing and adoption of common interoperability standards. Recent activities include discussing adoption of ISO compliant metadata standards that enable data sharing through the NASA's next generation earth science data discovery tool Reverb|ECHO and the NOAA-funded CEOS Working Group on Information Systems and Services (WGISS) Integrated Catalog (CWIC). Leveraging these current capabilities will enable data sharing beyond EUMETSAT and NOAA much sooner than other avenues. Currently CWIC provides search capability for some of NOAA's data holdings stored in Comprehensive Large data-Array Stewardship System and data holdings within NOAA's National Oceanographic Data Center. Collaboration ***with these data discovery groups has been initiated. Adoption and implementation will be discussed at future telecons.***

Status: Closed.

Action 39.53: WMO to further refine the web-based Product Access Guide for satellite products, within the WMO Space Programme website, in collaboration with CGMS satellite operators. Deadline: CGMS-40

WMO provided the link to the Product Access Guide: http://www.wmo.int/pages/prog/sat/product-access-guide_en.php

Status: Open. Ongoing activity.

Action 39.54: All CGMS Members to report at the next CGMS meeting on their progress with the implementation of WIS. Deadline: CGMS-40

Status: Closed with EUM-WP-15, CMA-WP-10. Discussed in WGIV/6.

Recommendation 39.34: CGMS satellite operators to adopt the World Geodetic System (WGS84) and Earth Geodetic Model (EGM-96) geographical reference systems for the normalised geostationary projections in all future geostationary systems and related products, and inform the users accordingly.

EUM-WP-16 (same as for WGIV39.47)
CGMS-40 OPEN

Status: Closed with EUM-WP-16. Discussed in WGIV/3. New Action formulated.

In summary the following actions remained open with new deadlines allocated:

ACTIONS OPEN FROM CGMS-38 AND -39 (AT CGMS-40)

Actionee	Action	#	Description	Action feedback/closing document	Deadline	Status	HLPP ref
EUMETSAT	WGIV	39.46	Action 39.46: EUMETSAT to re-assess the European user requirement for a L-band service from its LEO satellites, bearing in mind the ongoing broader consultation process of WMO, and report to CGMS accordingly. Deadline: CGMS-40	Ongoing.	(CGMS-40) New deadline: CGMS-41	OPEN	HLPP#2
CGMS Members and WMO	WGIV	39.49	Action 39.49: CGMS Members to nominate Points of Contact who can assist WMO with the development of common guidelines for long term data preservation. Deadline for nominations 31 December 2011. WMO to prepare a report on the guidelines to be presented to CGMS-40. Deadline:CGMS-40	EUM: Harald.rothfuss@eumetsat.int WMO: nhettich@wmo.int Other members to nominate their points of contact.	(CGMS-40) New deadline CGMS-41	OPEN	HLPP#5.1
CGMS Members	WGIV	39.51	Action 39.51: All CGMS Members to propose using interoperability standards for providing and sharing of climate data records and report on their efforts at the next meeting of CGMS Deadline: CGMS-40	EUMETSAT: No further developments since CGMS-39. EUMETSAT is prepared to revisit this following an input from other CGMS members NOAA has provided inputs which were circulated via the CGMS list server on 02/11/12. Other CGMS members to provide their input.	(CGMS-40) New deadline CGMS-41	OPEN	HLPP#5.1
WMO	WGIV	39.53	Action 39.53: WMO to further refine the web-based Product Access Guide for satellite products, within the WMO Space Programme website, in collaboration with CGMS satellite operators. Deadline: CGMS-40	WMO provided the link to the Product Access Guide: http://www.wmo.int/pages/prog/sat/product-access-guide_en.php Status: Open. Ongoing activity, link to be provided by WMO.	(CGMS-40) New deadline CGMS-41	OPEN	HLPP#4.1

WGIV/2 WGIV considerations and contributions to the HLPP

The outcome of the discussions in this Working Group resulted in the following updated HLPP proposed to the plenary:

D. Climate Monitoring

- Assess how CGMS can optimally contribute to the implementation of the GFCS by taking an active role in the construction of the Architecture for Monitoring Climate from Space, including the extended use of the Global Space-based Inter-Calibration System (GSICS) and the Sustained Co-Ordinated Processing of Environmental satellite data for Climate Monitoring (SCOPE-CM) frameworks. Consideration could also be given to providing an analysis of data for specific phenomena (e.g. evolution of convection in the tropical belt based on 35 years of GEOstationary (GEO) observations);

- Ensure the data holdings of CGMS members are appropriately reflected in the Architecture for Climate Monitoring from Space (physical view) through their systematic contributions to the Essential Climate Variable (ECV) Inventory

- Establish an integrated approach for accessing climate data records produced by CGMS members;

- Promote a common approach to the long-term preservation of data through the exchange of information and the establishment of a coordinated consensus on best practice.

E. Data Dissemination, direct read out services and contribution to the WIS

- Support the user-provider dialogue on regional/continental scales through regional coordination groups maintaining requirements for dissemination of satellite data and products through the various broadcast services;

- Support the implementation of sustained, coordinated DVB satellite services for the Americas, Africa, Europe and the Asia Pacific regions;

- Increase access to, and use of, data from R&D and pre-operational missions;

- Investigate the feasibility of introducing a coordinated dissemination service for meteorological information in helping to mitigate disasters;

- Investigate the feasibility of introducing a coordinated dissemination service for information in support of the Ocean User Community;

- Maintain the CGMS Direct Broadcast Global Specifications and harmonise and enhance them by including other dissemination means.

- Facilitate the transition to new direct readout systems (GOES-R, JPSS, FY-3);

- Further enhance the Regional ATOVS Retransmission Services (RARS) initiatives through their extension to advanced sounders;

- All CGMS satellite operators to utilize operationally the WIS infrastructure for satellite data provision and discovery.

- Provide coordinated CGMS inputs to WMO on satellite and instrument identifiers or data representation within the WIS (including the Regional Meteorological Data Communications Network).

G. Preparation for new generations of operational satellites

- Prepare operational users for the new generation of meteorological satellites through user readiness programmes, with implications for product generation, dissemination and user training, taking into account the "guidelines for ensuring user readiness for new generation satellites" adopted at CBS-XV.

WGIV/3 Direct readout and direct dissemination

EUM-WP-16 describes amendments to the LRIT/HRIT Global Specification (which is included as separate paper) required in order to align the geostationary projection with the World Geodetic System 84 (WGS 84). This is in response to action WGIV 39.47, in which EUMETSAT is asked to prepare this update to the specification in order to comply with current international standards recommended by the WMO Commission for Basic Systems. The amendment affects three parameters in Section 4.4.3.1 (Geographical coordinates) and Section 4.4.3.2 (Normalised geostationary projection): the reference meridian, the equator radius and the polar radius, as well as four numerical coefficients derived from these parameters.

The modified LRIT/HRIT Global Specification was endorsed by Working Group IV and will subsequently be published by EUMETSAT.

WMO thanked EUMETSAT for the implementation and expected that satellite operators would implement the updated LRIT/HRIT Global Specification and more generally would strive to comply with the geographic reference system in their product processing suites.

It was proposed to close Recommendation 39.34 in favour of a new action to report on the status of the implementation:

CGMS-40 ACTIONS - WGIV – GLOBAL DATA DISSEMINATION

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS satellite operators	WGIV	40.37	CGMS satellite operators to report about the implementation of the World Geodetic System (WGS84) and Earth Geodetic Model (EGM-96) geographical reference systems.		CGMS-41	OPEN	HLPP#2

EUM-WP-07 provides the analysis performed by EUMETSAT to answer CGMS action 39.43 regarding the suitability of the existing CGMS Global Specification CGMS 04 (Direct Broadcast Services: LRPT/AHRPT Global Specification) to support these services in future missions. The analysis performed concludes that the existing Global Specification is not suitable for specifying Direct Broadcast Services for future missions and that a major update of the CGMS Global Specification (CGMS 04) needs to be performed. This document also evaluates modelling methods and proposes a suitable one to specify the Direct Broadcast Services for future missions. Building upon this rationale, a draft for the revised Global Specification 04 is provided to WGI and WGIV of CGMS-40 for consideration and review by CGMS members.

EUM-WP-08 makes a proposal to CGMS for a new Global Specification of the Direct Broadcast Services (previously LRPT and AHRPT). It is based on the outcome of CGMS action 39.43 where EUMETSAT has performed an analysis and evaluation of the suitability of the existing CGMS Global Specification CGMS 04 (Direct Broadcast Services: LRPT/AHRPT Global Specification) to support these services in future missions. The analysis performed concludes that the existing Global Specification is not suitable for specifying Direct Broadcast Services for future missions and that a major update of the CGMS Global Specification (CGMS 04) needs to be performed. Building upon this rational, a draft for the revised Global Specification 04 is provided to WGI and WGIV of CGMS-40 for consideration and review by CGMS members.

Following comments from NOAA and CMA it became clear that LEO satellite operators need more time for a thorough review.

The following action was agreed:

CGMS-40 ACTIONS - WGIV – GLOBAL DATA DISSEMINATION

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CMA and NOAA	WGIV	40.39	CMA and NOAA to review the draft revised Global Specification 04 and provide comments by April 2013, with the goal to provide a revised version for CGMS-41.		31 Mar 2013; CGMS-41	OPEN	HLPP#2

NOAA-WP-28 presents a summary of the direct readout plans for future NOAA environmental spacecraft. The transition of the NOAA direct readout services is taking place across several spacecraft constellations. This will encompass many years of development, coordination and implementation. In 2005, replacement of the analogue Weather Facsimile (WEFAX) with the new digital LRIT started a transition period that will culminate with the implementation of the High Rate Information Transmission/Emergency Managers Weather Information Network (HRIT/EMWIN) service combined with the transition from today's GOES Variable (GVAR) retransmission format to the GOES Re-Broadcast (GRB) service on the GOES-R spacecraft constellation. NOAA's current direct broadcast services will change dramatically in data rate, data content, and frequency allocation, and will drive changes to field terminal configurations. The geostationary and polar-orbiting environmental satellite constellations will employ higher data rates, larger bandwidths, and new downlink frequency allocations. Environmental data users must employ new field terminal receivers unique to each particular broadcast service. This is also in response to action WGIV 39.42.

Responding to the question about user preparedness for the upcoming changes of satellite systems, in particular regarding the receiving stations NOAA explained that there are measures planned to make the transition as smooth as possible, such as extending the lifetime of legacy satellites as much as possible and supporting users in planning the upgrades. For GOES-R, a user readiness plan will be developed. Also, GOES-R plans to produce and distribute GRB simulators to assist manufacturers in the development of GRB receiver terminals. The distribution of the simulators is planned for late summer 2013.

WMO-WP-13 reported on the outcome of the fifteenth session of CBS regarding user uptake of satellite data. The paper stresses the need for timely preparation of the user community for new satellite generations and highlights the guidelines agreed by CBS-15 in this respect.

See also **Plenary Recommendation VI.1 40.03** (CGMS satellite operators to actively support user readiness projects as part of the implementation of their new generation satellite systems, following best practices recommended in the "CBS Guideline for Ensuring User Readiness for New Generation Satellites").

WGIV/4 Other satellite-based dissemination services

CMA-WP-09 informs the CGMS that CMACast officially began operation in June 2012. By the mid of September 2012, there have been 2,525 registration of user receiving stations, of which 22 are foreign stations. Besides the meteorological data for the domestic users, it provides overseas broadcast of Fengyun satellite data, the global exchange data from the ECMWF, and the NOAA-19/JASON-2/METEOSAT-9 satellite data from EUMETSAT, to users in the Asia Pacific region. The report also provides with the information on user registration process of CMACast and the information on suppliers of the hardware and software for the data reception. The fact sheet of CMACast with this information is annexed in response to CGMS Action 39.48.

CMA further explained that currently hardware and software of the receiving stations are only available in a combined package from the suppliers. But it is planned to offer a more open solution in the future, with possibility of separate provision for software and hardware.

JMA-WP-03 gave information on the status of current and future satellite systems from JMA. MTSAT-2 (145°E) is now operational in imaging over the West Pacific region with MTSAT-1R (140°E) as backup. MTSAT-1R has continuously performed the same imagery dissemination and data collection services as MTSAT-2 even since the switchover of the imaging function on 1 July, 2010. Its DCS (Data Collection System) has been functioning properly since the satellite began operation. JMA plans to launch Himawari-8 in summer 2014 and commence its operation in 2015, when MTSAT-2 is scheduled to complete its period of operation. The Agency also plans to launch Himawari-9 in 2016. As to the manufacture of Himawari-8 and -9, production is currently in the parts manufacture phase. The imagery data of Himawari-8 and -9 will be delivered mainly via the Internet. JMA has also started a feasibility study on data dissemination using a commercial telecommunication satellite. JMA opened web pages of Himawari-8 and -9, whose address is http://mscweb.kishou.go.jp/himawari89/index.html.

WMO welcomed the effort by JMA to provide users a transition between the two satellite generations through data formats and dissemination means.

NOAA-WP-26 reported on future plans for GEONETCast Americas. GEONETCast Americas (GNC-A) is a regional contribution to the global GEONETCast system. GNC-A provides a satellite based system to deliver near-real-time, environmental products and data in support of the Global Earth Observation System of Systems societal benefit areas (agriculture, energy, health, climate, weather, disaster mitigation, biodiversity, water resources, and ecosystems). GEONETCast Americas serves much of North America and the Caribbean Basin and all of Central, and South America. GEONETCast has links with regional environmental data dissemination systems deployed in Europe and Asia. GEONETCast Americas broadcasts to inexpensive satellite receiver stations based on Digital Video Broadcast standards that are in the geographic footprint of the commercial satellite; currently Intelsat 9.

WMO enquired about a possible convergence between GEONETCast Americas and EUMETCast Americas. EUMETSAT explained that the continuation of the EUMETCast Americas service is currently under review, as EUMETSAT does not feel responsible to provide data to South America.

The following action was agreed:

CGMS-40 ACTIONS - WGIV – GLOBAL DATA DISSEMINATION

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
WMO and NOAA	WGIV	40.40	WMO and NOAA to discuss future possibility of NOAA disseminating via GEONETCast-Americas certain environmental data to users in Central and South America.		CGMS-41	OPEN	HLPP#2

WGIV/5 Internet-based services

ROSC-WP-02 informed about Geoinformation Services of the Operator of the Earth Remote Sensing Space Systems in Russia. The accessibility of remote sensing data products in Russia is provided through the development and exploitation by Russian remote sensing systems Operator – Research Center for Earth Operative Monitoring (NTs OMZ of JSC Russian Space Systems) of the maximum unified technologies of generating and maintaining geographically distributed banks of primary space monitoring data and processed data products. At present the geoinformation services of the Operator that provide the consumers with Internet access to the Russian space data banks are ROSCOSMOS's Geoportal and Bank of Basic Remote Sensing Data Products of Interdepartmental Use. The experience gained in developing the integrated technologies for geoinformation support of applied tasks using the remote sensing data is used for implementation of number of international scientific projects, particularly within the European GMES Program.

ROSH-WP-03 presents an overview of internet-based services in SRC Planeta/Roshydromet, including participation in Eumetsat Advanced Retransmission System (EARS) and FTP access to real-time Electro-L data.

EUMETSAT thanked ROSHYDROMET for the cooperation and for making their data available to EUMETSAT member states.

WGIV/6 Global data exchange

In response to Action 39.54 **CMA-WP-10** reports CMA's work regarding implementation of WIS. It informs the CGMS that the GISC Beijing has started operation since 15 August 2011, and 4 internal DCPCs will start operation by the end of 2012. Next, CMA is to improve its GISC services and setup the backup mechanism with other GISCs.

Also in response to Action 39.54 **EUM-WP-15** reports on facilitation of satellite data exchange under WMO WIS. The WMO Information System (WIS) has reached a stage where users can discover and access in near and non real time operational products made available by the different WIS centres. A stronger involvement from Satellite operators is recommended to improve the visibility and availability of satellite products in WIS. This paper addresses some aspects of the WIS that are particularly relevant from a Satellite operator (DCPC) point of view and enumerates different areas of potential improvements. The WIS discovery services rely on product descriptions contained in standardised metadata records and the metadata records for satellite data is one of the necessary aspects for improvement in order to provide meaningful and consistent discovery results to the users. Another aspect is to promote the utilisation of the communication links between the WIS centres for data exchange as well as the integration and further strengthening of satellite operators' data dissemination systems in WIS to provide users improved access to satellite data.

The following two actions were proposed in the paper and agreed by the Working Group:

CGMS-40 ACTIONS - WGIV – GLOBAL DATA DISSEMINATION

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	WGIV	40.41	CGMS members to propose experts for a CGMS-WMO Task Force on Metadata implementation, for the purpose of interfacing with the WMO IPET-MDRD in the context of the revision of the WMO core metadata profile.		CGMS-41	OPEN	HLPP#2
CGMS Secretariat and WMO	WGIV	40.42	The CGMS Secretariat to draft, in consultation with the WMO secretariat and the Co-Chair of the IPET-MDRD, the terms of reference for the CGMS-WMO Task Force on meta data implementation.		31-Dec-12	OPEN	HLPP#2

WMO-WP-10 provides an update on the WMO Information System (WIS). CGMS-39 had reviewed the process for meteorological satellite centres to register as contributing centres to the WMO Information System, and adopted Action 39.54 requesting all CGMS Members to report to CGMS-40 on their progress with the implementation of WIS. The new functionality of WIS became operational from January 2012, and now has five operational GISCs (http://www.wmo.int/giscs). There are now 358 centres registered in WIS consisting of 15 GISCs, 120 DCPCs and 223 NCs. Six of the DCPCs have been registered as "satellite centres": WDC-RSAT of DLR (Germany), Meteorological Satellite Centre (Japan), National Data Centre (Netherlands), National Satellite Meteorology Center (China), National Environmental Satellite, Data, and Information Service (United States) and EUMETSAT. In order to fully benefit from WIS, centres are encouraged to implement key WIS functionality including registering of their Discovery Metadata describing available products and services.

Support to RARS and wider IGDDS initiatives is also encouraged in order to further expand the access to and use of satellite data and products.
The outcome of the preparatory workshop for the establishment of an international Forum of users of satellite data telecommunication systems (Satcom Forum), held in April 2012, is reported in CGMS-40-WMO-WP-02.

CGMS-40 RECOMMENDATIONS - WGIV – GLOBAL DATA DISSEMINATION

Actionee"	Rec	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS satellite operators	WGIV R	40.44	CGMS satellite operators to actively support user readiness projects as part of the implementation of their new generation satellite systems, following best practices recommended in the "CBS Guideline for Ensuring User Readiness for New Generation Satellites".		CGMS-41	OPEN	HLPP#4.2
CGMS members	WGIV R	40.45	CGMS members are highly encouraged to utilise the operational infrastructure of WIS in particular for the description, inclusion and provision of their satellite meta data to WIS GISCs such that satellite data becomes discoverable within WIS and also consider using WIS in the context of provision of their satellite data.		CGMS-41	OPEN	HLPP#2
CGMS members	WGIV R	40.46	CGMS members are encouraged to support the expansion of RARS to advanced sounder data and the broader IGDDS initiatives in order to further expand the access to and use of satellite data and products.		CGMS-41	OPEN	HLPP#2

The action below was initially raised in WGII as action CGMS-40 40.29. Following detailed review of all CGMS-40 actions and recommendations at the debriefing on 9 November 2012, the action was reallocated to WGIV:

CGMS-40 ACTIONS - WGIV – GLOBAL DATA DISSEMINATION

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
ROSH	WGIV	40.38	ROSHYDROMET to report at CGMS-41 on the technical modalities for the near-real time provision of Meteor-M global data sets and associated ancillary information, as needed to fully contribute to the GOS.	This action was previously WGII 40.29. Following the CGMS-40 debriefing on 9 November 2012 it was decided to allocate it to WGIV	CGMS-41	OPEN	HLPP#2

WGIV/7 Consolidation of user requirements for data to be disseminated

WMO-WP-11 presents a Procedure for Documenting Regional Requirements for Satellite Data Access and Exchange. The WMO Regional Association V (RA V) has initiated a task to identify and document the needs for satellite observation data and derived products of RA V member countries, in the areas of interest of WMO Programmes and Cosponsored programmes. Its Task Team on Satellite User Requirements (TT-SUR) will follow the Procedure for Documenting Regional Requirements for Satellite Data Access and Exchange, as recently adopted by CBS. The work will culminate in a workshop, proposed to be undertaken as a side meeting at the Fourth Asia Oceania Meteorological Satellite Users Conference to be held in Melbourne, Australia late in 2013. This task can only be completed with the collaboration and support of satellite providers. CGMS Members are invited to:

- consider providing representatives to contribute to the work of the TT-SUR;
- consider whether assistance can be provided to enable wide attendance by users from RA-V countries at the workshop in late 2013.

Actions/Recommendations proposed:
The paper recommends that CGMS members support regional task teams/groups documenting regional requirements for data access and exchange in all Regions. This is already part of the HLPP. It was noted that RA V (SW Pacific/Oceania) has established "TT-SUR"

The following actions were agreed:

CGMS-40 ACTIONS - WGIV – GLOBAL DATA DISSEMINATION

Actionee	Action	#	Description	Action feedback/ closing document	Deadline	Status	HLPP ref
CGMS members	WGIV	40.43	JMA, CMA, KMA, NOAA and other CGMS agencies, as appropriate, to nominate focal points to the Task Team on Satellite User Requirements recently established in RA V (South-West Pacific) (Lead: Russell Stringer, Bureau of Meteorology Australia, r.stringer@bom.gov.au); due date: end of the 2012	JMA: Osamu Hamada (Mr) Senior Scientific Officer Satellite Program Division Observations Department o-hamada@met.kishou.go.jp (e-mail 27 Dec 12) NOAA: Paul Seymour	31-Dec-12	OPEN	HLPP#2
CGMS members	WGIV	40.44	CGMS Members to support the RA V Task Team in organising a workshop in late 2013 to advance its work plan, in conjunction with the 4th Asia/Oceania Meteorological Satellites Users' Conference in Australia.		30-Sep-13	OPEN	HLPP#2

WGIV/8 Coordination of formats and code forms for satellite data

JMA-WP-03, which was presented already in WGIV/4, also contains information about data formats. JMA plans to use HRIT with extended metadata information in HRIT headers and netcdf for regional observations, as shown in table 8 of the document.

The Working group agreed on the importance of CGMS satellite operators reporting regularly on progress of formats (HRIT/LRIT, etc.), and that this has to be part of the HLPP.

WGIV/9 Review of actions, conclusions, preparation of WG report for plenary and planning of inter-sessional activities

No inter-sessional activities were identified.

The Chairperson thanked the participants for their contributions and the WGIV session was closed at 18:45 on Monday 5 November 2012.

ANNEXES

1. Agenda of CGMS-40
2. Opening ceremony addresses
3. List of Working Papers and presentations
4. List of Plenary participants
5. List of Working Group participants

ANNEX 1: CGMS-40 AGENDA

Plenary

0 Opening session

0.1 Welcome addresses, meeting objectives, agenda approval

I Session I: Setting the scene

I.1 Statements by high-level speakers on expectations from CGMS
I.2 Action review (from CGMS-39)

II Session II: User requirements

II.0 WMO and IOC requirements
II.1 GFCS
II.2 WIGOS
II.3 WCRP
II.4 GCOS
II.5 IOC

III Session III: Reports from space agencies

III.1 Reports on the status of current and future satellite systems by space agencies (operational)
III.2 Reports on status of current and future satellite systems by space agencies (R&D)

IV Session IV: Working Group reports

IV.1 Presentation on scientific benefits of LEO orbit coordination
IV.2 Operational continuity and contingency planning - Report from WGIII
IV.3 Global issues on satellite systems and telecommunication coordination - Report from WGI
IV.4 Presentations by the International Science Working Groups
IV.5 Satellite data and products - Report from WGII
IV.6 Global data dissemination - Report from WGIV

V Session V: Shaping the future

V.1 CGMS 3-5 year High-Level Priority Plan
V.2 Climate architecture

VI Education and Outreach

VI.1 Education and Training
VI.2 Outreach activities

VII AOB and closing session

VII.1 Summary list of actions and recommendations
VII.2 Nominations
VII.3 Any other business
VII.4 Closing
EP Round-table discussions

Working Group I: Global issues on satellite systems and telecommunication coordination

WGI/0 Introduction
WGI/1 Review of actions from the previous meeting
WGI/2 Frequency management matters: SFCG, ITU and WRC activities
WGI/3 Advances in telecommunication techniques
WGI/4 Direct broadcast services
WGI/4.1 Direct read-out stations
WGI/4.2 Coordination and global standards
WGI/5 International data collection and distribution
WGI/5.1 Future distribution
WGI/5.2 Coordination
WGI/6 WGI contributions to the HLPP
WGI/7 Any other business
WGI/8 Review of actions, conclusions, preparation of WG report for plenary and planning of inter-sessional activities

ANNEX 1: CGMS-40 AGENDA

Working Group II: Satellite Data and Products

WGII/0	Introduction
WGII/1	Review of actions from the previous meeting
WGII/2	Image processing techniques
WGII/3	Satellite data calibration and validation including climate related aspects
WGII/4	Infrared/microwave sounding and ITWG matters
WGII/5	Precipitation and IPWG matters
WGII/6	Atmospheric motion vectors and IWWG matters
WGII/7	Radio-occultation and IROWG matters
WGII/8	Cloud and ash/dust related matters
WGII/9	Ocean parameters
WGII/10	Other parameters and products (space weather, other)
WGII/11	WGII contributions to the HLPP
WGII/12	Review of actions, conclusions, preparation of WG report for plenary and planning of inter-sessional activities

Working Group III: Operational Continuity and Contingency Planning

WGIII/0	Introduction
WGIII/1	Review of actions from the previous meeting
WGIII/2	Status of implementation of the (new) CGMS baseline
WGIII/2.1	Contingency issues on core meteorological missions
WGIII/2.2	Recall of gaps identified at CGMS-39
WGIII/2.3	Mapping of planned missions against the baseline
WGIII/2.4	Monitoring the risk of delayed programme decisions/funding
WGIII/3	Optimization of the space-based observing system
WGIII/3.1	Outcome of the Sedona Workshop
WGIII/3.2	Optimization of LEO orbital planes
WGIII/4	Architecture for climate monitoring
WGIII/5	Integration of R&D missions
WGIII/6	Space weather
WGIII/7	WGIII contributions to the HLPP
WGIII/8	Review of actions, conclusions, preparation of WG report for plenary and planning of inter-sessional activities

Working Group IV: Global Data Dissemination

WGIV/0	Introduction
WGIV/1	Review of actions from the previous meeting
WGIV/2	WGIV considerations and contributions to the HLPP
WGIV/3	Direct readout and direct dissemination
WGIV/4	Other satellite-based dissemination services
WGIV/5	Internet-based services
WGIV/6	Global data exchange
WGIV/7	Consolidation of user requirements for data to be disseminated
WGIV/8	Coordination of formats and code forms for satellite data
WGIV/9	Any other business
WGIV/10	Review of actions, conclusions, preparation of WG report for plenary and planning of inter-sessional activities

ANNEX 2: STATEMENTS BY HIGH-LEVEL SPEAKERS ON EXPECTATIONS FROM CGMS

China
Xiofeng Xu
Deputy Administrator
CMA

Dear colleagues,

Good morning.

First, I would like, on behalf of the China Meteorological Administration (CMA) and in my own name, to congratulate the 40th anniversary of CGMS. Taking this opportunity, I would also like to pay tribute to all who have contributed to its birth
and growth.

During the past 40 years, CGMS has been well recognised for its importance in international earth observations. It actively and pragmatically facilitates the coordination of and cooperation among members at international level in order to meet the basic needs of meteorological satellite users. It acts as a core coordinator in quite a few international earth observation programs, so that National Meteorological Services around the world are able to share the outputs of satellite programs of CGMS members. As both the operator and user of meteorological satellites, I'd like to thank other CGMS members for their sharing of data services in the past years.

CMA started its satellite meteorological services in the early 1970s, when a National Satellite Meteorological Centre was inaugurated. From reception of satellite data from other systems at the beginning to the introduction of the Fengyun meteorological satellite system nowadays, 41 years have passed. In 1989, CMA became a member of CGMS, which allowed us to benefit from its activities. With strong government support, CMA is now operating an integral FY meteorological satellite application and service system, which contributes to the international earth observation.

While improving and maintaining a stable and continuous operation of satellite observation, CMA will further enhance its performance of satellite observation with additional observation items to respond to the emerging needs and requirements of national and international users more satisfactorily.

I am encouraged by the significant achievements that have been made by CGMS in the past 40 years.
For example, calibration of FY-2 was significantly improved through GSICS activities. We are here discussing the vision for the future, I look forward to further development in regard to standardisation for satellite production generation, verification and dissemination. On this occasion, I wish to inform you that in order to promote satellite applications, CMA is implementing a 5-year development plan for meteorological satellite applications. This plan covers 21 tasks in 6 thematic application areas, namely, the NWP, weather analysis, climate and climate change, assessment of environmental and natural disasters, agricultural service, validation and utilisation tools. Certain outcomes have been achieved, such as the assimilation of FY data into the CMA's GRAPRES NWP model, development of satellite utilisation platform for SWAP and SMART. Evaluation of the social and economic benefits of satellite programme is also a priority of CMA. Taking this opportunity, I call on CGMS to play an even bigger role in promoting satellite applications, especially in addressing the needs of users at different levels and improving their capacity development. I look forward to more convergences in the cooperation between CMA and CGMS members on satellite applications.

Finally, I assure you that CMA is ready to work together with CGMS members to move ahead and meet common challenges in the future for the benefit of well-beings of the people.

Thanks.

ANNEX 2: STATEMENTS BY HIGH-LEVEL SPEAKERS ON EXPECTATIONS FROM CGMS

Europe
Alain Ratier
Director-General
EUMETSAT

Thank you for giving me the opportunity to address the CGMS Plenary on behalf of the European Members of CGMS, namely CNES, ESA and EUMETSAT. It is natural that we speak with one voice at CGMS, as the three agencies cooperate to implement future generations of European geostationary and polar-orbiting meteorological satellites.

As required I will address the 3 to 5 year perspective for CGMS from a European standpoint.

1. CGMS is about international coordination and we believe this will be increasingly important in the next 3 to 5 years and beyond.

Today, the socio-economic benefits of meteorological information are undisputed but expectations from society continue to increase. Satellite observations are one critical element of a value-adding chain which delivers invaluable operational information services to decision-makers and the public.
Coordination is first required to secure continuity and global coverage of satellite observations. This is a must. This calls for CGMS coordination of our systems and orbits, appropriate contingency plans, but also coordinated efforts to protect our assets in space, in the areas of space situational awareness and frequency coordination.

We also need **to coordinate our respective contributions to the realisation GOS Vision 2025.** We all know that progress of weather forecasting is driven by research and advances in technology. If we wish to keep the high level of impact of our observations, stagnation is not an option: we need to implement more capable systems in response to user requirements. In this respect, coordination will remain essential between CGMS operational and R&D agencies to assess new observing techniques and prepare their transition to operational status.
Also, operational members of CGMS need to coordinate to prepare for extracting the best collective benefits from their next generation satellites.

Coordination is also a must to expand the scope of what we collectively deliver, to new observations of the ocean, the cryosphere and atmospheric composition that are now required by operational weather and climate monitoring applications. In Europe the GMES initiative has been established for this purpose.

Overall, coordination remains essential for us to form a worldwide operational capacity and maximise its benefit to the worldwide user community federated by WMO. Moreover, with severe budget constraints in many countries, the amplification of our respective and collective benefits through CGMS coordination is the way to demonstrate higher return on investment to our governments, and, ultimately, to leverage sustained public investment in our future satellite systems. Coordination is definitely part of a virtuous circle.

2. Keeping strong links with user communities and applications through WMO

CGMS needs to keep close links with user communities and applications through WMO and its programmes to be really in a position to respond to evolving requirements and to get feedback. This applies also to programmes handled by WMO in cooperation with other international bodies, such as IOC, ICSU, etc. Conversely, we expect WMO participation in CGMS to focus on expressing user requirements from its programmes and the global user communities.

3. We believe keeping a technical focus with strong science support is essential for CGMS

This is vital to keep the user and scientific communities interested in and committed to support satellite programmes and CGMS activities. We need to get regular feedback that makes us progress and deliver more benefits.

Technical focus is also a must to establish and implement standards and procedures to facilitate and share access to data.

Last but not least, technical coordination will be essential in the 3 to 5 years to prepare for the optimum use or our future systems by the worldwide community, as many CGMS members move towards next generation systems.

4. A stronger CGMS will meet the new challenge of climate monitoring from space

Only if CGMS is able to preserve and further develop these specific strengths, will it remain flexible enough to address new challenges, and in particular the one of climate monitoring. Climate monitoring from space is highly dependent on how we coordinate to extract Climate Records of Essential Climate Variables from operational meteorological systems of CGMS members. The long series of data already collected and our long term commitment are key assets, and the framework to deliver value from these assets already exists with the architecture for climate monitoring from space that we have established together with CEOS. However, to address the widest possible range of ECVs, we need to continue cooperating with operators of high resolution imagery satellites and research missions represented in CEOS. Therefore, we firmly believe that CGMS should not miss the unique opportunity to join forces with CEOS in the next 3 to 5 years to co-own and implement the architecture.

5. Summary
To summarise, in Europe we believe that the interactions with the WMO programmes and user communities, the scientific and technical dimensions of our cooperation, and our capability to coordinate our respective assets to form one worldwide operational capacity will be increasingly important to meet the future challenges of weather and climate monitoring and to amplify our respective and collective benefits. In the context of the economic crisis, this amplification is necessary to demonstrate to our governments and tax payers that return on their investment is maximised and, thus, to leverage sustained public investment.

I thank you for your attention.

India

Ashok Sharma
Deputy Director
General of Satellite Meteorology
India Meteorological Department (IMD)

The working of CGMS within the framework of its charter since its inception has been highly commendable and has numerous achivements and has served the purpose of the meteorology and other related fields very well.

Importance of a particular parameter along with required accuracy, temporal and spatial resolution to be known from forecasting/climatology point of view and efforts to be coordinated by CGMS to make this parameter available to forecasters /users.

There is a need to keep technical *as well as scientific* focus in CGMS discussions.

CGMS to recognize standard algorithms for various parameters and encourage satellite operators to adopt them for the sake of uniformity in derivation of products.

ANNEX 2: STATEMENTS BY HIGH-LEVEL SPEAKERS ON EXPECTATIONS FROM CGMS

Japan

Toshiyuki Kurino
Director
Data Processing Department, MSC/JMA

It is my great pleasure and honor to deliver statements on behalf of the Japan Aerospace Exploration Agency (JAXA) and the Japan Meteorological Agency (JMA) in this plenary of the 40th anniversary of CGMS.

The history of operational data utilization of meteorological satellites in Japan started in 1968, when JMA decided to receive Automatic Picture Transmission (APT) image from NASA's polar orbital satellite ESSA-6.
Few years later, to contribute to the First GARP Global Experiment (FGGE), JMA and the National Space Development Agency (NASDA), the predecessor of JAXA, developed the first Geostationary Meteorological Satellite (GMS), nicknamed Himawari, and launched it in 1977. Since then, over 35 years, Himawari series satellites have been observing the East Asia and Western Pacific regions from the space. During the operation period, JMA was faced with a difficulty in the continuation due to the launch failure of MTSAT-1 in 1999. At that time, NOAA/NESDIS kindly decided to move GOES-9 to 155 degrees East, and covered the Western Pacific region from May 2003 through June 2005 until MTSAT-1R was in operation. JMA highly appreciates NOAA/NESDIS for providing the image data by GOES-9 while JMA could not observe that region.

As one of the geostationary meteorological satellite operators, JMA joined CGMS from the very beginning as a founder member. While NASDA joined CGMS as an observer in the beginning, and became a full member as Japan's space development agency in 2003, just after the reorganization to JAXA. As you know, in the beginning, CGMS stands for Coordination on Geostationary Meteorological Satellites, and now, the CGMS stands for Coordination Group for Meteorological Satellites. That means now our scope covers not only Geostationary Meteorological Satellites but also Polar Orbiting (or Research and Development) Meteorological Satellites.
Japan is contributing to this aspect by TRMM Precipitation Radar, GOSAT, Ibuki, and GCOM-W1, Shizuku which was successfully launched in this May.

Through the great coordinating efforts of CGMS members, meteorological satellites became indispensable data source for real time monitoring of hazardous weather conditions. In recent years, the amount of satellite data assimilated into numerical weather prediction model has significantly increased. And now, it is getting more and more important for us to contribute to climate monitoring activities such as SCOPE-CM and Global Framework for Climate Services (GFCS). JMA and JAXA will continuously and eagerly support and cooperate with CGMS activities in this field.

Finally, availing this opportunity, let me briefly introduce future satellite programs of Japan. Next generation geostationary meteorological satellites, Himawari-8 and -9, will be launched in 2014 and 2016, respectively. Both satellites will take images much more frequently with almost tripled observation channels.

Regarding polar orbiting satellites, ALOS-2, GPM core satellite, EarthCARE and GCOM-C1 are planned to be launched from 2014 to 2016 timeframe. The GPM is the TRMM follow-on jointly developed with US, while the EarthCARE is the first joint mission with Europe. With steady implementation of these programs, we will continue to contribute to the global meteorological satellite constellation.

Last but not least, JAXA and JMA would like to express our sincere gratitude to EUMETSAT as the Secretariat of CGMS in contributing to the development of CGMS. CGMS-41 will be held in Japan next year. JAXA and JMA are looking forward to meeting with you all in Tokyo.

Thank you for your attention.

ANNEX 2: STATEMENTS BY HIGH-LEVEL SPEAKERS ON EXPECTATIONS FROM CGMS

Korea
Hee-Sang Lee
Director-General
NMSC/KMA

Thank you Mr. Chairman, dear Michel, Christian and Alain, good morning, ladies and gentlemen,

I am personally so happy to be here CGMS and to have an opportunity to deliver you an address as a representative of Korean delegation. As a matter of fact, before joining this group I spent about 27 years of my life in the area of NWP. I used to be one of strong users of satellite observation data to improve the accuracy of the weather forecasting. In early March this year I was transferred to management of satellite business in KMA. At this moment it's my great honor to become a member of international community of satellite. I am pretty new in this area and ready to learn about what I have to do.

First, on behalf of KMA I'd like to congratulate on the 40th anniversary of CGMS and appreciate for great efforts of the MeteoSwiss and EUMETSAT to host the meeting which is excellently organised and held in enchanted town, Lugano, Switzerland. I am pretty sure that this meeting is bridging CGMS member countries for positive cooperation and providing us many ideas for setting up satellite data service policies and planning satellite development.

The CGMS meeting which has been held annually since 1972 is playing an important role in international coordination and greatly performing it. KMA joined CGMS as an official member in 2005, and hosted the CGMS-37 at Jeju island in 2009 at the time of upcoming launch of the COMS scheduled in 2010.

The first thing we would like to address is that the first Korean meteorological satellite, namely, COMS which stands for Communication, Ocean and Meteorological Satellite is working well since the beginning of official operation, 1st April, 2011 and we are broadcasting MI (Meteorological Imager) image data via HRIT/LRIT for Asia-oceanic users and also constructed COMS MI website for web-based service of imagery and data. And the data service by FTP of MI image data and meteorological products is currently available for organizations which has MOU conclusion. KMA is working on expanding the data service to provide COMS MI data for more users. We hope to have more and more international users of COMS MI data and to get any feedback from users.

KMA successfully accomplished the project to support COMS receiving, processing systems and education program with Korea International Cooperation Agency, shortly, KOICA this year. And we finished specific training courses for Sri Lankan users and we are planning to extend this project to any other user countries.

KMA is considering that all of these accomplishments are based on the CGMS guideline and policies, so I'd like to express my deepest appreciation to CGMS as a representative of Korean delegation.

In addition, Korea is planning the COMS follow-on, GeoKOMPSAT-2A and -2B which are scheduled to be launched in 2017 and 2018, respectively. To maximize the benefits of developing and operating meteorological and oceanic/environmental satellite, all of us need to be aware of positive cooperation between each countries.

I believe that success of COMS as well as this endeavor drive more domestic organizations to join the satellite program, which means that more attentions and more investments from the government are expected in this area. I am certain that KMA's role is getting more important in satellite program in Korea and we'll keep at it to prepare well for the brighter future.

We're well aware of that the CGMS activities are based on the active cooperation between sub-organizations under the WMO/CGMS. Currently, KMA is actively participating in various CGMS activities, such as satellite data calibration, VLab training and the area of climate monitoring, space weather, and so on. For being a more significant contributor to CGMS in near future, more positive international cooperation is necessary to KMA as a latecomer of satellite development.

In this regard, the reconstructed CGMS on the 40th anniversary is suggesting new constructive directions to all CGMS members. I believe that CGMS has long provided and will continuously provide with a good opportunity to all the satellite operators and space agencies.

Thank you.

ANNEX 2: STATEMENTS BY HIGH-LEVEL SPEAKERS ON EXPECTATIONS FROM CGMS

Russia
Vasily Asmus
Director
SRC Planeta/ROSHYDROMET

Dear colleagues,

"CGMS-the changing landscape" document summarizes the key technical achievements of CGMS for the last 40 years. For Roshydromet the most important issues covered by the document are the following:

- Establishment of a global baseline for geostationary coverage. Complete coverage of the geostationary ring was made by agreeing on five fixed locations (135°W, 75°W, 0°, 76°E, 140°E) to be implemented by the USA, Europe, Russia, and Japan respectively.

- Establishment of a global back-up framework-contingency planning. A practical example of this planning is deployment by EUMETSAT a back-up Meteosat spacecraft over the Indian Ocean as a back-up for GOMS/Electro.

- Standardisation of data dissemination formats and coordinated planning for the analogue to digital transition. In Russia this approach was implemented for both LEO and GEO meteorological satellites of new generation (Meteor-M and Electro-L series).

- Development of a common standard for the International Data Collection System (IDCS). This standard was developed by CGMS and the performance of the system is regularly monitored at CGMS meetings. The Russian DCS is now being deployed using this same standard on the base of Electro-L geostationary satellite.

- Coordination of Radio Frequency Allocation, and protection of Radio Frequencies. Frequency management issues are regularly discussed during CGMS meetings together with the Russian representatives, and this work is expected to be continued in the future.

- Development of a coordinated approach to calibration and intercalibration. In conjunction with WMO, CGMS in 2005 initiated a system dedicated to inter-calibration (GSICS). Russia is planning to participate in GSICS in a more active manner with the forthcoming meteorological satellite launches.

- Development of a framework for improving the quality of sounding products and Atmospheric Motion Vectors. CGMS plays important role in the enhancement, utilisation and improving the quality of satellite products. In particular, it supports four international scientific working groups, namely IWWG, ITWG, IPWG and IROWG.

Speaking about the following 3-5 years, a High Level Priority Plan (HLPP) was developed and presented here, based on the decision of CGMS-39. It is supposed to be updated annually by CGMS members.

The HLPP covers 9 topics and is regarded by Roshydromet as a comprehensive list of high priority tasks. On behalf of Russian side I can assure you that we are ready to participate in all the activities concerned.

We expect significant achievements in item A (Coordination/Optimization of observing systems) regarding optimization of the distribution of Low Earth Orbit (LEO) sun-synchronous orbits to ensure efficient temporal sampling of the atmosphere. An equator crossing time for LEO Meteor-M series satellites could be coordinated in order to satisfy the requirements of National and foreign weather services.

Item B (Coordination/Optimization of data Collection systems) is also very important for Roshydromet, especially in regard to the National DCS deployment.

Item C (Satellite Products) is considered as one of the exceptional importance. We are waiting for a progress in establishing within GSICS a fully coherent calibration of relevant satellite instruments for LEO and GEO satellites (IR and MW spectral ranges). Along with this, we fully support the development and implementation of the methods to describe the error characteristics of satellite data and products.

Item E (Data Dissemination, direct read out services and contribution to the WIS) is supported by Roshydromet. In particular, we participate in the EARS/RARS initiative and have plans of extending the data coverage for the entire Russian territory.
The activities related to Item G (Preparation for new generation of operational satellites) are performed in the frame of our current and future Federal Space Programs. An important aspect here is that Russia is now developing an innovative HEO constellation of meteorological satellites called Arctica. There are a lot of issues in this program that could also be discussed with international user's community, such as data access and distribution, etc.

To conclude I want to mention that we expect further achievements in the future, together with CGMS community.

Thank you for your attention.

USA

Mary Kicza
Assistant Administrator Satellite and Information Service
NOAA/NESDIS

I would like to thank the World Meteorological Organization and MeteoSwiss for hosting this special 40th meeting of the Coordination Group for Meteorological Satellites (CGMS).

I acknowledge the significant work that has also been undertaken by the Restructuring Task Force since CGMS-39. And as always, the Restructuring Task Force has been amply supported by the CGMS Secretariat, thanks to EUMETSAT.

I am joined today by my Colleague Jack Kaye from NASA who contributed to this US statement. NASA as you know is NOAA's partner in the Suomi NPP mission, which is a major new contribution of the US to the CGMS operational constellation.

It is fitting that members of CGMS would commemorate 40 years of achievements with a Plenary intended to set the course for the future with renewed focus on how to best serve its members needs of today. I applaud the development of the proposed CGMS High Level Priority Plan and look forward to engaging with you on its substance tomorrow afternoon.

CGMS has been tremendously important to the United States with its solid record of achievements. The ongoing technical coordination, planning, and optimization that take place under the aegis of CGMS have benefitted the US directly and tangibly. To name only a few of these:

- establishment of a global back-up framework;
- optimization of the Global Observing System looking rigorously at requirements, gaps, and strategies to mitigate gaps;
- standardization of data dissemination formats;
- coordination and protection for radio frequency allocations; and
- the great strides being made on calibration and inter-calibration with the establishment of the Global Space-based Inter-calibration System (GSICS).

As we think about our expectations for CGMS for the next 3-5 years, I would highlight the following points in this current environment of continued fiscal pressure.

ANNEX 2: STATEMENTS BY HIGH-LEVEL SPEAKERS ON EXPECTATIONS FROM CGMS

1. CGMS will remain critical for contingency planning and back-up arrangements for NOAA core weather missions. We will need to work to make this more robust in these challenging times. We invite collective consideration by CGMS of the impact that constrained budgets faced by NOAA and other satellite agencies may have on observational capabilities over the next few years and how CGMS discussion of continuity and contingency planning may support our respective and collective ability to address risks and develop mitigation strategies. I understand this has been discussed already in Working Group III this week.
   The ongoing work of coordination and optimization of observing systems must be done realistically and with fresh eyes to understand the impact to the CGMS Baseline.
2. Based on my previous point, about contingency planning and mitigation strategies, it is increasingly important to be able to access/exchange and exploit each others' datasets if our requirements will be met using non-NOAA or non-US systems, in our case. A key component of NOAA's mitigation plans for potential gaps in data continuity is to develop a successful and sustainable strategy for non-NOAA data exploitation.
   This strategy is primarily focused on leveraging partnerships and moving to enterprise ground systems. With this critical need to access and exchange data – for both operations/assimilation/forecasting AND research – the value of sharing cal/val data and supporting algorithm intercomparisons, etc. has never been greater.
   I am happy that CGMS has been a strong leader in this area.

3. NOAA and NASA also endorse active participation of research agencies in CGMS. The differences between research and operational satellites is becoming less clear now than in the past. In the US, this is particularly the case with the Suomi NPP satellite, which has both operational and research goals. Those in the "utilization business" are working to use both data – entities like the Joint Center for Satellite Data Assimilation and Short-Term Regional Prediction Center are looking to help in utilization of both.

4. The WMO held its first ever Extra-ordinary Congress last week to advance the development of a Global Framework for Climate Services. In this regard, CGMS—along with CEOS and the WMO-- played the leading role in the Strategy for Developing an Architecture for Climate Monitoring from Space. As this Architecture will serve as a key part of the Observations and Monitoring Pillar of the GFCS, sustained coordinated work lies ahead to implement this Strategy. The unique value that CGMS can bring is to coordinate efforts of the operational meteorological satellite agencies to continue to define and strengthen the contributions that CGMS members can bring to developing operational climate services.

5. This leads me to a final point, it continues to be important to clearly define the role of CGMS relative to other organizations/entities (e.g. CEOS, GEO, WMO Space Programme) and to avoid unnecessary duplication.
   Some thought must be given to the appropriate alignment and coordination of activities undertaken by each of the groups. This "coordination among coordinators" cannot be done unilaterally, by CGMS or by any of the other groups. Rather, we call for a structured set of interactions, involving CGMS, CEOS, GEO, and WMO-SP to identify agreed areas of unnecessary duplication, and to define organizational responsibilities.

Thank you for the opportunity to underscore in this Plenary the value CGMS brings to its members. I look forward to our conversations over the next few days as we collectively celebrate the rich history of CGMS and chart its course for the future.

ANNEX 2: STATEMENTS BY HIGH-LEVEL SPEAKERS ON EXPECTATIONS FROM CGMS

User Community
Michel Jarraud
Secretary-General
WMO

Dear Colleagues,
Ladies and Gentlemen,

On the occasion of its 40th anniversary, the Coordination Group for Meteorological Satellites is again convened in Switzerland, in the beautiful city of Lugano. WMO and MeteoSwiss are extremely pleased and honoured to welcome you all to this meeting, members and observers to CGMS, representatives of satellite agencies, WMO co-sponsored programmes and our partners from the UNESCO Intergovernmental Oceanographic Commission (IOC).

WMO is happy to represent the community of meteorological satellite users within CGMS, which is the key technical coordination body for meteorological satellite operators. Satellite observations are underpinning most if not all WMO programmes and we could no longer imagine operating without satellites for Numerical Weather Prediction, for synoptic weather forecasting and nowcasting, for hurricane track prediction, for aeronautical and marine services, and for global climate monitoring and understanding, only to quote the most obvious applications. It is fortunate that the family of space observation operating nations has grown up to the present membership of CGMS.

Space should however not be a victim of its success, and the future development of space activities requires careful attention.

First of all the constant progress achieved across the past 40 years has been the combined result of tremendous technological advances and of developments within the science and operational user community, e.g. in data assimilation. The International Scientific Working Groups sponsored by CGMS and WMO have an essential role to play in developing science and applications to enhance the use of satellite data, and it is important that CGMS, together with WMO, continue to support their successful work.

CGMS and WMO have defined and put in place a strategy for training and education in satellite applications, which has been very successful, but still requires renewed attention since training resources are often sub-critical, for example in some VLab Centres of Excellence for Education and Training in Satellite Meteorology, and for the central coordination and support to training events. This is particularly important for building capacity in developing and least developed countries (LDCs). Satellite operators in CGMS should continue the successful practice of organizing user conferences and fora in all regions of the world as a very important user interaction mechanism. Systematic user preparation projects should be set up for each new generation of satellites, as recently recommended by the WMO Commission for Basic Systems.

Furthermore, worldwide technical harmonization and integration is essential for the maximum usefulness of satellite data to WMO users, from common data formats, to quality standards, integrated global satellite data distribution, or instrument intercomparison and calibration. The WMO Integrated Global Observing System (WIGOS) framework is being developed to facilitate this process. The need for standardization, integration and optimization of resources is particularly important for the means of data dissemination, where we need to strike a better balance between maintaining stable standards and being open to rapidly evolving technical solutions. We should take steps to anticipate in a coordinated way the forthcoming "data explosion" to expand data accessibility and avoid an increasing divide between satellite providers and the majority of users. Improved instrument performances must also be accompanied by the development of user-tailored data portals, or access guides.

Finally, as new capabilities become more mature and technologically ready to move into operations, such migration can only be successful if the new missions prove to be affordable. There is thus a double challenge: to optimize the costs of the new missions (and I trust that each satellite operator is struggling on this) and to demonstrate their benefit to society, or the risk incurred if we did not operate these missions. CGMS has certainly a role to play in communicating this message, and WMO is willing to support such advocacy.

ANNEX 2: STATEMENTS BY HIGH-LEVEL SPEAKERS ON EXPECTATIONS FROM CGMS

The Sixteenth World Meteorological Congress in 2011 has adopted the Global Framework for Climate Services, or GFCS, as one of its priorities for 2012–2015 and beyond. I am pleased to report that at its Extraordinary Session, held last week in Geneva, the Congress adopted the Implementation Plan of the GFCS and a Governance Mechanism, including an Intergovernmental Board on Climate Services.

Space observation has an important role to play in the implementation of the GFCS. Through its Space Programme, WMO is determined to work with CGMS and CEOS to develop an Architecture for Climate Monitoring from Space, which will be the space-based observation foundation of the GFCS. I welcome the common strategy defined in this regard and I look forward to see the CGMS assets be registered as building blocks of this architecture.

The coming 15-20 years shall see without doubt further improvement in the quality and value of weather, water and climate services for addressing severe impacts of climate variability and change on societies and economies, which will lead to increased demand for high quality services from NMHSs, resulting in increased expectations for sustained, reliable and high-quality satellite-derived information. The contribution by CGMS in this regard will be essential.

I wish in conclusion a happy anniversary to CGMS and we are expecting many more years of fruitful contribution to WMO's programmes and objectives.

ANNEX 3: LIST OF WORKING PAPERS AND PRESENTATIONS

CMA

WP Number	WP Title	Agenda Item
CGMS-40-CMA-WP-01	CMA Report on the Current and Future Satellite Systems	III.1
CGMS-40-CMA-WP-02	Frequencies Used by Current and Future Fengyun Satellite Systems	WGI/2
CGMS-40-CMA-WP-03	FY-3 Satellite Utilization of 7750-7900MHz	WGI/4.2
CGMS-40-CMA-WP-04	Operational Inter-calibration for IR channels of FY-2D/E	WGII/3
CGMS-40-CMA-WP-05	Initial Assessment of FY-3B Data for NWP	WGII/4
CGMS-40-CMA-WP-06	Rain Rate Estimation by the FY-3 Microwave Radiation Imager	WGII/5
CGMS-40-CMA-WP-07	Status of Operational AMVs from FY-2D/E	WGII/6
CGMS-40-CMA-WP-08	CMA Space Weather Activities	WGII/10
CGMS-40-CMA-WP-09	Status of CMACast Operation	WGIV/4
CGMS-40-CMA-WP-10	CMA progress with the implementation of WIS	WGIV/6

CNSA

WP Number	WP Title	Agenda Item
CGMS-40-CNSA-WP-04	Application of China Environmental Satellite on Aerosol Optical Depth Retrieval	WGII/8
CGMS-40-CNSA-WP-03	Application and development of environment and disaster small satellite constellation in environmental protection	WGII/10
CGMS-40-CNSA-WP-01	The status of current and future CNSA Earth Observation Systems	III.2
CGMS-40-CNSA-WP-02	Report on the curren status of the HY-2 satellite and its prospects	III.2
CGMS-40-CNSA-WP-51, ppt	The Status of current and future CNSA Earth Observing System	III.2

CSA

WP Number	WP Title	Agenda Item
CGMS-40-CSA-WP-51	Status report on the current and future satellite systems by the Canadian Space Agency	III.2

ESA

WP Number	WP Title	Agenda Item
CGMS-40-ESA-WP-01	Long-Term Monitoring of MERIS as a Reference Calibration Instrument	WGII/3
CGMS-40-ESA-WP-02	ESA Report on the Status of Current and Future Satellite Systems and on ESA Support to GCOS and Other Climate Monitoring Activities	III.2
CGMS-40-ESA-WP-52, ppt	Presentation of the ESA satellite programme status (ESA-WP-02)	III.2

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EUMETSAT

WP Number	WP Title	Agenda Item
CGMS-40-EUMETSAT-WP-17	EUMETSAT report on the status of current and future satellite systems	III.1
CGMS-40-EUMETSAT-WP-67, ppt	Presentation of EUMETSAT satellite programme status (EUM-WP-17)	III.1
CGMS-40-EUMETSAT-WP-94, ppt	WGIV report to plenary	IV.6
CGMS-40-EUMETSAT-WP-99, ppt (for Chairman non logo team)	Climate architecture	V.2
CGMS-40-EUMETSAT-WP-80, ppt	Background - Process toward the HLPP	V.1
CGMS-40-EUMETSAT-WP-81	CGMS - The changing landscape document v2C with track changes	V.1
CGMS-40-EUMETSAT-WP-82	Roundtable output on the HLPP	V.1
CGMS-40-EUMETSAT-WP-13	Status of actions and recommentations resulting from CGMS-39	WGI/1
CGMS-40-EUMETSAT-WP-04	EUMETSAT report on the list of frequencies used by current and future systems (PA10)	WGI/2
CGMS-40-EUMETSAT-WP-05	EUMETSAT report on frequency management topics	WGI/2
CGMS-40-EUMETSAT-WP-06	Report on the outcome of SFCG-32 issues of interest to CGMS	WGI/2
CGMS-40-EUMETSAT-WP-07	Analysis of the current Direct Broadcast Service LRPT/AHRPT Global Specification to support future LEO missions (WGIV 39.43)	WGI/4.2
CGMS-40-EUMETSAT-WP-08	Draft proposal for a revised CGMS Global Specification for Direct Broadcast Services (WGIV 39.43)	WGI/4.2
CGMS-40-EUMETSAT-WP-13	Status of actions and recommendations resulting from CGMS-39	WGII/1
CGMS-40-EUMETSAT-WP-09	Calibration Events Working Group (WGII R39.12)	WGII/3
CGMS-40-EUMETSAT-WP-14, (on behalf of IPWG)	Report on the outcome of the IPWG-6	WGII/5
CGMS-40-EUMETSAT-WP-11	Use of the "NWC SAF/High Resolution Winds (HRW) Software" as Portable Standalone AMV Calculation Software	WGII/6
CGMS-40-EUMETSAT-WP-01, (on behalf of IROWG)	Report from the 2nd International Radio Occultation Workshop (WGII 39.32)	WGII/7
CGMS-40-EUMETSAT-WP-02, (on behalf of IROWG)	Status of the global Radio Occultation observing system (A39.03, WGII 39.33)	WGII/7
CGMS-40-EUMETSAT-WP-03, (on behalf of IROWG)	Climate related Processing and Potential of Radio Occultation Data	WGII/7
CGMS-40-EUMETSAT-WP-10	Cloud Retrieval Evaluation Working Group	WGII/8
CGMS-40-EUMETSAT-WP-19,	Volcanic ash product	WGII/8
CGMS-40-EUMETSAT-WP-18	GMES-PURE processes for user requirement evaluation for future marine and atmosphere services	WGII/10
CGMS-40-EUMETSAT-WP-13	Status of actions and recommendations resulting from CGMS-39	WGIII/1
CGMS-40-EUMETSAT-WP-13	Status of actions and recommendations resulting from CGMS-39	WGIV/1
CGMS-40-EUMETSAT-WP-16	Amendment to the CGMS LRIT/HRIT Global Specification	WGIV/3
CGMS-40-EUMETSAT-WP-16	Amendment to the CGMS LRIT/HRIT Global Specification bis	WGIV/3
CGMS-40-EUMETSAT-WP-15	Facilitation of satellite data exchange under WMO WIS (WGIV 39.54)	WGIV/6
CGMS-40-EUMETSAT-WP-13	Status of actions and recommendations resulting from CGMS-39	I.2

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CGMS-40-EUMETSAT-WP-63, ppt	Presentation of the status of actions resulting from CGMS-39 (overview) (EUMETSAT-WP-13)	I.2
CGMS-40-EUMETSAT-WP-51, ppt	Report to CGMS Plenary from IROWG	IV.4
CGMS-40-EUMETSAT-WP-64, ppt	Report to CGMS Plenary from IPWG	IV.4
CGMS-40-EUMETSAT-WP-20, on behalf of Hinsman/Mohr	CGMS lessons learned	EP
CGMS-40-EUMETSAT-WP-21, on behalf of Jianmin Xu	Data distribution	EP
CGMS-40-EUMETSAT-WP-22, on behalf of John Morgan	Orbit coordination	EP
CGMS-40-EUMETSAT-WP-24, on behalf of Nobuo Sato	Numerical Weather Prediction	EP

IMD

WP Number	WP Title	Agenda Item
CGMS-40-IMD-WP-51, ppt	Status of Indian Satellite Systems	III.1
CGMS-40-IMD-WP-06	Validation of KALPANA-1 Derived Water Vapor Winds and its Impact on NWP Model	WGII/6

IOC-UNESCO

WP Number	WP Title	Agenda Item
CGMS-40-IOC-UNESCO-WP-01	Ocean Surface Vector Wind: Research Challenges and Operational Opportunities	II.5
CGMS-40-IOC-UNESCO-WP-51, ppt	Presentation on OSWV Research challenges and operational opportunities (IOC-UNESCO-WP-01)	II.5

JAXA

WP Number	WP Title	Agenda Item
CGMS-40-JAXA-WP-01	JAXA Report on the Status of Current and Future Satellite Systems	III.2
CGMS-40-JAXA-WP-51, ppt	Presentation of the JAXA satellite programme status (JAXA-WP-01)	III.2

JMA

WP Number	WP Title	Agenda Item
CGMS-40-JMA-WP-03	JMA Report on the Status of Current and Future Satellite Systems	III.1
CGMS-40-JMA-WP-53, ppt	Presentation of JMA satellite programme status (JMA-WP-03)	III.1
CGMS-40-JMA-WP-04	Progress Report on the RA II Pilot Project to Develop Support for NMHSS in Satellite Data, Products and Training (Third Phase: September 2011 – August 2012) and the Fourth Phase Action Plan (September 2012 – August 2013)	VI.2
CGMS-40-JMA-WP-03	JMA Report on the Status of Current and Future Satellite Systems	WGI/2

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CGMS-40-JMA-WP-05	Report on Direct Readout of Suomi-NPP	WGI/4.1
CGMS-40-JMA-WP-06	JMA's GSICS and SCOPE-CM Activities	WGII/3
CGMS-40-JMA-WP-07	JMA Atmospheric Motion Vectors	WGII/6
CGMS-40-JMA-WP-08	Assimilation of GNSS RO Refractivity Data into the JMA Global NWP System	WGII/7
CGMS-40-JMA-WP-09	Cloud and Volcanic Ash Products	WGII/8
CGMS-40-JMA-WP-10	Validation of the Multi-Channel Sea Surface Temperature (SST) Algorithm by JMA	WGII/9
CGMS-40-JMA-WP-02	Contribution to the WMO CBS Severe Weather Forecasting Demonstration Project (SWFDP)	WGII/10
CGMS-40-JMA-WP-03	JMA Report on the Status of Current and Future Satellite Systems	WGIV/4
CGMS-40-JMA-WP-01	Review of Action Items	I.2

KMA

WP Number	WP Title	Agenda Item
CGMS-40-KMA-WP-02	KMA report on the status of current and future satellite	III.1
CGMS-40-KMA-WP-52, ppt	Presentation of the status of KMA satellite programmes (KMA-WP-02)	III.1
CGMS-40-KMA-WP-03	KMA's activity to promote utilization of satellite data	VI.1
CGMS-40-KMA-WP-04	Progress Report on the RA II Pilot Project to Develop Support for NMHSs in Satellite Data, Products and Training (Third Phase: September 2011 – August 2012) and the Fourth Phase Action Plan (September 2012 – August 2013)	VI.2
CGMS-40-KMA-WP-05	The Third Asia/Oceania Meteorological Satellite Users' conference	VI.2
CGMS-40-KMA-WP-54, ppt	Progress Report on the RA II Pilot Project to Develop Support for NMHSs in Satellite Data, Products and Training	VI.2
CGMS-40-KMA-WP-06	KMA's GSICS Activities	WGII/3
CGMS-40-KMA-WP-07	Current Status of Atmospheric Motion Vector at KMA	WGII/6
CGMS-40-KMA-WP-08	Current Status of Weather Support for Nowcasting and Very Short Range Forecast	WGII/10
CGMS-40-KMA-WP-09	Current Status of the Satellite Data Assimilation in KMA	WGII/10
CGMS-40-KMA-WP-10	KMA Space Weather Service	WGII/10

NASA

WP Number	WP Title	Agenda Item
CGMS-40-NASA-WP-03	NASA Calibration and Validation	WGII/3
CGMS-40-NASA-WP-02	An Analysis and Visualization Tool for Inter-Calibration of Satellite Instruments	WGII/3
CGMS-40-NASA-WP-05	Report on Radio Occultation Activities at NASA	WGII/7
CGMS-40-NASA-WP-04	Sea Surface Salinity: Research Challenges and Opportunities	WGII/9
CGMS-40-NASA-WP-07	NASA Space Weather Activities	WGII/10
CGMS-40-NASA-WP-01	NASA Report on the Status of Current and Future Satellite Missions	III.2
CGMS-40-NASA-WP-51, ppt	Presentation on the status of NASA satellite programmes (NASA-WP-01)	III.2

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CGMS-40-NASA-WP-06	OPERATIONAL USE OF RESEARCH DATA AT NCEP AND THE JOINT CENTER FOR SATELLITE DATA ASSIMILATION	WGIII/5

NOAA

WP Number	WP Title	Agenda Item
CGMS-40-NOAA-WP-83, ppt	PowerPoint: Status of the Current and Future NOAA Satellite Systems (NOAA-WP-33)	III.1
CGMS-40-NOAA-WP-33	Status of the Current and Future NOAA Satellite Systems	III.1
CGMS-40-NOAA-WP-93, ppt	WGIII Report to plenary	IV.2
CGMS-40-NOAA-WP-91, ppt	Report from WGI	IV.3
CGMS-40-NOAA-WP-11	Summary of Virtual-training Laboratory Activities	VI.1
CGMS-40-NOAA-WP-31	CGMS Outreach Activities	VI.2
CGMS-40-NOAA-WP-81, ppt	PowerPoint: CGMS Outreach Activities (NOAA-WP-31)	VI.2
CGMS-40-NOAA-WP-12	NOAA Use of Frequency Bands: Current and Future	WGI/2
CGMS-40-NOAA-WP-30	NOAA Spectrum Status and Issues	WGI/2
CGMS-40-NOAA-WP-12, ppt	NOAA Use of frequency bands: Current and future	WGI/2
CGMS-40-NOAA-WP-35, ppt	NOAA response to LRD/HRD on JPSS	WGI/4.2
CGMS-40-NOAA-WP-13	Status of the International Data Collection System (IDCS)	WGI/5
CGMS-40-NOAA-WP-13, ppt	Status of the International Data Collection System (IDCS)	WGI/5
CGMS-40-NOAA-WP-14	Image Processing Techniques: Image Processing and Applications from SUOMI NPP VIIRS	WGII/2
CGMS-40-NOAA-WP-15	Satellite Data Calibration and Validation: NOAA SUOMI NPP Cal/Val Results	WGII/3
CGMS-40-NOAA-WP-16	Satellite Data Calibration and Validation: NOAA Report on Satellite Calibration Anomalies and Instrument Performance Monitoring	WGII/3
CGMS-40-NOAA-WP-17	Satellite Data Calibration and Validation: GSICS Progress Report	WGII/3
CGMS-40-NOAA-WP-05	Current Status of COSMIC-2 and plan to increase GPS-RO global coverage	WGII/4
CGMS-40-NOAA-WP-18	Infrared/Microwave sounding and ITWG Matters: Report from the International TOVS Working Group	WGII/4
CGMS-40-NOAA-WP-19	Infrared/Microwave sounding and ITWG Matters: Early sounding performance from CrIS/ATMS	WGII/4
CGMS-40-NOAA-WP-20	Precipitation and IPWG Matters: NOAA's contribution to Global Precipitation Missions	WGII/5
CGMS-40-NOAA-WP-21	Atmospheric Motion Vectors and IWWG Matters: Report from the International Winds Working Group	WGII/6
CGMS-40-NOAA-WP-22	Cloud and Ash/Dust related Matters: VIIRS Cloud Products and Performance	WGII/8
CGMS-40-NOAA-WP-23	Ocean Parameters: Report on NOAA VIIRS Ocean Color Product Accuracy and Preparations for User Readiness	WGII/9
CGMS-40-NOAA-WP-24	Other Parameters and Products: NearCasting demonstrations in Lake Victoria	WGII/10
CGMS-40-NOAA-WP-32	Mitigating a Potential Joint Polar Satellite System (JPSS) Data Gap	WGIII/2.2

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CGMS-40-NOAA-WP-32	PowerPoint:Mitigating a Potential Joint Polar Satellite System (JPSS) Data Gap	WGIII/2.2
CGMS-40-NOAA-WP-10	Update to NOAA contributions to the CGMS Baseline	WGIII/2.3
CGMS-40-NOAA-WP-25	Continuity and Contingency Planning: The impact of Constrained Budgets on Current and Planned Space-based Observation Systems	WGIII/2.4
CGMS-40-NOAA-WP-29	Current Data Exploitation Initiatives	WGIII/2.4
CGMS-40-NOAA-WP-29	PowerPoint: Current Data Exploitation Initiatives	WGIII/2.4
CGMS-40-NOAA-WP-28	Direct Broadcast Beyond 2015	WGIV/3
CGMS-40-NOAA-WP-26	NOAA Report on Future Plans for GEONETCast Americas	WGIV/4
CGMS-40-NOAA-WP-01	Review of CGMS-39 Action Items	I.2
CGMS-40-NOAA-WP-69, ppt	Report to CGMS Plenary from ITWG	IV.4
CGMS-40-NOAA-WP-71, ppt	Report to CGMS Plenary from IWWG	IV.4
CGMS-40-NOAA-WP-07	Anomalies From Solar Events	WGIII/6
CGMS-40-NOAA-WP-07	PowerPoint: Anomalies From Solar Events	WGIII/6

ROSCOSMOS

WP Number	WP Title	Agenda Item
CGMS-40-ROSCOSMOS-WP-03	Current state and the probable future of Russian National hydrometeorological constellations	III.1
CGMS-40-ROSCOSMOS-WP-01	Technologies for Data Stream Processing of the Russian Remote Sensing Systems Operator	WGII/2
CGMS-40-ROSCOSMOS-WP-02	Geoinformation Services of the Remote Sensing Systems Operator	WGIV/5

ROSHYDROMET

WP Number	WP Title	Agenda Item
CGMS-40-ROSHYDROMET-WP-04, (ROSHYDROMET/ROSCOSMOS)	Status of current and future Russian satellite systems	III.1
CGMS-40-ROSHYDROMET-WP-54, ppt	Status of current and future Russian Satellite Ssytems	III.1
CGMS-40-ROSHYDROMET-WP-01	Status of Russian data collection system	WGI/5
CGMS-40-ROSHYDROMET-WP-02	Satellite data and products in Roshydromet – new developments	WGII/4
CGMS-40-ROSHYDROMET-WP-03	Internet-based services in SRC "Planeta" including participation in EARS, access to Electro-L data	WGIV/5
CGMS-40-ROSHYDROMET-WP-05, (ROSHYDROMET/ROSCOSMOS)	Review of Action Items	I.2

WP Number	WP Title	Agenda Item
CGMS-40-WMO-WP-92	WG II Report to Plenary	IV.5
CGMS-40-WMO-WP-13	Outcome of CBS regardng User Uptake of Satellite Data	VI
CGMS-40-WMO-WP-18	Virtual Laboratory and Related Matters	VI.1
CGMS-40-WMO-WP-68, ppt	Virtual Laboratory and Related Matters	VI.1
CGMS-40-WMO-WP-01	WMO Survey on L-Band / X-Band Direct Broadcast	WGI/4.2

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CGMS-40-WMO-WP-02	International Forum of Users of Satellite Communication Systems	WGI/5
CGMS-40-WMO-WP-23	GSICS Progress Report	WGII/3
CGMS-40-WMO-WP-05	Effects of biomass burning on aerosols, atmospheric chemistry and climate	WGII/8
CGMS-40-WMO-WP-06	Issues with ocean surface winds: the Sri Lanka 25 November 2011 storm	WGII/9
CGMS-40-WMO-WP-22	Satellite Related Activities within the WMO Agricultural Meteorology Programme	WGII/10
CGMS-40-WMO-WP-04	Sustained Coordinated Processing of Environmental Satellite Data for Nowcasting (SCOPE-NWC)	WGII/10
CGMS-40-WMO-WP-14	Update on the Polar Space Task Group	WGII/10
CGMS-40-WMO-WP-21	Status of WG-III Actions and Recommendations	WGIII/1
CGMS-40-WMO-WP-07	Observing System Capability Analysis and Review Tool (OSCAR)	WGIII/2.2
CGMS-40-WMO-WP-08	Gap Analysis	WGIII/2.2
CGMS-40-WMO-WP-10	Update on the WMO Information System (WIS)	WGIV/6
CGMS-40-WMO-WP-11	Procedure for Documenting Regional Requirements for Satellite Data Access and Exchange	WGIV/7
CGMS-40-WMO-WP-19	Optimal Distribution of Polar-orbiting Sounding Missions: the impact of temporal spacing of observations on analysis accuracy	IV.1
CGMS-40-WMO-WP-20	Optimization of Sun-synchronous Orbital Planes: report on studies conducted in the United States	IV.1
CGMS-40-WMO-WP-70, ppt	Presentation on the optimization of sun-synchronous orbital planes. Report on studies conducted in the USA (WMO-WP-20)	IV.1
CGMS-40-WMO-WP-69, ppt	Presentation on optimization of sun-synchronous orbital planes. Report on studies conducted in Europe (WMO-WP-19)	IV.1
CGMS-40-WMO-WP-23	Scientific benefits of LEO missions orbital plane coordination - background	IV.1
CGMS-40-WMO-WP-73, ppt	Presentation on Optimization of sun-synchronous orbital planes. Report on studies conducted in China (WMO-WP-23)	IV.1
CGMS-40-WMO-WP-17	Outcome of the WMO Extraordinary Congress on the GFCS	II.1
CGMS-40-WMO-WP-67, ppt	Outcome of the WMO Extraordinary Congress on the GFCS	II.1
CGMS-40-WMO-WP-12	WMO Integrated Global Observing System (WIGOS)	II.2
CGMS-40-WMO-WP-62, ppt	WIGOS	II.2
CGMS-40-WMO-WP-16	Report from the World Climate Research Programme (WCRP)	II.3
CGMS-40-WMO-WP-66, ppt	Presentation of the Report from the World Climate Research Programme (WCRP) (WMO-WP-16)	II.3
CGMS-40-WMO-WP-15	Update of the Implementation Activities for the Global Climate Observing System	II.4
CGMS-40-WMO-WP-65, ppt	GCOS requirements	II.4
CGMS-40-WMO-WP-09	Outcome of the 5th WMO Workshop on the Impact of Observing Systems	WGIII/3.1
CGMS-40-WMO-WP-03	Report on WMO Space Weather Activities	WGIII/6

ANNEX 4 LIST OF PLENARY PARTICIPANTS

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Yu, Jixin	Counselor
Zhao, Datong	Director-General for observation network

CNSA

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von Engeln, Axel	Co-Chair IROWG

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KMA

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Kim, Dohyeong	Senior Researcher
Lee, Hee-Sang	Director General
Oh, Hyunjong	Researcher

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ANNEX 5: LIST OF WORKING GROUP PARTICIPANTS

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APPENDICES

GENERAL CGMS INFORMATION

6. Charter for CGMS

7. CGMS Membership

8. Addresses for Procuring Archive Data

9. Contact List for Operational Engineering Matters

10. Address List for Distribution of CGMS Documents

11. E-mail List Servers

12. Glossary

PREAMBLE

RECALLING that the Coordination on Geostationary Meteorological Satellites (CGMS) has met annually as an informal body since September 1972 when representatives of the United States (National Oceanic and Atmospheric Administration), the European Space Research Organisation (now the European Space Agency), and Japan (Japan Meteorological Agency) met to consider common interests relating to the design, operation and use of these agencies planned meteorological satellites,

RECALLING that the Union of Soviet Socialist Republics (State Committee for Hydrometeorology), India (India Meteorological Department) and the People's Republic of China (State Meteorological Administration) initiated development of geostationary satellites and joined CGMS in 1973, 1978, and 1986 respectively,

RECOGNIZING that the World Meteorological Organisation (WMO) as a representative of the meteorological satellite data user community has participated in CGMS since 1974,

NOTING that the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) has, with effect from January 1987, taken over responsibility from ESA for the METEOSAT satellite system and the current Secretariat of CGMS,

CONSIDERING that CGMS has served as an effective forum through which independent agency plans have been informally harmonised to meet common mission objectives and produce certain compatible data products from geostationary meteorological satellites for users around the world,

RECALLING that the USA, the USSR, China and Europe have launched polar-orbiting meteorological satellites, and that the polar and geostationary meteorological satellite systems together form a basic element of the space based portion of the WMO Global Observing System,

BEING AWARE of the concern expressed by the WMO Executive Council Panel of Experts over the lack of guaranteed continuity in the polar-orbit and its recommendation that there should be greater cooperation between operational meteorological satellite operators world-wide, so that a more effective utilisation of these operational systems, through the coordination and standardisation of many services provided, can be assured,

This Charter was amended at CGMS-31 to take into account new membership of the R&D agencies ESA, NASA, JAXA and Rosaviakosmos. It was further amended at CGMS-34 to take into account the new membership of CNES (since CGMS-32), KMA (since CGMS-33), and CNSA.

RECOGNIZING the importance of operational meteorological satellites for monitoring and detection of climate change,

RECOGNIZING the expansion of the space-based component of the WMO's World Weather Watch Global Observing System to include Research & Development missions and the commitment of the National Aeronautics and Space Administration (NASA), European Space Agency (ESA), Russian Aviation and Space Agency (Rosaviakosmos) and the National Space Development Agency of Japan (NASDA) to make observations from its missions available to the world community at the 2nd session of the WMO Consultative Meetings on High Level Policy on Satellite matters in February 2002,

NOTING the expansion of CGMS at CGMS-31 to include NASA, ESA, Rosaviakosmos and the Japan Aerospace Exploration Agency (JAXA) as full members to improve coordination between operational meteorological and R&D satellite operators,

NOTING the further expansion of CGMS at CGMS-32 to include CNES, at CGMS-33 to include KMA, and at CGMS-34 to include CNSA, following to their commitment to make observations from their missions available to the world community in full adherence with the space-based component of the WMO's World Weather Watch Global Observing System,

AND RECOGNIZING the need to update the purpose and objectives of CGMS,

AGREE

I. To change the name of CGMS to the Coordination Group for Meteorological Satellites

II. To adopt a Charter, establishing Terms of Reference for CGMS, as follows:

APPENDICES: GENERAL CGMS INFORMATION

OBJECTIVES

a. CGMS provides a forum for the exchange of technical information on geostationary and polar-orbiting meteorological satellite systems and research & development missions, such as reporting on current meteorological satellite status and future plans, telecommunications matters, operations, intercalibration of sensors, processing algorithms, products and their validation, data transmission formats and future data transmission standards.

b. CGMS harmonises to the extent possible meteorological satellite mission parameters such as orbits, sensors, and data formats and downlink frequencies.

c. CGMS encourages complementarity, compatibility and possible mutual back-up in the event of system failure through cooperative mission planning, compatible meteorological data products and services and the coordination of space and data related activities, thus complementing the work of other international satellite coordinating mechanisms.

MEMBERSHIP

d. CGMS Membership is open to all operators of meteorological satellites, to prospective operators having a clear commitment to develop and operate such satellites, and to the WMO, because of its unique role as representative of the world meteorological data user community. Further CGMS Membership is open to space agencies operating R&D satellite systems that have the potential to contribute to WMO and supported programmes.

e. The status of observer will be open to representatives of international organisations or groups who have declared an intent, supported by detailed system definition studies, to establish a meteorological satellite observing system. Once formal approval of the system is declared, membership of CGMS can be requested by the observer.

Within two years of becoming an observer, observers will report on progress being made towards the feasibility of securing national approval of a system. At that time CGMS Members may review the continued participation by each Observer.

f. The current Membership of CGMS is listed in Appendix 2 to this charter.

g. The addition of new Members and Observers will be by consensus of existing CGMS Members.

ORGANISATION

h. CGMS will meet in plenary session annually. Ad hoc Working Groups to consider specific issues in detail might be convened at the request of any Member provided that written notification is received and approved by the Membership at least 1 month in advance and all Members agree. Such Working Groups will report to the next meeting of CGMS.

i. One Member, on a voluntary basis, will serve as the Secretariat of CGMS.

j. Provisional meeting venues, dates and draft agenda for plenary meetings will be distributed by the Secretariat 6 months in advance of the meeting, for approval by the Members. An agreed Agenda will be circulated to each Member 3 months in advance of the meeting.

k. Plenary Meetings of CGMS will be chaired by each of the Members in turn, the Chairperson being proposed by the host country or organisation.

l. The Host of any CGMS meeting, assisted by the Secretariat, will be responsible for logistical support required by the meeting. Minutes will be prepared by the Secretariat, which will also serve as the repository of CGMS records. The Secretariat will also track action items adopted at meetings and provide CGMS Members with a status report on these and any other outstanding actions, four months prior to a meeting and again at the meeting itself.

PROCEDURE

m. The approval of recommendations, findings, plans, reports, minutes of meetings, the establishment of Working Groups will require the consensus of Members. Observers may participate fully in CGMS discussions and have their views included in reports, minutes etc., however, the approval of an observer will not be required to establish consensus.

n. Recommendations, findings, plans and reports will be non-binding on Members or Observers.

o. Once consensus has been reached amongst Members on recommendations, findings, plans and reports, minutes of meetings or other such information from CGMS, or its Working Groups, this information may be made publicly available.

p. Areas of cooperation identified by CGMS will be the subject of agreement between the relevant Members.

COORDINATION

q. The work of CGMS will be coordinated, as appropriate, with the World Meteorological Organisation and its relevant bodies, and with other international satellite coordination mechanisms, in particular the Committee on Earth Observation Satellites (CEOS) and the Earth Observation International Coordination Working Group (EO-ICWG) and the Space Frequency Coordination Group (SFCG).

Organisations wishing to receive information or advice from the CGMS should contact the Secretariat; which will pass the request on to all Members and coordinate an appropriate response, including documentation or representation by the relevant CGMS Members.

AMENDMENT

r. These Terms of Reference may be amended or modified by consensus of the Members. Proposals for amendments should be in the hands of the Members at least one month prior to a plenary meeting of CGMS.

EFFECTIVE DATE AND DURATION

s. These Terms of Reference will become effective upon adoption by consensus of all CGMS Members and will remain in effect unless or until terminated by the consensus of CGMS Members.

APPENDIX 2: MEMBERSHIP OF CGMS

The current Membership of CGMS is:

CMA	joined 1989
CNES	joined in 2004
CNSA	joined in 2006
ESA	re-joined in 2003
EUMETSAT	joined 1987 (currently CGMS Secretariat)
IMD	joined 1979
IOC/UNESCO	joined in 2001
JAXA	joined in 2003
JMA	founder member, 1972
KMA	joined in 2005
NASA	joined in 2003
NOAA	founder member, 1972
ROSCOSMOS	joined in 2003
ROSHYDROMET	joined 1973
WMO	joined 1973

In some cases delegates are supported by other Agencies,
for example SRC Planeta (with Roshydromet), and ISRO (with IMD).

APPENDIX 3: ADDRESSES FOR PROCURING ARCHIVE DATA

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CGMS International Radio Occultation Working Group

If you would like to be added to the mailing list of the International Radio Occultation Working Group, please consult the instructions on www.irowg.org/list.html.

APPENDIX 7: GLOSSARY

A

AAPP	AVHRR and ATOVS Processing Package
AATSR	Advanced Along Track Scanning Radiometer
ABI	Advanced Baseline Imager (GOES-R)
ABS	Advanced Baseline Sounder (GOES-R)
ACARS	Automated Communications Addressing and Reporting System
ACC	ASAP Coordinating Committee
ACRIMSAT	Active Cavity Radiometer Irradiance Monitor Satellite (NASA)
ADC	Atlantic Data Coverage
ADEOS-II	Advanced Earth Observing Satellite-II (JAXA)
ADM	Atmospheric Dynamics Mission (ESA)
ADM	Alternative Dissemination Methods
ADM	Advance Dissemination Means (WMO)
AERONET	Remote-sensing aerosol monitoring network programme
AIRS	Advanced IR Sounder
AHRPT	Advanced High Rate Picture Transmission
ALOS	Advanced Land Observing Satellite (JAXA)
AMDAR	Aircraft Meteorological Data Relay
AMR	Altimetry Microwave Radiomete
AMS	American Meteorological Society
AMSR	Advanced Microwave Scanning Radiometer
AMSR-E	Advanced Microwave Scanning Radiometer (modified version on ADEOS-II)
AMSU	Advanced Microwave Sounding Unit
AMV	Atmospheric Motion Vectors
AOCE	Attitude and Orbit Control Electronics
AOPC	Atmospheric Observation Panel for Climate (GCOS)
APSATS	Asian-Pacific Satellite Training
APT	Asia-Pacific Telecommunity (WRC)
APT	Automatic Picture Transmission
Aqua	Earth's water cycle observing mission (NASA)
Aquarius	global sea surface salinity measuring mission (NASA)
ARGOS	Data Collection and Location System
ARINA	scientific payload on Resurs-DK1 for earth quake prediction
ASAP	Automated Shipboard Aerological Programme
ASCAT	C-band dual swath scatterometer (Metop)
ASCII	American Standard Code for Information Interchange
ASDAR	Aircraft to Satellite Data Relay
ASICs	Application Specific Integrated Circuits
ATMS	Advanced Technology Microwave Sounder
ATOVS	Advanced TOVS
ATSR	Along Track Scan Radiometer (ERS, ESA)
Aura	Mission measuring atmospheric chemistry and trace gases (NASA)
AVHRR	Advanced Very High Resolution Radiometer
AVNIR	Advanced Visible and Near Infrared Radiometer type 2 (ALOS, JAXA)

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B

Baumanets	R&D space technology satellite primarily for students (Roscosmos)
BBC	Black Body Calibration (Meteosat)
BCCP	Business Continuity and Contingency Plan (USA)
GMD	Basic Meteorological Data
BMTC	Australia Bureau of Meteorology Training Centre
BTD	Brightness Temperature Differences
BUFR	Binary Universal Form for data Representation
BSS	Broadcasting Satellite Service

C

CAL	Computer Aided Learning
CALIPSO	Cloud-Aerosol Lidar and Infrared Pathfinder Satellite (NASA/CNES)
CART	Cloud and Radiation Test-bed
CAS	Commission for Atmospheric Sciences (WMO)
CboM	Commonwealth Bureau of Meteorology Australia
CBS	Commission for Basic Systems
CCD	Charged Couple Device (INSAT-2E)
CCIR	Consultative Committee on International Radio
CCRI	Climate Change Research Initiative
CCSDS	Consultative Committee on Space Data Systems
CD	Compact Disc
CDAS	Command and Data Acquisition Station
CDMA	Code Division Multiple Access
CDS	Climate Data Set (EUMETSAT)
CEOS	Committee on Earth Observation Satellites
CEPT	Conference Européenne des Postes et Télécommunications/European Conference of Postal and Telecommunications Administrations
Cg	WMO Congress
CGMS	Coordination Group for Meteorological Satellites
CHAMP	German EO Satellite
CHRIS	Compact High Resolution Imaging Spectrometer (PROBA, ESA)
CHRPT	Chinese HRPT (FY-1C and D)
CI	Convective Initiation (NOAA)
CIIS	Common Instrument Interface Studies
CIMS	GOES Channel Interference Monitoring System
CIMSS	Cooperative Institute of Meteorological Satellite Studies, Univ. Wisconsin
CIS	Commonwealth of Independent States
CITEL	Inter-American Telecommunication Commission
CLARE	Cloud Lidar And Radar Experiment
CLASS	Comprehensive Large-Array Stewardship System (NOAA)
CloudSat	Global cloud property measuring satellite (NASA/CSA)
CLS	Collecte Localisation Satellites (Toulouse)
CM	WMO Consultative Meetings on High-Level Policy on Satellite Matters
CMA	China Meteorological Administration

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CMD	Cyclone Warning Dissemination Service
CME	Coronal Mass Ejections
CMIS	Conical Scanning Microwave Imager/Sounder
CM-SAF	Satellite Application Facility on Climate Monitoring (EUMETSAT)
CMP	Climate Monitoring Principles (GCOS)
CMS	Centre de Météorologie Spatiale (Lannion)
CMV	Cloud Motion Vector
CMW	Cloud Motion Wind
CNR	Consiglio Nazionale delle Ricerche (Italy)
CNSA	China National Space Administration
COCTS	10-band Chinese Ocean Colour and Temperature Scanner
COEs	Centres of Excellence (WMO)
COMS	Communication, Ocean and Meteorological Satellite (KMA)
CONAE	Comisión Nacional de Actividades Espaciales (Argentina)
COOP	Coastal Oceans Observations Panel (GOOS)
COP	Conference of the Parties (GCOS)
COSPAR	Committee on Space Research
COSPAS/ SARSAT	International satellite system for search and rescue (SAR)
CPM	Conference Preparatory Meeting (WRC)
CRCGMS	Consolidated Report
CrIS	Cross track Infrared Sounder
CRYOSAT	Polar Ice Monitoring Programme (ESA)
CZI	4-band Coastal Zone Imager (HY-1B).

D

DAPS	DCS Automated Processing System (USA)
DCP	Data Collection Platform
DCPC	Data Collection or Production Centre (WIS, WMO)
DCRS	Collaboration on Global Frequency Allocation harmonisation
DCS	Data Collection System
DCWDS	Digital Cyclone Warning Dissemination System (India)
DIF	Directory Interchange Format
DMSP	Defense Meteorological Satellite Program (NOAA)
DOD	Department of Defense (USA)
DOMSAT	Domestic telecommunications relay Satellite (NOAA)
DPC	Directional Polarisation Camera (CNSA)
DPI	Derived Product Images (USA)
DPM	WMO Natural Disaster Prevention and Mitigation Programme
DPT	Delayed Picture Transmission
DR	Direct Readout services (ADM)
DRS	DCP Retransmission System (Meteosat)
DRT	Data Relay Transponder (INSAT)
DSB	Direct Soundings Broadcast
DSCOVR	Deep Space Climate Observatory (NASA)
DUS	Data Utilisation Station (USA) (Japan)

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DVB	Direct Video Broadcast
DWS	Disaster Warning System (India)

E

EARS	EUMETSAT ATOVS Retransmission Service
EarthCARE	Cloud & aerosol mission (ESA)
EBB	Electronic Bulletin Board
EC	Executive Council (WMO)
ECP	European Common Proposal (CEPT)
ECT	Equator crossing time
ECV	Essential Climate Variables
ECMWF	European Centre for Medium-Range Weather Forecasts
EDR	Environmental Data Records (NPOESS)
EDU	Engineering Development Unit
EEIS	EUMETSAT External Information System
EESS	Earth Exploration Satellite Service (Frequency Management)
EIRP	Effective isotropically-radiated power
ELEKTRO	Geostationary meteorological satellite
EMC	Electromagnetic Compatibility
EMWIN	Emergency Manager Weather Information Network (NOAA)
ENVISAT	ESA polar satellite for environment monitoring
EOEarth	Observation
EOS	Earth Observation System
EPA	US Environmental Protection Agency
EPS	EUMETSAT Polar System
ERBE	Earth Radiation Budget Experiment
ERBS	Earth Radiation Budget Satellite (NASA)
ERS	ESA Remote Sensing Satellite
ESA	European Space Agency
ESCAP	Economic and Social Commission for Asia and the Pacific, UN
ESJWG	Earth Sciences Joint Working Group
ESOC	European Space Operations Centre (ESA)
ET-ODRRGOS	Expert Team on Observational Data Requirements and Redesign of the GOS
ET-EGOS	Expert Team on Evolution of the Global Observing System (WMO)
ET-SAT	OPAG IOS Expert Team on Satellite Systems (WMO)
ET-SUP	OPAG IOS Expert Team on Satellite Utilisation and Products (WMO)
EU	European Union
EUCOS	EUMETNET Composite Observing System
EUMETCast	EUMETSAT Satellite Data Dissemination System
EUMETNET	The Network of European Meteorological Services
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites

F

FAA	Federal Aviation Authority (USA)
FAO	Food and Agriculture Organisation (UN)
FENGYUNCast	FENGYUN Satellite Data Dissemination System

FOV	Field of View (NOAA)
FTP	File Transfer Protocol
FWIS	Future WMO Information Systems (CBS Inter-Programme Task Team)
FXTS	Facsimile Transmission System (USA)
FY-1	Polar-orbiting Meteorological Satellite (PRC)
FY-2	Future Geostationary Meteorological Satellite (PRC)
FY-3	Second generation of Polar-orbiting Meteorological Satellite (PRC)

G

GAW	Global Atmosphere Watch (WMO Atmospheric Research Environment Programme)
GCOM	Global Change Observation Mission (NASDA)
GCOS	Global Climate Observing System
GDPT	Chinese Delayed Picture Transmission Format (Global Data) (FY-1C)
GDS	Ground Data System
GEO	inter-governmental Group on Earth Observations
GEOSS	Global Earth Observation System of Systems
GERB	Geostationary Earth Radiation Budget (MSG, EUMETSAT)
GESN	Global Education and Science Network
GEWEX	Global Energy and Water Cycle Experiment (WCRP)
GFCS	Global Framework for Climate Services
GIFTS	Geosynchronous Imaging Fourier Transform Spectrometer (NASA)
GISC	Global Information System Centre (WIS, WMO)
GIMTACS	GOES I-M Telemetry and Command System
GLI	Generation Global Imager (GCOM)
GLM	Geostationary Lightning Mapper (GOES, NOAA)
GLOBUS	multichannel scanning radiometer (Meteor-3M N2)
Glory	CCRI global distribution of natural and anthropogenic aerosols mission (NASA)
GMES	Global Monitoring for Environment and Security (EU)
GMR	GOES Meteosat Relay
GMS	Geostationary Meteorological Satellite (Japan)
GNSS	Global Navigation Satellite System
GOCE	Gravity Field and Steady State Ocean Circulation Explorer (ESA)
GOES	Geostationary Operational Environmental Satellite (USA)
GOME	Global Ozone Monitoring Experiment (Metop, ERS)
GOMS	Geostationary Operational Meteorological Satellite (Russ. Fed.)
GOMAS	Geostationary Observatory for Microwave Atmospheric Sounding (WMO)
GOOS	Global Ocean Observing System (IOC, UNEP, WMO, ICSU)
GOS	Global Observing System (WMO)
GOSAT	Greenhouse Gases Observing Satellite (JAXA/Jap. Min. of Environment)
GSLMP	Global Sea Level Monitoring Programme
GPCP	Global Precipitation Climatology Project
GPM	Global Precipitation Measurement (JAXA/NASA)
GPS	Global Positioning System
GRA	GOOS Regional Alliances
GRACE	Gravity Recovery and Climate Experiment (NASA/DLR)
GRAS	GNSS Receiver for Atmospheric Sounding

GRIB	Data representation form for General Regularly-distributed Information in Binary (WMO)
GRP	GEWEX Radiation Panel (GEWEX, WCRP)
GSICS	Global Satellite Intercalibration System
GTS	Global Telecommunication System (WMO)
GVAR	GOES Variable (data format) (USA)

H

HAPS	High Altitude Platform System
HDF	Hierarchical Data Format
HDFS	High Density Fixed Service
HDFSS	High Density Fixed Satellite Systems
HDR	High Data Rate
HEO	Highly Elliptical Orbit
HES	Hyperspectral Environmental Suite (GOES, NOAA)
HiRID	High Resolution Imager Data
HIRS	High Resolution Infrared Sounder
HLPP	(CGMS) High Level Priority Plan
HR	High Resolution
HRD	High Rate Data (NPOESS, USA)
HRDCP	High Rate DCP
HRPT	High Rate Picture Transmission
HSRS	High Spectral Resolution Sounder (MSG)
HWR	Hydrology and Water Resource Programme (WMO)
HYDROS	Hydrosphere State Mission (NASA)

I

ICESat	Ice Cloud and Land Elevation Satellite (NASA)
ICI	Inversion Coupled with Imager (Meteo-France)
ICSC	CAS International Core Steering Committee (THORPEX)
ICWG	International Coordination Working Group (EO)
IDCP	International DCP
IDCS	International Data Collection System
IDDI	Infra-red Difference Dust Index
IDN	International Directory Network (CEOS)
IDPS	Interface Data Processing Segment (NPOESS)
IFRB	International Frequency Registration Board
IGACO	Integrated Global Atmospheric Chemistry Observations (IGOS)
IGDDS	Integrated Global Data Dissemination Service
IGEOLab	International Geostationary Laboratory concept
IJPS	Initial Joint Polar-orbiting Operational Satellite System
IKFS-2	advanced IR atmospheric sounder
IMT-2000	International Mobile Telecommunication 2000 (before FPLMTS)
INSAT	Indian geostationary satellite
IOC	Intergovernmental Oceanographic Commission (UNESCO)
IODC	Indian Ocean Data Coverage

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IOP	Initial Operations Phase (SAF, EUMETSAT)
IOTWS	Indian Ocean Tsunami Warning Service
IPO	Integrated Program Office (NOAA)
IPOMS	International Polar-orbiting Meteorological Satellite Group
IPWG	International Precipitation Working Group
IPY	International Polar Year (ICSU, WMO)
IQGSE	Image Quality Ground Support Equipment (EUMETSAT)
IR	Infrared
IRAS	Infrared Atmospheric Sounder (FY-3, CMA)
IRTS	Infrared Temperature Sounder (EPS)
IRW	Infrared Window
ISS	Information Systems and Services; International Space Station
ISCCP	International Satellite Cloud Climatology Project (GEWEX, WCRP)
ISADP	Integrated System for the ATOVS Data Processing
ISWMR	SAF Integrated Satellite Wind Monitoring Report (EUMETSAT)
ISY	International Space Year
ITSC	International TOVS Study Conference
ITT	Invitation to Tender
ITU	International Telecommunication Union
ITWG	International TOVS Working Group
IVOS	Infrared and Visible Optical System Calibration (CEOS WGCV)
IWW	International Winds Workshop
IWWG	International Winds Workshop Group

J

JASON	Ocean surface Topography follow-on mission to TOPEX/POSEIDON (CNES/NASA)
JAXA	Japan Aeronautic Exploration Agency (name change of NASDA)
JCOMM	Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology
JCSDA	Joint Centre for Satellite Data Assimilation (USA)
JMA	Japan Meteorological Agency
JRA-25	"Japanese Re-Analysis 25 years" JMA research project of long-range re-analysis of global atmosphere
JSC	Joint Scientific Committee (WCRP)

K

KARI	Korea Aerospace Research Institute
KLIMAT	scanning Infrared radiometer on Meteor-3M N1 (Russia)
KMA	Korea Meteorological Administration
KNMI	the Royal Dutch Meteorological Institute
KOMPAS	Microsatellite, earthquake investigations (Roscosmos)

L

LAN	Local Area Networks (Telecommunication)
Landsat	NASA Earth observing Satellite (NASA/USGS)

LBR	Low Bit Rate
LCL	Latch Current Limiter
LDCM	Landsat Data Continuity Mission (NASA/US Geological Survey)
LDPT	Chinese Delayed Picture Transmission Format (Local Data Coverage) FY-1C
LEOP	Launch and Early Operations Phase
LR	Low Resolution
LRD	Low Rate Data (NPOESS, USA)
LRIT	Low Rate Information Transmission
LRPT	Low Rate Picture Transmission
LSPIM	Land Surface Processes and Interactions Mission (ESA)
LST	Local Solar Time

M

MAP	Mesoscale Alpine Experiment
MAP-SST	Merged Atlantic Product - Sea Surface Temperature (SAF, EUMETSAT)
MARF	Meteorological Archive and Retrieval Facility (EUMETSAT)
MBWG	MSG Biosphere Working Group
MCP	Meteorological Communications Package
MCUT	Multi-Constellation User Terminal (NOAA)
MDD	Meteorological Data Distribution (Meteosat)
MDUS	Medium-scale Data Utilization Station (for GMS S-VISSR)
MEGHA-TROPIQUE	CNES/ISRO mission
MERIS	Medium Resolution Imaging Spectrometer (ENVISAT)
MERSI	Medium Resolution Spectral Imager (FY-3, CMA)
MetAids	Meteorological Aids Service (frequency regulation)
Metop	European meteorological polar-orbiting satellite
METEOR	Polar-orbiting meteorological satellite (Roshydromet)
Meteosat	Geostationary meteorological satellite (EUMETSAT)
METSAT	Indian geostationary meteorological satellite
MetSat	meteorological satellite systems (frequency regulation)
MHS	Microwave Humidity Sounder (EPS)
MIEC	Meteorological Information Extraction Centre (ESOC)
MIMR	Multi-frequency Imaging Microwave radiometer
MIVZA	microwave scanning radiometer (Meteor 3M N1)
MOCC	Meteosat Operational Control Centre (ESOC)
MODIS	Moderate Resolution Imaging Spectroradiometer (NOAA)
MOP	Meteosat Operational Programme
MONITOR-E	Land Observing Satellite (Roscosmos)
MPEF	Meteorological Products Extraction Facility (EUMETSAT)
MSC	Meteorological Satellite Centre (Japan)
MSC-CAL	Computer Aided Learning system by JMA/MSC
MSG	Meteosat Second Generation
MSM	Meso-Scale Model
MSMR	Multichannel Scanning Microwave Radiometer (OCEANSAT-1)
MSS	Mobile Satellite Services (frequency regulation)

MSU	Microwave Sounding Unit
MTG	Meteosat Third Generation
MTP	Meteosat Transition Programme
MTS	Microwave Temperature Sounder (EPS)
MTSAT	Multi-functional Transport Satellite (Japan)
MTVZA	microwave scanning radiometer (Meteor 3M N1)
MVIS	Multi-channel VIS and IR Radiometer (FY-1C and D of PRC)
MWHS	Microwave Humidity Sounder
MWR	Microwave Radiometer (ERS, ESA)
MWRI	Microwave Radiation Imager (FY-3, CMA)
MWRS	Microwave Radiometers
MWTS	Microwave Temperature Sounder (FY-3, CMA)

N

NASA	National Aeronautics and Space Agency
NASDA	National Space Development Agency of Japan (changed to JAXA in 2003)
NEDT	Noise Equivalent Delta Temperature
NESDIS	National Environmental Satellite Data and Information Service
NGDC	National Geophysical Data Centre (USA)
NGSO	Non-geostationary systems
NIST	US National Institute of Standards and Technology
NMC	National Meteorological Centre
NMHS	National Meteorological & Hydrological Service
NMP EO-1	New Millennium Program Earth Observing Mission (NASA)
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service (USA)
NPOESS	National Polar-orbiting Operational Environmental Satellite System (USA)
NPP	NPOESS Preparatory Project
NSMC	National Satellite Meteorological Center of CMA (PRC)
NTIA	National Telecommunications and Information Agency (USA)
NWP	Numerical Weather Prediction
NWS	National Weather Service (USA)

O

OCAP	Operational Consortium of ASDAR Participants
OCEANSAT	Indian satellite for ocean applications
OCO	Orbiting Carbon Observatory (NASA)
OLR	Outgoing Longwave Radiation
OOPC	Oceans Observations Panel for Climate (GOOS)
OPAG-IOS	Open Programme Area Group in Integrated Observing Systems (successor of CBS WG on Satellites)
OSE	Operational System Experiments (ET-ODRRGOS)
OSSE	Observing System Simulation Experiments (ET-ODRRGOS)
OSTM	Ocean Surface Topography Mission (Jason-2) (CNES/NASA/ NOAA/EUMETSAT)
OWSE-AF	Operational WWW Systems Evaluation for Africa

APPENDIX 7: GLOSSARY

P

PALSAR	Phased Array type L-band Synthetic Aperture Radar ((ALOS, JAXA)
PAMELA	AntiMatter Exploration and Light-nuclei Astrophysics
PATMOS	AVHRR Pathfinder Atmosphere (NOAA)
PC	Personal Computer
PMW	Passive Microwave
POEM	Polar-orbiting Earth Observation Mission (ESA)
POES	Polar-orbiting Operational Environmental Satellite (USA)
PR	Precipitation Radar (on TRMM, JAXA)
PRC	People's Republic of China
PRISM	Panchromatic Remote-sensing Instrument for Stereo Mapping (ALOS, JAXA)
PROBA	Project for On-Board Autonomy (ESA EO satellite)
PTT	Post Telegraph and Telecommunications authority
PTWC	Pacific Tsunami Warning Centre

Q

QA4EO	Quality Assurance Framework for Earth Observation
QI	Quality Indices (EUMETSAT)
QuikSCAT	Quik Scatterometer (NASA)

R

RA	Regional Association of WMO
RARS	Regional ATOVS Re-transmission System (WMO)
RAMSDIS	Menu-driven system for analysing digital satellite imagery (McIDAS, USA)
RAOBS	Radiosonde Observations
RASA	Russian Aviation and Space Agency
RDCP	Regional DCP (Japan)
RDR	Raw Data Records (NPOESS)
Resurs-DK	Russian land observing satellite (Roscosmos)
RFI	Radio Frequency Interference
RLAN	new wireless LANs
RMS	Root Mean Square
RMTC	Regional Meteorological Training Centre (WMO)
Roscosmos	[Russian] Federal Space Agency
Roshydromet	Russian Federal Service for Hydrometeorology and Environmental Monitoring
RSB	Reflective Solar Bands (MODIS NOAA)
RSMC	Regional Specialised Meteorological Centre
RSO	Rapid Scan Operations (NOAA)
RSS	Rapid Scan Service (EUMETSAT)
RT	Radiative Transfer

S

S&R	Search and Rescue mission
SAF	Satellite Application Facility (EUMETSAT)
SAFISY	Space Agency Forum on the ISY
SAGE III	Stratospheric Aerosol and Gas Experiment (NASA)
SAM	Satellite Anomaly Manager
SAR	Synthetic Aperture Radar (ERS ESA)
SARA	Short Range Automotive Radar (frequency management)
SARSAT	Search And Rescue, Satellite supported facility
SAST	Shanghai Academy of Space Technologies.
SATAID	Satellite Animation and Interactive Diagnosis (Japan)
SATOB	WMO code for Satellite Observation
SBA	Societal Benefit Area
SBSTA	UNFCCC Subsidiary Body for Scientific and Technology Advice
SBUS	Solar Backscatter Ultraviolet Sounder (FY-3, CMA)
SBUV	Solar Backscattered Ultra Violet (ozone)
SD	Solar Diffuser (MODIS)
SDR	Sensor Data Records (NPOESS)
SEAS	Shipboard Environmental (data) Acquisition System
SEC	Space Environment Center (NOAA)
SEISS	Space Environmental In-Situ Suite (GOES, NOAA)
SEM	Space Environment Monitor (GOES)
SEVIRI	Spinning Enhanced Visible and Infrared Imager (MSG)
S-FAX	S-band facsimile broadcast of FY-2 (PRC)
SFCG	Space Frequency Coordination Group
SGLI	Second Generation Global Imager (CGOM-B1)
SG-RFC	Steering Group on Radio Frequency Coordination
SICH-1M	Russian oceanographic satellite (Roscosmos)
SIS	Solar Imaging Suite (GOES, NOAA)
SMA	State Meteorological Administration (PRC)
SMD	Stored Mission Data (NPOESS)
SMOS	Soil Moisture and Ocean Salinity (ESA)
SORCE	Solar Radiation and Climate Experiment (NASA)
SOT	Ship Observation Team (JCOMM)
SP	Space Programme (WMO)
SRR	Automotive Short-Range Radars (frequency management)
SRF	Spectral Response Function
SRS	Space Research Service (frequency regulation)
SRSO	Super-Rapid-Scan Operations
SRTM	Shuttle Radar Topography Mission (NASA)
SSM/I	Special Sensor Microwave/Imager (NOAA)
SSMI/S	Special Sensor Microwave Imager/Sounder (NOAA)
SSMR	Scanning Multispectral Microwave Radiometer
SSMT1	microwave temperature sounder (NOAA)
SSMT2	microwave water vapour sounder (NOAA)
SSP	Sub-Satellite Point

SST	Sea Surface Temperature
SSU	Stratospheric Sounding Unit
STC	Semi-Transparent Correction (NOAA)
S-VISSR	Stretched VISSR
SWARM	Earth Observation mission (ESA)
SXI	Solar X-Ray Imager (GOES-12)

T

TERRA	Earth climate measuring satellite (NASA)
TD	Technical Document (WMO)
THORPEX	International global atmospheric R&D programme (WMO CAS)
TIGGE	THORPEX Interactive Grand Global Ensemble
TIROS	Television Infrared Observation Satellite
TMI	TRMM Microwave Imager
TOMS	Total Ozone Mapping Spectrometer (NASA)
TOR	Terms of Reference
TOU	Total Ozone Unit (FY-3, CMA)
TOVS	TIROS Operational Vertical Sounder
TPW	Total Precipitable Water (NOAA)
TRMM	Tropical Rainfall Measuring Mission (NASA, JAXA)
TTC	Telemetry Tracking Control

U

UARS	Upper Atmosphere Research Satellite (NASA)
U-MARF	United Meteorological Archive Retrieval Facility (EUMETSAT)
UHF	Ultra High Frequency
UK	United Kingdom
UMTS	Universal Mobile Telecom System
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
UNISPACE	United Nations Space Conference
UN-OOSA	UN Office of Outer Space Affairs
USA	United States of America
UPS	Unified Propulsion Subsystem
UTC	Universal Time Coordinated
UWB	Ultra Wide Band

V

VAS	VISSR Atmospheric Sounder
VGT	Vegetation
VHF	Very High Frequency
VHRR	Very High Resolution Radiometer
VIIRS	Visible Infrared Imaging Radiometer Suite
VIRSR	Visible and Infrared Scanning Radiometer (EPS)

APPENDIX 7: GLOSSARY

VIS	Visible channel
VISITView	VL tool
VISSR	Visible and Infrared Spin Scan Radiometer
VL	Virtual Laboratory (training concept)
VL-FG	VL Focus Group Meeting
VLSI	Very Large Scale Integrated circuit
VPN-PP	WIS Virtual Private Network Pilot Project
VTX	VHF transmitter (NOAA)

W

WALEX	WAter vapour Lidar EXperiment
WARC	World Administrative Radio Conference
WCRP	World Climate Research Programme (WMO/ IOC/ ICSU)
WCS	WMO Core Standards
WEFAX	Weather facsimile
WG	Working Group
WGCV	CEOS Working Group on Calibration and Validation
WGNE	Working Group on Numerical Experimentation
WHyCOS	World Hydrological Cycle Observing System (HWR, WMO)
WIS	WMO Information System
WMO	World Meteorological Organization
WP	Working Paper
WRC	World Radio Conference (ITU)
WV	Water Vapour
WVMW	Water Vapour Motion Winds
WWW	World Weather Watch (WMO)

X

X-ADC	Extended Atlantic Data Coverage

Y

Y2K	Year 2000 compatibility

Z

ZAP	Z-axis Precession Mode (GOES)
ZAMG	Zentralanstalt für Meteorologie und Geodynamik (Austrian NMHS)

Please note that this report is published together with a CD-ROM containing an electronic version of the report and all working papers and viewgraphs presented at CGMS-40.

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