REPORT OF THE 36th MEETING OF THE COORDINATION GROUP FOR METEOROLOGICAL SATELLITES

CGMS-36

Maspalomas, Gran Canaria, Spain
3-7 November 2008

Cover page photo:
Antenna at INTA ground station, Maspalomas, Gran Canaria

Back cover photo:
View of the INTA ground station, Maspalomas, Gran Canaria

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CGMS MR 36

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FINAL REPORT OF THE PLENARY SESSION

A. INTRODUCTION

A.1 Welcome

On behalf of EUMETSAT and the CGMS Secretariat, Mr Mikael Rattenborg, Director of Operations of EUMETSAT, officially opened CGMS-36 at 12:00 on 3 November 2008 in Maspalomas, Grand Canaria, Spain.

He welcomed the participants to the 36th session of the CGMS noting that the extensive attendance should be considered as a shared acknowledgment of CGMS achievements to date. Recalling the 36th anniversary of CGMS and its success as a global dedicated forum for the coordination of meteorological satellite systems, he recalled that EUMETSAT joined CGMS in 1987 (just one year after the entry into force of the EUMETSAT Convention) and that CGMS meetings had already been hosted in Darmstadt in 1988, 1995 and in Capri in 2001. He also highlighted the critical role of meteorological satellites within the Global Observing System, stating that that the key task of enabling satellite operators, research and development agencies and WMO to ensure efficiency and sustainability, through technical and operational coordination, rests with CGMS. He closed the opening session by highlighting the launch of the Jason-2 mission as one of the important developments occurring in the year since CGMS-35 and an excellent example of international partnership as a mission successfully addressing satellite-based oceanography and global climate monitoring and supporting weather forecast. He then wished all participants a fruitful and constructive meeting.

Following the resumption of the Plenary session on Wednesday 5 November 2008, the Director-General of EUMETSAT, Dr Lars Prahm, expressed his pleasure in attending CGMS and welcomed all the participants again, recalling EUMETSAT's long-standing commitment to CGMS and its aspiration to continuing such support by further supporting the role of CGMS Secretariat.

A.2 Election of Chairperson

Dr Lars Prahm, EUMETSAT Director General, was unanimously elected as Chairman of CGMS-36, with Mr Mikael Rattenborg as Deputy Chairman and with Mr Gordon Bridge and Dr Piero Valabrega as Rapporteurs. The Plenary session confirmed the Chairpersons for the four Working Groups elected in the previous CGMS meeting: Mr Marlin O. Perkins for Working Group I on Telecommunications, with Mr Gordon Bridge as Rapporteur; Dr Toshiyuki Kurino for Working Group II on Satellite Products, with Dr Mitch Goldberg and Dr Johannes Schmetz as Rapporteurs; Mr Gary Davis for Working Group III on Global Contingency Planning with Mr Jerôme Lafeuille as Rapporteur; Mr Mikael Rattenborg as Chairman of Working Group IV on Global Data Dissemination, with Mr Gordon Bridge as Rapporteur.

A.3 Adoption of Schedule

CGMS-36 adopted the Agenda and agreed that the four working groups would meet on 3 and 4 November 2008.

The Secretariat provided a draft order of business (see Annex 1), which was used as a basis for the subsequent discussions together with the list of working papers submitted to CGMS-36 (see Annex 2).

A.4 Nomination of Drafting Committee

The Drafting Committee was nominated, consisting of the Chairman of CGMS-36. its Rapporteurs, the Chairmen of the Working Groups and their Rapporteurs, and the CGMS Secretariat.

The drafting of various sections of the final meeting report was carried out by the CGMS Secretariat with the assistance of CGMS participants, based upon summaries of submitted working papers and reports of the Working Groups and plenary sessions.

A.5 Review of Actions from Previous Meetings

The 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.

Actions open from CGMS-33 (at CGMS-35)					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
EUM; NOAA; WMO	33.24	Action 33.24 EUMETSAT, NOAA together with WMO to develop a EUMETCast to NOAA ADM transition plan for users in South America and report details to CGMS.	NOAA-WP-27 (CGMS-36) WMO-WP-12 (CGMS-36). At its 4th session in September 2008, the CBS Expert Team on Satellite Systems Utilization and Products (ET-SUP) confirmed the requirement for a sustainable coverage of South-America by a DVB-S service containing level 1 data. It pointed out the significant value to South American NMHS of the EUMETCast-Americas service and encouraged agencies to find a way to ensure that the associated requirements continue to be met in the future. During the Regional Training Course organized at the Centre of Excellence in Argentina (22/09-03/10/2008) participants from 13 Central/South American countries confirmed their need for frequent geostationary imagery, reaffirmed the strong interest of GOES-10 at 60°W for South-America, and regretted the lack of low-cost operational receiving systems to get GOES-10 imagery since it is neither present on EUMETCAST, nor in GEONETCast Americas. NOAA-WP-33 (CGMS-35), however, NOAA has positioned its GOES-10 satellite to provide geostationary satellite coverage over South America. GOES-10 data is currently being disseminated via direct broadcast and used operationally. NOAA does not currently have plans to develop ADM capability, but is in the process of developing GEONETCast service. EUM-WP-11 (CGMS-33). WMO-WP-20 (CGMS-33) and WMO-WP-24 (CGMS-35).	(5 Nov 2007) New date: CGMS-36	**CLOSED**

Actions open from CGMS-34 (at CGMS-35)					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members	34.12 WGI	Action 34.12 CGMS members to review Space Frequency Coordination Group (SFCG) Resolution Res A12-1R2 and inform whether this resolution shall be used by CGMS agencies. Deadline: 31 August 2007	Statement and resolution provided by e-mail to CGMS plenary. ESA and NOAA are SFCG members and use RES A12-1R2 for frequency coordination. (ESA-WP-05, CGMS-34; EUM-WP-15, CGMS-35; NOAA-WP-01, CGMS-36) JMA will use RES A12-1R2 for frequency coordination in principle if it is necessary (JMA-WP-01, CGMS-35) Discussed in WGI.	(31 Aug 2007) New date: 31 Jul 08	**CLOSED**
WMO	34.27	Action 34.27: WMO to set up a Task Force on Codes following the TORs spelled out in WMO-WP-36 and report progress at CGMS 35. Deadline: CGMS-35	The first meeting was convened on 26-27 February 2008. Information and documents are available at: http://www.wmo.int/pages/prog/sat/meetings/TFSDC-1.html The minutes of meeting can be found at http://www.wmo.int/pages/prog/sat/Reports.html#TFSDC Message to plenary on 28 May 2008. EUM-WP-27 WMO-WP-08	07-Nov-07	**CLOSED**
CGMS satellite operators	34.28	Action 34.28: Each Satellite Operator is invited to nominate an expert to contribute to the WMO led Task Force on codes. Deadline: 31 December 2006	CMA: Anlai Sun, sunal@cma.gov.cn ET-DRC Chairman: Milan Dragosavac, milan.dragosavac@ecmwf.int EUM: Dr Simon Elliott, simon.elliott@eumetsat.int NOAA: Mr Thomas Smith, Thomas.Smith@noaa.gov SRC Planeta/ROSHYDROMET: George Parkhomenko, parkhom@planet.iitp.ru Message to plenary on 28 May 2008. CGMS Members are still invited to nominate representatives. EUM-WP-27 WMO-WP-08	31-Dec-06	**CLOSED** **(reopened as a CGMS-36 action)**

CGMS-35 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 e-mail, of Satellites (tables 1-6 of the plenary report). The Secretariat to review the tables of current and planned polar and geostationary satellites, and to distribute this updated information, via the WWW Operational Newsletter, via Electronic Bulletin Board, or other means as appropriate. CGMS satellite operators to update table 7 for polar-orbiting satellite equator crossing times on an annual basis. CGMS Members to update the table on polar-orbiting satellite equator crossing times as well as the table on coverage from geostationary satellites. *(CGMS-35 permanent actions 02 and 09 were closed and are partly incorporated in permanent action 01).*	CMA and ROSHYDROMET by e-mail ESA-WP-01, ESA-WP-02 and by e-mail EUM included in the final report JMA-WP-02/-03 KMA-WP-02 NOAA-WP-02&03, 05&06, 30	CGMS-36	**CLOSED**
CGMS satellite operators	Permanent 02	CGMS Members to report on spacecraft anomalies from solar events at CGMS meetings. *NB The Secretariat has included the word "spacecraft" in this permanent action since CGMS-35*	CMA-WP-04 EUM-WP-05 ESA reported at CGMS-31 NOAA-WP-04 See also http://www.swpc.noaa.gov/dregion/index.html	CGMS-36	**CLOSED**
CGMS Members	Permanent 03	CGMS Members to provide information for the WMO database of satellite receiving equipment, as appropriate.	JMA: By e-mail. Document is available in the JMA directory on the ftp-server. NOAA-WP-25	CGMS-36	**CLOSED**
CGMS Members	Permanent 04	CGMS Members to review the list of available list servers used by CGMS groups and update as appropriate.	CMA, CNES, JAXA, KMA, ROSHYDROMET, WMO by e-mail. ESA-WP-05 JMA-WP-01 NOAA-WP-01	CGMS-36	**CLOSED**
CGMS Members	Permanent 05	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).	ESA-WP-04, EUM-WP-09 (NOAA-WP-29, CGMS-34)	CGMS-36	**CLOSED**
CGMS Members	Permanent 06	CGMS Members to consider WMO Core Metadata profiles within the context of the ISO Standard for Geographic Metadata (ISO 19115).	The Secretariat proposed to close this action. The topic has been incorporated in the CGMS-36 WGII Order of Business. NOAA-WP-01	CGMS-36	**CLOSED**

CGMS-35 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
NOAA	35.01	Action 35.01: NOAA to provide more detailed information on the DMSP satellite system. Deadline: CGMS-36	NOAA-WP-02&03. The CEOS Earth Observation Handbook also provides information on this matter available on www.eohandbook.com IPWG was approached via e-mail to provide specific details on the mission, to which the IPWG co-chair Ralph.R.Ferraro@noaa.gov provided during CGMS-36. As a result, reporting will be made at CGMS-37.	(CGMS-36) New deadline: CGMS-37	**OPEN**
NASA	35.02	Action 35.02: CGMS invited NASA to provide information on its current R&D Earth Observation satellites. Deadline: CGMS-36	NOAA will investigate if they can disseminate the NASA Decadal report to CGMS.	(CGMS-36) New deadline: 31 Dec 2008	**OPEN**
CMA, CNSA, WMO	35.03	Action 35.03: CMA/CNSA and WMO will cooperate in finalising the work of the GEO-Microwave Focus Group that, according to its Terms of Reference and taking into account the work already done, should: - define a mission scenario attempting to converge with results of feasibility studies in China as they become progressively available; - identify mission components suitable for international partnerships and preliminary assess the realism of collecting the interest of prospective partners; - draft a proposal to the group of prospective partners, including work plan and schedule; and present it to CGMS-36, that implies that CMA/CNSA commit to act as Leading Agency. Deadline: CGMS-36, preceded by a presentation at a last meeting of the Focus Group possibly to be held tentatively with the next IPWG meeting in Beijing in autumn 2008.	FG-5 meeting held in conjunction with the 4th Workshop of the IPWG (13-17 October 2008). WMO-WP-15 A proposal document for a GEO MW mission was completed and is provided as background information to Document CGMS-36 WMO-WP-15. The 5th IGEOLab Focus Group meeting on GEO MW was convened on 15-16 October 2008 during IPWG. However, as explained in WMO-WP-15, the discussion was not conclusive; no agency is currently in a position to take the lead of the project	IPWG 2008 and CGMS-36	**CLOSED**
CNSA	35.04	Action 35.04: CNSA to inform WMO of the data policy for the HY-2 satellite after completion of HY-2 phase B studies. Deadline: CGMS-36	CNSA-WP-05	CGMS-36	**CLOSED**
CGMS Members	35.05	Action 35.05: CGMS Members to indicate to JAXA their interest in having access to GOSAT data (kawai.takayuki@jaxa.jp and umezawa.kazuo@jaxa.jp). Deadline: CGMS-36	GOSAT: Greenhouse gases observing satellite. Monitoring of the distribution of the density of carbon dioxide. JMA started discussion with JAXA about cooperation on the GOSAT project such as utilization of the data/products. ESA is coordinating with JAXA (ESA-WP-05). NOAA contacted JAXA. WMO-WP-13. WMO confirmed to JAXA the strong interest from GAW, GCOS and WCRP.	CGMS-36	**CLOSED**
CGMS Members	35.06	Action 35.06: CGMS Members to provide feedback [on the gap analysis] to WMO (bibizzar@tin.it). Deadline: On a continuous basis, and for review at CGMS-36.	EUMETSAT provided an input via WMO (GSICS meeting, July 08). WMO-WP-16. An updated set of documents including the Gap Analysis is provided in attachment to the WP. (ESA-WP-05)	continuous and CGMS-36	**CLOSED**

CGMS-35 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
EUM, NOAA, WMO	35.07	Action 35.07: CGMS to form a small focus group to consider the recommendation "establish a new international science working group on the theme of climate and calibration", and to report their finding back to CGMS-36. The focus group to be composed of Dr Schmetz, EUMETSAT, Dr Goldberg NOAA/NESDIS, and Dr Purdom, Chairperson WMO OPAG-IOS. Deadline: May 2008 and to report at CGMS-36	Report from the GCOS/WCRP Atmospheric Observation Panel for Climate (AOPC, 14th session) is available at http://gcos.wmo.int It was recommended that no new WG is created (page 6, point 47). CGMS plenary message sent on 1 July 08. NOAA-WP-01	30 May 2008; CGMS-36	**CLOSED**
WMO	35.08	Action 35.08: WMO (supported by CGMS Members) to update their THORPEX Focal Points and Contacts given in Table 1, Annex 2 of WMO-WP-09 to CGMS THORPEX Rapporteur. Deadline: 1 December 2007	Information provided by ESA and EUM via cgmsplen listserver 29/30 Nov 07. CLOSED for EUM; ESA (Herland has been nominated) WMO-WP-06 Discussed in WGII	01-Dec-07	**CLOSED**
EUM	35.09	Action 35.09: EUMETSAT to prepare a paper on its SAF activities for the Bulletin of the Meteorological Society. Deadline: CGMS-36	This has been deferred to EUMETSAT.	CGMS-36	**CLOSED**
WMO	35.10	Action 35.10: WMO to contact IMD with a view to clarifying its plans as co-sponsor of the VL Centre of Excellence in Oman. Deadline: 31 December 2007	VL management meeting to take place in Sept 2009. WMO-WP-20. At ET-SAT/SUP-4 in September 2008, the representative from ISRO indicated that ISRO was considering to co-sponsor the Oman CoE.	31-Dec-07	**CLOSED**
CGMS Members	35.11	Action 35.11: All CGMS Members to nominate points of contact to support the CGMS website editorial committee. Deadline: 31 December 2007	ESA: TBD EUM: anne.taube (at) eumetsat.int, piero.valabrega (at) eumetsat.int JMA/MSC: Mr. Motoo Hayashi, System Engineering Division Tel: +81-42-493-4976, Fax: +81-42-492-2433, E-mail: mhayashi (at) met.kishou.go.jp NOAA: daniel.muller (at) noaa.gov WMO: jlafeuille (at) wmo.int	(31 Dec 2007) New deadline: 31 Dec 2008	**OPEN**
WMO, EUM	35.12	Action 35.12: WMO and CGMS Secretariat to establish a CGMS web editorial committee by March 2008 in order to guide the completion and further enhancement of the CGMS website and the ftp server and ensure their sustainability. Deadline: March 2008 and to report to CGMS-36	EUM-WP-13 Action was deferred due to lack of availability on both sides.	(CGMS-36) New deadline: 31 Mar 2009	**OPEN**
EUM	35.13 WGI	Action 35.13: CGMS Secretariat, with assistance of WMO, to prepare a draft letter to FCC expressing its concerns over the potential RF power increase for unlicensed fixed services devices around 60 GHz. Deadline: 30 November 2007	Letter submitted online with the FCC on 9 November 2007 (only online submissions accepted by the FCC).	30-Nov-07	**CLOSED**
WMO	35.14 WGI	Action 35.14: WMO to confirm its requirement for the continued use of the CGMS coordinated IDCS to support its ASAP programme, and to assist with the promotion of the IDCS for potential future ASAP operators. Deadlines: CGMS-36	EUM-WP-15/16/17 WMO does not confirm such requirement and does not promote the use of IDCS for ASAP since, as indicated at CGMS-35, ASAP operators prefer other telecommunication systems.	CGMS-36	**CLOSED**
NOAA	35.15 WGI	Action 35.15: NOAA to organise with other IDCS coordinator agencies (CMA, JMA, EUMETSAT) a meeting to discuss the future use and technical aspects of the IDCS. The participation of other CGMS Members would be welcomed. Deadline: 30 April 2008	Discussed in WGI. EUM-WP-18/19 NOAA-WP-01	30-Apr-08	**CLOSED**

CGMS-35 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
WMO	35.16 WGII	Action 35.16: WMO to distribute the RGB Workshop report and present representative examples of RGB schemes on the WMO web site. Deadline: 31 January 2008	This report is available at: http://www.wmo.int/pages/prog/sat/documents/RGB_workshop_final_report_rev1.pdf An introduction to RGB examples was prepared for the web pages but not finalized because of image size constraints on the WMO web site.	31-Jan-08	**CLOSED**
CMA, EUM, JMA, NOAA, WMO	35.17 WGII	Action 35.17: VL partners to implement RGB schemes for training use within the WMO Virtual Laboratory. Deadline: CGMS-36	(EUM-WP-12) JMA posted a RGB schemes training material on JMA's VRL website at http://mscweb.kishou.go.jp/VRL/index.htm. NOAA-WP-01 and -08 WMO has published the results of the RGB Workshop in 2007 on their web site.	CGMS-36	**CLOSED**
WMO	35.18 WGII	Action 35.18: GSICS GCC to propose web-based interface to other satellite agencies for near-real-time instrument monitoring. Deadline: CGMS-36	Input provided to GSICS (meeting July '08). NOAA-WP-14	CGMS-36	**CLOSED**
NOAA	35.19 WGII	Action 35.19: NOAA/NESDIS to send to all CGMS members the URL of web sites on climate products described in NOAA-WP-29. Deadline: 31 December 2007	NOAA-WP-31	31-Dec-07	**CLOSED**
NOAA	35.20 WGII	Action 35.20: NOAA/NESDIS to include information on global and regional anomalies in their products as well. Deadline: CGMS-36	NOAA-WP-14	CGMS-36	**CLOSED**
JAXA, NASA	35.21 WGII	Action 35.21: NASA and JAXA to report on status and plans for GPM at CGMS-36. Deadline: CGMS-36	JAXA-WP-04 NASA-WP-01	CGMS-36	**CLOSED**
CGMS Members	35.22 WGII	Action 35.22: CGMS Members to report on precipitation estimation and validation activities at CGMS-36. Deadine: CGMS-36	CMA-WP-08 ESA: There are no planned campaigns at ESA. EUM-WP-23 NASA-WP-02 NOAA-WP-19	CGMS-36	**CLOSED**
Satellite operators (+ WMO)	35.23 WGII	Action 35.23: The Task Force on codes to consider possible use of additional data formats for satellite product dissemination and archive delivery, and report to CGMS. Deadline: CGMS-36	The first Task Force on Codes met on 26-27 February 2008. The agenda included the use of different formats. Working document: http://www.wmo.int/pages/prog/sat/meetings/TFSDC-1.html The Task Force noted in particular the increasing demand on NetCDF. Report: http://www.wmo.int/pages/prog/sat/Reports.html#TFSDC Message to plenary 28 May 2008. EUM-WP-27 NOAA-WP-01	CGMS-36	**CLOSED**

CGMS-35 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
Satellite operators (current and future + WMO)	35.24 WGIII	Action 35.24: CGMS current and future satellite operators to review their possible flexibilities to adjust the nominal locations of their baseline geostationary satellites and to provide the information at the next CGMS session. Deadline: CGMS-36	Discussed in WGIII. JMA-WP-03 KMA-WP-01: COMS has three missions: communication, ocean and atmosphere monitoring. Due to another two missions of the different organizations, i.e., communication (ETRI) and ocean monitoring (KORDI), the flexibilities of COMS (orbit is 128.2E) will be highly limited. NOAA-WP-01: NOAA would be willing to entertain movement within existing physical and frequency constraints +/- 5 degrees.	CGMS-36	**CLOSED**
CMA, ROSH, EUM, NOAA	35.25 WGIII	Action 35.25: Each CGMS polar orbiting satellite operator to consider providing to all other polar orbiting satellite operators, and to the direct readout community, their processing software necessary to produce Level 1B data from the direct broadcast data stream, and to provide the technical specifications for their direct broadcast data stream necessary to produce Level 1B data. Deadline: 31 March 2008	Discussed in WGIII. NOAA-WP-01, also available in the CGMS-36 NOAA directory on the CGMS ftp server.	31-Mar-08	**CLOSED**
EUM	35.26 WGIV	Action 35.26: EUMETSAT to provide CGMS with the results of the Post-EPS, Phase 0 studies, in particular, results pertaining to data dissemination. Deadline: CGMS-36	Discussed in WGIV. See also plenary papers EUM-WP-06 and -07. Further information will be provided at CGMS-37.	CGMS-36	**CLOSED**
EUM	35.27 WGIV	Action 35.27: EUMETSAT to provide CGMS with the results of the MTG trade-off studies, in particular, results pertaining to the MTG data dissemination system. Deadline: CGMS-36	EUM-WP-08	CGMS-36	**CLOSED**
Satellite operators	35.28 WGIV	Action 35.28: Satellite operators to provide WMO with detailed information, on all the methods available, or planned, for operational data access from each of their satellites contributing to the GOS, via relevant URL of the satellite operator's web page. This detailed information shall include the designation of the dissemination or retrieval services, their summary contents, formats used, and technical characteristics such as: • For real-time dissemination via the satellite itself (Direct Broadcast): frequency, bandwidth, data rate (uncompressed); • For Real-time dissemination through multi-mission satellite dissemination system (Advanced Dissemination Methods): satellite name, location, frequency band, area covered, data rate (uncompressed); • For Real-time dissemination via Internet FTP: address; • For On-line data retrieval : address; • URL for precise information on data access modalities Deadline: May 2008, and to report at CGMS-36	Discussed in Working Group IV. CMA-WP-10 (ESA-WP-03, CGMS-35) EUM-WP-29 JMA: See JMA's web site: http://www.jma.go.jp/jma/jma-eng/satellite/ds.html and http://www.jma.go.jp/jma/jma-eng/satellite/index.html NOAA's response is available in the CGMS-36 NOAA directory on the CGMS ftp server. WMO-WP-21	31 May 2008; CGMS-36	**CLOSED**
WMO, EUM	35.29 WGIV	Action 35.29: WMO/CGMS Secretariat to collect the data access information from satellite operators and make it available through the CGMS and/or WMO websites. Deadline: CGMS-36	EUM-WP-29 WMO-WP-13. Link to the JMA web site was posted at: http://www.wmo.int/pages/prog/sat/Onlineproducts.html It is considered to redesign this part of the WMO Space Programme website when more input from satellite operators will be available. WMO-WP-21	CGMS-36	**CLOSED**

CGMS-35 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members	35.30 WGIV	Action 35.30: CGMS members to report on their use of compression techniques (from the operational and user perspectives) for current and future satellite systems. Deadline: CGMS-36	Discussed in WGIV. CLOSED for ESA: At application level ESA applies compression in different parts of the G/S: Data archiving: Compression is applied on the tape archive at HW level. Algorithm used is a a variation of LZ (Lempel-Ziv). Internal data transfer: Mainly ZIP used for selected data that compress well to transfer data from one centre to another or internally in a centre.. Products distribution: ESA normally uses two types of compression for distribution of products to the end users: standard ZIP and JPEG2000/Wavelet.In DDS we are sending products compressed with GZIP. NO compression applied at network level EUM-WP-27 JMA-WP-03 NOAA-WP-26	CGMS-36	**CLOSED**
NOAA, EUM	35.31 WGIV	Action 35.31: NOAA and EUMETSAT to study possibilities for the use of NPOESS ground infrastructure to improve the timeliness of Metop data, within the framework of JPS discussions and report findings to CGMS. Deadline: CGMS-36	Discussed in WGIV. NOAA: NOAA and EUMETSAT are engaged in ongoing discussions regarding the use of NOAA ground infrastructure to improve timeliness of Metop data.	(4 Nov 2008) New date: CGMS-37	**OPEN**
CGMS Members	35.32 WGIV	Action 35.32: CGMS members involved with the IGDDS to consider applying as DCPCs within the context of the IGDDS and WIS, in consultation with WMO. Deadline: May 2008	Discussed in WGIV. WMO-WP-13 WMO was informed of the intention of JMA to prepare an application. Letter sent by WMO Oct 2008 to all WMO Members and EUMETSAT, informing on the process of GISC/DCPC designation, and inviting to notify their intention to apply.	(31 May 2008) New deadline: 31 Dec 2008	**OPEN**

CGMS-35 recommendations					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members	Recommendation 35.01	Recommendation 35.01: CGMS Members were invited to use the Gap Analysis as a reference for further discussions on the evolution of the GOS and global planning of future missions.	(See also action 35.06). CNSA-WP-04	CGMS-36	**CLOSED**
Satellite operators (+ WMO)	Recommendation 35.02 WGII	Recommendation 35.02: Satellite operators are requested to provide near real-time monitoring of instrument performance on easily accessible websites and to archive the information.	GSICS data archive. ESA: Noted. Useful information can be found at http://wgcv.ceos.org EUM-WP-20/21 JMA-WP-05. JMA contribution provided via cgmsplen on 4 Jul 08 and is available at http://mscweb.kishou.go.jp/monitoring/calibration.htm Intercalibration results can be observed at http://mscweb.kishou.go.jp/monitoring/gsics/ir/gsir_mt1r.htm Guidance on using charts http://mscweb.kishou.go.jp/monitoring/gsics/ir/techinfo.htm NOAA-WP-14	CGMS-36	**CLOSED**
	Recommendation 35.03 WGII	Recommendation 35.03: Continue aircraft campaigns with SI traceable instruments to provide absolute calibration opportunities for critical satellite instruments, such as IASI, AIRS and CrIS.	Discussed in WGII.	CGMS-36	**CLOSED**
Satellite operators (+ WMO)	Recommendation 35.04 WGII	Recommendation 35.04: Satellite operators to explain significant discrepancies in satellite inter-calibration as part of their contribution to GSICS. Pertinent reports should be delivered to the GCC.	CMA-WP-07 ESA: Noted: To be coordinated with CEOS Cal/Val WG NOAA-WP-12 WMO: Information available on WMO/GCC website.	CGMS-36	**CLOSED**
	Recommendation 35.05 WGII	Recommendation 35.05: In view of the positive impact of radio-occultation measurements on NWP forecasts CGMS expresses strong support to future plans for the continuation of radio-occultation measurements from constellations with adequate coverage.	Discussed in WGII.	CGMS-36	**CLOSED**
CGMS Members	Recommendation 35.06, WGII	Recommendation 35.06: CGMS encourages continuation of the generation of long-term satellite-based climatologies.	Discussed in WGII. ESA-WP-03 (EUM-WP-09) JMA-WP-05 NOAA-WP-17	CGMS-36	**CLOSED**
CGMS Members	Recommendation 35.07 WGII	Recommendation 35.07: CGMS members to respond to recommendation 34.15 should finalise the first phase of the project (i.e. the processing of the AMVs with their own operational AMV algorithm without any modification) before IWW9 and discuss the results.	EUM-WP- 25 JMA-WP-06 NOAA-WP	31-Jan-08	**CLOSED**
EUM	Recommendation 35.08 WGII	Recommendation 35.08: IWW9 should discuss the results from the height assignment studies based on advanced instruments on the A-train. The co-Chairs of IWWG are invited to provide a summary report to CGMS-36.	EUM-WP- 25	30 Apr 08 CGMS-36	**CLOSED**

CGMS-35 recommendations					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
EUM	Recommendation 35.09 WGII	Recommendation 35.09: IWW9 should discuss the results of the studies using the images simulated from NWP model output to track AMVs. Co-Chairs of IWWG are invited to provide a summary report to CGMS-36 on results of the ongoing studies on deriving AMVs from images simulated from NWP model. The report should address both the imagers as well as the hyperspectral sounders.	EUM-WP- 25	30 Apr 08 CGMS-36	**CLOSED**
ESA	Recommendation 35.10 WGII	Recommendation 35.10: Direct retrievals of wind fields from Doppler Wind Lidars need to be continued beyond the ESA ADM mission.	ESA has initiated plans for an ADM follow-on.	CGMS-36	**CLOSED**
EUM	Recommendation 35.11 WGII	Recommendation 35.11: IWW9 should discuss the height allocation to atmospheric layers and pursue tests within NWP assimilation and forecast systems.	EUM-WP- 25	30-Apr-08	**CLOSED**
EUM	Recommendation 35.12 WGII	Recommendation 35.12: CGMS 35 recommends to put the CGMS wind statistics on the new IWWG web site and to discuss at IWW9 whether a strict adherence to CGMS collocation criteria should be followed and whether the criteria need to be re-defined.	EUM-WP- 25	30-Apr-08	**CLOSED**
CGMS Members	Recommendation 35.13 WGII	Recommendation 35.13: CGMS members are encouraged to present papers demonstrating the possibilities of advanced sounding for analysing convective instability of the atmosphere, particularly utilising information from the hyperspectral sounders AIRS and IASI.	EUM-WP-26 NOAA-WP-15	CGMS-36	**CLOSED**
Satellite operators (+ WMO)	Recommendation 35.14 WGII	Recommendation 35.14: Future satellite sensors are expected to be used for fire monitoring; relevant channels and sensors should be adequately characterised for this application. The matter should be part of the pertinent work under GSICS.	To be discussed in WGII. NOAA-WP-21	CGMS-36	**CLOSED**
Satellite operators	Recommendation 35.15 WGII	Recommendation 35.15: CGMS satellite operators to consider making a data interface available such as ADDE servers so that McIDAS-V and HYDRA can be applied to their data. Deadline:	EUM-WP-28 NOAA-WP-23	CGMS-36	**CLOSED**
CGMS Members	Recommendation 35.16 WGII	Recommendation 35.16: CGMS Members to continue to support activities of the three International Working Groups (ITWG, IWWG and IPWG) particularly upcoming science meetings in 2008.	Discussed in WGII. Ongoing. ESA generally supporting such WGs EUM-WP-25 JMA-WP-01: JMA dispatched an expert on AMV to IWWG-9. JMA will host the IWWG-10 in the first quarter of 2010.	2008 GMS-36	**CLOSED**

B. REPORT ON THE STATUS OF CURRENT SATELLITE SYSTEMS

B.1 Polar-orbiting Meteorological Satellite Systems

In CMA-WP-02, CMA reported on the status of the Chinese polar orbiting meteorological satellite programme. FY-1 is the first Chinese polar-orbiting meteorological satellite series that started with the launch of FY-1A on 7 September 1988. The FY-1 programme produced four satellites in all, namely the FY-1A/B/C/D. The FY-1 series is a 3-axis stabilised spacecraft programme, carrying the multi-channel Visible and Infrared Scanning Radiometer (VIRR) for Earth environment monitoring at sub-point resolution of 1.1 km, and the Space Environment Monitor (SEM) for in-situ observation of charged particles in the solar wind. A Direct Readout Service is available through an HRPT transmission service. As of 20 October 2008, FY-1D has become the operational satellite.

FY-3 is a new satellite series, to replace the FY-1 series. The first FY-3 satellite, FY-3A, was launched on 27 May 2008. The satellite is 3-axis stabilized. To keep the continuity of AVHRR observation, FY-3A carries the multi-channel Visible and Infrared Scanning Radiometer that flies on FY-1. In addition, the FY-3A carries the Medium Resolution Spectral Imager (MERIS), the Microwave Radiation Imager (MWRI), the Infrared Atmospheric Sounder (IRAS), the Microwave Temperature Sounder (MWTS), the Microwave Humidity Sounder (MWHS), a Total Ozone Unit and a Solar Backscatter Ultraviolet Sounder (TOU/SBUS), as well as an Earth Radiation Budget instrument. During the commissioning test, the ground stations received the L-band AHRPT data, X-band MPT data, and DPT data. The commissioning test for FY-3A will be finished by the end of November 2008. FY-3 will provide Direct Broadcast service to global users.

The WP also mentioned that the launch of the FY-3B satellites is scheduled for 2010, and will be in an afternoon orbit, with a Local Solar Time of 14:00.

The status of the EUMETSAT Polar System (EPS), as per August 2008, was provided in EUM-WP-03. The paper reported that Metop-A operations have continued nominally with the exception of the direct LRPT and HRPT broadcast missions, both of which remain switched off, and several anomalous interruptions to instrument operations.

On 19 March 2008 a problem was detected with the communications to the Payload Module (PLM) which led to a switching to the redundant units and a complete turn-off of the PLM. The spacecraft was manually reconfigured and the payload reinitialised. The outage time was used to decontaminate the IASI instrument. Investigations on this transient anomaly are ongoing.

A double-burn out-of-plane manoeuvre was executed on 8-9 April 2008 and an in-plane manoeuvre on 24 April. All instruments are currently performing nominally (with A-DCS on the B-side), although operational interruptions have occurred due to manoeuvres and on-board detected problems.

The dissemination of Metop-A products has evolved along with the progress of product validation and commissioning. Operational level 1 product services (ATOVS, AVHRR, IASI) have continued nominally. The main outages are related to nominal instrument operations of IASI external calibration and spacecraft anomalies.

NOAA-WP-02 updated CGMS on the status of the Polar-orbiting Operational Environmental Satellite (POES) programme. The POES spacecraft constellation includes one afternoon primary, one afternoon secondary, one morning backup, and one morning secondary satellite. These spacecraft are in circular orbits inclined at approximately 98 degrees (retrograde). As of 21 May 2007, NOAA declared EUMETSAT's METOP-A as their mid-morning operational spacecraft. The primary operational spacecraft, NOAA-18 is in sun-synchronous afternoon orbit, and three secondary spacecraft, NOAA-17, NOAA-16 and NOAA-15 provide additional payload operational data. NOAA-14 and NOAA-12 were decommissioned on May 23, 2007 and August 10, 2007, respectively. The next POES launch, NOAA-N' is slated for launch in February 2009, and will be renamed NOAA-19 once it achieves orbit. This is the last of the Advanced TIROS-N series of spacecraft built for NOAA by NASA. For over forty years, NASA has translated NOAA requirements into technical specifications, contracted for the build of instruments and spacecraft, and provided launch services. NOAA has successfully operated these spacecraft for weather forecasting and warning and has now led to the capability to monitored changes in the climate.

Table 1: Current Polar-Orbiting Satellites Coordinated within CGMS
(as of 7 November 2008)

Orbit type (equatorial crossing times)	**Satellites in orbit** (+operation mode) P=Pre-operational Op=operational B=back-up L=limited availability R= R&D	**Operator**	**Equatorial Crossing Time** A=Ascend (northward) D=Descend (southward) +Altitude	**Launch date**	**Status**
Sun-synchronous local "early morning" orbit (05:00 –07:00) (17:00 – 19:00)	FY-1D (Op)	CMA	06:50 (D) 866 km	15 May 2002	Functional. CHRPT. MVISR, SEM. Expected end of service ≥2007. Last s/c of FY-1 series.
	NOAA-15 (B)	NOAA	05:16 (D) 807 km	05/1998	Functional (intermittent problems with AVHRR, AMSU-B & HIRS)
	DMSP-F13 (B)	NOAA	18:33 (A) 850 km	03/1995	Defence satellite. Data available to civilian users through NOAA.

Orbit type (equatorial crossing times)	Satellites in orbit (+operation mode) P=Pre-operational Op=operational B=back-up L=limited availability R= R&D	Operator	Equatorial Crossing Time A=Ascend (northward) D=Descend (southward) +Altitude	Launch date	Status
Sun-synchronous local "early morning" orbit (05:00 –07:00) (17:00 – 19:00)	DMSP-F14 (B)	NOAA	17:24 (A) 852 km	04/1997	Defence satellite. SSMT1 (microwave temperature sounder) non-functional. SSMT2 non-functional. Only 1 functional onboard recorder. Data available to civilian users through NOAA.
	DMSP-F17 (Op)	NOAA	17:31 (A) 850 km	4 Nov 2007	Defence satellite. SSMIS. Data available to civilian users through NOAA.
Sun-synchronous local "morning" orbit (07:00 – 12:00) (19:00 – 24:00)	FY-3A	CMA	10:00 (D) 836 km	27 May 2008	AHRPT/MPT VIRR, MERSI, MWRI, IRAS, MWTS, MWHS, TOU/SBUS, SEM, ERM
	Metop-A (Op)	EUMETSAT	21:30 (A) 837 km	19 Oct 2006	Operational. HRPT and LRPT not functional. EUMETCast ADM
	NOAA-17 (B)	NOAA	10:08 (D) 810 km	6/2002	Functional. AMSU-A1 failed.
	DMSP-F15 (B)	NOAA	19:37 (A) 850 km	12/1999	Defence satellite. SSMT2 (microwave water vapour sounder) non-functional. Data available to civilian users through NOAA.
	DMSP-F16 (Op)	NOAA	20:04 (A) 850 km	10/2003	Defence satellite. SSMIS. Data available to civilian users through NOAA.
Sun-synchronous local "afternoon" orbit (12:00 – 17:00) (00:00 – 05:00)	NOAA-16 (B)	NOAA	16:04 (A) 849 km	09/2000	Functional, no APT. Intermittent problems with AVHRR.
	NOAA-18 (Op)	NOAA	13:37 (A) 854 km	5/2005	Functional. Noise on HIRS long wave channels
	DMSP-F12 (L)	NOAA	15:35 (A) 850 km	8/1994	Defence Satellite. SSMI (microwave imager) and SSMT1 non-functional. Non-operational (no onboard recorders).
Non-sun synchronous orbit	OSTM/Jason-2 (Ocean Surface Topography Mission)	CNES EUMETSAT NASA NOAA	(66° inclin.) 1336 km	20/06/ 2008	Follow-on of Jason-1. Sea surface topography measurement. Global ocean circulation for climate prediction.

B.2 Geostationary Meteorological Satellite Systems

CMA-WP-03 reported on the status of the current FY-2 geostationary satellite programme (FY-2A/B/C/D) providing GEO imagery observations. It stated that currently FY-2C/D are operationally active. FY-2D was launched on

November 15, 2006 and positioned at 86.5°E, whereas FY-2C was launched on 19 October 2000 and it is positioned at 105°E.

FY-2C and FY-2D alternatively observe and transmit S-VISSR imagery every 15 minutes during the rainy season from June to September, and every 30 minutes from October to May.

The amount of remaining propellant onboard FY-2C is expected to keep the satellite operational for another year.

The FY-2 Programme will continue with FY-2E/F, where the launch of FY-2E is scheduled in December 2008 and FY-2E, which is identical to FY-2C, shall initially be placed at 123.5°E before FY-2C is decommissioned.

In EUM-WP-04 EUMETSAT reported on the operation of its Meteosat System including the EUMETSAT ATOVS Retransmission Service (EARS) and the International Data Collection System (IDCS) service. The EUMETCast Alternative Dissemination Mission was reported on in a separate Working Paper (EUM-WP-11). WP-04 stated that the Meteosat system currently comprises four satellites: Meteosat-6, -7, -8 and -9, where Meteosat-9 is the primary spacecraft at 0°, with Meteosat-8 as backup, and also providing a rapid scanning service. Meteosat-6 and -7 contribute to the Indian Ocean Data Coverage Service. Meteosat-5 was de-orbited in April 2007 after more than 16 years of service.

The working paper also provided detailed information on the various spacecraft and ground segments, on the long-term planning and assumptions, on IDCS, on service transitions, and on dedicated project, such as the Indian Ocean service, the EARS project, and the EUMETCast South America Service.

The WP concluded with an outline of a new initiative, the Earth Observation Portal Project, whose main objective is to implement a unified and central service structure, in order to provide EUMETSAT users with a single point of entry for online access to all EUMETSAT data and dissemination services.

JMA-WP-02 reported on the status of JMA's multi-functional transport satellites, MTSAT-1R and MTSAT-2, including the International Data Collection System (IDCS) of MTSAT-1R.

No significant spacecraft anomalies had occurred on MTSAT-1R during the reporting period. MTSAT-2 experienced a Loss of Lock (LOL) of the Earth pointing and attitude control on 5 November 2007.

JMA terminated the HiRID and WEFAX broadcast services in March 2008, and started providing compact imagery files via the Internet in January 2008.

The IDCS of MTSAT-1R has been functioning properly since the start of operations. As of the end of September 2008, 11 IDCPs were registered on 5 out of 33 MTSAT-IDCS channels.

The WP concluded by adding that the MTSAT-2 has been in standby in a geostationary orbit since 4 September 2006 and that JMA had conducted Rapid Scan observations using MTSAT-2 from 10-13, from 17-18, and from 27-28 September 2008, as a part of the THORPEX Pacific Asian Regional Campaign (T-PARC).

NOAA-WP-03 reported on the status of its geo-synchronous meteorological satellites, where it nominally operates two meteorological satellites in geostationary orbit over the equator. Each satellite views almost a third of the Earth's surface: One monitors North and South America and most of the Atlantic Ocean, the other North America and the Pacific Ocean basin. GOES-12 (or GOES-East) is positioned at 75°W longitude and the equator, while GOES-11 (or GOES-West) is positioned at 135°W longitude and the equator. GOES-10 is located at 60°W and will support coverage of South America through December, 2009.

The GOES-13 satellite was successfully launched on 24 May 2006 and is currently in in-orbit storage mode as the primary backup for the operational GOES satellites.

NOAA informed CGMS that GOES-10 will have to be removed from its orbit in December 2009 as all station keeping fuel would be consumed by that time.

Responding to a query from WMO, NOAA added that there was no possibility for this satellite to drift East or West in order to extend its lifetime because of fuel constraints. NOAA added that more information on this would be presented to the participants of the GOES Direct Readout Conference being held in Miami, USA, in December 2008.

Recalling the great value of GOES-10 at 60°W for South America, WMO suggested that NOAA consider replacing GOES-10 by another spacecraft, for instance GOES-11 in spite of its battery weakness, in order to bridge the gap until GOES-R and –S can provide an adequate coverage on a permanent basis.

Table 2: Current Geostationary Satellites Coordinated within CGMS
(as of 7 November 2008, sorted by organisation)

Sector	Satellites currently in orbit (+type) P: Pre-operational Op: Operational B: Back-up L: Limited availability	Operator	Location	Launch date	Status
West–Pacific (108°E-180°E)	MTSAT-1R (Op)	JMA	140°E	26 Feb 2005	Fully Functional
	MTSAT-2 (B)	JMA	145°E	18 Feb 2006	Multifunctional Transport Satellite (in-orbit back-up to MTSAT-1R until 2010 thereafter operational)
East-Pacific (180°W- 108°W)	GOES-11 (Op)	NOAA	135°W	3 May 2000	Operational GOES-West spacecraft since 28 Jun 2006
West-Atlantic (108°W-36°W)	GOES-10 (B)	NOAA	60° W	04/1997	Supports South America. Inverted, solar array anomaly, DCP interrogator on back-up.
	GOES-12 (Op)	NOAA	75°W	07/2001	Solar X-Ray Imager anomaly May 2005 under investigation.
	GOES-13 (B)	NOAA	105°W	16 May 2006	In storage mode.
East-Atlantic (36°W-36°E)	Meteosat-8 (B)	EUMETSAT	9.5°E	28 Aug 2002	No LRIT. Back-up to Meteosat-9. Rapid scanning service. EUMETCast ADM.
	Meteosat-9 (Op)	EUMETSAT	0°W	21 Dec 2005	Primary s/c. Fully operational. EUMETCast ADM.
Indian Ocean (36°E-108°E)	FY-2C (Op)	CMA	105°E	19 Oct 2004	S-VISSR (improved), DCS, SEM. Expected end of service ≥2009
	FY-2D (Op)	CMA	86.5°E	15 Nov 2006	S-VISSR (improved), DCS, SEM, LRIT. Back-up to FY-2C.
	Meteosat-6 (B)	EUMETSAT	67.5°E	11/1993	Functional. Back-up to Meteosat-7. DCP mission support. EUMETCast ADM.
	GOMS-N1 (L)	Roshydromet	76°E	11/1994	Since 09/1998 in stand-by
	Meteosat-7 (Op)	EUMETSAT	57.5°E	02/1997	Functional. IODC coverage committed till end 2010. EUMETCast ADM.

Sector	Satellites currently in orbit (+type) P: Pre-operational Op: Operational B: Back-up L: Limited availability	Operator	Location	Launch date	Status
Indian Ocean (36°E-108°E) (continued)	INSAT 3-C (L)	IMD	74°E	24 Jan 2002	No meteorological payload. Used for dissemination of processed meteorological data in broadcast mode in S-Band only over India and neighbouring countries. No WEFAX broadcast capability in L-band.
	Kalpana-1 (Op) (formerly METSAT)	IMD	74°E	20 Sep 2002	Dedicated meteorological satellite. - Monitoring cyclones & monsoon - CMV Winds - OLR - Rainfall Estimation Working satisfactorily.
	INSAT-3A (Op)	IMD	93.5°E	10 Apr 2003	- Monitoring cyclones & monsoon - CMV Winds - OLR - Rainfall Estimation - Mesoscale features - Flood/intense precipitation advisory - Snow detection Operational since 24 Apr 2003. A 3-channel VHRR imager and CCD payload available for use similar to INSAT-2-E.

B.3 Research and Development Satellite Systems

CNSA presented in CNSA-WP-01 the current status of the Chinese Earth Observation missions, which includes the FY satellite series, the CBERS satellite series, and the HY-1B and Environment and Disaster Monitoring Small Satellite Constellation. The Working Paper also presented the status of the respective CNSA satellites in orbit, i.e. CBERS02B, HJ-1A and HJ-1B.

CNSA-WP-03 presented the status of the Chinese Ocean Colour Series Satellite (HY-1). This is an operational satellite for measuring ocean colour and sea surface temperature. HY-1A was successfully launched on 15 May 2002 and HY-1B on 11 April 2007 and the main sensors on board include the

10-band Chinese Ocean Colour and Temperature Scanner (COCTS) as well as a 4-band Coastal Zone Imager (CZI).

The WP further described the various satellite data applications and projects developed resulting from HY-1B: The distributed data processing system studies, more than 40 quantitative satellite remote sensing products including chlorophyll, suspended sand, sea surface temperatures, vegetation index; and application service projects such as studies of ocean fisheries, marine primary productivity, monitoring of red tide, sea surface temperature, and sea ice and coastline variation.

The WP was complemented by a PowerPoint presentation which is available on the CGMS ftp-server.

In ESA-WP-01, CGMS was informed of the status of the current European Space Agency (ESA) Earth Observation (EO) missions. The Working Paper stated that two of these missions, MSG and Metop, are undertaken in cooperation with EUMETSAT. Furthermore, the success of the Envisat mission, launched in 2002, was well established, with a constant increase of user demand for data and services. Currently, over 2200 scientific projects are served with Envisat data. Today, the Envisat mission has exceeded the original foreseen 5 years lifetime and is expected to continue nominal operations until 2010. Technical solutions to further extend the Envisat mission until 2013 with a different orbit cycle are under preparation.

ERS-2, the second ESA EO mission, launched in 1995, continues to satisfy the steady increasing data demand despite the failure of the gyroscopes and the low rate recorders for which workaround solutions have been successfully implemented. Finally, PROBA, an experimental ESA satellite, provides remarkable hyperspectral data since 2001.

In JAXA-WP-01, JAXA presented the updated status of its Advanced Land Observing Satellite (ALOS) which has been renamed Daichi, a routinely operated polar orbiting Earth Observation satellite. The main objectives of the mission cover cartography, regional observation, disaster monitoring (Sentinel Asia), resources surveying and technology development. The WP also provided information on the spacecraft instruments.

Furthermore, the WP indicated that ALOS data was available through ALOS data nodes dedicated to each region and that in this context, the ALOS Level 0 data were distributed to the nodes on a regular basis and users could obtain the ALOS products through the user's node. A regional distributor was designated for each node for commercial distribution of the ALOS products within the relevant zone. The WP explained the current concept which envisages 4 Nodes world-wide in order to achieve the necessary global coverage.

The WP concluded by reporting on the continued JAXA ALOS's contribution to Sentinel Asia, a collaboration between space agencies and disaster

management agencies applying Remote Sensing and Web-GIS technologies to assist disaster management in the Asia-Pacific region. The Sentinel Asia Step 2 project was initiated in June 2008 and was also described in the WP.

Table 3: Current R & D satellites discussed within CGMS
(as of 7 November 2008, sorted by organisation)

Satellites in orbit (+operation mode)	**Operator**	**Crossing Time** A=Northw D=Southw +Altitude	**Launch date dd/mm/ yyyy**	**Application/ instruments**	**Status, Application and other information**
PARASOL	CNES	705 km sun-synchr.	18/12/2004	POLDER	Characterisation of clouds and aerosols micro-physical and radiative properties. Data can be accessed at <http://www.icare.univ-lille1.fr/>
SPOT-5	CNES	832 km sun-synchr.	3/05/2002	DORIS, HRG, HRS, VEGETATION	Cartography, land surface, agriculture and forestry, civil planning and mapping, digital terrain models, environmental monitoring
CBERS-02	CNSA/ AEB	10:30 (D) 778 km	10/2003	Multi-spectral Camera, Infrared Scanner Camera, Wide Field Imager Camera	Land resource observation
CBERS-02B	CNSA/ AEB	10:30 (D) 778 km	19/09/2007	Multi-spectral Camera, Infrared Scanner Camera, Wide Field Imager Camera	Land resource observation
HJ-1A	CNSA	650 km 10:30 A	06/09/2008	Land, resource and environment monitoring	
HJ-1B	CNSA	650 km 10:30 A	06/09/2008	Land, resource and environment monitoring	
HY-1B	CNSA	10:30 +/-30 min (D) 798 km	04/2007	Ocean colour and temperature scanner and 4 bands CCD imager. (CZI)	In operation.
ERS-1	ESA	10:30 (D) 785 km	07/1991	Altimeter, SAR, SAR-wave, ATSR, Scatterometer	Replaced by ERS-2 in March 2000 after an overlapping period

Satellites in orbit (+operation mode)	**Operator**	**Crossing Time** A=Northw D=Southw +Altitude	**Launch date dd/mm/ yyyy**	**Application/ instruments**	**Status, Application and other information**
ERS-2	ESA	10:30 (D) 785 km	04/1995	Altimeter, SAR, SAR-wave, ATSR, Scatterometer, GOME	▪ No on-board recorder since 2003, the data acquisition is only ensured over ESA agreed acquisition stations. ▪ ATSR-2 instrument anomaly since Feb 2008.
ENVISAT	ESA	10:000 (D) 800 km	03/2002	10 instruments for Environment: ASAR, AATSR, MERIS, GOMOS, MIPAS, SCHIAMACHY, RA-2, MWR, DORIS	▪ MIPAS is operated at 80% of its duty cycle. ▪ GOMOS performs satisfactorily with reduced azimuth range, since Aug 2005. ▪ Altimeter: Loss of secondary frequency (S-band) in Jan.08, compensated with on-ground ionospheric corrections. Operations funding extended 3 years (till 2010)
PROBA	ESA	10: 30 (D) 615 km	10/2001	CHRIS	Drifting orbit. Technology experiment. AO Science mission since 2001.
OCEANSAT-1	ISRO	12:00 (A)/ 24:00 (D) 98.28° 720 Km Sun-synch.	26 May 1999		Multifrequency Scanning Microwave Radiometer (MSMR) for SST, Sea surface wind speed, total water vapour, cloud liquid water, sea ice extend, rainfall, soil moisture etc.
DAICHI (previously ALOS)	JAXA	10:30 691.65 km sun-synchronous	24 Jan 2006	PRISM, AVNIR-2, PALSAR	Advanced Land Observing Satellite (mapping, precise land coverage observation, disaster monitoring, resource surveying)
TRMM	JAXA/ NASA	402 km non-sun-synchr.	11/1997	Precipitation Radar equipment provided by JAXA and TRMM Microwave Imager (TMI), satellite bus and other instruments provided by NASA	Measures tropical rainfall/precipitation and radiation energy

Satellites in orbit (+operation mode)	**Operator**	**Crossing Time** A=Northw D=Southw +Altitude	**Launch date dd/mm/ yyyy**	**Application/ instruments**	**Status, Application and other information**
ACRIMSAT	NASA	716 km sun-synchr.	20/12/1999	ACRIM III	Active Cavity Radiometer Irradiance Monitor Satellite Measures total solar irradiance, studies incoming solar radiation and adds measurements of ocean and atmosphere currents and temperatures as well as surface temperatures.
Aura	NASA/BNSC	705 km sun-synchr.	15/07/2004	Comprehensive measurements of atmospheric chemistry and trace gasses	
Terra	NASA	705 km sun-synchr.	18/12/1999	CERES, MISR, MODIS, MOPITT, ASTER	Measurement of the Earth's climate system, atmosphere, land, oceans and interactions with solar radiation
Jason-1	NASA/ CNES	1336 km non-sun-synchr.	07/12/2001	Laser retroreflector array Poseidon-2 solid state radar altimeter DORIS receiver Jason Microwave Radiometer BlackJack GPS Receiver tracking system	Ocean surface topography Follow-on mission to TOPEX/P. Monitor global ocean circulation for global climate prediction.
Aqua	NASA	705 km sun-synchr.	04/05/2002	AMSR-E, AIRS, AMSU-A, CERES, HSB, MODIS	Collects data on Earth's water cycle, precise atmospheric and oceanic measurements, and interaction with solar radiation AMSR-E provided by JAXA. HSB provided by INPE (no longer functional)
Landsat 7	NASA	705 km sun-synchr.	15/04/1999	Enhanced Thematic Mapper Plus Instrument (ETM+)	Well-calibrated, multispectral, moderate resolution, substantially cloud-free, sunlit digital images of the Earth's continental and coastal areas

Satellites in orbit (+operation mode)	**Operator**	**Crossing Time** A=Northw D=Southw +Altitude	**Launch date dd/mm/ yyyy**	**Application/ instruments**	**Status, Application and other information**
NMP EO-1 (New Millennium Program Earth Observing-1)	NASA	10:01 (D) 705 km sun-synchr.	21/11/2000	Advanced Land Imager Hyperion LAC (atmospheric corrector)	Demonstrates and validates advanced technology instruments (multi and hyperspectral), spacecraft systems, and in flight mission concepts
ICESat (Ice, Cloud, and Land Elevation Satellite)	NASA	600 km circular non-sun-synchr.	Jan. 2003	Geo-science Laser Altimeter System GPS BlackJack receiver	Measures ice sheet topography, ice sheet elevation changes, cloud and aerosol heights and land topography and vegetation characteristics.
QuikSCAT (Quick Scatterometer)	NASA	803 km sun-synchr.	19/06/1999	SeaWinds	Sea surface wind speed and direction data for global climate research operational weather forecasting and storm warning
SORCE (Solar Radiation and Climate Experiment)	NASA	(40˚ incl) 640 km non-sun-synchr.	25/01/2003	- XPS (Extreme Ultraviolet (XUV) Photometer System) - TIM (Total Irradiance Monitor) - SIM (Spectral Irradiance Monitor A&B) - SOLSTICE (Solar Stellar Irradiance Comparison Experiment A&B)	Will provide total irradiance measurements and full spectral irradiance measurements. Continuation of ACRIMSAT total solar irradiance measurements.
GRACE (Gravity Recovery and Climate Experiment)	NASA/ DRL	(89˚ incl) 485 km non-sun-synchr.	17/03/2002	- Star Camera Assembly - GPS BlackJack Receiver - Instruments Processing Unit - Laser Retro-Reflector Assembly - K-Band Ranging Instruments - SuperSTAR Accelerometers	Accurate global and high-resolution determination of static and time-variable components of Earth's gravity field Measurement of: - Gravitational field - GPS atmospheric and ionospheric limb sounding
SRTM (Shuttle Radar Topography Mission)	NASA	233 km non-sun-synchr.	11/02/2000 (11 day duration)	X-SAR SIR-C GPS BlackJack Receiver	Topographic mapping of the Earth. Data currently used by various Government Agencies

Satellites in orbit (+operation mode)	**Operator**	**Crossing Time** A=Northw D=Southw +Altitude	**Launch date dd/mm/ yyyy**	**Application/ instruments**	**Status, Application and other information**
CALIPSO	NASA/ CNES	705 km sun-synchronous	28 Apr 2006		Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations for climate predictions. Data can be accessed at <http://eosweb.larc.nasa.gov/PRODOCS/calipso/table_calipso.html> and <http://www.icare.univ-lille1.fr/>
CloudSAT	NASA/ CSA	705 km sun-synchronous	28 Apr 2006		Global cloud properties (applications: air quality, aviation safety, disaster management, energy and water management)
Monitor-E	ROSCOSMOS	(550 km) (10:30)	08/2005	Land Observing Satellite	Experimental exploitation
RESURS-DK1	ROSCOSMOS	Elliptical orbit, H_p=360km, H_a=604km, incl.=70.4°	15 Jun 2006	- Panchromatic scanner - Multi-spectral scanner - PAMELA (Italy) for primary cosmic radiation investigation - ARINA for earthquake prediction investigation	Exploitation

B.4 Anomalies from solar and other events

CMA-WP-04 reported on the findings of a study comparing the errors of the FY-2C synchronizer with the high-energy electron flux events recorded by the GOES satellite in the period February 2005 to July 2008. The occasional sudden jumps of the FY-2C synchronizer from one operational state to the other interrupts the ongoing data downlink, and needs Command and Data Acquisition Station (CDAS) commands to restore it. The study at NSMC compares the occurrence of jumps with the solar-event record from the GOES satellite, and finds that errors occur when the high-energy electron flux is high. The study preliminarily concludes that the high-energy electron flux must be one cause for the FY-2C synchronizer error. The report also mentions that further study with simulation analysis is needed to verify the conclusion.

EUM-WP-05 gave an updated report on the anomalies attributed to solar events that had been detected on the EUMETSAT in-orbit satellites from October 2007 till September 2008: Metosat-6, 7, 8 and 9 and Metop-A.

These events included a Meteosat-9 Safe Mode on 13 May 2008, a Metop Payload Module Switch-Off Line (PLSOL) on 19 March 2008 and several outages on IASI and MHS on board Metop A and how these were handled.

CGMS learnt that WMO plans to host a section addressing space weather events on the WMO web site. In response, NOAA commented that the Space Weather Prediction Center already had such information at

http://www.swpc.noaa.gov/dregion/index.html

NOAA-WP-04 provided an example of a new space weather product, the progression and prediction of the solar cycle, and a summary of significant space weather events. The new experimental product is one that serves customers, such as airlines flying polar routes, by providing the effect of solar protons on High Frequency (HF) communications at high latitudes. Predictions were given for the year and magnitude of the maximum of Solar Cycle 24. There are two consensus predictions, one for a large solar cycle with a maximum in October 2011 and another for a small cycle with a maximum in August 2012. This prediction, of great importance for planning activities affected by solar activity, will be updated annually. Information was provided on major activity observed from August 2007 through July 2008. A single moderate-sized (M-class) solar flare occurred in March 2008. It is typical for energetic electron fluxes to increase during the declining phase of the solar cycle as recurrent coronal holes produce regular intervals of high-speed solar winds that interact with the geomagnetic field. Electron flux levels reached high levels at geosynchronous orbit on about 63% of the days during the period. Very high flux levels occurred on 29 March 2008.

WMO-WP-14 reported on preliminary activities of the WMO Secretariat regarding Space Weather and on the outcome of the sixtieth Executive Council (EC-LX) in this respect. A report was prepared in April 2008 on the potential scope, cost and benefit of a WMO involvement in support of international coordination of Space Weather services, and is available online (*The potential role of WMO in Space Weather, WMO, April 2008*).

EC-LX recognised the importance of Space Weather phenomena, in particular with regard to their impact on the space-based observing system and on radio-communications, and noted the potential synergy between meteorological and Space Weather service delivery. EC-LX has thus endorsed the principle of WMO activities in support of international coordination in Space Weather. Given the strict limitation of budgetary and staff resources available for WMO programmes, this additional activity should rely on external resources and the Council thus urged WMO Members to consider the provision of resources through secondments and Trust Fund donations. Work programmes will be developed in respect of Space Weather for the Commission for Basic Systems (CBS) and the Commission for Aeronautical Meteorology (CAeM), in consultation with relevant organizations.

In view of the critical impact of Space Weather events on satellite status and operations, the WP proposed that CGMS may wish to play a proactive role in the future, in this area.

NOAA, CMA and ROSHYDROMET supported this proposal and offered to share more space weather information in the framework of CGMS in future.

CGMS encouraged WMO to support these activities.

C. REPORT ON FUTURE SATELLITE SYSTEMS

C.1 Future Polar-orbiting Meteorological Satellite Systems

EUM-WP-06 provided updates on plans for post-EPS, which would be the continuation of the EUMETSAT Polar System (EPS) operational programme with an anticipated start of operations in 2018/2019. The Post-EPS Programme is ongoing and at present EUMETSAT is running a Phase 0 for its definition on the basis of established preliminary mission requirements and with the support of ESA, whose Pre-Phase A competitive studies started in 2008 and will be completed in 2009.

Furthermore, the WP included a list of observation missions identified in the Mission Requirements Document and the related study approach. It concluded with an overview of the timing of phases 0 (ongoing) to E (2009-2018 plus 15 years of operations).

NOAA-WP-05 discussed NOAA's future polar-orbiting meteorological satellite systems, current operational system, and the planned launch schedule for NOAA-N Prime. Information was provided on the international polar-orbiting satellite programme coordination between EUMETSAT and NOAA. The goal of this cooperation is to provide continuity of measurements from polar orbits, cost sharing, and improved forecast and monitoring capabilities through the introduction of new technologies. An agreement is in place between NOAA and EUMETSAT on the Initial Joint Polar-orbiting Operational Satellite System (IJPS), which will include two series of independent but fully coordinated NOAA and EUMETSAT satellites, exchange of instruments and global data, cooperation in algorithm development, and plans for real-time direct broadcast.

The WP also discussed the development and implementation plans for NPOESS. Beginning early in the next decade, NPOESS spacecraft will be launched into two orbital planes to provide significantly improved operational capabilities and benefits to satisfy the critical civil and national security requirements for space-based, remotely sensed environmental data. The advanced technology visible, infrared, and microwave imagers and sounders that are being developed for NPOESS will deliver higher spatial and resolution atmospheric, oceanic, terrestrial, and solar-geophysical data enabling more accurate short-term weather forecasts and significantly improved long range numerical weather forecasts as well as serving the data continuity

requirements for improved global climate change assessment and prediction. The NPOESS programme is on the path to creating a high performance, polar-orbiting satellite system that will be more responsive to user requirements and provide sustained, space-based measurements as a cornerstone of an Integrated Global Observing System. These activities represent a sound beginning for achieving the planned national and international operational satellite programmes that will ensure continuous support to a variety of users well into the 21st century. The goal of this cooperation is to provide continuity of measurements from polar orbits, cost sharing, and improved forecast and monitoring capabilities through the introduction of new technologies.

ROSC-WP-01/ROSH-WP-01 provided information on the design, main characteristics, onboard devices, development status and planned launch time of the future Russian meteorological polar orbiting satellite Meteor-M N1. As stipulated in the Federal Space Programme of Russia to 2015, three hydrometeorological and oceanographic satellites are to be created within the framework of the METEOR-3M project and will be launched in the first half of 2009, 2010 and 2012, respectively.

METEOR-M #1 is now fully assembled; its integration tests are in progress. The satellite is to be put into sun-synchronous orbit at an altitude of 835 km. The equator crossing time at the descending node is foreseen for 09:30 and the orbit inclination is 98.77 degrees.

The WP also described the ground station reception and processing capabilities.

Table 4: Future Polar-Orbiting Satellites Coordinated within CGMS

(as of 7 November 2008)

Orbit type (equatorial crossing times)	Future additional Satellites	Operator	Crossing Time A=Ascend. (northward) D=Descend. (southward) +Altitude	Planned launch date	Other information
Sun-synchronous local "early morning" orbit (05:00 – 07:00) (17:00 – 19:00)	NPOESS-2	NOAA	05:30 (D) 833 km	01/2016	LRD (AHRPT), HRD
	NPOESS-4	NOAA	05:30 (D) 833 km	2022	LRD (AHRPT), HRD
	DMSP-F19	NOAA	05:30 (D) 833 km	2010	(SSMI/S)
	DMSP-F20	NOAA	05:30 (D) 833 km	10/2012	(SSMI/S)
Sun-synchronous local "morning" orbit (07:00 – 12:00) (19:00 – 24:00)	FY-3C	CMA	836 km	2013	- " -
	FY-3D	CMA	836 km	2015	- " -
	FY-3E	CMA	836 km	2017	- " -
	FY-3F	CMA	836 km	2019	- " -
	FY-3G	CMA	836 km	2021	- " -
	Metop-1	EUMETSAT	21:30 (A) 837 km	2012	HRPT, LRPT. EUMETCast ADM.
	Metop-3	EUMETSAT	21:30 (A) 837 km	2015	HRPT, LRPT. EUMETCast ADM.
	DMSP-F18	NOAA	08:00 (D) 833 km	2009	(SSMI/S)
	METEOR-M N1	ROS-HYDROMET	09:30 (D) 835 km	2009	HRPT, LRPT
	METEOR-M N3	ROS-HYDROMET	TBD ~560 km	2012	HRPT, LRPT
Sun-synchronous local "afternoon" orbit (12:00 – 17:00) (00:00 – 05:00)	FY-3B	CMA	14:00 (A) 836 km	2010	AHRPT/MPT VIRR, MERSI, MWRI, IRAS, MWTS, MWHS, TOU/SBUS, SEM, ERM, SIM
	NOAA-N'	NOAA	14:00	02/2009	(NOAA-19 once in orbit)
	NPP-NPOESS Preparatory Project	NOAA/NASA	13:30 (A) 833 km	06/2010	(VIIRS, CrIS, ATMS, OMPS) HRD. Monitoring climate trends, global biological productivity
	NPOESS-1	NOAA	13:30 (A) 833 km	01/2013	LRD (AHRPT), HRD
	NPOESS-3	NOAA	13:30 (A) 833 km	2020	LRD (AHRPT), HRD
	METEOR-M N2	ROS-HYDROMET	15:30 (A) 835 km	2010	HRPT, LRPT

C.2 Future Geostationary Meteorological Satellite Systems

EUM-WP-07 provided information about the status of the preparations for MSG-3 and MSG-4 in 2011 and 2013, respectively. MSG-3 remains in storage in the clean room at the prime contractor's premises for re-testing after repair of the SEVIRI Preamplifier Unit. A change in the design concept of the Gauging Sensor Unit, mounted on both MSG-3 and MSG-4, is undergoing a delta Qualification and Critical Design Review and the delivery of flight units is planned for summer 2009.

Concerning MSG-4, the need to replace the Drive Unit inside SEVIRI due to an anomaly will imply work for about 3 years which, fortunately, will not impact the satellite readiness for launch, but may interfere with MSG-3 preparations. The Drive Unit replacement is currently under negotiation with Industry. In the summer of 2008 EUMETSAT and Arianespace signed the MSG-4 Launch Service Agreement and the Amendment to the MSG-3 Launch Service Agreement (introducing Soyuz as a back-up to Ariane 5). The MSG-3 and MSG-4 LEOP service contract was signed in late 2007 with ESOC, which had already performed this service for MSG-1 and MSG-2, following a competitive tender procedure.

The WP concluded by confirming that MSG-3 launch is planned for January 2011, and MSG-4 in 2012-2013, implying that the first of the third generation Meteosat satellites (MTG) will have to be launched in 2015.

EUM-WP-08 updated CGMS on its plans for Meteosat Third Generation (MTG). The MTG Programme is well under definition and Phase A is planned to be completed by end of 2008 with the system level Preliminary Requirements Review.

Phase A included competitive Space Segment and Ground Segment studies to address the feasibility of the system concepts. A twin-satellite concept has been adopted, with an Imaging Satellite embarking a Flexible Combined Imager and a Lightning Imaging Instrument, and a sounding Satellite embarking the Infrared Sounder and providing accommodation for the GMES provided Sentinel-4 instruments supporting atmospheric chemistry applications.

The WP concluded with information on the Phase B activities, planned to start early 2009 and run until mid 2010.

JMA-WP-03 provided a report on the tentative plans for the follow-on satellite to MTSAT-2. The WP also reported on the plans for follow-on satellites to MTSAT-2, where JMA is planning to launch one in summer 2014 for a start of operations in 2015, when MTSAT-2 is scheduled to complete its operational period.

This satellite is tentatively planned to carry an imager comparable to the Advanced Baseline Imager (ABI) or the Flexible Combined Imager (FCI). In

order to handle the huge amounts of data to be obtained with the follow-on satellite, JMA plans to provide observation data via the Internet instead of direct broadcast. JMA also plans to continue studying advanced lossless compression techniques for efficient data dissemination.

The WP also confirmed that JMA will continue the Data Collection System (DCS) service with the follow-on spacecraft, and with fundamentally the same specifications as those of the MTSAT series.

WMO expressed some concern about the distribution of MTSAT Follow-on imagery via internet only, as this could negatively impact reception in developing and less advanced countries. WMO encouraged JMA to also consider the use of alternative dissemination methods in future to mitigate the impact of poor internet access in some regions.

KMA-WP-02 provided an update on the COMS programme, which is the first multi-purpose geostationary satellite programme called (in full) the Communication, Ocean and Meteorological Satellite (COMS), and initiated in cooperation with three other government ministries. The multi-missions of COMS are intended, not only as meteorological and oceanic observation for public welfare, but also as in-orbit test of a developed communications payload to be used for the next geosynchronous satellite.

The COMS MI spacecraft has been shipped to the KARI Assembly Integration Test (AIT) facility and is currently in its integration phase. GOCI will be delivered to the KARI site at the end of November 2008. The compatibility test between the payloads and the ground image processing system will be performed by the 1st quarter of 2009 with the launch planned for the 3rd quarter in the same year. The WP also included the current status of COMS payload development, information about the observation channels, and the HRIT/LRIT services.

KMA confirmed that data distribution will be performed via HRIT and LRIT plus some distribution via the Internet.

NOAA-WP-06 provided a status and an overview of the future GOES and GOES-R series of satellites. The GOES-O spacecraft is undergoing post storage testing and is ready for launch in March 2009. GOES-P has completed system integration and testing and is in ground storage at the spacecraft contractor facility, in El Segundo, California, and is planned to be launched in April 2010.

The GOES-R programme reached several important milestones in 2008. The programme entered the Acquisition and Operations phase of its development, and all instruments are in the implementation phase. The new GOES-R instruments will advance operational environmental remote sensing technology by several decades, and will provide four-times the environmental information over a greater geographical location in less time, at higher resolutions, and with higher spectral content. Source selection efforts are

underway to select the Flight Spacecraft prime contractor and Ground System prime contractor, with contract awards expected in FY 2009.

In response to a query from WMO concerning the distribution of the lightning mapper information, NOAA commented that such information will most likely, be in the form of products, however at this time the method and timeliness of distribution has not been determined.

EUMETSAT added that the processing of its future MTG lightning mapper data would become an activity of one of its Satellite Application Facilities, and data would be used in complement with ground based measurements.

ROSC-WP-02/ROSH-WP-02 provided information on the design, main characteristics, onboard devices, development status and planned launch time of the future Russian geostationary meteorological satellite Electro-L or GOMS-2. Launches are foreseen for 2009 and 2010. Furthermore, information on the corresponding ground station composition and characteristics were given in the WP.

In response to a question from WMO on Elektro-L data access, ROSHYDROMET informed CGMS that the data policy will be open, with HRIT and LRIT dissemination.

WMO-WP-15 described the IGeoLab initiative for a demonstration mission of microwave imaging/sounding in geostationary orbit (GEO-Microwave) which has been discussed since CGMS-32 (Sochi, Russia, 17-20 May 2004) and has been pursued in practice since the first meeting of the GEO-Microwave Focus Group approximately 3.5 years ago (Washington DC, 7 June 2005).

At CGMS-35 (Cocoa Beach, USA, 5-9 November 2007) the possibility of convergence was found between GEO-Microwave and the FY-4 programme of CMA. WMO and CMA were tasked to write a proposal for the China National Space Agency to take leadership in implementing GEO-Microwave in the framework of the FY-4 programme, and to CGMS members to contribute to the implementation of GEO-Microwave in the framework of the IGeoLab initiative.

The proposal was duly written and was provided as background information to WMO-WP-15. An advanced presentation took place at the 5th meeting of the Focus Group, structured as a parallel session at the 4th Workshop of IPWG (Beijing, 13-17 October 2008). However, in the meantime the Chinese space meteorology plan has been restructured and as the FY-4 satellite intended to embark a MW payload is now on standby, China cannot currently commit to serving as Lead Agency for GEO-Microwave.

Consequently, CGMS-36 needed to re-assess the situation of GEO-Microwave. It was noted that, at present, microwave payloads in geostationary orbit are being studied by:

- NASA, with GeoSTAR on the PATH mission concept, considered in the framework of the Earth Observation Decadal Survey;
- ESA, with the GAS instrument concept, in the framework of the ESA Technology Development Programme.

However, it is also worthwhile mentioning that:

- In the initial phases of the Focus Group, India declared an interest in the GEO-Microwave initiative;
- China continues to be interested, and some technological studies are being carried out.

Furthermore, IPWG reaffirmed a strong interest in the development of a GEO-Microwave demonstration mission.

CGMS-36 were invited to:

- Take note of the IGeoLab GEO-Microwave situation and instruct the Focus Group on whether to further continue its effort.

- Consider the “Proposal for the Implementation of a Microwave Mission in Geostationary Orbit (GEO-Microwave) in the framework of the Second-Generation Feng-Yun Geostationary Satellite Series (FY-4)” provided separately as a background document.

CGMS acknowledged that as there was no offer to take up this activity from CGMS Membership, the Focus Group would be disbanded for the time being, and all the valuable information collected by this project would be archived until such time when a CGMS Member may chose to reactivate this activity.

Table 5: Future Geostationary Satellites Coordinated within CGMS
(as of 7 November 2008)

Sector	Future additional satellites	Operator	Planned launch	(Planned location) Other remarks
East-Pacific (180˚W-108˚W) and West-Atlantic (108˚W-36˚W)	MSG-3	EUMETSAT	2011	0°. LRIT, EUMETCast ADM.
	MSG-4	EUMETSAT	2013	0°. LRIT, EUMETCast ADM.
	GOES-O	NOAA	03/2009	135° W or 75° W
	GOES-P	NOAA	04/2010	135° W or 75° W
	GOES-R	NOAA	2015	135° W or 75° W ABI, GLM, SUV, EXIS, SEISS (Advanced Baseline Imager, Geostationary Lightning Mapper, Solar UV Imager, Extreme UV and X-ray Irradiance Sensors, Space Environment In-Situ Suite)
Indian Ocean (36˚E-108˚E)	FY-2F	CMA	2011	5 channel VISSR, LRIT 86.5°E
	Electro-L N1	Roshydromet	2009	76°E
	Electro-L N2	Roshydromet	2010	14.5° E (TBD)
	Electro-M N1	Roshydromet	2015	TBD
Indian Ocean (36˚E-108˚E) continued	INSAT-3D	IMD	2009	Location TBD. Dedicated Meteorological mission with improved 6-channel Imager and a 19 channel Sounder.
West-Pacific (108˚E-180˚E)	FY-2E	CMA	2008	5 channel VISSR, LRIT 123°E
	FY-2F	CMA	2013	5 channel VISSR, LRIT 123°E
	MTSAT follow-on	JMA	2014	140°E
	COMS-1	KMA	2009	5 channel. HRIT/LRIT Meteorological imager (MI), Geostationary Ocean Colour Imager (GOCI) 128.2°E
	COMS-2	KMA	2016	116.2°E or 128.2°E

C.3 Future Research and Development Satellite Systems

CNSA-WP-02 informed CGMS of the status of the Earth Observation missions under development, including CBERS-03/04, HY-2 (ocean monitoring) and the HJ-series (environmental and disaster monitoring), where HJ-1C is planned for launch in 2009 or 2010.

The WP also indicated that CNSA hoped to cooperate with other partners having similar oceanic satellites and providing complementary data, with a view to inter-calibration and data sharing.

ESA-WP-02 informed CGMS of the status of the future European Space Agency Earth Observation missions where two of them, MTG and post EPS, are being prepared in cooperation with EUMETSAT. It also stated that the Living Planet Programme has three lines of implementation: Earth Explorer satellites, Earth Watch satellites, plus services and applications demonstration.

The 7th Core Explorer was under selection and the launch of the first Explorer, GOCE, was foreseen for February 2009. Earth Watch includes, since January 2002, the Global Monitoring for Environment and Security (GMES) service element, and the ESA GMES space component programme Phase 1 was well advanced. Five families of Sentinels are planned and the Sentinel-1 development phase was kicked off in April 2007. Sentinels -2 and 3 were kicked off in spring 2008.

It was agreed that ESA-WP-03 would be presented under order of business topic D.1.

JAXA-WP-02 provided a status report on JAXA's Greenhouse Gases Observing Satellite, GOSAT, nicknamed "IBUKI", which will monitor the distribution of the density of carbon dioxide. Launch preparations were ongoing with proto-flight tests preparing for a launch early 2009. The WP also provided information on the ground system, data policy and data distribution plan as well as cooperation with other international organisations.

The WP also described the active promotion of collaboration in the field of cross-calibration and data exchange, where information on instrument data exchange and calibration for GOSAT and the Orbiting Carbon Observatory mission (OCO; NASA/JPL) was provided, and their accuracy prior to launch to assign common observation standards. JAXA and NASA are also considering possibilities to compare post-launch data and conduct calibration experiments together as well as discussing shared data utilisation.

WMO expressed its appreciation of JAXA's willingness to share GOSAT data with WMO Members for the .Global Atmospheric Watch (GAW), GCOS and the World Climate Research Programme (WCRP) and welcomed the proposal to discuss technical modalities for accessing this data.

In JAXA-WP-03, CGMS was provided with an update on the status of JAXA's Global Change Observation Mission GCOM. The GCOM-W project had progressed and Phase-C studies started in FY2007. The GCOM-C1 project started in October 2008.

Finally, the WP reported on the progress of GCOM and NPOESS cooperation in the GEOSS context. In April 2008 NOAA and JAXA had exchanged a Letter

of Intent to prepare the way for a Memorandum Of Understanding (MOU) for their cooperation.

In response to CGMS action 35.21, JAXA-WP-04 provided the current status of the Global Precipitation Measurement (GPM), a Japan-US joint mission, and JAXA's Dual-frequency Precipitation Radar (DPR) onboard the GPM core satellite.

The Global Precipitation Measurement (GPM) is a follow-on and enhanced mission of the Tropical Rainfall Measuring Mission (TRMM). TRMM is a joint Japan-US mission, and was launched at the end of November 1997 by a H-II rocket. TRMM targeted to measuring tropical/subtropical rainfall and their diurnal variations, and covers latitude from 35°S to 35°N. TRMM has three precipitation sensors, Precipitation Radar (PR) and TRMM Microwave Imager (TMI) and Visible Infrared Scanner (VIRS), which enables observing rainfall structures by multiple sensors, simultaneously. TRMM is still in operation and its data has been accumulated over 10-years.

GPM is a satellite programme to measure the global distribution of precipitation accurately with sufficient frequency so that the information provided by this programme can significantly improve numerical weather prediction, climate modelling and the understanding of water cycles. Its feasibility has been studied at NASA Goddard Space Flight Center and JAXA. The accurate measurement of precipitation will be achieved by the Dual-frequency Precipitation Radar (DPR) installed on the GPM core satellite. DPR is being developed by JAXA and the National Institute of Information and Communications Technology (NICT).

The WP also reported on activities related to the CEOS Precipitation Constellation, one of CEOS virtual constellations.

WMO supported JAXA's encouragement to Russia, China and other CGMS Members to join in, in this effort.

Action 36.01 ROSCOSMOS/ROSHYDROMET, CMA/CNSA and other CGMS Members to provide JAXA with their points of contact if planning to join the activities of the CEOS Precipitation Constellation as microwave satellite operators. Deadline: 31 March 2009

JAXA-WP-05 provided information on the first ESA-JAXA joint development Earth Observation missions. JAXA has provide the Cloud Profiling Radar (CPR) to the joint ESA/Japan EarthCARE mission. The aim is to identify the global distribution and vertical structure of aerosol and clouds, and to reveal interaction by processing the data. The WP also described the specification and planned data products of the CPR.

ROSC-WP-03/ROSH-WP-03 reported on the future Russian multi-purpose space system "Arctica" which is intended for meteorology, oceanography, ice cover investigation, disaster monitoring and communication task fulfilment

over the Arctic region. The WP also provided information on the system structure, principal characteristics, spacecraft types (similar to Elektro-L), onboard instruments, ground reception and processing station composition. The launch of the "Arctica-M" sub-system satellite and the start of operations is proposed from 2012 to 2014.

WMO applauded the efforts of Russia for implementing a highly elliptical orbit mission with imager capability. WMO suggested reactivating the IGEOLAB-HEO initiative to foster cooperation on this matter, recalling the readiness of Canada and Finland to participate in such a project.

ROSHYDROMET thanked WMO for its overall support and the setting up of the associated IGEOLAB-HEO focus group, and explained that Canadian and Finnish participation was ongoing.

Table 6: Future R&D satellites discussed within CGMS
(as of 7 November 2008, sorted by organisation)

Satellites	Operator	Crossing Time	Planned launch date	Application and other information
SARAL	CNES/ISRO	Sun synchr.	2010	AltiKa (Ka band altimeter)
MEGHA-TROPIQUES	CNES/ISRO	Tropical region Non sun-synch. Low inclination	2009	Microwave radiometer (MADRAS), microwave humidity sounder (SAPHIR), Radio Occultation sounder, Earth radiation budget
HJ-1C	CNSA	6:00 D	2009-2010	Land, resource and environment monitoring
CBERS-03	CNSA/AEB	10:30 A	2010	Land, resource and environment monitoring
CBERS-04	CNSA/AEB	10:30 A	2012	Land, resource and environment monitoring
CRYOSAT-2	ESA	717 km Non-sun-synchronous	Nov 2009	Polar ice monitoring
GOCE	ESA	250 km (6:00 A)	2009	Gravity mission
SMOS	ESA	755 km (6:00 A)	Apr 2009	Salinity & Soil moisture
ADM-Aeolus	ESA	405 km (18:00 A)	Dec 2010	Wind profiles
SWARM (three satellites)	ESA	2 sats at 450 km 1 sat at 530 km (drifting up to 9 hours from the lower pair)	Oct 2010	Earth interior
EarthCare	ESA/JAXA	400 km (13:30D)	Sep 2013	Cloud, radiation, aerosols
OCEANSAT-2	ISRO	Sun synch.	2009	Scatterometer, Radio Occultation Sounder,
GOSAT "IBUKI"	JAXA & Japan's Ministry of Environment	13:00 666km sun-synchronous	Jan 2009	Greenhouse Gases Observing Satellite monitoring the distribution of the density of carbon dioxide

Satellites	Operator	Crossing Time	Planned launch date	Application and other information
OCO	NASA	705 km sun-synchronous polar	Jan 2009	Orbiting Carbon Observatory (observations of atmospheric carbon dioxide)
Aquarius	NASA/CONAE	657 km sun-synchronous	May 2010	Global sea surface salinity (SSS)
GPM	NASA/JAXA	407 km Non sun-synchr. (core-satellite)	Jul 2013	Global Precipitation Measurement, follow-on and expanded mission of the current on-going TRMM
GCOM-W1	JAXA	699.6 km sun-synchronous	JFY2011	Global water and energy circulation
GCOM-C1	JAXA	798 km Sun-synchronous	JFY2013	Carbon cycle and radiation budget (Atmosphere, Ocean, Land and Cryosphere)
LDCM (Landsat Data Continuity Mission)	NASA/US Geological Survey	828 km (at equator) sun-synchronous	Jan 2011	Extension of Landsat record of multispectral 30m resolution
Glory	NASA	824 km sun-synchronous	Jun 2009	in framework of Climate Change Research Initiative (CCRI) global distribution of natural and anthropogenic aerosols
Deep Space Climate Observatory (DSCOVR)	NASA (offices of Earth and Space Science)	L1	TBD	Measure how solar radiation affects climate by using Sun-Earth libration point L1 from which it will observe Earth
Kanopus-V N1	ROSCOSMOS	510-540 km sun-synchronous	2009	Monitoring of naturally occurring and man-made extreme events
Kanopus-V N2	ROSCOSMOS	510-540 km sun-synchronous	2011	Monitoring of naturally occurring and man-made extreme events

C.4 Reconfiguration of future combinations of LEO and GEO missions

No Working Paper was presented under this item.

D. OPERATIONAL CONTINUITY AND RELIABILITY

D.1 Global Planning, Including Orbital Positions and Reconfiguration of the Space-based Component of the GOS

ESA-WP-03 provided information on the content and status of an ESA initiative under the umbrella of its Earth Watch Programme. ESA has a large amount of data in its archives which are needed to obtain essential climate information. This initiative responds to the well-defined requirements emanating from the States signatory of the UNFCCC. It will implement actions which have been agreed between space agencies co-ordinated by CEOS, and the Global Climate Observing System (GCOS), by a formal process over

the last 3 years, and it will implement a range of activities including data preservation, re-calibration and re-processing of long term records, algorithm development, product generation and validation.

EUMETSAT pointed out that the Global Space-based Inter-calibration System (GSICS) is an international reference activity for satellite inter-calibration and this needs to be mentioned in this context. CGMS, therefore, suggested that ESA should become a Member of GSICS.

ESA informed CGMS that the full programme proposal makes explicit references to coordination with GSICS and the RSSC-CM. ESA commented that the new Chair of the CEOS CAL/VAL Working Group intends to participate as an Observer in the next GSICS meetings.

NOAA reminded CGMS that there will be a GSICS Executive panel meeting on Friday 7 November 2008.

EUM-WP-09 informed CGMS on the current activities and future plans of EUMETSAT to reach the objectives laid down in the "EUMETSAT Strategy: 2030", approved by EUMETSAT Member States in July 2006, in the specific domains of climate monitoring and operational oceanography.

Concerning Climate Monitoring, the WP first reviewed the activities of EUMETSAT in international initiatives and then presented the direct EUMETSAT contribution through EUMETSAT programmes and EUMETSAT Satellite Application Facilities (SAFs).

Concerning operational oceanography, the WP presented the relevance of current EUMETSAT programmes (MSG, EPS, Jason-2) and the specific contribution of the EUMETSAT Ocean and Sea Ice (OSI) SAF. It then elaborated on a set of planned EUMETSAT activities related to the development of a Jason Follow-On programme; on the operations of the Kopernikus (former GMES) Sentinel-3 oceanography mission by EUMETSAT; and on the access to third party data relevant for the oceanographic community.

ROSHYDROMET recalled its contribution (ice-cover in the Arctic region) to the RSSC-CM initiative and expressed interest in full participation in future. In response, WMO invited ROSHYDROMET to participate in the next RSSC-CM meeting to consider this proposal.

WMO-WP-16 presented the latest issue of the "Status of the space-based component of the Global Observing System (GOS)". The WP provided a continuation of the yearly series submitted by WMO, aiming at reviewing the status of satellite programmes and analysing particular aspects. It introduced a set of documents on the space-based component of the Global Observing System (GOS):

- **Volume I, "Satellite Programme Description"**, gathers information on satellite programmes from operational and R&D agencies. The number of space agencies and the nature of the programmes considered have been greatly extended in respect of previous issues.

- **Volume II, "Earth observation satellites and their instruments"**, gathers instrument descriptive tables for instruments that are currently operating, or close to be operating, or at an advanced stage of their approval process.

- **Volume III, "Gap analysis in the space-based component of GOS",** is based on the current schedule of current and planned programmes up to year 2025, and contains a gap analysis with respect to user requirements, taking into account the suitability of the technological level of current or planned instruments to meet these requirements. It is an update and expansion of a similar document presented to CGMS-35, and includes recommendations.

- **Volume IV, "Estimated performance of products from typical satellite instruments"**, is entirely new material. For 98 user-required geophysical parameters, it evaluates the data quality potentially achievable by those instruments in a typology of 29 instrument categories that are relevant for observing the parameters.

This dossier was provided in an electronic format with hyperlinks enabling navigation across the four volumes, provided that the volumes are saved in the same folder. It is intended to be used as a reference document, and its regular updating requires feedback from CGMS Members.

CGMS thanked WMO, and Dr. Bizzarri in particular, for the impressive amount of work and expertise contained in the dossier, and which makes it a useful reference. CGMS discussed the best approach to further maintain and make use of this set of reference documents and recommended the following way forward:

Recommendation 36.01: CGMS Satellite Operators to keep the WMO Space Programme Office informed of updates of their programmes, satellite and instrument plans to allow the Space Programme Office to incorporate this factual information into Volume I, II and III of the Dossier on the Space-based Global Observing System, as appropriate.

Recommendation 36.02: WMO to continue to keep the Dossier on the Space-based Global Observing System under review by the relevant groups of experts of WMO Members (e.g. the CBS/OPAG-IOS Expert Teams on Satellite Systems and on Satellite Utilization and Products).

ESA informed CGMS that CEOS was considering regular updates of the mission plans as an input for the CEOS/WMO database and for the CEOS Earth Observation Handbook.

Recommendation 36.03: WMO to coordinate as appropriate with CEOS for further updates of the Dossier on the Space-based Global Observing System, with a view to avoid duplication in the call for input from space agencies, taking into account the updating process of the CEOS Earth Observation Handbook (www.eohandbook.com).

Action 36.02: WMO to report at CGMS on the major updates brought to the Dossier on the Space-based Global Observing System. Deadline: CGMS-37

WMO-WP-17 presented updates to the Vision for the Global Observing System (GOS) to 2025 since the last meeting of CGMS. The new Vision for the GOS had been further developed using additional inputs from special workshops and OPAG-IOS Expert Teams and was endorsed by the CBS OPAG-IOS-ICT. The word "new" was used in the context that it represented an evolution since the original version which covered the period up to 2015, adopted by CBS in 2001, and subsequently endorsed by CGMS.

The Vision document provides high-level goals to guide the evolution of the Global Observing System in the coming decades, which are intended to be challenging but achievable. System specific recommendations are given for the evolution of both the surface and space-based sub-systems of the GOS.

CGMS satellite operators were invited to comment on this development, to support its refinement until CBS 2009 and to plan to contribute to its implementation in the coming decade.

Recalling the discussions of WGIII, NOAA commented that it would be difficult for GEO satellite operators to make any significant changes in geostationary orbit locations.

Concerning the LEO sun-synchronous satellite table, there were missions planned in mid-morning orbits around 09:30, and some satellite operators are considering different Equatorial Crossing Times (ECT) for afternoon orbits, however, no sounding mission is currently planned in an early morning orbit (17:30).

CGMS Members expressed their appreciation to WMO for preparing the Vision of the GOS, adding that it provided a very valuable roadmap for their activities in the years to come.

Recommendation 36.04: CGMS satellite operators are invited to take the Vision of the GOS into account when developing their own planning and to report at the next meeting of CGMS on their initiatives to respond and contribute to its implementation.

D.2 Inter-regional contingency measures

There were no Working Papers presented under this item.

D.3 Long-term global contingency planning

There were no Working Papers presented under this item.

E. SATELLITE REQUIREMENTS OF WMO AND IOC PROGRAMMES

E.1 World Weather Watch

WMO-WP-24 informed CGMS Members on WMO's Tropical Cyclone Programme activities and related satellite needs. It described recent and planned activities related to the use of satellite data in tropical cyclone applications and drew attention to the vital importance of satellite data to the detection, monitoring and structure characterisation of tropical cyclones and for predicting their evolution.

WMO-WP-18 provided a report on the actions within the Implementation Plan for Evolution of the GOS (IP-EGOS) that are relevant to CGMS. CGMS was invited to consider these actions and take them into account in future planning.

WMO added that this was in effect a living document, but would serve as a baseline document to track the evolution of the implementation to 2025. Information would be provided on the WMO web sites which would be updated at regular intervals in line with developments.

E.2 Other WMO Programmes

NOAA-WP-07 provided information on the progress regarding the Global Space-based Inter-Calibration System (GSICS). The main highlights include extensive inter-comparisons of the Metop-A Infrared Atmospheric Sounding Interferometer and the Earth Observing System Aqua Atmospheric InfraRed Sounder instruments. These comparisons show that the two instruments typically have small (~ 0.2 K) biases, except over very cold Earth scenes (T<230 K) where biases can increase. In regards to inter-calibration analysis between geostationary and low-earth-orbiting satellites, some results have been released by EUMETSAT, JMA, and NOAA. These results are available on the local GSICS web pages being developed by the GSICS Processing and Research Centers. Communication amongst GSICS members has been fostered through meetings of the GSICS Research and Data Working Groups and the GSICS Executive Panel, as well as through the GSICS Quarterly newsletter. The central GSICS web site, currently hosted by NOAA, is also overhauled to make the site more user-friendly, maintainable, and extendable. Finally, progress has been made on setting priorities for GSICS information services and products, as well as developing a procedure for product acceptance within GSICS.

NOAA expressed its appreciation for the significant progress made so far, adding that it was a very complex subject and there was still much work to be done. NOAA encouraged other CGMS Members to participate in GSICS activities in the years to come.

The Chairman added that he would raise the profile of GSICS at the CEOS Plenary meeting the following week.

WMO-WP-22 highlighted the priority satellite observation requirements in support of ocean applications as detailed in the JCOMM Observations Programme Area strategic work plan for building a sustained Global Ocean Observing System in support of the Global Earth Observation System of Systems. These include (i) sea surface temperature, (ii) sea surface height, (iii) surface vector winds, (iv) ocean colour, and (v) sea ice. The gap analysis produced by JCOMM as part of the Statement of Guidance for Ocean Applications is addressing the requirements for Met-ocean forecasts and services (global and regional wave modelling and forecasting, marine meteorological services, including sea-ice, and ocean mesoscale forecasting). Wave observations and sea level are key variables for which satellite observations are needed.

CGMS Members were invited to note that the JCOMM Observations Programme Area is working on producing a more comprehensive document on the integrated observing strategy for a number of geophysical variables including sea surface temperature, sea surface height, ocean vector winds, chlorophyll-a, sea-ice, sea state, and sea surface salinity. The document should be delivered for JCOMM-III (Morocco, November 2009) and will address the observing strategy for these geophysical variables with emphasis on operational utility and on the integrated nature of the space and in situ observing components.

WMO-WP-23 (which included a PowerPoint presentation) reported on the Global Observing Systems (WIGOS) initiative, the WIGOS Development and Implementation Plan (WDIP), and its Concept of Operations (CONOPS). Information was also provided on current activities related to the implementation of the WIGOS concept, including the Pilot Projects and Demonstration Projects for the Development and Implementation of WIGOS within NMHSs.

The importance of the space-based component for WIGOS was stressed by the Implementation Coordination Team for Integrated Observing Systems (ICT-IOS). Guidance from CGMS was welcomed for the development of the space-based aspect of WIGOS and in particular with respect to the potential space related activities that should contribute to the WDIP. For example, the Pilot Project on Marine Meteorology may offer a particular scope for a significant contribution from space. GSICS might also be considered as a model case for global integration of space-based observations at data quality level.

CGMS was invited to:

- Comment on the possible role of space agencies for the development of the space-based aspect of WIGOS, and indicate potential space related activities that should contribute to the WDIP;
-
- Consider in particular possible support from satellite operators to the Pilot Project on Marine Meteorology for fostering integration of space-based ocean surface wind data with surface-based wind observation; and

- Consider GSICS as a potential new Pilot Project demonstrating the benefit of integration at the data quality level.

Recommendation 36.05: GSICS Executive Panel to develop a WIGOS pilot project proposal based on GSICS activities. Deadline: February 2009

WMO-WP-26 provided the current status of implementation of the International Polar Year 2007-2008 (IPY) that started in March 2007 and will be continued up to March 2009. CGMS was informed on the current activities of the Space Task Group (STG) of the Sub-Committee on Observations of the ICSU/WMO Joint Committee for the IPY. It stressed that the STG is instrumental in mobilising the data acquisition and processing resources of Space Agencies to meet IPY science priorities and provide substantial contributions to the development of the Global Inter-agency IPY Polar Snapshot Year (GIIPSY) project. Significant progress had been achieved by Space Agencies during the first year of IPY in response to acquiring comprehensive Arctic and Antarctic snapshots. An impressive array of new data products have been acquired and archived, and a number of further key acquisition plans developed to address some of the key IPY scientific goals. Results also demonstrated significant progress in building a space-borne component of the IPY data legacy.

CGMS supported the two recommendations proposed in the WP.

Recommendation 36.06: WMO to maintain the International Polar Year (IPY) Space Task Group (STG) as a mechanism to promote cooperation between major satellite agencies ensuring coordination of their polar observations beyond IPY.

Recommendation 36.07: CGMS Members to continue their coordination of international efforts in securing collection of space-borne "snapshots" of the Polar Regions during the IPY and to give further consideration to the establishment of a preliminary structure for sustaining observations in the future, with the goal to achieve a Polar Satellite Constellation as a significant part of the IPY legacy.

E.3 IOC Programmes

ESA-WP-04 informed CGMS about the ocean related parameters provided or planned by ESA missions: ERS, Envisat, Explorer and GMES Space

programme. Many of them are relevant to IOC requirements. Additional information can also be found at http://envisat.esa.int/ and http://www.estec.esa.nl/explorer/

F. WORKING GROUP REPORTS

Reports from the four working groups were presented by Mr Marlin O Perkins (WG I on Telecommunications), Dr Toshiyuki Kurino (WG II on Satellite Products), Mr Gary Davis (WG III on Global Contingency Planning) and Mr Mikael Rattenborg (WG IV on Global Data Dissemination).

CGMS-36 took note of the reports and thanked the Working Group participants, Chairmen and Rapporteurs for their active and fruitful discussions.

CGMS-36 endorsed the proposed actions and recommendations formulated by each Working Group and congratulated the four Groups for their comprehensive reports and for their achievements since the preceding meeting of CGMS.

G. INTERACTION WITH GEO

G.1 Applications of Meteorological Satellite Data for Environment Monitoring

EUM-WP-10 presented the status of the Network of EUMETSAT Satellite Application Facilities (SAF). The first 7 approved SAFs started a 5-year Continuous Development and Operations Phase (CDOP) in March 2007 and they operationally distribute MSG and EPS based products and software.

In the period to 2012, the SAF network will continue the development and operations phase and will carry on operations based upon Meteosat and third party products, Metop-based product validation, and the development and operations of new products, including post-MSG and post-EPS.

A further CDOP period is anticipated for 2012-2017 approved to be financed as part of the MTG Programme.

In response to recommendation 35.14, NOAA-WP-21 reported that a geostationary fire monitoring network was technically feasible but had to be supported by operational agencies to sustain the activity and produce standardised long-term data records and derived fire inventories of known accuracy. This requires commitment from operational agencies for ongoing support of global geostationary fire monitoring through appropriate sensor design and application and subsequent ongoing characterisation.

In order to ensure that future geostationary sensors are capable of active fire detection and characterisation, the fire monitoring community should be involved in evaluating specifications for next generation operational

geostationary satellites and provide feedback to operational agencies on issues relating to data access and pre-processing chains, pixel saturation in the middle and long-wave IR window bands, characterization of sensor behaviour at high temperatures, navigation, band-to-band co-registration, PSF implications, and cal/val.

CGMS-36 adopted the following action:

Action 36.03: CGMS agencies with current and/or future geostationary programmes to review CGMS-36 NOAA-WP-21, and to complete an assessment on the level of compliance to the recommendations in the Working Paper. Deadline: 31 May 2009

G.2 GEONETCast/EUMETCast

EUM-WP-11 provided information on GEONETCast, which comprises three major dissemination systems, namely, GEONETCast Americas, by NOAA, FENGYUNCast, by CMA and EUMETCast, by EUMETSAT. Together they have nearly achieved global coverage. The three GEONETCast Network Centres (GNC) NOAA, CMA and EUMETSAT are interconnected with bi-lateral data exchange for the exchange of GEONETCast relevant data. All three GNCs are disseminating their GEONETCast contributions in their respective footprints on an operational basis. The next steps are to include the contributions of the other GNCs into their respective regional dissemination. EUMETSAT is already disseminating those contributions of NOAA and CMA on all EUMETCast footprints covering Europe, Africa and South America.

The WP presented in more detail the actual status of the GEONETCast system, in particular, the respective participating dissemination systems, data exchange and data services supported, and likely near term evolution. Additional focus was placed upon the actual status and intended evolution of EUMETCast services, which were seen as a major contribution to GEONETCast. The WP also provided an overview of the GEONETCast Product Navigator which is provides one-stop-shop access to GEONETCast data discovery.

WMO strongly encouraged the initiative and proposed a close monitoring of the evolution of the NOAA/CMA/EUMETSAT components of GEONETCast due to its importance for all users of the services provided. WMO invited other CGMS agencies to join the discussions on GEONETCast.

NOAA thanked EUMETSAT for having started the initiative, adding that there will be demonstrations at several high profile events in the coming months and years.

CMA confirmed it will continue to support the GEOSS through its contribution to GEONETCast and endevour to broaden its user base.

WMO enquired whether there would be a distribution of FY-3 data and products on GEONETCast. In response, CMA informed CGMS that it was considering the distribution of some FY-3 level 2 products by Fengyungcast. However, this would be in accordance with user requirements.

CMA added that it was looking at ways to accommodate the large FY-3 data-set on Fengyungcast and would report to CGMS-37 accordingly.

The discussions concluded with EUMETSAT suggesting that GEONETCast should be seen as a complementary service to the WMO IGDDS and this would enhance its use by the wider GEOSS community. The system had great potential for providing new data-sets and products to users. A recent example being the sand/dust products for African users demonstrated by AEMET (the Spanish Meteorological Agency) during the CGMS-36 technical visit.

G.3 CGMS and GEO/GEOSS interactions

There were no Working Papers presented under this item.

H. OTHER ITEMS OF INTEREST

H.1 Training

CMA-WP-11 informed CGMS that a short training course had been held at the WMO/CGMS Virtual Laboratory Centre of Excellence in Beijing from 8-17 October 2008, sponsored by CMA. 36 forecasters from 4 countries attended the course which was designed to extend knowledge on satellite meteorology, and more recent operations, scientific research and applications of meteorological satellites. CMA expressed its appreciation for the lectures by Dr Jim Purdom, from CIRA, USA, which contributed so much to the success of the course. The lectures were greatly appreciated by the students.

EUM-WP-12 reported on the status and future plans for its training activities in satellite meteorology and those in support of the Centres of Excellence (CoE) in Africa, the Middle East and Europe.

The WP also provided information on two important training milestones, namely, the recently approved EUMETSAT Training Strategy and the EUMETSAT 5-year Training Plan 2009-2013.

JMA-WP-07 reported on its Virtual Laboratory activities and the experiences of JMA to date.

In March 2008, JMA thoroughly redesigned the MSC's website, including JMA's VRL website. JMA has renewed the training materials on the VRL website, reflecting the latest training materials used in training courses at JMA. JMA has provided the group training course in meteorology with the Japan International Cooperation Agency (JICA) since 1973 which is held annually from September to December. In addition, since VLMG-3, JMA has

dispatched meteorologists to Fiji and Cambodia as JICA experts on satellite meteorology. Moreover, JMA dispatched an expert to the Indonesian Meteorological and Geophysical Agency (BMG) in Jakarta in August 2007.

KMA-WP-09 reported on the 2nd International Training Course on the analysis of COMS data in Korea, held in Seoul, Republic of Korea, from 18 September to 9 October 2008. CGMS noted with interest that KMA had organised this training course for potential foreign users of its data from 12 countries from the Asia-Pacific area in order to introduce them to the COMS programme and to form a user community for COMS data.

The Virtual Laboratory Management Group co-Chair from EUMETSAT noted the KME training activities with great interest and invited KMA to participate in the Virtual Laboratory initiative. This proposal was warmly supported by WMO.

NOAA-WP-08 reported on NOAA support for the CGMS Virtual Laboratory Focus Group, and the status of Virtual Laboratory Activities carried out during 2007 and 2008. NOAA has also worked with WMO Virtual Laboratory (VL) members and the Argentina and Brazilian "RMTCOE" in preparation for a September 2008 training event. NOAA, in coordination with Costa Rica and Barbados, held monthly virtual Focus Group sessions. The Cooperative Institute for Research in the Atmosphere (CIRA) has assisted with the Barbados briefing sessions held for the benefit of Caribbean countries. They were held weekly during the tropical 2007 season and less frequently throughout the "dry" months. A web page at CIRA has been created to showcase the cooperative activities of WMO's "Regional Meteorological Training Centres of Excellence" http://rammb.cira.colostate.edu/training/rmtc/

In 2008/2009, NOAA plans to participate in the Argentina training event 22 September – 3 October, prepare for next virtual training event, continue with Monthly Focus Group briefings (English and Spanish) using VISITview and CIRA server.

It was agreed that WMO-WP-20 should be presented before WMO-WP-19.

WMO-WP-20 reported on training activities within the Virtual Laboratory (VL) since CGMS-35 along with future plans and directions. It described the outcome of the fourth meeting of the VL Management Group (VLMG) in September 2008 and invited CGMS to consider the following VLMG recommendations:

(1) CGMS Members to endorse the addition of a new Virtual Laboratory Centre of Excellence in South African Weather Service (SAWS) sponsored by EUMETSAT;

(2) CGMS Members to endorse the addition of a new Virtual Laboratory Centre of Excellence under the Russian framework located at Russian institutes and sponsored by Roshydromet;

(3) Satellite operators that sponsor a Centre or Centres of Excellence are urged to work closely with them in the formation of Regional Focus Groups similar to the WMO VL Focus Group of the Americas reported on at CGMS-34 and 35; and

(4) There is a need for a technical support officer for support of the planned training and education activities as elaborated through the new Virtual Laboratory strategy and the ET-SUP work plan, who could be located at a CoE and sponsored by satellite operators.

WMO-WP-19 presented the new training strategy of the Virtual Laboratory for Education and Training in Satellite Meteorology for the next five years. The Virtual Laboratory (VL) has undergone considerable growth since its formal inception in 2001. WMO and CGMS members have become increasingly aware of the importance of the use of satellite data for a number of Societal Benefit Areas. Because of the VL's growth and scope of activity, it was deemed important that the VL develop a five-year training strategy.

The new strategy was developed by the Virtual Laboratory Management Group after its third meeting (VLMG-3) in June 2007, discussed at VLMG-4 in September 2008, and presented for the first time to the WMO Expert Team on Satellite Utilization and Products, also in September 2008. The strategy was subsequently adopted at the WMO CBS Open Programme Area Group on Integrated Observing Systems Implementation and Coordination Team later that month. It is the intent of the CBS OPAG-IOS to take this strategy forward to the Commission for Basic Systems (CBS) for adoption.

The strategy foresees i) an expansion in the scope of training addressing environmental satellite data applications; ii) a strengthening of the VL network through additional Centres of Excellence and closer coordination; iii) improving the VRL through a centralised portal; iv) to rely more on blended learning methods which combine e-learning and face-to-face training; and v) to reaffirm and enhance the role of Regional Focus Groups.

CGMS was invited to:

- Review the VL training strategy and comment as necessary; and
- Adopt the new VL training strategy for the next five years, as a sponsor of the VL.

Expressing its appreciation for the presentations made by Dr Purdom and Dr Gaertner, NOAA offered its full support for the proposals made in the WP and invited the VLMG co-Chairs to continue with the process of seeking the necessary resources.

CGMS agreed that this training initiative would ensure the upcoming availability of the next generation of remote sensing scientists and technicians.

Strongly supporting the initiative, CMA added that it was very important that forecasters acquire the right level of knowledge, therefore it was highly desirable that the instructors were fully trained in the use of satellite data and products.

WMO thanked the VLMG co-Chairs for having developed the strategy which provided a roadmap for VL activities for the next five years.

WMO added that the success of the VL to date was actually restricting its further development. There was a very clear need for an additional technical support officer to coordinate and further develop the many activities which the VL had set in place. WMO recalled that the successful and effective exploitation of satellite data and products was highly linked to the level of training provided.

ROSHYDROMET expressed its appreciation to EUMETSAT for the provision of training lectures at recent Russian training events.

Concluding the discussion, CGMS-36:

- Approved the new Virtual Laboratory training strategy;

- Endorsed the addition of a new Virtual Laboratory Centre of Excellence in South African Weather Service (SAWS) sponsored by EUMETSAT;

- Endorsed the addition of a new Virtual Laboratory Centre of Excellence (CoE) under the Russian framework located at Russian institutes and sponsored by Roshydromet;

- Agreed that Satellite operators sponsoring Centres of Excellence should work closely with them in the formation of Regional Focus Groups similar to the WMO VL Focus Group of the Americas reported on earlier CGMS meetings;

- Agreed that there is a need for a technical support officer for support of the planned training and education activities as elaborated through the new Virtual Laboratory strategy and the ET-SUP work plan, who could be located at a CoE and sponsored by satellite operators; and

Action 36.04: The VLMG co-Chairs to set in place the procedure to recruit the technical support officer whose list of duties were presented in the Working Paper and to report to CGMS-37. Deadline: CGMS-37

H.2 Information

Following the discussions at CGMS-35, and in response to CGMS action/recommendation A35.11 and A35.12, EUM-WP-13 reported on the status of the CGMS web site. The WP described CGMS pages hosted on the EUMETSAT and WMO web sites and which provided general information on

CGMS, its organisation, membership, scope and objectives, activities and publications, as well as the latest satellite status and GSICS.

With the overall aims of fostering and enhancing the presence of CGMS on the Internet, and as a means to coordinate the ongoing web initiatives by the CGMS Secretariat and WMO, the WP proposed that CGMS Members complete their point of contact nominations for the CGMS web editorial committee as soon as possible.

The WP also proposed that the CGMS web editorial committee, once fully established:

- evaluate the possibility for CGMS Members to create dedicated CGMS pages on their institutional web sites, thereby reflecting their specific CGMS involvement and delivering background information on their CGMS participation; and

- review the coordination and content of the general CGMS pages hosted by EUMETSAT (as the CGMS Secretariat) and WMO, with the aim of ensuring that adequate links are set up.

CGMS-36 endorsed the proposed approach and way forward presented in the WP. It also reaffirmed previous Actions 35.11 and 35.12 with new deadlines and adopted a new Recommendation:

Action 35.11: All CGMS Members to designate points of contact to support the CGMS web editorial committee. New deadline: 31 December 2008

Action 35.12: WMO and CGMS Secretariat to establish a CGMS web editorial committee by March 2009 in order to guide the completion and enhancement of the CGMS web presence and the ftp server and ensure their sustainability. New deadline: March 2009 and to report to CGMS-37

Recommendation 36.08: The CGMS web editorial committee to evaluate suggesting to CGMS Members the creation of a dedicated CGMS page on their institutional web sites, and to define broad guidelines for the preparation of such a page. Deadline: October 2009 and to report to CGMS-37

EUM-WP-14 gave a brief summary of conferences and events which had taken place since CGMS-35 and listed those planned for the next two years. EUMETSAT's recent, current and future publications were also listed.

Major events included a Jason-2 launch event on 20 June 2008 at the Belgian Senate; the annual EUMETSAT Meteorological Conference held in September 2008 (with around 400 participants), the main theme being operational oceanography. The next Conference in this series will be held in Bath, UK, and will focus on climate change. The SpaceOps conference jointly organised by EUMETSAT and ESA in May 2008 focused on the theme of

"Protecting the Earth – Exploring the Universe". EUMETSAT also actively contributed to the GMES Lille Conference in September 2008 which focused on demonstrating the already-available GMES services and to interact with potential users.

EUMETSAT expressed its special appreciation to Dr Purdom for his contribution on the value of satellite meteorological data made at the SpaceOps conference.

WMO-WP-21 referred to the need for comprehensive user information. It noted that one outcome of the biennial user enquiry performed by WMO was the need for more information on available satellite data, products and services, which was seen as a key limiting factor for their wide and effective use. Two particular actions are envisaged by the WMO Space Programme Office to address this need:

(i) To complement the satellite status information provided through the CGMS web pages maintained by WMO (http://cgms.wmo.int) with an indication of the actual available data access means, in line with CGMS-35 Actions 35.28 and 35.29 which are still open;

(ii) To maintain a list of recognized sources of satellite products that are operationally available, organized in a thematic way. A sketch of such a description is currently provided for some product categories at: http://www.wmo.ch/pages/prog/sat/onlineproducts.htm

The WP added that (ii) would be expanded and a selection performed in due course. Furthermore, this action would be pursued with the support of the VL partners and CGMS satellite operators.

H.3 Any other business

There were no working papers presented under this item.

I. FINAL SESSION

I.1 Nomination of CGMS Representatives at WMO and other meetings

CGMS-36 agreed that EUMETSAT would represent CGMS at the 61st Executive Council of WMO (EC-LXI) on 3-12 June 2009, in Geneva, Switzerland.

CGMS-36 agreed that EUMETSAT would represent CGMS at the Commission for Basic Systems CBS-XIV, on 25 March-2 April 2009 in Dubrovnik, Croatia

CGMS-36 agreed that the outgoing CGMS Rapporteur, Dr James Purdom, will represent CGMS at the 7th session of the International Core Steering

Committee for THORPEX (THORPEX ICSC) on 18-20 November 2008 in Geneva, Switzerland.

CGMS was informed of the imminent need to appoint a new Rapporteur to THORPEX, who will also serve as its representative to the THORPEX ICSC, and agreed that EUMETSAT, as the CGMS Secretariat, and WMO will, in due course, identify a suitable candidate for endorsement by the CGMS Members.

Recommendation 36.09: Nomination of CGMS representative to attend the 3rd THORPEX International Science Symposium on 9-13 Mar 09 in Monterey, USA. Deadline: 14 February 2009

CGMS also agreed that the WMO Space Programme will represent CGMS at the 15th session of the Commission for Atmospheric Sciences (CAS-XV) on 18-27 November 2009 in Korea.

CGMS finally agreed that EUMETSAT, as the CGMS Secretariat, and NOAA will represent CGMS at the NOAA's 2008 Satellite Direct Readout Conference on 8-12 December 2008, in Miami, USA.

I.2 Nomination of Chairpersons of Working Groups for CGMS-37

- **Working Group I on Telecommunications** will be chaired by Mr Marlin O Perkins, with Mr Gordon Bridge as Rapporteur;

- **Working Group II on Satellite Products including Satellite-Derived Winds** will be chaired by Dr Zhang Peng, CMA, with Dr Johannes Schmetz and Dr Mitch Goldberg as rapporteurs;

- **Working Group III on CGMS Global Contingency Planning** will be chaired by Mr Gary Davis, with Mr Jerome Lafeuille as Rapporteur;

- **Working Group IV on Global Data Dissemination** will be chaired by Mr Mikael Rattenborg, with Mr Gordon Bridge as Rapporteur.

I.3 Any Other Business

WMO reported that, following an exchange of correspondence in January 2008, the Brazilian Institute for Space Research (INPE) was recognised as an agency contributing to the Global Observing System, in particular through the China-Brazil Earth Resources Satellite (CBERS) programme. INPE was furthermore actively supporting training activities through the Centre of Excellence based in the Centre for Weather Forecasting and Climate Studies (CPTEC) in Cachoeira Paulista. INPE will be informed of the possibility to participate in CGMS, as a GOS contributing agency.

I.4 Summary List of Actions from CGMS-36

Actions open from CGMS-35 (at CGMS-36)					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
NOAA	35.01	Action 35.01: NOAA to provide more detailed information on the DMSP satellite system. Deadline: CGMS-36	NOAA-WP-02&03. The CEOS Earth Observation Handbook also provides information on this matter available on www.eohandbook.com IPWG was approached via e-mail to provide specific details on the mission, to which the IPWG co-chair Ralph.R.Ferraro@noaa.gov provided during CGMS-36. As a result, reporting will be made at CGMS-37.	(CGMS-36) New deadline: CGMS-37	OPEN
NASA	35.02	Action 35.02: CGMS invited NASA to provide information on its current R&D Earth Observation satellites. Deadline: CGMS-36	NOAA will investigate if they can disseminate the NASA Decadal report to CGMS.	(CGMS-36) New deadline: 31 Dec 2008	OPEN
CGMS Members	35.11	Action 35.11: All CGMS Members to nominate points of contact to support the CGMS website editorial committee. Deadline: 31 December 2007	ESA: TBD EUM: anne.taube (at) eumetsat.int, piero.valabrega (at) eumetsat.int JMA/MSC: Mr. Motoo Hayashi, System Engineering Division Tel: +81-42-493-4976, Fax: +81-42-492-2433, E-mail: mhayashi (at) met.kishou.go.jp NOAA: daniel.muller (at) noaa.gov WMO: jlafeuille (at) wmo.int	(31 Dec 2007) New deadline: 31 Dec 2008	OPEN
WMO, EUM	35.12	Action 35.12: WMO and CGMS Secretariat to establish a CGMS web editorial committee by March 2008 in order to guide the completion and further enhancement of the CGMS website and the ftp server and ensure their sustainability. Deadline: March 2008 and to report to CGMS-36	EUM-WP-13 Action was deferred due to lack of availability on both sides.	(CGMS-36) New deadline: 31 Mar 2009	OPEN
NOAA, EUM	35.31 WGIV	Action 35.31: NOAA and EUMETSAT to study possibilities for the use of NPOESS ground infrastructure to improve the timeliness of Metop data, within the framework of JPS discussions and report findings to CGMS. Deadline: CGMS-36	Discussed in WGIV. NOAA: NOAA and EUMETSAT are engaged in ongoing discussions regarding the use of NOAA ground infrastructure to improve timeliness of Metop data.	(4 Nov 2008) New date: CGMS-37	OPEN
CGMS Members	35.32 WGIV	Action 35.32: CGMS members involved with the IGDDS to consider applying as DCPCs within the context of the IGDDS and WIS, in consultation with WMO. Deadline: May 2008	Discussed in WGIV. WMO-WP-13 WMO was informed of the intention of JMA to prepare an application. Letter sent by WMO Oct 2008 to all WMO Members and EUMETSAT, informing on the process of GISC/DCPC designation, and inviting to notify their intention to apply.	(31 May 2008) New deadline: 31 Dec 2008	OPEN

CGMS-36 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 e-mail, of Satellites (tables 1-6 of the plenary report). The Secretariat to review the tables of current and planned polar and geostationary satellites, and to distribute this updated information, via the WWW Operational Newsletter, via Electronic Bulletin Board, or other means as appropriate. CGMS satellite operators to update table 7 for polar-orbiting satellite equator crossing times on an annual basis. CGMS Members to update the table on polar-orbiting satellite equator crossing times as well as the table on coverage from geostationary satellites. *(CGMS-35 permanent actions 02 and 09 were closed and are partly incorporated in permanent action 01).*		CGMS-36	OPEN
CGMS satellite operators	Permanent 02	CGMS Members to report on spacecraft anomalies from solar events at CGMS meetings. *NB The Secretariat has included the word "spacecraft" in this permanent action since CGMS-35*		CGMS-36	OPEN
CGMS Members	Permanent 03	CGMS Members to provide information for the WMO database of satellite receiving equipment, as appropriate.		CGMS-36	OPEN
CGMS Members	Permanent 04	CGMS Members to review the list of available list servers used by CGMS groups and update as appropriate.		CGMS-36	OPEN
CGMS Members	Permanent 05	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).		CGMS-36	OPEN

CGMS-36 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
ROSC, ROSH, CMA, CNSA	36.01	Action 36.01 ROSCOSMOS/ROSHYDROMET, CMA/CNSA and other CGMS Members to provide JAXA with their points of contact if planning to join the activities of the CEOS Precipitation Constellation as microwave satellite operators. Deadline: 31 March 2009		31 Mar 2009	OPEN
WMO	36.02	Action 36.02: WMO to report at CGMS on the major updates brought to the Dossier on the Space-based Global Observing System. Deadline: CGMS-37		CGMS-37	OPEN
CGMS agencies	36.03	Action 36.03: CGMS agencies with current and/or future geostationary programmes to review CGMS-36 NOAA-WP-21, and to complete an assessment on the level of compliance to the recommendations in the Working Paper. Deadline: 31 May 2009		31 May 2009	OPEN
VLMG co-Chairs	36.04	Action 36.04: The VLMG co-Chairs to set in place the procedure to recruit the technical support officer whose list of duties were presented in the Working Paper and to report to CGMS-37. Deadline: CGMS-37		CGMS-37	OPEN
CGMS satellite operators	WGI 36.05	Action 36.05 All CGMS satellite operators are invited to consider the above proposal and the status of discussions at SFCG for a coordinated future use of the band 401 – 403 MHz, and to provide responses to the CGMS Secretariat. Deadline: 30 December 2008		30 Dec 2008	OPEN
EUM	WGI 36.06	Action 36.06 CGMS Secretariat to develop a coordinated response, based on the input received from CGMS members, on the future use of the 401 - 403 frequency band. Deadline: 31 January 2009.		31 Jan 2009	OPEN
EUM	WGI 36.07	Action 36.07 CGMS Secretariat to request WMO to coordinate a separate meeting of all CGMS satellite operators that are in attendance at the Working Party 7B and 7C meetings in Geneva, Switzerland, February 2009, to discuss the coordination of the CGMS response to the proposal for future use of the 401 – 403 MHz band. Deadline: 30 December 2008		30 Dec 2008	OPEN
EUM	WGI 36.08	Action 36.08 CGMS Secretariat to develop a final, coordinated report, based on CGMS members input, for the future use of the 401 – 403 MHz frequency band. Deadline: 30 April 2009		30 Apr 2009	OPEN
EUM	WGI 36.09	Action 36.09: CGMS Secretariat to present the CGMS coordinated response on the future use of the 401 – 403 MHz band at the SFCG meeting in June 2009. Deadline: 1 June 2009		1 June 2009	OPEN
EUM	WGI 36.10	Action 36.10: CGMS Secretariat to send a letter thanking the SFCG Executive Secretariat for the "SFCG Liaison Statement to CGMS." Deadline: 30 November 2008		30 Nov 2008	OPEN
CGMS Members	WGI 36.11	Action 36.11: CGMS members should implement the IDCS frequency allocation plan change in their systems and update the associated documentation and web pages. The Secretariat will update the IDCS Users' Guide. Due date 31 July 2009		31 Jul 2009	OPEN
NOAA	WGII 36.12	Action 36.12: NOAA to facilitate the setting up of a small Working Group comprising CGMS representatives to encourage public access of agency satellite datasets for nowcasting applications. Deadline: CGMS-37		CG<S-37	OPEN
CGMS Members	WGII 36.13	Action 36.13: All CGMS Members to make available the instrument characterisation of their imaging and sounding instruments in polar and geostationary orbit, in particular the spectral response functions. This should include both the currently operational as well as all previous instruments. It is sufficient to make available the web link where the instrument characterisation data can be found. Deadline: 30 May 2009		30 May 2009	OPEN

CGMS-36 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
GSICS	WGII 36.14	Action 36.14: GSICS to finalise recommendations for its instrument performance monitoring website. Deadline: CGMS-37		CGMS-37	OPEN
GSICS (+ CEOS WG)	WGII 36.15	Action 36.15: GSICS, in consultation with CEOS WG Cal/Val, to finalise development of guidelines for prelaunch instrument characterization. Deadline: CGMS-37		CGMS-37	OPEN
CGMS agencies	WGII 36.16	Action 36.16: CGMS agencies to provide URL addresses of satellite-based climate datasets to the CGMS Secretariat for posting on the CGMS website. Deadline: CGMS-37		CGMS-37	OPEN
WMO, EUM	WGII 36.17	Action 36.17: WMO and the CGMS Secretariat to initiate the formation of the small group (J. Lafeuille [WMO], M. Goldberg (NOAA) and J. Schmetz [EUMETSAT]) to consider the role of a new International Radio- occultation Working Group under CGMS and to elaborate its draft terms of reference. Deadline: CGMS-37		CGMS-37	OPEN
IWWG Co-Chairs (+ Dr Genkova)	WGII 36.18	Action 36.18: Co-Chairs of IWWG, jointly with Dr Iliana Genkova, to provide a summary paper describing and evaluating the CGMS AMV intercomparisons using MSG image data. Deadline: CGMS-37		CGMS-37	OPEN
CGMS satellite operators	WGII 36.19	Action 36.19: Satellite operators deriving AMVs to summarise their methods and ways to characterise the AMV errors, with emphasis on the height assignment error. Deadline: CGMS-37		CGMS-37	OPEN
EUM	WGII 36.20	Action 36.20: CGMS Members to present WPs to CGMS-37 describing their processes for product development, verification and implementation into operations, as well as the process for continuous improvement. Deadline: CGMS-37		CGMS-37	OPEN
	WGII 36.21	Action 36.21: The CGMS Secretariat to include “Coordination of code forms for satellite data” within the agenda of WG IV, instead of WG II for future CGMS meetings. Deadline: CGMS-37		CGMS-37	OPEN
WMO Task Force on Codes	WGII 36.22	Action 36.22: WMO Task Force on Codes to investigate whether the WMO file naming convention can be made more flexible than merely having (long filename).bin for all data types. Deadline: CGMS-37		CGMS-37	OPEN
WMO	WGII 36.23	Action 36.23: WMO to revise the Terms of Reference of the Task Force on Satellite Data Codes as proposed by the Task Force. Deadline: 28 Feb 2009		28 Feb 2009	OPEN
WMO	WGIII 36.24	Action 36.24: WMO to convene a contingency planning workshop in the second half of 2009 in order to investigate critical missions and associated potential contingency actions regarding the new missions implied by the Vision for the GOS in 2025. Deadline: 30 June 2009		30 Jun 2009	OPEN
EUM	WGIV 36.25	Action 36.25 : CGMS Secretariat to propose a revised Terms of Reference for Working Group IV to reflect the fact that it will now also include activities of the CGMS Task Force on satellite data codes. Deadline: 31 December 2008		31 Dec 2008	OPEN
CGMS Members	WGIV 36.26	Action 36.26 : CGMS Members to nominate their participants to the CGMS Task Force on Satellite Data Codes. Deadline: 31 January 2009		31 Jan 2009	OPEN
CGMS Task Force on Codes	WGIV 36.27	Action 36.27: CGMS Task Force on Satellite Data Codes to propose a permanent framework for the activity by CGMS-37. Deadline: CGMS-37		CGMS-37	OPEN
CMA	WGIV 36.28	Action 36.28: CMA to investigate possibilities for the provision of global FY-3 data to the GTS main trunk network and report back at CGMS-37. Deadline CGMS-37		CGMS-37	OPEN

CGMS-36 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
NOAA	WGIV 36.29	Action 36.29: NOAA to provide CGMS with more information on the reception of GOES-R data sets. Deadline: CGMS-37		CGMS-37	OPEN
NOAA	WGIV 36.30	Action 36.30: NOAA to consider options for a multi-cast service in support of the dissemination of GOES-R data and products and inform CGMS accordingly. Deadline: CGMS-37		CGMS-37	OPEN

CGMS-36 recommendations					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS satellite operators	Recommendation 36.01	Recommendation 36.01: CGMS Satellite Operators to keep the WMO Space Programme Office informed of updates of their programmes, satellite and instrument plans to allow the Space Programme Office to incorporate this factual information into Volume I, II and III of the Dossier on the Space-based Global Observing System, as appropriate.		CGMS-37	OPEN
WMO	Recommendation 36.02	Recommendation 36.02: WMO to continue to keep the Dossier on the Space-based Global Observing System under review by the relevant groups of experts of WMO Members (e.g. the CBS/OPAG-IOS Expert Teams on Satellite Systems and on Satellite Utilization and Products).		CGMS-37	OPEN
WMO	Recommendation 36.03	Recommendation 36.03: WMO to coordinate as appropriate with CEOS for further updates of the Dossier on the Space-based Global Observing System, with a view to avoid duplication in the call for input from space agencies, taking into account the updating process of the CEOS Earth Observation Handbook (www.eohandbook.com).		CGMS-37	OPEN
CGMS satellite operators	Recommendation 36.04	Recommendation 36.04: CGMS satellite operators are invited to take the Vision of the GOS into account when developing their own planning and to report at the next meeting of CGMS on their initiatives to respond and contribute to its implementation.		CGMS-37	OPEN
GSICS Executive Panel	Recommendation 36.05	Recommendation 36.05: GSICS Executive Panel to develop a WIGOS pilot project proposal based on GSICS activities. Deadline: February 2009		28 Feb 2009	OPEN
WMO	Recommendation 36.06	Recommendation 36.06: WMO to maintain the International Polar Year (IPY) Space Task Group (STG) as a mechanism to promote cooperation between major satellite agencies ensuring coordination of their polar observations beyond IPY.		CGMS-37	OPEN
CGMS Members	Recommendation 36.07	Recommendation 36.07: CGMS Members to continue their coordination of international efforts in securing collection of space-borne “snapshots” of the Polar Regions during the IPY and to give further consideration to the establishment of a preliminary structure for sustaining observations in the future, with the goal to achieve a Polar Satellite Constellation as a significant part of the IPY legacy.		CGMS-37	OPEN
CGMS web editorial committee	Recommendation 36.08	Recommendation 36.08: The CGMS web editorial committee to evaluate suggesting to CGMS Members the creation of a dedicated CGMS page on their institutional web sites, and to define broad guidelines for the preparation of such a page. Deadline: October 2009 and to report to CGMS-37		31 Oct 2009	OPEN
WMO and EUM	Recommendation 36.09	Recommendation 36.09: Nomination of CGMS representative to attend the 3rd THORPEX International Science Symposium on 9-13 Mar 09 in Monterey, USA. Deadline: 14 February 2009		14 Feb 2009	OPEN
CGMS Members	WGII Recommendation 36.10	Recommendation 36.10: CGMS Members to pursue the provision of further satellite data of common interest via ADDE servers for training and scientific cooperation activities and to report back to CGMS-37.		CGMS-37	OPEN
GSICS Executive Panel	WGII Recommendation 36.11	Recommendation 36.11: The GSICS Executive Panel to consider establishing in 2009 an end-to-end demonstration toward an operational GSICS by including beta-users in the GSICS process.		CGMS-37	OPEN
CGMS Members	WGII Recommendation 36.12	Recommendation 36.12: All CGMS Members are encouraged to actively participate in GSICS by sending delegates to the Executive Panel meetings, and also to participate in the GSICS Research and Data Working Groups. This invitation addresses, in particular, the research space agencies that are planning long-term missions and data analyses for climate applications.		CGMS-37	OPEN

CGMS-36 recommendations					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
GSICS GPRCs	WGII Recommendation 36.13	Recommendation 36.13: GSICS GPRCs should compare geostationary observations with both AIRS and IASI to demonstrate consistency and relative stability of AIRS and IASI.		CGMS-37	OPEN
CGMS Agencies	WGII Recommendation 36.14	Recommendation 36.14: CGMS Agencies to support aircraft campaigns and other methods for using reference observations to provide independent assessment of the absolute accuracy of satellite observations. Comparisons should be periodic (at least annually) and each campaign needs to be tied to a SI traceable reference.		CGMS-37	OPEN
CGMS Members	WGII Recommendation 36.15	Recommendation 36.15: In view of the most recent studies showing the great benefit of hyperspectral sounding to predict the onset of severe weather with much longer lead times and the potential for climate monitoring and improved satellite intercalibration, CGMS sees a firmly established need to fly hyperspectral sounders on next-generation geostationary satellites.		CGMS-37	OPEN
CGMS Members	WGII Recommendation 36.16	Recommendation 36.16: CGMS Members to provide Working Papers addressing the seven top concerns of ITWG, as listed in the CGMS-36 WG II Report.		CGMS-37	OPEN
CGMS WGII	WGII Recommendation 36.17	Recommendation 36.17: That Dr. Volker Gaertner (EUMETSAT) takes over from Dr. J. Purdom as IPWG rapporteur to CGMS.		CGMS-37	OPEN
CGMS Members	WGII Recommendation 36.18	Recommendation 36.18: CGMS Members consider ways to provide additional financial support for attendance at CGMS Science Working Group Meetings, particularly for those participants coming from developing and least developed countries.		CGMS-37	OPEN
CGMS Members	WGII Recommendation 36.19	Recommendation 36.19: CGMS Members provide and update the inventory of routinely produced precipitation estimates, either operational or experimental/research, and investigate common methods to describe their error characteristics.		CGMS-37	OPEN
CGMS Members	WGII Recommendation 36.20	Recommendation 36.20: CGMS Members continue to provide data necessary for global, 4-km IR data-products in a timely manner to precipitation product producers.		CGMS-37	OPEN
WMO, IPWG Co-Chairs	WGII Recommendation 36.21	Recommendation 36.21: The WMO Space Programme, the IPWG through its Co-chairs, and the WMO Hydrology Programme establish a small team to investigate the feasibility of “Mainstreaming the Operational use of Satellite Precipitation Data and Products” for Meteorological and Hydrological Services.		CGMS-37	OPEN
CGMS Members	WGII Recommendation 36.22	Recommendation 36.22: All CGMS members are encouraged to continue or to commence participation in the CGMS AMV intercomparison using the specific MSG image data.		CGMS-37	OPEN
CGMS Agencies	WGII Recommendation 36.23	Recommendation 36.23: CGMS agencies to report on the height assignment of AMV cloud tracers using additional information on cloud characteristics.		CGMS-37	OPEN
ITWG, IPWG	WGII Recommendation 36.24	Recommendation 36.24: CGMS encourages the ITWG and IPWG to consider case studies to intercompare algorithms similar to the activity underway in IWWG.		CGMS-37	OPEN
CGMS Members	WGII Recommendation 36.25	Recommendation 36.25: CGMS Members should actively participate in THORPEX field programmes and become engaged in the planning and execution of those programmes.		CGMS-37	OPEN

CGMS-36 recommendations					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members	WGII Recommendation 36.26	Recommendation 36.26: CGMS Members should support the YOTC concept and objectives and, in particular, encourage satellite agencies to facilitate access to relevant satellite data sets and help provide the verification data and products needed to make this project a success.		CGMS-37	OPEN
CGMS Members	WGII Recommendation 36.27	Recommendation 36.27: CGMS Members to identify a point of contact to aid in the development of a comprehensive satellite component to the YOTC and for further detailed discussion of satellite requirements to support YOTC.		CGMS-37	OPEN
CGMS Members	WGII Recommendation 36.28	Recommendation 36.28: CGMS Members to consider their participation in the Task Force on Satellite Data Codes to ensure broad and permanent representation of CGMS members.		CGMS-37	OPEN

I.5 Approval of Draft Final Report

CGMS reviewed the Draft Final Report of the meeting. The Secretariat agreed to include amendments received at the meeting in a revised draft version, which would be distributed electronically to CGMS Members for final comments. It was agreed that CGMS Members would submit any further modifications to the Secretariat by Tuesday 25 November 2008, to enable the electronic distribution of a finalised version by the Secretariat three weeks thereafter. It was further agreed that the final version of the report would be provided to participants both as a hard copy document and via CD-ROM, which would also contain all CGMS-36 Working Papers and presentations. The final report would also be made available on the EUMETSAT web site.

I.6 Date and Place of Next Meetings

CGMS was pleased to accept an offer from KMA to host CGMS-37 on the Jeju Island, Korea, from 26-30 October 2009.

Noting that this was his last participation in CGMS meetings, CGMS-36 expressed its special appreciation to Dr Jim Purdom, CIRA/WMO, for his long service and many vaulable contributions to CGMS.

Mr Manuel Palomares, representing the Spanish Meteorological Service (AEMET), as an observer, stated that AEMET was pleased to support the organisation of this meeting of CGMS, and congratulated the participants for the fruitful results of the meeting.

The Chairman thanked all participants for their cooperation and fruitful participation in CGMS-36, adding that there had been many interesting discussions and important developments during the Working Group and Plenary sessions. He also thanked the Rapporteurs and Secretariat for preparing the Final Report in a timely manner.

The meeting adjourned at 10:30 on 7 November 2008.

PARALLEL WORKING GROUP SESSIONS

WORKING GROUP I: TELECOMMUNICATIONS

I/0 Introduction

As agreed at CGMS-35, Mr Marlin O. Perkins (NOAA) and Mr Gordon Bridge (EUMETSAT) were elected as Chairperson and Rapporteur, respectively, of Working Group I (WG I) on Telecommunications. WG I comprised representatives of the satellite operators from CAST, CMA, CNES, CNSA, ESA (part-time), EUMETSAT, JMA, NOAA, KMA, ROSCOSMOS, ROSHYDROMET and WMO (see Annex 4 for full list of participants).

I/I Coordination of frequency allocations: SFCG, ITU and WRC activities

The meeting recalled that at the World Radio Conference 2007 (WRC-07) which took place in Geneva from 22 October to 16 November 2007, several agenda items of importance for CGMS were discussed and which related to the requirements of meteorological satellites and the Earth exploration satellite service in particular for passive sensing.

EUM-WP-15, JMA-WP-04, WMO-WP-01, NOAA-WP-10 and NOAA-WP-11 each highlighted topics of most relevance to CGMS members and provided a short summary of the decisions on those items and their consequences for the operation of meteorological satellites.

WRC-07 agenda items of relevance to CGMS were:

- **Agenda Item 1.2:**
  Extension of the 18 GHz Meteorological Satellite service (MetSat) frequency band allocation and protection of the 10.6 – 10.68 GHz and 36 – 37 GHz Earth Exploration-Satellite service (EESS) (passive) bands

- **Agenda Item 1.17:**
  Protection of the EESS (passive) band 1400 – 1427 MHz

- **Agenda Item 1.20:**
  Protection of the EESS (passive) from unwanted emissions in the frequency bands 1400 – 1427 MHz, 23.6 – 24.0 GHz, 31.3 – 31.5 GHz, 50.2 – 50.4 GHz and 52.6 – 54.25 GHz

- **Agenda Item 1.4:**
  To consider frequency-related matters for the future development of IMT-2000 and systems beyond IMT-2000

- **Agenda Item 7.2:**
  Agenda items for WRC-11.

Decisions of WRC-07 Regarding the Extension of the METSAT Frequency Band Allocation at 18 GHz Under Agenda item 1.2

WRC-07 adopted an extension of the existing MetSat service allocation in the band 18.1 – 18.3 GHz into the band 18.3 – 18.4 GHz in ITU Regions 1 and 3 (Europe, Africa including Arabian countries and Asia) and in ITU Region 2 (Americas) into the band 18.0 – 18.1 GHz without any restrictions that could hamper the operation of a MetSat system over 300 MHz of contiguous spectrum.

This extension of the primary MetSat frequency allocation to 300 MHz of contiguous spectrum in the band 18.1 – 18.4 GHz in ITU Regions 1 and 3 adopted at WRC-07 satisfies the spectrum requirement specified for the EUMETSAT next generation geostationary MetSat system MTG (Meteosat Third Generation) raw data downlink.

The extension of the 18.1-18.4 GHz band will support JMA, since such an extension will be beneficial to the radio communication performance of meteorological satellites, particularly for the high-rate downlink of raw observation data by the next generation of geostationary meteorological satellites.

Decisions Regarding the Protection of the Number of EESS (Passive) Bands Under Agenda Item 1.2, 1.7 and 1.20

WRC-07 adopted a package solution for the bands under agenda items 1.2 and 1.20. The key issue for resolving agenda items 1.2 and 1.20 turned out to be the bands 1400 – 1427 MHz and 10.6 – 10.68 GHz. A compromise on those two bands to adopt only recommended protection levels allowed, in return, achieving mandatory protection limits from unwanted emissions from numerous active services in neighbouring frequency bands for all remaining 5 bands under discussion (24 GHz, 31 GHz, 36 GHz, 50 GHz and 52 GHz).

Four of those bands are currently used by AMSU-A and are expected to be used by any future microwave temperature sounder follow-on instruments. Long-term protection for passive sensing in those bands is therefore of most importance for many of the existing and future Earth Exploration satellite systems.

Even for the band 1400-1427 MHz, for which under agenda item 1.7 the protection status was improved by deleting a frequency allocation to feeder links for mobile satellite systems in a neighbouring band, and for 10.6- 10.68 GHz for which only recommended protection levels were adopted and included in the Radio Regulations it can be expected that most administrations in the long term will incorporate these levels into national regulations when the usage situation of existing services allows.

The regulations adopted by WRC-07 under agenda items 1.2, 1.7 and 1.20 constitute a major achievement in terms of long term protection of important passive sensing bands for Earth Exploration and Meteorology.

Consideration of frequency-related matters for the future development of IMT-2000 and systems beyond IMT-2000 under Agenda Item 1.4

In August 2006, IMT-2000 & Beyond, Working Party 8F (WP8F) submitted a draft report to the International Telecommunication Union's Radio communication Sector (ITU-R) on studies for sharing between other radio communication services and IMT systems operating in the 450-470 MHz band. The report said that no countries were using or planning to use this band for MetSat (space-to-Earth) at that time, and thus studies on sharing between IMT systems and MetSat (space-to-Earth) were not required.

In JMA-WP-04, JMA informed WG1 it has been using the 468 MHz band to provide earthquake and tsunami warning information to users in Japan via the Japanese geostationary meteorological satellites, and will continue the service using the same band. JMA therefore explained to the MIC that it was necessary to correct the description in the draft report in order to reflect Japan's current status and future plans for utilization of the 460-470 MHz band by Japanese geostationary meteorological satellites, and that sharing studies were necessary. The MIC requested WP8F to correct the description to reflect the actual status in Japan.

JMA reported that WRC-07 concluded to allocate the additional bands of 450-470 MHz, 470-806/862 MHz, 2300-2400 MHz and 3400-3600 MHz to IMT-2000 in all Regions. In Japan, while the bands of 450-470 MHz, 470-806 MHz, 2300-2400 MHz and 3400-3600 MHz are allocated additionally to IMT-2000, the MIC planned use for the bands 698-806MHz and 3400-3600MHz will be the major utilization bands for IMT-2000.

Agenda Items Adopted for WRC-11 Under Agenda Item 7.2

WRC-11 Agenda Items of interest for a meteorological satellite operator such as CGMS are:

- WRC-11 Agenda Item 1.6 regarding frequency allocations for EESS (passive) in bands above 275 GHz,

- WRC11 Agenda Item 1.24 regarding the extension of the frequency band allocation for non-geostationary MetSat in the band 7750 - 7850 MHz by 50 MHz into the band 7850 7900 MHz.

WRC-11 did not only adopt issues that are to the benefit of the MetSat and EESS (passive) services. There are also issues which have the potential to impact negatively on the future use of frequency bands, particularly for passive sensing.

The issue currently with highest potential impact is WRC-11 Agenda Item 1.8, which calls for ITU-R studies concerning the technical and regulatory issues relative to the fixed service in the bands between 71 GHz and 238 GHz. Since this frequency range includes bands currently used by many passive sensors such as AMSU-A and MHS as well as future passive sensors on planned missions, it must be ensured that any consideration or studies resulting in proposals to WRC-11 do not negatively impact the long term usability and protection of these EESS (passive) bands.

Outlook to WRC-11

As experience in past WRCs has shown, a detailed and coordinated preparation of the agenda items of interest and concern will be mandatory in order to be able to achieve a satisfactory outcome of WRC-11.

WRC-11 Agenda item 1.6 Regarding Frequency Allocations for EESS (Passive) in Bands Above 276 GHz

Regarding WRC-11 Agenda Item 1.6 the frequency bands listed in Radio Regulations Footnote 5.565 will have to be reviewed and compared with the planned use of frequency bands above 275 GHz by passive sensors on future missions.

The individual plans of space agencies and MetSat operators will have to be merged and transferred into a coordinated and consolidated list of frequency bands above 275 GHz, finding a reasonable compromise between requirements and plans for current and future use by passive sensors as opposed to potential other users of bands above 275 GHz.

WRC-11 Agenda item 1.24 (Extension of the METSAT Allocation at 7750 – 7850 MHz into the Band 7850 – 7900 MHz)

Regarding WRC-11 Agenda Item 1.24 the following issues/activities would need to be addressed and coordinated between the MetSat operators already using this band or planning to use it in future:

- Regarding dump of stored instrument data to dedicated Earth stations, confirmation of the applicability of the results of the sharing studies for the band 7750 – 7850 MHz in preparation for WRC-07 also to the band 7850 – 7900 MHz and possible adaptation to the situation in the extension band;

- For other applications such as the dissemination of data directly to the user, sharing with the fixed and mobile services would need to be studied and results would have to be fed into WP7B;

- Considering the different concepts for using this band by current polar-orbiting MetSat systems, such as FY-3, NPOESS and Metop and the potential to interfere with each other, a coordinated approach for planning the long term use of the band 7750 – 7900 MHz would be necessary, taking into account SFCG RES 19-7R3.

Note: This issue was discussed at the SFCG-28 meeting held on 16-25 September 2008.

As preparatory activities for WRC-11, JMA will continue to take notice of the discussions in working parties of ITU-R, especially in WP7C (Working Party for earth exploring satellite, meteorological aids and meteorological satellite services) and WP5B (Working Party for aeronautical and marine mobile services) that are closely related to JMA's meteorological service such as meteorological radar observation, wind profiler radar observation and meteorological satellite. JMA will continue to request the MIC to understand and advocate the WMO positions as appropriate.

JMA will also continue preparatory activities for future WRC meetings regarding protection of the existing frequency bands and acquisition of the new frequency bands necessary for MetSat through exchanging information with CGMS members as well as the WMO/CBS/SG-RFC.

Technical Information from the Space Frequency Co-ordination Group and ITU-R

In NOAA-WP-09, NOAA reported on the SFCG-28 held 16 – 25 September 2008, with the Canadian Space Agency as host in Quebec City, Canada. At SFCG-28, the working group on ITU Matters and preparation for WRC-11 drafted a new resolution dealing with WRC-11 agenda items of importance to the SFCG membership. These items were:

International Telecommunication Union – Radio communication (ITU-R) sector Working Parties 7B and 7C (WP7B, WP7C)

The ITU-R WP7B and WP7C met twice in the last 12 months (31 March – 4 April 2008 and 7-13 October 2008). WP7B is concerned with space radio systems, i.e. the transmissions between the Earth and satellites, both uplinks and downlinks. A major topic of interest to CGMS under consideration in this WP is furthering technical studies toward gaining approval of expanding the existing non-geostationary metsat space-to-Earth allocation at 7750-7850 MHz by 50 MHz.

WP7C covers applications in the EES concerning active and passive sensors as well as metaids, i.e. radiosondes and meteorological radars. The major topics of interest to CGMS in WP7C is to address the WRC-11 agenda item 1.6, viz., to review the last footnote (5.565) in the ITU table of frequency allocations in order to update the spectrum use by the passive services between 275 GHz and 3 000 GHz.

World Meteorological Organization (WMO) Commission for Basic Systems (CBS) Steering Group on Radio Frequency Coordination (SG-RFC)

The WMO's SG-RFC met in 2008 to discuss topics related to metaids and metsats. The major topic of interest to metsat operators was to finalize updates to the handbook entitled "Use of Radio Spectrum for Meteorology". Completion of revisions to the handbook will permit availability of a new edition in late 2008, updating the original edition published in 2002. The WMO position on WRC-07 on several agenda items of concern to metsats and metaids was also discussed, including expansion of the metsat allocation in 7750-7850 MHz.

Argos Frequency Coordination Plan

CNES-WP-01 and CNES-WP-02 put forward to WG1 an outlook of the current ARGOS system and the frequency coordination aspects of the future ARGOS-4 configuration.

WG1 was reminded that CNES has the technical responsibility for the Argos Advanced Data Collection System (A-DCS) acquisition, for support after launch, and for French ground segment technical activity. Currently, the Argos DCS instruments are flying on board 4 NOAA and one EUMETSAT (METOP-A) spacecraft.

CNES informed WG1 that it is currently designing a new ARGOS generation, ARGOS-4, to ensure the continuity of the location and data collection mission on meteorological polar satellites over the period 2014-2022. Also, CNES plans improve the Service offered to the users, in order to fulfil their needs until 2022 (more than 30000 Argos platforms are expected from 2015).

Argos-4 instruments will go on-board the NPOESS spacecraft. Preliminary discussions with EUMETSAT are in progress to embark Argos 4 instruments on the future Post-EPS satellites.

In order to fulfil the needs of the future ARGOS-4 system, additional frequency bands are necessary. At SFCG-27, held in September 2007, CNES presented a frequency declaration for the ARGOS-4 system in which five beams were identified with frequency bands in the range 401 – 403 MHz (Beam-1: 401.275 – 401.580 MHz, Beam-2: 401.690 – 402.400 MHz, Beam-3: 402.521 – 402.650 MHz, Beam-4: 402.850 – 403 MHz and Beam-6: 401 – 401.225 MHz). The ARGOS-4 frequency plan has been filed through ITU-R, but has not yet been notified since the coordination is still in progress. Following the discussions that took place within SFCG (Space Frequency Coordination Group) and with other administrations, a specific frequency plan is envisaged for ARGOS-4. However, some difficulties remain with some administrations, including meteorological agencies. Therefore, CNES considers that CGMS could be an appropriate place to start discussing the remaining frequency coordination difficulties with the meteorological agencies.

Coordination of Future Use of the DCS in the 401 – 403 MHz Band

NOAA provided CGMS members information regarding proposed expansion of frequencies used by GOES DCPs that would affect future DCP use of 401-403 MHz by both geostationary and non-geostationary metsats. NOAA-WP-11 informed WG1 that the growth of data collection platforms (DCPs) to collect and transmit environmental data to GOES satellites continues to accelerate. Since 2003 the number of DCPs sending data to NOAA's GOES satellites has swelled from 9,000 to more than 28,000. Future estimates project a continued expansion with total requirements likely to exceed 100,000. In order to accommodate this expansion, much has been done or is being done to efficiently use the limit radio frequency spectrum available. However, the limits of efficiency dictate the additional spectrum must be used to meet the expected DCP growth.

Currently there are 2 MHz of spectrum allocated in 401-403 MHz to Earth-to-space use by Earth-exploration and meteorological satellites (metsats). The Argos-3 system that uses 110 kHz of spectrum in a single channel will be replaced with Argos-4 designed to have 4 or 5 channels expected to be ready for implementation on satellites as early as 2011. In the CNES proposal, the various Argos and GOES DCP spectrum use shows overlap with the Argos-4 channels 401.69 - 402.4 and 402.52 - 402.65 MHz with existing and proposed GOES DCP frequencies. Such overlap was noted by CNES and at the 42nd Argos operations committee meeting in June 2008, CNES stated that it would not pursue use of these two channels for the Argos-4 system. To compensate for this loss, a band from 401-401.225 MHz was added to the International Telecommunication Union satellite filing.

Considering the current and planned use of the 401 to 403 MHz band, congestion in the band will surly affect CGMS satellite operators because other metsats using DCPs might not have been considered. Were these to be brought into consideration, the true congestion would be realized. Truly there is a need for CGMS to provide guidance to the metsat operators as was done in the past. Early intervention by CGMS is necessary for orderly development of the limited 2 MHz of spectrum resources.

EUM-WP-15 provided an overview of future considerations for the planned use of the band 401 – 403 MHz for Data Collection Systems (DCS) by geostationary and non-geostationary meteorological satellite systems. These strategies will make it necessary to consider a coordinated approach for using, and possibly segmenting the 401 – 403 MHz band in order to ensure an interference-free utilisation of the band, as was done in the past, when different parts of the band were designated for different systems.

As an input to the SFCG-28 meeting (16 – 25 September 2008) an overview of the current and planned spectrum use for DCS in the range 401 – 403 MHz was provided and an attempt was made to propose a possible arrangement to accommodate future requirements.

In view of the information on current and future planned use of the band 401-403 MHz by non-geostationary and geostationary MetSat system for DCS. A proposal was presented at SFCG-28 for discussion.

EUM-WP-17 briefly addressed the progress made at SFCG-28 regarding an agreement between DCS operators based on a proposal made by EUMETSAT for segmenting the MetSat band 401-403 MHz**,** aiming to achieve a common operational agreement for segmenting the full DCP band that should eliminate/minimise the potential for interference between non-GSO and GSO systems as well as establish the band assignments between neighbouring GSO DCP systems.

The issue was discussed in September 2008 at SFCG-28, amongst all the Space Agencies having an interest in the topic (except for the Chinese and Indian Space Agencies which were not present at SFCG-28), and the following, in line with the original proposal of EUMETSAT, constitutes the basis for further discussions to come to a final agreement:

1) For the band 401.701 – 402.001 MHz and 402.1 - 402.435 MHz, SFCG concluded that overlapping frequency use, as would be the case for Beam-2 (401.690 – 402.400 MHz) between ARGOS-4 on non-geostationary MetSat systems and regional DCP and IDCS use on current geostationary MetSat systems, would result in mutual harmful interference. Therefore, the band 401.701 - 402.435 MHz should remain available only for DCS using geostationary MetSat systems in cross-support between the regions. This would also avoid interference into neighbouring MetSat systems.

2) The band 402.435 – 402.85 MHz could be designated for DCS using geostationary MetSat systems and split-up in two sub-bands (402.435 – 402.635 MHz and 402.635 – 402.850 MHz) in similar fashion as done for the current regional DCP bands in order to avoid interference into neighbouring MetSat systems. The concept of cross-support between the regions could also be applied.

   Note: For the partitioning for regional DCP use and cross support among GSO MetSat operators no conclusion could be drawn at SFCG-28 as such a split would not provide the amount of spectrum which is planned for GOES-R.

   This specific part of the proposal is awaiting NOAA's, and potentially other GSO MetSat operator's (e.g. Russia, India), support of the proposed partitioning.

3) Within the band 402.435 – 402.850 MHz, that could be designated for regional DCP use on GSO MetSat systems, 100 kHz could be designated for an ARGOS-GEO component, ideally made available on a global basis by all geostationary MetSat operators. If the concept of cross-support would be applied, these 100 kHz could be positioned across both sub-bands (e.g. 402.585 – 402.685 MHz), or in one of the two sub-bands. CNES and

EUMETSAT are currently arranging a test at which ARGOS platform messages are relayed via geostationary MetSat system.

4) For the band 401.1 – 402.4 MHz which is currently used by FY-2 satellites, no conclusion could be drawn whether or not this sub-band should be designated for DCS using geostationary MetSat systems or non-geostationary systems, or both, as CNES and CMA are currently in coordination negotiations and CMA was not present at the SFCG-28 meeting.

5) The remaining portions of the band 401 – 403 MHz, namely 401- 401.1 MHz, 401.4 – 401.7 MHz and 402.850 – 403 MHz, could be designated to the ARGOS LEO component, if there are no other requirements identified by CGMS. These remaining portions do include ARGOS-B bandwidth 401.580 – 401.690 MHz which is already notified through the ITU-R and which is flying onboard Metop-A, a non-GSO satellite.

WGI endorsed the actions of EUMETSAT and the SFCG Secretariat. In addition WGI noted the letter sent by the SFCG Executive Secretariat to the CGMS Secretariat on CGMS coordination and agreed that the CGMS Secretariat should send a letter in reply conveying the appreciation of CGMS.

Furthermore, CGMS members were encouraged to participate in SFCG meetings.

Following on from the above, WGI agreed the following actions:

Action 36.05 All CGMS satellite operators are invited to consider the above proposal and the status of discussions at SFCG for a coordinated future use of the band 401 – 403 MHz, and to provide responses to the CGMS Secretariat. Deadline: 30 December 2008

Action 36.06 CGMS Secretariat to develop a coordinated response, based on the input received from CGMS members, on the future use of the 401 - 403 frequency band. Deadline: 31 January 2009.

Action 36.07 CGMS Secretariat to request WMO to coordinate a separate meeting of all CGMS satellite operators that are in attendance at the Working Party 7B and 7C meetings in Geneva, Switzerland, February 2009, to discuss the coordination of the CGMS response to the proposal for future use of the 401 – 403 MHz band. Deadline: 30 December 2008

Action 36.08 CGMS Secretariat to develop a final, coordinated report, based on CGMS members input, for the future use of the 401 – 403 MHz frequency band. Deadline: 30 April 2009

Action 36.09: CGMS Secretariat to present the CGMS coordinated response on the future use of the 401 – 403 MHz band at the SFCG meeting in June 2009. Deadline: 1 June 2009

Action 36.10: CGMS Secretariat to send a letter thanking the SFCG Executive Secretariat for the "SFCG Liaison Statement to CGMS." Deadline: 30 November 2008

I/2 Telecommunication techniques

EUM-WP-16 provided a summary of the activities performed by EUMETSAT for testing in quasi-operational conditions pre-industrialized prototypes (transmitter and receiver) of a High Rate DCP (HRDCP) System using the Meteosat Second Generation satellites. The pre-industrialised HRDCP prototype transmitters have been deployed at the operational Primary Ground Station of MSG (Usingen, Germany) and MTP (Fucino, Italy). The prototype receivers have been installed in the MSG Primary Ground Station. The system has been extensively exercised during the eclipse season of Met-9 in autumn 2007. Delta improvements and minor corrections have been identified and implemented in a new SW release for the transmitter and receiver that has been tested around the eclipse season of Met-9 in spring 2008 and that have confirmed the system characteristics for a potential operational implementation. During the final stages of testing of this final version, particular attention has been given to the cases of moving DCP platforms (e.g. buoys) and adjacent channel interference due to spectral re-growth in commercial HPAs. WG I were pleased to note that HRDCP would support regional as well as IDCS channels in the Meteosat field-of-view.

CMA-WP-05 informed CGMS about the planning of the FY-4 Program. This will be the next generation of Chinese geostationary meteorological satellites that will take over from the FY-2 series after 2015. Preliminary consideration on the FY-4 frequency network is given with respect to the frequency requirements for the increased amount of data to be transmitted. The spacecraft will collect atmospheric and surface condition parameters such as vertical temperature and moisture profiles, sea surface temperature, clouds, occurrence of lightning, and aerosol using instruments sensing in visible, near-IR and thermal IR frequencies. The data broadcast system will include LRIT and a data downlink as well as an international and domestics DCP service. Due to the increased data volume, the raw data transmission (downlink) will be either K_a band (18.1-18.4GHz) or x-band (7350-7550 MHz). Other factors to be considered for the future FY-4 frequency network include the requirement for a new orbital location for satellites for backup/storage purposes, beside the primary locations at 86.5°E, 105°E, 123.5°E.

EUM-WP-17 presented a summary technical description of the Meteosat Third Generation (MTG) characteristics for the Data Collection System as defined at the time of the end of the Phase A of the EUMETSAT MTG Preparatory Programme. The final MTG payload complement is to be decided by EUMETSAT Member States in the autumn of 2008 and therefore the information collected here is based on the payload complement assumptions used for the Phase A studies.

Continuity of services is a mandatory requirement for MTG and, when applied to the DCS system, special care has been placed on ensuring that seamless continuity is provided. Nevertheless, through the technical definition of the MTG satellites, three main differences have been identified when comparing the previous MTP and MSG DCS systems and the concepts considered in the Phase A for MTG. These three main differences are related to the downlink from the MTG satellite towards the receiving station of EUMETSAT (Primary Ground Stations for MTP and MSG) and are as follows:

- Physical layer: DCP downlink is no longer in L-Band but assumed to be in K-Band (18.1-18.4 GHz) and using a steerable pencil beam with a limited footprint (approx 820 Km at sub-satellite point)

- Link Layer: DCP signal is digitalised on board and down-linked using a bit stream service of the CCSDS packet TM service stack.

- Mission analysis. The use of K-Band in the downlink means that the satellite vs. receiving Ground Station geometry (i.e. elevation angle) influences the link budget margin because of the atmospheric conditions and the associate slant path loses (specially in the troposphere).

These three differences do not affect the technical requirements for the DCP platforms using the MTG system, because they do not imply any modification on the user segment for using the DCS in MTG, but represent a definitive departure from the previous technical characteristics for the satellite downlink signal (MTP and MSG use L-Band bent-pipe transponders) complicating the possibility of cross-support.

I/3 Co-ordination of International Data Collection and Distribution

I/3.1 Status and Problems of the IDCS

EUM-WP-18 informed WG1 that as from the beginning of October 2008, there were 18 International DCP (IDCP) registered by EUMETSAT for normal use of the IDCS, using only 4 of the 33 channels available. This is a substantial reduction when compared to the number operating in 2007, due to removal of unused allocations.

It will be recalled that channels I22 (CMA), I23-I24 (Aeronet), I27-I33 (WMO networks) and I25-I26 (Planeta/ROSHYDROMET) are being used within the Meteosat IDCS for regional use, on a temporary basis, with the special agreement of CGMS with the following allocations:

- 60 DCP allocated on channels I23 and 24, operated by the Aeronet programme;

- 20 DCP allocated on channels I25 and I26, operated by ROSHYDROMET, these transmissions are not received or processed by EUMETSAT;

- 80 DCP allocated on channels I27-I33, operated by WMO agro-meteorological and hydro-meteorological networks;

- 43 DCP allocated on channels I08, I09, I11, I17, and I19 supporting IOTWS. I21 is provisionally allocated for future expansion of the IOTWS.

Globally, the total number of IDCP allocated on individual IDCS channels is:

Channel	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
No.	0	0	0	0	0	0	0	10	10	0	10	0	4	0	1	3	8
								I	**I**		**I**		**R**		**R**	**R**	**I**

Channel	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	
No.	0	4	10	0	0	30	30	20	0	44	32	0	1	0	2	1	
		I	**I**		CMA	Aeronet		Russia		WMO							

(R = regular IDCS; I = IOTWS)
Table WGI-1: All DCP messages are relayed via EUMETCast and the GTS. Meteosat-9 (MSG-2) is fully operational in supporting both the IDCS and the Meteosat DCS.

The DCP allocations in support of the Indian Ocean Tsunami Warning Service (IOTWS) using Meteosat-6 and Meteosat-9 continue to grow. The Pacific Tsunami Warning Centre and the Ocean Data and Information Network (ODIN) Africa now have allocations, with the agreement of CGMS. DCP messages are transmitted every 15 minutes and are relayed as bulletins to the GTS and EUMETCast via the Fucino ground station and the EUMETSAT control centre in Darmstadt. Further growth is expected over the coming years, especially with the establishment of a regional centre in the future.

In addition to the DCPs allocated to the IOTWS using Meteosat-6, 3 regional channels on MSG-2 (Meteosat-9) are supporting 26 IOTWS DCPs.

During the last twelve months the level of interference affecting IDCS channels within the Meteosat telecommunications field of view has not been sufficient to affect system performance.

Currently there are 33 DCP channels allocated for IDCS use. Many are now used for regional purposes by EUMETSAT, NOAA and, in the future, possibly by JMA.

JMA-WP-02 informed CGMS that MTSAT-1R's International Data Collection System (IDCS) has been functioning properly since the satellite started operations. Although harmful interference was frequently observed on IDCS channel 33 from August 2007 through July 2008, there was no negative impact on IDCS operation since no International Data Collection Platforms are registered on that channel. JMA added that no DCP data has been transmitted during the reporting period, though IDCPs are registered on 5 out of 33 MTSAT-IDCS channels as of the end of 11 July 2008. Further information regarding the MTSAT-IDCS is available under the *Monthly Operations report* on the MSC website at:
http://mscweb.kishou.go.jp/operation/opr_report.htm

NOAA-WP-16 presented a status report on the performance of the International Data Collection System (IDCS). NOAA will be utilizing the Channel Interference Monitoring System (CIMS) in a stand alone mode once it is available. The system is for all intents and purposes complete, but NOAA has not received final delivery from the contractor. This system, originally intended to provide better monitoring and evaluation of the international channels, has proven to be useful for overall system monitoring, including troubleshooting of interference problems.

From October 2007 through September 2008 the total numbers of platforms assigned to the international channels were as follows:

00	06	07	08	12	13	14	15	16	17	18	20	23	27	31	32
10	9	13	14	11	1	3	6	1	2	10	8	20	3	18	59

There have been very few new allocations of IDCPs within the past year. CGMS members are invited to take note of the status and performance of the IDCS at www.dcs.noaa.gov

I/3.2 Ships, Including ASAP

No working papers were presented under this topic.

I/3.3 Dissemination of DCP messages (GTS or other means)

No working papers were presented under this topic.

I/4 Future use of the IDCS

WG1 recalled from CGMS-35, that NOAA was asked to organise with other IDCS coordinator agencies (CMA, JMA, EUMETSAT) a meeting to discuss the future use and technical aspects of the IDCS.

EUM-WP-19 presented the findings of a study conducted by EUMETSAT in coordination with NOAA and JMA to determine the future use of the IDCS channels. The bandwidth allocated to the IDCS has, in recent years, been reallocated to Regional/Domestic DCP systems on a temporary basis with agreement of the CGMS. In contrast to the slow decrease in IDCS usage there continues to be a growth in the Regional/Domestic use of the DCS and an increasingly limited capacity to support new Programmes, particularly for NOAA. In the case of the Meteosat DCS, part of the IDCS bandwidth has, for several years, been re-allocated to WMO sponsored regional programmes and more recently, Tsunami Warning Systems with the understanding from CGMS that this is a temporary arrangement.

A questionnaire, completed by JMA, NOAA and EUMETSAT, shows that the overall usage of the IDCS for its intended purpose has decreased in recent

years, whereas Regional/Domestic use has increased. Based on the results of the questionnaire and follow-up discussions between JMA, NOAA and EUMETSAT it is proposed to make more effective use of the bandwidth allocated to the IDCS by decreasing the number of International channels to 11 and thereby increasing the bandwidth available for regional purposes.

The proposed change in bandwidth allocation between IDCS and DCS may be summarised as follows:

Current bandwidth allocation:
402.0025 MHz – 402.0985 MHz i.e. 33 channels at 3 KHz spacing

Proposed bandwidth allocation:
402.0025 MHz – 402.0325 MHz for NOAA – 11 extra 3 KHz channels for domestic use

402.0355 MHz – 402.0655 MHz for IDCS - 11 channels at 3 KHz spacing

402.0685 MHz – 402.0985 MHz for EUM – 11 extra channels for regional use

This allocation would also apply to JMA and its MTSAT.

EUMETSAT has no allocations at 0° on the current International channels I1 – I11, however, EUMETSAT will continue to use these channels for the IODC Tsunami Warning System DCPs transmitting through Meteosat-6 at 67°E, as they would not interfere with NOAA domestic allocations on these channels.

NOAA would ensure that there are no allocations on the current International channels I23 – I33 (no different from today).

The change in frequency allocation will necessitate an update to the IDCS User's Guide and other related documentation and web pages. CGMS is invited to endorse this proposal

WG1 reminded CGMS members that the proposed plan on the utilisation of the IDCS would satisfy CGMS Action 35. 15. Therefore this Action is closed. WG1 proposed the following action:

Action 36.11: CGMS members should implement the IDCS frequency allocation plan change in their systems and update the associated documentation and web pages. The Secretariat will update the IDCS Users' Guide. Deadline: 31 July 2009

I/5 Search and Rescue (S&R)

CNES-WP-03 informed WG1 that the Cospas-Sarsat Secretariat was informed of the proposed regulation for the use of the 406.1-430 MHz band in the United Kingdom. The consultation period had an expected closing date of 1 August 2008 for responses. The provided maximum power flux densities

(pfd) to be established over UK territory for the 406-406.1 and 406.1-410 MHz spectrum, is of particular interest to Cospas-Sarsat.

CNES stated that the Cospas-Sarsat Secretariat sent a letter to all space segment providers about this consultation and highlighted the need for Cospas-Sarsat parties (which are the space segment providers) to take appropriate measures to protect the 406-406.1 MHz band from out of band emissions derived from transmissions above 406.1 MHz. In order to provide a consolidated Cospas-Sarsat reply to the UK administration, the Secretariat needs input from all Cospas-Sarsat Space Segment Providers.

CNES was informed in July 2008 about the consultation, and with the help of the French administration (ANFR), sent comments to OFCOM at the beginning of August 2008. Based on the OFCOM document, the Search and Rescue Processor (SARP) on board the LEO component of the Cospas-Sarsat system will experience interference with only a few transmitters aggregated within the field of view of the satellite. In addition to that, this analysis shows discrepancies in proposed aggregate pfd units (MHz) since there is a big discrepancy with the total bandwidth for Mobile Satellite Service from 406 to 406.1 MHz dedicated to Search and rescue operations, and also with the individual bandwidth of each transmitter in operation above 406.1 MHz. ANFR and CNES believe the whole specification from UK OFCOM appears questionable and definitely needs clarification.

EUMETSAT performed an analysis based upon the MSG transponder to show there is a low risk of interference due to out of band specification. Due to the shape of the on-board filter, there is a big risk that the 406 to 406.1 MHz band will be polluted by in-band emissions starting at 406.1 MHz. The analysis was sent to the Cospas-Sarsat Secretariat.

Finally, NOAA plans to send its comments to the Cospas-Sarsat secretariat within a short time frame. The Secretariat will perform a consolidated document based on the following inputs:

- the ANFR comments sent to OFCOM,
- the EUMETSAT and NOAA comments.

The document will be distributed to the parties for formal approval. Then, the Cospas-Sarsat Secretariat will forward this document to UK OFCOM for further discussion. CGMS members are invited to contact OFCOM UK for further clarification of a better sharing between those two adjacent bands.

I/6 Conclusion and preparation of WG report

The WG report was prepared and the all actions were agreed upon in the Plenary.

WORKING GROUP II: SATELLITE PRODUCTS, INCLUDING SATELLITE WINDS

II/0 Introduction

Working Group II on Satellite Products was chaired by Mr. Toshiyuki Kurino, JMA. Mitch Goldberg, NOAA, and Johannes Schmetz, EUMETSAT, assisted as rapporteurs. 45 Working Papers were presented and discussed of which some were presented in plenary as well as in WG II. The order of presentation was modified: All presentations on GSICS were moved to the 4th of November because key presenters had to be in other working groups. NOAA-WP-20 was moved from session II/1 to II/7. Several of these papers were in response to actions and recommendations from CGMS-35 providing a continuity in the discussions and traceable progress. The three CGMS Working groups ITSC, IPWG and IWWG did hold workshops in 2008 and therefore detailed presentations on the outcome of the workshops were presented and recommendations from the workshops were discussed. It was noted that all past actions were successfully addressed and closed.

11 new actions and **19** recommendations have been proposed.

II/1 Image Processing Techniques

CMA-WP-06 described the activities related to FY-3 product development. The Fengyun 3 series is a new Chinese meteorological polar orbit system. The first satellite of Fengyun 3 series, FY-3A, is experimental. It was launched successfully at 11 am on 27 May 2008. FY-3A is currently under commissioning tests (as of 27 October 2008). A presentation to WGII introduced the FY-3A ground segment, showed several FY-3A images, and a few application examples during the Beijing 2008 Olympic Games. There are 11 instruments on board FY-3A: the Visible and InfraRed Radiometer (VIRR), InfraRed Atmospheric Sounder (IRAS), MicroWave Temperature Sounder (MWTS), MicroWave Humidity Sounder (MWHS), MEdium Resolution Spectral Imager (MERSI), Microwave Radiation Imager (MWRI), Solar Backscatter Ultraviolet Sounder (SBUS), Total Ozone Unit (TOU), Earth Radiation Measurement (ERM), Solar Irradiance Monitor (SIM) and Space Environment Monitor (SEM). CMA explained that there are different categories with regard to availability of data from FY-3. Of major interest to operational applications is that data analogous to the well-known ATOVS class and AVHRR class (i.e. IRAS, WMTS, WMHS, and VIRR and MERSI, respectively) will be made available after commissioning. The pre-processing software for these five instruments would be available to CGMS members about six months after commissioning. The commissioning will be completed in early 2009.

EUM-WP-12 reported on the ongoing training activities. The Group was informed that the strategy and implementation of the EUMETSAT training was approved by the EUMETSAT Council in 2008. A cornerstone of the training

strategy is the cooperation with international partners. In Europe this is performed under the coordination of the EUMETCAL project of EUMETNET and on the global scale EUMETSAT is strongly committed to the training activities of the WMO Virtual Laboratory for education and training in satellite meteorology. EUMETSAT is sponsoring the Centres of Excellence in Niamey, Nairobi, Muscat and more recently also Pretoria. In additional to hosting conventional classroom courses the delivery of training through distant learning methods has become more and more important. However, for the African continent the limitations in Internet access is still a problem. This can only partly be compensated by the planned dissemination of training information via EUMETCast. It was emphasised that the success of a satellite program has to be measured by the successful introduction of products into operational services. Therefore training is an essential mechanism to ensure this. The Group was encouraged to actively provide cases of best practise to demonstrate how the derived satellite information can be optimally used in the various user communities.

EUM-WP-28 informed the Group on its current and future activities concerning the use of the newly developed McIdas-V and HYDRA tools. These tools for data visualisation, processing and analysis were developed by SSEC at the University of Wisconsin in cooperation with UNIDATA which had developed the Integrated Data Viewer (IDV). This new toolset is an open source software set based on Java and runs on a variety of platforms under Linux, Windows and Mac. This tool is very suitable to display and process multi-spectral image data and hyperspectral sounding data. It can easily combine those data with other sensor data and conventional meteorological information (e.g. synop data, NWP output, radar data, lightning information). Therefore, the tool is ideally suited for the generation of most comprehensive displays for the analysis of interesting weather situations. As such, it has great value for training and scientific cooperation. The datasets which are used by this toolset are usually made available via ADDE servers. In this context it is highly recommended that the CGMS partners continue their efforts to make as many datasets as possible available on their ADDE servers (see previous CGMS action 35.15). The Group was therefore encouraged to investigate how they can use this new toolset, especially as it is freely available via the Wisconsin Web site and easy to install. It was recommended to report back to CGMS 37 on any progress in using McIdas-V and HYDRA for satellite training and scientific cooperation.

NOAA-WP-23 was in response to Recommendation 35.15, CGMS satellite operators to consider making a data interface available such as ADDE servers so that McIDAS-V and HYDRA can be applied to their data. A project is well underway at the University of Wisconsin SSEC to develop the fifth generation of McIDAS, a Java-based, freely available, open-source system for multispectral and hyperspectral researchers and algorithm developers that will provide powerful new data manipulation and visualization tools to work in this data rich environment. A major component of the McIDAS-V environment is the integration of HYDRA into its software toolkit to add greatly increased interactive data interrogation capabilities to the existing McIDAS functionality.

Conversely, integrating HYDRA into this toolkit takes advantage of the great flexibility in analysis and display already within McIDAS-V. NASA EOS MODIS and AIRS data as well as MSG SEVERI and METOP IASI data are now being used in conjunction with in situ and gridded data to develop new analysis and product validation techniques in the McIDAS-V environment.

McIDAS-V is a very convenient tool to display satellite data available on data servers. McIDAS-V has a dashboard interface which allows a user to select a particular server. Once the server is selected, a connection is established and available datasets are listed. The user then selects the dataset, which is followed by a list of parameters such as a particular channel or a derived product. The user then selects the parameter and the image is displayed. Several images can be selected, such as the past 30 geostationary images, for animation applications. The CGMS recognize McIDAS-V as a very important tool for real-time nowcasting applications.

An extended discussion on both EUM-WP-28 and NOAA-WP-23 further explained the broad benefit of McIDAS-V in training and scientific activities and also addressed potential operational applications for visualisation in addition to training and scientific studies..

Action 36.12: NOAA to facilitate the setting up of a small Working Group comprising CGMS representatives to encourage public access of agency satellite datasets for nowcasting applications. Deadline: CGMS-37

Recommendation 36.10: CGMS Members to pursue the provision of further satellite data of common interest via ADDE servers for training and scientific cooperation activities and to report back to CGMS-37.

II/2 Satellite Data Calibration and Validation

CMA-WP-07 responded to various recommendations from CGMS 35. CMA explained that in order to facilitate the use of the Chinese FY satellites for climate study, NSMC is reprocessing the archived data. The expected outcome is the fundamental climate data records (FCDR). NMSC will re-calibrate the archive such as the FY-1C/1D data. A database from several field measurements in China has already been established compiling all the data from the past Cal/Val experiments. These measurements are important to calibrate and validate the L1B radiance and the retrieval products. NSMC is also beginning to design and develop a website and database of FY's Sensor Cal/Val. The CMA GSICS Processing and Research Center (GPRC) is being constructed at NSMC since June 2008. The goal is to run the common GSICS GEO-LEO algorithm for FY-2C/2D. The inter-calibration comparison between FY-2C/2D and AIRS has been conducted for some cases. NSMC/CMA will establish a routine intercalibration for the FY series as part of GSICS. NSMC will also create a web page to display the results of inter-calibration.

WG II responded to the presentation by mentioning the various efforts and acknowledging the importance of the achievements of CMA.

EUM-WP-20 summarised scientific achievements related to GSICS: A routine inter-calibration has been established for the infrared channels of Meteosat imagers with the Infrared Atmospheric Sounding Interferometer (IASI) on Metop-A. A method has also been developed to inter-calibrate the High-resolution Infrared Radiation Sounder (HIRS/4) and IASI, both operating on Metop-A. These direct comparisons of collocated observations from pairs of instruments with similar characteristics form part of EUMETSAT's inter-calibration strategy to ensure consistency amongst its products and between those of other operation meteorological satellites. Key results included an intercalibration with IASI for Meteosat-7, -8 and -9 during 2007, which demonstrate the reliability of the inter-calibration method and show it can be used to monitor the gradual change in calibration bias of the 13.4 μm channel of Meteosat-9. This has been shown to be consistent with the build up of ice contamination on the instrument's optical elements. The modelling of this process, together with the inter-calibration monitoring can be used to help understand the mechanism responsible for the changing biases and develop and validate operational corrections. Promising first results for the inter-calibration of HIRS/4 and IASI on Metop-A are also shown.

In the discussion the need to include beta-users in the process toward an operational GSICS was discussed.

Recommendation 36.11: The GSICS Executive Panel to consider establishing in 2009 an end-to-end demonstration toward an operational GSICS by including beta-users in the GSICS process.

EUM-WP-21 During 2007/08, EUMETSAT has participated in GSICS Data Management working Group meetings where it was tasked to take a lead in the design and implementation of the Data Management server to support the GSICS Research Working Group in their inter-calibration comparisons. This also included the definition of the data formats needed to package the comparable data sets up from different satellites in such a form that it can be used by all GSICS partners, encapsulate only the data needed for the comparisons and compact enough for transfer over the internet. The WP presented the status of these developments giving the milestones achieved and those achievable by the end of 2008.

JMA-WP-05 reported on JMA's activities regarding GSICS and R/SSC-CM in response to Recommendations 35.02 and 35.06. JMA established an MTSAT-1R infrared intercalibration system on 2 July 2008 using AIRS and IASI data. Concurrently, JMA opened a GSICS website, whose front page is http://mscweb.kishou.go.jp/monitoring/calibration.htm. JMA has participated in the establishment of R/SSC-CM. JMA will proceed with initial activities related to Essential Climate Variables (ECV) satellite products of Atmospheric Motion Vectors (AMV) and Clear Sky Radiance (CSR), as one of the pilot projects in the framework of R/SSC-CM.

WG II commended JMA on its contribution to GSICS. In particular, WG II highlighted that JMA was the first CGMS member to make its GSICS web site operational.

KMA-WP-04 reported on KMA's GSICS activities. KMA installed the S/W for MTSAT-1R IR intercalibration with LEO (AIRS and IASI) based on ATBD version 1.2 before releasing COMS data in late 2009. KMA plans to implement the S/W for operational use by the end of 2008. For VI calibration, KMA implemented the vicarious calibration system using ocean and desert target. In addition, KMA will make plan to collaborate with Seoul National University to develop the method using DCC (Deep Convective Cloud).

WG II expressed its appreciation to KMA for its contribution to GSICS, notably the re-invigoration of the visible channel calibration using deep convection clouds is seen as element that should be pursued in a wider context within GSICS. In the discussion, KMA was also invited to participate in the GSICS Data Working Group.

Recommendation 36.12: All CGMS Members are encouraged to actively participate in GSICS by sending delegates to the Executive Panel meetings, and also to participate in the GSICS Research and Data Working Groups. This invitation addresses, in particular, the research space agencies that are planning long-term missions and data analyses for climate applications.

NOAA-WP-12 is a response to CGMS Recommendation 35.04 (Satellite operators to explain significant discrepancies in satellite inter-calibration as part of their contribution to GSICS) and demonstrates the use of routine intercalibration of GOES imagers with IASI and AIRS to monitor the performance of GOES. It was noted that the GOES long-term performance is not stable, but changes over time. The 13.6 micron channel needs to be shifted by -4.7 cm^{-1}. The paper demonstrates the importance of GSICS to take the next step for making corrections to GOES for climate and weather applications. It was also noted that by comparing GOES with both IASI and AIRS, one can assess the relative stability of AIRS vs. IASI at GOES spectral resolution. This is a very important discovery and is a very powerful new approach for assessing the relative stability of both AIRS and IASI.

Recommendation 36.13: GSICS GPRCs should compare geostationary observations with both AIRS and IASI to demonstrate consistency and relative stability of AIRS and IASI.

NOAA-WP-13 is a response to CGMS Recommendation 35.05 (Aircraft campaigns with SI traceable instruments should continue to provide absolute calibration opportunities for critical satellite instruments, such as IASI, AIRS and CrIS). The paper demonstrates the absolute intercomparisons achievable between aircraft and satellite observations. A recent campaign to validate IASI resulted in difference less than 0.1 K for many spectral regions.

A very important step in using aircraft instruments to assess the performance of satellite instruments includes the absolute traceability to a NIST transfer radiometer. The difference between aircraft instruments and the NIST transfer radiometer was less than 0.04 K.

Recommendation 36.14: CGMS Agencies to support aircraft campaigns and other methods for using reference observations to provide independent assessment of the absolute accuracy of satellite observations. Comparisons should be periodic (at least annually) and each campaign needs to be tied to a SI traceable reference.

Action 36.13: All CGMS Members to make available the instrument characterisation of their imaging and sounding instruments in polar and geostationary orbit, in particular the spectral response functions. This should include both the currently operational as well as all previous instruments. It is sufficient to make available the web link where the instrument characterisation data can be found. Deadline: 30 May 2009

NOAA-WP-14 is a response to CGMS Action 35.18 (GSICS GCC to propose a web-based interface to other satellite agencies for near real time instrument monitoring) and notes that instrument performance monitoring is critical for ensuring level 1b product quality for both numerical weather prediction and climate change detection. Since these products are increasingly dependent on data from the international constellation of earth observing satellites, it is important to establish a central interface from which instrument monitoring information from all over the world can be distributed. This WP also introduces a comprehensive web-interface for near real-time instrument performance monitoring, created, maintained, and located at the WMO Global Space-based Inter-Calibration System (GSICS) Coordination Center.

Action 36.14: GSICS to finalise recommendations for its instrument performance monitoring website. Deadline: CGMS-37

NOAA-WP-32 is a response to a request by the GSICS Executive Panel to develop a paper on the best practice for pre-launch characterization and calibration of instruments for remote sensing. The WP stresses that pre-launch characterization and calibration of remote sensing instruments should be planned and carried out in conjunction with their design and development to meet the mission requirements. Without proper prelaunch characterization, it is very difficult to obtain climate trends from the observations, with high certainty because of uncertainties in the instrument characterization. The recommended best practice in this paper is based on experience gained at the National Institute of Standards and Technology (NIST) working with the National Aeronautics and Space Administration (NASA), National Oceanic and Atmospheric Administration (NOAA) and Department of Defense (DoD) programs in the past two decades.

WGII recommended that GSICS consults with the CEOS WG on Cal/Val on the guidelines for pre-launch instrument characterisation and calibration.

Action 36.15: GSICS, in consultation with CEOS WG Cal/Val, to finalise development of guidelines for prelaunch instrument characterization. Deadline: CGMS-37

WMO-WP-02 recalled the goals of GSICS and highlighted recent achievements that were reported at the fourth meeting of the GSICS Executive Panel held in July 2008.

Discussion has been initiated with GCOS and CIMO to explore collaboration on the GCOS Upper Air Reference Network (GRUAN). The GRUAN objective would be to have a small subset of radiosondes with very high accuracy for temperature and especially humidity, that can be used in radiative transfer calculations to simulate the clear-sky radiances for comparison with the satellite observations. Attention is also paid to the progress of the CEOS Working Group on Calibration/Validation (WGCV) and of the Regional/Specialized Centres for Climate Monitoring (RSSC-CM) who are considered as important and complementary partners of GSICS. While GSICS is still in a building phase it has already reached a stage where it demonstrates its fundamental usefulness. WMO had recommended that all CGMS Members are invited to join GSICS, which aims at ensuring actual interoperability of Earth-Observation data from different satellite programmes, and is thus an essential mechanism to optimize the benefit from the space-based GOS and enhance its role as a component of GEOSS.

II/3 Vertical sounding and ITWG matters

EUM-WP-09 informed WG II about the current activities and future plans of EUMETSAT toward climate monitoring. This is part of the activities to reach the objectives laid down in the "EUMETSAT Strategy: 2030", approved by EUMETSAT Member States in July 2006, in the specific domains of climate monitoring and operational oceanography. In Climate Monitoring, the WP first reviewed the activities of EUMETSAT in international initiatives and then presented the direct EUMETSAT contribution through EUMETSAT programmes and EUMETSAT Satellite Application Facilities (SAFs). On operational oceanography, the WP presented the relevance of current EUMETSAT programmes (MSG, EPS, Jason-2) and the specific contribution of the EUMETSAT Ocean and Sea Ice (OSI) SAF. It then elaborated a set of planned EUMETSAT activities related to the development of a Jason follow-on programme, on the operations of the Kopernikus (former GMES) Sentinel-3 oceanography mission by EUMETSAT and on the access to third–party data, relevant for the oceanographic community, by EUMETSAT. The Representative of ESA informed WG II that a WP describing ESA climate initiatives will be presented to the CGMS Plenary.

KMA-WP-05 summarised recent progress made in satellite data assimilation in numerical weather prediction at KMA, in particular, AMV (Atmospheric Motion Vector). AMVs derived from MTSAT-1R were being assimilated in the 10 km resolution KMA Weather and Research Forecasting (KWRF) model. MTSAT-1R AMV data had also been used in the Global Data Assimilation and Prediction

System (GDAPS) since 2007, but they were not used for the KWRF model until May 2007. AMV data cover most of the ocean regions of the KWRF model domain and are expected to improve the model performance especially, in the ocean areas.

NOAA WP-15 is a response to recommendation 35.13 (CGMS members are encouraged to present papers demonstrating the possibilities of advanced sounding for analysing convective instability of the atmosphere, particularly utilising information from the hyperspectral sounders AIRS and IASI). The WP reports that retrieval simulations have shown that temperature and moisture information retrieved with high spectral and temporal resolution IR instrument far exceed those from the broadband Sounders on current GOES. A high spectral resolution IR sensor has a much greater vertical resolving power of temperature and moisture than broad band sensors.

High spectral and temporal resolution observations benefit nowcasting and NWP applications by providing spatially and temporally continuous measurements of temperature, water vapour, and the wind profile. With high spectral resolution IR geostationary sounding capabilities, forecasters and regional models will have sufficient information (e.g., meeting user requirements) regarding the fine-scale three dimensional structure of atmospheric water vapour and capping inversions and how these structures vary in time. A high spectral (and hence vertical) resolution IR sounder with faster scanning will be able to monitor the evolution of important low-level information about the atmosphere and thus substantially improve the capability to forecast severe weather. The WP demonstrated that advanced high spectral resolution infrared sounder data used in a geostationary forecast leads to the possibility to predict the onset of severe weather nearly six hour prior to storm development, instead of the 2 hour advanced warning by the planned GOES-R Advanced Baseline Imager (ABI).

Recommendation 36.15: In view of the most recent studies showing the great benefit of hyperspectral sounding to predict the onset of severe weather with much longer lead times and the potential for climate monitoring and improved satellite intercalibration, CGMS sees a firmly established need to fly hyperspectral sounders on next-generation geostationary satellites.

NOAA-WP-17 is an update to the regular reporting on the status of the generation of long-term satellite-based climatologies at NOAA. The WP responds to CGMS Action 35.20 (NOAA/NESDIS to include information on global and regional anomalies in their products as well) and presents information on regional and global trends and anomalies for clouds, aerosols, precipitation, OLR, ozone, and atmospheric temperature.

WMO expressed its appreciation to NOAA, also on behalf of GCOS, and asked NOAA to continue this valuable activity and to contribute to the WMO R/SSC-CM program.

NOAA-WP-31 provides the URL of websites on climate products described in NOAA-WP-29 at CGMS-35 and is a response to Action 35.19 (NOAA/NESDIS to send to all CGMS members the URL of web sites on climate products described in NOAA-WP-29)

Action 36.16: CGMS agencies to provide URL addresses of satellite-based climate datasets to the CGMS Secretariat for posting on the CGMS website. Deadline: CGMS-37

NOAA-WP-18 reported on the International TOVS Study Conference (ITSC). The Sixteenth International TOVS Study Conference. ITSC XVI, which was held near the town of Angra in Brazil from 6-13 May 2008. Around 137 participants attended the Conference and provided scientific contributions. 18 countries, and 3 International Organizations were also represented, namely, Australia, Brazil, Argentina, Canada, China, Taiwan, France, Germany, Hungary, India, Italy, Japan, Norway, Poland, Russia, Sweden, United Kingdom, United States, ECMWF, EUMETSAT and WMO. The number of attendees was the highest ever. The Working Groups had very useful discussions and it was again encouraging to see a large number of new younger scientists participating. This was the first opportunity for the conference to discuss the use of new data from Metop-A, which was launched just after ITSC-XV and it was exciting to see the substantial progress already achieved by several centres.

There were total of 27 major recommendations in the Working Group Report, which can be obtained from http://cimss.ssec.wisc.edu/itwg.

Below are seven of those recommendations requiring the attention of CGMS, WMO and CEOS.

1. The group noted that LEO IR and MW sounding capability on 3 orbital planes is essential to proper sampling of atmospheric temperature and humidity vertical profiles. At present there is no IR sounding capability planned for the early morning orbit and the performance of the MIS sounding channels is yet to be assessed. The group recommended WMO, CGMS and CEOS investigate scenarios for sounding instruments in the early morning orbit.

2. The Regional ATOVS Retransmission Service, RARS, has continued to develop since ITSC-XV. The Asia-Pacific RARS service has continued to expand and more NWP centres are using the RARS data. RARS networks in S. America and Africa are now available. The group encouraged WMO and the space agencies to continue to develop this ATOVS retransmission service as a low cost means of providing more timely ATOVS data for 90% of the globe. The Southern Ocean and North Pacific were identified by one study as particularly needing RARS.

3. The group continues to strongly support the SafetyNet concept, which will allow rapid dissemination of global NPOESS data products, identifying it as one of the most attractive features of NPOESS. WMO and the RARS Implementation Group were invited to consider an expansion of RARS for NPP and NPOESS-C1 as SafetyNet will become fully operational only from NPOESS-C2 onwards.

4. An important issue for consideration is that when MODIS is retired, according to current plans, there will not be an imager in polar orbit with a channel in the water vapour band. This will degrade the accuracy of any polar satellite derived winds. Space agencies are urged to consider the best means for providing a polar orbiting imager with water vapour channels along with the conventional VIS and IR channels.

5. The community software packages (i.e. AAPP, IAPP, IMAPP) have been essential in the use of ATOVS, IASI, AIRS and MODIS data by the meteorological community. The group encouraged satellite agencies to continue to support these packages for existing missions and to develop and release pre-processing software packages (e.g. IPOPP) as soon as practical before launch.

6. The group noted the increasing threat of RF interference in microwave imager channels. All members were urged to lobby their respective radio communication authorities to support protection of the imager and sounder bands and specifically to identify useful bands between 275 and 3000 GHz and to undertake more detailed studies in support of 52.6-59.3 GHz and 86-92 GHz.

7. Satellite agencies were again encouraged to continue and expand their support for education and training of the next generation of remote sensing scientists

Recommendation 36.16: CGMS Members to provide Working Papers addressing the seven top concerns of ITWG, as listed in the CGMS-36 WG II Report.

WMO-WP-03 addressed an outcome of the workshop on applications of Global Positioning by Satellite (GPS) radio occultation held at ECMWF in June 2008. Thereafter, WMO was informed of a recommendation from the radio occultation user community to establish an International Radio Occultation Working Group (IROWG) in order to foster scientific development and applications of radio occultation to areas such as global and regional numerical weather prediction, climate research, and space weather. This new working group should follow the successful examples of the International TOVS Working Group (ITWG), the International Winds Working Group (IWWG) and the International Precipitation Working Group (IPWG). It was furthermore proposed that the IROWG be established under the auspices of CGMS and be sponsored by WMO. The draft Terms of Reference for such a group were enclosed and follow closely the terms of reference of IWWG and IPWG.

WG II was also informed about a letter from Dr. Lars Prahm, Director-General of EUMETSAT to CGMS Heads of Delegations, proposing establishment of a new working group on radio-occultation and confirming EUMETSAT support.

WG II considered the demonstrated value of radio occultation sounding in NWP, its role in the new Vision of the GOS to 2025, the potential benefit of international cooperation to expand and optimize the use of radio occultation for NWP and climate monitoring, and proposed the setting up of a initial small study group to elaborate the terms of reference of such a working group and report to CGMS-37.

Action 36.17: WMO and the CGMS Secretariat to initiate the formation of the small group (J. Lafeuille [WMO], M. Goldberg (NOAA) and J. Schmetz [EUMETSAT]) to consider the role of a new International Radio-occultation Working Group under CGMS and to elaborate its draft terms of reference. Deadline: CGMS-37

II/4 Precipitation and IPWG Matters

CMA-WP-08 described the three rainfall estimation products that have been or are being developed at NSMC/CMA: i) FY-2 Satellite Rainfall Estimate, ii) Typhoon Rainfall Retrieval, and iii) FY-3 Satellite Rainfall Estimate. The FY-2 operational rainfall estimate is made using the satellite rainfall estimate and a fusing technique developed by NSMC. Based on hourly rainfall estimates from infrared measurements, the product is created by fusing with the 1, 3, 6, and 24-hour-accumulated rain gauge rainfall amount. Typhoon rainfall is retrieved using microwave measurements. Comparison between with the Hong Kong Radar rain rate, the rain belts and the large rain areas are very close. NSMC developed a visual system to display ATOVS sounding products and AMSU-B retrieved rain rate that many weather forecasters have expressed great interest. A microwave Radiation Imager (MWRI) is carried on FY-3A satellite. Rainfall estimate product is being developed using the MWRI measurements.

EUM-WP-23 presented EUMETSAT's activities in producing and validating satellite derived precipitation estimates, notably a product that is centrally derived as a multi-sensor precipitation product. The activities of the EUMETSAT Satellite Application Facility network in the area of precipitation were outlined, and finally the joint project between EUMETSAT and the South African Weather Service regarding a NOAA based algorithm was discussed. WG II recalled that this WP is a follow-up to EUM-WP-20 of CGMS-35.

The following two papers were not verbally presented at CGMS 36:

NASA-WP-01 gave a mission overview, current status, and future plans of the Global Precipitation Measurement (GPM) mission, a NASA/JAXA joint satellite effort is reported as requested in CGMS-35 Action Item 35.21.

NASA-WP-02 provided a summary of the precipitation estimation and validation activities of the Global Precipitation Measurement (GPM) mission, a

NASA/JAXA joint satellite effort was reported as requested in CGMS-35 Action 35.22. The WP also included future plans.

NOAA-WP-19 reported on the status of NOAA precipitation estimation and validation activities in response to CGMS Action 35.22 (CGMS Members to report on precipitation estimation and validation activities at CGMS-36). NOAA/NESDIS produces Hydro-Estimator (H-E) rainfall estimates from GOES over the CONUS and surrounding regions. The H-E is produced globally on a real-time (but non-operational) basis in support of users such as the flash flood forecasting projects over Central America and the Mekong River Basin in Southeast Asia that are being carried out by the Hydrologic Research Center and the World Meteorological Organization. NOAA/NESDIS generates operational swath and gridded precipitation estimates from the Advanced Microwave Sounding Unit (AMSU) and Microwave Humidity Sounder (MHS) sensors. Work continues on the validation and transition of a snowfall rate algorithm as part of this product. Under development is a hydrometeor profile retrieval from AMSU and MHS (i.e., liquid and ice water vertical distribution). NOAA/NESDIS also continues to support the DMSP Special Sensor Microwave/Imager (SSM/I) and Special Sensor Microwave Imager/Sounder (SSMI/S) rainfall rate product that is generated at Fleet Numerical Meteorology and Oceanography Center (FNMOC). Additionally, NESDIS continues to generate a SSM/I pentad and monthly rainfall climatology for the entire data record (July 1987 to present).

NOAA/NESDIS continues to improve the Self-Calibrating Multivariate Precipitation Retrieval (SCaMPR) technique, which is now performing on a level comparable to the operational H-E. SCaMPR uses microwave precipitation estimates to calibrate rainfall estimated from infrared measurements, which has difficulty in warm stratus cloud rain events.

NOAA/NESDIS continues to provide satellite rainfall estimates to the Global Energy and Water cycle Experiment (GEWEX) Global Precipitation Climatology Project (GPCP), NOAA/NESDIS is engaged in several validation activities that helps monitor and improve its satellite based precipitation estimates.

WMO-WP-04 informed CGMS on the status of activities related to the International Precipitation Working Group (IPWG) since CGMS-35. The Fourth IPWG Workshop (IPWG-4) met from 13-17 October 2008 in Beijing. It was attended by over 75 scientists from 20 different countries. The Workshop addressed topics that included current operational and research precipitation estimation techniques, applications to climate and weather, validation, sensor calibration, and future satellite missions. A new subgroup on new technology was formed within the IPWG. Dr. George Huffman and Dr. Christopher Klepp were confirmed as new Co-chairs who follow Mr. Ralph Ferraro and Dr. Chris Kidd whose contributions and leadership were acknowledged by CGMS. Other activities of note include:

- Second International Workshop on Space-based Snowfall Measurement

- First Programme for the Evaluation of High Resolution Precipitation Products (PEHRPP) Workshop

- IPWG Validation Activities

WG II thanked Dr. James Purdom for his outstanding support as rapporteur from the IPWG to CGMS and wished him a fruitful and pleasant future; it is hoped that his broad expertise would also be available in the future. WG II echoed the concern relating to the lack of funding to support the travel costs of scientists and users from less developed countries. As this issue had been already raised in earlier CGMS meeting, though with limited success, WG II considered new action appropriate.

Recommendation 36.17: That Dr. Volker Gaertner (EUMETSAT) takes over from Dr. J. Purdom as IPWG rapporteur to CGMS.

Recommendation 36.18: CGMS Members consider ways to provide additional financial support for attendance at CGMS Science Working Group Meetings, particularly for those participants coming from developing and least developed countries.

Recommendation 36.19: CGMS Members provide and update the inventory of routinely produced precipitation estimates, either operational or experimental/research, and investigate common methods to describe their error characteristics.

Recommendation 36.20: CGMS Members continue to provide data necessary for global, 4-km IR data-products in a timely manner to precipitation product producers.

Recommendation 36.21: The WMO Space Programme, the IPWG through its Co-chairs, and the WMO Hydrology Programme establish a small team to investigate the feasibility of "Mainstreaming the Operational use of Satellite Precipitation Data and Products" for Meteorological and Hydrological Services.

II/5 Atmospheric Motion Vectors and IWWG Matters

CMA-WP-09 reported on the status of AMV derivation at NSMC. At present, BUFR code AMVs of FY-2C and D are transmitted through the GTS. In order to have a homogeneous geographic distribution for image interpretation utilization, AMVs from thin cirrus tracers are also transmitted. With thin cirrus tracers, IR AMVs may cover 70% of the area. However, comparisons with radiosonde data show larger differences for those AMVs. It is expected that incorrect height assignment from thin cirrus tracers are the main contributor to the larger differences. To improve the performance of AMVs, a review to the algorithm is undertaken. Images after point spread function recovery are tested in the AMV derivation. This measure helped to improve the geometric tracing. Other measures may include a quality indicator for thin cirrus tracers.

CMA-WP-11 responded to Action Item 35.28. The WP summarized the methods disseminating the Fengyun satellite data. It stated that Fengyun satellite data is made available through DB service: the FY-1 polar orbiting satellite transmits the S-band CHRPT Data, the FY-3 transmits the S-band AHRPT and the X-band MPT data; the FY-2 geostationary satellite broadcasts the S-VISSR data. CMA uses DVB-S technology as an alternative method to disseminate FY data, and for this purpose, the FengyunCast system has been developed that uses the C- band of AsiaSat-4 satellite at 122.2E to broadcast near-real time data to Asia-Pacific region. Online access to Fengyun data is also made possible at the address http://satellite.cma.gov.cn. However, as the result of a temporary measure that attempted to protect CMA network from being attacked during the period of the Beijing Olympics, the website has become inaccessible since June 2008.

EUM-WP-24 reported on the development of an operational AMV product over polar regions using the 11 µm channel of AVHRR/3 (Advanced Very High Resolution Radiometer) onboard Metop-A. The algorithm has been developed at CIMSS (Cooperative Institute for Meteorological Satellite Studies) and estimates cloud motions which are derived from overlapping areas of subsequent orbits. The original code has been modified with respect to image navigation and mapping and is capable to ingest either EPS (EUMETSAT Polar System) Level 0 or Level 1B data. Moreover, cloud top pressures extracted from co-located IASI (Infrared Atmospheric Sounding Interferometer) measurements serve as additional information to validate the height assignment of the retrieved winds. For both, Arctic and Antarctic regions, the assigned altitudes show the strongest correlation between 300 hPa and 700 hPa. After successfully finishing the prototyping, the prime focus will be on the validation of the results, the generation of a reference test data set and the definition of the algorithm requirements and the product format for EUMETSAT's EPS Ground Segment.

EUM-WP-25 summarised the outcome of the 9th International Winds Workshop (IWW9). The workshop was hosted by NOAA/NESDIS and took place from 14 - 18 April 2008 in Annapolis, Maryland, USA. The IWW9 was attended by 45 scientists from 13 countries. With CMA, JMA, NOAA/NESDIS, KMA and EUMETSAT most of the members of CGMS producing AMVs were represented. Many global numerical weather prediction (NWP) centers participated too, with some sending several contributors reflecting the importance of AMV products for NWP. The WP i) recalled recommendations from CGMS 35 to IWW9, ii) summarised the highlights of IWW9 with details given as annexes in three working group reports, iii) introduced the two new co-chairs Dr Mary Forsythe (UK) and Mr Jaime Daniels (USA) who follow Mr Chris Velden and Dr Kenneth Holmlund.

In the discussion WG II gratefully acknowledged the leadership of Chris Velden and Ken Holmlund over the last decade. Outstanding progress has been made in this period; particularly noteworthy examples were the introduction of quality indicators and work toward having more commonality in the AMV derivation algorithms. WG II took note of the recommendations of IWWG 9 and requested

updates on the currently ongoing CGMS AMV intercomparison work as well the other items listed in the conclusions of EUM-WP-25.

Recommendation 36.22: All CGMS members are encouraged to continue or to commence participation in the CGMS AMV intercomparison using the specific MSG image data.

Action 36.18: Co-Chairs of IWWG, jointly with Dr Iliana Genkova, to provide a summary paper describing and evaluating the CGMS AMV intercomparisons using MSG image data. Deadline: CGMS-37

Action 36.19: Satellite operators deriving AMVs to summarise their methods and ways to characterise the AMV errors, with emphasis on the height assignment error. Deadline: CGMS-37

Recommendation 36.23: CGMS agencies to report on the height assignment of AMV cloud tracers using additional information on cloud characteristics.

JMA-WP-06 reported on the status of MTSAT-1R AMVs and recent JMA's activities on it. JMA terminated the production of SATOB reports at 06 UTC on 1 April 2008. JMA's AMV are currently available in BUFR format. The qualities of IR AMVs and cloudy-region WV AMVs have been improved since June 2007 when JMA updated the height assignment scheme. The distinct improvement is recognized in winter AMVs over the Southern Hemisphere. For further AMV improvement, JMA is developing a new height assignment scheme for IR AMVs, and seeking the best size of image segment for tracking target. JMA plans to introduce the new algorithm by March 2009. In the T-PARC study in 2008, JMA conducted Rapid Scan observations using MTSAT-2. JMA generated AMVs from Rapid Scan observations with appropriate parameters such as image segment for tracking target. JMA plans to start reprocessing AMVs from GMS, GOES-9 and MTSAT-1R images using available best algorithms to contribute to future reanalysis projects by the end of 2008.

KMA-WP-07 introduced the current status of AMV production at KMA including the accuracy of AMV compared with radiosonde observation data. The WP also described on-going international collaborations in order to improve the KMA AMV scheme – the Global AMV inter-comparison study and the impact of target size on AMV estimation.

In the discussion WG II queried whether the NWP system would be used in the validation process of AMVs from the COMS satellite.

WG II commended both JMA and KMA on their recent progress and contributions which also helped progress at other satellite centres, e.g. at EUMETSAT.

NOAA-WP-20 reported on the current status of the international operational AMV algorithms comparison study proposed at the 8th International Winds

Workshop and formulated as Recommendation 34.15 at the 34th CGMS meeting. Part 1 of the Study is completed and the results are presented in this WP. Part 2 of the Study is ongoing and it is anticipated to be completed by end of 2008. AMVs are important variables assimilated routinely by a number of weather prediction centres. The AMV data disseminated by the producers around the world undergo a thorough quality control including quality indicator (QI) and/or recursive filter function (RFF) threshold-based AMV pre-selection, blacklisting, thinning of the data, etc. Until now there has been a lack of an in depth understanding of how consistent all the data sets are, how algorithm set up and tuning impact the quality of the results, are the quality indicator routines implemented in a consistent fashion, etc.

In Part 1 of the study (known as CGMS-1 Study) five AMV producers – EUMETSAT, NOAA-NESDIS, JMA, KMA, and the Brazilian Meteorological services retrieved AMVs from one MSG-SEVIRI image triplet applying their own retrieval algorithm as it is used in operations. Winds derived by the various producers from the 10.8 µm IR channel are inter-compared.

Part 2 of the study (known as CGMS-2 Study) is ongoing at the time of writing of this WP. In this study the AMV producers are requested to produce AMVs from the same SEVIRI images, but using consistent target and search box sizes. This will allow for a more meaningful comparison of target height assignments and target height estimation algorithms.

CGMS commends this very important study because it has already resulted in the discovery and correction of errors in AMV processing systems and will result assimilation of more reliable and consistent AMV from operational centres. More comparisons of similar satellites products from operational agencies are desired.

Recommendation 36.24: CGMS encourages the ITWG and IPWG to consider case studies to intercompare algorithms similar to the activity underway in IWWG.

II/6 Cloud and Dust-related Parameters

KMA-WP-08 reported on the Operational Analysis of Asian Dust at KMA. KMA has been using the GEO as well as LEO satellites for operational analysis of Asian dust since 2002. A brightness temperature difference of IR window channels (BTD) is basically used for dust detection due to its availability in the night time. KMA developed the IODI (*Infrared Optical Depth Index)* which is now operationally used and will update BTD method to reduce the uncertainties, such as low sensitivity over ocean, diurnal variation of BTD, and the false signal near northern Chinese continent.

KMA-WP-08 triggered a more general question on the development of new products and their migration to operations. While there is a commonality in the approaches it was felt satellite operators could learn from one another by providing a detailed account of the relevant processes.

Action 36.20: CGMS Members to present WPs to CGMS-37 describing their processes for product development, verification and implementation into operations, as well as the process for continuous improvement. Deadline: CGMS-37

II/7 Other Parameters and Products

WMO-WP-05 presented a compendium on "Estimated Performance of Products from Typical Satellite Instruments". This document is also included as Volume IV of the dossier on "The Space-based Global Observing System in 2008 (GOS-2008)" and is introduced in WMO-WP-16, under agenda item D1 in the Plenary session. The document is an attempt to anticipate the quality of derived products (in terms of horizontal resolution, vertical resolution, accuracy, frequency of coverage), as a function of the characteristics of typical future instruments or missions (in terms of spectral range, spectral resolution, horizontal resolution, radiometric accuracy, swath or image cycle). The main purpose of this exercise is to appreciate the contribution of different instruments to the overall multi-instrument scheme that might be adopted in order to generate a product with as little bias as possible, by balancing strengths and weaknesses of the different instruments types. This study may be used as an input for the formulation of realistic user requirements for future observing systems.

WG II commended WMO on this extremely useful collection of estimates of product performance and agreed that the document will be very useful in the planning of future elements of the global observing system from space with a good emphasis on the practical application in terms of products.

CNSA-WP-05 introduced the HY-2 oceanographic satellite and its data and product applications. The HY-2 satellite will carry a scatterometer, an altimeter and a radiometer. The main parameters to be derived are: sea surface wind field, significant wave height, sea surface height, gravity field, ocean circulation and sea surface temperature. As secondary parameters the derivation of sea ice, sea level and water vapour content are envisaged. The HY-2 satellite will be launched in 2010. It can fill up the gap of scatterometer observations after 2012. The instrument will measure in the Ku band.

In the discussion WG II expressed a great interest in this new mission. WMO also recalled the need to have real-time access to data from HY-2.

EUM-WP-26 investigated the possibilities of advanced sounding for analysing convective instability of the atmosphere, particularly utilising information from the hyper-spectral sounder IASI on Metop-A. The idea is to obtain initial temperature and humidity information for the MSG-2 SEVIRI based Global Instability Index (GII) from collocated measurements from IASI. All case studies indicated the potential of the method. Some problems were detected with moisture retrievals at low levels; those problems are currently being investigated.

In the discussion it was mentioned that an update on this study using an improved moisture retrieval with IASI could be presented to the next CGMS meeting. WG II noted the linkage between this paper and NOAA-WP-15. Referring to the NOAA paper, WGII iterated the essential need to have hyperspectral infrared sounders in geostationary orbit.

KMA-WP-06 reported on an update of the Operational Analysis of Tropical Cyclones at KMA. KMA has added a new algorithm to retrieve the radius of maximum wind (RMW) in its web-based Satellite Image Analysis System. The comparison of RMW and QuikSCAT wind speeds has been performed by using seven typhoon cases in 2008.

In the discussion WGII commended KMA on this work and JMA expressed an interest in this product.

WMO-WP-06 informed CGMS Members about activities and plans for THORPEX, with particular focus on major science activities related to remote sensing, on activities of the THORPEX Observing Systems Working Group and on its merging with the Data Assimilation and Observing Strategies Working Groups, resulting in a new working group called the Data Assimilation and Observing Systems Working Group. The WP reaffirms the importance of CGMS satellite operators' active participation in both the planning and execution of THORPEX, through active focal points. Additionally, CGMS Members were informed that the CGMS Rapporteur to THORPEX is retiring and that a new Rapporteur has to be appointed. WG II recalled that THORPEX looks at targeting activities that will include optimised thinning of satellite data for NWP.

WMO-WP-25 informed CGMS about the Year of Tropical Convection (YOTC) which is currently underway. A satellite component of YOTC is essential to the success of the initiative and will involve establishing a database of key products for the evaluation and assessment of numerical model output. This should primarily involve data and products that have not been assimilated into the models.

In the discussion it was pointed out that the current satellite observing system provides unique possibilities to make progress on understanding the physical processes that govern tropical convection. It was also mentioned that the reprocessing of AMVs would help describe the large-scale tropical flow and the interannual differences from year to year.

WMO-WP-07 reported on the goal of the global network of WMO Regional/Specialized Satellite Centres for Climate Monitoring (R/SSC-CM), which is the continuous and sustained provision of high-quality Essential Climate Variables satellite products on a global scale responding to the requirements of GCOS. Following the adoption of the first R/SSC-CM Implementation Plan in November 2007, a first workshop for refining the planning was convened by WMO in April 2008, in Darmstadt, Germany, to identify initial areas of activities. Five topics were selected:

1. AVHRR-based data set of cloud and aerosol properties;
2. SSM/I total column water vapour, precipitation and liquid water path;
3. Surface albedo, clouds and aerosols from geostationary satellites;
4. Atmospheric motion vectors and clear sky radiances;
5. Upper tropospheric humidity.

Participating organizations have been requested to submit proposals related to these five areas by November 2008. The proposals will be discussed at the first R/SSC-CM Executive Panel (REP) Meeting which is tentatively planned for early next year.

The discussion clarified the importance of including the user community in the process of deriving climate products.

Recommendation 36.25: CGMS Members should actively participate in THORPEX field programmes and become engaged in the planning and execution of those programmes.

Recommendation 36.26: CGMS Members should support the YOTC concept and objectives and, in particular, encourage satellite agencies to facilitate access to relevant satellite data sets and help provide the verification data and products needed to make this project a success.

Recommendation 36.27: CGMS Members to identify a point of contact to aid in the development of a comprehensive satellite component to the YOTC and for further detailed discussion of satellite requirements to support YOTC.

II/8 Coordination of Code Forms for Satellite Data

EUM-WP-27 responded to CGMS Actions 34-27 and 34-28 and was presented by the chair of the CGMS Task Force on Satellite Data Codes (TFSDC), Dr Simon Elliott (EUMETSAT). It was recalled that the Task Force was established in order to advise CGMS and WMO on issues related to satellite data representation, identification and handling within the WMO Information System. The first meeting of the TFSDC was held at WMO in Geneva, 26 – 27 February 2008. In addition to reviewing its function and Terms of Reference, the Task Force considered a number of technical issues relating to the encoding and exchange of satellite data. The Final Report of the meeting was provided as the Annex to EUM-WP-27.

WMO-WP-08 discussed a number of additions to the BUFR and Common Code Tables as proposed by the Joint Meeting of the Coordination Team on Migration to Table Driven Code Forms and Expert Team on Data Representation and Codes; that meeting was held at the WMO headquarters from 1 to 5 September 2008. The meeting also reviewed the proposed sub-centre identifiers for the RARS network, as described in WMO-WP-09, and agreed them for operational use. The meeting also reviewed the proposed categories and sub-categories for satellite data that were proposed by the

Chairman/Rapporteur of the CGMS/WMO Task Force on Satellite Data Codes, following the first meeting of this Task Force (see EUM-WP-27). The proposed approach is based on a typology of generic instruments, consistent with the typology used in the Gap Analysis (see WMO-WP-16) instead of a list of particular instruments.

The WP presenters stressed that a permanent and dedicated group of experts is needed to deal with these complex coding issues in a timely manner with the required level of attention.

WMO-WP-09 informed of the status of definition of codes, GTS bulletin headings and filenames for the dissemination of data from the global network of Regional ATOVS Retransmission Systems (RARS).

In the discussion WG II noted that some coding issues were product specific and deserved discussion by WG II, however, in general, coding issues were more relevant to data dissemination and should be reviewed by WG IV. Therefore WG IV would be a more natural forum to discuss coding issues.

Action 36.21: The CGMS Secretariat to include "Coordination of code forms for satellite data" within the agenda of WG IV, instead of WG II for future CGMS meetings. Deadline: CGMS-37

Referring to EUM-WP-27 and WMO-WP-08, WG II commended the Task Force on Satellite Data codes for its work to date. WG II welcomed the definition of generic data categories and sub-categories that would allow accommodating expanded data sets that will be available in the future. It was clarified that at the "validation" stage changes and iterations are foreseen and readily considered. Once a "pre-operational" stage was reached definitions should in principle not be changed until it is declared "operational" and included into the Manual on Codes. Then the usual procedure of request for changes would apply.

In addition, WG II proposed that the Task force should investigate whether the WMO file naming convention can be made more flexible than merely having (long filename).bin for all types of data, e.g. (long filename).nc for netCDF data, etc.

Action 36.22: WMO Task Force on Codes to investigate whether the WMO file naming convention can be made more flexible than merely having (long filename).bin for all data types. Deadline: CGMS-37

In view of the importance of dealing with the complex coding issues in a timely manner, WG II supported the conclusions of the Task Force on Satellite Data Codes regarding its Terms of Reference and membership.

Action 36.23: WMO to revise the Terms of Reference of the Task Force on Satellite Data Codes as proposed by the Task Force. Deadline: 28 Feb 2009

Recommendation 36.28: CGMS Members to consider their participation in the Task Force on Satellite Data Codes to ensure broad and permanent representation of CGMS members.

II/9 Conclusion

The Chairman thanked all participants for open and fruitful discussions. WG II returned its thanks to Mr Toshiyuki Kurino for his very good Chairmanship.

All agreed that discussions in WG II had covered a broad range of activities, highlights being the various reports from space agencies on GSICS and the reports from the workshops of the three working groups reporting to CGMS all which held meetings in 2008.

WORKING GROUP III: CONTINGENCY PLANNING

III/0 Introduction

As agreed at CGMS-35, Mr Gary Davis from NOAA was elected Chairman of Working Group III (WGIII) on Contingency Planning, with Mr Jerome Lafeuille, from WMO, appointed as Rapporteur. WGIII comprised representatives of CMA, CNSA, EUMETSAT, JMA, KMA, NOAA, Roshydromet and WMO (see Annex 4 for the list of participants). Working Group III considered Working Papers CNSA-WP-04, NOAA-WP-22, NOAA-WP-24 and WMO-WP-10.

WMO-WP-10 recalled that contingency planning was meant to secure continuity of critical missions of the nominal operational configuration. The space-based GOS is now widening its scope to include ocean surface measurements such as altimetry, scatterometry and ocean colour and, in the future, will include a number of other missions as described in the new WMO Vision of the GOS in 2025. Thus there will be a need to review the CGMS Global Contingency Plan in this perspective. Discussions should be initiated in due time to identify the critical elements of these missions that would justify contingency actions.

WG III agreed to first focus on contingency issues related to the current baseline, before discussing plans for new missions and related contingency planning.

III/1 Contingency issues related to geostationary missions

Geostationary plans are currently well established to provide adequate coverage of most of the sectors, however two particular sectors required the attention of the Working Group: South America and the Indian Ocean.

Frequent image coverage of South America is currently provided by GOES-10, relocated at 60º W, which is extremely valuable for South American users. GOES-10 has exceeded by far its nominal lifetime and is planned to be out of service by the end of December 2009. NOAA plans to launch GOES-O in February 2009 and GOES-P in February 2010, but there is currently no plan to relocate a GOES satellite at 60º W after GOES-10. NOAA highlighted a battery problem on GOES-11, which is in the GOES-West position at 135º W. WMO encouraged NOAA to consider a replacement for GOES-10 at 60º W, until the full GOES-R,S configuration will allow frequent coverage of both North and South America.

As concerns the Indian Ocean sector, currently covered by Meteosat IODC mission until end of 2010, Roshydromet confirmed that Elektro-L1 was planned for launch in 2009 and would be located at 76º E, Elektro-L2 was planned for late 2010 and would be located at 14.5º E. If Elektro-L1 was delayed, extension of the IODC mission would be particularly critical.

III/2 Contingency issues related to Low-Earth Orbit missions

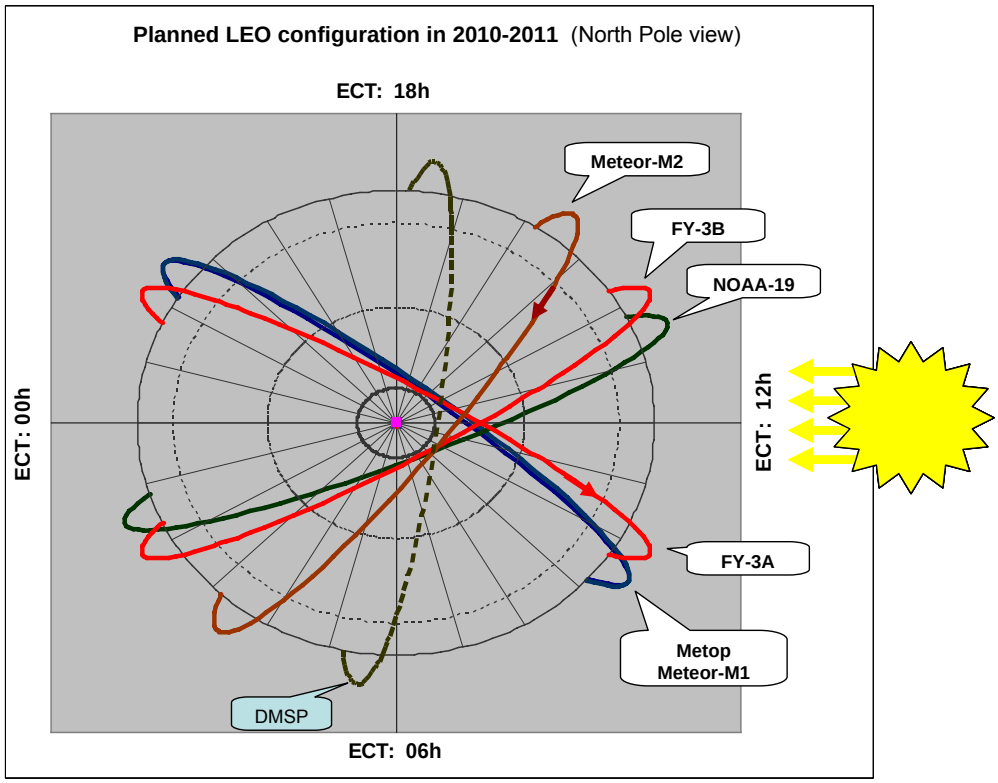
For the mid-morning orbit, continuity is planned through Metop-A/B/C. At present, NOAA-17, launched in 2002, is providing back-up. After commissioning, FY-3A will also contribute to this mission, provided that data are available in real-time.

For the afternoon orbit, NOAA-18 is currently operational and will be followed by NOAA-N' to be launched in February 2009. Since NPP is not designed as a fully operational satellite, continuity beyond NOAA-N' will rely on NPOESS-C1 planned for launch in 2013, and a back-up should be secured. WG III welcomed the confirmation from CMA that FY-3B was planned for launch on an afternoon orbit (14:00 ECT).

WG III also welcomed the announcement from ROSHYDROMET that Meteor-M1 would be launched in 2009 on a morning orbit (9:30 Descending Node) and Meteor-M2 in 2010 on a mid- afternoon orbit (15:30 Ascending Node).

No contingency issue was raised for the early morning orbit (05:30) since it is currently not part of the operational baseline.

In summary, the temporal distribution of the planned missions is illustrated below (The early morning orbit is shown as a dashed line since DMSP is not fully considered as an operational mission of the GOS, and no full sounding package is currently planned on that orbit).



III/3 Planning for new missions: Radio-occultation sounding

NOAA-WP-22 described NOAA's preliminary activities towards defining a radio-occultation sounder constellation to provide an operational follow-on for COSMIC. NOAA is seeking cooperation from other CGMS Members to contribute to such a mission.

EUMETSAT indicated that it had plans to operate the GRAS instrument on Metop-A, B and C and that preliminary studies for the post-EPS missions included considerations of a GRAS-type instrument, rather than a contribution to a constellation of small dedicated spacecraft.

ROSHYDROMET indicated that Meteor-M3 will fly the GNSS radio-occultation sounder Radiomet.

WMO recalled that, based on the demonstrated benefit of using COSMIC data in NWP, establishing a radio-occultation sounder constellation was one of the priorities defined in the new vision for the GOS; CGMS Members were thus highly encouraged to cooperate on such an initiative.

III/4 Planning for new missions: ocean surface monitoring

CNSA-WP-04 presented the plans for HY-2, a contribution from CNSA and the National Satellite Ocean Application Service to global ocean observation. The mission of HY-2 is to monitor the dynamic ocean environment including the sea surface wind field, sea surface height, wave height, gravity field, ocean circulation and sea surface temperature. For this purpose, the HY-2 payload will include a Ku band scatterometer, an altimeter and a microwave radiometer. The HY-2 mission is planned for launch in 2010 for a 3-year mission; it will be operated on a 964 km sun-synchronous orbit at 6:00 ECT. HY-2 is designed to contribute, in particular, to the continuity of ocean surface wind vector and altimetry measurements, in accordance with the global observation strategy recommended by WMO. CNSA and NSOAS further indicated that altimetry and scatterometry data would be made available, upon authorization by CNSA, with a delay of one month and one week, respectively.

WG III welcomed the very informative presentation and commended CNSA and NSOAS for this plan that will contribute to global ocean observation. WMO expressed its particular appreciation that the global observing strategy had been taken into account in planning this programme. WG III, however, stressed that timeliness was an important requirement for operational meteorological and oceanic applications and expressed concern that these operational applications may not fully benefit from this important mission if data were not available in near-real time. CNSA explained that accurate altimetry data required processing to determine precise orbit positioning, which could not be done in real time; furthermore, as the first HY-2 was an experimental mission, data would not have the same level of availability as for an operational mission. Given the high interest expressed by CGMS, CNSA

indicated its readiness to make data available in near-real time with an experimental status for interested users. WG III welcomed this offer that would allow the HY-2 programme to play a substantial role in the global observing strategy of the ocean surface besides the Jason-2 and Sentinel-3 programmes.

ROSHYDROMET informed WG III that the Meteor-M3 ocean monitoring mission was planned for launch in 2012, on a 565 km sun-synchronous orbit.

III/5 Planning for new missions: geostationary hyperspectral IR sounding

WMO recalled that hyperspectral IR sounding from the geostationary orbit was one of the points of the new vision for the space-based GOS in 2025. Additionally, the Committee on Earth Observation Satellites (CEOS) had identified a particular task to review current plans in this respect.

EUMETSAT reported that the IR sounding mission had now been confirmed for MTG, with a plan to launch the MTG-sounding spacecraft in 2018.

CMA confirmed its plan for an IR interferometric sounder aboard FY-4, planned for launch in 2014.

JMA reported that a sounder was not planned for the MTSAT-Follow-On spacecraft (FO-1, to be launched in 2014, nor for FO-2, to be launched in 2016). However, JMA had been discussing with JAXA the feasibility of cooperation on developing a hyperspectral sounder for geostationary satellites after the MTSAT follow-on satellites.

KMA added that it had not yet defined the payload of the COMS-1 follow-on satellites.

ROSHYDROMET commented that it will only consider a possible geostationary sounder after having experienced in Low Earth Orbit with Meteor-M2.

NOAA reported that no hyperspectral sounder was planned on GOES-R and S, but it was trying to plan such a capability on the following spacecraft.

III/6 Contingency planning for new missions

WG III noted that the future space-based GOS will be a composite system including various constellations. Continuity requirements and possible contingency measures may be defined separately for each mission. There will be more flexibility to deploy contingency scenarios. WG III suggested that a specific workshop should be convened to define critical missions and corresponding re-launch or contingency measures to be considered for each mission. WG III recommended that WMO should convene this workshop in the second half of 2009.

Action 36.24: WMO to convene a contingency planning workshop in the second half of 2009 in order to investigate critical missions and associated potential contingency actions regarding the new missions implied by the Vision for the GOS in 2025. Deadline: 30 June 2009

III/7 Review of relevant actions from CGMS-35

Two actions from CGMS-35 had been assigned to WG III for discussion (see below in italics).

Nominal geostationary locations:
Action 35.24: CGMS current and future satellite operators to review their possible flexibilities to adjust the nominal locations of their baseline geostationary satellites and to provide the information at the next CGMS session. Deadline: CGMS-36

NOAA reported that it would be willing to undertake moving its geostationary satellites within existing physical and frequency constraints, which would be about ± 5 degrees.

EUMETSAT reported that, if approved by the EUMETSAT Council, it will also be ready to relocate its operational geostationary satellites (MSG) within existing physical and frequency constraints; specific orbital slots within +/- 10 deg. are already notified and coordinated within ITU and fuel provisions are made in all satellites to enable this. For the future geostationary satellites (MTG) the current status at Phase A level includes design provisions similar to the ones of the MSG system. However, in the case of the MTG system, it had to be pointed out the additional frequency co-ordination hurdle created by the intended use by MTG of a MetSat band (K-Band) shared with the Fixed Satellite Service. Being a commercial band, it is not excluded that the frequency coordination process may influence the final orbital location for the MTG satellites.

ROSHYDROMET commented that it is considering the possibility of moving the location of the geostationary satellite Elektro-L 1, if it were necessary. Taking into account the technical resources of the spacecraft and the frequency management constraints, the flexibility is thought to be within ± 15 deg at most.

JMA stated that it was necessary for Japan to continue the meteorological observation mission at 140 º E in order to maintain observation continuity and consistency, and for the convenience of its user community, since Japan had been continuing observation from the same longitude since 1977, throughout the operational periods of the GMS and MTSAT series.

CMA indicated that there is little flexibility to adjust the locations of FY-2, as they have been optimised for the operational service delivered in response to user requirements.

WG III concluded that there existed some flexibility to adjust the nominal locations, however, the maximum separation between neighbouring nominal locations was currently 85 deg between MTSAT and GOES West, and the potential for reducing this was limited.

It was clarified that different provisions would apply in the case of a contingency situation requiring the activation of a bilateral back-up agreement. In such a situation, NOAA could move a GOES satellite up to about 5 º W, and EUMETSAT has made provisions for operating its MTG series at locations ranging from 50º W to 70º E.

Use of direct broadcast

Action 35.25: Each CGMS polar orbiting satellite operator to consider providing to all other polar orbiting satellite operators, and to the direct readout community, their processing software necessary to produce Level 1B data from the direct broadcast data stream, and to provide the technical specifications for their direct broadcast data stream necessary to produce Level 1B data. Deadline: 31 March 2008

WG III noted that this action was fulfilled for the EUMETSAT Metop programme.

For the future NPP and NPOESS systems, NOAA plans to use the International Polar Orbiter Processing Package (IPOPP). It is the primary processing package that will enable the Direct Readout community to process, visualize, and evaluate National Polar-orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project (NPP) Sensor and Environmental Data Records (EDR), which is a necessity for the Direct Readout community during the transition from the Earth Observing System (EOS) era to the NPOESS era. IPOPP will be:

- Freely available
- Portable to Linux x86 platforms
- Efficient to run on modest hardware
- Simple to install and easy to use
- Able to ingest and process Direct Broadcast overpasses of arbitrary size
- Able to produce core and regional value-added EDR products

As concerns FY-3, CMA had provided technical information in document CMA-WP-10, presented to Working Group IV, and announced that further details and pre-processing software for FY-3A data would be made available once it becomes operational.

Concerning the future Meteor-M1 and -M2 satellites, ROSHYDROMET indicated that all the necessary information to receive and process data to level 1B would be made available to the users after completion of the launch and commissioning of Meteor-M1.

III/8 Conclusions

The Chairman thanked the participants for their active contribution to the business of WG III.

WORKING GROUP IV: GLOBAL DATA DISSEMINATION

IV/0 Introduction

As agreed at CGMS-35, Mr Mikael Rattenborg from EUMETSAT was elected Chairman of Working Group IV (WG IV) on Global Data Dissemination by Satellite, with Mr Gordon Bridge, also from EUMETSAT, appointed as Rapporteur. WG IV comprised representatives of the satellite operators from CNSA, CMA, CNSA, EUMETSAT, JMA, KMA, NOAA, ROSCOSMOS, ROSHYDROMET and WMO (see Annex 4 for the full list of participants).

WG IV then reviewed the status of actions from previous meetings:

Action 33.24 EUMETSAT, NOAA together with WMO to develop a EUMETCast to NOAA ADM transition plan for users in South America and report details to CGMS. **Closed at the meeting.**

Action 35.26 EUMETSAT to provide CGMS with the results of the Post-EPS, Phase 0 studies, in particular, results pertaining to data dissemination. **Closed with a report to Plenary.**

Action 35.27 EUMETSAT to provide CGMS with the results of the MTG trade-off studies, in particular, results pertaining to the MTG data dissemination system. **Closed with a report to Plenary.**

Action 35.28 Satellite operators to provide WMO with detailed information on all the methods available, or planned, for operational data access from each of their satellites contributing to the GOS, via relevant URL of the satellite operator's web pages. This detailed information shall include the designation of the dissemination or retrieval services, their summary contents, formats used, and technical characteristics such as:

- For real-time dissemination via the satellite itself (Direct Broadcast): frequency, bandwidth, data rate (uncompressed);
- For Real-time dissemination through multi-mission satellite dissemination system (Advanced Dissemination Methods): satellite name, location, frequency band, area covered, data rate (uncompressed);
- For Real-time dissemination via Internet FTP: address;
- For On-line data retrieval: address;
- URL for precise information on data access modalities

Closed at this meeting. WG IV also noted that more information of this type will become available by the time of CGMS-37.

Action 35.29 WMO/CGMS Secretariat to collect data access information from satellite operators and make it available through the CGMS and/or WMO websites. **Closed.**

Action 35.30 CGMS members to report on their use of compression techniques (from the operational and user perspectives) for current and future satellite systems. **Closed.**

Action 35.31 NOAA and EUMETSAT to study possibilities for the use of NPOESS ground infrastructure to improve the timeliness of Metop data, within the framework of JPS discussions and report findings to CGMS. **New deadline: CGMS-37**

Action 35.32 CGMS members involved with the IGDDS to consider applying as DCPCs within the context of the IGDDS and WIS, in consultation with WMO. **New deadline: 31 December 2008**.

IV/1 Direct Dissemination from Meteorological Satellites

EUM-WP-27, which was also discussed in WG II, informed WG IV that in response to CGMS Actions 34-27 and 34-28, the CGMS Task Force on Satellite Data Codes was established in order to advise CGMS and WMO on issues related to satellite data representation, identification and handling within the WMO Information System. The first meeting of the Task Force was held at WMO Headquarters in Geneva, 26 – 27 February 2008. In addition to reviewing its function and Terms of Reference, the Task Force considered a number of technical issues relating to the encoding and exchange of satellite data. The Final Report of the meeting was presented in an Annex to the WP.

Given the subject matter, and the relationship with WMO/IDDS issues, WG IV agreed that in future it would be more appropriate to discuss this topic within the Agenda of WG IV rather than WG II. This would also raise the profile of this activity within CGMS. However, WG IV realised that its terms of reference would have to be modified to reflect this change, and also possibly those of the Task Force.

Action 36.25: CGMS Secretariat to propose a revised Terms of Reference for Working Group IV to reflect the fact that it will now also include activities of the CGMS Task Force on satellite data codes. Deadline: 31 December 2008

The Chairman noted that there was a need for increased participation by CGMS in the work of the Task Force and, at the very least, a virtual meeting of this Task Force should take place before the 2009 WMO CBS meeting. Several members expressed an interest, and the following action was agreed:

Action 36.26: CGMS Members to nominate their participants to the CGMS Task Force on Satellite Data Codes. Deadline: 31 January 2009

Action 36.27: CGMS Task Force on Satellite Data Codes to propose a permanent framework for the activity by CGMS-37. Deadline: CGMS-37

CMA-WP-10, presented in response to Action 35.28, summarized the methods for disseminating Fengyun satellite data. It stated that Fengyun satellite data is made available through a Direct Broadcast service. The FY-1 polar orbiting satellite transmits S-band CHRPT Data, FY-3 transmits both S-band AHRPT and X-band MPT data.

The FY-2 geostationary satellite broadcasts S-VISSR data. CMA uses DVB-S technology as an alternative method to disseminate FY data, and for this purpose, the FengyunCast system has been developed. This system uses a C-band transmitter of the AsiaSat-4 satellite, at 122.2E, to broadcast near-real time data to the Asia-Pacific region. Online access to Fengyun data is also made possible at the address http://satellite.cma.gov.cn. However, as the result of a temporary measure that attempted to protect the CMA network from being attacked during the time of the Beijing Olympics, the website has become inaccessible since June 2008.

The Chairman commented that the global meteorological user community would greatly appreciate access to FY3 data, in particular sounding and imagery products. Metop-A level 2 products and a subset of level 1 products were now regularly exchanged via the GTS and he hoped that other polar orbiting satellite operators would do the same. It was suggested that this topic could be put on the Agenda of the forthcoming WMO High Level Consultative Committee meeting in January 2009. In the meantime, on behalf of its members, WMO expressed its appreciation to CMA for the successful commissioning and operation of FY3 and looked forward, in due course, to the wider exchange of products from FY3.

WG IV proposed the following action:

Action 36.28: CMA to investigate possibilities for the provision of global FY-3 data to the GTS main trunk network and report back at CGMS-37. Deadline CGMS-37

Concerning the status of FengyunCast, CMA added that whilst the Shinetek company had now become a commercial entity, it was still very much involved with supporting the system with various software developments, including the packaging of exchanged EUMETSAT data and products in readiness for uplink to, and rebroadcast via FengyunCast. This Service was now operating via C-band.

KMA-WP-03 informed WG IV that the Korea Meteorological Satellite Centre (KMSC) of KMA will have a number of functional systems supporting COMS operations, meteorological product generation and dissemination. The COMS ground system at KMSC has been fully installed and it is currently in its integration test phase. The document introduces the COMS ground system at KMSC/KMA and explains how it performs each of the functions. KMA added that the COMS satellite was scheduled for launch in June 2009.

NOAA-WP-28 presented 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. Replacement of the analogue Weather Facsimile (WEFAX) with the new digital LRIT in 2005, started a transition period that will culminate with the implementation of the EMWIN/LRIT service on the GOES-R spacecraft constellation, combined with the transition from today's GVAR to the GOES Re-Broadcast (GRB) service on GOES-R. NOAA's current direct broadcast services will change dramatically in data rate, data content, frequency allocation and field terminal configurations. The geostationary and polar-orbiting environmental satellite constellations will employ new downlink frequency allocations, larger bandwidths, and faster data rates. Therefore, environmental data users will have to make use of new field terminal receivers, unique to that particular broadcast service.

Noting this latter point, WG IV proposed the following actions:

Action 36.29: NOAA to provide CGMS with more information on the reception of GOES-R data sets. Deadline: CGMS-37

Action 36.30: NOAA to consider options for a multi-cast service in support of the dissemination of GOES-R data and products and inform CGMS accordingly. Deadline: CGMS-37

NOAA-WP-29 provided information on the status of the Low Rate Information Transmission (LRIT) Service on the GOES I-M spacecraft. The LRIT broadcast is operational on both GOES-east and GOES-west spacecraft.

NOAA has concentrated its efforts on upgrading system reliability and upgrading monitoring efforts. In the near term, NOAA will work to expand the product suite through the addition of imagery products and environmental products. NOAA continues to work with users and vendors to assess the quality and reliability of the service.

Additionally, NOAA will continue its re-evaluation of the system architecture and will upgrade the hardware and software in LRIT domains. Future development of the LRIT system will be defined through increased utilization and community outreach activities and working in the provision of an HRIT broadcast on the upcoming GOES-R series of satellites.

NOAA added that it maintains a user database and periodically sends out emails informing users about changes in system status and services. A review board procedure is in place to access the need for additional products in line with user requirements, the main user being the US National Weather Service.

EUMETSAT informed the meeting that it was providing an LRIT service from its Meteosat-9 satellite, however, there were relatively few LRIT reception

stations because of the wide acceptance to date of the EUMETCast broadcasts. Even so, the coverage of LRIT was somewhat wider than EUMETCast, and LRIT allowed access to data in some remote island locations out of the field of view of the EUMETCast beams.

IV/2 Advanced Dissemination Methods

WMO-WP-11 reported on the progress of the global network of Regional ATOVS Retransmission Systems (RARS) that currently includes 10 stations for the EUMETSAT Advanced Retransmission System (EARS), 13 stations for the Asia-Pacific RARS (AP-RARS), and five stations for the South America RARS (SA-RARS). The resulting coverage is about 60% of the surface of the globe and is expected to reach 78% at the beginning of 2009 and 82% in early 2010. With the implementation of additional stations on Pacific islands and in coastal regions that is planned in 2009, the coverage will significantly expand over oceanic areas which are of primary importance for the use of RARS data for NWP. Furthermore, contacts have been made with operators of stations in central and southern Africa which could ultimately contribute to the objective of covering 90% of the globe.

Quality monitoring of RARS data is performed at the global level by the EUMETSAT SAF for NWP and at the regional level by the RARS operators. Information and links are provided on the WMO Space Programme RARS web pages www.wmo.int/pages/prog/sat/RARS.html.

The 16th International Scientific TOVS Conference (ITSC-16) strongly encouraged the further implementation of the network and consideration of the extension of the concept to include advanced sounding instruments. Discussions have been initiated about the extension of the RARS project to include ATMS and CRIS sounding data from the NPP and NPOESS-C1 sounding missions since the timeliness requirements of global NWP cannot be guaranteed otherwise on these missions that will not benefit from the full SafetyNet implementation. This new phase of the RARS project would involve an optimized subset of stations without aiming at 90% of global coverage.

EUMETSAT informed the meeting that the actual start of RARS operations by Oman was still TBC, however, an exchange of letters had been signed on RARS co-operation between EUMETSAT and ROSHYDROMET. The new Russian station based in Moscow was making good progress and its operation within the EUMETSAT EARS network was expected to start in the first quarter of 2009. Two further stations will be installed in 2009 in Novosibirsk and Khabarovsk.

WMO, recalling the significant overlap in coverage of some RARS stations, commented that fewer X-band stations (needed to receive, e.g. NPP and NPOESS broadcasts) could still result in an acceptable coverage.

WG IV noted that the present and planned (2009) coverage of the RARS system can be found in the Space Programme part of the WMO Web site.

EUMETSAT informed the meeting that it was now operating a restricted HRPT service from Metop-A, using the redundant on board unit. In order to minimize the risk of radiation damage, the unit was only switched on over certain portions of the orbit. In the meantime the units to be flown on Metop-B and C were being refurbished, so that operational contribution to the RARS network could be fully maintained over a long period.

The Chairman noted that all CGMS Members had expressed continued support to the RARS network and would consider a further evolution of the network to accommodate the new transmissions of NPP and NPOESS as far as possible, and taking account of maximum reuse of existing infrastructure.

EUM-WP-29 outlined the current status of and future plans for the EUMETSAT Earth Observation Portal. The purpose of this Portal is three-fold:

1. To implement a central service point to provide the EUMETSAT User with a single point of online access to all EUMETSAT data and dissemination services. Thus, the EUMETSAT Earth Observation Portal will allow users to discover data, search for data and to order data or subscribe to dissemination services (in particular to services available on EUMETCast);

2. To expand the above portal to allow EUMETSAT Users to discover, search, order and subscribe to earth observation data and services from partner agencies, in particular CNES Altimetry products, NOAA data, ECMWF data, GMES service products, etc;

3. To allow partner agencies to discover, search, order and subscribe to EUMETSAT data and dissemination services via a set of programmatic, interoperable services.

EUMETSAT has established a two-year project to realise the above requirements. The aim of the first phase is to implement the EUMETSAT User oriented functionality and the aim of the second phase is to implement catalogue interoperability with partner organisations. This project was also seen an important contribution to the WMO Information System and to the GEOSS (as a key component of the GEO Portal).

NOAA, congratulating EUMETSAT on providing a very effective and user-friendly interface, added that in due course it hoped to develop a similar service for its users.

EUM-WP-11 informed WG IV that GEONETCast, consisting of three major dissemination systems, namely, GEONETCast Americas by NOAA, FENGYUNCast by CMA and EUMETCast by EUMETSAT, had reached near global coverage. The three GEONETCast Network Centres (GNC) NOAA, CMA and EUMETSAT are interconnected via bi-lateral data exchange mechanisms for the exchange of GEONETCast relevant data. All three GNCs are disseminating their GEONETCast contributions in their respective footprints on

an operational basis. The next steps are to include the contributions of the other GNCs into their respective regional dissemination. EUMETSAT is already disseminating contributions from NOAA and CMA within all EUMETCast footprints, covering Europe, Africa and South America.

The WP also presented more details on the actual status of the GEONETCast system, in view of the respective participating dissemination systems, data exchange and data services supported, with an outlook into the near-term. There was also additional information on the actual status and intended evolution of the EUMETCast services, being a major contribution to GEONETCast, and an overview of the GEONETCast Product Navigator which is the one-stop-shop access to GEONETCast data discovery.

The Chairman thanked CMA, EUMETSAT, NOAA and WMO for the very successful implementation of GEONETCast. CGMS Members had played a major role in the global success of this important information exchange system which had, in effect, become a flag-ship service of the GEOSS. He added that the next demonstration of GEONETCast will take place at the forthcoming GEO-V Plenary meeting in Bucharest, Romania.

IV/3 Global Data Exchange

NOAA-WP-26, which was a response to CGMS Action 35.30, provided a brief summary on the use of data compression for GOES, POES, GOES-R and NPOESS data in order to reduce sensor data volume.

In almost all cases, NOAA uses “Lossless” data compression. By definition, the data that is restored is exactly the same as the original pre-compressed data. NOAA satellites use only what is known as the “RICE” lossless data compression algorithm. The POES satellite system uses no data compression.

The RICE compression algorithm is used in the current generation of operational GOES satellites. The “Rice” compression algorithm is also planned for use with the GOES-R series. However, the GOES R system may add a new, as yet undefined, Lossless compression algorithm to further assist data distribution by satellite.

The NPOESS system also will use the RICE “Lossless” compression algorithm for VIIRS data. The compression efficiency is estimated to range from 1.5:1 to greater than 1.8:1, the actual compression achieved is dependent upon the complexity of the scene sensed.

For VIIRS LRD, Data reduction techniques employed for data within the LRD link include lossy JPEG2000 compression of VIIRS mission data. It is anticipated that imagery visible bands will be compressed no greater than 6:1, while imagery infrared bands are compressed no greater than 9:1. Other moderate resolution bands will be compressed between 4:1 to 9:1 depending upon the LRD link configuration chosen.

IV/4 Integrated Global Dissemination Service (IGDDS) development

NOAA-WP-27 informed WG IV that GEONETCast Americas is a regional regional contribution to a developing, global, near-real-time, environmental data dissemination system in support of the Global Earth Observation System of Systems. It is a contribution from NOAA, whose goal is to enable enhanced dissemination, application, and exploitation of environmental data and products for the diverse societal benefits areas defined by the Group on Earth Observations. The societal benefit areas (SBA) are agriculture, energy, health, climate, weather, disaster mitigation, biodiversity, water resources, and ecosystems. GEONETCast Americas serves North, Central, and South Americas and became operational in April, 2008. GEONETCast Americas uses inexpensive satellite receiver stations based on Digital Video Broadcast standards. GEONETCast has links with similar regional environmental data dissemination systems deployed in Europe and Asia. The dissemination comprises mainly SBA-related and EUMETSAT-exchange products. NOAA added that whilst there is currently no funding for a further evolution of GEONETCast Americas, further attempts by NOAA to secure funding will be made in FY2011.

NOAA also informed WG IV meeting that there will be promotion of the GEONETCast Americas dissemination scheme at the forthcoming GOES Direct Readout Conference being held in Miami, USA, in the first week of December 2008.

WMO-WP-12 informed WG IV about the status of the Integrated Global Data Dissemination Service (IGDDS) project, in the light of the conclusions of the second meeting of the IGDDS Implementation Group and the fourth meeting of the Expert Team on Satellite Utilization and Products (ET-SUP-4).

The Implementation Group had reviewed draft IGDDS standards for DVB-S services and reaffirmed the importance of compliance with WMO Information System (WIS) standards, in particular, as concerns data description by metadata and catalogue interoperability through search interface standards.

The Implementation Group had welcomed the progress in the implementation of the global Digital Video Broadcast by Satellite (DVB-S) infrastructure, of inter-regional data exchange mechanisms and of user support arrangements.

The Implementation Group, however, reaffirmed the high priority to be given to identifying data requirements for each regional DVB-S service and to ensuring quasi-global DVB-S dissemination coverage responding to these requirements on a sustainable basis.

This was reinforced by ET-SUP-4 which requested that the WMO Secretariat brings this point to the attention of CGMS-36, highlighting the value of the EUMETCast-America's service to South American NMHSs and encouraging agencies to find a way to ensure the associated requirements continue to be met in the future for this region.

WMO added that whilst the infrastructure was largely in place to support GEONETCast Americas, arrangements that would ensure long term continuity and a wide take up of the service by countries in South America remained somewhat inadequate. WMO, therefore, invited CGMS Members to take all possible steps to ensure a long term, low cost data and product exchange service for the users in that region.

Concerning the availability of GOES-10 data, NOAA informed WG IV that this satellite will have to be turned off and de-orbited at the end of 2009 as there will no longer be sufficient onboard station-keeping fuel.

WMO, referring to section 4 of its WP-12, recalled its anticipation that CGMS satellite operators will express an intention to apply as DCPC for the provision of satellite data and products within the framework of the IGDDS and the WIS. There was considerable information on the WMO Web site relating to the roles and responsibilities of the DCPC and WMO hoped that more CGMS Members would be prepared to contribute to this activity.

The Chairman recalled the important role to be played by the satellite operators in the context of the WMO Information System. With this understanding, and to allow more time for CGMS Members to respond, WG IV agreed that old Action 35.32 should remain open until the end of 2008.

IV/5 Conclusion and preparation of WG report

WG IV concluded its business with the finalisation of its Report to Plenary, taking into account the related actions generated during the session.

ANNEXES:

ORDER OF BUSINESS OF THE CGMS-36
3-7 November 2008

PLENARY SESSION

A. INTRODUCTION

A.1 Welcome
A.2 Election of Chairmen
A.3 Adoption of Schedule
A.4 Nomination of Drafting Committee
A.5 Review of Action Items

B. REPORT ON THE STATUS OF CURRENT SATELLITE SYSTEMS

B.1 Polar Orbiting Meteorological Satellite Systems
B.2 Geostationary Meteorological Satellite Systems
B.3 Research and Development Satellite Systems
B.4 Anomalies from solar and other events

C. REPORT ON FUTURE SATELLITE SYSTEMS

C.1 Future Polar Orbiting Meteorological Satellite Systems
C.2 Future Geostationary Meteorological Satellite Systems
C.3 Future Research and Development Satellite Systems
C.4 Reconfiguration of future combinations of LEO and GEO missions

D. OPERATIONAL CONTINUITY AND RELIABILITY

D.1 Global planning, including orbital positions and reconfiguration of the space-based component of the GOS
D.2 Inter-regional contingency measures
D.3 Long-term global contingency planning

E. SATELLITE REQUIREMENTS OF WMO AND IOC PROGRAMMES

E.1 World Weather Watch
E.2 Other WMO Programmes
E.3 IOC Programmes

F. WORKING GROUP REPORTS

F.1 Reports from Working Groups I-IV

G. INTERACTION WITH GEO

G.1 Applications of Meteorological Satellite Data for Environment Monitoring
G.2 Geonetcast/EUMETCast
G.3 CGMS and GEO/GEOSS interactions

H. OTHER ITEMS OF INTEREST

H.1 Training
H.2 Information
H.3 Any other business

I. FINAL SESSION

I.1 Nomination of CGMS Representatives at WMO and other meetings
I.2 Nomination of Chairmen of Working Groups for CGMS-37
I.3 Any Other Business
I.4 Summary List of Actions from CGMS-36
I.5 Approval of Draft Final Report
I.6 Date and place of next meeting

WORKING GROUP SESSIONS

WORKING GROUP I: TELECOMMUNICATIONS

I/0 Introduction
I/1 Coordination of frequency allocations: SFCG, ITU and WRC activities
I/2 Telecommunication techniques
I/3 Coordination of International Data Collection & Distribution
I/3.1 Status and Problems of IDCS
I/3.2 Ships, including ASAP
I/3.3 Dissemination of DCP messages (GTS or other means)
I/4 Future use of IDCS
I/5 Search and Rescue (S&R)
I/6 Conclusion and preparation of WG report

WORKING GROUP II: SATELLITE PRODUCTS

II/0 Introduction
II/1 Image processing techniques
II/2 Satellite Data Calibration and Validation
II/3 Vertical sounding and ITWG matters
II/4 Precipitation and IPWG matters
II/5 Atmospheric Motion Vectors and IWWG matters
II/6 Cloud and dust related parameters
II/7 Other parameters and products
II/8 Coordination of code forms for satellite data
II/9 WMO Core Metadata profiles within the context of ISO 19115, geographic Metadata (ref Permanent action 06 resulting from CGMS-35)
II/10 Conclusion and preparation of WG report

WORKING GROUP III: CONTINGENCY PLANNING

III/0 Introduction
III/1 Revised GOS baseline for geostationary satellites
III/2 CGMS Global Contingency Plan for geostationary orbit
III/3 Revised GOS baseline for polar-orbiting satellites
III/4 CGMS Contingency plan for operational oceanographic satellites
III/5 GCOS Climate Monitoring IGL
III/6 Conclusion and preparation of WG report

WORKING GROUP IV: GLOBAL DATA DISSEMINATION BY SATELLITE

IV/0 Introduction
IV/1 Data dissemination from meteorological satellites
IV/2 Advanced Dissemination Methods
IV/3 Global data exchange
IV/4 Integrated Global Dissemination Service (IGDDS) development
IV/5 Conclusion and preparation of WG report

WORKING PAPERS SUBMITTED TO CGMS-36

CMA

CMA-WP-01	CMA Review of Action Items	A.5
CMA-WP-02	Status of CMA Polar-orbiting Meteorological Satellites	B.1
CMA-WP-03	Status of CMA Operational Geostationary Satellite	B.2
CMA-WP-04	FY-2 Anomalies and Space Weather	B.4
CMA-WP-05	Preliminary Consideration on FY-4 Frequency Network	I/1
CMA-WP-06	Activities of FY-3 Products Development	II/1
CMA-WP-07	In response to CGMS Recommendations: CMA Activities in inter-calibration	II/2
CMA-WP-08	Precipitation Estimation and Validation at CMA	II/4
CMA-WP-09	Activities to Improve AMV Products	II/5
CMA-WP-10	Access to Fengyun Satellite Data	IV/1

CNES

WP Number	Title	Agenda Item
CNES-WP-01	ARGOS presentation, overview of the system, evolution of the various generations, frequency coordination of ARGOS-4	I.1/I.3
CNES-WP-02	Input paper about the ARGOS-4 frequency plan presented at the last SFCG, September 2007	I.1/I.3
CNES-WP-03	COSPAS-SARSAT, Search And Rescue Interference within the 406-406.1 MHz band	I.1/I.5

CNSA

WP Number	Title	Agenda Item
CNSA-WP-01	Status of CNSA Earth Observation	B.3
CNSA-WP-02	Status of CNSA Future Earth Observation	C.3
CNSA-WP-03	Status of the HY-1B satellite and its application	B.3
CNSA-WP-04	The contribution of global ocean observation of continuity	III/4
CNSA-WP-05	HY-2 satellite data application product	II/7

ESA

WP Number	Title	Agenda Item
ESA-WP-01	Status of current ESA Earth Observation missions	B.3
ESA-WP-02	Status of the future ESA Earth Observation missions	C.3
ESA-WP-03	Global monitoring of essential climate variables	C.3
ESA-WP-04	Oceanographic information provided by ESA missions	E.3
ESA-WP-05	Status of ESA actions	A.5

Annex 2

EUMETSAT

WP Number	Title	Agenda Item
EUM-WP-01	Review of action items (included in the final report)	A.5
EUM-WP-02	EUMETSAT input to satellite tables (complementary to EUM-WP-01) (included in the final report)	A.5
EUM-WP-03	Status of the EUMETSAT Polar System (EPS)	B.1
EUM-WP-04	Status of the Meteosat System (incl MSG-2)	B.2 & I/3.1
EUM-WP-05	Report on spacecraft anomalies from solar events	B.4
EUM-WP-06	Plans for Post-EPS	C.1
EUM-WP-07	Status of preparations for MSG-3 and MSG-4	C.2
EUM-WP-08	Plans for Meteosat Third Generation (MTG)	C.2
EUM-WP-09	EUMETSAT strategy - Contribution to climate and ocean monitoring	D.1 + WGII/3
EUM-WP-10	Status of the EUMETSAT Satellite Applications Facilities	G.1
EUM-WP-11	Report on GEONETCast	G.2 & WGIV/2
EUM-WP-12	Report on EUMETSAT Training Activities	H.1 + WGII/1
EUM-WP-13	CGMS web site	H.2
EUM-WP-14	EUMETSAT Conferences and Publications	H.2
EUM-WP-15	General frequency management topics	I/1
EUM-WP-16	Status report on the prototyping on high rate DCP for MSG	I/1
EUM-WP-17	The Data Collection System in MTG: Preliminary considerations	I/1
EUM-WP-18	Status of the IDCS	I/3.1
EUM-WP-19	Future use of IDCS	I/4
EUM-WP-20	GSICS scientific achievements 2007/2008	II/2
EUM-WP-21	GSICS data management achievements 2007/2008	II/2
EUM-WP-23	Status of/report on precipitation estimation and validation activities - title TBC	II/4
EUM-WP-24	Polar CAP Winds AVHRR from AVHRR Onboard Metop-A	II/5
EUM-WP-25	Report from the 9th International Winds Workshop	II/5
EUM-WP-26	Preconvective sounding analysis using IASI and SEVIRI	II/7
EUM-WP-27	Report on the Task Force on codes (WP includes information on compression technique usage)	II/8, IV/1
EUM-WP-28	Current use of IDV/HYDRA and intended use of McIDAS-V at EUMETSAT	II/1
EUM-WP-29	The EUMETSAT Earth Observation Portal	IV/1

JAXA

WP Number	Title	Agenda Item
JAXA-WP-01	Update of ALOS Status	B.3
JAXA-WP-02	Update of GOSAT Status	C.3
JAXA-WP-03	Update of GCOM Status	C.3
JAXA-WP-04	Status of GPM and CEOS Precipitation Constellation	C.3
JAXA-WP-05	Status of EarthCARE	C.3

JMA

WP Number	Title	Agenda Item
JMA-WP-01	Review of Action Items	A.5
JMA-WP-02	Status of Multi-functional Transport Satellite (MTSAT)	B.2, I/3.1
JMA-WP-03	Tentative Plans for Follow-on Satellites to MTSAT-2	C.2
JMA-WP-04	Result of WRC-07 and JMA's activities for WRC-11	I/1
JMA-WP-05	JMA's GSICS and R/SSC-CM activities	II/2
JMA-WP-06	Status and recent activities on Atmospheric Motion Vectors at JMA	II/5
JMA-WP-07	Virtual Laboratory Activities and Experience of JMA	H.1

KMA

WP Number	Title	Agenda Item
KMA-WP-01	Review of Action Items	A.6
KMA-WP-02	Update on COMS Program	C.2
KMA-WP-03	Update on COMS Data Service Plan and Ground System at Meteorological Satellite Center of KMA	IV/1
KMA-WP-04	KMA's GSICS Activities	II/2
KMA-WP-05	Current Status of the satellite Data Assimilation in KMA	II/3
KMA-WP-06	Update on Operational Analysis of the Tropical Cyclone at KMA	II/7
KMA-WP-07	Current Status of Atmospheric Motion Vector at KMA	II/5
KMA-WP-08	Operational Analysis of Asian Dust at KMA	II/6
KMA-WP-09	The 2nd International Training Course on the Analysis of COMS Data in Korea	G.1

NASA

NASA-WP-01	Status and Plans of GPM	WGII/4
NASA-WP-02	GPM Precipitation Estimation and Validation Activities	WGII/4

NOAA

WP Number	Title	Agenda Item
NOAA-WP-01	Review of CGMS XXXV Action Items	A.5
NOAA-WP-02	Polar Orbiting Operational Environmental Satellites	B.1
NOAA-WP-03	Geostationary Operational Environmental Satellite (GOES)	B.2
NOAA-WP-04	Anomalies from Solar Events	B.4
NOAA-WP-05	Future Polar-orbiting Meteorological Satellite System	C.1
NOAA-WP-06	Future Geostationary Meteorological Satellite System	C.2
NOAA-WP-07	Global Space-based Intercalibration System (GSICS) Progress Report	E.2
NOAA-WP-08	NOAA Support for the CGMS Virtual Laboratory Focus Group (Session II)	G.2
NOAA-WP-09	Technical Input to the SFCG and ITU-R	I/1
NOAA-WP-10	Report from the WRC 2007	I/1
NOAA-WP-11	Report from the WRC 2007—Proposed Expansion of GOES-R DCS	I/1
NOAA-WP-12	NOAA Report on Satellite Calibration Anomalies	II/2
NOAA-WP-13	Report on Aircraft Campaigns with SI Traceable Instruments	II/2
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ROSCOSMOS/ROSHYDROMET

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ROSC/ROSH-WP-02	Future geostationary meteorological satellites: Russian geostationary meteorological satellite ELECTRO-L	C.2
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WMO

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WMO-WP-18	CGMS Related Recommendations of the Implementation Plan for Evolution of the GOS	E.1
WMO-WP-19	Virtual Laboratory Training Strategy	H.1
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WMO-WP-21	User information	H.2
WMO-WP-22	JCOMM Satellite Observational Requirements for Ocean Applications	E.2
WMO-WP-23	WIGOS	E.2
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APPENDIX: GENERAL CGMS INFORMATION

1. Charter for CGMS
2. CGMS Membership
3. Addresses for Procuring Archive Data
4. Contact List for Operational Engineering Matters
5. Address List for Distribution of CGMS Documents
6. E-mail List Servers
7. Glossary

CHARTER FOR THE COORDINATION GROUP FOR METEOROLOGICAL SATELLITES (CGMS)[1]

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,

[1] 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:

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 an annex 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.

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).

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Appendix 7

GLOSSARY

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)

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
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
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)
CR	CGMS Consolidated Report
CrIS	Cross track Infrared Sounder
CRYOSAT	Polar Ice Monitoring Programme (ESA)
CZI	4-band Coastal Zone Imager (HY-1B).
DAPS	DCS Automated Processing System (USA)
DCP	Data Collection Platform
DCPC	Data Collection and Processing Centres
DCRS	Collaboration on Global Frequency Allocation harmonization
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)
DVB	Direct Video Broadcast
DWS	Disaster Warning System (India)
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
EMWIN	Emergency Manager Weather Information Network (NOAA)
ENVISAT	ESA polar satellite for environment monitoring
EO	Earth 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
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)

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	GEWEX Radiation Panel (NOAA)
GIFTS	Geosynchronous Imaging Fourier Transform Spectrometer (GOES-R)
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
GOS	Global Observing System
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	Numerical weather prediction data in gridpoint form, expressed in binary
GSICS	Global Space-based Inter-calibration System
GTS	Global Telecommunication System
GVAR	GOES Variable (data format) (USA)
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
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)
ICESat	Ice Cloud and Land Elevation Satellite (NASA)
ICI	Inversion Coupled Imager (India)
ICSC	CAS International Core Steering Committee (ICSC) (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
IGL	International Geostationary Laboratory
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 Collection
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 (TIGGE/THORPEX)
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
ISCCP	International Satellite Cloud Climatology Project
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
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
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)
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)
LAN	Local Area Networks (Telecommunication)
Landsat	NASA Earth observing Satellite
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
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	Future 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)
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)
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
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
QI	Quality Indices (EUMETSAT)
QuikSCAT	Quik Scatterometer (NASA)
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&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)
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
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
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)
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)
WALEX	WAter vapour Lidar EXperiment
WARC	World Administrative Radio Conference
WCRP	World Climate Research Programme
WCS	WMO Core Standards
WEFAX	Weather facsimile
WG	Working Group
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
WV	Water Vapour
WVMW	Water Vapour Motion Winds
WWW	World Weather Watch
X-ADC	Extended Atlantic Data Coverage
Y2K	Year 2000 compatibility
ZAP	Z-axis Precession Mode (GOES)
ZAMG	Zentralanstalt für Meteorologie und Geodynamik (Austrian NMHS)