Report of the 44th Meeting

of the Coordination Group for Meteorological Satellites

CGMS

5-10 June 2016, Biot, France

REPORT OF THE 44TH PLENARY SESSION OF THE COORDINATION GROUP FOR METEOROLOGICAL SATELLITES

CGMS-44
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CGMS MR 44

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PLENARY SESSION

A OPENING SESSION

Mr Alain Ratier, EUMETSAT Director-General and Head of the CGMS Secretariat, welcomed participants to the 44th plenary session of CGMS at Biot, France.

B APPROVAL OF AGENDA, ACTION REVIEW

B.1 Approval of the Agenda

The CGMS Secretariat presented the objectives of the plenary session and the agenda was approved by all participants.

B.2 Review of actions from CGMS-43

The CGMS Secretariat provided an overview of the status of the list of actions and recommendations resulting from CGMS-43:

CGMS-43	Status	Open
WG I	All actions but 1 closed	1 action open with revised deadline
WG II	All actions but 6 closed	6 actions and 13 recommendations open with revised deadlines
WG III	All actions but 1 closed	1 action and 2 recommendations open with revised deadlines
WG IV	All actions but 4 closed	4 actions and 1 recommendation open with revised deadlines
Space weather	All actions and recommendations closed	
Plenary	All actions but 7 closed	7 actions expected to be closed following CGMS-44 plenary discussions related to IODC, IOC-UNESCO, GAW, and JWG CLIM. The plenary will be requested to endorse the implementation of the roadmap for the IODC multi-partner service.

Details of the open plenary actions are provided below.

Plenary actions open at the start of CGMS-44 plenary session:

Plenary actions open from earlier plenary session (at CGMS-43)							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
CEOS/CGMS joint climate WG	Plen H.3.2	A42.11	Regarding the Pilot FCDR Inventory: • Conduct an initial analysis of available FCDRs, past and current, available or planned for use in the current set of SCOPE-CM projects using CEOS, CGMS, and WMO satellite data bases; • Identify SCOPE-CM ECV projects that are using or may be able to use the above FCDRs; • Assess availability of the above FCDRs for the future; • Following the first ECV gap analysis, consider FCDRs that may be useful in assessing ECV opportunities in the future ECV gap analysis.	Nov '14: ONGOING. Discussions were held at the Climate Symposium regarding the Pilot FCDR inventory and work has begun on the specific identification of SCOPE-CM ECV projects and use of higher temporal and spatial resolution data from the next generation of geostationary satellites. The project will leverage the ECV assessment reference process being developed by WG Climate. CMA and KMA have been invited to participate in these efforts. *Reports were made to CGMS-43 WGII and plenary, and will also be made to CGMS-44.* *CGMS-44: JWG will provide a report. Action will be closed following plenary. JWG has a standing item on the CGMS plenary agenda.*	CGMS-43 and CGMS-44	**OPEN**	HLPP # 5

Plenary actions open from CGMS-43 plenary session							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	D.4	A43.05	CGMS members to take into account the user requirements identified in the WMO survey when discussing continuous satellite coverage over the Indian Ocean region.	[CMA, EUM, ISRO, ROSH] EUM: Pending Council decision, EUMETSAT will relocate Meteosat-8 to support part of the IODC service. *CGMS-44: Expected to be closed following CGMS-44 discussion on the IODC.*	CGMS-44	**OPEN**	HLPP # 1.1.6

Plenary actions open from CGMS-43 plenary session							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
WMO	D.4	A43.06	WMO to validate and consolidate the preliminary user requirements for satellite data in the Indian Ocean region with major user groups and stakeholders in the region, and to report on results to CGMS-44.	*CGMS-44: Expected to be closed following discussions in plenary on IODC.*	CGMS-44	**OPEN**	HLPP # 1.1.6
WMO	D.5	A43.07	WMO to provide an update on the international observation requirements for atmospheric composition developed by the GAW Task Team, drawing on existing requirements and considering region-specific needs.	CGMS-44 WMO-WP-03 *CGMS-44: Expected to be closed following discussions in plenary on IODC.*	CGMS-44	**OPEN**	HLPP # 1.1
IOC-UNESCO	D.7	A43.08	IOC-UNESCO to provide a paper on guidance to CGMS members on sea ice observations.	CGMS-44 IOC-WP-01 *CGMS-44: Expected to be closed following the related plenary session.*	CGMS-44	**OPEN**	HLPP# 1.1
IOC-UNESCO	D.7	A43.09	IOC-UNESCO to provide status of the Second International Indian Ocean Expedition (IIOE-2) for enhanced data acquisition and management.	CGMS-44 IOC-WP-02 IIOE-2 - planned as a 5-year research programme in the Indian Ocean, timed to coincide with the 50th anniversary of the first IIOE. It is being sponsored by SCOR, IOC and Indian Ocean GOOS, and the IOC Assembly has adopted a resolution embracing it as a major IOC programme activity. The IIOE-2 will be formally launched in Goa in December, 2015. *CGMS-44: Expected to be closed following the related plenary session.*	CGMS-44	**OPEN**	HLPP# 1.1
CMA, EUM, ISRO, ROSH	F.4.2	A43.14	The partners of the IODC roadmap to report on the implementation and progress at CGMS-44.	[CMA, EUM, ISRO, ROSH] To be treated in WGIII initially and a slot in plenary has been foreseen. CGMS-44 EUM-WP-11 *Closure expected following CGMS-44 discussions.*	CGMS-44	**OPEN**	HLPP #1.1.6

The final status of CGMS-43 plenary actions and recommendations resulting from CGMS-44 discussions is available at http://www.cgms-info.org/documents/CGMS-43_actions_recs_final.pdf.

The status of CGMS-44 plenary actions and recommendations is provided in section K of this report.

The CGMS-44 actions and recommendations are maintained on the CGMS website under MEETINGS and CGMS-44.

C USER REQUIREMENTS (WMO AND IOC-UNESCO)

C.1 Vision of WIGOS 2040

The WMO regularly reviews its vision of future global observing systems to support weather, climate and related environmental applications. The Vision of the WIGOS Space-Based Components 2040 is intended to provide a shared, high-level goal to guide the efforts of WMO Member States and satellite operators in the evolution of satellite-based observing systems. It is based on an attempted anticipation of user requirements in the WMO application areas and technological capabilities, in 2040. The vision, to be developed and finalised by 2018 under CBS auspices, will be based on a broad consultation of user communities, WMO technical commissions, and space agencies, with the aim of having it approved by the 18th World Meteorological Congress in 2019.

CGMS-44-WMO-WP-01 provided draft v0.2 of the vision, using an initial draft developed by the CBS Expert Team on Satellite Systems (ET-SAT), an input from a workshop held at WMO Secretariat on 18-20 November 2015, and taking into consideration comments provided at WMO meetings held from January to April 2016.

NOAA encouraged recognising the change in technologies rather than anticipating them. In components 2 and 3 of the Working Paper, there is a level of detail which is not needed. The vision should stay at high level – stating measurement objectives – not entering into instrument technology level.

IOCs noted that there is a need for a stronger separate ocean emphasis since it is not covered implicitly by climate and atmosphere, and appreciated the plan to interact with JCOMM in September 2017.

EUMETSAT supported the view of NOAA that technologies should not be prescribed. In addition, there is a need to recognise additional capabilities, but without linking this to data policy concepts. One should welcome additional capabilities or capacities from private sector, and not prescribe what the private sector shall do.

The Plenary Chair congratulated the work done, noting the major progress since the Consultative Meeting on Satellite Matters in January 2016.

From this discussion, CGMS-44 plenary made the following comments on the Vision 2040 for WMO to take into account in their upcoming revision process:

- CGMS recommended that section 3 of the document (trends in system capabilities, ref. CGMS-44 WMO-WP-01) should recognise that the pace of evolution of IT technologies is fast and not predictable in the 2040 timeframe, and that, therefore, explicit assumptions on the evolution of IT technologies and references to possible detailed solutions and architectures for data access be removed;

- CGMS recommended that the Vision 2040 should propose a targeted architecture but not elaborate on the possible roles of the public and the private sectors in its implementation, which requires substantial amendments to section 4 and 5 of the document. In this regard, reference to "essential" and "additional" data should be eliminated as these data policy concepts can neither be mixed with architecture concepts nor be the basis for sharing of responsibilities between the public and the private sector. Indeed NMHS requirements and data actually exchanged across NMHSs exceed by far "essential" data, as foreseen by Resolution 40. Instead, section 5 should identify the fourth element of the architecture as additional capacities or other capabilities that may complement the backbone of the targeted observing system; and

- CGMS recommended that, in response to COP21 and the Paris Agreement, the Vision 2040 may also address sampling requirements and preferred orbits for observations of atmospheric CO2 and other greenhouse gases, if such requirements or preference arise from ongoing discussions on the monitoring of emissions.

EUMETSAT added that the first two recommendations were raised at the WMO High Level Meeting on Consultative Matters in January 2016.

WMO invited CGMS operators to provide comments on the draft vision to the WMO by 8 July 2016. This will allow sufficient time to consider the comments in a new draft of the vision for endorsement by CBS-16 as a work-in-progress document in November 2016.

CGMS-44 actions - PLENARY						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	C.1	A44.01	**Vision for the WIGOS Space-Based Component in 2040:** CGMS operators are invited to provide comments on draft v0.2 of the Vision for the WIGOS Space-Based Component in 2040, to sbojinski@wmo.int, by 8 July 2016. Ref. CGMS-44 WMO-WP-01: http://www.eumetsat.int/website/wcm/idc/idcplg?IdcService=GET_FILE&RevisionSelectionMethod=LatestReleased&Rendition=Web&dDocName=CWPT_1666	8 Jul 2016	**OPEN**	1.1

The Plenary Chair thanked WMO and the expert teams, in particular ET-SAT, for the work undertaken. The Vision 2040 will become a standing item on the agenda for the coming CGMS plenary sessions.

C.2 RA II/V pilot activity on satellite for Disaster Risk Reduction

The WMO Integrated Global Observing System (WIGOS) Joint Workshop for Region II (Asia) and Region V (South-West Pacific) for Disaster Risk Reduction (DRR) was held in Jakarta, Indonesia, on 12-14 October 2015. **CGMS-44-WMO-WP-05** provided a report on the outcome and recommendations from the workshop. The workshop was aimed at enhancing the exchange of observations across Southeast Asia and to improve the availability and quality of those observations that have significant applications in DRR, e.g. in early warning systems for severe weather events.

Representatives from eight RA II and six RA V WMO members participated in the workshop and its major outcome is contained in the "Jakarta Declaration". The declaration proposes the development of two Joint RA II/RA V WIGOS projects: one on satellite data and one on radar data. The satellite data project aims at (i) strengthening the capabilities of all members to use geostationary satellite images and derived products in support of DRR and (ii) developing a protocol for the National Meteorological and Hydrological Services (NMHSs) in the project countries to request event-driven rapid-scan imagery for their respective national areas of interest. After approval by RA II and RA V management groups, a joint RA II/V coordination group should be established for each project.

The "Jakarta Declaration" recommends to CGMS that the satellite operators provide the necessary support to the joint RA II/V WIGOS project on satellite data.

Specifically, the declaration encourages the satellite operators of the Republic of Korea, China, and Japan to make digital data at the full resolution available to all members involved in the satellite data project and to support the project in any way they can. CGMS encouraged the satellite operators to publicise the rapid scan capabilities of current and future geostationary satellites among the user community in RA II and V, and build the necessary capacity. The Asia-Oceania Meteorological Satellite Users Conference is a mechanism for this.

CGMS-44-JMA-WP-06 reported on the feasibility study on Himawari-8 event-driven rapid scan.

The Advanced Himawari Imager (AHI) installed in Himawari-8 has the ability to scan the "Target Area" every 2.5 minutes. Essentially, the Himawari-8 rapid scan target area observation is focused on tropical cyclones in the RSMC Tokyo - Typhoon Center's area of responsibility and on volcanic eruptions for the Tokyo Volcanic Ash Advisory Center (VAAC Tokyo). In October 2015, the Joint RA II/RA V Workshop on WIGOS for Disaster Risk Reduction adopted the Jakarta Declaration, and one of its goals is aimed at developing a protocol for NMHSs of the countries in the region to request event-driven rapid-scan imagery. Based on this, JMA and the Australian Bureau of Meteorology (BoM) conducted a joint feasibility study on the development of a protocol to produce Himawari-8 rapid-scan observations. The target area designated by the BoM was observed successfully and BoM received the acquired data in real time.

During the overall discussion of both Working Papers, EUMETSAT noted that satellite systems are becoming more programmable and that there is a need to clarify how this capability is activated.

NOAA urged that a connection with emergency management teams be established in order to ensure that the fundamental observations are being used.

BoM noted that the feasibility study demonstrated that satellites can be programmed, however, operators now need to connect with the relevant points of contact in the NMSs to make the links with the data users.

The Plenary Chair added that an important issue is to ensure that users are aware of the RSS opportunities.

CGMS-44 actions - PLENARY						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CMA, JMA, KMA	C.2	A44.02	CGMS operators to publicise the rapid-scan capabilities of current and future geostationary satellite among the user community in RA II and V, and build the necessary capacity (on the occasion of 7th AOMSUC).	30 Oct 2016	**OPEN**	1.1

CGMS-44 recommendations - PLENARY						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
KMA, KARI, CMA, CNSA, JMA, JAXA	C.2	R44.01	**On disaster risk reduction:** The "Jakarta Declaration" recommends to CGMS that satellite operators provide the necessary support to the Joint RA II/V WIGOS project on satellite data. The declaration encourages the satellite operators of the Republic of Korea, China, and Japan to make digital data at the full resolution available to all members involved in the satellite data project and to support the project in any way they can.	CGMS-45	**OPEN**	1.1

C.3 User readiness - Himawari-8

CGMS-44-JMA-WP-07 reported on the user readiness activities performed by JMA to ensure the readiness of the Asia-Oceanic user community for Himawari-8.

The Himawari-8 geostationary meteorological satellite began operation on 7 July 2015, replacing the previous MTSAT-2 operational satellite. In order to deliver Himawari-8 imagery, JMA established two new services known as HimawariCast (provided via a communication satellite) and HimawariCloud (provided via an Internet cloud service for NMHSs).

MTSAT-2 continued observations after the operational satellite switchover. Data from MTSAT-2 and Himawari-8 were disseminated in tandem for a period to support user preparations for the utilisation of Himawari-8 data provided via the HimawariCast and/or HimawariCloud services.

Himawari-8's observation capability is far superior to that of the previous MTSAT series satellites. To maximise the benefits of this capability, JMA has been running the training activities for NMHSs in the Asia-Pacific region. In particular, JMA adopted a program of dispatching experts to a number of NMHSs in the Asia-Pacific region in 2015 and 2016 to conduct training seminars on Himawari-8 utilisation.

The Plenary Chair noted that the end-to-end experience of JMA is invaluable for other operators when introducing new satellites.

C.4 User preparation for new generation satellites - satellite operator contributions

CGMS-44-WMO-WP-02 presented, in an integrated manner, best practice for user readiness projects performed by user organisations (e.g. NHMSs) as well as for satellite development programmes in support of user preparation.

The WMO guidelines on user preparation for the new generation of meteorological satellites adopted at CBS-XV in 2012 urges each of the NMHSs, and other operational user organisations, to: "Establish a user readiness project focused on the introduction of new satellite data streams into operations (to be initiated ~5 years prior to launch)". Against this background, the 17th World Meteorological Congress 2015, through Resolution 37 (Cg-17), recommended "to all concerned members to set up user preparation projects in advance of the launches of new satellite systems, in accordance with the CBS Guidelines for ensuring user readiness for new generation satellites."

It is crucial that the satellite development entities and operators provide detailed and up-to-date plans for their activities conducted in support of user readiness projects. The WMO Space Programme, supported by a number of experts, has analysed how the typical cycle of satellite system development relates to typical user readiness projects and the outcome of this analysis is a summary of best practices and a generic project schedule. The generic schedule indicates at what time relative to planned launch the information should be available in order to satisfy the user preparation schedule and respect the constraints of satellite system development.

Section 5 of **CGMS-44-WMO-WP-02** provides details on the deliverables needed from satellite development programmes to support user readiness projects.

NOAA supported the best practice document, noting that it is in line with the experience gained with the user preparation for the use of GOES-R data, and added that this constitutes necessary activities, albeit possibly not sufficient, to ensure user readiness for new satellite data.

NOAA also emphasised the importance of a direct readout to ensure early user familiarisation and to pave the way for improved L2 products through local application development projects.

The Plenary Chair emphasised the need for capacity building activities.

WMO noted that the document will be submitted to the Commission for Basic Systems for endorsement as Best Practices for WMO members.

In as far as it applies to satellite operators, CGMS adopted the document as CGMS best practice.

C.5 Updates of the requirements of the Global Atmospheric Watch – GAW - including the proposal for Integrated Global GHG Information System - I3GIS

CGMS-44-WMO-WP-03 presented background material on the WMO Global Atmosphere Watch (GAW) Programme and on the planned Integrated Global Greenhouse Gas Information System (IG3IS). The paper describes the work accomplished so far by the GAW Task Team on Observational Requirements and by the GAW Scientific Advisory Groups (SAG).

Three SAGs (Reactive Gases, Greenhouse Gases and Solar UV Radiation) have provided detailed requirements for a large suite of parameters of relevance to atmospheric chemistry and air pollution. These requirements have been passed on to the OSCAR Team for ingestion into the OSCAR Requirements Database. The other SAGs are preparing similar inputs.

An overview of relevant parameters within the three application areas pertinent to atmospheric chemistry including requirements specific to IG3IS are provided in the document.

CGMS Members were invited to take note of the work carried out so far by the GAW Task Team on Observational Requirements and by the GAW Scientific Advisory Groups, and to provide their advice.

IOC stressed the need for observations of CO2 at the ocean-atmosphere interface, and that these measurements should become part of IG3IS

EUM emphasised the need to consider all GHGs, not just CO2 and CH4.

WMO informed that IG3IS will be considered at upcoming WMO EC. The intent is to establish a coordinated system to monitor GHG after Paris agreement. This will include globally coordinated in-situ + space observations. WMO will focus on requirement part and will incorporate feedback from space agencies on the future space capabilities.

ESA urged caution and stressed that a comprehensive approach with a broader perspective is necessary.

The session stressed the difference between defining observation requirements for atmospheric composition parameters, and designing an information system on GHG emissions. The latter will have to rely not only on CO2 and CH4 observations but also on a broad range of components of the carbon cycle (e.g., forest cover, land use).

C.6 Key results from 6th NWP impact workshop of May 2016

CGMS-44-WMO-WP-04 reported on the outcome of the sixth WMO Workshop on the Impact of Various Observing Systems on Numerical Weather Prediction (NWP), held 10-13 May 2016, at the

Shanghai Meteorological Service (SMS) headquarters in Shanghai, China. At the workshop were about 80 participants from 14 countries, including experts on data assimilation and observation impact, experts on climate change and seasonal forecasting, representatives from space agencies and from private industry, as well as managers of observing networks. In general, the major NWP centres tend to see less evidence of redundancy of observations or saturation of the impact than was reported at the previous WMO Impact Workshop in Sedona in 2012. In other words, it was reported that adding new observations to the assimilation would almost always lead to a positive impact on forecast skill. In terms of the most important observing systems contributing to forecast skill of global NWP models, little had changed since Sedona 2012. The top five systems remain - in no particular order - microwave sounders (AMSU-A, ATMS), hyperspectral IR sounders (AIRS, IASI, CrIS), radiosondes, aircraft data and atmospheric motion vectors (AMVs). Compared to the status reported in 2012, significant progress is made regarding data impact on limited area data assimilation systems, both for space-based and conventional data, including new data types provided by radars, lidars and ground-based GNSS systems. WMO will publish a final report, which will include a consensus statement regarding the impact of various observing systems, as well as a number of formal recommendations, later in 2016. All presentations will be accessible on the WMO website once available.

It is recommended that CGMS members take note of the work of the WMO and the NWP community on identifying the respective impacts on forecast skill of various observing systems, including the space-based, and to formulate their requests (if any) for additional impact assessment work and transmit them to the WMO Secretariat.

CMA welcomed the report, as the results are very useful for CMA and the mechanism will help bring scientists from satellite agencies and NWP centres to work together. The Chinese decision to move a satellite to an early morning orbit is based on this type of activity and research. CGMS shall continue to support such activities. CMA suggests that links to relevant impact studies be provided from WMO OSCAR/Space.

EUMETSAT urged extreme care when using cost/impact ratios for emerging measurement methods. Anticipating the cost of new technology is error-prone since technology can be costly today and not in 10 years' time, and data assimilation might not be able for optimisation now but could be in the future, maximising the impact.

EUMETSAT stated that studies of timeliness impact are crucial, as timeliness is a key driver for ground segment design. The WMO agreed to take this up.

CGMS also agreed the following:

CGMS-44 actions - PLENARY						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS members	C.6	A44.03	**On NWP and impact on forecasting skills:** **(**Ref. CGMS-44 WMO-WP-04) CGMS members to formulate their requests (if any) for additional impact assessment work and transmit them to the WMO Secretariat (lriishojgaard@wmo.int).	30 Oct 2016	**OPEN**	1.1.2
WMO	C.6	A44.04	**On NWP and impact on forecasting skills:** WMO to brief CGMS-45 on the final report from the sixth WMO Impact Workshop, with a particular focus on those recommendations that are directed to the CGMS members and CGMS working groups.	CGMS-45	**OPEN**	1.1.2

C.7 Status of the Second International Indian Ocean Expedition (IIOE-2) for enhanced data acquisition and management

CGMS-44-IOC-UNESCO-WP-02 presented the status of the Second International Indian Ocean Expedition (IIOE-2).

The International Indian Ocean Expedition (IIOE) of 1959-65 left an important societal legacy, and 50 years on, IOC and the Scientific Committee on Ocean Research (SCOR) again, along with the Indian Ocean Global Ocean Observing System Regional Alliance (IOGOOS), are working together to oversee a contemporary phase of coordinated international research and associated applications/knowledge transfer through capacity building (i.e. IIOE-2: 2015-20). This will encompass research on the basin's hydrodynamic and climatic phenomena of regional and global significance, guided by science priorities as per the IIOE-2 Science Plan developed under SCOR. IIOE-2 is forging new international scientific research programs with far-reaching benefits for the Indian Ocean and beyond. IIOE-2 aims to provide a rich, new framework of data, process understanding and input into oceanographic and climate modelling, focusing on open ocean science and oceanographic links to continental shelf and coastal systems and coupled climatic phenomena affecting societies regionally and globally. The transfer of knowledge and delivery of tangible outputs for societal applications and benefit are key pursuits.

A four-year phase of planning and preparation for IIOE-2 culminated in the launch of the IIOE-2 on 4 December 2015, during the IO50 conference in Goa, India. This presentation will report on IIOE-2's scope, from science to capacity building, and on the governing framework for the initiative. It will also highlight the imperative of ensuring that strong linkages are made between the IIOE-2's developing framework and plans and the remote sensing community, as represented at CGMS-44.

The main issue of relevance to CGMS in IIOE-2 is how the project will make the best possible use of satellite remote sensing of the Earth in IIOE-2. This is addressed by:

- matching IIOE-2 objectives with concurrent satellite missions in order to identify the most suitable ones;
- organising access to these data sets, so that the community does not wander randomly in search of data;
- evaluating the need for specific products that may not exist in agencies' portfolios (e.g., primary production);
- if such gaps exist, organising, when feasible, collection of field measurements that could help develop these products;
- evaluating if and how the field data to be collected in IIOE-2 can be used in support of cal/val operations of international satellite missions;
- If the answer to the above point is negative, engage with space agencies so that they can evaluate the support they would need to provide in order to take advantage of IIOE-2 operations for collection of cal/val information;
- having a forum that connects IIOE-2 and the complementary remote sensing community to promote synergies in the context of remote sensing and IIOE-2.

WMO suggested that the JCOMM Task Team on Satellite Data Requirements should be involved in this process.

The Plenary Chair noted that the timing is good to this purpose. Meteosat-8 will be moved to the Indian Ocean and some CGMS members have already launched a few ocean satellites (Jason-2, Jason-3, and Sentinel-3) and ISRO will soon launch SCATSAT. CGMS confirmed it will be happy to continue interacting with IIOE-2 to best exploit the new capabilities. CGMS and its members were encouraged to liaise with IIOE-2 regarding the access to, and use of, satellite data and products in IIOE-2.

CGMS-44 recommendations - PLENARY						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
IOC-UNESCO, CGMS members	C.7	R44.02	**On Second International Indian Ocean Expedition (IIOE-2) for enhanced data acquisition and management:** It was recommended to establish a working alliance between the IIOE-2 and the remote sensing community (CGMS) within/through the IIOE-2 Steering Committee framework and/or the IIOE-2 Joint Project Office.	CGMS-45	**OPEN**	2.5

C.8 Guidance to CGMS members on sea ice observations

CGMS-44-IOC-UNESCO-WP-01 presented the status of satellite sea ice measurements in the Arctic Ocean.

Sustained satellite observations since 1979 have been the primary source of information revealing that the extent of Arctic Ocean sea ice is diminishing rapidly. Confirmation that sea ice is also thinning is based on historical surface and near-surface records and more recent satellite retrievals. There is a new "normal" environment in the Arctic environment with substantial socio-economic impacts. A key question is: What are the spatial and temporal characteristics of the sea ice thickness distribution throughout the annual cycle, and what is the evolving inter-annual trend? Arctic Ocean sea ice conditions have been determined with passive microwave radiometer, active scatterometer and other satellite instrument measurements recorded by a continuing series of satellites. An important feature of the continuous time series measurements has been the overlap of each new satellite dataset with ongoing measurements, to provide adequate time intervals for calibration and validation. Satellite instrument diversity has provided both coarse spatial resolution measurements over the entire Arctic Ocean for long-period time series and limited-duration fine spatial resolution data over selected regions for navigation and other applications. Satellite observations of Arctic Ocean sea ice will continue to increase in importance because predictability of sea ice is poor and societal interest is great. Unfortunately, however, the sustainability of some critical elements of the current Arctic Ocean satellite measurement suite beyond 2020 remains uncertain, e.g., after the CryoSat-2 and ICESat-2 missions have concluded.

The Chair noted that the need for continuity of passive microwave measurements is fully recognised, also in view of the importance for precipitation. He also expressed that the best framework for supporting the way forward could be the establishment of a Virtual Constellation on Sea Ice.

JAXA appreciated the importance of GCOM-W for Sea Ice measurements and the need for a continuity of the mission expressed by CGMS.WMO noted the importance of passive microwave measurements for Climate.

CGMS members expressed strong support for the continuation of GCOM-W and for the creation of a Virtual Constellation on Sea Ice.

The following recommendations were made by the session:

- Enable sustainability of satellite passive microwave sea ice extent measurements begun in 1978.
- Promote the implementation of sustained satellite sea ice observations by scatterometer to provide an independent source of information concerning climate change impacts on the marine cryosphere.
- Enable sustainability of frequent, high spatial resolution marginal ice zone satellite measurements for navigation and other near-real time applications.
- Promote the implementation of sustained satellite measurements of Arctic Ocean sea ice thickness.
- Encourage the joint CEOS/CGMS Working Group on Climate to establish a CEOS Virtual Constellation on GCOS ECV Sea Ice Measurements.

CGMS generally supported the recommendations, and recommended that JAXA consider continuing the GCOM-W series in support of precipitation and sea-ice measurements. CGMS agreed the following:

CGMS-44 actions - PLENARY						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
IOC-UNESCO	C.8	A44.05	IOC-UNESCO to provide guidance to CGMS on ocean surface wave observations at CGMS-45.	CGMS-45	**OPEN**	1.1.6
CGMSSEC	C.8	A44.06	**On sea ice:** Consistent with the discussions held at CGMS-44, CGMS Secretariat to liaise with CEOS SIT Chair on the suggestion that CEOS develop a Virtual Constellation for Sea Ice - following its established process for this purpose, and in coordination with the activities of the WMO PSTG. An initial discussion will be held at the 2016 CEOS SIT Technical Workshop (September 2016).	01-Sep-16	**OPEN**	1.1.6
CGMSSEC	C.8	A44.07	CGMSSEC to write a letter on behalf of CGMS to Japan recommending that JAXA consider continuing the GCOM-W series, particularly in support of precipitation and sea-ice measurements.	30-Jun-16	**OPEN**	1.1.6

CGMS-43 recommendations - PLENARY						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS agencies	C.8	R44.03	CGMS agencies to promote sustainability of satellite passive microwave sea ice measurements begun in 1978.	Long term	**OPEN**	1.1.6
CGMS agencies	C.8	R44.04	CGMS agencies to promote the implementation of sustained satellite scatterometer sea ice observations by scatterometer to provide an independent source of information concerning climate change impacts on the marine cryosphere.	Long term	**OPEN**	5.1
CGMS agencies	C.8	R44.05	CGMS agencies to promote sustainability of frequent, high-spatial marginal ice zone satellite measurements for navigation and other near-real time applications.	Long term	**OPEN**	1.1
CGMS agencies	C.8	R44.06	CGMS agencies to promote the implementation of sustained satellite measurements of Arctic Ocean sea ice thickness.	Long term	**OPEN**	1.1

D REPORTS FROM THE SPACE AGENCIES

D.1 Report on the status of current and future satellite systems by members (operational agencies)

In **CGMS-44-CMA-WP-01**, CMA presented the status of current and future satellite systems.

CMA operates FENG YUN geostationary and polar-orbiting satellite systems. The current sun-synchronous, polar-orbiting FY fleet has 3 satellites, FY-3A/B/C. FY-3B/C provide X-band and L-band DB services with VIS, IR, and microwave imagery, IR and microwave sounding data. Other functions include ozone detection and space environment monitoring. The paper informed CGMS that FY-3D will be launched at the end of 2016. The X-band transmission contains full information of the instruments' measurements. Future plans include FY-3E/F/G/RM. In particular, the FY-3E (2018) is under development for the early morning orbit; FY-3RM (2020) is planned for measuring rainfall with Ku/Ka band active radar.

The current FENG YUN geostationary constellation has four satellites in orbit: FY-2D/E/F/G. FY-2E(86.5°E) and FY-2G(105°E) routinely transmit S-VISSR imagery; FY-2F(112°E) takes sector scanning on request; FY-2D(123.5°E) is retired. CMA is developing FY-4, a three-axis stabilized platform to carry the Advanced Geo Radiation Imager, the Geo Interferometric Infrared Sounder, the Lightning Mapping Imager, and the Space Weather Monitor. FY-4 will transmit LRIT/HRIT format data and provide DCS. The current launch target for FY-4 is for the end of 2016.

JMA was pleased to hear that Himawari-8 data were used as proxy data for FY-4 and encouraged further cooperation between JMA and CMA on application development for the advanced GEO imagers in the SCOPE-NWC framework

CGMS welcomed the planning for launching FY-3H into an early morning orbit to provide continuity after FY-3E.

CGMS-44-EUMETSAT-WP-19 presented the status of current and future EUMETSAT satellite systems.

Regarding current satellites in orbit:

In GEO orbit, Meteosat-7 (Meteosat first generation), launched on 2 September 1997, is on station at 57.5°E providing Indian Ocean Data Coverage. The second generation satellite Meteosat-8, launched on 28 August 2002, has been on station at 3.5°E since 11 February 2013. The satellite is available for use as a hot back-up for the Meteosat-10 prime service and for the Meteosat-9 RSS service. Pending EUMETSAT Council approval, Meteosat-8 will be relocated to 41.5°E in a best effort support to the multi-partner IODC service continuity. Meteosat-9, launched on 21 December 2005, has been on station at 9.5°E since 5 February 2013, supporting the Rapid Scanning Service (RSS) since 9 April 2013. Meteosat-10, launched on 5 July 2012, following January 2013 relocations, has been the prime Meteosat satellite for the 0° service since 21 January 2013. Meteosat-10, launched on 5 July 2012, following January 2013 relocations, has been the prime Meteosat satellite for the 0° service since 21 January 2013.

The geostationary MSG-4 satellite was launched from Kourou on 15 July 2015, on an Ariane 5. The commissioning of MSG-4 was successfully completed late 2015 and the satellite renamed Meteosat-11 and placed in in-orbit storage for about two-and-a-half years, but ready to be activated, if needed.

In LEO orbit, the Metop-B satellite took over from Metop-A as the primary operational Metop satellite on 24 April 2013. Metop-A continues full service provision in parallel, as the secondary Metop satellite. Both Metop satellites continue to perform well, although signs of ageing are present on some instruments on Metop-A. A detailed Metop-A end-of-life scenario is under preparation.

The Jason-3 satellite was finally launched on Falcon-9 from Vandenberg 17 January 2016 and, after commissioning, was handed over from CNES to NOAA end of May 2016, for routine operations. The satellite's status is nominal and OGDR/IGDR product commissioning activities are continuing.

The first Copernicus ocean observation satellite, Sentinel-3A was launched 16 February 2016. The handover of the Sentinel-3A satellite flight operations to EUMETSAT will take place in July 2016 and, following the commissioning phase, the start of routine operations is currently foreseen for Spring 2017.

Regarding future satellites:

The preparation activities for the Low Earth Orbit Metop-C satellite are continuing with a launch readiness target of 1 October 2018. The launch will be on a Soyuz from Kourou.

The second Copernicus ocean observation satellite, Sentinel-3B, is planned for launch in December 2017.

The Meteosat Third Generation (MTG) satellite system is in phase C/D of development. The planned launch date for the first satellite MTG-I1, carrying the FCI imager and the Lightning Imager, is now planned for the 3rd quarter of 2020. The launch of the second MTG satellite, MTG-S1, carrying the Infrared Sounder (IRS) and the UV and near-IR Sounder (UVN), is planned for the 3rd quarter of 2022.

The low Earth orbit EPS-SG programme is now fully approved by EUMETSAT Member States and the overall EPS-SG system has entered development phase C. The launches of the first satellites of the system are planned as follows: Metop-SG A1 in 2021 and Metop-SG B1 in 2022.

The Member States' subscription process is ongoing for the EUMETSAT Jason-CS/Sentinel-6 optional programme, including two satellites that will ensure continuity of reference ocean altimetry after Jason-3. The launch of the first Jason-CS satellite is planned for 2020.

IMD asked if EUMETCast access to the whole of India could be provided. EUMETSAT responded that arrangements are ongoing with ISRO in order to establish terrestrial dissemination of EUMETSAT data to India.

In **CGMS-44-JMA-WP-08**, JMA presented the status of JMA current and future GEO satellite systems. The current satellite, Himawari-8 (140.7°E), started its imaging and data collection services

operations over the East Asia and Western Pacific regions as a replacement for MTSAT-2 and MTSAT-1R on 7 July 2015. HimawariCast and HimawariCloud services are in operation to distribute Himawari-8 imagery. These services use the communication satellite and the Internet respectively. MTSAT-2 (145°E) is currently on stand-by as a back-up for Himawari-8 until Himawari-9 is ready for back-up. JMA plans the launch of Himawari-9 in 2016.

The WMO thanked JMA for its efforts (together with BoM) in supporting the user community in the transition to Himawari-8, for the establishment of the operational HimawariCast satellite broadcast system and, in particular, for the support given to a number of WMO members in RA II and V, to ensure continuity of data access through the provision of new HimawariCast user stations.

In **CGMS-44-IMD-WP-03**, the status of current and future Indian satellites as well as IMD satellite products was provided.

Mr. A.K. Sharma of IMD presented the agency report. At present, three INSAT satellites are in operation. Kalpana–1 is a meteorological satellite, launched in September 2002 and positioned at 74°E. It carries a Very High Resolution Radiometer (VHRR) capable of imaging the Earth in the visible, thermal infrared and water vapour bands. It also carries a Data Relay Transponder (DRT) for collecting data from unattended meteorological platforms (AWS). INSAT-3A, a geostationary satellite launched in April 2003, is located at 93.5°E in a geostationary orbit. INSAT-3A is a multipurpose satellite for providing telecommunications, television broadcasting, meteorological and search and rescue services. INSAT-3D is India's advanced weather satellite and was launched on July 26 2013, from Kourou, French Guiana. It is a dedicated meteorological satellite and carries four payloads: imager (six channels), sounder (19 channels), Data Relay Transponder (DRT) and satellite aided search and rescue (SAS & R). INSAT-3D has the capability of providing vertical profiles of temperature and humidity, along with several products similar to Kalpana-1 and INSAT-3A but with increased resolution. The details of the three payloads and the products derived from these satellite data were also presented. Product details are available on the IMD website www.imd.gov.in . A web-based tool named "RAPID" for analysing the satellite data and products was also described. It can be seen at http://www.rapid.imd.gov.in .

India has plans to launch INSAT-3DR, INSAT-3DS and SCATSAT in near future and is installing ground segments for these satellites. INSAT-3D/S is identical to INSAT-3D and SCATSAT and will provide ocean wind vectors similar to Oceansat-II. IMD is utilising satellite data and products by issuing a satellite bulletin every three hours. Cyclone monitoring is being done by utilising the Dvorak technique. INSAT-3D radiances and winds are being assimilated in NWP models in India. IMD has plans to establish a CAL/VAL site for INSAT-3D, and subsequent satellites, at a suitable location in India and two field campaigns have already been undertaken by Indian scientists. IMD has also joined the SCOPE-CM-06 IOGEO team for calibrating its old archived satellite data from the past 30 years. IMD is also contributing to the WMO's RARS group by providing the direct broadcast of NOAA and Metop data from the Delhi and Chennai receiving stations. IMD has plans to establish a Satellite data centre with data analysis tools for use by all. A network of 25 GNSS stations for measurement of Integrated Precipitable Water Vapour (IPWV) will be operational this year and the data will be used in NWP models. The data will also be available to users through the IMD website.

IMD would like to see EUMETCast coverage over India (New Delhi). EUMETSAT replied that a dedicated link between EUMETSAT and ISRO's facilities is being established and will provide global satellite data to India.

In **CGMS-44-KMA-WP-01**, KMA presented the status of Korean current and future meteorological satellite systems.

COMS (128.2ºE) MI is currently operational and data are distributed via landline and satellite over the Western Pacific region. COMS GOCI (Geostationary Ocean Colour Imager) data are distributed over the East Asian region.

KMA provided a progress report of the development of GEO-KOMPSAT-2A (meteorological mission) and -2B (ocean and environmental mission). The satellites are scheduled for launch in May 2018 and March 2019, respectively.

In **CGMS-44-NOAA-WP-01**, NOAA provided an overview of its current and future satellite systems, describing its missions and priorities.

NOAA highlighted its numerous upcoming and recent launches and discussed its plans and the improvements expected for the upcoming GOES-R series of geostationary satellites, as well as the Joint Polar Satellite System (JPSS). GOES-R is scheduled to launch in October of 2016 and JPSS-1 is scheduled to launch in January of 2017. NOAA also provided updates on its cooperative missions with partners including COSMIC-2, Jason-3, and DSCOVR. Phase 1 of COSMIC-2 is scheduled to launch in Q1 of 2017 and will be the new radio occultation satellite mission. NOAA updated CGMS on the Jason-3 cal/val status following Jason-3's successful launch in January 2016, as well as providing an update on DSCOVR, which monitors space weather.

The satellite updates were followed by information about future plans for collecting data. NOAA discussed its commercial data activities, its big data project, and future architecture study.

In **CGMS-44-ROSHYDROMET-WP-01**, ROSHYDROMET and ROSCOSMOS presented the status of current and future Russian satellite systems.

Meteor-M N2 polar-orbiting meteorological satellite (launched on 8 July 2014), Electro-L N1 and N2 geostationary meteorological satellites (launched on 20 January 2011 and 11 December 2015 respectively). The future Russian geostationary meteorological constellation will consist of three Electro-L series satellites. The satellites will be positioned at 14.5°W, 76°E and 166°E orbital positions. The mission objectives, payload and ground segment details were presented.

The working paper provides an overview of the future Meteor-3M polar-orbiting satellite system, which will comprise three meteorological and one oceanographic satellites. The next generation series of Meteor-MP satellites was briefly described.

The Arctica-M constellation of highly elliptical orbit satellites is now under development. The system consists of two spacecraft. These satellites will provide continuous observations over the Arctic region. The launch is scheduled for 2017–2019. An overview of the mission objectives, payload and ground segment details was presented.

D.2 Report on the status of current and future satellite systems by members (R&D Agencies)

In **CGMS-44-CNSA-WP-01**, CNSA gave a presentation entitled, "New Era, System Capacity, Global Contribution, the Vision and Future of China Space".

CGMS-44-CNSA-WP-02 presented the status of China's current and future ocean observing satellites.

CGMS-44-ESA-WP-01 presented the status of the current and future ESA Earth observation missions and programmes.

CGMS was informed of the status of the current European Space Agency Earth observation missions. Two of them, MSG and Metop are in co-operation with EUMETSAT.

The first Gravity field and steady state Ocean Circulation Explorer satellite – GOCE - launched on 17 March 2009, ended its mission in November 2013. The SMOS satellite was launched on 2 November 2009. All reprocessed Level 1 and 2 data have been available from the ESA Cal/Val portal since mid-March 2012. The CryoSat-2 satellite was launched on 8 April 2010. Release of systematic CryoSat products (Level 1b and 2) to the scientific community continues. The Proba-V small satellite was launched on 7 May 2013. Its coarse resolution imager continues the data acquisition of the vegetation payload on-board SPOT-4 and -5. The Swarm satellites were launched on 22 November 2013.

About 4,000 user projects worldwide use data from the ESA EO missions and this number is increasing. The total volume of ESA EO mission data exceeds 100 Terabytes per year, available to users free of charge.

CGMS was further informed of the status of the future European Space Agency Earth observation missions. Two of them, MTG and Post EPS (now EPS SG) are in co-operation with EUMETSAT. The Living Planet Programme has three lines of implementation: Earth Explorer satellites, Earth Watch satellites plus services and applications demonstration. Progress in the preparation of the forthcoming Explorer missions ADM-Aeolus, EarthCARE and BIOMASS was described.

Copernicus represents the major new initiative of European efforts in Earth observation. The first Copernicus-dedicated satellite ("Sentinel-1A") was launched on 3 April 2014, followed by Sentinel-2A in June 2015, Sentinel-3A in February 2016, and Sentinel-1B in April 2016. Other Sentinels will follow from 2016 onwards. Sentinel missions are developed in partnership with the European Union. The Sentinel-4 and -5 instruments developed by ESA will fly on MTG-S and Metop-SG respectively.

CGMS was also informed of the status of the Earth Watch Programme element, Global Monitoring of Essential Climate Variables (also known as the "ESA Climate Change Initiative" or CCI). The CCI Programme has continued to progress well. The 13 existing project teams have made significant progress on algorithm development and on specifying a future operational system. The programme achieved its phase 1 objectives at the end of 2013 and has continued in Phase 2 since early 2014.

In **CGMS-44-ISRO-WP-01**, ISRO presented the status of current and future satellite systems.

ISRO is committed to using space technology for the benefit of society. To fulfil its commitment, ISRO launched several communications, meteorological and earth observation satellites. With the launch of INSAT-1A in 1982, India started its INSAT program to provide a wealth of meteorological data over the Indian landmass and neighbouring region. In addition, ISRO has meteorological satellites in low Earth orbit.

Currently Kalpana-1(74°E), INSAT-3A (93.5°E) and INSAT-3D(82°E) are providing various weather and climate-related data products such as SST, LST, UTH, OLR, rain rate, clear and cloudy radiances/brightness temperature from geostationary orbit with. Kalpana, INSAT-3A and INSAT-3D together cover almost the entire eastern hemisphere.

In LEO orbits, ISRO has the Oceansat-2 (OS-2), Megha-Tropiques (MT) and SARAL-Altika satellites. OS-2 has provided ocean surface winds globally. MT, an India-France collaboration, has ScaRab, SAPHIR, MADRAS, and ROSA onboard. Presently, only ScaRab, SAPHIR and ROSA are providing various parameters such as temperature, moisture profiles (from ROSA), layer averaged humidity profiles and rain rate (from SAPHIR), radiation budget (from ScaRab) over the tropical region (30°N-30°S). SARAL-Altika, also an India-France collaborative mission, is providing sea surface height and wind speed over the ocean.

ISRO is planning to launch INSAT-3DR and ScatSat-1 in 2016, GISAT in 2020 and INSAT-3DS in 2022. In addition, ISRO is aiming to launch NEMO-AM in 2017, Oceansat-3 in 2018 and the NASA-ISRO joint mission, NISAR, in 2020.

CGMS-44-JAXA-WP-01 presented the status of current and future JAXA satellites.

The report mainly focused on the remote sensing satellites which are and will be able to contribute to climate observations. JAXA currently is operating ALOS-2 (Daichi-2), DPR on the GPM, GCOM-W (Shizuku) and GOSAT (Ibuki). JAXA is preparing GCOM-C, GOSAT-2, and CPR on the EarthCARE. ALOS-2 was successfully launched on May 24 2014, and it is operating very well. The standard product of ALOS-2 is distributed by a commercial vendor, however, some research products could be available from the JAXA EORC web e.g. annual global mosaic and the forest/non-forest map. If a major natural disaster i.e. earthquake, flooding, landslide, has happened, ALOS-2 is activated to make emergency observations to collect information about the site as soon as possible. GPM/DPR was successfully launched from Tanegashima Space Center on 28 February 2014. GPM successfully replaces the TRMM/PR, whose operation had been terminated after 17 years of service. Distribution of the products from DPR started from 2 September 2014. The latest versions of products have been released since March 2016. Users are able to access the data from JAXA's G-Potal. The Japan Meteorological Agency (JMA) started the DPR assimilation in the meso-NWP system on 24 March 2016. GCOM-W is operating normally and all AMSR2 products are freely available at the GCOMW1 Data Providing Service system (DPSS). The DPSS will be integrated into the JAXA GPortal system in 2017. NOAA continues to receive directly AMSR-2 data to utilise operationally for their weather and marine services. AMSR-E, the predecessor of AMSR2, on NASA's Aqua satellite completed its operation on 4 December 2015. The AMSR-E had been operated in a slow rotation mode since December 2012 and obtained a three-year overlap of observations with AMSR2. The GOSAT data products are distributed through the GOSAT User Interface Gateway (GUIG), a website for GOSAT

data distribution. The newly released Level 1B (L1B) (radiance spectra) of version V201 have long-term uniform quality and provide consistent retrieval accuracy, even after satellite system anomalies. GOSAT continues its operations to connect to the next GOSAT-2 mission, scheduled to launch in JFY2017. The developments of EarthCARE/CPR and GCOM-C are under way. GCOM-C will be launched in JFY2016. EarthCARE will be launched in JFY2018. The advanced, fine-resolution optical satellite has started development. As of June 2016, it was in the preliminary design phase and will be launched in JFY2019 as scheduled.

CGMS-44-NASA-WP-01 presented the status of current and future NASA Earth satellite systems.

NASA currently supports the operations of 17 Earth science missions. Since CGMS-43 (May 2015), NASA's Earth science programme has not launched any new missions but several missions continue in development, with three due to launch in the coming year. During this time, the Aquarius mission ended due to a failure of the SAC-D satellite platform, and the Soil Moisture Active-Passive (SMAP) mission was commissioned for routine operations but suffered a failure of its active instrument. All missions are currently producing data, but several also show signs of aging, resulting in reduced data collection or reduced science utility. Although all missions were conceived as research missions, the efficiency of the communications and ground data handling systems has supported operational and near-real-time applications.

NASA's Earth science programme is implementing a balanced and robust plan to accomplish a broad set of critical Earth observation measurements from space. The programme advances knowledge of the integrated Earth system, the global atmosphere, oceans (including sea ice), land surfaces, ecosystems, and interactions between all elements, including the impacts of humans. A balance of satellite measurements, science research, technology development and applications is needed to address a complex global Earth system. NASA's plans include the launch of 13 missions and seven instruments (on host missions) in the future.

E WORKING GROUPS REPORTS

E.1 Global issues on satellite systems and telecommunication coordination (WGI)

E.1.1 Report from WGI including endorsement of best practice for support to regional LEO services

Working Group I (WGI) on global issues on satellite systems and telecommunications coordination convened on Monday 6 June 2016, from 9:00 to 16:00.

Vanessa Griffin from NOAA served as Chair and Joaquin Gonzalez from EUMETSAT as rapporteur. Unfortunately, Co-chair Sergey Uspensky was unable to attend CGMS-44. Representatives of the following organisations attended the session: CMA, EUMETSAT, GEO Secretariat, ISRO, JMA, KMA, NOAA, ROSCOSMOS, ROSHYDROMET and the WMO.

The full report from the meeting of WGI, together with the full list of participants, is provided in the chapter, “Parallel Working Group Sessions” and in the Annex respectively.

The CGMS-44 plenary recognised, with appreciation, the increasing importance of the Space Frequency Coordination Group (SFCG) liaison in support of technical frequency management aspects for CGMS.

The CGMS-44 plenary endorsed the actions and recommendations proposed by WG-I and in particular endorsed the proposal for CGMS agency best practice in support to local and regional processing of LEO direct broadcast data (**CGMS-44-EUMETSAT-WP-07** and **CGMS-44-CGMS-WP-22 PPT**).

E.2 Global data dissemination (WGIV)

E.2.1 Report from WGIV

Working Group IV (WGIV) on global data dissemination convened Monday 6 June 2016, 16:00-18:00 and Tuesday 7 June, 2016, 08:30-13:00.

Vasily Asmus from ROSHYDROMET served as Chair and Klaus-Peter Renner from EUMETSAT as rapporteur. Representatives of the following organisations attended the session: CEOS-CSIRO, CMA, ESA, EUMETSAT, ISRO, JMA, KMA, NASA (WEBEX), NOAA, ROSCOSMOS, ROSHYDROMET and the WMO (the full list of participants is included in the Annex).

JMA proposed Dr Hiroshi Kunimatsu (JMA) as a candidate for Co-chair and Dr. Kunimatsu was unanimously elected as Co-chair by the WG-IV participants.

The full report from the meeting and the list of participants of WGIV are provided in the chapter, “Parallel Working Group Sessions” and in the Annex respectively.

The CGMS-44 plenary endorsed the actions and recommendations proposed by WG-IV and, in particular, endorsed the proposal for best practice for achieving user readiness for new meteorological satellites (**CGMS-44-WMO-WP-02**).

CGMS-44 actions - PLENARY						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CMA, EUM, ISRO, ROSH	E.2.1	A44.08	**On IODC** (ref. WGIV/3.3)**:** CGMS agencies in the IODC region (CMA, EUMETSAT, ISRO, ROSHYDROMET) to support the distribution of essential data to IODC users via their existing dissemination methods (CMACast, EUMETCast, GTS, Internet, etc). *Originating from WGIV and endorsed by CGMS-44 plenary on 9 June 2016.*	CGMS-45	**CLOSED**	1.1.6

E.3 Operational continuity and contingency planning (WGIII)

E.3.1 Endorsement of WGIII terms of reference

CGMS-44 plenary endorsed the WGIII terms of reference as presented in **CGMS-44-CGMS-WP-31**.

E.3.2 Report from WGIII

Working Group III (WGIII) on operational continuity and contingency planning convened on Tuesday 7 June, 2016, 14:00-18:00.

Suzanne Hilding from NOAA served as Co-chair and Lars Peter Riishojgaard from the WMO as rapporteur. Unfortunately, Co-chair Dr. Zhang Peng of CMA was unable to attend CGMS-44. Representatives of the following organisations attended the session: CMA, EUMETSAT, ISRO, JMA, KMA, NASA, NOAA, ROSCOSMOS, ROSHYDROMET, GEO Secretariat and the WMO. The Chair was pleased to note the large number of participants in this year's WGIII meeting.

The full report from the meeting of WGIII, as well as the full list of participants, is provided in the chapter, "Parallel Working Group Sessions" and in the Annex respectively.

The CGMS-44 plenary endorsed the actions and recommendations proposed by WGIII.

E.3.3 Indian ocean data coverage (IODC) service – endorsement of the CGMS roadmap

EUMETSAT presented the status of implementation of the CGMS roadmap for the IODC service. The CGMS-44 plenary noted with appreciation the progress in the implementation of the IODC roadmap, the next major step being the approval by the EUMETSAT Council at the end of June 2016 of the relocation of Meteosat-8 to 41.5°E.

The plenary also emphasised the urgent need for CGMS operators in the Indian Ocean Region to review and update the list of essential data and products from the relevant geostationary satellites and to support the implementation of dissemination of essential data and products to users in the region through all available dissemination methods.

CGMS-44 actions - PLENARY						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMSSEC EUM, CMA, ISRO, ROSH	E.3.3	A44.09	**On IODC:** CGMSSEC with EUMETSAT to coordinate with CMA, ISRO and ROSH and update the table on IODC essential data and products (essential as per WMO Res. 40)	15-Jun-16	**OPEN**	1.1.6
CGMSSEC EUM, (CMA, ISRO, ROSH)	E.3.3	A44.10	**On IODC:** CGMSSEC EUMETSAT to prepare a letter (on behalf of EUM, CMA, ISRO and ROSH) to WMO confirming the baseline for the future multi-partner IODC service essential data and product baseline.	31-Jul-16	**OPEN**	1.1.6

E.4 Report from the Space Weather Task Team

The CGMS Space Weather Task Team (SWTT) convened on Sunday 5 June, 2016, 12:00-18:00.

Suzanne Hilding from NOAA served as Chair and Elsayed Talaat from NASA as rapporteur. Representatives of the following organisations attended the session: CMA, EUMETSAT, IMD, JMA, NICT, KMA, NASA, NOAA, ROSCOSMOS, ROSHYDROMET and the WMO. The Chair was pleased to note the large number of participants in the SWTT meeting.

The Space Weather Task Team began with a review of its objectives, to identify the methodology by which space weather support can be implemented within the existing construct of CGMS in order to support the continuity and integration of space-based observing capabilities for operational space weather products and services. The agenda and outcome of the inter-sessional meeting of SWTT was presented, primarily the need to define the role of CGMS amongst the diverse spectrum of space weather-related entities, such as ISES, ICTSW, ISWI, ICAO and others. The goal of facilitating a workshop with leaders from the related organisations within the next year was presented. The SWTT discussed the charts that capture the results of the inter-sessional meeting, making necessary modifications for the plenary presentation. As the SWTT discussed the next step of conducting a workshop with other space weather entities such as ISES, ISWI, and others, it was decided that we needed to make the recommendation to plenary to maintain the SWTT activity for another year. This will also enable the SWTT to provide oversight of the additional work required to integrate space weather into CGMS activities.

The full report from the meeting of SWTT, as well as the full list of participants, is provided in the chapter, “Parallel Working Group Sessions” and in the Annex respectively.

E.5 Satellite Data and Products (WGII)

E.5.1 Endorsement of WG II terms of reference

The CGMS-44 plenary discussed the proposal for terms of reference for WGII, as presented in **CGMS-44-CGMS-WP-30,** and endorsed the proposal with the amendment proposed by WGII to include:

- two-yearly rotation scheme for one of its Co-chairs, with KMA starting after the end of CGMS-44. Subsequently, Co-chairs from CMA, JMA, ROSHYDROMET, and IMD will follow;
- WMO to provide the second Co-chair;
- NOAA and EUMETSAT to provide the rapporteurs.

E.5.2 Report from WG II

The working group held its session as part of the CGMS-44 meeting on Monday, 6 June 2016, from 09:00-18:00 and Tuesday, 7 June 2016, from 09:00-16:00, for which Stephan Bojinski (WMO) and Toshiyuki Kurino (JMA) served as Co-chairs. Rapporteurs were Kenneth Holmlund (EUMETSAT) and Mitch Goldberg (NOAA).

The full report from the meeting of WGII, as well as the full list of participants, is provided in the chapter, “Parallel Working Group Sessions” and in the Annex respectively.

The CGMS-44 plenary endorsed the actions and recommendations proposed by WGII.

E.5.3 Summary of highlights and request for guidance from ITSC-20

The 20th International TOVS Study Conference, ITSC-20, was hosted by the Space Sciences and Engineering Centre (SSEC) of the University of Wisconsin, Madison, USA, in Lake Geneva, Wisconsin, from 25 October to 3 November 2015. One hundred and sixty participants from 35 organisations attended the conference, providing a wide range of scientific contributions. Seventeen countries and three international organisations were represented: Australia, Brazil, Canada, China, Czech Republic, France, Germany, India, Japan, Norway, Poland, Russia, South Korea, Spain, Switzerland, the United Kingdom, the United States, the ECMWF, EUMETSAT, and the WMO. The working groups had very productive discussions and it was again encouraging to see a large number of new, younger scientists participating.

The meeting benefitted from presentations about new operational satellite data from new, global operational data providers, in particular China and Russia. Evaluations of data from instruments on FY-3C as well as Meteor-M N2 show promising results, with operational usage of the FY-3C data being considered at several NWP centres. Efforts for international data provision and collaborative evaluation that builds on the international expertise were warmly welcomed and supported by the group.

Within the context of a diversification of providers of polar-orbiting satellite sounding data, there is an ongoing requirement for international coordination and optimisation of these activities. The group again expressed a strong requirement for both infrared and microwave sounders in at least three complementing orbital planes.

E.5.4 Summary of highlights and request for guidance from ICWG

CGMS-44-ICWG-WP-01 presented a summary report of ICWG activities over the past year and recommendations to CGMS from its topical groups. In response to A42.02, ICWG co-chairs drafted a white paper to define common cloud parameters to be discussed at ICWG-1. These parameters

include: cloud mask (CM), cloud top temperature (CTT), cloud emissivity, effective radius (Re), and cloud optical thickness (COT). These cloud parameter retrievals are increasingly used for near-term (nowcasting), short-term (weather forecasting), medium-term (regional monitoring), and decadal (climate monitoring), as well as for potential improvements in the cloud and convection parameterisations adopted in weather and climate models. Six topical groups (TGs) were convened in the ICWG-1 meeting. In response to R43.14, a new TG called "Assessment of level-2 Passive Imager Cloud Parameter Retrievals" was established, to assess the differences in cloud parameter retrievals over the Asia region. CMA, EUMETSAT, JMA, KMA, NASA-GSFC, NASA-LaRC and NOAA participated in this intercomparison study, applying existing retrieval algorithms to Himawari-8 measurements on 19 August 2015, (as the golden day for intercomparison). In addition, the reports and recommendations from other TGs (Severe Weather, Cloud Models for Remote Sensing, Cloud Climate Data Record, and Uncertainties) are included in this paper. ICWG interactions with other CGMS groups were discussed. Andrew Heidinger will replace Bryan Baum as a new Co-chair of ICGW.

CGMS-44 actions - PLENARY						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
IWWG	E.5.4	A44.11	**On IWWG matters:** IWWG to develop a detailed plan for the 3rd wind intercomparison, including concept and deliverables, and an estimate of the required resources.	CGMS-45	**OPEN**	3.2.1
ICWG	E.5.4	A44.12	**On ICWG matters:** ICWG to develop a detailed plan for the cloud intercomparison activity, including concept, deliverables, and an estimate of the required resources.	CGMS-45	**OPEN**	3.2.3

F GEO

F.1 GEO and CGMS coordination

Barbara Ryan, Director of the GEO Secretariat, presented **CGMS-44-GEO-WP-01**, the current status of GEO and its CGMS coordination efforts. Transition to GEO's second decade (2016-2025) has begun with the strong endorsement of GEO's 102 members and 95 participating organisations, including CGMS. Recognition of GEO's convening power with members, participating organisations, development banks, foundations, and the private sector is cited as a key benefit of the organisation. The new GEO Strategic Plan defined several programmatic mechanisms including community activities, foundational tasks, initiatives and flagships and also identified eight societal benefit areas (SBAs).

Several of the GEO 2016 work programme tasks relate to CGMS activities, and an invitation for CGMS to contribute or link to these GEO tasks was made.

The GEO Secretariat also encouraged CEOS and CGMS to continue their close cooperation on climate activities, and to consider extending it to other areas such as the recent initiation of non-meteorological applications for the next generation of geostationary satellites.

In response to a question from IOC, GEO clarified that the approach for the new GEO work plan was to capitalise on the efforts of cooperating organisations like CGMS to improve data acquisition, whereas the efforts of GEO itself are now concentrating on improving data access through the data brokering activities.

GEO also clarified that climate is no longer considered a separate SBA, reflecting its character as a cross-cutting area underpinning all societal benefit areas.

CGMS-44 recommendations - PLENARY						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CMA, EUM, NOAA	F.1	R44.07	The GEONETCast operators (CMA, EUMETSAT and NOAA) to actively follow-up the commitment made at the Side Event at the GEO Mexico City Summit.		**OPEN**	

G THEMATIC SESSION

G.1 Short-range numerical weather prediction

G.1.1 Short range NWP - SRNWP

In **CGMS-44-EUMETSAT-WP-32**, Thibaut Montmerle and Jean-François Mahfouf, Météo-France (CNRM/GMAP), provided the keynote paper for the SRNWP session.

Short-range numerical weather prediction (SRNWP) systems are based on non-hydrostatic models with a 1-4km horizontal resolution range. At those resolutions, convective processes are resolved explicitly, leading to realistic representation of clouds and precipitation, turbulence and surface interactions. SRNWP systems use lateral boundary conditions from NWP systems at global scale and usually perform analyses more frequently. Data assimilation (DA) of satellite data is inherited from global scale NWP, and is generally based on the same observation operators, but used with a finer thinning. Because of their high temporal resolutions, GEO satellites are essential, but LEO satellites play an important role at high latitude.

The AROME-France SRNWP system was presented for illustration. It is based on an hourly cycled 3DVar allowing the assimilation of a comprehensive set of conventional, radar and satellite observations. In rainy conditions, its analyses are highly impacted by radar Doppler winds and reflectivities in the mid- to low troposphere. In the mid- to high troposphere, radiances from GEO mostly impact humidity, while radiances from different LEOs are an important contributor to the analysis error variance reduction for temperature. However, the number of assimilated satellite observations is still much lower than the number of conventional observations that are frequently available over Western Europe. Different strategies to increase the potential impact of satellite data in SRNWP were discussed, especially to consider cloudy radiances in the microwave or to include instruments onboard future satellites.

G.1.2 Outcome of CGMS survey/questionnaire on SRWNP in response to CGMS-43 WGII A43.14

CGMS-44-EUMETSAT-WP-24 provided the outcome of CGMS survey/questionnaire on SRWNP in response to CGMS-43.

This questionnaire was sent to leading experts on short-range numerical weather prediction (SRNWP) and limited area modelling. In addition to the major European projects (Aladin/Arome, COSMO, HIRLAM, UKV/Met Office) and associated NMSs, responses were also received from CMA, KMA, JMA, NOAA and NASA.

Whilst some differences remain, and some research is driven by the anticipated locally available future satellite systems, there is generally a large degree of commonality in the projected future evolutions of short-range NWP and the use of satellite data. Some of the main evolutions for the future are listed below.

- Increased horizontal resolution down to sub-kilometer scale - even down to 100m. This implies convective scale cloud-resolving modelling.

- The need for further improvements in the vertical structures and the planetary boundary layer (PBL).
- Shorter update cycles of 1 hour and less, even down to 15 minutes
- Stronger coupled modelling, including ocean and atmospheric chemistry. The latter also for aerosol.

These evolutions also drive the associated need in modelling and data assimilation, including error characterisation and observation operators, as well as imposing stringent requirements on data availability, timeliness and products. In particular, data latency is an issue that needs to be discussed in the context of the future SRNWP update cycles and assimilation methodologies using e.g. 4d-var.

The aim is for EUMETSAT is to use the outcome of this questionnaire to compile a comprehensive view of the current state and future perspectives of SRNWP research and development, with emphasis on utilisation and future requirements for satellite data and products.

More specifically, EUMETSAT intends to use the collected responses to develop a coherent picture of the needs by SRNWP with regard to data and products from Meteosat Third Generation (MTG).

One emerging need identified already is on the data assimilation aspects of hyperspectral infrared data in SRNWP and the relationship to principal component compression, use of reconstructed radiances versus original radiance or the use of level-2 retrieval. Here EUMETSAT is looking at the possibility of organising a dedicated workshop within the next 24 months.

G.1.3 SCOPE-NWC status and plans

CGMS-44-WMO-WP-15 provided status and plans for SCOPE-Nowcasting.

The four pilot projects of the Sustained Coordinated Processing of Environmental Satellite Data for Nowcasting (SCOPE-Nowcasting) initiative have made steady progress since their inception in 2013.

- Pilot Project 1: Basic satellite imagery for Severe Weather Forecasting Demonstration Project (SWFDP) focus regions in Asia and the South-West Pacific, including RGBs from Himawari-8, with the key focus on consistent and agreed products across satellites from multiple operators.
- Pilot Project 2: Intercomparison of satellite-based volcanic ash retrieval algorithms, to inform operationalisation of such algorithms for aviation services and ICAO.
- Pilot Project 3: Blended global satellite rainfall product for nowcasting and severe weather risk reduction using web-mapping services.
- Pilot Project 4: Sand and dust monitoring in Asia using different data sources, exchange of ground-based validation data, and intercomparison of JMA and CMA algorithms.

A meeting of the SCOPE-Nowcasting Steering Group is envisaged for late 2016 or early 2017 to advise on the way forward into the pre-operational phase of the initiative. The steering group will be formalised by the WMO in the course of 2016, including invitations to the satellite operators currently contributing to SCOPE-Nowcasting (EUMETSAT, JMA, CMA, KMA, and NOAA). A priority

task for the steering group will be reviewing the current pilot projects and establishing clear project plans, accountability and deliverables for each project.

CGMS members were urged to continue to support SCOPE-Nowcasting and its transition to the pre-operational phase, in particular, to financially support the finalisation of the satellite-based volcanic ash retrieval algorithm intercomparison activity (Pilot Project 2) over the next 12-18 months.

The session noted that, whilst short-term NWP is expected to significantly change the way satellite data is accessed by users, this will only be true for those countries with advanced NWP capabilities. For the remainder of countries, satellite data for nowcasting, and supporting products, are expected to remain very important.

The WMO noted that future projects within the framework of SCOPE-Nowcasting may explore further the moving boundaries between SRNWP and nowcasting.

CGMS members should consider the full range of user capabilities (ranging from advanced SRNWP to more conventional nowcasting) when planning their data utilisation, product generation and dissemination strategies.

The following recommendation was proposed and endorsed:

CGMS-44 recommendations - PLENARY						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS members	G.1.3	R44.08	**On SCOPE-NWC:** CGMS members to continue to support SCOPE-Nowcasting and its transition to the preoperational phase, in particular, to financially support the finalisation of the satellite-based volcanic ash retrieval algorithm intercomparison activity (Pilot Project 2) over the next 12-18 months. (Ref. CGMS-44-WMO-WP-15).	30 Dec 2017	**OPEN**	3.2.4

G.2 Carbon observation programmes

G.2.1 Towards a European operational observing system to monitor fossil CO2 emissions

Philippe Ciais presented the European Commission CO2 report **(CGMS-44-CGMS-WP-35)**, responding to five key questions focusing on human-induced carbon emissions. These include uncertainties and limitations of current inventories of fossil CO2 emissions; how inventories could be improved using space-borne missions; what the current capabilities (space, in-situ) are, how to optimise these, and a roadmap toward a carbon observation system. The report was intended to raise policymakers' awareness of the importance of satellite observations of CO2.

Emissions rates have reduced recently. 65% of emissions come from developing nations, therefore, the Paris Agreement includes all nations. Global emissions uncertainty is increasing with time, mainly because of the use of coal in developing countries. Estimates in China differ by up to 14%, which is significant at global scale ("losing our anchor"). He illustrated the differences using emissions from the City of London (measured and based on the national inventory), and showed (through an example from China) the impact of the uncertainty in the location of power plants. Current emission inventories are based on self-reported statistical data from emitters themselves, and are relatively costly. Despite efforts to improve inventories, global CO2 emissions information is becoming more uncertain.

Hence, it is proposed to complement inventories by atmospheric measurements, based on a combination of top-down and bottom-up approaches. Since the atmosphere is a power integrator of surface fluxes, and because mixing is efficient and mainly driven by weather synoptic systems, sampling of emission sources and sinks needs to be dense. Natural fluxes require relatively sparse sampling; inversion requires very accurate atmospheric transport models. For capturing human-induced emission hot spots, high-resolution spatial and temporal sampling is required.

Two complementary traits of an observing system are proposed in the report:

- dense sampling of selected emission hotspots, such as megacities and major industrial areas, can be achieved from satellites measurements of CO2;
- separate fossil CO2 component from the natural fluxes at regional scale by measurement of additional trace species such as C14 and carbon monoxide.

Four pillars of an operational observing system to monitor fossil fuel CO2 emissions are:

- frequent updates and improved maps of emissions from bottom-up inventories;
- satellite measurement of column CO2;
- in-situ tall tower networks;
- inverse modelling with operational capabilities.

If the Paris Agreement is followed, developing a monitoring system is urgent in order to establish a baseline against which progress with emission reductions can be tracked. This will help inform a critical verification period in the 2025-2035 timeframe and accompany implementation of intended nationally determined contributions (INDCs).

An overview was provided of existing and planned satellite missions addressing GHG fluxes, distinguishing missions with capabilities for natural fluxes and with opportunities to estimate emissions, missions with capabilities to estimate emissions, and missions with capabilities to monitor emissions, which will require relatively frequent sampling. The OCO-2 instrument capabilities were shown, and validation against a TCCON site (ref. **CGMS-44-NASA-WP-09**). Results demonstrate accuracy of around 1ppm, despite remaining biases.

Elements of a fossil fuel data assimilation system are: remote sensing, a model of natural fluxes, an atmospheric transport model, and an emissions model. Separation of the fossil fuel CO2 component using tracers (NOx, CO) is possible over Europe, e.g., to distinguish emissions from energy and

transport. Interpretation of results for decision-makers needs to be made by a decision support unit/system.

Conclusions of the report included:

- there are limitations of current inventories to assess mitigation policy;
- inverse modelling with dense atmospheric CO2 measurements make it possible to improve fossil fuel CO2 emission estimates;
- current capabilities need to be strongly developed within Copernicus to build four pillars of a future operational CO2 emission monitoring system by 2030;
- the system will require frequently updated bottom-up emission maps, an operational fossil fuel data assimilation system, and adequate space-based and in-situ CO2 observations.

The need to coordinate and optimise global sampling of the atmosphere from different satellite missions was recognised.

EUMETSAT stated that this was very timely in light of the WIGOS 2040 vision, if we do not consider this now, it would be a lost opportunity. Nevertheless it needs to be an international undertaking, capitalising on both OPS and R&D missions.

NOAA pointed out that the assumed schedule for LIDAR missions was much too aggressive and also suggested to consider LEO IR sounders, in particular for CO. NOAA also pointed out that satellites are only a contribution to the overall systems, modelling is very important.

ESA urged extreme caution in using satellite observations for verification of fossil emissions.

NASA noted that satellites are particularly important where ground observations are difficult to get.

GEO emphasised the need for establishing links with ICOS, the Pan-European network for in-situ measurement of carbon cycle and greenhouse gas budget and perturbations.

G.2.2 Carbon observation programmes (agency plans) - Satellite contributions to emission monitoring

In **CGMS-44-CMA-WP-02,** CMA provided a report on China's plans for satellite carbon observation, including the TanSat mission, and the FY-3 mission in support of measuring carbon.

TanSat has as its mission objective to retrieve the atmosphere column-averaged CO2 dry air mole fraction with precision of 1% for monitoring CO2 emissions on national and global scales. It is a joint R&D mission of CAS, MOST and CMA. TanSat has two major payloads: a CO2 spectrometer and a Cloud and Aerosol Polarisation Instrument (CAPI). Spatial resolution of the CO2 spectrometer is 2x1km. There are two mission modes (land and ocean). There is a significant ground segment associated with the mission, with a number of validation stations in China. Launch is planned for October/November 2016.

The CMA operational FY-3 series will have a new GHG payload on board FY-3D, the Greenhouse Gases Absorption Spectrometer (GAS). The mission priority is CO2 and CH4 column density (during

the orbital daytime) using short-wave infrared observation. The GAS instrument is currently in the testing phase. FY-3D will be launched in 2016.

CGMS-44-JAXA-WP-02 provides an overview and status report of the JAXA Himawari Monitor.

Hiroshi Suto (JAXA) presented the status of GOSAT and GOSAT-2 (by webex).

GOSAT accommodated two sensors: TANSO-FTS and TANSO-CAI and has been providing data for seven-and-a-half years. He showed a comparison of North America CH4 emissions using a model, and GOSAT. Some operational issues exist with GOSAT. Radiometric calibration results were shown for both instruments, using vicarious campaign data, as well as results of the long-term consistency of the H/M observation of XCO2. There are improvements in the TIR record after applying a non-linearity correction. Radiometric calibration errors still existed albeit having been significantly reduced.

GOSAT-2 innovation includes FTS-2 CO detectability, programmable pointing; and CAI-2 with forward/backward-looking functionality. The footprint size is comparable to GOSAT. The instrument and satellite are undergoing testing with launch planned for 2017. A GOSAT-3 spacecraft is included in the Japanese space programme, with development to start in 2018, and a launch target of 2023.

In **CGMS-44-NASA-WP-09**, NASA reported on the status of OCO-2 and OCO-3.

Fossil fuel combustion, deforestation, and other human activities are adding almost 40 billion tons of carbon dioxide (CO_2) to the atmosphere each year. This is enough CO_2 to increase the atmospheric concentration of this gas by 1% per year. Interestingly, less than half of this CO_2 stays airborne, on average. The rest is apparently being absorbed by natural processes at the surface, whose identity and location are poorly understood. Ground-based CO_2 measurements accurately record the global atmospheric CO_2 budget and its trends, but do not have the spatial resolution or coverage needed to identify the “sources” emitting CO_2 into the atmosphere or the natural “sinks” absorbing this gas at the surface.

One way to improve the resolution and coverage of these measurements is to collect precise observations of CO_2 from an orbiting satellite. The Orbiting Carbon Observatory–2 (OCO-2) is NASA’s first satellite designed to address this need. OCO-2 was successfully launched on 2 July 2014. By early September of 2014, its high-resolution imaging grating spectrometers were recording almost a million soundings over Earth’s sunlit hemisphere each day. Observations recorded over the first 18 months of operation clearly show the most robust features of the atmospheric carbon cycle, including the intense northern hemisphere spring drawdown, as land plants rapidly absorb CO_2 to form new leaves, stems, and roots. They also show enhanced CO_2 over regions with intense fossil fuel combustion, such as the east coast of China and the U.S. As these measurements are analysed by the carbon cycle science community, they are expected to reveal far more detail about the processes controlling the atmospheric CO_2 build-up.

As part of the OCO-2 mission, NASA authorised the development of a flight spare instrument to minimise schedule impacts of any delays introduced by problems with the flight instrument development. OCO-2 shows overall robust agreement with TCCON validation sites, however some

biases remain. In November 2012, NASA approved a Phase-A effort to adapt this instrument for deployment on the International Space Station (ISS) as the Orbiting Carbon Observatory-3 (OCO-3). The plan is to install OCO-3 on the Japanese Equipment Module Exposed Facility (JEM-EF) as early as 2018 for a three-year nominal mission. Unlike OCO-2 and other greenhouse gas missions flying in near-polar, sun-synchronous orbits, ISS flies in a low inclination orbit, which overflies latitudes equatorward of 51°. This orbit will preclude coverage of higher latitudes, but will provide somewhat better coverage of mid-latitudes, where human activities emit the most CO_2. The orbit precession will allow OCO-3 to sample different parts of the Earth at different times of day. This will provide the first opportunity to search for variations in X_{CO2} and other carbon cycle variables, such as chlorophyll fluorescence, across the entire range of local times from dawn to dusk from a single space-based platform.

Regarding plans for observing carbon, CGMS satellite operators stated that:

- CMA plans to follow-up TanSat with a carbon payload on the operational FY-3D, to be launched late 2016;
- NASA stated that further decisions regarding carbon depend on the next decadal survey, and will be framed around decision-making support, and the relative importance of observations. There might be an interest from the community for a GEO platform and CH4 might also be looked at. An important component is the sustained long-term commitment of missions. The importance of airborne platforms to derive CH4 was stressed;
- NOAA currently has no requirement for measuring CO2 and will look for recommendations in the decadal survey, available by the end of 2017. Specific CO2 missions are currently not part of the NOAA portfolio, but modelling activities in NOAA touch upon many aspects of the carbon cycle;
- JMA maintains a ground network of CO2 measurements for validation. The current line of satellite missions is planned to continue and JMA will cooperate with the Ministry of the Environment;
- Russia uses the IR sounder from Meteor-M N2 and ground systems in Siberia for validation of CO2 measurements;
- KMA has no current plans for a carbon mission but can contribute to validation;
- ESA and EUMETSAT informed about preliminary activities to accommodate a carbon mission in the next phase of the European Commission Copernicus programme 2021-2027. ESA will start preparatory activities and technology development within the coming years;
- India has intentions to plan for a carbon mission.

It was noted that CGMS members should combine many sources of data to support the build-up of carbon information systems.

The Chair asked for views from members as to whether CGMS should engage in a coordinated approach to observing carbon from space by 2040, and develop details of such an approach over the next two years.

ESA stated that there is currently no coherent, coordinated approach among agencies around measuring carbon. The foundation has been laid through the GCP. There is a Carbon Implementation

Plan, and a CEOS response exists, but it is not very specific. ESA believed there is justification for a specific, common approach.

NOAA supported the idea, bringing together CEOS and CGMS.

CGMS agreed to:

- address the need to develop a Vision for the space-based observing system in 2040;
- the need to combine the space assets from member agencies;
- CGMS agreed to engage in a coordinated approach with CEOS to define the approach by space agencies towards observing carbon within 2 years.

CGMS-44 actions - PLENARY						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMSSEC	G.2	A44.13	**ON carbon observation programmes:** Consistent with the discussions held at CGMS-44, CGMS Secretariat to request CEOS SIT Chair to organise a discussion at the CEOS SIT Technical Workshop (September 2016) on developing a suitable mechanism involving both CGMS and CEOS agencies to review how planned carbon observation missions might be better coordinated in response to the GCOS Implementation Plan and to develop a coherent contribution to the WMO Vision for WIGOS 2040.	Sep-16	**OPEN**	
CGMSSEC	G.2	A44.14	**On carbon observation programmes:** CGMS Secretariat to include a standing agenda item on carbon observation programmes at future CGMS plenary sessions.	CGMS-45	**OPEN**	

H CLIMATE

H.1 Status report by the CEOS-CGMS Joint Working Group on Climate

In **CGMS-44-JWGCLIM-WP-01**, Pascal Lecomte, Chair of the Joint CEOS/CGMS Working Group on Climate (WG Climate) outlined the main objectives of the working group, the associated implementation modalities and schedule for the period November 2015 to November 2019. This period covers the WG Chair periods of ESA (Pascal Lecomte) and EUMETSAT (Jörg Schulz). This plan will be updated with further details as they become available, particularly in view of the uncertainties associated with the evolution of the requirements. For practical reasons, this work-plan covers four years, from November 2015 to November 2019, in order to encompass two revision cycles of the ECV Inventory. It is more detailed for the next two-year cycle (cycle 2 of the ECV Inventory), and a bit less for the following cycle (cycle 3), which will include lesson learned during cycle 2.

The WG Climate mandate has been to facilitate the implementation and exploitation of essential climate variable (ECV) time series through coordination of the existing and substantial activities undertaken by CEOS member agencies. In addressing this goal, the WG Climate reviews and assesses, on behalf of CEOS and CGMS, the generation of fundamental climate data records (FCDRs) and derived essential climate variable (ECV) climate products supported by space agencies. WG Climate has also contributed to the review of compliance of satellite missions and products with the Global Climate Observing System (GCOS) Climate Monitoring Principles and with the “Guideline for the Generation of Datasets and Products meeting GCOS Requirements”. It also identifies multi-agency implementation teams for each product, reviews their actions, and ensures that a coherent implementation plan exists for each and every climate data product.

WG Climate also provides guidance to CEOS and CGMS regarding climate-related tasks in the Group on Earth Observations (GEO) Work Plan. In part, this is accomplished by reviewing relevant reports prepared by the climate societal benefit area (SBA) lead on behalf of the space agencies. These reports include the updating of documents such as the Space Agency Response to GCOS Requirements and the updating of reports to the United Nations Framework Convention on Climate Change Subsidiary Body for Scientific and Technological Advice (UNFCCC/SBSTA) on space agencies' climate actions. WG Climate also supports the work of GCOS in defining and delivering the ECVs required by the UNFCCC and supports the overall relation of CEOS to the UNFCCC, its subsidiary bodies, and to the Intergovernmental Panel on Climate Change (IPCC).

Review of actions:

Plenary actions open from earlier plenary session (at CGMS-43)							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
CEOS/CGMS joint climate WG	Plen H.3.2	A42.11	Regarding the Pilot FCDR Inventory: • Conduct an initial analysis of available FCDRs, past and current, available or planned for use in the current set of SCOPE-CM projects using CEOS, CGMS, and WMO satellite data bases; • Identify SCOPE-CM ECV projects that are, or may be able to, use the above FCDRs; • Assess availability of the above FCDRs for the future; • Following the first ECV gap analysis, consider FCDRs that may be useful in assessing ECV opportunities in the future ECV gap analysis.	Nov '14: ONGOING. Discussions were held at the Climate Symposium regarding the Pilot FCDR inventory and work has begun on the specific identification of SCOPE-CM ECV projects and use of higher temporal and spatial resolution data from the next generation of geostationary satellites. The project will leverage the ECV assessment reference process being developed by WG Climate. CMA and KMA have been invited to participate in these efforts. Reports were made to CGMS-43 WGII and plenary, and will also be made to CGMS-44. *CGMS-44: JWG Climate provided a report at plenary. Action closed and the topic will be integrated into the updated HLPP. JWG Climate has a standing item on the CGMS plenary agenda.*	CGMS-43 and CGMS-44	**CLOSED**	HLPP # 5

Reference was also made to an old CGMS-39 action:

Actionee	Action	Description	Action feedback/closing document	Deadline	Status
CGMS Members	WGIV 39.51	Action 39.51: All CGMS members to propose using interoperability standards for providing and sharing of climate data records and report on their efforts at the next meeting of CGMS Deadline: CGMS-40	EUMETSAT: No further developments since CGMS-39. EUMETSAT is prepared to revisit this following an input from other CGMS members. NOAA provided inputs which were circulated via the CGMS list server on 02/11/12. Other CGMS members to provide their input. *Action closed following CGMS-44 plenary discussions.*	(CGMS-40) **New deadline CGMS-41**	**CLOSED**

Regarding the climate priorities in the HLPP, the revised JWG Climate Work Plan proposed to replace the nine different priorities under "5.1 Advancing the architecture for climate monitoring from space" with the following four priorities:

5.1.1 update ECV Inventory, Gap Analysis and Action Plan for the active cycle of WG Climate as described in detail in the WG Climate Four-year Work Plan. (This is a standing cyclic action and all three parts are covered during a two-year cycle (currently cycle #2));

5.1.2 report to UNFCCC Subsidiary Body for Scientific and Technological Advice-Research and Systematic Observation (SBSTA-RSO). (This action is also part of the cyclic regular annual reporting.);

5.1.3 respond (via CEOS) to the GCOS IP and Satellite Supplement for submission (via GCOS) to COP;

5.1.4 Contribute to the Global Framework for Climate Services.

The CGMS plenary expressed its appreciation of the progress of the JWG Climate and endorsed the revised four-year work plan.

Regarding the JWG Climate proposal for revision of the HLPP, the plenary expressed the view that the revision should better reflect the part of the process involving the agency CDR holdings. This will be taken into account in the final revision of the HLPP.

H.2 Summary of highlights and request for guidance from GSICS Executive Panel

In **CGMS-44-WMO-WP-13**, GSICS reported on its recent activities, including key activities for the near future. Significant progress has been made in terms of implementing products and services. The first four GSICS products have now become operational, another four are in pre-operational status and a further 27 are in the demonstration phase. Additional products are under early development (prototypes). Progress is also reflected in improved web presence (GSICSWiki.net) and on respective agency sites. The JMA site was specifically lauded.

On the research side, good progress is being made in developing new algorithms and products. Specifically, the importance of lunar calibration in order to achieve high accuracy SI-traceable calibration required for climate monitoring and other applications was discussed. This item is also discussed in a dedicated paper to WG II and the recommendations are reflected there. Also the process for promoting product status to pre-operational and operational as well as the promotion of products from instrument families that are already in pre-operational or operational phase was discussed. This is also reflected in a specific WG II paper on transfer of reference instruments and the associated recommendations are there. An important aspect raised related to outreach. GSICS has recently performed a user survey, with feedback that is now integrated into the normal work of the various working groups. Furthermore, GSICS is reaching out to user communities and a proposal to engage in a dedicated project with ISCCP through SCOPE-CM was discussed. The participation in SCOPE-CM IOGEO also was endorsed. There were also convincing results presented on the utility to provide improved SST estimates using GSICS corrections. Part of the outreach has also been the

provision of a clear, structured set of documents. These include a GSICS overview, vision, terms of reference and a guide to products or services. The vision and terms of reference are already finalised and the others are under development. Finally, it should be noted that the next GSICS Users' Workshop will be organised as part of the JPSS Annual Science Team Meeting 8-12 August 2016, and there will also be a side event on the use of ICVS (Integrated Calibration/Validation System).

A specific concern on the workload of GSICS Data Management Working Group (GDWG) was raised and discussed. The current activities go beyond the originally foreseen scope of the GDWG since the activities originally foreseen for the GSICS Coordination Centre can only be performed by the GDWG members. In addition to a revision of the terms of reference and the associated resourcing, an active engagement in the GDWG is required. This does not only benefit GSICS itself, but is also beneficial for the agency activities requiring such attention nevertheless. E.g. this was demonstrated by the use of GSICS by JMA to identify calibration issues during Himawari-8 commissioning and by KMA to readjust SRFs for Kompsat-2.

The highlights of the recent work by GSICS include:

- first GSICS products are declared operational;
- very good user feedback, particularly from satellite operators;
- members to strengthen their engagement in GSICS and, in particular in GDWG;
- all CGMS members invited to join GSICS;
- members to analyse their requirements for calibration;
- support inclusion of calibration references in the Vision 2040;
- support GSICS engagement with CEOS/WGCV in the Architecture for Climate Monitoring from Space;
- support GSICS efforts for outreach to further document GSICS and communicate to ensure visibility and full benefit.

By adding a few small parameters as ancillary data, all users of geostationary imager data can apply an adjustment, which will provide bias consistency of all GEO imagers enabling improved applications.

It should be noted that the GSICS activities were also presented to t CGMS Working Group II, which endorsed the specific actions and recommendations proposed by GSICS in **CGMS-44-WMO-WP-13**.

GSICS expressed its thanks to Jerome Lafeuille (WMO) for his many years of support to GSICS.

H.3 GCOS status report and outcome of the March 2016 Global Climate Conference

CGMS-44-WMO-WP-06 provided a GCOS status report and reported on the outcome of the March 2016 Open GCOS Science Conference

The Global Climate Observing System (GCOS) includes surface-based, air-borne, and space-based components and constitutes, in aggregate, the climate observing component of the Global Earth Observation System of Systems (GEOSS). The next GCOS Status Report on the global observing systems for climate has been available to the public since October 2015. The GCOS Secretariat has

initiated the process of drafting a new GCOS Implementation Plan, which will be highly relevant to space agencies, WMO programmes and related IOC and UNEP programmes and climate science activities, especially in light of the evolving Global Framework for Climate Services (GFCS).

The Open GCOS Science Conference, held from 2-4 March 2016, launched the draft of the new Implementation Plan and invited the scientific community to contribute. The GCOS Implementation Plan will be submitted to the upcoming UNFCCC COP22 in Morocco, and will be published early 2017.

CGMS members were invited to contribute to the public review of the draft GCOS Implementation Plan and provide their inputs to the CEOS-CGMS JWG Climate, from end July to the early September 2016.

CGMS-44 actions - PLENARY						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
JWG CLIM (CGMS members)	H.3	A44.15	**On GCOS Implementation Plan:** CGMS - through the CEOS-CGMS JWG Climate (pascal.lecomte@esa.int, joerg.schulz@eumetsat.int) - to contribute to the public review of the draft GCOS Implementation Plan (http://www.wmo.int/pages/prog/gcos/)	25 July-5 Sept 2016	**OPEN**	5.1

I EDUCATION AND TRAINING

I.1 Virtual laboratory – Vlab

CGMS-44-JMA-WP-09 outlined the mission of the WIGOS Project to Develop Support for NMHSs in Satellite Data, Products and Training, and also detailed recent, related accomplishments. JMA plans a range of activities to support users in preparation for Himawari-8, in the context of the Asia-Oceania Meteorological Satellite Users Conference (AOMSUC). The fourth meeting of the Coordinating Group of the RA II WIGOS Project will be held on 28 October 2016, on the occasion of the 7th Asia-Oceania Meteorological Satellite Users' Conference (AOMSUC-7) in Korea.

CGMS-44-KMA-WP-03 introduced recent activities and future plans for international education and training on the analysis and application of next generation satellite data in the period 2016-2018, which will be hosted by the Centre of Excellence (CoE) Korea as a member of WMO/CGMS VLab group. The first training course is scheduled to run for four weeks (10 Oct – 2 Nov 2016) at the NMSC. Eighteen weather forecasters, meteorologists, satellite analysers or hydrologists in the 16 developing countries over the Asia-Oceania regions will attend.

Furthermore, KMA will host a training event at the time of AOMSUC-7 on 21-28 October in Songdo, Incheon, Korea (http://nmsc.kma.go.kr/aomsuc7/main.jsp). The training will be held at the NMSC in Jincheon for two days (21-22 Oct 2016). It will focus on the detection of rapidly developing thunderstorms (RDT) and analyse severe convective storms by utilising new satellite data and be lead by KMA, BoM, JMA and possibly CMA.

CGMS-44-WMO-WP-09 reported on recent activities and plans of the WMO-CGMS Virtual Laboratory for Education and Training in Satellite Meteorology (VLab). In 2015, VLab members offered a variety of training opportunities, with highlights being the Himawari-8 Training Campaign, the "Preparing for the Next Generation of Satellites" event, a Train the Trainer Workshop on GEONETCast Americas, and the Meteorological Science Week. These provided very good opportunities for stakeholders from all WMO Regional Associations to be informed and make effective use of data, products and tools that are or will soon be available

At its May 2016 meeting, the VLab management group made key decisions in response to the new VLab Strategy 2015-2019:

- organisation of a virtual roundtable on climate monitoring from space in 2016, in all WMO languages; for further scoping of training on climate datasets, access to the ECV inventory will be needed;
- support user preparation in the Indian Ocean region in connection with the IODC CGMS roadmap (iii); develop a process of quality control and self-assessment of the centres of excellence and supporting satellite operators;
- organise an expert workshop on RGB composites derived from multi-spectral (including new-generation) imagers in 2017.

VLab also identified the recommendations for consideration by CGMS related to:

- the availability of training resources in languages other than English;
- continuation of the project "Conceptual Models for the Southern Hemisphere (CM4SH)".

The VLab Trust Fund has received an increased level of contributions since May 2015 compared to the previous year, from NOAA, EUMETSAT, KMA, and the WMO. However, a larger number of contributing CGMS agencies is required to improve its resilience. Regular financial contributions from CGMS members are critical to maintain technical support to the VLab.

The paper proposed the following actions and recommendations, which were endorsed by the plenary session:

CGMS-44 actions - PLENARY						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
JWG CLIM (CGMS members)	I.1	A44.16	**On training/VLab:** For the scoping of training activities on climate datasets: CGMS - through CEOS-CGMS JWG Climate - to inform the VLab TSO (luveeck@gmail.com) about access to the ECV inventory once available.	CGMS-45	**OPEN**	5.1

CGMS-44 recommendations - PLENARY						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**

CGMS-44 recommendations - PLENARY						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS members	I.1	R44.09	**On training/VLab:** CGMS members are invited to share product information, dissemination information and training resources with the CoEs in Kenya, South Africa, Russian Federation, China, and Oman, and with users, to support VLab training activities in the Indian Ocean region.	Long term	**OPEN**	4.2.1
CGMS members	I.1	R44.10	**On training/VLab:** CGMS operators to make available training resources in all official languages as defined by the satellite operator's charter. Translation of training resources should be considered as a continuous, ongoing effort. Satellite operators without multiple official languages should consider coordinating the translation of their training resources through in-kind contributions by user institutions.	Long term	**OPEN**	4.2.1
CGMS members	I.1	R44.11	**On training/VLab:** CGMS to join efforts with VLab to investigate ways to fund the continuation of the Project "Conceptual Models for the Southern Hemisphere" (CM4SH) and also extend the initiative to prepare case studies related to the new generation of satellites.	Long term	**OPEN**	4.2

B. Ryan (GEO Secretariat) suggested coordination of the planned training on the climate-agriculture nexus for Southern Africa with AfriGEOSS and GEOGLAM (Terry Newby, terry@arc.agric.za; Andiswa Mlisa: amlisa@geosec.org).

J HLPP

J.1 Status of HLPP implementation 2015

CGMS-44-CGMS-WP-25 presented the status of implementation of the CGMS High Level Priority Plan (2015-2019). It incorporates inputs from:

- WG I, II, III and IV chairs and rapporteurs;
- International Science Working Group chairs and rapporteurs;
- GSICS project;
- SCOPE-CM project;
- CEOS-CGMS Joint Working Group on Climate;
- CGMS Space Weather Task Team.

The CGMS plenary noted the good progress in the implementation of the HLPP and took note of the actions initiated by CGMS Working Groups to advance the implementation.

J.2 Proposed update to the CGMS High-Level Priority Plan for the period 2016-2020

CGMS-44-CGMS-WP-26 presented the proposed revision of the CGMS High-Level Priority Plan (HLPP) to cover the period 2016-2020. The update has been based on the following intersessional activities:

- Space Weather Task Team meeting in Darmstadt, February 2016 and in Biot 5 June 2016;
- revision of the JWG Climate Work Plan;
- other revisions identified during intersessional work.

WGs I, II, III, IV considered the proposed updated set of high-level priorities and after making some amendments:

- confirmed that the proposed revision properly represents the high-level priorities that should guide CGMS activities for a four-year period;
- WG-I recommends two targets within its area of activity to be considered achieved:
  - establish a coordinated position on the future of L-band services;
    - The coordinated position has been established, presented in relevant fora and no further activities are planned.
  - evaluate the set of applicable (or TBD) standards for dissemination mechanisms in use by CGMS members and assess if there is a need, in view of future systems, to amend, modify or revise such transmission frequency broadcast standards (or to derive new ones);
    - This evaluation has been completed by WG-I in its intersessional work and confirmed at CGMS-44.
- WG I, II, III and IV recommended the endorsement by the CGMS plenary of the proposal for an HLPP covering the period 2016-2020.

The CGMS plenary endorsed the final proposal for the revised CGMS High-Level Priority Plan to cover the period 2016-2020.

Following CGMS-44, the revised version of the updated HLPP will be published on the CGMS website.

K REVIEW OF CGMS-44 ACTIONS AND RECOMMENDATIONS

K.1 Review of summary list actions and recommendations

The remaining open actions from CGMS-43 at the start of CGMS-44, were closed following the deliberations of CGMS-44 plenary discussions. The final status of all CGMS-43 actions and recommendations (plenary and working groups) is available here (http://www.cgms-info.org/documents/CGMS-43_actions_recs_final.pdf).

The list of CGMS-44 plenary actions and recommendations is provided below. The status of actions is maintained by the CGMS Secretariat and actionees are kindly requested to provide feedback to cgmssec@eumetsat.int as necessary. The status of actions and recommendations is maintained on the CGMS website under MEETINGS and CGMS-44.

Plenary actions open following CGMS-44 deliberations:

CGMS-44 Plenary actions							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	C.1	A44.01	**Vision for the WIGOS Space-Based Component in 2040:** CGMS operators are invited to provide comments on draft v0.2 of the Vision for the WIGOS Space-Based Components in 2040, to sbojinski@wmo.int, by 8 July 2016.	CGMS-44 WMO-WP-01: http://www.eumetsat.int/website/wcm/idc/idcplg?IdcService=GET_FILE&RevisionSelectionMethod=LatestReleased&Rendition=Web&dDocName=CWPT_1666	8 Jul 2016	**OPEN**	1.1
CMA, JMA, KMA	C.2	A44.02	CGMS operators to publicise the rapid scan capabilities of current and future geostationary satellites among the user community in RA II and V, and build the necessary capacity (on the occasion of 7th AOMSUC).		30 Oct 2016	**OPEN**	1.1
	C.6	A44.03	**On NWP and impact on forecasting skills:** **(**Ref. CGMS-44 WMO-WP-04) CGMS Members to formulate their requests (if any) for additional impact assessment work and transmit them to the WMO Secretariat (lriishojgaard@eumetsat.int).		30 Oct 2016	**OPEN**	1.1.2
WMO	C.6	A44.04	**On NWP and impact on forecasting skills:** WMO to brief CGMS-45 on the Final Report from the Sixth WMO Impact Workshop, with a particular focus on those recommendations that are directed to the CGMS members and CGMS Working Groups.		CGMS-45	**OPEN**	1.1.2
IOC-UNESCO	C.8	A44.05	IOC-UNESCO to provide guidance to CGMS on ocean surface wave observations at CGMS-45.		CGMS-45	**OPEN**	1.1.6

CGMS-44 Plenary actions							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
CGMSSEC	C.8	A44.06	**On sea ice:** Consistent with the discussions held at CGMS-44, CGMS Secretariat to liaise with CEOS SIT Chair on the suggestion that CEOS develop a Virtual Constellation for Sea Ice - following its established process for this purpose, and in coordination with the activities of the WMO PSTG. An initial discussion will be held at 2016 CEOS SIT Technical Workshop (September 2016).		01-Sep-16	**OPEN**	1.1.6
CGMSSEC	C.8	A44.07	CGMSSEC to write a letter on behalf of CGMS to Japan recommending that JAXA consider continuing the GCOM-W series in particular in support of precipitation and sea-ice measurements.		30-Jun-16	**OPEN**	1.1.6
CMA, EUM, ISRO, ROSH	E.2.1	A44.08	**On IODC** (ref. WGIV/3.3)**:** CGMS agencies in the IODC region (CMA, EUMETSAT, ISRO, ROSHYDROMET) to support the distribution of essential data to IODC users via their existing dissemination methods (CMACast, EUMETCast, GTS, Internet, etc).	Originating from WGIV and endorsed by CGMS-44 plenary on 9 June 2016.	CGMS-45	**CLOSED**	1.1.6
CGMSSEC EUMETSAT CMA, ISRO, ROSH	E.3.3	A44.09	**On IODC:** CGMSSEC with EUMETSAT to coordinate with CMA, ISRO and ROSH and update the table on IODC essential data and products (essential as per WMO Res. 40)		15-Jun-16	**OPEN**	1.1.6
CGMSSEC EUMETSAT (CMA, ISRO, ROSH)	E.3.3	A44.10	**On IODC:** CGMSSEC EUMETSAT to prepare a letter (on behalf of EUM, CMA, ISRO and ROSH) to WMO confirming the baseline for the future multi-partner IODC service essential data and product baseline.		31-Jul-16	**OPEN**	1.1.6

CGMS-44 Plenary actions							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
IWWG	E.5.4	A44.11	**On IWWG matters:** IWWG to develop a detailed plan for the 3rd wind intercomparison, including concept and deliverables, and an estimate of the required resources.		CGMS-45	**OPEN**	3.2.1
ICWG	E.5.4	A44.12	**On ICWG matters:** ICWG to develop a detailed plan for the cloud intercomparison activity, including concept, deliverables, and an estimate of the required resources.		CGMS-45	**OPEN**	3.2.3
CGMSSEC	G.2	A44.13	**ON carbon observation programmes:** Consistent with the discussions held at CGMS-44, CGMS Secretariat to request CEOS SIT Chair to organise a discussion at the CEOS SIT Technical Workshop (September 2016) on developing a suitable mechanism involving both CGMS and CEOS agencies to review how planned carbon observation missions might be better coordinated in response to the GCOS Implementation Plan and to develop a coherent contribution to the WMO Vision for WIGOS 2040.		Sep-16	**OPEN**	
CGMSSEC	G.2	A44.14	**On carbon observation programmes:** CGMS Secretariat to include a standing agenda item on carbon observation programmes at future CGMS plenary sessions.		CGMS-45	**OPEN**	
JWG CLIM (CGMS members)	H.3	A44.15	**On GCOS Implementation Plan:** CGMS - through the CEOS-CGMS JWG Climate (pascal.lecomte@esa.int, joerg.schulz@eumetsat.int) - to contribute to the public review of the draft GCOS Implementation Plan (http://www.wmo.int/pages/prog/gcos/)		25 July-5 Sept 2016	**OPEN**	5.1

CGMS-44 Plenary actions							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
JWG CLIM (CGMS members)	I.1	A44.16	**On training/VLab:** For the scoping of training activities on climate datasets: CGMS - through CEOS-CGMS JWG Climate - to inform the VLab TSO (luveeck@gmail.com) about access to the ECV inventory once available.		CGMS-45	**OPEN**	5.1

CGMS-44 Plenary Recommendations							
"Actionee"	**AGN item**	**Rec #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
KMA, KARI, CMA, CNSA, JMA, JAXA	C.2	R44.01	**On disaster risk reduction:** The "Jakarta Declaration" recommends to CGMS that the satellite operators provide the necessary support to the Joint RA II/V WIGOS project on Satellite Data. The declaration encourages the satellite operators of the Republic of Korea, China, and Japan to make digital data at the full resolution available to all members involved in the "Satellite Data Project" and to support the project in any way they can.		CGMS-45	**OPEN**	1.1
IOC-UNESCO, CGMS members	C.7	R44.02	**On Second International Indian Ocean Expedition (IIOE-2) for enhanced data acquisition and management:** It was recommended to establish a working alliance between the IIOE-2 and the remote sensing community (CGMS) within/through the IIOE-2 Steering Committee framework and/or the IIOE-2 Joint Project Office.		CGMS-45	**OPEN**	2.5
CGMS agencies	C.8	R44.03	CGMS agencies to promote sustainability of satellite passive microwave sea ice measurements begun in 1978.		Long term	**OPEN**	1.1.6

CGMS-44 Plenary Recommendations							
"Actionee"	**AGN item**	**Rec #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
CGMS agencies	C.8	R44.04	CGMS agencies to promote the implementation of sustained satellite scatterometer sea ice observations with scatterometer to provide an independent source of information concerning climate change impacts on the marine cryosphere.		Long term	**OPEN**	5.1
CGMS agencies	C.8	R44.05	CGMS agencies to promote sustainability of satellite frequent high-spatial marginal ice zone measurements for navigation and other near-real time applications.		Long term	**OPEN**	1.1
CGMS agencies	C.8	R44.06	CGMS agencies to promote the implementation of sustained satellite measurements of Arctic Ocean sea ice thickness.		Long term	**OPEN**	1.1
CMA, EUM, NOAA	F.1	R44.07	The GEONETCast operators (CMA, EUMETSAT and NOAA) to actively follow-up the commitment made at the side event at the GEO Mexico City Summit.			**OPEN**	
CGMS members	G.1.3	R44.08	**On SCOPE-NWC:** CGMS members to continue to support SCOPE-Nowcasting and its transition to preoperational phase, in particular to financially support the finalisation of the satellite-based volcanic ash retrieval algorithm intercomparison activitiy (Pilot Project 2) over the next 12-18 months. (Ref. CGMS-44-WMO-WP-15).		30 Dec 2017	**OPEN**	3.2.4

CGMS-44 Plenary Recommendations							
"Actionee"	**AGN item**	**Rec #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
CGMS members	I.1	R44.09	**On training/VLab:** CGMS members are invited to share product information, dissemination information and training resources with the CoEs in Kenya, South Africa, Russian Federation, China, and Oman, and with users, to support VLab training activities in the Indian Ocean region.		Long term	**OPEN**	4.2.1
CGMS members	I.1	R44.10	**On training/VLab:** CGMS operators to make available training resources in all official languages as defined by the satellite operators' charter. Translation of training resources should be considered as a continuous, ongoing effort. Satellite operators without multiple official languages should consider coordinating the translation of their training resources through in-kind contributions by user institutions.		Long term	**OPEN**	4.2.1
CGMS members	I.1	R44.11	**On training/VLab:** CGMS to join efforts with VLab to investigate ways to fund the continuation of the Project "Conceptual Models for the Southern Hemisphere" (CM4SH) and also extend the initiative to prepare case studies related to the new generation of satellites.		Long term	**OPEN**	4.2

L AOB AND CLOSING SESSION

L.1 CGMS nominations and representatives at meetings

In view of the many endorsed nominations at CGMS-43, only the changes to date are highlighted at CGMS-44:

- Dr Dohyeong Kim from KMA became Co-chair of WGII following the departure of Mr Toshiyuki Kurino, JMA (endorsed by CGMS-44 plenary);
- Dr Hiroshi Kunimatsu, JMA became Co-chair of WGIV following the departure of Dr. Jang Jae-Dong, KMA (endorsed by CGMS-44 plenary);
- Dr Ulrich Foelsche and Dr Sean Healy became IROWG Co-chairs following the departure of David Ector and Axel Von Engeln. Anthony Mannucci remains the Rapporteur.

The CGMS Secretariat (EUMETSAT) will continue to represent CGMS at relevant WMO meetings as necessary.

L.2 Any other business

There was no other business discussed.

L.3 Closing

L.3.1 Schedule of future CGMS plenary sessions (2017 and beyond)

KMA will host CGMS-45 on 11-16 June 2017 in South Korea.

The *tentative* plan for CGMS plenary sessions in the 2018-2027 period is:

CGMS plenary #	Year	Location
CGMS-45	2017	South Korea (confirmed)
CGMS-46	2018	India
CGMS-47	2019	Russian Federation
CGMS-48	2020	WMO
CGMS-49	2021	Japan
CGMS-50	2022	China
CGMS-51	2023	North America
CGMS-52	2024	Europe
CGMS-53	2025	South Korea
CGMS-54	2026	India
CGMS-55	2027	Russian Federation

India was kindly invited to explore the possibilities for hosting CGMS-46 in India in 2018.

L.3.2 Handover of CGMS flag

EUMETSAT handed over the CGMS flag to KMA, which will host the 45th CGMS plenary session.

L.3.3 Closing

Concluding the meeting, the Chairman declared that CGMS-44 had been a fruitful meeting recalling that a number of actions had been taken for addressing between now and the next plenary session in a year's time.

He thanked the representatives of all members and observers for their dedication and contributions to the meeting and also those who contributed to organising the meeting prior and during the meeting, namely the Working Group Chairs and rapporteurs, the CGMS Secretariat including the organising committee.

The 44th plenary session of CGMS closed at 17:00 on Friday, 10 June 2016.

PARALLEL WORKING GROUP SESSIONS

WG I REPORT

WGI/ 0 Introduction

During the plenary session of CGMS-43, Mrs. Vanessa Griffin (NOAA), Mr. Sergey Uspensky (ROSHYDROMET) and Mr. Joaquin Gonzalez (EUMETSAT) were appointed as Co-Chairs and Rapporteur of Working Group I, respectively. Unfortunately, Mr. Uspensky could not attend CGMS 44.

WG I included representatives of the satellite operators from CMA, EUMETSAT, GEO Secretariat, ISRO, JMA, KMA, NOAA, ROSCOSMOS, ROSHYDROMET and WMO (see CGMS report for full list of participants).

WGI reviewed and adopted the draft agenda proposed by the CGMS Secretariat prior to the meeting.

WGI/ 1 Review of actions from the Previous Meeting

Actions and recommendations from previous CGMS plenary sessions were discussed and the status following WG I discussions is summarised below.

Status of WG I CGMS-43 actions and recommendations resulting from CGMS-44 discussions:

CGMS-43 WGI actions							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
EUM	WGI/I	A43.01	EUMETSAT to contact IROWG Chair to confirm needs for dedicated frequency protection for GNSS	Action closed during CGMS-43. (Need to improve characteristics of the receivers. Space agencies to enhance the specifications to make manufacturers aware).	22 May 2015	**CLOSED**	-
EUM	WGI/I	A43.02	CGMS Liaison officer to SFCG to report to CGMS WG-I on the discussions and disposition of SFCG on all topics of interest to the different CGMS members. For achieving that a dedicated CGMS Secretariat WG-I working paper will be prepared by EUMETSAT Frequency Manager (in the role of liaison officer from CGMS to SFCG) and will be released to the participants of WG-I before end of the corresponding year. Based on the contents, CGMS members will decide the level of information they will include in their specific reports to CGMS for the corresponding WG-I meeting	CGMS-44 EUM-WP-01 and -02	30 Dec 2015	**CLOSED**	HLPP #1.3

CGMS-43 WGI actions							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	WGI/4.2	A43.03	CGMS members to comment on the work done in the context of the EUMETSAT provided VIIRS Regional Service, and to provide feedback on the proposal to define a standardised compact product format, generalised to cover the advanced imagers of the current and planned polar orbiting satellites.	WGIV webex #2 - encouraged space agencies to contribute with working papers.	CGMS-44	**CLOSED**	HLPP #2.6
NOAA	WGI/4	A43.04	NOAA to assess the need for user registration for Direct Broadcast	CGMS-44 NOAA-WP-xx	CGMS-44	**CLOSED**	HLPP #1.4
CGMS mebers	WGI/5	A43.05	CGMS Members to assess, comment on the info package for the SATCOM Forum prepared by the appointed CGMS representative	The CGMS representative (Sean.burns@eumetsat.int) will attend the SATCOM executive committee meeting on 23 Feb 2016. The first SATCOM forum will be held on 27-29 September alongside the Met tech expo and the WMO TECO in Madrid, Spain. CGMS-44 EUM-WP-04	30 Oct 2015	**CLOSED**	HLPP #1.2.1
WMO	WGI/6	A43.06	WMO to assess the impact of improved data latency from polar orbiters on NWP (WMO Impact Workshops) and other applications	Next WMO workshop will take place in May 2016 (China), hence there might be a verbal/preliminary report only to CGMS-44.	(CGMS-44) New deadline CGMS-45	**OPEN**	HLPP #1.4.5

CGMS-43 WGI Recommendations							
"Actionee"	**AGN item**	**Rec #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
WMO	WGI/3	R43.01	WMO to make the information on all (active, passive and comms) frequency use available and searchable in OSCAR/Space, such that pre-defined reports are easily accessible via external hyperlinks	WGIV webex #2 9 Dec 2015: WMO likely to make a presentation on OSCAR/Space and its evolution at CGMS-44. Main source on frequencies is the SFCG database. To assure there is no duplication of effort, coordination required between WMO and SFCG databases. SFCG data bases: X-band database open, disaster database open, frequency is pwd restricted. Suggested that WMO participates in the next SFCG meeting in Mainz, Germany, 7-15 June 2016, for the coordination of the two (or more?!) databases (following CGMS-44).	CGMS-44	**CLOSED**	HLPP # 1.3
CGMS members	WGI/3	R43.02	Recommends CGMS members to continue bringing all frequency management and coordination issues under the expert forum of SFCG and actions the liaison officer (from CGMS to SFCG) to report to CGMS WG-I all aspects of SFCG discussions considered of relevance to CGMS.		CGMS-44	**CLOSED**	HLPP # 1.3

CGMS-43 WGI Recommendations							
"Actionee"	**AGN item**	**Rec #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
WMO	WGI/6	R43.03	WMO DBNET Coordination Group to report annually to CGMS WG-I on status and progress	Discussed at WGI webex session 21 Oct 2015 (best practice proposal). WMO DBNet presentation to be circulated to WGI (NOAA, EUM, CMA and ROSH in particular - LEO satellites with direct broadcast CGMS-44 WMO-WP-10	CGMS-44	**CLOSED**	HLPP # 1.4.5
CGMS space agencies	WGI/6	R43.04	CGMS agencies to publish details on their SG-ICD with enough lead time to allow RARS/DBNET operators to plan their technical systems in advance (to be included in CGMS best practices)	WGI webex session 21 Oct 2015: To be addressed at CGMS-44. EUM circulate a template in January 2015 to be used in the future webex sessions.	CGMS-44	**CLOSED**	HLPP # 1.4.5
CGMS space agencies	WGI/6	R43.05	CGMS agencies to make use of RH circular polarisation for future Direct Broadcast systems, if technically feasible.	To be addressed at CGMS-44, in particular CMA's plans for FY-3E	CGMS-44	**CLOSED**	HLPP # 1.4.5

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

CGMS-44-EUMETSAT-WP-01, in response to Action Item CGMS-43 A43.02, provides a report from the CGMS/SFCG Liaison Officer on the discussions and dispositions of SFCG from its 35th meeting (28 July - 5 August 2015) on all frequency management issues of mutual interest and concern It also addresses the increasing number of information databases containing the technical information of new systems (freq related), SFCG has maintained three databases of satellite data, namely:

- SFCG Satellite Database (Members Only);
- X-Band Database;
- On-line Searchable Remote Sensing Disaster Database (RSDD).

The databases are maintained through dedicated action items issued at every SFCG meeting to ensure that the information in the databases is up-to-date.

The RSDD contains both, individual satellites and missions composed of many satellites which provide, or are expected to provide, useful data to the emergency management community for a minimum of 2 years. The maintenance of this database is coordinated with WMO and ITU. A hyperlink is provided between the WMO web site, the ITU web site, and the SFCG database.

At SFCG-35, WMO presented document SF35-39/I providing an overview of the WMO online "Observing Systems Capability Analysis and Review Tool" (OSCAR). It is an important tool for WMO's Integrated Global Observing System (WIGOS) framework in recording and undertaking gap analyses between users' observational needs and observing systems current and future capabilities. It contains information that may be useful to the work of SFCG in the form of frequency and or wavelength details for observing instruments and related communication systems. With a live presentation of the tool SFCG was encouraged to explore the use of OSCAR, especially OSCAR/Space with an aim to benefiting from this resource. SFCG was invited to provide feedback to WMO directly to the secretariat or through other groups such as the SG-RFC.

Editor's Note: Extract from the minutes of the WMO SG-RFC meeting 22 – 25 September 2015 on the discussion and findings regarding the OSCAR database:

- The inclusion of the operational frequencies and associated bandwidths for each system shall be sufficient. It is important that the user is provided the capability to search for systems where any part of a system's bandwidth fall within the searched frequency range of interest.
- Point of contact is also essential for getting additional metadata when needed
- If more detailed information was included, it would be necessary to restrict access to the reporting in order to avoid misuse of misrepresentation of the data, especially if currency of data is problematic.
- Entering of data by instrument and site representatives needs to be simple and supported by limited vocabulary. e.g. Current usage could be limited to Operational, Research, Retired, Proposed. Records and should be available as a frequency, but also wavelength.

- Reporting should be possible in wavelength, frequency and band (Use ITU regulation for definition of frequency to bands.) **CGMS-44 EUM-WP-01** v1, 18 December 2015 Page 5 of 9
- WMO SG-RFC noted that OSCAR should provide search and reporting on frequency. The document, which included some use cases and example data entries, was provided to the OSCAR metadata group in October 2015.

Coordination between WMO and SFCG is progressing to make sure the related databases contain consistent information. WMO indicated that there is a version 2 of OSCAR recently launched and informed the group that the OSCAR database contains more than frequency related information. WMO also requested that the different CGMS members review the SFCG databases and OSCAR and report to the different responsible parties any discrepancies identified.

NOAA, requested if there was redundancy between OSCAR and SFCG remote sensing disaster database. SFCG liaison officer recognised that the drivers for the two databases were based on a different set of premises and intended use but agreed in bringing the question back to the SFCG plenary (starting this week). Likewise, standardisation of RFI reporting is encouraged.

CEOS representative indicated the development of the IEEE databases in this area. SFCG liaison commented on the participation of IEEE in the next SFCG meeting and the intention of discussing the scope of the new IEEE database(s) and if it is not covered already by the existing OSCAR and SFCG databases (for avoiding duplication).

CGMS-44 actions - WGI						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
SFCG liaison officer (EUM)	WGI /2	A44.01	SFCG liaison officer to bring to SFCG/WMO the possibility of migrating the SFCG Remote Sensing Disaster Database (RSDD) into OSCAR from the following perspectives: • Identify the level of overlap between the two databases; • Possibility for WMO to introduce, and maintain, the delta elements of the SFCG RSDD into OSCAR; • Level of support of SFCG members to migrate the SFCG RSDD into OSCAR or preference to retain a separate database; • Arguments for retaining a stand-alone SFCG RSDD, if any.	CGMS-45	**OPEN**	1.3
SFCG liaison officer (EUM)	WGI /2	A44.02	SFCG liaison officer to provide a report to WGI on the outcome of SFCG by Q3 2016 (as part of the CGMS-45 WPs)	30 Sep 2016	**OPEN**	1.3.3

WGI thanked the CGMS/SFCG Liaison Officer for the detailed report provided on the frequency related topics of interested to CGMS.

CGMS WGI also wanted to re-iterate to SFCG the appreciation of CGMS on the support provided in protecting and preserving the frequency bands assigned or related to the activities of CGMS.

CGMS-44-EUMETSAT-WP-02 reported on the outcome of WRC-15. The World Radiocommunication Conference 2015 (WRC-15) took place in Geneva on 2 - 27 November 2015. The agenda of WRC-15 contained several items of interest and concern to the operators of meteorological satellite systems. This report summarises the results of WRC-15 on those topics and provides an outlook for WRC-19 on agenda items of relevance to meteorological satellite systems.

As outcome and conclusion it can be summarised as follows:

After a preparatory process of more than 3 years and intense discussions and negotiations at WRC-15, which had its main focus on identifying additional spectrum for terrestrial mobile broadband systems and other commercial services, the outcome of WRC-15 on all items with relation to meteorological satellite systems was finally very positive.

In particular, the positive outcome on the issue of identification of spectrum for mobile broadband can be mentioned, where all bands used for telemetry and telecommand functions of meteorological satellites (2025-2110 and 2200-2290 MHz) and used for dissemination of data to the users (1695-1710 MHz and 3700–4200 MHz) were fully preserved despite the significant global pressure to find spectrum for mobile broadband systems.

Also the band 13.25–13.75 GHz used for active sensing by instruments on many meteorological satellites was preserved from a new uplink allocation for the FSS which would have had a significant interference potential to the active sensors in this band. Only the compatible new downlink FSS allocation was introduced in the band 13.4 – 13.65 GHz.

As well, the postponement of the conclusion regarding an extension of the spectrum for RLANs in the band 5350-5470 MHz to WRC-19 can be considered as a positive result as it shows that the issue of global protection of active sensors under the EESS is now taken seriously. However, the outcome of WRC-19 on this specific topic is still open and all agencies having active sensors (present or future) in this band will need to contribute for achieving a positive solution to this agenda item at WRC-19.

Furthermore, the level of protection of the band 406-406.1 MHz used for the uplink of distress and safety signals in the framework of COSPAS-SARSAT has been improved by requesting administrations to implement a guard band of 100 kHz below and above the 406-406.1 MHz band when making new frequency assignments for the already allocated services in those neighbouring bands.

Finally, the potential impact of the WRC-19 agenda was kept to the minimum possible, but still with 10 items of relevance to meteorological satellite systems. Unfortunately, also the identification of spectrum for mobile broadband is not over with the end of WRC-15. More than 31 GHz of spectrum in bands

above 24 GHz will be studied for a possible introduction of future mobile broadband systems, including the EESS band 25.5–27 GHz and a number of bands adjacent to passive sensing bands above 30 GHz. Fortunately, the frequency bands 7750-7900 MHz (used by non-geostationary meteorological satellite systems) and 8025-8400 MHz (used by numerous EESS systems) were excluded from this consideration at the very last negotiations at WRC- 15.

NOAA stressed the need to closely monitoring the band around DCS uplink as it is increasingly attracting attention for other applications and services. SFGC liaison officer agreed with this view and recalled that WRC-19 contains an Agenda 1.7 already on this point. In addition, NOAA brought to the attention of WG-I the ongoing initiative inside the US to open for restricted applications the band 5350-5470 noting that this is a band used by operational SCATs and therefore the potential of interference to occur. SFGC liaison officer reminded WGI that WRC15 was inconclusive on mitigating actions for allowing sharing and it is identified as an agenda point for WRC-19 noting that there the outcome is likely to be the same as for WRC15 (no identified mitigating actions) with the increased risk of individual countries authorizing the sharing of the band and the potential for interference and operational degradation. WG-I agreed that this should be reported to plenary (linked to action from **CGMS-44-NOAA-WP-11**). WG-I also thanked EUMETSAT for the detailed report provided on the frequency related topics of interested to CGMS.

CGMS-44-NOAA-WP-11 on the NOAA Use of Frequency Bands: Current and Future.

This NOAA working paper provided the description of current and future NOAA satellite networks, radio frequencies used/to be used by these networks, and spectrum recently repurposed or in consideration for repurposing (with the note that official authorizations and frequency assignments are on file with the International Telecommunications Union (ITU) and the U.S. National Telecommunications and Information Administration (NTIA)). The following are summarised to be the related bands:

- 1695-1710 MHz: Recently repurposed for sharing with AWS-3 (Advanced Wireless Services -3) licensees for use as LTE uplink band.
- 1675-1680 MHz: In consideration for repurposing as LTE downlink band and continued shared use as METSAT downlink band. Consideration due to commercial party petition to US FCC in Proceeding RM-11681. It is open for public comments till 21 June 2016.
- 400.15-420 and 150.05-174 MHz: WRC-19 agenda item 1.7, resolution 659, assessment of the suitability of using existing SOS allocations below 1 GHz to accommodate the TT&C requirements for NGSO satellites with short duration missions.
- 5150-5925 MHz: WRC-19 agenda item 1.16, to consider issues related to wireless access systems, including radio local area networks. May include additional spectrum allocations to the mobile service.
- 24.5-27.5 GHz: WRC-19 agenda item 1.13, to consider identification of frequency bands for the future development of IMT, including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution 238.

- Above 24 GHz: FCC Notice of Proposed Rulemaking, "Use of Spectrum Bands Above 24 GHz for Mobile Radio Services, GN Docket No. 14-177": Solicitation of comments on mobile use in the following bands – 27.5-28.35 GHz, 37-38.6 GHz, 38.6-40 GHz, 64-71 GHz.

As well as other spectrum related issues/aspects brought to the attention of WGI in the **CGMS-44-NOAA WP-11**:

- Small Sat: Extremely large growth in small sat deployments are being projected and observed. Spectrum use is increasing and placing pressure on established systems for coordination in UHF, S, and X bands as well as other space allocated bands.
- Passive Bands: Various international mobile telecommunications (IMT) groups are examining spectrum above 6 GHz as part of 5G growth. Several bands in consideration are adjacent to critical passive bands used for remote sensing.

Degradation in ability to use passive bands is consequently a growing concern.

An action was proposed within the WP for CGMS Members to report on proposed regulatory changes to repurpose spectrum currently in use or planned for use by meteorological satellites (both active and passive spectrum bands) to CGMS WGI.

Throughout the discussion in WGI it was considered to propose this action to be reported to the SFCG where the expertise at frequency management and regulatory resides along with the need for the SFCG liaison officer then to report updates (relevant) to CGMS WGI as a permanent section of his yearly SFCG outcome report to WGI.

In addition, WMO indicated that the Space Weather Task Team, in its meeting on 5th June 2016, invited WGI to consider whether there were any frequency related aspects on the applications of space weather that should additionally be considered in the scope of WGI. The discussion with the WGI concluded that ITU working party 7C is having these aspects already under their agenda and therefore WPs can be submitted for the next WP 7C meeting in October 16.

CGMS-44 actions - WGI						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
SFCG liaison officer (EUM)	WGI /2	A44.03	SFCG liaison officer to propose to SFCG that SFCG members will report yearly to SFCG on national regulatory changes/issue in their countries (e.g. to repurpose spectrum currently in use or planned for use by meteorological satellites (both active and passive spectrum bands)).	CGMS-45	**OPEN**	1.3.3
SFCG liaison officer (EUM)	WGI /2	A44.04	SFCG liaison officer to report to CGMS WGI as a permanent section of his yearly SFCG outcome report to WGI updates (relevant) on proposed regulatory changes to	CGMS-45	**OPEN**	1.3.3

CGMS-44 actions - WGI						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
			repurpose spectrum currently in use or planned for use by meteorological satellites (both active and passive spectrum bands).			
CGMS space agencies	WGI /2	A44.05	CGMS agencies to provide prior to CGMS 45 a report on the space weather activities (including spacecraft and instruments) of relevance on Freq Management and freq protection topics	Feb 2017	**OPEN**	1.3

CGMS-44 recommendations - WGI						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	WGI /2	R44.01	CGMS agencies to inform their Freq Managers on the space weather activities to ensure the necessary protection and coordination at Freq management level	Long term	**OPEN**	1.3

In addition, WGI agreed that, following the discussions on the different WPs on frequency protection and coordination topics, it should review the HLPP entries and prioritise the list of WRC-19 agenda items for regular review by WGI. The list therefore is organised as follows (HLPP entries and WRC19 considered as priorities for WG-I):

- WRC-19 Agenda Items 1.2, 1.3 and 1.7 (DCS)
- WRC-19 Agenda Items 1.13 Mobile broadband 26 GHz and
- Protection of passive sensing bands from adjacent bands under various agenda items
- WRC-19 Agenda Item 1.16 (Radio LANs in 5 GHz)

GEO representative indicated the support of GEO to these actions and recommendation and proposed that CGMS bring a proposal to GEO plenary (as dedicated intervention by CGMS Sec for example) to help in propagating the information within the GEO members.

With all WPs on frequency topics presented and discussed CGMS WG-I recalled that CGMS nominated the Frequency Manager of EUMETSAT as liaison officer between CGMS and SFCG. CGMS WG-I noted with appreciation the work done so far by the liaison officer.

WGI/ 3 Optimisation/harmonization of direct readout dissemination (CGMS DB global spec)

WGI/ 3.1 Current systems

CGMS-44-EUM-WP-30 summarised the outcome of the different inter-sessional meetings held between CGMS 43 and 44 in the aspects of formatting data for users recalling that the CGMS LRIT/HRIT Global Specification was established some years ago, and before the current generation of satellites was

operational. It defines the global aspects of an architectural specification for standardised data dissemination from geostationary satellites towards LRIT/HRIT user stations. The role of this global specification has been re-evaluated in the context of the adoption by data providers of widely established standards for data dissemination and formats.

This document is based upon inter-sessional discussions of this re-evaluation. It proposes formats for product delivery to users for future missions and instruments.

In summary, it proposes to simplify the specification of formats used for product deliver to users for future missions and instruments and proposes that the HRIT/LRIT Global Specification is frozen in its current state. It is also proposed that products are delivered to users using one of:

- the HRIT/LRIT global specification as it is presently defined,
- BUFR or GRIB as defined by WMO, or
- netCDF and HDF as specified by their respective governing bodies.

It is noted that for data assimilation into numerical models, there is still a requirement from international weather agencies for BUFR and GRIB formats.

When data volume is critical for dissemination, instrument dependant formats may be developed, such as JMA's HSD format for Himawari-8/9 data. Software tools supporting the conversion of these data to one or more of the standard data formats should be made available to users.

In the event of a different format being used, specific details of the data format need to be given in the Mission Specific Implementation. A link to the Mission Specific Implementation documents should be made available and referenced in this Section.

It is further proposed that the use of existing standard compression and encryption schemes is to be preferred. Only if a different mechanism is adopted should this be reflected in the Mission Specific Implementation. The same consideration should also be applied to the Transport, Network, Data Link and Physical Layers

NOAA confirmed that, at the request from NWS (in support to WMO decisions), some of the GOES-R products will also be provided in BUFR. WMO thanked the report provided and recalled that BUFR formatting is a decision of the 191 WMO members to allow data circulation through GTS. WMO also requested that any future new format to be additionally adopted should be based, as much as possible, on open and widely used standards.

CGMS WG-I thanked EUMETSAT for the detailed analysis and proposal and agreed in further progressing on the aspects of formatting data for users and global specs via dedicated inter-sessional meetings (covered at the end of this report).

WGI/ 3.2 Transition to new direct readout systems (GOES-R, JPSS, FY-3, EPS-SG, ...)

CGMS-44-NOAA-WP-03 presented the NOAA plans for transitioning from the current GOES operational satellites to GOES-R (anticipated for launch on 13 October 2016) with improved data products for hemispheric retransmission:

- "GOES Rebroadcast" (GRB)
- Faster full disk images: 5 minutes (Mode 4) - 15 minutes (Mode 3)
- Full set of Level 1b data: 6 GOES-R instruments (16 ABI channels)

But requiring new antenna, receiver hardware, and processing system to handle the new data volumes.

It also summarised the Open Source Software developed by SSEC/CIMSS in CSPP processing package for GOES. The GRB software package contains:

- Software capable of processing CCSDS packets and outputting NetCDF-4 files containing ABI Level 1b, GLM Level 2, and all space weather instrument L1b data.
- Software to generate GeoTiff and .png images for each ABI band.

In addition, NOAA provided web links (i.e. http://www.goes-r.gov/users/grb.html) to the GRB resources for users.

CGMS-44-NOAA-WP-03 also presented the transitioning plan for HRIT/EMWIN from GOES NOP to GOES-R providing improved data products for hemispheric retransmission with at least 3 channels of GOES-NOP and/or GOES-R imagery along with warnings, watches and forecast products along with a copy of the GOES-DCS observations:

- Faster full disk images: between 15 and 30 minutes
- Warnings, Watches, Tropical Storm Information
- Copy of GOES Data Collection System (GOES DCS)

Also requiring new antenna and receiver hardware

CGMS-44-NOAA-WP-04 presented to the CGMS WG-I an overview of the transition to new Direct Readout systems for JPSS. Additionally, JPSS shall provide the DR community with software, documentation, and periodic updates to enable them to produce data products from JPSS, using their own hardware to receive the JPSS HRD broadcasts. The JPSS Ground Project also supports the University of Wisconsin Cooperative Institute for Meteorological Satellite Studies (CIMSS) and the NASA GSFC Direct Readout Laboratory (DRL integrators) to provide enhanced services via user-friendly software packages. The JPSS-1 launch is scheduled for spring 2017.

The paper informed WGI that JPSS Level 1 Requirements Document (JPSS L1RD) provides the fundamental requirements and scope of JPSS Field Terminal and confirmed that JPSS will not perform encryption of the direct broadcast.

CGMS WGI thanked NOAA for the detailed presentations on the plans for transitioning to GOES-R and JPSS.

WGI/ 4 Impact of the move of FY-3E to an early morning orbit

There were no papers presented under this agenda item.

WGI/ 5 Data collection systems

CGMS-44 actions - WGI						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMSSEC	WGI /5	A44.06	CGMS Secretariat to distribute to CGMS members (PoC for SATCOM Forum at least) the questionnaire on IDCS (included in EUM-WP-06) end June 2016 EUMETSAT (Sean Burns) circulated an e-mail to NOAA, ISRO, CMA JMA and ROSHYDROMET on 7 June 2016	30-Jun-16	**OPEN**	1.2.1
CGMS space agencies	WGI /5	A44.07	CGMS agencies to reply (end of August) to the questionnaire and to confirm attendees to the splinter meeting on IDCS during the next SATCOM Forum (Sept 2016 in Madrid)	31-Aug-16	**OPEN**	1.2.1

CGMS WGI thanked EUMETSAT for the dedicated report and update of information regarding the status of preparation for the first SATCOM Forum as well as the dedicated reports on EUMESAT DCS system and IDCS and the proposal for consolidation of the IDCS plans in the midterm future.

CGMS-44-JMA-WP-01 reported on the present status of the Japan Meteorological Agency (JMA)'s Data Collection System (DCS) and related future plans, highlighting a recent increase in the number of Data Collection Platform (DCP) stations at which DCS regional channels are used for better tidal/tsunami monitoring. Based on the increased importance of disaster reduction/mitigation activities and the recognition of significant role of the DCS, JMA has positively accepted such international requests by the effective use of allocated channels to Himawari-DCS. In the last couple of years, it is significant for responding to those requests from existing stations in the Indian Ocean and Western Pacific including transition of the use of DCS from Meteosat-7 to Himawari 8. JMA will start discussion about the rearrangement of channels, which are previously allocated to the stations which have not been in used over the long term.

WGI expressed its appreciation for the dedicated report provided by JMA.

CGMS-44-NOAA-WP-02 provided an update on the status of Argos and DCS.

Argos:

- with currently more than 21,000 active Argos Platforms being tracked by nearly 2,000 programs/users in over 100 countries
- Future use of 399.9-400.05 MHz is anticipated for non-environmental applications, beginning with the next Argos launches by ISRO & NOAA (~2018-20), with the first Argos-4 instruments

DCS:

- There are currently more than 27,000 active GOES DCS Platforms being tracked by nearly 800 programs/users in the footprint of GOES. More than 6M observations are delivered into the global observing system.
- DCS Automated Data Distribution System (DADDS) has 1800 registered users.
- New version 2 transmitters have been deployed, with over 7000 currently in the system
- High Data Rate transition is officially complete, with only 30 of the 27,000 platforms reporting at 100 bps. These are expected to be removed soon

and also reported on the frequency matters that continue to be a concern for the use of the ADCS and DCS (already addressed during the agenda topics under frequency related matters) like:

- Possible auction of 1675-1695 MHz band
- Petition by Ligato Networks (formerly LightSquared) for possession of 1675-1680 MHz in return for vacating GPS adjacent frequencies
- Launch of large numbers of small satellites into 401-403 MHz

WGI thanked NOAA for the detailed and comprehensive report covering all aspects of the DCS and A-DCS under NOAA responsibility.

CGMS-44-ROSHYDROMET-WP-02 addressed the current status and technical specifications of Russian data collection system, and related future plans. The DCS is established to provide collection and distribution of meteorological data from the remote areas and to support natural hazards warning system. Roshydromet has developed and deployed the national DCS based on Electro-L series GMS with backup option via Luch series communication satellites. The Roshydromet DCS system is based on the national technical equipment. The messages transmitted from DCPs to Electro-L N1/N2 and Luch-5B are relayed to the European (Moscow region), Siberian (Novosibirsk) and Far Eastern (Khabarovsk) regional centers of SRC Planeta.

The number of DCPs is now 568 DCPs allocated (April, 2016). DCPs are distributed all over the whole territory of Russia, including the remote areas and northern regions with extremely low elevation angles (about 3 degrees) (Figure 4 of **CGMS-44-ROSH-WP-02**).

The national DCS currently has a reliability of 99.8 % based on the number of messages successfully received. International DCS channels on Electro-L series satellites could be provided to WMO members

for data transmission from DCPs (e.g. in support of IODC) and the corresponding messages will be made available on the GTS, WGI thanked the proposal made by Roshydromet.

WG-I thanked Roscosmos/Roshydromet for the detailed report and suggested they keep CGMS informed of their continued success confirming also the plans to make DCS related data available in the GTS.

WMO reminded that only 10% of the overall surface observations are reported outside the meteorological services generating them. Increasing the availability of these data to other CGMS members (e.g. via GTS) is considered an improvement in the current situation.

CGMS-44 recommendations - WGI						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	WGI/ 5	R44.02	All CGMS DCS operators to consider making all DCP messages available in the GTS.	Long term	**OPEN**	1.2

WGI/ 6 Best practices for operators support to LEO local processing (Direct Readout/DBNet/ RARS)

WGI/6.1 The Direct Broadcast Network (DBNet) for Near Real-time Relay of Low-Earth Orbit Data

CGMS-44-WMO-WP-10 presented the Guide to the Direct Broadcast Network (DBNet) For Near Real-Time Relay of Low Earth Orbit Satellite Data.

It reminded WGI that the Regional ATOVS Retransmission Service (RARS), which allows fast delivery of ATOVS satellite sounding data acquired by receiving stations around the globe, has been a very successful collaborative undertaking of the World Meteorological Organization and its members, which has improved the availability and impact of satellite sounding data on short-term regional and global Numerical Weather Prediction.

With the advent of advanced sounding instruments like METOP/IASI and SNPP/CrIS, and with successful launches of the Chinese FY-3 series of Low Earth Orbit satellites, the scope of the undertaking has now been substantially extended and the initiative has been renamed as DBNet (Direct Broadcast Network for Near Real-Time Relay of Low Earth Orbit Satellite Data). DBNet will successively provide fast delivery services for µ-wave sounding, hyperspectral IR sounding, scatterometry, VIS/IR imaging and µ-wave imaging.

The DBNet Coordination Group has been established in 2015, composed of DBNet regional or subregional network coordinators, organizations providing software for L0/L1 processing, technical experts designated by organizations contributing to the global DBNet network, planning or considering to contribute to it, the WMO Secretariat and CGMS members. Over the last year experts from the DBNet Coordination Group has drafted “A Guide to DBNet” to record the DBNet specifications, define standards, best practices and coordination mechanisms. The guide is a reference for DBNet providers, users and for CGMS operators.

The draft Guide was discussed at APSDEU-NAEDEX (now GODEX-NWP), ITSC-20, WMO IPETSUP-2 and is herewith presented to CGMS-44 before submission to WMO CBS-16 (November 2016) for formal endorsement as a WIS guide.

WGI thanked WMO for the contents of the guide and confirmed that comments, if any, to the proposed draft guide will be submitted by the different agencies directly to WMO.

In addition, CGMS Sec recalled that the Space Weather Task Team has identified the need of getting access in quasi near real time to Radio Occultation data to lower the latency for derived ionospheric information for space weather. For achieving the related timeliness requirements, the contribution of the regional RARS/DBNet systems might be fundamental.

CGMS-44 actions - WGI						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	WGI /6.1	A44.08	CGMS agencies with satellites with DB and RO sensors to assess the technical feasibility of a RARS/DBNet RO service in support of the Space Weather community.	CGMS-45	**OPEN**	1.4

The following recommendation from WGI and CGMS-43 was maintained:

CGMS-43 recommendation maintained at CGMS-44 - WGI						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
WMO	WGI /6	R43.03	WMO DBNET Coordination Group to report annually to CGMS WG-I on status and progress Discussed at WGI webex session 21 Oct 2015 (best practice proposal). WMO DBNet presentation to be circulated to WGI (NOAA, EUM, CMA and ROSH in particular - LEO satellites with direct broadcast) CGMS-44 WMO-WP-10	(CGMS-44) New deadline CGMS-45	**OPEN**	1.4.4

WGI/6.2 Proposal for CGMS agency best practices in support to local and regional processing of LEO direct broadcast data

CGMS-44-EUMETSAT-WP-07 presented a proposal for the CGMS Agency Best Practices in support to Local and Regional Processing of LEO Direct Broadcast data. Manufacturers and operators of Direct Broadcast reception stations for the polar orbiting satellites critically depend on support from the satellite operating CGMS agencies. This includes the provision of technical specification of the Direct Broadcast, TLE orbit information, software packages for product processing, auxiliary operational data for instrument processing as well as operational coordination.

The paper has been written in coordination with NOAA, NWP SAF and WMO.

WG-I thanked EUMETSAT, NOAA, NWP SAF and WMO for the efforts put in preparing the draft Best Practices and the comprehensive list of BPs proposed to WG-I.

WGI endorsed (with the following amendments) the proposed Best Practices (BP-1, -2, -3, -4, -5, -6) noting the need to make sure this is clearly understood to be only relevant to operational missions with Direct Broadcast.

Agreed amendments:

Best Practice BP.04: Each LEO satellite operator should therefore ensure that:

….

Source code should be made available to comply with the security standards of the satellite operators.

Docs and S/W releases shall be made available at least in English

…

WGI confirmed recommending to CGMS Plenary the adoption as CGMS Agency Best Practices in support to Local and Regional Processing of LEO Direct Broadcast data (BP 1-6 as amended above).

WGI considered the potential of the additional topics proposed for consideration as Best Practice (Section 8 of **CGMS-44-EUM-WP-07**) and decided this to be a topic to be progressed by dedicated Inter-sessional meetings before CGMS-45 focusing on:

- CGMS operators to consolidate and detail the solution for making TLE orbit data accessible to Direct Broadcast reception station operators in a standardised manner.
- CGMS operators to consider if the installation of processing S/W packages can be standardised and made more user friendly, considering tools such as Docker (www.docker.com).
- CGMS operators to consider the advantages of using RHCP/LHCP as a means to minimise interference against the simplicity/affordability of the Direct Broadcast stations and to formulate a CGMS Agency Best Practice on use of Circular Polarisation for Direct Broadcast.
- CGMS to consider the advantages of orbital phasing between satellites as a measure for reducing pass scheduling conflicts and maximising the amount of instrument observation collected.

WGI/ 7 Review and updating of the HLPP

The WG considered the status of implementation of the High-Level Priority Plan (HLPP).

CGMS-44-CGMS-WP-25 presented the status of implementation of HLPP and identified the progress needed on the DCS related HLPP items and the close correlation with the discussions on the preparation for the SATCOM Forum and the actions agreed to prepare for it.

Similarly, **CGMS-44-CGMS-WP-26** presented the proposal for the revised HLPP and WGI recommended to the CGMS Plenary the proposal for an update in the High-Level Priority Plan.

WGI/ 8 Any other business

WG-I discussed nominations for CGMS-44 and agreed in proposing to plenary the following:

Co-chairs:

Vanessa Griffin (NOAA)
Sergey Uspensky (Roshydromet)

Rapporteur:

Joaquin Gonzalez Picazo (EUMETSAT)

CGMS-SFCG Liaison Officer:

Markus Dreis (EUMETSAT)

CGMS Representative at SATCOM Forum:

Sean Burns (EUMETSAT)

WGI/ 9 Inter-sessional activities/meetings in 2016-2017 [CGMS-44-CGMS-45]

WGI addressed the need of achieving progress in the HLPP and preparing for CGMS-45 through dedicated Inter-Sessional meetings and it was agreed to group them by themes as follows:

I. WGI-IS-DB. Theme is Direct Broadcast Best Practices and it is proposed to organise them quarterly with the following dates:

- Sept-16 (7 September, 13:00 CET)
- Dec-16 (7 December, 13:00 CET)
- March-17 (8 March, 13:00 CET)

II. WGI-IS-DCS. Theme is DCS and SATCOM Forum Direct and it is proposed to organise them quarterly with the following dates:

- Sept-16 (during the SATCOM Forum)
- Dec-16 (14 December, 13:00 CET)
- March-17 (15 March, 13:00 CET)

III. WGI-IS-Formats. Theme is Data formats and Formatting standards and it is proposed to organise them every 4 months with the following dates:

- October-16 (5 October, 13:00 CET)
- February-17 (15 February, 13:00 CET)

Frequency related topics, if necessary to be addressed in specific Inter-Sessional meeting will be organised around the DB and DCS related ones.

WGI/ 10 Review of actions, conclusions, preparation of WG report for plenary

The following actions and recommendations were raised following CGMS-44 WGI discussions:

CGMS-44 WGI actions resulting from previous plenary sessions						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
WMO	WGI/6	A43.06	WMO to assess the impact of improved data latency from polar orbiters on NWP (WMO Impact Workshops) and other applications *Next WMO workshop will take place in May 2016 (China), hence there might be a verbal/preliminary report only to CGMS-44.*	(CGMS-44) New deadline CGMS-45	**OPEN**	1.1.2

CGMS-44 WGI actions						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
SFCG liaison officer (EUM)	WGI/2	A44.01	SFCG liaison officer to bring to SFCG/WMO the possibility of migrating the SFCG Remote Sensing Disaster Database (RSDD) into OSCAR from the following perspectives: • Identify the level of overlap between the two databases; • Possibility for WMO to introduce, and maintain, the delta elements of the SFCG RSDD into OSCAR; • Level of support of SFCG members to migrate the SFCG RSDD into OSCAR or preference to retain a separate database; • Arguments for retaining a stand-alone SFCG RSDD, if any.	CGMS-45	**OPEN**	1.3
SFCG liaison officer (EUM)	WGI/2	A44.02	SFCG liaison officer to provide a report to WGI on the outcome of SFCG by Q3 2016 (as part of the CGMS-45 WPs)	30 Sep 2016	**OPEN**	1.3.3
SFCG liaison officer (EUM)	WGI/2	A44.03	SFCG liaison officer to propose to SFCG that SFCG members will report yearly to SFCG on national regulatory changes/issue in their countries (e.g. to repurpose spectrum currently in use or planned for use by meteorological	CGMS-45	**OPEN**	1.3.3

CGMS-44 WGI actions						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
			satellites (both active and passive spectrum bands)).			
SFCG liaison officer (EUM)	WGI/2	A44.04	SFCG liaison officer to report to CGMS WGI as a permanent section of his yearly SFCG outcome report to WGI updates (relevant) on proposed regulatory changes to repurpose spectrum currently in use or planned for use by meteorological satellites (both active and passive spectrum bands).	CGMS-45	**OPEN**	1.3.3
CGMS space agencies	WGI/2	A44.05	CGMS agencies to provide prior to CGMS 45 a report on the space weather activities (including spacecraft and instruments) of relevance on Freq Management and freq protection topics	Feb 2017	**OPEN**	1.3
CGMSSEC	WGI/5	A44.06	CGMS Secretariat to distribute to CGMS members (PoC for SATCOM Forum at least) the questionnaire on IDCS (included in EUM-WP-06) end June 2016 *EUMETSAT (Sean Burns) circulated an e-mail to NOAA, ISRO, CMA JMA and ROSHYDROMET on 7 June 2016*	30-Jun-16	**OPEN**	1.2.1
CGMS space agencies	WGI/5	A44.07	CGMS agencies to reply (end of August) to the questionnaire and to confirm attendees to the splinter meeting on IDCS during the next SATCOM Forum (Sept 2016 in Madrid)	31-Aug-16	**OPEN**	1.2.1
CGMS space agencies	WGI/6.1	A44.08	CGMS agencies with satellites with DB and RO occultation sensors to assess the technical feasibility of a RARS/DBNet RO occultation service in support of the Space Weather community.	CGMS-45	**OPEN**	1.4

CGMS-44 WGI actions						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	WGI	A44.09	From CGMS-44 WGII: CGMS operators and WMO to work with GODEX-NWP to explore options for optimal data exchange of advanced data from next-gen GEOs	CGMS-45	**OPEN**	

CGMS-44 WGI Recommendations						
"Actionee"	**AGN item**	**Rec #**	**Description**	**Deadline**	**Status**	**HLPP ref**
WMO	WGI/6	R43.03	WMO DBNET Coordination Group to report annually to CGMS WG-I on status and progress *Discussed at WGI webex session 21 Oct 2015 (best practice proposal). WMO DBNet presentation to be circulated to WGI (NOAA, EUM, CMA and ROSH in particular - LEO satellites with direct broadcast)* *CGMS-44 WMO-WP-10*	(CGMS-44) New deadline CGMS-45	**OPEN**	1.4.4
CGMS space agencies	WGI/2	R44.01	CGMS agencies to inform their Freq Managers on the space weather activities to ensure the necessary protection and coordination at Freq management level	Long term	**OPEN**	1.3
CGMS space agencies	WGI/5	R44.02	All CGMS DCS operators to consider making all DCP messages available in the GTS.	Long term	**OPEN**	1.2
CGMS space agencies	WGI	R44.03	From CGMS-44 WGII: Agencies to explore the possibilities to develop suitable processing packages to support a direct broadcast implementation of RO processing, within the DBNet to improve timeliness for space weather applications		**OPEN**	5.2

WG II REPORT

CGMS-44 Working Group II: Satellite Data and Products

The Working Group held its session as part of the CGMS-44 meeting on Monday, 6 June 2016 from 09:00-18:00 and Tuesday, 7 June 2016 from 09:00-16:00. As group co-chairs served Stephan Bojinski (WMO) and Toshiyuki Kurino (JMA). Rapporteurs were Kenneth Holmlund (EUMETSAT) and Mitch Goldberg (NOAA).

WGII/0 Objectives

S. Bojinski welcomed participants, thanked agencies for following the revised agenda of WG II. He explained the new agenda format and commended agencies for following the guidance provided in preparing WPs. Reduction of WP (to 37, compared to 64 and 50 in previous years) is expected to lead to more discussion time.

A tour-de-table followed.

WGII/ 1 Nomination of candidates for the co-chair of WGII

Given his imminent retirement from JMA, T. Kurino proposed a 2-yearly rotation scheme for one of the co-chairs of WG II, with KMA starting after the end of CGMS-44. Subsequently, co-chairs from CMA, JMA, ROSHYDROMET, and IMD will follow. This was endorsed by the Group. WMO to provide the second co-chair, and NOAA and EUMETSAT to provide the rapporteurs. KMA was invited to nominated a candidate; KMA suggested Dohyeong Kim as co-chair, which the Group accepted by acclamation to be proposed to Plenary.

WGII/2 Review of actions and recommendations from previous meetings

The table below provides a summary of the outcome of the review of CGMS-43 actions and recommendations resulting from CGMS-44 WGII discussions.

WGII actions open from previous plenary sessions (at CGMS-43)							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
JMA	WGII/ 8	41.26	JMA to establish an environment to implement multiple algorithms to retrieve quantitative ash cloud parameters from operational satellites. This will serve as a test bed for the intercomparison of retrievals on an operational basis in the framework of SCOPE-Nowcasting. JMA is invited to perform an intercomparison based on historical data and report on this to CGMS-42.	JMA introduced software based on EUMETSAT approach to the testbed, and started validation activities in collaboration with Tokyo VAAC. The NOAA algorithm will also be included. CGMS-42 JMA-WP-07/ppt: VA retrieval intercomparison activity started and workshop to be organised in the framework of WMO SCOPE-Nowcasting at SSEC, Madison, on 29 June-2 July 2015 (a preparatory meeting was held on 20-23 October 2014). The JMA testbed will be useful once results from VA retrieval algorithm intercomparison are available. New deadline following discussions at CGMS-42. CGMS-43-JMA-WP-05 (Section 2) New deadline following CGMS-43 WGII discussions. WMO to report on VA Intercomparison at CGMS-44 Nov 2015: JMA has received NOAA/NESDIS VA Algorithm, and is	(CGMS-41/-42/-43) **New deadline : CGMS-44**	**CLOSED**	HLPP #3.2.2

WGII actions open from previous plenary sessions (at CGMS-43)							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
				now tuning it for JMA NWP and SST data. Until March 2016, which means end of FY of JMA, VA testbed will be started with EUMETSAT and NOAA/NESDIS algorithms for some typical cases. JMA will report to CGMS-44. *CGMS-44: Reported on in CGMS-44-JMA-WP-04 and discussed in WGII.*			

WGII actions open from previous plenary sessions (at CGMS-43)							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
CMA, EUM, JMA, NASA, NOAA, WMO	WGII/3	A42.02	The new task team on calibration events logging to identify a common set of parameters to be monitored as part of the calibration events logging and sensor performance monitoring.	1st step: Template for calibration event landing pages presented at GDAWG in March 2015. New version of OSCAR/Space allows for identification of individual instruments and thus linking to calibration event test pages, test mode of new version of OSCAR/Space continuing until 1 month before CGMS-43; 2nd step: Draft a white paper to agree on common terminology to be used on landing pages, foreseen in 2015/2016 for presentation to CGMS-44. CGMS-43 EUM-WP-10 CGMS-43-JMA-WP-03 (Section 2.4) NOAA: Work ongoing as a part of the GSICS work plan. Next steps are gathering information and agreeing on common terminology. New deadline following CGMS-43 WGII discussions. Nov 2015: Co-chair R Roebling, drafting white paper to be circulated within ICWG by end 2015 in preparation of CGMS-44. To be included in the GSICS paper	(CGMS-43) **New deadline: CGMS-45**	**OPEN**	HLPP# 3.1

WGII actions open from previous plenary sessions (at CGMS-43)							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
				following the new WGII agenda (possibly EUMETSAT's paper - TBD). CGMS-44: Delays incurred - new deadline proposed.			
KMA	WGII/4	A42.03	KMA is invited to present a paper of different sources of soil moisture retrieval on their NWP forecasts	CGMS-43-KMA-WP-04: Test use of Metop-B/ASCAT on their global NWP system New deadline following CGMS-44 WGII discussions - KMA NWP centre have not yet concluded analyses.	(CGMS-43) **New deadline : CGMS-45**	**OPEN**	-

CGMS-43 WGII actions							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	WGII/3	A43.01	Calibration events logging task team to prepare a white paper outlining the set of parameters, the nomenclature, and the standards to be used for reporting on instrument calibration across space agencies.	Nov '2015: Part of/related to CGMS-42 action 42.02. *CGMS-44: Work in progress, new deadline proposed.*	(CGMS-44) New deadline CGMS-45	**OPEN**	HLPP # 3.1
GSICS	WGII/3	A43.02	GSICS to document and implement its approach to manage changes in reference instruments.	Nov 2015: GSICS research working group to look into this. A specific working paper will be prepared in response to this action. CGMS-44-GSICS-WP-02	CGMS-44	**CLOSED**	HLPP # 3.1
ROSH	WGII/3	A43.03	Roshydromet to present an update on Meteor-M N2 data access, processing packages, and results of an intercomparison of the IKFS-2 with other hyperspectral sounders (IASI, AIRS, CrIS), to CGMS-44.	Nov 2015: ECMWF has looked at microwave instruments which were reported on at the recent ITSC. ITWG and CGMS welcomes the sharing of data by ROSH, and further collaboration is expected. EUM has received Meteor-M N2 sample data of the MTVZA-GY Imaging/Sounding Microwave Radiometer (29 channels) and dissemination through EUMETCast is expected in Q1 2016 pending EUM Council approval in Dec 2015. mtg. ROSH will deliver a L1 pre-processing software to EUMETSAT early 2016. *CGMS-44: No progress reported at CGMS-44 - proposed new deadline.*	(CGMS-44) New deadline CGMS-45	**OPEN**	HLPP # 1.4

CGMS-43 WGII actions							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	WGII/ 3	A43.0 4	CGMS operators to provide a report on their approach on cal/val, including information on dedicated campaigns and permanent sites, and potential support to cal/val infrastructure, in order to maximize benefits of satellite missions.	Nov 2015: Feedback is expected as part of the general agency report or in a dedicated WP for the proposed new WGII agenda item 4 (CGMS-44 WG II item 8). 3 agencies reponded (JMA; NOAA NASA-WP-02); keep open as action for CGMS-45 for remaining agencies.	(CGMS-44) New deadline CGMS-45	**OPEN**	-
CGMS space agencies	WGII/ 3	A43.0 5	CGMS operators to report on their specific plans for reprocessing and associated user requirements (such information would be useful for the ISWGs).	Item 8 - NASA-WP-02), and NOAA responded (WP-09) keep open as action for CGMS-45 for remaining agencies.	(CGMS-44) New deadline CGMS-45	**OPEN**	HLPP # 3.3, 3.6
GSICS	WGII/ 3	A43.0 6	GSICS to establish the requirements for absolute lunar calibration and prepare a white paper describing the tentative way to meet those requirements in case they go beyond those lunar calibration capabilities.	Nov '2015: EUMETSAT is working on this and will prepare a WP for CGMS-44. Adressed in CGMS-44 GSICS-WP-01	CGMS-44	**CLOSED**	HLPP # 3.1

CGMS-43 WGII actions							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
IPWG	WGII/5	A43.07	The session recommended a stronger application focus of IPWG (e.g, NWP, hydrology, agriculture), and asked IPWG to organize a IPWG-NWP workshop in 2015 or 2016.	Outgoing IPWG co-chairs Wang and Aonashi were part of the organizing committee for the 3rd Joing JCSDA-ECMWF Workshop on Assimilating Satellite Observations of Clouds and Precipitation into NWP Models (which was suggested as an action at IPWG-7). The meeting will take place Dec 1-3, 2015 at NOAA in College Park, Maryland USA. Additionally, the current IPWG co-chairs Roca and Tufa are considering an IPWG sponsored Africa focused user workshop for sometime in 2016 (somewhere in Africa, TBD). Nov 2015: sPending upcoming workshop. IPWG requested to report on the outcome of the Dec '15 workshop at next WG II intersessional meeting (Feb '16). Current IPWG co-chairs looking into possibility of a user applications workshop in Africa CGMS-44 IPWG-WP-01	CGMS-44	**CLOSED**	HLPP #3.2
NASA, JAXA	WGII/5	A43.08	NASA and JAXA to provide information about availability of GPM data on near real-time data distribution channels (GTS,	Nov 2015: Action closed following discussions during the review of the draft CGMS-43 meeting report.	30-Jul-15	**CLOSED**	HLPP # 2.3

CGMS-43 WGII actions							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
			DVB-S).				
IWWG	WGII/6	A43.09	IWWG to define the experiments for the next intercomparison at the next IWW workshop in 2016. [For co-chairs at next IWWS]	Addressed in CGMS-44 IWWG-WP-01	CGMS-44	**CLOSED**	HLPP # 3.2.1
CGMS RO space agencies	WGII/7	A43.10	CGMS members that operate RO instruments to explore RO capabilities to support space weather applications and report on their support to space weather application to CGMS-44.	Nov 2015: EUM is exploring this since it is relevant for the EPS Second Generation activities and it is currently discussed by EUM within the framework of the next reference period for the EUMETSAT Satellite Application Facilities (SAFs) 2017-2022. A EUM WP is expected for CGMS-44 . Two agencies responded: NOAA-WP-10, NASA-WP-05, both in WGII/8	CGMS-44	**CLOSED**	HLPP # 5.2
WMO	WGII/8	A43.11	WMO to provide a report on the volcanic ash intercomparison within SCOPE-Nowcasting at CGMS-44.	Nov 2015: A workshop took place in June 2015 and WMO expect to report on this at CGMS-44. Addressed in CGMS-44 WMO-WP-15	CGMS-44	**CLOSED**	HLPP # 3.2.2
NASA	WGII/10	A43.12	NASA to report on polar-based RGB composite viewing angle corrections to CGMS-44.	Nov 2015: NASA is preparing a manuscript for publication to be available early 2016 and results will be presented to CGMS-44.	CGMS-44	**CLOSED**	-

CGMS-43 WGII actions							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
				CGMS-44 NASA-WP-03			
CGMS members	WGII/10	A43.13	(Action transferred from WGIV) CGMS members that have not yet done so to nominate focal points that would work with the WMO Secretariat in populating the WMO Product Access Guide.	• ESA: Jean-Louis Fellous jfellous@noos.fr • EUM: Sally Wannop, Sally.Wannop@eumetsat.int • JMA: Daisaku Uesawa, satellite@ml.kishou.go.jp • NOAA: Tony Mostek, anthony.mostek@noaa.gov • ROSH: Dr. Sergey Uspensky, Head of Department, SRC "PLANETA" uspenskys@planet.iitp.ru • CMA: Xu Zhe, xuzhe@cma.gov.cn NASA: Richard.Eckman, richard.s.eckman@nasa.gov KMA: Chu-Yong CHUNG (Mr), Senior Researcher NMSC/KMA, cychung@kma.go.kr J. WOO (Ms) superjwoo@korea.kr Nov 2015: Closed on the occasion of WGII inter-sessional meeting 25 Nov 2015.	30-Jul-15	**CLOSED**	-

CGMS-43 WGII actions							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
CGMS members	WGII/ 10	A43.14	CGMS members to provide responses to the questionnaire on use of satellite data for SRNWP from experts (in their organization) and provide a compilation of responses to CGMS-44.	Nov 2015: Feedback to EUMETSAT will be required by CGMS Members by end Feb 2016 to enable compilation and summary/analysis of the responses to CGMS-44. CGMSSEC to remind/inform CGMS members accordingly. *18 Feb 2016: NASA feedback by e-mail to CGMSSEC.April 2016: JMA feedback.* Summarized in CGMS-44 EUM-WP-10	CGMS-44	**CLOSED**	HLPP # 1.4.5
NASA	WGII/ 10	A43.15	NASA to report on progress in testing the use of surface pressure retrievals from OCO-2 by NWP centres, with a view to report on results at the WMO Impact workshop in May 2016 (and to CGMS-44).	Nov 2015: CGMS-44 NASA-WP-04	May 2016 and CGMS-44	**CLOSED**	HLPP #

CGMS-43 WGII Recommendations							
Actionee	**AGN item**	**Rec #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
SCOPE-CM members	WGII/ 3	R43.01	SCOPE-CM to invite contributions to its next call for proposals, with particular regard to the sea ice, snow cover and land surface temperature communities, and others currently not represented.	SEP in Sep 2016 to decide on approach regarding next call for proposals	End 2015	OPEN	HLPP # 5.3

CGMS-43 WGII Recommendations							
Actionee	**AGN item**	**Rec #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
CGMS members	WGII/3	R43.02	CGMS members to consider removing spectral gaps from future hyperspectral sounders to support GSICS intercalibration of IR imagers.			OPEN	HLPP # 3.1
CGMS members	WGII/6	R43.03	CGMS members to consider include a water vapour channel and a CO2 channel to polar-orbiting imagers, to maintain accuracy and coverage of polar winds and cloud height retrievals achieved by MODIS.			OPEN	HLPP # 1.1.6
CGMS space agencies	WGII/3	R43.04	CGMS operators to consider displaying instrument performance in a way similar to the ICVS. NOAA could share the software among CGMS operators.	See CGMS-43 R43.05	CGMS-44	**CLOSED**	3.1
NOAA	WGII/3	R43.05	NOAA to organize a workshop for CGMS operators on ICVS software design and development, and implementation.	Workshop organized by NOAA on 8-12 August 2016 in College Park MD, USA; with side event on ICVS.	CGMS-44	**CLOSED**	3.1
GSICS members	WGII/3	R43.06	Members to strengthen their engagement in GSICS and in particular in its GDWG.	CGMS-44 WGII: Superseded by action on GDWG, GSICS EP (CGMS-44 A44.01)		**CLOSED**	3.1
CGMS space agencies	WGII/10	R43.07	CGMS agencies to make available a non real-time cache of satellite level 1 data over the previous 2-3 months, similar to the NOAA CLASS system.	CGMS-44 IMD: At present there are no such plans (until a new data centre is installed).	CGMS-44	OPEN	HLPP # 2.
ROSH	WGII/4 and WGII/8	R43.08	Roshydromet is invited to attend the next sessions of the ICWG, ITWG and the other Int'l Science Working Groups.	Nov 2015: 2 participants from ROSH attended latest ITSC (plus 2 persons from St Petersburg). Recommendation closed following WG II IS#1 on 25 Nov 2015.	CGMS-44	CLOSED	-

CGMS-43 WGII Recommendations							
Actionee	**AGN item**	**Rec #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies (EUM, CMA, ROSH, ISRO)	WGII/ 10	R43.09	CGMS operators (EUM, CMA, ROSH, ISRO) to ensure continuity of geostationary coverage and data access over the Indian Ocean area.	CGMS-44 EUM-WP-11 and -14.	CGMS-44	**CLOSED**	1.1.6
ISRO	WGII/ 5	R43.10	ISRO is encouraged to implementing a multi-sensor precipitation estimate based on SAPHIR and INSAT-3D		CGMS-45	OPEN	HLPP # 3
ICWG, IWWG	WGII/ 6 and WGII/ 8	R43.11	ICWG and IWWG to liaise as appropriate on the provision of further information characterising the AMV derivation for enhanced QC and error characterisation.	CGMS-44 WGII: ICWG and IWWG collaborate on the next intercomparison of their products	CGMS-45	**CLOSED**	HLPP # 3.5.2
IWWG, IPET-OSDE	WGII/ 6	R43.12	IWWG to liaise with the application focal points in the WMO RRR process (on IPET-OSDE) to provide feedback on the winds-related observation requirements in the RRR database.		CGMS-44	OPEN	HLPP # 1.1
CGMS space agencies	WGII/ 7	R43.13	CGMS Members to approach Operators of GNSS systems to request them to provide a minimum level of information on the signal structure and interface control (ICD) in a timely manner to enable the use of these for future RO missions.	CGMS-44 NOAA: The requested information on signal structure and ICD for GPS are available at the following website: http://www.gps.gov/technical/icwg/	CGMS-44	OPEN	HLPP # 1.1.3

CGMS-43 WGII Recommendations							
Actionee	**AGN item**	**Rec #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
ICWG	WGII/ 8	R43.14	At its next meeting (May 2016), ICWG should put focus on investigating data from the new-generations instruments on Himawari-8 and if available GOES-R for the retrieval of cloud parameters.	Nov 2015: The ICWG has established a Topical Group titled "Assessment of level-2 Passive Imager Cloud Parameter Retrievals" that is lead by Yong-Sang Choi (Ewha Womans University, Korea). Among other, this Topical Group will assess, for 19 August 2015, the differences in Cloud Parameter Retrievals over the Asian region, using retrievals from Himawari, METEOSAT-7, and some other Asian instruments as well (not yet decided). Addressed at the ICWG workshop in May 2016	CGMS-44	**CLOSED**	HLPP # 3.2.4

Action from plenary CGMS-43 on WGII:

ROSH	E.1	A43.10	ROSHYDROMET to nominate a point of contact for GSICS related matters	To be treated in WGII. CGMS-44: ROSHYDROMET has confirmed their poc for GSICS	CGMS-44	**CLOSED**	HLPP # 3.1

WGII/ 3 Terms of Reference of WGII

In this WP, Terms of Reference for the Working Group II were proposed. CGMS Working Group II on "Satellite Data and Products, meets at the annual CGMS plenary sessions usually before the plenary session. The WG II meeting has a membership consisting of specialists on the delegations of participating CGMS members. WG II serves as important link between the annual CGMS meetings and the CGMS International Science Working Groups which provide regular reports and feedback to CGMS. These are currently:

- International TOVS working group (ITWG)
- International Radio Occultation Working Group (IROWG)
- International Precipitation Working Group (IPWG)
- International Satellite Winds Working Group (IWWG)
- International Clouds Working Group (ICWG)

WGII is also the primary interface between CGMS and other international initiatives (such as GSICS and SCOPE) and user communities, such as those organized in the areas of oceanography and marine meteorology, and atmospheric composition. In order to clearly define the interface between WGII and the above International Science Working Groups and initiatives, the need to define the Terms of Reference for WGII has emerged.

CGMS-44 RECOMMENDATIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS plenary	WGII /3	R44.01	CGMS to endorse the proposed Terms of Reference for WGII including the following updates: - A 2-yearly rotation scheme for one of its co-chairs, with KMA starting after the end of CGMS-44 [Dohyeong Kim (KMA) to become the WG II co-chair, replacing Toshiyuki Kurino (JMA)]. Subsequently, co-chairs from CMA, JMA, ROSHYDROMET and IMD will follow. - WMO to provide the second co-chair - NOAA and EUMETSAT to provide the rapporteurs. *Endorsed by CGMS-44 plenary.*	9 June 2016	**CLOSED**	

WGII/ 4 Working papers of international groups/initiatives

CGMS-44-EUMETSAT-WP-08: Status report and recommendations from SCOPE-CM

This document reports on the status of the WMO Sustained, Co-Ordinated Processing of Environmental Satellite Data for Climate Monitoring (SCOPE-CM) activity.

SCOPE-CM is a coordination mechanism that enables the continuous and sustained provision of high-quality datasets for climate monitoring and services. The foundation of SCOPE-CM is an international network of relevant space agencies and other organizations (including GSICS) to develop, extend and preserve capabilities and skills required for the provision of Climate Data Records (CDR). SCOPE-CM is a major enabler of coordinated space agency contributions to the second pillar of the climate architecture (climate record creation and preservation). The establishment of SCOPE-CM has been structured into different phases and is now entering the 4th year of its phase-2 activity. The objectives of phase 2 are to establish a systematic approach to increase the sustainability (maturity) of CDRs and to establish the structures necessary for the routine, operational generation of CDRs. These are being achieved by conducting nine projects that generate both Fundamental and Thematic CDRs. All projects show significant progress resulting from the SCOPE-CM coordination and may result in efficiencies realized by the individual participating agencies. There are also a number of interactions across the projects realizing additional benefits among them.

The next meeting of the SCOPE-CM Executive Panel is planned for September 2016, during the EUMETSAT Meteorological Satellite Conference in Darmstadt, Germany. During this meeting the progress of each project concerning scientific and operational maturity of CDRs will be reviewed and the future evolution of SCOPE-CM will be addressed.

The Group applauded progress with SCOPE-CM, noting that phase 2 is in its fourth year, SCOPE-CM should review its IP, Terms of Reference, and prepare for the next phase including a possible call for proposals.

There are two SCOPE-CM projects ("Inter-calibration of passive imager observations from time-series of geo stationary satellites" (IOGEO and "Land surface albedo using GEO") that benefit from imagery from the geostationary ring, using hyperspectral and heritage sounders (e.g., HIRS) as a reference in the IR, and other GSICS techniques for intercalibration in the visible range.

CGMS-44 ACTIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
SCOPE-CM Executive Panel	WGII /4	A44.01	SCOPE-CM should review its IP, Terms of Reference, and prepare for the next phase including a possible call for proposals.	CGMS-45	**OPEN**	5.1

CGMS-44 RECOMMENDATIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
GSICS	WGII /4	R44.02	GSICS to report to SCOPE-CM projects on its plan to intercalibrate the geostationary ring using hyperspectral IR sounders as transfer function. Response needed for SCOPE-CM EP	15 Sep 2016	**OPEN**	3.3.2

CGMS-44 RECOMMENDATIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
GSICS	WGII /4	R44.03	GSICS member agencies to identify roles and responsibilities and funding needs to support the geostationary ring GSICS corrections including the processing of retrospective data going back to NASA EOS AIRS (2002).	CGMS-45	**OPEN**	3.1.1

CGMS-44-ICWG-WP-01: Summary Report of ICWG Activities **-** This working paper presents a summary report of ICWG activities in the past year and recommendations to CGMS from its topical groups. In response to A42.02, ICWG co-chairs drafted white paper to define common cloud parameters to be discussed at ICWG-1. These parameters include: cloud mask (CM), cloud top temperature (CTT), cloud emissivity, effective radius (Re), and cloud optical thickness (COT). These cloud parameter retrievals are increasingly used for near-term (now-casting), short-term; weather forecasting), medium-term (regional monitoring), and decadal (climate monitoring), as well for potential improvements in the cloud and convection parameterizations adopted in weather and climate models. Six topical groups TGs were convened in the ICWG-1 meeting. In response to R43.14, a new TG titled "Assessment of level-2 Passive Imager Cloud Parameter Retrievals" was established, to assess the differences in cloud parameter retrievals over the Asian region. CMA, EUMETSAT, JMA, KMA, NASA-GSFC, NASA-LaRC and NOAA participated in this intercomparison study, applying existing retrieval algorithms to Himawari-8 measurements on 19 August 2015 (as the golden day for intercomparison). In addition, the reports and recommendations from other TGs (Severe Weather, Cloud Models for Remote Sensing, Cloud Climate Data Record, and Uncertainties) are included in this paper. ICWG interactions with other CGMS groups are discussed. Cloud information very important to the work of other ISWGs, especially for severe weather analysis, height assignments of winds, improved cloud detection in hyperspectral sounding

Andrew Heidinger will replace Bryan Baum as a new co-chair of ICGW.

Currently, ICWG helps to facilitate to collect the data (e.g., level-3 climate data record in TG Climate Product, level-2 retrieval assessment in TG Intercomparison), but many teams carried out the efforts on a volunteer basis. Lack of funding limited the scope and prohibited a definitive analysis of the new HIMAWARI-8 data set.

CGMS-44 ACTIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	WGII /4	A44.02	CGMS members to submit data to the ICWG intercomparison: full-disk data at 10 minute temporal resolution, 2 km spatial resolution in the native AHI projection is preferred. The data should be submitted by 1 September 2016.	1 Sept 2016	**OPEN**	3.2.3

CGMS-44 RECOMMENDATIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS members	WGII /4	R44.05	CGMS members to budget a baseline funding for the cloud intercomparison study, given its importance and impacts on global cloud products.	1 Nov 2016	**OPEN**	3.2.3
IROWG, IPWG, IWWG, ITWG	WGII /4	R44.06	To enhance coordination, ISWGs to discuss with ICWG co-chairs key items for collaboration.	1 Sep 2016	**OPEN**	
CGMS R&D agencies	WGII /4	R44.07	Research agencies to consider continuing space-borne lidar for ice/liquid water since they have proven very valuable to validate retrievals from passive sensors		**OPEN**	1.1.3
CGMS space agencies	WGII /4	R44.08	All operators of next-generation GEO imagers to consider the implementation of routine full-disc 10-min (or better) scanning for nowcasting	CGMS-45 (for update)	**OPEN**	3.2.4

CGMS-44-IPWG-WP-01: Status Report from the International Precipitation Working Group - Working paper **CGMS-44-IPWG-WP-01** was written by the two co-chairs of the International Precipitation Working Group (IPWG), Dr. Remy Roca and Dr. Tufa Dinku. The report highlights the recent achievements of IPWG during the past year, including progress on actions from IPWG-7 (November 2014, Tsukuba, Japan) and provides an outlook for the planned activities over the next two years. The report also addresses recommendations and actions from CGMS-43, as well as any IPWG items from the HLPP. Finally, this working paper will describe the status and plans for IPWG-8 which will be held concurrently with the 5th International Workshop on Space-based Snowfall Measurement, IWSSM-5, which is a specialty workshop under the auspices of IPWG (October 2016, Bologna, Italy).

R. Ferraro reviewed actions to be considered by CGMS from IPWG-7. Linkages to ICWG are active with ITWG, and there are emerging opportunities within ICWG.

Regarding a precipitation validation site in India, rain gauge or radar data (24h accumulated), or merged data, would be required. IMD to participate in validation activities of IPWG (the Rapporteur should liaise with AK Sharma).

CGMS-44 ACTIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
IPWG, IMD	WGII /4	A44.03	IPWG Rapporteur to liaise with IMD (AK Sharma) on the development of precipitation validation sites over India.	CGMS-45	**OPEN**	3.3.1

The Group stressed the need for ensuring continuity of geostationary coverage and data access over the current METEOSAT-7 coverage area.

IPWG expressed concern over the health of the operational constellation of conically-scanning MW platforms, given the uncertainty around GCOM-W follow-on, SSMIS F20 and DMSP follow-on, and GMI-2.

CGMS-44 RECOMMENDATIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	WGII /4	R44.09	CGMS Members to continue an operational constellation of conically-scanning microwave platforms to guarantee sustained support for the current level of capability. *CGMS-44 WGII - For reference: WG III should discuss this and come up with results at CGMS-45.*		**OPEN**	1.1.6
CGMS members	WGII /4	R44.10	At the request of IPWG, CGMS to improve cross-agency coordination of satellite assets into A-train-like convoys of instruments with sensitivities to distinct aspects of precipitation processes (e.g., CloudSat, EarthCare, GPM, etc.). *CGMS-44 WGII - For reference: WG III should discuss this and come up with results at CGMS-45.*		**OPEN**	

IPWG identified the need for better agency coordination for better monitoring of distinct aspects of precipitation processes, such as cloud phase, microphysics, and liquid/ice water path.

CGMS-44-IROWG-WP-01: Report of IROWG activities **-** This report summarizes IROWG activities since CGMS-43. The full group has not met since CGMS-43, but several developments and activities are noteworthy and described here. Of particular concern is the continued uncertainty in funding for the polar component of the COSMIC-2 mission. This uncertainty will probably lead to a launch date that slips past the original 2018 timeframe. The highest priority of IROWG remains: Ensure that both equatorial and polar components of COSMIC-2 are fully funded and launched; this is required for Numerical Weather Prediction, Climate, and Space Weather (emphasized also at CGMS-43).

The IROWG has elected two new co-chairs: Dr. Sean Healy of ECMWF and Prof. Ulrich Foelsche of University of Graz.

Progress is reported on HLPP task 1.1.4 “Investigate through IROWG how a coordinated and optimised system could be set up for radio occultation observations for atmosphere and ionosphere monitoring.” An “Ionosphere-Atmosphere Coordination Workshop” held in October of 2014 at Boulder, Colorado,

with more than 50 attendees, moved this task forward. A follow on workshop is planned, coincident with the IROWG-5 workshop in September 2016, to be held at Seggau Castle near Graz, Austria.

Recommendation (4) from IROWG-4 was to convene an "interagency workshop to define cooperation options for implementing the next steps towards a LEO-LEO research and demonstration mission." Such a workshop was held within the ESA Living Planet Symposium in Prague, Czech Republic from 9-13 May 2016 (http://lps16.esa.int/).

The session discussed some aspects of the WP:

- NOAA clarified that funding for COSMIC-2B or an alternative was in the US President's budget
- RO is subject of the current Request for Information that NOAA issued as part of their Commercial Weather Data Pilot
- Results from the recent 6th WMO NWP impact workshop show that support to 20 000 daily globally distributed (in horizontal and vertical) radio occultations is highly desirable
- NWP has high interest in RO profiles extending to lower levels of the troposphere
- Impact is also dependent on the real or assumed performance level of the RO receivers
- An optimized constellation of operational (backbone) and R&D-based RO satellites is required

The Group recognized the value of 20 000 occultations per day, recognizing the highest impact from good coverage of RO in horizontal and vertical, and particularly extending into the lower troposphere.

The Group recognized the impact of polar RO to be provided through COSMIC-2B or a similar programme.

The Group recommended experiments to confirm the impact of RO measurements, especially down to troposphere above the boundary layer, and the related cost.

The Group recommended a strong dialogue between IROWG and NOAA regarding the Commercial Weather Data Pilot.

CGMS-44 RECOMMENDATIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
NOAA	WGII /4	R44.11	NOAA to ensure that both, equatorial and polar components of COSMIC-2 are fully funded and launched.	CGMS-45 (for update)	**OPEN**	1.1.4
CGMS members	WGII /4	R44.12	CGMS agencies to target at least 20,000 occultations/day, at appropriate global distribution, to be made available to the operational and research communities, based on recent impact studies (NWP, climate and space weather)		**OPEN**	1.1.4
CGMS members	WGII /4	R44.13	CGMS agencies to ensure that the RO receiver design includes sufficient software/firmware flexibility to allow		**OPEN**	1.1.4

CGMS-44 RECOMMENDATIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
			changes in the signal processing including processing of new GNSS signals/constellations, including ionospheric measurements			

CGMS-44-ITWG-WP-01: International TOVS Working Group Report -The twentieth International TOVS Study Conference, ITSC-20, was hosted by the Space Sciences and Engineering Centre (SSEC) of the University of Wisconsin, Madison, USA, in Lake Geneva, Wisconsin, between 25 October and 3 November 2015. 160 participants attended the Conference from 35 organizations, providing a wide range of scientific contributions. Seventeen countries and three international organizations were represented: Australia, Brazil, Canada, China, Czech Republic, France, Germany, India, Japan, Norway, Poland, Russia, South Korea, Spain, Switzerland, United Kingdom, United States, ECMWF, EUMETSAT, and the WMO. The Working Groups had very productive discussions and it was again encouraging to see a large number of new, younger scientists participating (40% of participants were first-timers).

The meeting benefitted from presentations about new operational satellite data from new global operational data providers, in particular China and Russia. Evaluations of data from instruments on FY-3C as well as Meteor-M N2 show promising results, with operational data usage of the FY-3C data being considered at several NWP centres. Efforts for international data provision and collaborative evaluation that builds on the international expertise were warmly welcomed and supported by the group. Within the context of a diversification of providers of polar-orbiting satellite sounding data, there is an on-going requirement for international coordination and optimisation of these activities. The group again expressed a strong requirement for both infrared and microwave sounders in at least three complementing orbital planes.

All recommendations are provided in the report available on the CGMS agenda website and the CIMSS ITWG website. The following are the critical recommendations:

1. To CGMS and other satellite agencies: the constellation of at least three polar orbits (early morning, morning, and afternoon), each with full sounding capabilities (IR and MW), should be maintained. The overpass times of operational satellites with sounding capability (IR and MW) should be coordinated between agencies to maximize their value. Noting the excellent news regarding the move of FY-3E to the early morning orbit, the group recommends to consider how the early morning orbit will be covered post FY-3E or the DMSP satellites.
   When an agency has two or more satellites in the same nominal orbit (e.g. 2pm) they should be staggered by phase (as Metop). With multiple satellites from different agencies it is recommended to stagger them in ECT.

CGMS-44 RECOMMENDATIONS – WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	WGII /4	R44.14	CGMS agencies to maintain the constellation of at least three polar orbits (early morning, morning, and afternoon), each with full sounding capabilities (IR and MW). The overpass times of operational satellites with sounding capability (IR and MW) should be coordinated between agencies to maximize their value. *CGMS-44 WGII - For reference: WG III should discuss this and come up with results at CGMS-45.*		**OPEN**	1.1.1

2. To US DoD: noting that the launch of F20 is currently uncertain, ITWG strongly recommends that SSMI/S on F20 should be flown, preferably in an early morning orbit, in support of maintaining a robust global satellite observing system.
3. To space agencies: the SSMIS 60 GHz upper stratospheric and mesospheric sounding capability should be continued, noting the trend for NWP models to extend higher in the stratosphere and lower mesosphere and the development of thermosphere modelling for Space Weather applications.
4. To WMO/CGMS/other space agencies: future programs should include the provision of high temporal frequency MW humidity sounding radiances (alongside cloud and precipitation sensitive observations).

CGMS-44 RECOMMENDATIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	WGII /4	R44.15	Future satellite programmes should include the provision of high temporal frequency MW humidity sounding radiances (alongside cloud and precipitation sensitive observations). *CGMS-44 WGII - For reference: WG III should discuss this and come up with results at CGMS-45.*		**OPEN**	1.1.1

5. To space agencies: ITWG recommends to develop, test, and implement an SI Traceable radiometric standard in space as soon as feasible.
6. To space agencies and NWP centres: noting the urgent need for realistic trade-off studies regarding the field-of-view size, instrument noise and spectral resolution of future infrared sounders, and the continued lack of a coherent analysis of these aspects, ITWG recommends dedicated studies to investigate these trade-offs in an NWP context. Such studies should also

consider the effects of clouds and other geophysical uncertainties. Space agencies should consider commissioning such studies to optimize the usefulness of future infrared sounders.

7. To satellite agencies: If PC compression is used to disseminate hyperspectral IR observations; a conservative approach should be taken in order to mitigate information loss (e.g., by retaining as many principal components as possible).
8. To satellite agencies in dialogue with users: devise and document a mutually acceptable update strategy for the principal component basis when a principal component scores product is disseminated to users. Users are encouraged to monitor reconstructed radiances in parallel to operations so that the PC update strategy can be properly tested.
9. To Roshydromet: Roshydromet are encouraged to release a direct broadcast processing package for the Meteor-M N2 series, including level 1 processing for the MTVZA-GY microwave imager.

CGMS-44 RECOMMENDATIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
ROSH	WGII /4	R44.16	Roshydromet to develop and release a direct broadcast processing package for the Meteor-M N2 series, including level 1 processing for the MTVZA-GY microwave imager.	CGMS-45 (for update)	**OPEN**	1.1.5

CGMS-44-IWWG-WP-01: Status report from the International Winds Working Group **-** The biennial International Winds Workshops are the forums used by the International Winds Working Group (IWWG) for co-operation in the operational and research community, and have strongly contributed to the improvement in quality of the derived wind fields.

The paper summarizes the ongoing activities and relevant discussion items of IWWG in advance of IWW13. CGMS 44 WGII is invited to discuss and provide advice on the topics addressed in this working paper and any related IWWG topics submitted to CGMS 44 by other CGMS operators.

This paper has been written by the co-chairs, Jaime Daniels (NOAA) and Mary Forsythe(Met Office).

IWWG are preparing the 3rd AMV intercomparison study. A key goal of these AMV inter-comparison studies is to learn and understand similarities and differences in AMVs produced at different operational centres, and ultimately, to improve their quality and consistency. For the 3rd AMV inter-comparison study it is proposed to use an image triplet from JMA's Himawari-8/AHI, the first of the next generation series of geostationary imagers with higher spatial resolution, higher temporal resolution, and more spectral channels.

The new spectral channels will bear new information on cloud microphysics the higher temporal resolution will be useful to better understand the characteristics of the tracked cloud.

IWWG will select image triplets from H-8/AHI golden day (19 August 2015) data that the ICWG intends to use for its next cloud inter-comparison study. Cloud products well studied and characterized by ICWG members. Two typhoons with a multitude of different cloud regimes occurred on the Golden Day.

CALIPSO data/products, collocated to H-8/AHI data, are available for validation.

New AMV derivation schemes applied to the next generation of instruments are making use of pixel-based cloud products from new and improved cloud retrieval schemes

New cloud retrieval schemes can provide:

- Improved cloud heights
- cloud microphysical properties
- Estimates of retrieval error

This brings opportunities to improve QC and assignment of observation errors to AMVs

The next IWWG workshop will be hosted by NRL in Monterey, CA, USA, on 27 June – 1 July 2016.

IWWG expressed concern about the level of resources required to perform the intercomparison.

IWWG identified the need to fill scatterometer wind data gaps and improve coverage through coordination – for example there are no scatterometry missions planned for the 0300/1500 orbit, but many planned for the 0600 orbit.

CGMS-44 RECOMMENDATIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	WGII /4	R44.17	CGMS agencies to identify the resources required to support the 3rd intercomparison of satellite-derived winds. (Reference is made to recommendation for ICWG).	1 Nov 2016	**OPEN**	3.2.1
CGMS space agencies	WGII /4	R44.18	CGMS satellite operators to consider coordination of orbits for scatterometer instruments and to provide open and timely access to data in order to maximise independent coverage and benefits to nowcasting and NWP from assimilation of scatterometer wind data. *CGMS-44 WGII - For reference: WG III should discuss this and come up with results at CGMS-45.*		**OPEN**	1.1.6

Regis Borde and Steve Wanzong are taking over as co-chairs of IWWG.

A number of new and future satellite missions that are/will contribute to the generation of atmospheric wind observations (JMA's Himawari-8 (2014), ESA's Aeolus Wind LIDAR (2016), CMA's FY-2G (2014), NOAA's GOESR ABI (2016), EUMETSAT's MSG-4 (June 2015), China's HY-2B (2015), JMA's Himawari-9 (2016),

ISRO's SCATSAT (2015), ISRO's Oceansat-3 scatterometer (2016), EUMETSAT's Metop-C (2018), EUMETSAT's MTG-I (2018), KMA's Kompsat (2018), and China's HY-2C (2019).)

CGMS-44 RECOMMENDATIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	WGII /4	R44.19	CGMS agencies to explore possibilites to derive winds from new upcoming satellites and opportunities.	CGMS-45 (for update)	**OPEN**	

CGMS-44-KMA-WP-04: KMA's GSICS and SCOPE-CM Activities - This document reports on KMA's GSICS and SCOPE-CM activities.

- COMS IR inter-calibration system with LEOs (IASI-A, IASI-B, AIRS and CrIS) from April 2011 to December 2015
- COMS VI calibration using Moon with ROLO model from GSICS (GIRO) from April 2011 to December 2015 with four Earth targets (Ocean, desert, water cloud and Deep Convective Cloud)
- COMS Water Vapor channel anomaly correction using Spectral Response Function shift
- To contribute to SCOPE-CM activity by applying GSICS correction to Sea Surface Temperature (SST) and Clear Sky Radiance (CSR)

CGMS commended KMA for their contribution to GSICS and SCOPE-CM.

CGMS-44-WMO-WP-13: GSICS Report **-** GSICS reported on its recent activities including key activities for the near term. Significant progress has been made in terms of implementing products and services. The first four GSICS products have now become operational and another four are in preoperational status and further 27 in demonstration phase. Additional products are under early development (prototypes). The progress is also reflected in improved web-presence (GSICSWiki.net) also on the respective Agency sites. The JMA site was specifically lauded.

On the research side good progress is being made in developing new algorithms and products. Specifically the importance of lunar calibration in order to achieve high accuracy SI-traceable calibration required for climate monitoring and other applications was discussed. This item is also discussed in a dedicated paper to WGII and the recommendations are reflected there. Also the process for promoting product status to pre-operational and operational as well as the promotion of products from instrument families that are already in pre-operational or operational phase was discussed. Also this is reflected in a specific WG II paper on transfer of reference instruments and the associated recommendations are there. An important aspect raised was on outreach. GSICS has recently performed a user survey, with feedback that is now integrated into the normal work of the various working groups. Furthermore GSICS

is reaching out to user communities and a proposal to engage in a dedicated project with ISCCP through SCOPE-CM was discussed. Also the participation in SCOPE-CM IOGEO was endorsed. There were also convincing results presented on the utility to provide improved SST estimates using GSICS corrections. Part of the outreach has also been the provision of a clear structured set of documents. These include a GSICS overview, Vision, Terms of Reference and a Guide to products or services. The Vision and ToR are already finalised and the others are under development.

A specific concern on the workload of GSICS Data Management Working Group (GDWG) was raised and discussed. The current activities go beyond the originally foreseen scope of the GDWG as these activities, originally foreseen for the GSICS Coordination Centre, can only be performed by the GDWG members, In addition to a revision of the Terms of Reference and the associated resourcing an active engagement in the GDWG is required, This does not only benefit GSICS itself, but was also seen as beneficial for the Agency activities that will require attention in any case. This was for example demonstrated by the use of GSICS by JMA to identify calibration issues during HIMAWARI-8 commissioning and by KMA to readjust SRFs for Kompsat-2.

In summary:

- First GSICS products are declared operational
- Very good user feedback in particular from satellite operators
- Members to strengthen their engagement in GSICS and in particular in GDWG
- All CGMS Members invited to join GSICS
- Members to analyze their requirements for calibration
- Support inclusion of calibration references in the Vision 2040
- Support GSICS engagement with CEOS/WGCV in the Architecture for Climate Monitoring from Space
- Support GSICS efforts for outreach: to further document GSICS and communicate to ensure visibility and full benefit

In conclusion the following Actions and recommendations were placed:

CGMS-44 ACTIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
GSICS members, GSICS EP	WGII /4	A44.04	GSICS to review the GDWG Terms of Reference and associated indicated levels of effort of the members	CGMS-45	**OPEN**	3.1.1
GRWG	WGII /4	A44.05	GRWG to dicuss with ISCCP (SCOPE-CM Project 9) a detailed project proposal for the use of GSICS methodologies to produce a GSICS-compliant ISCCP dataset for evaluation	CGMS-45	**OPEN**	5.1
CMA	WGII /6	A44.07	CMA to provide more information (documentation, availability details, URL) about the 3D-ADVP tool , for inclusion in	1 Oct 2016	**OPEN**	

CGMS-44 ACTIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
			the WMO webpage on Visualization Tools to CGMSSEC.			

By adding a few small parameters as ancillary data – all users of geostationary imager data can apply an adjustment which will provide bias consistency of all geo imagers enabling improved applications.

CGMS-44 RECOMMENDATIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	WGII /4	R44.04	CGMS agencies should employ the GSICS Correction as part of their operational procedures	**OPEN**	3.1.1	**OPEN**

Finally the WGII endorsed the other activities proposed by GSICS as presented in **CGMS-44-WMO-WP-13**.

The Group expressed its thanks to Jerome Lafeuille (WMO) for his many years of support to GSICS.

CGMS-44-WMO-WP-15: SCOPE-Nowcasting Progress Report **-** The four pilot projects of the Sustained Coordinated Processing of Environmental Satellite Data for Nowcasting (SCOPE-Nowcasting) initiative have made steady progress since their inception in 2013:

Pilot Project 1: Basic satellite imagery for Severe Weather Forecasting Demonstration Project (SWFDP) focus regions in Asia and South-West Pacific, including RGBs from Himawari-8, with key focus on consistent and agreed products across satellites from multiple operators

Pilot Project 2: Intercomparison of satellite-based volcanic ash retrieval algorithms, to inform operationalisation of such algorithms for aviation services and ICAO .

The primary conclusions of the intercomparison activity can be summarized as follows:

- The primary sensitivity of passive satellite measurements is to the presence or, lack thereof, of detectable volcanic ash.
- Only a couple of automated ash detection methods were able to approach the skill of a human analyst.
- The lower detection limit of the most sensitive algorithm/sensor combinations was between 0.01 and 0.1 g/m2.
- Given the uncertainty of aircraft based estimates of mass loading, the uncertainty in satellite based assessments is greater than a factor of 2 and most satellite derived mass loadings differed from aircraft assessments by a factor of 4 or more (see Figure). The uncertainty in concentration will be greater.
- Complicated backgrounds are common and further increase uncertainty in all satellite-derived products.

- High spectral resolution measurements while currently spatially and temporally limited, help to mitigate some issues with complicated scenes.

In general, for reasons of scientific understanding and utility of its results for operational volcanic ash services, the intercomparison revealed the need for additional scientific development of algorithms and more detailed comparisons between datasets within an organized international framework. Thus, a continuation of the intercomparison over a period of 12-18 months is recommended, for which dedicated resources would be required. The proposed next steps are outlined in **CGMS-44-WMO-WP-15**.

Pilot Project 3: Blended global satellite rainfall product for nowcasting and severe weather risk reduction using webmapping services.

Pilot Project 4: Sand and dust monitoring in Asia using different data sources, exchange of ground-based validation data, and intercomparison of JMA and CMA algorithms

A meeting of the SCOPE-Nowcasting Steering Group is envisaged for early 2017 to advise on the way forward into the pre-operational phase of the initiative. The Steering Group will be formalized by WMO in the course of 2016, including invitations to the satellite operators currently contributing to SCOPE-Nowcasting (EUMETSAT, JMA, CMA, KMA, and NOAA).

CGMS-44 RECOMMENDATIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS members	WGII /4	R44.20	CGMS members to continue to support SCOPE-Nowcasting and its transition to pre-operational phase, in particular to consider financial support the finalization of the satellite-based volcanic ash retrieval algorithm intercomparison activitiy (Pilot Project 2) over the next 12-18 months. *(Deadline for indication of support to volcanic ash activity)*	1 Nov 2016	**OPEN**	3.2.2

WGII/ 5 Working papers on other international science community reports – oceans, CEOS VCs

CGMS-44-NASA-WP-08: Alternate NASA view of the 2015/2016 El Nino -NASA satellites recorded impacts to, and responses from, a wide variety of atmospheric, oceanic and terrestrial parameters that can be at least partially attributed to the 2015-2016 El Nino.

- Atmosphere – CO, CO2, water vapor, clouds, wind vector, smoke, humidity, radiative fluxes, precipitation
- Land – vegetation, river flow, soil moisture
- Ocean – sea surface temperature, sea surface height, ocean surface wind vector, marine productivity

NASA observations provide opportunities to test hypotheses and assess the reliability of forecast models of the influence of El Nino on local, regional and global scales. Scientific analyses of NASA and other observations recorded during the 2015-2016 El Nino are continuing and will continue after the El Nino has dissipated –in March 2016, the El Nino was at moderate strength with a NOAA Oceanic Nino Index (ONI) of 1.6 in the ONI 3.4 Region.

CGMS-44-NOAA-WP-05: El Nino Rapid Response Campaign **-** This presentation provided to the CGMS community an overview of how satellites supported the NOAA El Nino Rapid Response Campaign and some early results from the campaign.

- The El Nino rapid response field campaign is a NOAA/OAR-led multi-agency mission, see link for details: http://www.esrl.noaa.gov/psd/enso/rapid_response/
- Goal of this campaign is to monitor this extreme El Nino event and improve weather forecasting with targeted observations in the Intertropic Convergence Zone (ITCZ)
- JPSS scientists provided real time S-NPP soundings from CrIS and ATMS using direct broadcast assets from Corvallis Oregon and Honolulu Hawaii. 22 flights were supported Jan. 21 through Mar. 10, 2016, Over 500 dropsondes deployed
- Significance: Real time JPSS data was used as guidance for aircraft flights and the JPSS soundings was used to characterize the thermodynamic field in regions that could not be measured with in-situ observations. Data collected from the campaign provided opportunities for unique datasets for validating satellite products.

Conclusions:

1. El Niño Rapid Response organized important study of tropical convection and links to extratropical impacts of historic 2015-16 El Niño with a combination of deployed aircraft and drop sondes, in-situ and ship released radiosondes, ground met stations, radar, and focused satellite retrievals.
2. Surprising result: NOAA G-IV drop sondes had a beneficial impact on 24 hour forecasts of NASA GEOS-5

a) “Per observation”, no other part of the tropical observing system contributed more, on average, to a reduction of 24 hour forecast error in the global moist energy during 25 January to 24 February 2016.
b) G-IV drop sondes in a void of tropical radiosonde observations are comparable to major satellite systems even in total impact.
c) Impact needs to be assessed in NOAA Global Forecasting System

WGII/ 6 Selected topics of high priority to members [90'] (WPs will be pre-selected)

CGMS-44-CMA-WP-03: CMA report on progress of 3D Atmospheric Data Visual Platform **-** This paper introduced a 3D Atmospheric Data Visual Platform (3D-ADVP) developed by NSMC/CMA. The highlight of this platform is technical solution for fusion of different observation data, 3D visualization of global atmosphere, hybrid visualization of accurate volume data, and geometry data in 3D spherical space, etc.

Forecasters get information quickly on this platform-- a very useful tool in global weather monitoring, analyzing and forecasting.

The tool enables navigating different data streams and models in Earth view. It is in principle available to all users and can be made available by CMA. Information on software format, interfaces, and APIs, as well as documentation would be needed.

CGMS-44 ACTIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CMA	WGII /6	A44.07	CMA to provide more information (documentation, availability details, URL) about the 3D-ADVP tool , for inclusion in the WMO webpage on Visualization Tools to CGMSSEC.	1 Oct 2016	**OPEN**	

CGMS-44-IMD-WP-02: RAPID software tool **-** IMD presented a visualization tool developed by ISRO and IMD to analyse INSAT-3D data, as well as model fields simultaneously. It provides a convenient way of displaying a range of datas sources, channels of satellite imagery, and satellite products. The software should also be included in the WMO webpage on data visualization tools, provided information on installation, documentation, and a URL can be made available.

CGMS-44 ACTIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
IMD	WGII /6	A44.08	IMD to provide more information (documentation, availability details, URL) about the RAPID tool , for inclusion in the WMO webpage on Visualization Tools to CGMSSEC	1 Oct 2016	**OPEN**	

CGMS-44-EUMETSAT-WP-10: Outcome of questionnaire: Utilisation of Geostationary Satellite Data for Short-range NWP **-** EUMETSAT presented the paper on the questionnaire was sent to leading experts on Short-Range Numerical Weather Prediction (SRNWP) and Limited Area Modelling. In addition to the major European Projects (Aladin, COSMO, HIRLAM, UKV/MetOffice) and associated NMSs, responses were also received from KMA, JMA, NOAA, NASA, and CMA (responses yet to be included in the analysis).

Whilst some differences remain and some research is driven by the anticipated locally available future satellite systems, there is generally a large degree of commonality in the projected future evolutions of Short-Range NWP and the use of satellite data. Some of the main evolutions for the future include:

- Increased horizontal resolution down to sub-kilometer scale even down to 100 m. This implies convective scale cloud-resolving modelling.
- Need for further improvements in the vertical structures and the planetary boundary layer (PBL)

- Shorter update cycles of 1 hour and less, even down to 15 minutes
- Stronger coupled modelling including ocean and atmospheric chemistry. The latter also for
- Aerosol
- Ensemble forecasting
- 4D-VAR
- Research priorities for SRNWP over the next 10 years identified are:
- Surpassing the skill of nowcasting (<3 hours)
- Surface-atmosphere interaction
- Characterizing the PBL
- Cloud and moist physics and cloud-radiation feedback
- Non-Gaussian errors and nonlinear observation operators
- Ensemble techniques

Most important satellite observations to improve SRNWP:

- High temporal observations, not only from geostationary, but also from high-elliptical orbits
- Temperature and humidity profiling that could be provided via space-based lidar and
- geostationary hyperspectral instruments
- Better products for surface characterisation
- Aerosol information
- Lightning observations

Statistical metrics, OSE/OSSEs, FSO are among the methods to demonstrate the impact of satellite data in short-range models.

These evolutions also drive the associated need in modelling and data assimilation, including error characterisation and observation operators, as well as pose stringent requirements on data availability, timeliness and products.

The purpose for EUMETSAT is to use the outcome of this questionnaire to compile a comprehensive view of the current state and future perspectives of SRNWP Research and Development with emphasis on utilisation and future requirements for satellite data and products.

More specifically EUMETSAT intends to use the collected responses to develop a coherent picture of the needs by SRNWP with regard to data and products from Meteosat Third Generation (MTG).

The Group noted that meeting the short latency requirements has implications on data flow: for example, sequential processing of polar data during overpass can help; the DBNet should continue looking at this. Regarding MTG IRS-type (high-resolution GEO) data, agencies are investigating ways to improve latency, by disseminating PC scores or sub-sampled data.

Assimilation of GEO radiances can be done in many different ways; the question was raised whether CGMS should provide guidance regarding flow and uptake of high-resolution imagery/radiances.

It was noted that WMO will organise a NWP assimilation workshop in 2017.

As a conclusion the WG II noted that a critical finding of the survey is related to data latency as well as to the efficient exchange of data. Whilst the latter is best addressed at the various Data Exchange Groups (NAEDEX and APSDEU) the former led to the following recommendation:

CGMS-44 RECOMMENDATIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	WGII /6	R44.21	Operators to take into account in the planning of their data distribution systems the emerging stringent requirements on data latency from SRNWP	CGMS-45 (for update)	**OPEN**	2

CGMS-44 ACTIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	WGII /6	A44.09	CGMS operators and WMO to work with NAEDEX-APSDEU to explore options for optimal data exchange of advanced data from next-gen GEOs	CGMS-45	**OPEN**	2

CGMS-44-IMD-WP-02: RAPID software tool **-** Visualization tool developed by ISRO and IMD to analyse INSAT-3D data, as well as model fields simultaneously. It should also be included in the WMO webpage on data visualization tools.

The following three WPs were covered by KMA in one presentation:

CGMS-44-KMA-WP-05: Satellite Data Application in KMA's NWP Systems **-**This document reported on KMA's Satellite Data Application in NWP Systems. Radiances from ATMS and CrIS were used in a Global Model. Clear-sky radiances from SEVIRI, Meteosat-7, and GOES-E/W were used and had positive impact. The radiance data from polar orbit and geostationary satellites will be added in operational mode in June 2016. Also there were tries to introduce satellite data to convective scale model.

The assimilation of high resolution AMSU-B data for the local model is being studied.

NMSC (National Meteorological Satellite Center) of KMA has developed a new algorithm for higher resolution COMS AMV, and NMB (Numerical Modeling Bureau)/KMA has tested its impact in the KMA operational system. The target size of the higher resolution AMV is about 64 km (16x16 pixels, T16), and it is much smaller than current one (about 96 km, 24x24 pixels, T24) which is being used in the operational system. NMSC reported that the number of AMV data produced with the new algorithm is increased more than two times through all four channels showing less bias and RMSE against the wind speed of sonde observations.

The impact of ground-based GNSS data was evaluated using 1.5km high-resolution model. KMA receives raw signal data from about 100 GNSS stations over Korea peninsular and generates Zenith Total Delay (ZTD) observation of 15 stations in near real time. The assimilation of ground-based GNSS data gave a positive impact on the lower tropospheric humidity field in early forecast times and significant improvements for heavy rainfall cases in the summer. It will be implemented operationally in the middle of 2016.

CGMS-44-KMA-WP-06: KMA's improvement in fog detection from COMS **-** This paper introduces the improvement of fog detection using COMS observation data to support severe weather forecast of KMA. Fog detection algorithm has mainly two parts: one is the decision part of fog area and the other is surface temperature calculation part. Usually, fog detection algorithm uses the similarity between surface temperature and cloud top temperature. KMA tested clear sky brightness temperature from COMS (hereafter "CSTB") and skin temperature from numerical weather prediction model (UM, RDAPS) (hereafter "NWPT") which is a regional model of KMA for surface temperature. In the future, the fog detection algorithm will be improved using the high-resolution data of the next generation satellite COMS-2A.

CGMS-44-KMA-WP-08: KMA Implementation Plan for Climate Products **-** This document reports on KMA's implementation plan for climate product activities.

- To produce Satellite-based Essential Climate Variables (ECVs) applying GSICS correction to COMS product from April 2011 to March 2015
- To improve accuracy of Sea Surface Temperature (SST) Outgoing Longwave Radiation(OLR), and Insolation(INS)
- To contribute to SCOPE-CM activity by producing the primary ECVs (SST, OLR and INS)

KMA is establishing a long-term plan for the development of ECVs, retrievals of Sea Surface Temperature (SST), Outgoing Longwave Radiation (OLR), and Insolation (INS), and product of Thematic Climate Data Records (TCDR). The plan includes 1) the initial development phase, 2) continuing development and steady production phase, and 3) continuous production and services provision phase that each phase was specified with action plans. The phases were developed taking into account KMA's international contribution for Sustained and Coordinated Processing of Environmental satellite data for Climate Monitoring (SCOPE-CM) and priorities of the plan such as continuous production using the methodologies described in this research. In addition, it includes an implementation plan for satellite-based standard climate Database.

The Group commended KMA for its work in these areas

CGMS-44-NOAA-WP-10 was moved to item 8.

WGII/ 7 CGMS agency reports on highlights and issues in dataset and product generation

CGMS-44-CMA-WP-04 PPT: CMA report on highlights and issues in dataset and product generation **-** This CMA report introduces recent progress in product generation (PG) for FY-3C, FY-3D and FY-4A. The

FY-3C PG system has many improvements compared with FY-3A and FY-3B. Some new products are added into FY-3C PG system, the product precision is improved, 5km global coverage products are produced every day.FY-3D carries a number of new instruments such as GAS, HIRAS, MERSI-2. Products for these new instruments are being developed. Algorithms for FY-4A products have been established. H8 data is used as the proxy data to validate these algorithms. FY-4A commissioning will take about one year; first data to be made available in spring 2017.

Hyperspectral instruments to be launched on FY-3D and FY-4A at the end of 2016, and CMA would like to work with other agencies on product development.

NSMC/CMA will keep improving the quality of satellite products and continue to contribute to the international cooperation.

Besides algorithms, fast RTMs and input NWP data will influence the quality of satellite products. International cooperation should be strengthened in these fields.

NSMC/CMA has accumulated decades of years of Fengyun satellite data, and hope to get guidance on the reprocessing of these data to make them contributable to the global change study.

CMA introduced the application development for FY-4 using Himawari-8 data as a proxy data.

The Group commended CMA for the great progress that they have made with their various satellites and data production systems. The upcoming challenges with launching three satellites by the end of the year was also noted and in particular the fact that 2 hyperspectral instruments, one on FY-3D and the other on FY-4a, will be launched. Therefore the following recommendation following the best practices for user readiness and preparation was placed on CMA:

CGMS-44 RECOMMENDATIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CMA	WGII /7	R44.22	CMA to make available data from FY-3D HIRAS and FY-4A GIIRS early in commissioning	CGMS-45 (for update)	**OPEN**	

To better understand satellite-derived winds in the Indian Ocean region, CMA suggested that the International Winds Working Group pursue intercomparisons of Meteosat-8 and FY-2/4 winds over the IODC region. During the transition phase, also Meteosat-7 should be considered.

CGMS-44 ACTIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
IWWG	WGII /7	A44.10	IWWG to pursue intercomparisons of Meteosat-8 and FY-2/4 winds over the IODC region. During the transition phase also Meteosat-7 should be considered.	CGMS-45 (for update)	**OPEN**	3.2.1

CGMS-44-ESA-WP-02: ESA Support to climate monitoring and research through the Earth Explorer missions and other programmes **-** CGMS WGII is informed about some outstanding results from the Earth Explorer missions CryoSat-2 and SMOS. Launched on 2 November 2009, SMOS is the second Earth Explorer Opportunity mission to be developed as part of ESA's Living Planet Programme. The data acquired from the SMOS mission will lead to better weather and extreme-event forecasting, and contribute to seasonal climate forecasting, as demonstrated in the results presented. ESA's Earth Explorer CryoSat-2 mission, launched on 8 April 2010, is dedicated to precise monitoring of the changes in the thickness of marine ice floating in the polar oceans and variations in the thickness of the vast ice sheets that overlie Greenland and Antarctica.

CGMS WGII is also informed on the status of the Earth Watch Program Element, Global Monitoring of Essential Climate Variables (ECV), also known as the 'ESA Climate Change Initiative (CCI)'. The CCI program continues to proceed well and according to schedule. All thirteen ECV projects initiated in 2010 and in early 2012 are completed. Phase 2 of this program element was kicked-off in February 2014 and is now ongoing for almost all projects. ECV products are being made available under an open and free data policy for uptake by the wider climate science community through the CCI Open Data Portal.

The ESA Earth Watch programme encompasses the series of Sentinel satellites, which will continue and extend in the coming decades the series of environmental observations from space initiated by former ESA and other European satellite missions.

CGMS-44-EUMETSAT-WP-09: EUMETSAT report on data and products **-** EUMETSAT gave an update the current status of its programmes and product development activities. The mandatory operational programmes, Meteosat Second Generation (MSG) and the EUMETSAT Polar System (EPS) are in good health. For MSG all satellites have now been deployed, offering the opportunity to transfer Meteosat-8 to 41.5 degrees east to support Indian Ocean Data Coverage after Meteosat-7 will be decommissioned. The final decision for the transfer is anticipated in June 2016. On the future programmes, Meteosat Third Generation (MTG) and EPS Second Generation, development activities are in full progress. The new systems will present significant new opportunities and challenges with the enhanced and new instrument complements. Onboard these new satellites EUMETSAT will also incorporate the Copernicus Sentinel-4 and -5 instruments for atmospheric composition measurements. In addition to these programmes EUMETSAT is now also operating the Copernicus Sentinel-3 mission and with its partners the various Jason satellites.

Whilst the focus of the development activities are on the new programmes further improved and new products are also developed for the current operational satellites. These include improved cloud and atmospheric motion vector products, products in support of marine monitoring and atmospheric composition.

CGMS-44-JMA-WP-03: JMA report on highlights and issues in dataset and products - The new-generation Himawari-8 geostationary meteorological satellite of the Japan Meteorological Agency (JMA) started operation in July 2015 after the completion of in-orbit testing and checking of the overall system. Himawari-8 features the new Advanced Himawari Imager (AHI), which has 16 bands and

doubles the spatial resolution of its MTSAT-series predecessor satellites. Full-disk imagery is obtained every 10 minutes, and regional observation is conducted at 2.5-minute intervals. These significant improvements are expected to bring unprecedented levels of performance in nowcasting services and short-range weather forecasting systems.

To leverage the full potential of the advanced imager, precision in image navigation and radiometric calibration is essential. Accordingly, precision is evaluated in ground-segment applications such as pattern matching for navigation and the Global Space-based Inter- Calibration System (GSICS) for radiometric calibration. On 9 March 2016, JMA updated the image navigation/registration module and other elements of its ground process system for further quality improvement. This update covered the implementation of a coherent noise reduction process, improvement of the band-to-band co-registration process for infrared bands, and enhancement of the resampling process.

JMA's Meteorological Satellite Center (MSC) generates level-2 products such as Atmospheric Motion Vectors, Clear Sky Radiance and High-resolution Cloud Analysis Information based on Himawari-8/AHI observation. A volcanic ash product is also applied in MSC's data processing system using VOLCAT software developed by NOAA/NESDIS. Himawari-8 product algorithm documents were published in MSC Technical Note on the JMA/MSC website in March 2016.

JMA also contributes to SCOPE-Nowcasting and SCOPE-CM activities, and Himawari-8 RGB composite images for SWFDP and SWFDDP are available on the JMA/MSC website. JMA/MSC is currently researching colour tuning based on recipe parameter adjustment to enhance the RGB-image display of meteorological phenomena in the Asia-Pacific area.

The Group noted that exchange of large data volumes can be a challenge. The high-density AMVs data surrounding Japan are not disseminated to users via GTS due to its line speed. To go beyond the GTS, EUMETSAT and NOAA are working on multicasting data using the internet (based on NRENs) or DBNet, to exchange large amounts of data.

JMA is not planning to re-process the Himawari-8 level-1 imagery archives due to lack of resources.

CGMS-44-KMA-WP-07: The status of KMA program on GK-2A product retrievals and applications - This report is to describe the current status of GK-2A product retrieval algorithms and application techniques development. KMA plans to extract 52 meteorological and geophysical products from GK-2A AMI measurement. L2 products are categorized into 23 primary and 29 secondary products with regard to operational importance and expected product accuracy. The proto-type algorithms of 23 primary products are prepared now. The performance and accuracy of these algorithms are tested and improved by using the Himawari-8 AHI data. The proto-types for secondary products will be developed by the end of February 2017. For maximize the GK-2A observation and products, application techniques are also being developed under the GK-2A ground segment program. Nowcasting, typhoon and ocean, and hydrology and environmental application techniques are considered and the detail items of each application area are designed and started to be developed.

The GEO-KOMPSAT-2A observation schedule is 10 minutes baseline. KMA are considering coordination with JMA of staggered scanning with respect to AHI which would result in a scan every 5 minutes. This would be an advantage for the users in the footprint of GK-2A and Himawari-8

CGMS-44-NASA-WP-02: NASA Report on Highlights and Issues in Dataset and Product Generation **-** With its current fleet of 17 operating satellites and a vigorous program of airborne and surface-based observations that both complement and provide calibration/validation for space-based sensors, laboratory calibration facilities, and the production of model/data hybrid products through data assimilation and reanalysis, NASA provides significant knowledge about the Earth's global environment. This knowledge extends both to quantitative knowledge of Earth system parameters (many of which are not well documented through previous space-based measurement programs), and the understanding of the processes that drive Earth system behaviour. In this working paper, recent results and/or a summary of activities from several NASA activities not addressed in separate working papers that are addressing questions we feel are of particular interest to CGMS members are presented. These include particular activities in calibration/validation (both laboratory facilities and field campaigns that can provide relevant information for satellite missions relevant to CGMS), data products from NASA satellite missions (including selected highlights from recently-launched missions, major reprocessing of previously-released data sets, and production of reanalysed data sets incorporating results from multiple data sets).

International coordination of cal/val facilities and their shared use was discussed. Many cal/val sites originate in research activities, but have an operational role (such as AERONET). It was raised whether guidance from CGMS or WMO could help the maintenance of ground sites necessary for satellite validation.

GOES-R preparation included upgrading of 8 SURFRAD sites.

NASA has been maintaining ozone (e.g. SHADOZ) and radiation networks for a long time, with continuing strong support by the agency. Network maintenance also being discussed in GCOS and GSICS, and two agencies reported under item 8 of WG II. It should be identify what types of observations are needed for cal/val, and which agencies contribute (task on CEOS WGCV and GSICS).

NASA identified the challenge to maintain geodetic reference networks, but these are growing in importance in tandem with altimetry and gravimetry. This has been recognised by GCOS in the new implementation plan.

CGMS-44-NOAA-WP-06-PPT: JPSS/GEOS-R Community Satellite Processing Package (CSPP) **-** This presentation provides a status report and plans for the NOAA sponsored Community Satellite Processing Package (CSPP), which has been extended to generate geostationary products. CSPP for polar satellites reduces latency, but also provides an excellent testbed for evaluating new algorithms without impacting the central ground segment until the value of new algorithms/products are assessed by the user community For GOES-R, this concept of testing new algorithms was well received. CSPP is freely available. For JPSS includes both level 1 (SDR) and level 2 (EDR) algorithms GOES-R will include

baseline products and a select number of option 2 products. CSPP will provide to the direct broadcast community operational products for both JPSS and GOES-R. Other agencies with LEO and GEO direct broadcast/rebroadcast are encourage to provide level 1 and 2 processing packages

CGMS-44 RECOMMENDATIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	WGII /7	R44.23	CGMS agencies with operational direct broadcast needs are encouraged to attend the next ITWG sponsored Direct Broadcast Users Meeting in March 2017 hosted by CONAE, Argentina.	Mar 2017	**OPEN**	

CGMS-44-NOAA-WP-07 PPT: NOAA NESDIS Science Report **-** This presentation provides an overview of NESDIS Science activities, including transition to enterprise algorithms, enterprise life cycle approach for algorithm development, and proving ground and training activities. An end-to-end science development approach combined with a science application program and training are critical for ensuring accurate and reliable satellite products for the life of the program as well as their utilization in user's product and services. New applications using VIIRS for droughts, fire, coral bleaching, illegal boating, and gas flare monitoring were presented.

NOAA has adopted an end-to-end science development approach combined with a science application programme. These are critical for ensuring accurate and reliable satellite products for the life of the programme, as well as their effective utilization in user products and services (and training).

Use of third party data will become more important, such as data from Sentinel-3.

Building blocks of science maturity are: ATBDs, Cal/Val Plan, Manual, System Maintenance Manual, Peer-reviewed publications, Regular validation reports, (Training).Enterprise Life Cycle embodies these elements.

CGMS-44 RECOMMENDATIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	WGII /7	R44.24	CGMS agencies to provide key documentation related to the quality of their products, to allow for informed uptake by users. These documents should include ATBDs, cal/val plans, and regular validation reports. *CGMS-44 WGII: Part of WGII action to develop best practices.*	CGMS-44 WGII: Part of WGII action to develop best practices	CGMS-45	**OPEN**

CGMS-44 ACTIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS members	WGII /7	A44.11	CGMS to develop best practices for documenting products and their quality.	CGMS-45 (for update)	**OPEN**	3

CGMS-44-ROSHYDROMET-WP-03: Data and products from meteorological and environmental satellites in Roshydromet **-** The document gave an overview of operational and research activity in Roshydromet related to the derivation and application of remote sensing products from weather and environmental satellite data. It is focused mainly on the results of the Meteor-M N2 exploitation. The sample products are presented based on Meteor-M N2 and other satellite data.

Russia is now developing a space observation system Meteor-3M, including meteorological and oceanographic satellites of new generation based on several polar – orbiting platforms of Meteor-M type. In July, 2014 the second satellite of this series, Meteor-M №2, has been successfully launched on sun-synchronous orbit (~830 km, equator crossing time ~9h:30 min, inclination 98,79□). According to the Russian Federal Space Program it is planned to launch a constellation of similar satellites with the same payload as the one of Meteor-M N2, namely Meteor-M N2-1 Meteor-M N2-2, etc. The goal is to create a system of identical operational meteorological satellites in morning and afternoon orbits. Also there is a constellation of environmental satellites of Resurs-P series (last one launched in 2016), providing high spatial resolution images in visible spectra. Additional details can be found in WMO OSCAR database (https://www.wmosat.info/oscar/satellite programmes/view/135).

Roshydromet as an operational agency is responsible for the exploitation of existing Russian meteorological satellites. Roshydromet ground segment consists of three regional SRC Planeta centers, responsible for receiving, processing, disseminating and archiving satellite data: European (Moscow-Obninsk- Dolgoprudny), Siberian (Novosibirsk) and Far-Eastern (Khabarovsk). These centers together give full coverage of Russia and neighbouring states. This ground segment ensures satellite data acquisition, processing, dissemination and archiving, including Meteor-M N2 data. The system also provides the access to the operational data from foreign satellites in near real-time. Roshydromet/SRC Planeta has become an official member of EUMETSAT Advanced Retransmission Service (EARS system) in 2009. Currently NOAA, Metop and SNPP data acquired in Moscow is processed and transmitted to the main EUMETSAT headquarters in Darmstadt for retransmission in near real-time. Negotiations are in place about the provision of data received at Siberian and Far- Eastern SRC Planeta centers to the EARS network.

The paper presented examples for products on: cloud analyses, forest fire detection, flood mapping, SST, ice cover, sounding.

SRC Planeta products can be made available online at http://planet.iitp.ru. Participants showed interest in NRT access to IKFS-2 data, and enquired about access to MTVZA-GY data.

The WGII took note of the presentation and congratulated Roshydromet in particular on the performance of the microwave instruments and the hyperspectral infrared sounder IKFS-2 and placed the following action:

CGMS-44 ACTIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
ROSH	WGII /7	A44.12	ROSHYDROMENT to explore the possibilities to implement an operational NRT service for the hyperspectral infrared sounder IKFS-2 on Meteor-M N2	CGMS-45	**OPEN**	1.4.5

CGMS-44-WMO-WP-17: Update on the WMO Polar Space Task Group and Strategic Plan 2015-2018 - This paper provides an update on Polar Space Task Group (PSTG) activities and plans, and in particular on the new Strategic Plan for PSTG 2015-2018. The 17th World Meteorological Congress formally extended the mandate of PSTG, under new EC-PHORS Terms of Reference, until 2018. The SAR Coordination Working Group under PSTG has released a unique 20-Year compendium of multi-agency radar imagery, and developed a three-year implementation plan.

At the fifth meeting of PSTG in October 2015, internationally-coordinated community user requirements in four thematic areas (ice sheets, floating ice, snow, permafrost) were further discussed, and agency contributions to address these requirements systematically identified, based on user priorities.

REFERENCES:

- Polar Space Task Group (PSTG) http://www.wmo.int/pages/prog/sat/pstg_en.php
- Polar Space Task Group Strategic Plan 2015-2018: http://www.wmo.int/pages/prog/sat/documents/SAT-GEN_PSTG-StratPlan2015-2018.pdf
- Polar Space Task Group Strategic Plan 2015-2018: http://www.wmo.int/pages/prog/sat/documents/SAT-GEN_PSTG-StratPlan2015-2018.pdf
- PSTG SAR Coordination Working Group: Three-Year Implementation Plan http://www.wmo.int/pages/prog/sat/documents/SAT-GEN_PSTG-SAR-CWG-3YearIPMar2016.pdf
- SAR 20-Year Data Compendium: http://www.wmo.int/pages/prog/sat/documents/SAT-GEN_PSTG-SAR-CWGDataCompendium-Apr2016.pdf

EUMETSAT made a statement in support of PSTG. One of the experiments contributing to YOPP will be to exploit the new GEOs, studying transport from mid-latitudes to Polar Regions; and cloud features. For HEO, ROSHYDROMET confirm that Arktika-1 slated for 2017, and Arktika-2 for 2019.

CGMS-44 RECOMMENDATIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	WGII /7	R44.25	For monitoring the Polar Regions, the Group stressed the importance of the deployment of HEO missions. *Link to WGIII required?*		**OPEN**	1.1

WGII/ 8 Working papers responding to or raising CGMS actions

CGMS-44-CEOS-WP-01: Joint CEOS/CGMS Working Group on Climate – 4-year Work Plan **-** The purpose of this document is to outline the main Joint CEOS/CGMS Working Group on Climate (WGClimate) objectives, associated implementation modalities and schedule for the period November 2015 to November 2019, embracing the WG Chair periods of ESA (Pascal Lecomte) and EUMETSAT (Jörg Schulz).

The WGClimate 4-year Work Plan is attached in annex of this CGMS Working Document.

A detailed presentation of the WGClimate Work Plan will be made in WGII item 8 of the Agenda, a shorter higher level presentation will be made in Plenary (Agenda item G.1).

The Group commended WGClimate on its achievements and noted that it has successfully demonstrated the effective coordination and benefits of CEOS and CGMS working together and supported the activities with respect to the ECV inventory.

CGMS-44-GSICS-WP-01: Requirements for an absolute lunar-calibration reference for solar band radiometer instruments **-** The Moon is an invariant reflectance target that is observable from geostationary and low Earth orbits. It can be used as an absolute reference for on-orbit radiometric calibration, provided high-accuracy characterization measurements of its spectral reflectance are acquired, and given the availability of continuous, SI-traceable solar spectral irradiance measurements. A system for lunar calibration has been developed for reflected solar wavelengths, 0.35 to 2.5 µm. Lunar calibration has the potential to provide absolute radiometric calibrations of solar band sensors in orbit with SI-traceable accuracy better than 1.0% (k=2). This is beyond current capabilities, but is achievable if high-accuracy, SI-traceable absolute measurements of the Moon are acquired and developed into an absolute lunar reference standard. The availability of such a high-accuracy absolute reference has significant implications for the utility of data acquired from solar band instruments, particularly with regard to consistency and inter-operability across sensors and platforms, and the construction of climate records. With this reference standard, absolute accuracy requirements for visible and near-infrared channel sensors could be set to a similar level. This paper has been prepared in response to CGMS Action A43.01, which specifies that GSICS is to establish requirements for absolute lunar calibration. It introduces a set of tentative requirements for developing a new absolute lunar reference standard, and describes the potential capabilities enabled by this standard once it is established.

The paper proposed the following Actions and Recommendations:

1. Satellite instrument operators should establish requirements to observe the Moon with VIS/NIR channel sensors.
2. Satellite operating agencies should support proposals and programs to acquire high-accuracy characterization measurements of the Moon, to develop a new, high accuracy, SI-traceable lunar reference standard for reflected solar wavelengths.
3. Long-term continuity of absolute solar spectral irradiance measurement with SI-traceable accuracy should be ensured.

In Conclusion:

The availability of a high-accuracy lunar reference standard: significant impact on Earth observation datasets acquired from space (by way of improved consistency and inter-operability across sensors and platforms) – provide benefits to climate monitoring programs & satellite operating agencies worldwide

Requirements

- collecting a new, high-accuracy set of characterization measurements of the Moon
- redeveloping the lunar reference using this improved dataset

The EP discussed the requirements for developing a high-accuracy absolute lunar calibration reference. A refined lunar reference has the potential to achieve ≤ 1% (k=2) absolute calibration accuracy in the reflected solar wavelength range. The EP acknowledged that no current user requirements specify this level of accuracy, but recognized this is likely due to the unavailability of the methodologies and standards needed to meet such a requirement. A primary motivation for improving the measurement accuracy of satellite sensors is to allow the detection of decade-scale signals of climate change above the background of natural variability. The time needed for such change detection is strongly dependent on the accuracy capabilities of the sensors. An improved Lunar calibration reference addresses this need with regard to the essential climate variables measured at reflected solar wavelengths, such as cloud optical properties and feedbacks, land cover and land use changes (e.g. vegetation indexes), and ocean colour measurements. Additionally, a high-accuracy lunar reference enables validating transfer – to-orbit calibrations and provides a consistent tie point to bridge a potential gap in an otherwise continuous series of Earth observations. Thus the EP endorsed the approach and tentative set of requirements for developing a high-accuracy, SI-traceable lunar reference standard, and supported the recommendations sent to CGMS (by GSICS) to acquire lunar measurements with solar band instruments on orbit and to support programs and proposals to advance development of an absolute lunar reference.

CGMS-44 RECOMMENDATIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	WGII /8	R44.26	Satellite operating agencies should support proposals and programs to acquire high-accuracy characterization measurements of the Moon, to develop a new, high		**OPEN**	3.1.2

CGMS-44 RECOMMENDATIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
			accuracy, SI-traceable lunar reference standard for reflected solar wavelengths.			
CGMS space agencies	WGII /8	R44.27	Long-term continuity of absolute solar spectral irradiance measurement with SI-traceable accuracy should be ensured.		**OPEN**	3.2.1

CGMS-44-GSICS-WP-02 described the process of "Selecting, Transferring and Merging GSICS Reference Instruments", which are key to the inter-calibration strategy of the Global Space-based Inter-Calibration System. The paper considered the identification of reference instruments, noting that multiple references may be used - for example to provide better coverage of any diurnal calibration variations. It proposed a scoring scheme, where the performance of each candidate reference is assessed. Based on the assessment, a specific reference can be used as an anchor for a specific spectral band. The concept of Prime GSICS Corrections was also introduced to allow calibration to be transferred between different reference instruments, through a series of double differences. The discussion highlighted the importance of providing a report to demonstrate the reference instruments have stable calibration, traceable to community standards with specified uncertainties. It was also further noted that based on the agreed approach for identifying and using reference instruments that all GPRCs should generate all operational products using any identified reference instruments. Hence, the associated action A43.02 was superseded by a change in the use of reference instruments and the notion of anchor instruments.

CGMS-44-IMD-WP-01 presented the lunar-based calibration of INSAT-3D. The USGS ROLO model had been introduced in IMD and applied to the moon captured in a full disk imagery taken by the INSAT-3D on-board imager. The result from a feasibility study shows that the more observations are needed to obtain reliable statistics.

CGMS-44-JMA-WP-04: JMA Testbed for Satellite-based Volcanic Ash Products -To contribute to the improvement of satellite-based volcanic ash retrieval algorithms and the reduction of related inconsistencies, the Meteorological Satellite Center (MSC) of the Japan Meteorological Agency (JMA) established a testbed system in which multiple retrieval algorithms can be implemented and compared systematically. The JMA Testbed can be used to run several programmes of different algorithms with common satellite and ancillary data to enable comparison of algorithm performance.

JMA/MSC also set up a monitoring website for the JMA Testbed. For intercomparison, the resource incorporates two algorithms for Himawari-8 volcanic ash retrieval: one is provided by the National Environmental Satellite, Data, and Information Service (NESDIS) of the National Oceanic and Atmospheric Administration (NOAA), and the other was developed in collaboration with the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT). Results from these two algorithms are posted on the Web with 2D distribution maps, frequency analysis data and other information on a near-real-time basis.

JMA introduced that the VA Test bed is now open in public to provide comparisons of two retrieval algorithms introduced from NOAA/NESDIS and EUMETSAT on real time basis.

The Group expressed its appreciation to JMA for establishing the testbed system. EUMETSAT commented that some RGB composite images in addition to Ash RGB and true colour image would also be useful for users. The importance of uploading historical event data was also noted, it would be done in the near future.

A feasibility of incorporating additional algorithm was discussed. JMA noted that the new algorithm could be ingested to the tested if input/ output interfaces are prepared by users.

CGMS-44-JMA-WP-05: JMA's Cal/Val Activities **-** The new-generation Himawari-8 geostationary meteorological satellite of the Japan Meteorological Agency (JMA) started operation in July 2015 after the completion of in-orbit testing and checking of the overall system. Himawari-8 features the new Advanced Himawari Imager (AHI), which has 16 bands and double the spatial resolution of its MTSAT-series predecessor satellites.

To leverage the full potential of the advanced imager, precision in image navigation and radiometric calibration is essential. All 16 AHI bands have been calibrated using on-board sources such as a solar diffuser and a blackbody, observation of hyperspectral infrared sounders, simulated top-of atmosphere radiance using a radiative transfer model, and pseudo-invariant targets such as deep convective clouds. These methods have been developed within the framework of the Global Space-based Inter-Calibration System (GSICS) and through collaborative research with the Atmosphere and Ocean Research Institute (AORI) at the University of Tokyo.

Estimated calibration biases for infrared bands are less than 0.5 K for standard scenes. Calibration biases for visible and near-infrared bands were reduced by calibration coefficient updates based on SD observation, but biases of around 5% still remain in bands 5 and 6. The background to this issue is currently under investigation.

It is expected that the system for monitoring based on comparison of the current AHI image with the previous one, will facilitate quick checking of calibration quality.. It is useful especially in the case of satellite anomaly or a possible interference such as stray lights.

CGMS-44-NOAA-WP-08: NOAA Cal/Val Status Report for NOAA Satellite Missions **-** This presentation provided an overview and lessons learned for SNPP/JPSS cal/val and preparations for GOES-R. The NOAA cal/val programs for JPSS and GOES-R includes prelaunch, post launch, and long term sustained monitoring and algorithm corrections, and validation campaigns, and documents associated with science maturity. These documents include an Algorithm Theoretical Basis Documents (ATBD), Cal/Val Plans, Peer reviewed papers, and regular, at least on an annual basis, validation reports. Extensive cal/val activities provides high confidence in the accuracy and reliability of satellite products and should be a cornerstone of each CGMS satellite agency plans for commissioning new satellites and sustaining the science maturity for the life of the program. Science maturity provides critical information to the user community on the quality (error characteristics) and provenance of the product.

CGMS-44-NOAA-WP-09: NOAA plans for reprocessing JPSS SDRs and EDRs and other satellite-based data **-** This presentation provided an overview of plans by NESDIS STAR as part of their JPSS cal/val program to reprocess SDRs and EDRS. Reprocessing is now part of the cal/val program to validate algorithm corrections/improvements over a large and wide range of representative conditions, with comprehensive documentation of product performance – consistent with the "FULL" (Validated) product performance level. Reprocessed SDRs and EDRs will be provided to the NOAA archive. Processing a single year of SNPP data for a particular instrument ranges from just a few hours to a few days. Reprocessing demonstrations have been completed for VIIRS SST, Clouds, Ocean Colour, and CrIS/ATMS soundings, ATMS, CrIS SDRs, and a subset of VIIRS SDRs used for Ocean Colour. The change history of operational code for ATMS, CrIS, VIIRS, and OMPS SDRs were presented and benefits of the reprocessed data were given.

CGMS-44-NASA-WP-03: Limb Correction of Polar-orbiting Imagery for the Improved Interpretation of RGB Composites **-** Red-Green-Blue (RGB) composite imagery combines information from several spectral channels into one image to aid in the operational analysis of atmospheric processes. However, infrared channels are adversely affected by the limb effect, the result of an increase in optical path length of the absorbing atmosphere between the satellite and the earth as viewing zenith angle increases. This paper reviews a newly developed technique to quickly correct for limb effects in both clear and cloudy regions using latitudinally and seasonally varying limb correction coefficients for real-time applications. These limb correction coefficients account for the increase in optical path length in order to produce limb-corrected RGB composites. The improved utility of a limb-corrected Air Mass RGB composite from the application of this approach is demonstrated using Aqua Moderate Resolution Imaging Spectroradiometer (MODIS) imagery. However, the limb correction can be applied to any polar-orbiting sensor infrared channels, provided the proper limb correction coefficients are calculated. Corrected RGB composites provide multiple advantages over uncorrected RGB composites, including increased confidence in the interpretation of RGB features, improved situational awareness for operational forecasters, and the ability to use RGB composites from multiple sensors jointly to increase the temporal frequency of observations.

Limb effect in IR due to longer optical paths at the edge of scenes (e.g., a full disk image). Comparison of MODIS and SEVIRI RGBs and correction of limb effects in MODIS swath. Meteosat-7 sees significant limb effects. The package may be useful for CSPP-GEO. There are benefits of this work for SCOPE-Nowcasting Pilot Project 1.

The Group thanked NASA for this presentation.

CGMS-44-NASA-WP-04: Surface Pressure Measurements from the Orbiting Carbon Observatory-2 (OCO-2): A Progress Report **-** The Orbiting Carbon Observatory-2 (OCO-2) is the first NASA mission designed to measure atmospheric carbon dioxide (CO2) with the precision, accuracy, resolution, and coverage needed to quantify the "sources" emitting this gas into the atmosphere, and the "sinks" at the surface that are absorbing it. OCO-2 was successfully launched in July of 2014 and was inserted into the 705 km Afternoon Constellation (A-Train) one month later. Since September of 2014, OCO-2 has been returning almost one million soundings each day over the sunlit hemisphere. Over 10% of these soundings are

sufficiently cloud free to return accurate, full column estimates of the column averaged CO2 dry air mole fraction, XCO2.

To estimate XCO2, the OCO-2 retrieval algorithm also returns an estimate of surface pressure for each clear-sky sounding. These surface pressure estimates are routinely delivered to the Goddard Earth Science Data and Information Services Center (GES DISC) for distribution to the science community, as part of the version 7 OCO-2 Level 2 product. Comparisons of these preliminary surface pressure estimates with those from the European Center for Medium Range Weather Forecasts (ECMWF) and other standards indicate a global bias of 1.4 to 3 hPa and a single sounding random error of about 1 hPa. Recent improvements in the instrument calibration, oxygen A-band absorption cross sections and other improvements in the retrieval algorithm are expected to improve the overall accuracy of this product in the next data product release (version 8), which is scheduled for early 2017. That delivery is targeting an overall surface pressure accuracy better than 1 hPa as well as improved single sounding random errors.

Work is underway at the Global Modelling and Assimilation Office (GMAO) at NASA Goddard Space Flight Center to incorporate OCO-2 surface pressure retrievals into the Goddard Earth Observing System (GEOS) atmospheric data assimilation system (ADAS). In these tests, a bias correction of 1.4, 2.2, and 3.0 hPa was applied to the OCO-2 land/nadir, land/glint, and ocean/glint observations, respectively. While these estimates have the potential to fill in data voids in the existing observing system, the bias-corrected OCO-2 version 7 product still systematically disagrees with the existing observations in some locations. Further investigation is ongoing to assess the impact of the OCO-2 surface pressure retrievals on the ADAS – specifically how they interact with the existing conventional surface pressure observations in the assimilation procedure. The impact of the retrievals on numerical weather prediction skill will also be considered. These results will be re-evaluated with the release of the Version 8 retrieval product

Other OCO-2 retrieval is total column water vapour, and its potential utility is being studied.

CGMS-44-NASA-WP-05: Space weather capabilities of NASA RO instruments **-** GNSS instruments developed by NASA for radio occultation have been capable of supporting space weather measurements for several years, with steadily increasing capabilities. Ionospheric capability of an RO instrument is not only a function of instrument design, but also depends on the spacecraft design and antenna configuration. In this paper we describe how NASA's RO instruments combine atmospheric and ionospheric capabilities. This working paper is in response to CGMS action A43.10 from Working Group II "CGMS members that operate RO instruments to explore RO capabilities to support space weather applications and report on their support to space weather application to CGMS-44."

Agile onboard design as called for by IROWG means correct placement of antenna positioning, and the processes to trigger software and signal processing. Generally, data rates are much lower in the ionosphere.

EPS-SG RO leads to an increase in data rate both in ionosphere and neutral atmosphere; currently with Metop cutting off at 110 km; EPS-SG anticipated to go up to 500 km.

CGMS-44-NOAA-WP-10: NOAA plans for using RO to support Space Weather Applications **-** This paper presented the NOAA generation of space weather information in application areas such as aviation. Enhanced observations over data-scarce polar regions and the oceans are required to improve forecasts and services, and RO is a mechanism. COSMIC-2 polar, and COSMIC-2A equatorial, will be beneficial for observing both the neutral atmosphere and the ionosphere.

Conclusions:

Demand for space weather services is growing around the globe.

- GNSS applications are impacted by space weather through disturbances in the ionosphere
- Radio occultation provides global coverage –including over oceans and regions with few ground-based receivers
- COSMIC-2 will substantially enhance the density of measurements and reduce data latency relative to COSMIC-1
- NOAA is developing numerical models to increase services to customers affected by ionospheric conditions
- Workshops are encouraged to increase synergy with terrestrial weather application of GNSS radio occultation

In response to the presentation, the WG II discussed the need of profiles in the ionosphere and the data latency. Whilst the improvements in data latency with COSMIC-2 reduced to ca 38 minutes on average some space weather applications, do have an even stronger need. This need could be addressed through an implementation in direct broadcast system and will be addressed user CGMS WG I, but in addition, the following two items need attention:

CGMS-44 RECOMMENDATIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	WGII /8	R44.28	Agencies to explore the possibilities to develop suitable processing packages to support a direct broadcast implementation of RO processing, within the DBNet to improve timeliness for space weather applications	CGMS-45 (for update)	**OPEN**	

CGMS-44 ACTIONS - WGII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
IROWG	WGII /8	A44.13	IROWG to define the requirements on timeliness for RO observations	CGMS-45	**OPEN**	1.1.4

WGII/ 9 Review and updating of the HLPP

M. Rattenborg presented the progress in implementing the HLPP 2015-2019, and a proposal for an updated Plan 2016-2020. No suggestions for change to the proposed new HLPP were made. The Group agreed to review the Plan as needed on a continuing basis.

WGII/ 10 Any other business

None raised.

WGII/ 11 Inter-sessional activities/meetings in 2016-2017 [CGMS-43 -> CGMS-44]

13 Oct 2016, 18 Jan 2017, 12 Apr 2017, all at 12.00 UTC.

WGII/ 12 Election of CGMS WGII co-chair

Dohyeong Kim (KMA) was unanimously elected by WGII.

WGII/ 13 Review of actions/conclusions, preparation of WG report for plenary

Summary of WGII actions and recommendations resulting from CGMS-44 discussions:

WGII actions open from previous plenary sessions (at CGMS-44)							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
CMA, EUM, JMA, NASA, NOAA, WMO	WGII/3	A42.02	The new task team on calibration events logging to identify a common set of parameters to be monitored as part of the calibration events logging and sensor performance monitoring.	1st step: Template for calibration event landing pages presented at GDAWG in March 2015. New version of OSCAR/Space allows for identification of individual instruments and thus linking to calibration event test pages, test mode of new version of OSCAR/Space continuing until 1 month before CGMS-43; 2nd step: Draft a white paper to agree on common terminology to be used on landing pages, foreseen in 2015/2016 for presentation to CGMS-44. CGMS-43 EUM-WP-10 CGMS-43-JMA-WP-03 (Section 2.4) NOAA: Work ongoing as a part of the GSICS work plan. Next steps are gathering information and agreeing on common terminology. New deadline following CGMS-43 WGII discussions. Nov 2015: Co-chair R Roebling, drafting white paper to be circulated within ICWG by end 2015 in preparation of CGMS-44. To be included in the GSICS paper following	(CGMS-43) **New deadline: CGMS-45**	**OPEN**	3.1

WGII actions open from previous plenary sessions (at CGMS-44)							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
				the new WGII agenda (possibly EUMETSAT's paper - TBD). CGMS-44: Delays incurred - new deadline proposed.			
KMA	WGII/4	A42.03	KMA is invited to present a paper of different sources of soil moisture retrieval on their NWP forecasts	CGMS-43-KMA-WP-04: Test use of Metop-B/ASCAT on their global NWP system New deadline following CGMS-44 WGII discussions - KMA NWP centre have not yet concluded analyses.	(CGMS-43) **New deadline: CGMS-45**	**OPEN**	-
CGMS space agencies	WGII/3	A43.01	Calibration events logging task team to prepare a white paper outlining the set of parameters, the nomenclature, and the	Nov '2015: Part of/related to CGMS-42 action 42.02. *CGMS-44: Work in progress, new deadline proposed.*	(CGMS-44) New deadline CGMS-45	**OPEN**	3.1

WGII actions open from previous plenary sessions (at CGMS-44)							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
			standards to be used for reporting on instrument calibration across space agencies.				
ROSH	WGII/3	A43.03	Roshydromet to present an update on Meteor-M N2 data access, processing packages, and results of an intercomparison of the IKFS-2 with other hyperspectral sounders (IASI, AIRS, CrIS), to CGMS-44.	Nov 2015: ECMWF has looked at microwave instruments which were reported on at the recent ITSC. ITWG and CGMS welcomes the sharing of data by ROSH, and further collaboration is expected. EUM has received Meteor-M N2 sample data of the MTVZA-GY Imaging/Sounding Microwave Radiometer (29 channels) and dissemination through EUMETCast is expected in Q1 2016 pending EUM Council approval in Dec 2015. mtg. ROSH will deliver a L1 pre-processing software to EUMETSAT early 2016. *CGMS-44: No progress reported at CGMS-44 - proposed new deadline.*	(CGMS-44) New deadline CGMS-45	**OPEN**	1.4.5
CGMS space agencies	WGII/3	A43.04	CGMS operators to provide a report on their approach on cal/val, including information on dedicated campaigns and permanent sites, and potential support to cal/val infrastructure, in order to maximize benefits of satellite missions.	Nov 2015: Feedback is expected as part of the general agency report or in a dedicated WP for the proposed new WGII agenda item 4 (CGMS-44 WG II item 8). 3 agencies reponded (JMA; NOAA NASA); keep open as action for CGMS-45 for remaining agencies.	(CGMS-44) New deadline CGMS-45	**OPEN**	-

WGII actions open from previous plenary sessions (at CGMS-44)							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	WGII/3	A43.05	CGMS operators to report on their specific plans for reprocessing and associated user requirements (such information would be useful for the ISWGs).	Item 8 - NASA, and NOAA responded (WP-09) keep open as action for CGMS-45 for remaining agencies.	(CGMS-44) New deadline CGMS-45	**OPEN**	5.1
CMA	(Plenary F.1.5.3) for WGII	A43.11	From CGMS-43 plenary: IROWG encouraged CMA to provide NRT GNOS data on the GTS, and CMA agreed to investigate this further	CGMSSEC recommends this to be discussed in WGII and reported to plenary through WGII	(CGMS-44) New deadline CGMS-45	**OPEN**	1.1.4

CGMS-44 WGII actions							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
SCOPE-CM Executive Panel	WGII/4	A44.01	SCOPE-CM should review its IP, Terms of Reference, and prepare for the next phase including a possible call for proposals.		CGMS-45	**OPEN**	5.1
CGMS space agencies	WGII/4	A44.02	CGMS members to submit data to the ICWG intercomparison: full-disk data at 10 minute temporal resolution, 2 km spatial resolution in the native AHI projection is preferred. The data should be submitted by 1 September 2016.		1 Sept 2016	**OPEN**	3.2.3
IPWG, IMD	WGII/4	A44.03	IPWG Rapporteur to liaise with IMD (AK Sharma) on the development of precipitation validation sites over India.		CGMS-45	**OPEN**	3.3.1

CGMS-44 WGII actions							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
GSICS members, GSICS EP	WGII/4	A44.04	GSICS to review the GDWG Terms of Reference and associated indicated levels of effort of the members		CGMS-45	**OPEN**	3.1.1
GRWG	WGII/4	A44.05	GRWG to dicuss with ISCCP (SCOPE-CM Project 9) a detailed project proposal for the use of GSICS methodologies to produce a GSICS-compliant ISCCP dataset for evaluation		CGMS-45	**OPEN**	5.1
CMA	WGII/6	A44.07	CMA to provide more information (documentation, availability details, URL) about the 3D-ADVP tool , for inclusion in the WMO webpage on Visualization Tools to CGMSSEC.		1 Oct 2016	**OPEN**	
IMD	WGII/6	A44.08	IMD to provide more information (documentation, availability details, URL) about the RAPID tool , for inclusion in the WMO webpage on Visualization Tools to CGMSSEC		1 Oct 2016	**OPEN**	
CGMS space agencies	WGII/6	A44.09	CGMS operators and WMO to work with NAEDEX-APSDEU to explore options for optimal data exchange of advanced data from next-gen GEOs		CGMS-45	**OPEN**	2
IWWG	WGII/7	A44.10	IWWG to pursue intercomparisons of Meteosat-8 and FY-2/4 winds over the IODC region. During the transition		CGMS-45 (for update)	**OPEN**	3.2.1

CGMS-44 WGII actions							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
			phase also Meteosat-7 should be considered.				
CGMS members	WGII/7	A44.11	CGMS to develop best practices for documenting products and their quality.		CGMS-45 (for update)	**OPEN**	3
ROSH	WGII/7	A44.12	ROSHYDROMENT to explore the possibilities to implement an operational NRT service for the hyperspectral infrared sounder IKFS-2 on Meteor-M N2		CGMS-45	**OPEN**	1.4.5
IROWG	WGII/8	A44.13	IROWG to define the requirements on timeliness for RO observations		CGMS-45	**OPEN**	1.1.4
WGII	SWTT	A44.14	From CGMS-44 SWTT: WGII to determine how to implement the planning and development of Space Weather research and data management activities within the auspices of WGII.		CGMS-45	**OPEN**	

CGMS-44 WGII Recommendations							
"Actionee"	**AGN item**	**Rec #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
SCOPE-CM members	WGII/3	R43.01	SCOPE-CM to invite contributions to its next call for proposals, with particular regard to the sea ice, snow cover and land surface temperature communities, and others currently not represented.	SEP in Sep 2016 to decide on approach regarding next call for proposals		**OPEN**	3.3.2
CGMS members	WGII/3	R43.02	CGMS members to consider removing spectral gaps from future hyperspectral sounders to support GSICS intercalibration of IR imagers.	To be discussed at first WGII inter-sessional meeting after CGMS-44.		**OPEN**	3.1.1
CGMS members	WGII/6	R43.03	CGMS members to consider include a water vapour channel and a CO2 channel to polar-orbiting imagers, to maintain accuracy and coverage of polar winds and cloud height retrievals achieved by MODIS.	To be discussed at first WGII inter-sessional meeting after CGMS-44.		**OPEN**	1.1.6
CGMS space agencies	WGII/10	R43.07	CGMS agencies to make available a non real-time cache of satellite level 1 data over the previous 2-3 months, similar to the NOAA CLASS system.	CGMS-44 IMD: At present there are no such plans (until a new data centre is installed).	CGMS-44	**OPEN**	2
ISRO	WGII/5	R43.10	ISRO is encouraged to implementing a multi-sensor precipitation estimate based on SAPHIR and INSAT-3D		CGMS-45	**OPEN**	HLPP # 3

CGMS-44 WGII Recommendations							
"Actionee"	**AGN item**	**Rec #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
IWWG, IPET-OSDE	WGII/6	R43.12	IWWG to liaise with the application focal points in the WMO RRR process (on IPET-OSDE) to provide feedback on the winds-related observation requirements in the RRR database.		CGMS-44	**OPEN**	HLPP # 1.1
CGMS space agencies	WGII/7	R43.13	CGMS Members to approach Operators of GNSS systems to request them to provide a minimum level of information on the signal structure and interface control (ICD) in a timely manner to enable the use of these for future RO missions.	To be discussed at first WGII inter-sessional meeting after CGMS-44.	CGMS-45	**OPEN**	HLPP # 1.1.3
CGMS plenary	WGII/3	R44.01	CGMS to endorse the proposed Terms of Reference for WGII including the following updates: Ø A 2-yearly rotation scheme for one of its co-chairs, with KMA starting after the end of CGMS-44 [Dohyeong Kim (KMA) to become the WG II co-chair, replacing Toshiyuki Kurino (JMA)]. Subsequently, co-chairs from CMA, JMA, ROSHYDROMET and IMD will follow. Ø WMO to provide the second co-chair Ø NOAA and EUMETSAT to	Endorsed by CGMS-44 plenary	9 Jun 2016	**CLOSED**	

CGMS-44 WGII Recommendations							
"Actionee"	**AGN item**	**Rec #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
			provide the rapporteurs				
GSICS	WGII/4	R44.02	GSICS to report to SCOPE-CM projects on its plan to intercalibrate the geostationary ring using hyperspectral IR sounders as transfer function	*Response needed for SCOPE-CM EP*	15 Sep 2016	**OPEN**	3.3.2
GSICS	WGII/4	R44.03	GSICS member agencies to identify roles and responsibilities and funding needs to support the geostationary ring GSICS corrections including the processing of retrospective data going back to NASA EOS AIRS (2002).		CGMS-45	**OPEN**	3.1.1
CGMS space agencies	WGII/4	R44.04	CGMS agencies should employ the GSICS Correction as part of their operational procedures			**OPEN**	3.1.1
CGMS members	WGII/4	R44.05	CGMS members to budget a baseline funding for the cloud intercomparison study, given its importance and impacts on global cloud products.		1 Nov 2016	**OPEN**	3.2.3

CGMS-44 WGII Recommendations							
"Actionee"	**AGN item**	**Rec #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
IROWG, IPWG, IWWG, ITWG	WGII/4	R44.06	To enhance coordination, ISWGs to discuss with ICWG co-chairs key items for collaboration.		1 Sep 2016	**OPEN**	
CGMS R&D agencies	WGII/4	R44.07	Research agencies to consider continuing space-borne lidar for ice/liquid water since they have proven very valuable to validate retrievals from passive sensors			**OPEN**	1.1.3
CGMS space agencies	WGII/4	R44.08	All operators of next-generation GEO imagers to consider the implementation of routine full-disc 10-min (or better) scanning for nowcasting		CGMS-45 (for update)	**OPEN**	3.2.4
CGMS space agencies	WGII/4	R44.09	CGMS Members to continue an operational constellation of conically-scanning microwave platforms to guarantee sustained support for the current level of capability.	CGMS-44 WGII - For reference: WG III should discuss this and come up with results at CGMS-45.		**OPEN**	1.1.6
CGMS members	WGII/4	R44.10	At the request of IPWG, CGMS to improve cross-agency coordination of satellite assets into A-train-like convoys of instruments with sensitivities to distinct aspects of precipitation processes (e.g., CloudSat, EarthCare, GPM, etc.).	CGMS-44 WGII - For reference: WG III should discuss this and come up with results at CGMS-45.		**OPEN**	
NOAA	WGII/4	R44.11	NOAA to ensure that both, equatorial and polar components of COSMIC-2 are fully funded and launched.		CGMS-45 (for update)	**OPEN**	1.1.4

CGMS-44 WGII Recommendations							
"Actionee"	**AGN item**	**Rec #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
CGMS members	WGII/4	R44.12	CGMS agencies to target at least 20,000 occultations/day, at appropriate global distribution, to be made available to the operational and research communities, based on recent impact studies (NWP, climate and space weather)			**OPEN**	1.1.4
CGMS members	WGII/4	R44.13	CGMS agencies to ensure that the RO receiver design includes sufficient software/firmware flexibility to allow changes in the signal processing including processing of new GNSS signals/constellations, including ionospheric measurements			**OPEN**	1.1.4
CGMS space agencies	WGII/4	R44.14	CGMS agencies to maintain the constellation of at least three polar orbits (early morning, morning, and afternoon), each with full sounding capabilities (IR and MW). The overpass times of operational satellites with sounding capability (IR and MW) should be coordinated between agencies to maximize their value.	CGMS-44 WGII - For reference: WG III should discuss this and come up with results at CGMS-45.		**OPEN**	1.1.1
CGMS space agencies	WGII/4	R44.15	Future satellite programmes should include the provision of high temporal frequency MW humidity sounding radiances	CGMS-44 WGII - For reference: WG III should discuss this and come up with results at CGMS-45.		**OPEN**	1.1.1

CGMS-44 WGII Recommendations							
"Actionee"	**AGN item**	**Rec #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
			(alongside cloud and precipitation sensitive observations).				
ROSH	WGII/4	R44.16	Roshydromet to develop and release a direct broadcast processing package for the Meteor-M N2 series, including level 1 processing for the MTVZA-GY microwave imager.		CGMS-45 (for update)	**OPEN**	1.1.5
CGMS space agencies	WGII/4	R44.17	CGMS agencies to identify the resources required to support the 3rd intercomparison of satellite-derived winds.	Reference is made to recommendation for ICWG.	1 Nov 2016	**OPEN**	3.2.1
CGMS space agencies	WGII/4	R44.18	CGMS satellite operators to consider coordination of orbits for scatterometer instruments and to provide open and timely access to data in order to maximise independent coverage and benefits to nowcasting and NWP from assimilation of scatterometer wind data.	CGMS-44 WGII - For reference: WG III should discuss this and come up with results at CGMS-45.		**OPEN**	1.1.6
CGMS space agencies	WGII/4	R44.19	CGMS agencies to explore possibilites to derive winds from new upcoming satellites and opportunities.		CGMS-45 (for update)	**OPEN**	
CGMS members	WGII/4	R44.20	CGMS members to continue to support SCOPE-Nowcasting and its transition to pre-operational phase, in particular to consider financial support the finalization	*Deadline for indication of support to volcanic ash activity)*	1 Nov 2016	**OPEN**	3.2.2

CGMS-44 WGII Recommendations							
"Actionee"	**AGN item**	**Rec #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
			of the satellite-based volcanic ash retrieval algorithm intercomparison activitiy (Pilot Project 2) over the next 12-18 months.				
CGMS space agencies	WGII/6	R44.21	Operators to take into account in the planning of their data distribution systems the emerging stringent requirements on data latency from SRNWP		CGMS-45 (for update)	**OPEN**	2
CMA	WGII/7	R44.22	CMA to make available data from FY-3D HIRAS and FY-4A GIIRS early in commissioning		CGMS-45 (for update)	**OPEN**	
CGMS space agencies	WGII/7	R44.23	CGMS agencies with operational direct broadcast needs are encouraged to attend the next ITWG sponsored Direct Broadcast Users Meeting in March 2017 hosted by CONAE, Argentina.		Mar 2017	**OPEN**	
CGMS space agencies	WGII/7	R44.24	CGMS agencies to provide key documentation related to the quality of their products, to allow for informed uptake by users. These documents should include ATBDs, cal/val plans, and regular validation reports	CGMS-44 WGII: Part of WGII action to develop best practices	CGMS-45	**OPEN**	5.3
CGMS space agencies	WGII/7	R44.25	For monitoring the Polar Regions, the Group stressed the importance of the deployment	*Link to WGIII required?*		**OPEN**	1.1

CGMS-44 WGII Recommendations							
"Actionee"	**AGN item**	**Rec #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
			of HEO missions				
CGMS space agencies	WGII/8	R44.26	Satellite operating agencies should support proposals and programs to acquire high-accuracy characterization measurements of the Moon, to develop a new, high accuracy, SI-traceable lunar reference standard for reflected solar wavelengths.			**OPEN**	3.1.2
CGMS space agencies	WGII/8	R44.27	Long-term continuity of absolute solar spectral irradiance measurement with SI-traceable accuracy should be ensured.			**OPEN**	3.2.1
CGMS space agencies	WGII/8	R44.28	Agencies to explore the possibilities to develop suitable processing packages to support a direct broadcast implementation of RO processing, within the DBNet to improve timeliness for space weather applications		CGMS-45 (for update)	**OPEN**	
WGII	WGIII/6	R44.29	From WGIII to WGII: WGII to study this issue and provide guidance on the potential impact of temporal a gap in the PMW SST products.	*(From WGIII to WGII)*	CGMS-45	**OPEN**	

WG III REPORT

WGIII on Operational Continuity and Contingency Planning convened on Tuesday 7 June 2016, 14:00 - 18:00.

- Chair: Suzanne Hilding, NOAA
- Rapporteur: Lars Peter Riishojgaard, WMO

WGIII/ 0 Objectives

The Co-Chair opened the meeting with a welcome and introductions.

WGIII/ 1 Review of actions and recommendations from previous meetings

The Chair and Rapporteur made a decision to review the actions at the end of the meeting leading to the following status summary:

WGIII actions open from previous plenary sessions (at CGMS-43)							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Dead-line**	**Status**	**HLPP ref**
ISRO	WGIII/2.2	A42.05	ISRO to report at CGMS-43 on its progress on radio-occultation processing of ROSA on Oceansat-2 and Megha-Tropiques, and on the possibility of near-real time access to ROSA data acquired at a high latitude station such as Svalbard.	CGMS-43 ISRO-WP-03 partially closed. NRT access to ROSA data remains open. CGMS-44:	(CGMS-43) **new deadline CGMS-44**	**OPEN**	HLPP# 1.1.4
EUM, ISRO	WGIII/2.2	A42.08	ISRO and EUMETSAT to report at CGMS-43 on their discussions on data dissemination collaboration for SCATSAT data.	Ongoing. New deadline following CGMS-43 WGIII discussions. Nov 2015: EUM-ISRO discussions ongoing. WGIII intersessional 10 Dec: 2015: EUM expects to report to CGMS-44 CGMS-44: EUMETSAT provided a verbal report. Implementation is under way.	CGMS-43) **new deadline CGMS-44**	**CLOSED**	HLPP# 1.1.3

CGMS-43 WGIII actions							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
NOAA	WGIII/2.2	A43.01	NOAA to report on results of new OSSE on radio occultation.	WGIII inter-sessional 10 Dec 2015: NOAA will report at next intersessional meeting. CGMS-44-NOAA-WP-12: NOAA's Update Observing System Simulation Experiments (OSSE) with GNSS Radio Occultation Observations (In response to Action # 43.01)	CGMS-44	**CLOSED**	-
WMO	WGIII/2.2	A43.02	WMO to report on the outcome of the WMO Impact Workshop in May 2016.	Verbal report to CGMS-44 by WMO (LP Riishojgaard)	CGMS-44	**CLOSED**	-
WMO	WGIII/6	A43.03	WMO to report on the status of the Vision for the WIGOS space-based component in 2040 in WGIII meeting at CGMS-44.	WMO/NOAA report at CGMS-44 expected CGMS-44 WMO-WP-01	CGMS-44	**CLOSED**	-

CGMS-43 WGIII Recommendations							
"Actionee"	**AGN item**	**Rec #**	**Description**	**Action feedback/closing document**	**Dead-line**	**Status**	**HLPP ref**
CGMS members	WGIII/2.2	R43.01	CGMS members are encouraged to consider including RO capabilities on all future polar-orbiting satellites.		Ongoing	OPEN	-
IPWG	WGIII/2.2	R43.02	IPWG should consider reporting impact of both passive microwave imaging and active dual-band radar to WMO Impact Workshop in May 2016.	Nov '15: White paper expected around mid 2016. Lead: Remy Roca. CGMS-44 IPWG-WP-01	01-Nov-15	**CLOSED**	-
CGMS members (CMA, EUM, ISRO, ROSH)	WGIII/2.3	R43.03	CGMS members to take into account the user requirements identified in the WMO survey (CGMS-43-WMO-04) when discussing continuous satellite coverage over the Indian Ocean region.	CGMS-44 EUM-WP-11 and -14	CGMS-44	**CLOSED**	-
CGMS members	WGIII/3	R43.04	CGMS satellite operators to keep WMO informed of satellite/instrument commissioning dates or termination dates and prepare individual instruments “landing pages” that could be pointed to by OSCAR.	CGMS-44-WMO-WP-14	Ongoing	OPEN	-

WGIII/ 2 Terms of Reference of Working Group III

CGMS-44-CGMS-WP-31 Proposed draft Terms of Reference for WGIII **-** Mikael presented the draft Terms of Reference for WGIII. The structure of the document is simple starting with a brief introduction regarding overall objectives as to why we have the WGIII. It was established in 1992 to deal with the risk of discontinuity in the key data services provided to WMO, and with contingency action planning to mitigate such risks. The Working Group was initially focused on key missions for weather monitoring and forecasting.

The scope of Working Group III is to review global satellite planning agreed by CGMS members in response to requirements expressed by WMO, IOC and other relevant user communities, to monitor the risk of gaps in implementing this planning, and to define individual or collaborative actions to be taken accordingly by CGMS members is the risk arises, in order to secure continuity of the critical services.

WGIII has 7 objectives:

1. Review of the overall baseline for the CGMS baseline observing system,
2. Review of the Status of implementation of the CGMS baseline,
3. Analyse the mapping of planned missions against the baseline
4. Identify continuity issues and initiate risk analysis as appropriate,
5. Propose contingency planning addressing specific observational gaps,
6. Propose optimisation measures for the observing systems as appropriate,
7. Integration of R&D missions (research to operations transition).

WGIII is of permanent nature and is co-chaired by two chairpersons supported by a rapporteur, all appointed by the CGMS plenary. All agencies of CGMS participate in WGIII.

The Chair asked the group to review the terms of reference and provide feedback over the course of the meeting. At the end of the meeting the group will do a final review and official adopt the terms of reference. Wenjian Zhang commented that the document was well written, but suggested that the document add a sentence to reflect that it is in align with the WMO vision.

WGIII **r**eviewed and adopted the Terms of Reference to would be presented to the 44th plenary session for endorsement.

WGIII/ 3 WIGOS 2040

CGMS-44-WMO-WP-01 Development of a Vision for the WIGOS space-based component in 2040 **-**WMO regularly reviews its Vision of future global observing systems to support weather, climate and related environmental applications. The 2040 Vision of the WIGOS space-based component systems is intended to provide a shared, high-level goal to guide the efforts of WMO Member states and satellite operators in the evolution of satellite-based observing systems. It is based on an attempted anticipation of user requirements in the WMO application areas, and technological capabilities, in 2040. The Vision, to be

developed and finalized by 2018 under CBS auspices, will be based on a broad consultation of user communities, WMO Technical Commissions, and space agencies. This document provides draft v0.2 of the Vision, using an initial draft developed by the CBS Expert Team on Satellite Systems (ET-SAT), input from a workshop held at WMO Secretariat on 18-20 November 2015, and taking into consideration comments provided at WMO meetings held in the January – April 2016 timeframe. CGMS operators have an action to provide comments on the draft, by 8 July 2016. This will allow for sufficient time to consider the comments in a new draft of the Vision to be endorsed by CBS-16 in November 2016.

CGMS-44 ACTIONS – WGIII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS members	WGIII/	A44.01	CGMS Members: to review and react to the WIGOS Vision 2040 as it develops	Aug-16	**OPEN**	1.1
WMO	WGIII/	A44.02	WMO Secretariat: to present the draft Vision at CEOS, GEO plenary sessions 2016.	31-Dec-16	**OPEN**	1.1

WGIII/ 4 Status of implementation of the CGMS baseline

No papers or discussion in this section.

WGIII/ 5 Mapping of planned missions against the baseline

CGMS-44-NOAA-WP-01 NOAA Report of the Status of Current and Future Satellite Systems - NOAA provided an overview of its current and future satellite systems describing its missions and priorities.

NOAA highlighted its numerous upcoming and recent launches. NOAA discussed its plans and improvements expected for the upcoming GOES-R series of geostationary satellites as well as the Joint Polar Satellite System (JPSS). GOES-R is scheduled to launch in October of 2016 and JPSS is scheduled to launch in January of 2017. NOAA also provided updates on its cooperative missions with partners including COSMIC-2, Jason-3, and DSCOVR. Phase 1 of COSMIC-2 is scheduled to launch in Q1 of 2017 and will be the new radio occultation satellite mission. NOAA updated CGMS on Jason-3 cal/val status following Jason-3's successful launch in January of 2016 as well as providing an update on DSCOVR which monitors space weather.

NOAA followed their satellite updates with information about its future plans for collecting data. NOAA discussed its commercial data activities, big data project, and future architecture study.

Karen St. Germain noted that the NOAA Commercial Weather Data Pilot RFI was released for public comment. A recommendation was taken for CGMS members to review. The details can be found at: https://www.fbo.gov/index?s=opportunity&mode=form&id=09512e960853e562024b6bd2f631ee6b&tab=core&_cview=0

CGMS-44 RECOMMENDATIONS - WGIII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS members	WGII I/	R44.01	CGMS Members are invited to comment on NOAA Commercial Space Policy and/or associated RFI by June 13, providing inputs per directions at the link: https://www.fbo.gov/index?s=opportunity&mode=form&id=09512e960853e562024b6bd2f631ee6b&tab=core&_cview=0	13-Jun-16	**OPEN**	

WGIII/ 6 Continuity Issues, Risk Analysis

CGMS-44-EUMETSAT-WP-13 Passive Microwave Constellation for SST - EUMETSAT presented a paper on the use of Passive Microwave radiometers (PMW) for Sea Surface Temperature (SST). The use of Passive Microwave radiometers (PMW) for Sea Surface Temperature (SST) retrievals is an essential component of the global constellation of SST sensors, providing information on the temperature of the ocean under clouds, where SST measurements from infrared sensors are not possible. Recent research has shown that large sampling error due to cloud masks at high latitudes compromise the SST CDR if only derived from IR SSTs. The PMW SSTs provide essential measurements in the high latitude regions where cloud persistence can prevent IR SST retrievals for significant periods of time (Liu et al, 2016) and where the climate change impacts are occurring first. While the IR SSTs provide accurate data in the Tropics, a large volcanic event could significantly impact the availability and accuracy of the SSTs in this region, further compromising any SST CDR that is derived from IR SST only. Additionally, SST from PMW is a crucial contribution providing input to ocean modelling and weather forecasting models. This capability is particularly important in synoptically active regimes where knowledge of the ocean surface temperature under low pressure systems, hurricanes and storms is needed. SST from PMW provides important, observations of the ocean surface temperature. There is a risk to the current and continued PMW constellation for SST and a need for a redundant capability of PMW with ~7 GHz. The issue was raised at the CEOS SIT Technical Workshop 2015 and followed with a presentation to CEOS SIT-31 in April 2016. This paper summarises the current constellation of PMW for SST with a view to the likely future constellation. Coordination and assistance is requested from CGMS for continuation of the existing capability and to facilitate redundancy of PMW for SST, particularly with access to current and future operational data streams. The paper follows on from a joint Group for High Resolution SST (GHRSST) / CEOS SST-Virtual Constellation (SST-VC) presentation to CGMS-42, WG III, agenda item 3 in 2014 on the current status of the SST constellation.

- Coordination and assistance to ensure the continuation of the existing capability of PMW for SST.
- Coordination and assistance to ensure the redundancy of PMW for SST.
- Assistance with access to current and future operational PMW data streams.

WGIII recommended to WGII to study this issue and provide guidance on the potential impact of temporal a gap in the PMW SST products.

CGMS-44-NOAA-WP-12 NOAA's Update Observing System Simulation Experiments (OSSE) with GNSS Radio Occultation Observations **-** In response to action A43.01, NOAA presented a paper on NOAA's Update on Observing System Simulation Experiments (OSSE) with GNSS Radio Occultation Observations.

The COSMIC constellation was launched in 2006 and had a design life for 5 years. COSMIC is currently at 10 years and began as a research mission that ultimately was used operationally. COSMIC-2A will launch in spring of 2017. COSMIC-2A is the low inclination portion of the constellation, whereas COSMIC-2B is the polar version. NOAA will be funding several OSSE's using current systems. Experiments are being run on GFS and HWRF and are estimated to be done by September 2016. There are currently 4 scenarios: Impact of the total loss of COSMIC; Impact of COSMIC-2A only (assuming COSMIC end of life); Impact of COSMIC-2A and COSMIC2B combination; Impact of COSMIC-2A and alternative polar constellation at COSMIC quality.

WGIII/ 6.1 Operational agencies' risk assessment

There were no papers submitted under this agenda item

WGIII/ 7 Indian Ocean Data Coverage (IODC) Roadmap Implementation

CGMS-44-EUMETSAT-WP-11 presents the status of implementation of the roadmap for the Indian Ocean Data Coverage (IODC) agreed at CGMS-43. The paper also lists the current satellites in orbit and future planned satellites in orbit for the region.

The joint ROSHYDROMET/ROSCOSMOS paper, **CGMS-44-ROSCOSMOS-WP-01,** presents the status and future plans of Russian GEO space system for Indian Ocean data coverage up to 2025. This includes Electro-L N1 and Electro-L N2 geostationary meteorological satellites occupy now 76°E and 77.8°E orbital positions. The Electro-L N1 satellite operates in a degraded mode due to technical issues onboard and is used for DCP purposes only. Electro-L N2 satellite was launched on 11 December 2015 to provide the operational coverage of the Indian Ocean region and is undergoing commissioning. The working paper also presents details on the satellite payload, products, data collection system specifications and data distribution.

WGIII/ 8 Space-based observing system review and optimisation

CGMS-44-JMA-WP-06 A feasibility study on Himawari-8 event-driven rapid-scan - In response to the Jakarta Declaration, adopted by the joint RAII/RAV workshop on WIGOS for DRR, JMA and the Bureau of Meteorology presented results from a feasibility study regarding event driven rapid scan imagery from Himawari 8.

CGMS-44-WMO-WP-14 WMO OSCAR/Space V2.0 **-** The new version 2.0 of the WMO OSCAR/Space on-line resource provides improved search capabilities, more accurate instrument status description, and a new instrument evaluation scheme based on an expert system approach. It offers three kinds of "Gap

Analysis": - Gap analysis by variable, based on expert rules - Gap analysis by variable, based on the declared mission objectives - Gap analysis by type of instrument, comparing e.g. the plans to the "Vision". The new approach is expected to increase the value and reliability of OSCAR/Space as a reference tool. It should also enable engaging expert groups to review the rules related to their fields of competence, leading to a truly collaborative resource. Beyond its primary role to support the WIGOS Rolling Review of Requirements, OSCAR/Space is expected to be a valuable resource for the satellite community as a reference tool for planning, studies, reports, frequency management, etc. It will require however a comprehensive documentation of sensor characteristics and status, which can only be achieved through close collaboration between space agencies and the WMO Secretariat.

CGMS-44 ACTIONS – WGIII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS members	WGIII/3	A44.03	CGMS operators nominate focal points for maintaining these elements (dates, landing pages), and other elements included in OSCAR/Space (e.g., instrument characteristics).	Ongoing	**OPEN**	5.3

CGMS-44 RECOMMENDATIONS - WGIII						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
WMO	WGIII/	R44.02	Noting the recent conclusions of the WMO IPET-DRMM and the concurrence expressed CGMS WG III, WMO is encouraged to add the satellite identifier (from Common Code Table C5) and satellite instrument identifier (from Common Code Table C8) to OSCAR Space.	CGMS-45	**OPEN**	2.7

WGIII/ 9 Integration of R&D missions (research to operations transition)

There were no papers discussed in this section.

WGIII/ 10 LEO-LEO research and demonstration mission

There were no papers discussed in this section.

WGIII/ 11 Update on Socio-Economic benefits Tiger Team (SETT)

CGMS-43-NOAA-WP-13 presents an update of the Socio-Economic Benefits Tiger Team (SETT). To date, the SETT has completed a literature review; identified socioeconomic expertise among CGMS members

and related institutions; conducted 3 workshops; and developed a guidance document for CGMS Members. This 25-page resource document is intended to assist CGMS members when they are considering contracting studies. Though all of these are marked complete, we consider them living documents or activities and update them and grow them as needed.

The current focus of our work is to undertake a pilot socioeconomic benefit study as a test of some of the approaches and lessons learned identified throughout this process. The SETT chose to focus on an assessment of the socioeconomic benefits of improved operational sea ice products resulting from enhanced satellite data. CGMS members are currently considering what resources (data, expertise, funding) they can contribute to this study. CMA will host the next SETT workshop in Beijing on 20-21 September 2016, which will focus on the Case Study.

WGIII invited the CGMS Space Weather Task Team (SWTT) members to participate in the SETT activities, and to provide their contact information to the SETT accordingly (Charles.wooldridge@noaa.gov).

WGIII/ 12 Review and updating of the HLPP

CGMS-43-CGMS-WP-29 Proposed CGMS High Level Priority Plan (HLPP) 2015-2019 **-** As part of the agreed revision cycle for the CGMS High Level Priority Plan, this document presents a proposed HLPP covering the period 2016-2020.

WGIII agreed to endorse the proposed CGMS HLPP 2016-2020.

WGIII/ 13 Any other business

There were no other topics discussed.

WGIII/ 14 Inter-sessional activities/meetings in 2016-2017 [CGMS-44 -> CGMS-45]

Proposed dates for WGIII inter-sessional meetings are 14 September 2016, 14 December 2016, and 15 March 2017.

WGIII/ 15 Review of actions, conclusions, preparation of WG report for plenary

The following provides a summary of the actions and recommendations resulting from WGIII discussions at CGMS-44:

WGIII actions open from previous plenary sessions (at CGMS-44)						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
ISRO	WGIII/ 2.2	A42.05	ISRO to report at CGMS-43 on its progress on radio-occultation processing of ROSA on Oceansat-2 and Megha-Tropiques, and on the possibility of near-real time access to ROSA data acquired at	(CGMS-43) **new deadline CGMS-44**	**OPEN**	1.1.4

WGIII actions open from previous plenary sessions (at CGMS-44)						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
			a high latitude station such as Svalbard. *CGMS-43 ISRO-WP-03 partially closed.* *NRT access to ROSA data remains open.*			

CGMS-44 WGIII actions						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS members	WGIII/	A44.01	CGMS Members: to review and react to the WIGOS Vision 2040 as it develops	Aug-16	**OPEN**	1.1
WMO	WGIII/	A44.02	WMO Secretariat: to present the draft Vision at CEOS, GEO plenary sessions 2016.	31-Dec-16	**OPEN**	1.1
CGMS members	WGIII/3	A44.03	CGMS operators nominate focal points for maintaining these elements (dates, landing pages), and other elements included in OSCAR/Space (e.g., instrument characteristics).	Ongoing	**OPEN**	5.3

CGMS-44 WGIII Recommendations						
Actionee	**AGN item**	**Rec #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS members	WGIII/2.2	R43.01	CGMS members are encouraged to consider including RO capabilities on all future polar-orbiting satellites. *Discussed at CGMS-44, remains open.*	Ongoing	**OPEN**	1.1.4
CGMS members	WGIII/	R44.01	CGMS Members are invited to comment on NOAA Commercial Space Policy and/or associated RFI by June 13, providing inputs per directions at the link: https://www.fbo.gov/index?s=opportunity&mode=form&id=09512e960853e562024b6bd2f631ee6b&tab=core&_cview=0	13-Jun-16	**OPEN**	
WMO	WGIII/	R44.02	Noting the recent conclusions of the WMO IPET-DRMM and the concurrence expressed CGMS WG III, WMO is encouraged to add the satellite identifier (from Common Code Table C5) and satellite instrument identifier	CGMS-45	**OPEN**	2.7

CGMS-44 WGIII Recommendations						
Actionee	**AGN item**	**Rec #**	**Description**	**Deadline**	**Status**	**HLPP ref**
			(from Common Code Table C8) to OSCAR Space.			
CGMS space agencies	WGII	R44.03	From CGMS-44 WGII: CGMS Members to continue an operational constellation of conically-scanning microwave platforms to guarantee sustained support for the current level of capability		**OPEN**	
CGMS space agencies	WGII	R44.04	From CGMS-44 WGII: CGMS to have a special discussion on the value of formation flying similar to the A Train – especially for precipitation and other hydrological applications		**OPEN**	
CGMS space agencies	WGII	R44.05	From CGMS-44 WGII: CGMS satellite operators to consider coordination of orbits for scatterometer instruments and to provide open and timely access to data in order to maximise independent coverage and benefits to nowcasting and NWP from assimilation of scatterometer wind data.		**OPEN**	

WG IV REPORT

WGIV on Global Data Dissemination convened on Monday 6 June 2016 at 16:15.

The Working Group held its session on Monday 6 June 2016 16.15-18:30, and Tuesday 7 June 08:30 – 11:30. Vasily Asmus from ROSHYDROMET served as chair and Klaus-Peter Renner from EUMETSAT as rapporteur. Representatives of the following organisations attended the session: CEOS-CSIRO, CMA, ESA, EUMETSAT, ISRO, JMA, KMA, NASA (WEBEX), NOAA, ROSCOSMOS, ROSHYDROMET and WMO (the full list of participants is included in the Annex).

WGIV adopted the agenda as proposed by the CGMS Secretariat with the following modifications:

The working paper **CGMS-44-CEOS-WP-02** was addressed at the beginning of the meeting, to allow a remote presentation via WEBEX, and the action review was moved to the end for discussion together with new actions and recommendations under item WGIV/15. The initial ordering of the agenda items is kept for the sake of the reporting below.

WGIV/ 0 Objectives

The Chairperson recalled the objectives of the WGIV as reflected in the agenda.

WGIV/ 1 WGIV co-chair

JMA nominated Dr. Hiroshi Kunimatsu (JMA) as a candidate for co-chair. There were no further nominations. WGIV participants unanimously elected Dr Hiroshi Kunimatsu as co-chair.

WGIV/ 2 Review of actions and recommendations from previous meetings

After CGMS-43 a total of 13 actions were open, 9 could be closed during the meeting, 4 actions remain open as per the below summary:

WGIV Actions open from previous plenary sessions (at CGMS-43)							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
CGMS Members	WGIV	A39.51	Action 39.51: All CGMS Members to propose using interoperability standards for providing and sharing of climate data records and report on their efforts at the next meeting of CGMS Deadline: CGMS-40	EUMETSAT: No further developments since CGMS-39. EUMETSAT is prepared to revisit this following an input from other CGMS members. NOAA provided inputs which were circulated via the CGMS list server on 02/11/12. Other CGMS members to provide their input. CGMS-41 WGIV commented that a more standardised solution is needed. Further discussion could take place at the EUMETSAT-WCRP Symposium on climate research and Earth observation from space planned for October 2014 if not completed earlier. Feb '15: Outcome still pending. WG-IV at CGMS-43 recommended to highlight this topic at plenary, in particular during the Climate session G. after consultation with John Bates (CEOS) who provided a presentation about data access, it is recommended to address this at the first inter-sessional meeting Presentation provided at WGIV webex Oct 2015.	(CGMS-40, -42) **New deadline CGMS-44**	**CLOSED**	HLPP# 5.1.3

WGIV Actions open from previous plenary sessions (at CGMS-43)							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
				webex #2 9 Feb 2015: WGIV rapporteur discussed matter with new vice chair of CEOS-CGMS JWG Climate and he will come back with a proposal and might be taken over by the JWG. Jan 2016: CEOS/CGMS WG Climate will integrate the action into the 2016 work plan of WG Climate with the aim to discuss the matter at the next WG Climate meeting in March 2016 and to provide a document to CGMS-44. Information circulated to csr on 10 Feb 2016. *CGMS-44: See CGMS-44-JWG CLIM-WP-02 and related new recommendation/action closed for WG-IV.*			
(CGMS satellite operators) **ROSH**	WGIV	A40.37	CGMS satellite operators to report about the implementation of the World Geodetic System (WGS84) and Earth Geodetic Model (EGM-96) geographical reference systems.	EUMETSAT has updated the standard and reported that it will implement the new standard starting with the next generation of GEO satellites MTG. JMA has recently made up a new document for the format of "Himawari standard data" and it adopts WGS84 for the reference of geodetic parameters. The document has been available on the JMA/MSC Web site since 30	(CGMS-41, 42, -43) **New deadline CGMS-44**	**CLOSED**	HLPP #3.2

WGIV Actions open from previous plenary sessions (at CGMS-43)							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
				October 2013. http://www.data.jma.go.jp/mscweb/en/himawari89/space_segment/hsd_sample/HS_D_users_guide_en_v11.pdf IMD is using WGS84 for Insat 3D as documented in the product guide "INSAT/DP/SAC/ SIPA/DPSG/TN-02/Ver 1.3/Mar 10" (provided by IMD). KMA: COMS HRIT and LRIT data is based on CGMS LRIT/HRIT Global Specification(Isuue 2.6, not WGS84). KMA does not plan to adopt WGS84 for the COMS data. For GK-2A which is the COMS follow-on, KMA will adopt WGS84 for HRIT, LRIT and UHRIT (all 16 channels data) disseminated by GK-2A to users. Documentation will be available in the near future. Other CGMS members (CMA) to report on the implementation. CGMS-42-ROSH-WP-02: Open. CGMS-43-JMA-WP-08 (Section 2)			

WGIV Actions open from previous plenary sessions (at CGMS-43)							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
				NOAA does not have plans to use WGS-84 for GOES-R, but will instead use GRS-80. See more information here: http://www.goes-r.gov/users/docs/PUG-main-vol1-verC.pdf &NOAA does not have plans to use WGS-84 for GOES-R, but will instead use GRS-80. See more information here: http://www.goes-r.gov/products/docs/PUG-Vol-5A-vC.1-Interim.pdf. Current POES are using WGS-72. Suomi NPP and JPSS will use WGS-84. *WG-IV at CGMS-43: change actionee to Roshydromet.*			
ROSH	WGIV	A40.38	ROSHYDROMET to report at CGMS-41 on the technical modalities for the near-real time provision of Meteor-M global data sets and associated ancillary information, as needed to fully contribute to the GOS.	This action was previously WGII 40.29. Following the CGMS-40 debriefing on 9 November 2012 it was decided to allocate it to WGIV. A new satellit of Meteor-M series is to be launched in 2013. After the commissioning phase ROSH will review the technial modalities for the near real time provision of Meteor-M data and associated anscillary information. CGMS-42 ROSH-WP-02: A new Meteor-M satellite is to be	(CGMS-41, 42, -43) **New deadline CGMS-44**	**CLOSED**	HLPP# 2.8

WGIV Actions open from previous plenary sessions (at CGMS-43)							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
				launched in summer 2014. After the commissioning phase Roshydromet will review the technical modalities for the near-real time provision of Meteor-M data and associated ancillary information based on instrument operational functionality. Apr 2015: Meteor-M N2 is now operational. There are still calibration issues to be resolved for major instruments. Microwave sounder MTVZA-GY data simulation is now being supported by the RTTOV v11 package. Provision of global datasets could be discussed. ROSH was unable to attend CGMS-43 and the action was postponed to CGMS-44 *CGMS-44: ROSHYDROMET:Meteor M-N2 and Elektro-L-N1/N2 are using WGS-84. see CGMS-44-ROSH-WP-05*			

WGIV Actions open from previous plenary sessions (at CGMS-43)							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
EUMETSAT	WGIV/2	A41.49	EUMETSAT to present the MTG dissemination baseline for RA-I (Africa).	CGMS-42: Definition is in progress but too premature to report upon. Jan 2015 IS#1 WGI/WGIV webex session: A study is under preparation bringing together thre user community. Unlikely that results will be available for CGMS-43. Verbal status report to be provided. Output will serve as input to data dissemination baseline for Africa. *WG-IV at CGMS-43: verbal status by EUMETSAT: Study is in progress and the results will be provided at CGMS-44.* *Webex WGIV 21 Oct 2015: WMO RA1 expert group meeting discussions in Aug 2015. Users do not make use of all available channels however users would like to have all MTG data. Migration from 2nd to 3rd generation is critical. Report by EUMETSAT expected at CGMS-44.* *Webex WGIV 9 Dec 2015: Transition scenario to be presented to EUM sr mgmt in Jan 2016. MTG Africa dissemination baseline*	(CGMS-42, -43) **new deadline CGMS-44**	**CLOSED**	HLPP# 2.2, #5.3

WGIV Actions open from previous plenary sessions (at CGMS-43)							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
				concept note proposal preparation ongoing. *Data volume and bandwidth issues to be considered. Baseline will be ready by the time MTG will be ready but not in the mmediate future and the action will be ongoing. It is suggested to close this action but to have it included in the preparation for the user preparation phase for Africa.* *Verbal summary will be provided to CGMS-44 (and future meetings).2016 internal EUM project formaly to be kicked-off to include this activity.* *CGMS-44-WMO-WP-07 superseded by new action on user preparation, can be closed*			
(CGMS members) **CMA**	WGIV/8	A41.56	Each CGMS member to review the GEO version of the Long Term Data Preservation Guidelines (GEO LTDP) and provide feedback on the applicability of each single guideline to its own organisation by creating a compatibility table for the organisation	CGMS-42-ROSH-WP-02: Still open CGMS-42-NOAA-WP-01: In general, NOAA is compliant with the GEO Long Term Preservation Guidelines (GEO LTDP) since these guidelines are based upon the Reference Model for an Open Archival Information System (OAIS-ISO 14721) and Producer Archive Interface Methodology Abstract Standard (PIAMAS-ISO 20652).	(CGMS-42, -43) **new deadline 31 Dec 2015**	**CLOSED**	HLPP# 5.1

WGIV Actions open from previous plenary sessions (at CGMS-43)							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
				Please see WP for full feedback. EUM: Michael Schick. *WG-IV at CGMS-43: further feedback expected by CMA only, change actionee to CMA, deadline Dec 2015* *See CGMS-44-CMA-WP-07*			
WMO	WGIV/8	A41.57	WMO to provide feedback from CCl (Commission for Climatology) regarding the GEO LTDP.	Jan 2015: CCl to still provide feedback. WMO to remind them. *WG-IV at CGMS-43: a last reminder to be sent, topic for intersessional meeting, deadline Dec 2015, then closure with or without feedback. No feedback received [Mar 2016]* *Closed following discussions in WGII at CGMS-44*	(CGMS-42, -43) **new deadline 31 Dec 2015**	**CLOSED**	HLPP# 5.1
CGMS members	WGIV/9	A42.05	CGMS Members to provide detailed comments on the Reference User Readiness Project to WMO (sbojinski@wmo.int)	EUM: Input on MTG provided through the WMO ET-SUP. This is now referred to SATURN Satellite User Readiness Navigator, part of SATURN portal. https://www.wmo-sat.info/satellite-user-readiness/ *WG-IV at CGMS-43: extend deadline to CGMS-44* *Superseded by "Best Practices" WPs, can be closed.*	(CGMS-43) **new deadline CGMS-44**	**CLOSED**	HLPP# 5.3

CGMS-43 WGIV actions							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
CGMS members	WGIV/3	A43.01	CGMS members to comment on "WMO Satellite Data Dissemination Strategy" (CGMS-43-WMO-WP-09)	EUM: Will provide comments directly to WMO prior to CGMS-44. Closed following discussions at CGMS-44.	CGMS-44	**CLOSED**	-
EUMETSAT	(WGIII/2.) WGIV/4 ?	A43.02	(Action transferred from WGIII) EUMETSAT to propose dissemination plan for data from Indian Ocean Data Coverage partners identified in CGMS-43-EUM-14 roadmap.	WGIV webex 9 Dec 2015: WMO seeking to assure that the dissemination to users will be equivalent to the current one (EUMETSAT, CMA, ROSH and ISRO to collaborate and clarify this in view of CGMS-44. EUMETSAT makes FY-2E data available through EUMETCast. EUM expects its Council to take a decision on moving Meteosat-8 to ca 40 degr E in June 2016 (after CGMS-44). *See CGMS-44 EUM-WP-14, extend deadline to CGMS-45, ongoing work*	(CGMS-44) New deadline CGMS-45	**OPEN**	-
NOAA	(WGI/4) WGIV/7 ?	A43.03	NOAA to consider including GLM products in the HRIT stream	Webex 21 Oct 2015 discussion: NOAA is working on it, and final product list will be ready in the course of 1st 1/2 of 2016. *NOAA is planning to include it in an updated Q3 2016 product list, extended deadline.*	(CGMS-44) New deadline Dec 2016	**OPEN**	-

CGMS-43 WGIV actions							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
CGMS members	WGIV/10.1	A43.04	CGMS members to provide comments on the Progress Report of Task Team on discovering Meta Data (CGMS-43-EUMETSAT-WP-19)	Ongoing. CGMS TF-MI chair [EUM] will provide feedback to the corresponding WMO technical groups for review/information. Oct 2015: - The 7th CGMS-WMO TFMI Telco took place on 8 Oct 2015. Minutes: https://github.com/CGMS-TFMI/CGMSTFMI-Teleconferences/blob/master/20151008-TF-MI-7th-Telco/20151008-CGMS-TF-MI-7th-Telco-Minutes_v1.0.docx - The Mapping of the Information Model developed by the CGMS WMO TFMI to WMO Core Profile 1.3 will be complete by end Dec 2015. - A list of representative products from each organisations will be defined and finalised by end Nov 2015. - Each member organisation will provide by end Nov 2015 a spreadsheet for at least one of their products with the information for describing the product as defined in http://www.cgms-info.org/documents/CGMS-TF-MI-SatelliteDataEssentialInformationForDiscoveryMetadata.pdf	CGMS-44	**CLOSED**	-

CGMS-43 WGIV actions							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
				- Complete documentation and examples to be provided for March 2016 and submitted to CGMS Working group IV, WMO IPET-MDRD and WMO ET-WISC (GISC Task Team). WGIV webex 9 Dec 2015: Task Team will conclude its activities prior to CGMS-44 and an endorsement will be required by plenary for the description of satellite data. *Closed following CGMS-44-EUMETSAT-WP-17*			
EUMETSAT	(WGI/6) WGIV/10.1	A43.05	CGMS Task Team on metadata to define discovery metadata for DBNET	WGIV webex 9 Dec 2015: Draft DBNet guide submitted to TT, for cross-checking. To assure meta data aspects are taken into account. Expected to be endorsed as part of the final report. *CGMS-44-EUMETSAT-WP-17, ongoing work, extended deadline.*	(CGMS-44) New deadline CGMS-45 (TFM???)	**OPEN**	-

CGMS-43 WGIV actions							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
CGMS members		A43.06	CGMS members to provide a listing of their data access portals.	CGMS-44-NOAA-WP-14 PPT EUM: http://navigator.eumetsat.int https://eoportal.eumetsat.int *Deadline extended following CGMS-44. OSCAR to be checked by the CGMS agencies*	(CGMS-44) New deadline CGMS-45	**OPEN**	-

CGMS-43 WGIV Recommendations							
"Actionee"	**AGN item**	**Rec #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	WGIV/7	R42.01	Satellite operators to provide WIS Discovery Metadata Records, compliant to WIS requirements and following the guidance to be provided by the CGMS-WMO Task Force on metadata implementation, in order to facilitate satellite information discovery and access	NOAA: Related to metadata, the best reference is NGDC metadata provided here the URL: http://www.ngdc.noaa.gov/metadata/ *WGIV CGMS-43 discussions: Ongoing and routine activity. Recommendation maintained until CGMS-44* *WGIV webex 9 Dec 2015: To be taken up at the TT on Meta Data meeting the week of 14 Dec 2015.* *See CGMS-44-EUMETSAT-WP-17. Recommendation is still valid, to be extended.*	(CGMS-43) New deadline **CGMS-45**	**OPEN**	HLPP# 2.9

WGIV/ 3 WGIV key issues

WGIV 3.1 Recommendation/endorsement of the Task Force on Metadata

CGMS-44-EUMETSAT-WP-17 The TFMI chair (EUMETSAT) presented the Progress Report and Outcomes from the TF on Metadata Implementation.

The CGMS-WMO Task Force on Metadata Implementation (TFMI) has been created after CGMS 42 to provide a consolidated view regarding the WMO Information System (WIS) discovery metadata definition for satellite data products, accelerate the adoption of WIS by satellite data providers and represent the satellite data users' point of view within the WIS. The Task force has continued to work on its prime task: publishing guidance documentation on WIS metadata creation for satellite data products. The document presents the work performed by the Task Force during year two: the finalisation of the guidance documentation on metadata creation, the participation of the Task Force to the creation of the WIS metadata official documentation and the outcome within the WIS from the last year WIS Portal Usability Report. This report details also the future work to be performed by the Task Force and is asking the CGMS to endorse the assessment by CGMS TFMI of the WIGOS metadata OGC Observations and Measurements mapping to insure that WIGOS is covering the most common use-cases for satellite observations.

WMO thanked the TFMI for the work done and emphasised the importance of activity and also of the involvement in the WIGOS review. WGIV agreed that the documentation must be completed and the mandate should be extended to cover the WIGOS review.

CGMS-44 ACTIONS – WGIV						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
TFMI (Task Force on Metadata)	WGIV/3.1	A44.01	TFMI to submit the "Guidance Documentation on WMO Core Profile Metadata Creation For Satellite Products" to WMO IPET-MDRD and IPET-SUP.	30 Dec 2016	**OPEN**	2.7

Following a recommendation from WG IV, CGMS-44 plenary endorsed the extension of the CGMS Task Force on Metadata Implementation (TFMI) mandate to assess the WIGOS Metadata OGC Observations and Measurements mapping and to report its findings/recommendations to WMO IPET-MDRD.

WGIV 3.2 Recommendation/endorsement of the User Readiness Planning

CGMS-44-WMO-WP-02 WMO presented Best Practices for Achieving User Readiness for New Meteorological Satellites.

The WMO guidelines on user preparation for the new generation of meteorological satellites adopted at CBS-XV in 2012 urges each of the NMHSs and other operational user organizations to:

"Establish a user readiness project focused on the introduction of new satellite data streams into operations (to be initiated ~5 years prior to launch)" Against this background, Seventeenth World

Meteorological Congress 2015, through Resolution 37 (Cg-17), recommended “to all concerned Members to set up user preparation projects in advance of the launches of new satellite systems, in accordance with the CBS Guidelines for ensuring user readiness for new generation satellites”. It is crucial, that the satellite development entities and operators provide detailed and up-to-date plans for their activities conducted in support of User Readiness Projects. The WMO Space Programme has, supported by a number of experts, analysed how the typical cycle of satellite system development relates to typical User Readiness Projects, and the outcome of this analysis is a summary of best practices and a generic project schedule. The generic schedule indicates at what time relative to planned launch what information should be available in order to both satisfy the user preparation schedule and respect the constraints of satellite system development. Section 5 of the document provides detail on the deliverables needed from satellite development programmes to support user readiness projects.

The document presents, in an integrated manner, Best Practices for User readiness Projects performed by user organisations (e.g. NHMSs) as well as for satellite development programmes in support to user readiness.

WMO and NOAA thanked for this presentation and both laid out how important it is for users and satellite operators to coordinate their effort in the upcoming transition from the current to the next generation satellites, e.g. for GOES to GOES-R. WMO stressed that there is not only a commitment for satellite operators to support the transition, but also an obligation for users to set up user readiness projects. A mutual effort is necessary between both sides. The Himawari-8 project provided a blue print for such a transition scenario.

The working group agreed to the best practices and recommends endorsement by plenary.

CGMS-44 RECOMMENDATIONS - WGIV						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS members	WGIV/3.2	R44.01	CGMS members to contribute to the implementation of the Best Practices for User Readiness for meteorological satellite systems under development, both GEO and LEO	CGMS-45	**OPEN**	5.3
CGMS members	WGIV/3.2	R44.02	CGMS members to continue the provision of up-to-date User Readiness information in the SATURN portal	CGMS-45	**OPEN**	5.3

Following a recommendation from WG IV, CGMS-44 plenary endorsed "**CGMS-44-WMO-WP-02** Best Practices for Achieving User Readiness for New Meteorological Satellites", as far as it applies to satellite operators, as CGMS Best Practice.

WGIV/ 3.3 IODC data dissemination plan (CMA, EUM, ISRO, ROSH)

CGMS-44-EUMETSAT-WP-14 EUMETSAT presented as a response to action A43.02 the EUMETSAT contribution to a CGMS Data Dissemination Plan for IODC.

The paper presents the current status of access to satellite data from satellite operators in the Indian Ocean region. Meteosat-7 is planned to be replaced by Meteosat-8, subject to a decision of the EUMETSAT Council in June 2016. This service from an orbital position of 41.5° E will be on a best effort basis.

Meteosat-8 15 minutes Full-Earth repeat cycle image data, the full set of derived meteorological products, and DCP messages will be available via EUMETCast Europe and Africa and from the Data Centre. A subset of meteorological products and DCP bulletins will be available via GTS, and GERB data will be available via the Data Centre.

EUMETSAT will also provide Elektro-L N2 images on EUMETCast Europe following successful commissioning of the spacecraft

The WMO CGMS VLab is aware of the changes in the Indian Ocean data coverage and the WMO-CGMS Centres of Excellence in the region are planning their support to the national training program efforts.

The presentation shows that there is no single “one fits all” data access solution available, but the combination of data access methods from different agencies covers the region very well.

WMO pointed out the importance of the IODC coverage for East Africa and that on the long term a more permanent solution must be found to close the gap. CMA added that wind products from FY2E are available via GTS.

CGMS-44-ISRO-WP-02 ISRO presented as a response to action A43.02 the IODC data dissemination plan: ISRO report.

The document provides an overview of the various meteorological satellite missions from ISRO, the data formats and characteristics, and data access means.

Questions were raised about the eligibility of getting access to data.

In this respect, as a first step, CGMS Secretariat has sent letters to CMA, ISRO and ROSHYDROMET to support the definition of a set of essential products from all satellite operators in the region. This will be addressed in a dedicated session under Agenda item E.3.3. Once the set of essential data is defined the details of data access and distribution can be assessed which requires support from the partners.

Following a recommendation from WG IV, CGMS-44 plenary endorsed that CGMS agencies in the IODC region (CMA, EUMETSAT, ISRO, ROSHYDROMET) support the distribution of essential data to IODC users via their existing dissemination methods (CMACast, EUMETCast, GTS, Internet, etc.).

WGIV/ 4 Implementation of sustained and coordinated communication satellite broadcast systems

CGMS-44-NOAA-WP-14 NOAA presented an Update on the Product Distribution and Access (PDA) System.

The PDA will become the main source for near real time distribution of satellite data with the exception of McIDAS format. Current manual subscription processes will be highly automated. The system is aiming to support much higher future data volumes and download demands from users. Current CGMS users of the DDS will be informed by NESDIS in the two months on the process to re-validate access of data from the future PDA. Following approval, NESDIS will provide connection information and work the interface. PDA subscriptions will be established by NESDIS for the data requested. There are significant changes forthcoming to contingency GOES-R and JPSS operations in the PDA era. The current suite of back-up products will be limited to NWS AWIPS, key GOES Rebroadcast (GRB) products, and a JPSS subset of primary sensors. Operational readiness review is planned for July 2016. Migration of data flows from DDS will requires coordination. The transition period is coupled to support GOES-R operations, i.e. GOES-R data is expected to be the first products available from the PDA.

The data access and distribution policy was described and online links with contact points were also presented.

NOAA responded to a question from WMO about the meaning of signed cooperation agreements, that this is intended to manage the priorities of data delivery in case of high demand such that all user requests cannot be satisfied. This situation should normally not be the case for all international agencies that provide real-time 24x7 support to protect life and property. However, due to overall demand at any given time, users may have a delay in service. WMO suggested following the “one access per country” policy to limit the number of parallel requests, as it is established by JMA.

WMO also mentioned that using different avenues helps to facilitate the transition, e.g. cloud, HimawariCast, GISC as used by JMA.

The WG took note of the PDA presentation.

WGIV/ 5 Incorporation and dissemination of R&D and pre-operational mission data

CGMS-44-EUMETSAT-WP-15 EUMETSAT presented an overview of the EUMETSAT Third Party Data Service. This document summarises ongoing activities in the area of Third-Party Data Services. The document is structured in two parts – an assessment of the Third-Party Data Services under consideration, and a summary of the status of currently ongoing Third-Party Data Service implementation activities, excluding those implemented at the request of Copernicus. The document lists products/instruments from all non-EUMETSAT satellite missions including operational satellites and R&D satellites. The implementation of products which are of interest for EUMETSAT member states is following a standard process and the status is updated on a regular basis.

The working group took note.

WGIV/ 6 Coordinated dissemination services for additional user communities

CGMS-44-NOAA-WP-15 NOAA presented a Report on Status and Future Plans for GEONETCast Americas.

GEONETCast-Americas (GNC-A) is a regional contribution to the global GEONETCast system. GNC-A serves much of North America, the Caribbean Basin, and all of Central and South America. GEONETCast Americas forms part of the "global" GEONETCast environmental data dissemination systems with system deployed in Europe, Africa, and Asia.

NOAA continues to work closely with regional partners to support the GEOSS Societal Benefit Areas and to address the requirements of the Coordination Group on Satellite Data requirements for RA III and RA IV where appropriate. NOAA is working to expand the broadcast bandwidth to support upcoming satellite systems.

Discussions are in progress with the vendor of the GNC-A to expand the bandwidth an additional 4.7 Gbps. With the contribution of 1 Mbps from INPE, there is a potential of a total bandwidth of 7.7 Mbps by fall 2016. INPE is collaborating with NESDIS IIA to become a full partner in GNC-A activities that would enable formal financial contribution toward GNC-A development.

GNC-A supports capacity building through assisting the efforts of countries to add receive stations and develop national networks like those in Brazil, El Salvador, Costa Rica, Colombia, and Mexico. Additionally, GNC-A supports capacity building through collaboration with the WMO Virtual Laboratory for Training and Education in Satellite Meteorology (VLab) and promoting participation in the GEONETCast Americas Coordination Group. GEONETCast also participates in training events including a training event on GNC-A and GOES-R held in Mexico City in May, 2016 and a four day AmeriGEOSS Week training and train-the-trainer event at the National University of Colombia the week of June 6-10, 2016. Many users are particularly interested in NOAA's new satellite, GOES-R, the operational utility of its ABI spectral bands. This will be an outreach focus at upcoming meetings.

The GNC-A Coordination Group is being re-vitalized to serve as a forum for regional partners, providers, and users to provide advice and coordinated input on the GEONETCast Americas data flow, including the identification of data and products, data acquisition, priorities, data utilization, system operation, and opportunities for capacity building. GEONETCast Americas has been recognised as an AmeriGEOSS Foundational Group Activity in November 2015.

WMO thanked for the progress and the planned evolution of GEONETCast Americas, in particular regarding GOES-R content. This allows using this service as an affordable backup solution for GOES-R data reception.

The GEO Secretariat added that the GEO initiatives are supported through monthly teleconferences.

NOAA thanked WMO for the help to bring users in the region together.

WGIV/6.1 Disaster mitigation purposes

There was not specific paper presented under this topic, see previous paper **CGMS-44-NOAA-WP-15**.

WGIV/6.2 Ocean user community

CGMS-44-JCOMM-WP-01 ESA presented the Report from JCOMM Cross-Cutting Task Team on Satellite Data Requirements.

JCOMM TT-SAT (cross-cutting task Team on Satellite Data Requirements) has been established in order to consider, define and coordinate JCOMM satellite interests. The group was formed in March 2014. JCOMM TT-SAT is in charge of developing a strategy document addressing the “Marine meteorology and oceanographic forecasting service requirements for integrated satellite products".

Initiated mid-2014, the strategy document has been already partially developed for some Essential Ocean variables and discussed by the JCOMM Management Committee (MAN) mid November 2015. MAN recommended to highlight the synergy between in-situ and space based data, emphasize the need for a project about Surface Wind Vectors and involve space agencies in order to get feedback about the requirements.

The strategy document will be further developed according to these recommendations with a target release in October 2017 for the 5th JCOMM session.

JCOMM TT-SAT recently contributed to the IOC Working Papers for Coordination Group for Meteorological Satellites (CGMS): “Aquarius and SMOS Sea Surface Salinity Measurements: A Review of Initial Results” (2015), and Satellite Sea Ice Measurements in the Arctic Ocean (2016).

In the following discussion by the working group it was acknowledged that there is a slow progress in the definition of a suitable standard due to very diverse requirements, communities and ideas about data access. The development of the GHRSST standard was mentioned as a positive example starting from a similar situation.

CGMS-44 ACTIONS – WGIV						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
JCOMM task team	WGIV/6.2	A44.04	The JCOMM Task Team to work together with the International Wind Working Group and the CEOS "Ocean Surface Vector Wind Virtual Constellation" (OSVW-VC) at developing a project on Surface Vector Winds, using the well-known and highly successful GHRSST Project as a model for the adoption of globally-agreed standards for the production and distribution of global, integrated, surface vector winds and associated products.	CGMS-45	**OPEN**	2.5

WGIV/ 7 Development of efficient standardised data handling for high-resolution imaging and hyper-spectral instruments

CGMS-44-EUMETSAT-WP-16 EUMETSAT presented an overview of the MTG FCI and IRS Format.

The document describes the principle scanning pattern of the Flexible Combined Imager (FCI) and the InfraRed Sounder (IRS). The two instruments are on different satellites called MTG-I (FCI) and MTG-S (IRS). The scanning pattern of the FCI is uniform across the disk, whereas the IRS scans 4 different areas at different frequencies. The data volumes are considerable higher compared to the MSG volumes, therefore efficient data formats must be used to reduce bandwidth demand. For both instruments L1 data netCDF-4 was chosen, with lossless CharLS (based on JPEG-LS) compression used for FCI and principal components used for IRS. A consolidated L1 format is expected by end of 2016.

For L2 products other formats may be used (e.g. BUFR) based on dissemination requirements, either directly or using converters (e.g. netCDF to BUFR).Also the dissemination baseline for the different data access methods is not yet finalised, it depends on user needs, throughput, number of users for a given product, location of users and level of service.

WMO urged that a timeline for the missing information should be made available soon to support user preparation, following the Best Practices for Achieving User Readiness.

CGMS-44 ACTIONS – WGIV						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
EUMETSAT	WGI V/7	A44.02	To provide a timeline for the users preparation information for MTG, in accordance with "CGMS-44-WMO-WP-02 Best Practices for Achieving User Readiness for New Meteorological Satellites"	30 Dec 2016	**OPEN**	5.3

WGIV/ 8 Use of the WMO Information System (WIS) infrastructure for data provision and discovery

WGIV/8.1 WMO Satellite Data Dissemination Strategy

CGMS-44-WMO-WP-07 WMO presented the WMO Satellite Dissemination Strategy.

The working paper addresses both strategic and technical aspects of satellite data dissemination, at global and regional levels. Quantitative performance indicators for assessing progress with elements of the Satellite Data Dissemination Strategy are discussed, building on the WIS and contributing to the IGDDS. The indicators should

- Represent critical success indicators for SDDS
- Cover all 5 main strategic areas of strategy
- Be produced with reasonable amount of effort on a sustained basis

Examples are provided for existing progress indicators (such as DBNet coverage), and ideas for new ones. The possibility of generating monitoring results on satellite data availability at global NWP centres was discussed. For satellite data, the success criteria for WIS implementation defined by WMO are not currently fulfilled operationally. To bridge this gap for the medium-term, a discussion should be held on generating satellite data monitoring reports based on monitoring activities performed by existing global NWP centres.

A discussion on suitable monitoring tools and the focus of the monitoring started. The working group took note.

WGIV/ 9 Coordination of metadata for satellites and instruments

CGMS-44-WMO-WP-08 WMO presented the WIGOS Metadata Standard.

The WMO Integrated Global Observing System (WIGOS) Metadata Standard is a semantic standard, defining a common set of requirements for metadata elements, to be recorded and reported, describing all kinds of observations, meteorological, climatological, hydrological, oceanic and environmental. The WMDS is applicable to all observing systems, in-situ, remote, fixed, mobile, on land, on sea, on ice, on rivers, etc.

WIGOS metadata is observational or description metadata which explains what, why, where, how and who made the observations, enabling data values to be interpreted. It is not discovery metadata that facilitates data discovery, access and retrieval, which is part of the WMO Information System (WIS).

Version 1.0 of the WIGOS Metadata Standard (WMDS) was approved by the 17th World Meteorological Congress (May-June 2015, Geneva, Switzerland), as part of the Manual on WIGOS and it will come into force for WMO Members on 1 July 2016.

A major outcome of a workshop on WIGOS metadata for space-based observations (Geneva, Sep/Oct 2015) was that the WMDS is applicable and should be used by the meteorological satellite community, after a few additions and small adjustments that were identified. The workshop recognized the benefits of all observing systems, surface and space-based, adopting the WMDS to ensure interoperability. It was recognised that strengthened collaboration between WMO/WIGOS and the satellite community should contribute to the further improvement of the WMDS, in order to ensure its full applicability to all observations from space-based systems. Amongst the actions agreed in the workshop, some changes, additions, as well as examples were incorporated in the interim version of the WMDS, version 1.01

The working group noted that the new standard is planned to be reviewed by the CGMS TFMI. Therefore there is no need for a related action until the feedback from the TFMI is available.

WGIV/ 10 Evolution and promoting harmonisation of data access portals

CGMS-44-CEOS-WP-02 NASA (via WEBEX) presented the Committee on Earth Observation Satellites (CEOS) Working Group on Information System and Services (WGISS) Data Access Infrastructure and Interoperability Standards, in response to CGMS action A39.51.

The Committee on Earth Observation Satellites (CEOS) serves as a focal point for international coordination of the satellite Earth Observation (EO) programs of the world's government agencies, along with agencies that receive and process data acquired remotely from space. The Working Group on Information Systems and Services (WGISS) is a subsidiary body of CEOS tasked with promoting collaboration in the development of systems and services that manage and supply these observatory data. Through WGISS, CEOS is harmonizing the aspects of data systems necessary to facilitate interoperability.

WGISS has adopted the CEOS OpenSearch Best Practices and the Open Geospatial Consortium (OGC) Catalogue Services for the Web (CSW) v2.0.2 standards for searching remote sensing catalogues, both for collection and inventory information. WGISS supports several implementations of multi-agency catalogues that use both these standards -- which then serve as the WGISS data access infrastructure. WGISS supports the International Directory Network (IDN) for registering data collections. Both CWIC (CEOS WGISS Integrated Catalogue) and FedEO (Federated Earth Observation missions access) systems offer search of inventory data and access to the data records. The FedEO, CWIC and IDN systems have implemented the WGISS supported standards are providing access to over 2300 collections and 76+millions granules of EO mission data. These systems have also integrated with GEOSS (Group on Earth Observations System of Systems) and are being accessed by the GEO components (Geo Web Portal, Data Access Broker - DAB). CEOS strives to make all Essential Climate Variable (ECV) products provided by CEOS agencies discoverable and accessible via WGISS supported standards.

WGISS will continue to work towards a common understanding of the information model for satellite data, the identification and testing of common search criteria for satellite data products, and adaption and testing of the common standards and protocols to describe, search, and access satellite data.

CGMS-44 ACTIONS – WGIV						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS members (data providers)	WGIV/10	A44.03	CGMS members (data providers) to: a) discuss and respond to the recommendation from CGMS-44-CEOS-WP-02: CEOS recommends the adoption of the WGISS supported standards for searching Climate Data Records (CDRs). WGISS will provide technical support to CGMS data providers providing their climate data records through the WGISS	CGMS-45	**OPEN**	5.1

CGMS-44 ACTIONS – WGIV						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
			data access infrastructure (IDN, CWIC, FedEO); and b) report how far the standards WGISS developed (as described in CGMS-44-CEOS-WP-02) are supported.			

This action will be on the agenda for the next WGIV inter-sessional meeting.

WGIV/ 11 User dialogue and interface

CGMS-44-ROSHYDROMET-WP-12 ROSHYDROMET presented the Satellite Data Exchange in ROSHYDROMET.

The document presents an overview of satellite data exchange mechanisms in ROSHYDROMET, including participation in EUMETSAT Advanced Retransmission Service (EARS).

EUMETSAT thanked Roshydromet for the successful cooperation and is looking forward to further evolution and the introduction of Elektro-L-N2 products.

WGIV/11.1 Response to region-based requirements for satellite data access and exchange

CGMS-44-WMO-WP-12 WMO presented the "Update on data requirements of the WMO Coordination Group on Satellite Data Requirements for Region III and IV".

The WMO Coordination Group on Satellite Data Requirements for Region III and IV (RA-3-4-SDR) has made significant progress in the inter-sessional period, particularly in:

- Developing a draft roadmap for regional satellite data distribution in the Regions
- Carrying out a detailed Region-based user survey
- Maintaining a baseline of requirements for satellite data and product access
- Maintaining a close dialogue with NOAA and EUMETSAT on matters related to satellite data access and user preparedness (in particular to GOES-R)
- Planning for the second face-to-face meeting of the Group, scheduled 5-8 September 2016 in Willemstad, Curaçao, with focus on finalizing country-specific satellite data access solutions NOAA and EUMETSAT have been strong supporters to the Group's objectives, and this should continue. For example, since the EUMETCast-Americas service will be terminated by the end of 2016, both agencies are helping users in the transition from EUMETCast-Americas to GEONETCast-Americas.

The working group appreciated the progress and recommended continuation of the engagement.

CGMS-44 RECOMMENDATIONS - WGIV						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
EUM and NOAA	WGIV/11.1	R44.03	NOAA (and EUMETSAT, as appropriate) to continue their strong engagement in the WMO Coordination Group on Satellite Data Requirements for Region III and IV (Americas) and to provide support to Region-based access to satellite data, including from GOES-R and JPSS, according to user needs.	CGMS-45	**OPEN**	2.1

WGIV/ 12 Review and updating of the HLPP

CGMS-44-CGMS-WP-25 CGMS Secretariat presented the status of implementation of CGMS High Level Priority Plan (2015-2019), relevant to WGIV.

CGMS-44-CGMS-WP-26 CGMS Secretariat presented the Proposed Update to the CGMS High Level Priority Plan for 2016-2020, relevant to WGIV.

After the discussion, the working group concluded that all of the HLPP items covered by WGIV are still considered relevant and important. In agreement with WGI the following item was moved under the responsibility of WGI:

2.6 Develop efficient standardized data handling for high-resolution imaging and hyper-spectral instruments, employing novel methods like dissemination of hyperspectral infrared data based on Principal Component Analysis.

WG-IV also agreed with the inclusion of space weather in relevant WG-IV sections for:

- Metadata description
- Data format documentation
- Near real time data access and global data exchange

WGIV/ 13 Any other business

There were no items.

WGIV/ 14 Planning of inter-sessional activities/meetings

Three inter-sessional meetings are planned. Tentative dates are:

1. 5 October 2016, 13:00 UTC:
    - WG-IV intersessional meeting: topics are IODC dissemination coordination, status of actions/recommendations
2. 7 December 2016, 13:00 UTC:

- WG-IV intersessional meeting: topics are IODC dissemination coordination, status of actions/recommendations and preparation of agenda for CGMS-45

3. 15 February 2017, 13:00 UTC:
   - WG-IV intersessional meeting: preparation for CGMS-45.

WGV/ 15 Review of actions/conclusions, preparation of WG report for plenary

WGIV concluded with the following summary of actions and recommendations as a result of the discussions.

WGIV Actions open from previous plenary sessions (at CGMS-44)							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
EUMETSAT	(WGIII/2.) WGIV/4?	A43.02	(Action transferred from WGIII) EUMETSAT to propose dissemination plan for data from Indian Ocean Data Coverage partners identified in CGMS-43-EUM-14 roadmap.	WGIV webex 9 Dec 2015: WMO seeking to assure that the dissemination to users will be equivalent to the current one (EUMETSAT, CMA, ROSH and ISRO to collaborate and clarify this in view of CGMS-44. EUMETSAT makes FY-2E data available through EUMETCast. EUM expects its Council to take a decision on moving Meteosat-8 to ca 40 degr E in June 2016 (after CGMS-44). *See CGMS-44 EUM-WP-14, extend deadline to CGMS-45, ongoing work*	(CGMS-44) New deadline CGMS-45	**OPEN**	1.1.6
NOAA	(WGI/4) WGIV/7?	A43.03	NOAA to consider including GLM products in the HRIT stream	Webex 21 Oct 2015 discussion: NOAA is working on it, and final product list will be ready in the course of 1st 1/2 of 2016. *NOAA is planning to include it in an updated Q3 2016 product list, extended deadline.*	(CGMS-44) New deadline Dec 2016	**OPEN**	
Task Force on Metadata	(WGI/6) WGIV/10.1	A43.05	CGMS Task Team on metadata to define discovery metadata for DBNET	WGIV webex 9 Dec 2015: Draft DBNet guide submitted to TT, for cross-checking. To assure meta data aspects are taken into account. Expected to be endorsed as part	(CGMS-44) New deadline CGMS-45	**OPEN**	3.4.1

WGIV Actions open from previous plenary sessions (at CGMS-44)							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
				of the final report. *CGMS-44-EUMETSAT-WP-17, ongoing work, extended deadline.*			
CGMS members		A43.06	CGMS members to provide a listing of their data access portals.	CGMS-44-NOAA-WP-14 PPT EUM: http://navigator.eumetsat.int https://eoportal.eumetsat.int *Deadline extended following CGMS-44. OSCAR to be checked by the CGMS agencies*	(CGMS-44) New deadline CGMS-45	**OPEN**	-

CGMS-44 ACTIONS - WGIV						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
TFMI (task force on Metadata)	WGIV/3.1	A44.01	To submit the “Guidance Documentation on WMO Core Profile Metadata Creation For Satellite Products” to WMO IPET-MDRD and IPET-SUP.	30 Dec 2016	**OPEN**	2.7
EUMETSAT	WGIV/7	A44.02	To provide a timeline for the users preparation information for MTG, in accordance with "CGMS-44-WMO-WP-02 Best Practices for Achieving User Readiness for New Meteorological Satellites"	30 Dec 2016	**OPEN**	5.3

CGMS-44 ACTIONS - WGIV						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
CGMS members (data providers)	WGIV/10	A44.03	CGMS members (data providers) to a) discuss and respond to the recommendation from CGMS-44-CEOS-WP-02: CEOS recommends the adoption of the WGISS supported standards for searching Climate Data Records (CDRs). WGISS will provide technical support to CGMS data providers providing their climate data records through the WGISS data access infrastructure (IDN, CWIC, FedEO); and b) report how far the standards WGISS developed (as described in CGMS-44-CEOS-WP-02) are supported. *For discussion at the next WGIV inter-sessional meeting.*	CGMS-45	**OPEN**	5.1
JCOMM task team	WGIV/6.2	A44.04	To work together with the International Wind Working Group and the CEOS "Ocean Surface Vector Wind Virtual Constellation" (OSVW-VC) at developing a project on Surface Vector Winds, using the well-known and highly successful GHRSST Project as a model for the adoption of globally-agreed standards for the production and distribution of global, integrated, surface vector winds and associated products.	CGMS-45	**OPEN**	2.5
CGMS members	WGII	A44.05	From CGMS-44 WGII: CGMS operators and WMO to work with GODEX-NWP to explore options for optimal data exchange of advanced data from next-gen GEOs.			
ROSH	WGII	A44.06	From CGMS-44 WGII: ROSHYDROMENT to explore the possibilities to implement an operational NRT service for the hyperspectral infrared sounder IKFS-2 on Meteor-M N			

CGMS-44 RECOMMENDATIONS - WGIV							
Actionee	**AGN item**	**Rec #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
CGMS space agencies	WGIV/7	R42.01	Satellite operators to provide WIS Discovery Metadata Records, compliant to WIS requirements and following the guidance to be provided by the CGMS-WMO Task Force on metadata implementation, in order to facilitate satellite information discovery and access	NOAA: Related to metadata, the best reference is NGDC metadata provided here the URL: http://www.ngdc.noaa.gov/metadata/ *WGIV CGMS-43 discussions: Ongoing and routine activity. Recommendation maintained until CGMS-44* *WGIV webex 9 Dec 2015: To be taken up at the TT on Meta Data meeting the week of 14 Dec 2015.* *See CGMS-44-EUMETSAT-WP-17. Recommendation still valid, to be retained.*	(CGMS-43) New deadline **CGMS-45**	**OPEN**	2.7
CGMS members	WGIV/3.2	R44.01	CGMS members to contribute to the implementation of the Best Practices for User Readiness for meteorological satellite systems under development, both GEO and LEO		CGMS-45	**OPEN**	5.3
CGMS members	WGIV/3.2	R44.02	CGMS members to continue the provision of up-to-date User Readiness information in the SATURN portal		CGMS-45	**OPEN**	5.3

CGMS-44 RECOMMENDATIONS - WGIV							
Actionee	**AGN item**	**Rec #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
EUM and NOAA	WGIV/11.1	R44.03	NOAA (and EUMETSAT, as appropriate) to continue their strong engagement in the WMO Coordination Group on Satellite Data Requirements for Region III and IV (Americas) and to provide support to Region-based access to satellite data, including from GOES-R and JPSS, according to user needs.		CGMS-45	**OPEN**	2.1
CGMS-44 plenary	WGIV/3.1	R44.04	WG-IV recommends to CGMS plenary to endorse the extension of the CGMS TFMI activity to assess the WIGOS Metadata OGC Observations and Measurements mapping and to report its findings/recommendations to WMO IPET-MDRD	Endorsed by CGMS-44 plenary	9 Jun 2016	**CLOSED**	2.7
CGMS-44 plenary	WGIV/3.2	R44.05	WG-IV recommends to CGMS plenary to adopt "CGMS-44-WMO-WP-02 Best Practices for Achieving User Readiness for New Meteorological Satellites", as far as it applies to satellite operators, as CGMS Best Practice.	Endorsed by CGMS-44 plenary	9 Jun 2016	**CLOSED**	5.3
CGMS-44 plenary	WGIV/3.3	R44.06	In the context of IODC data access, WG-IV supports the definition of essential data first and, once defined, recommends the distribution of these data via the established dissemination means by the CGMS agencies in the region (CMA, EUMETSAT, ISRO, ROSHYDROMET).	Endorsed by CGMS-44 plenary	9 Jun 2016	**CLOSED**	1.1.6

The co-chairs thanked the participants and the WG-IV session was closed at 11:30 on Tuesday 7 June.

SPACE WEATHER TASK TEAM REPORT

SWTT/ 1 Review of actions and recommendation from previous meetings

Following the SWTT discussions at CGMS-44, the action and recommendation from CGMS-44 could be closed:

CGMS-43 ACTIONS - SWTT							
Actionee	**AGN item**	**Action #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
SWTT Chair	Ad hoc SW	A43.01	SWTT Chair to convene an intersession meeting to translate the ToRs into specific objectives for the HLPP and to define next steps for action until CGMS-44	Meeting held on 11-12 Feb 2016. Closed following CGMS-44 plenary discussions.	2 Sept 2015, CGMS-44	**CLOSED**	-
CGMS-43 RECOMMENDATIONS - SWTT							
"Actionee"	**AGN item**	**Rec #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
SWTT	Ad hoc SW	R43.01	Space weather matters to be addressed in a dedicated Space Weather Task Team (to be initially based on CGMSspaceweather@wmo.int) as discussed in CGMS-43 plenary.	New list server created in April 2016 (superseeding the one hosted at WMO): L-SWTT@LISTSERV.EUMETSAT.INT Closed following CGMS-44 plenary discussions.	CGMS-44	**CLOSED**	-

A Space Weather Task Team was formed and telecoms and an intersessional meeting were held to advance space weather matters within CGMS. A new list server was created in April 2016 and is now hosted by the CGMS Secretariat/EUMETSAT: L-SWTT@LISTSERV.EUMETSAT.INT. It superseded the one previously hosted at WMO.

SWTT/ 2 Review and Status the Space Weather Task Team (SWTT) Meeting in February

The Space Weather Task Team began with a review of the SWTT's objective, to identify the methodology by which space weather can be implemented within the existing construct of CGMS in order to support the continuity and integration of space based observing capabilities for operational space weather products and services. The agenda and outcome of the intersessional meeting of SWTT was presented, primarily the need to define the role of CGMS amongst the diverse spectrum of space weather related entities, such as ISES, ICTSW, ISWI, ICAO and others. The goal of facilitating a workshop with leaders from the related organizations within the next year was presented. The SWTT discussed the charts that capture the results of the intersessional meeting, making necessary modifications for the plenary presentation. As the SWTT discussed the next step of conducting a workshop with other space weather entities such as ISES, ISWI, and others, it was decided that we needed to make the recommendation to plenary to maintain the SWTT activity for another year. This will also enable the SWTT to provide oversight of the additional work required to integrate space weather into CGMS activities.

SWTT/ 3 Updates by CGMS members and partner organisations on their space weather satellite missions

In **CGMS-44-NOAA-WP-17.ppt** Terrence Onsager (NOAA/SWPC) presented the status of the DSCOVR satellite that was launched on 11 Feb 2015, and is currently in commissioning in a Lissajous orbit at L1. Comparison with ACE magnetometer and solar wind particles sensor measurements shows excellent consistency. Products are being developed at the NOAA Space Weather Prediction Center (SPWC) and will be available on-line and archived at the NOAA Center for Environmental Information (NCEI). It was noted that international cooperation is essential to ensure real-time reception of such deep space mission data through receiving facilities distributed around the globe. Plans for a Space Weather Follow-On (SWFO) mission were also briefed. The purpose of SWFO is to continue to maintain space weather measurement requirements at L1.

SWTT/ 4 Updates by CGMS members and partner organisations on their space weather activities and plans

Xiuqing Hu (CMA) presented CMA activities in space weather (**CGMS-44-CMA-WP-05**), noting the establishment of State Observatory for Space Weather Forecast in 2016, based on the former National Centre for Space Weather. CMA plans to add a new instrument, XEUVI, designed to provide solar imagery at x-ray and ultraviolet wavelengths to the operational sun-synchronous FY-3E satellite, scheduled to launch in 2018.

Juha-Pekka Luntama (ESA) presented ESA Space Situational Awareness (SSA) Programme plans for space weather (**CGMS-44-ESA-WP-03 PPT**). ESA is developing a SSA Space Weather (SWE) system

and associated services tailored for end users. The approach is based on federated services connecting SWE assets in SSA Participating States via a network of Expert Service Centres. The SSA SWE space segment is planned for 2017 onwards beginning with Geospace monitoring with hosted payload missions and potentially dedicated SmallSat missions. Ensuring continued availability of critical SWE measurements outside the Earth's magnetosphere has high priority. ESA is also seeking collaboration with international partners, specifically to coordinate potential development of missions to L1 and L5.

Toshiyuki Kurino provided an overview of recent activities in Japan related to space weather in **CGMS-44-JMA-WP-02/PPT**. JMA has monitored the high-energy-particle environment in geostationary orbit at 140 degrees east since 1978 using the space environment monitors (SEMs) on board GMS (Himawari) through GMS-4 (Himawari-4). After a hiatus, space environment monitoring was resumed in November 2014 with the launch of Himawari-8 using the on-board Space Environment Data Acquisition (SEDA) unit. The monitoring/SEDA data collected are provided to the National Institute of Information and Communications Technology (NICT) for work relating to space weather monitoring and forecasting. JMA's continued support for the Institute's space weather activities is expected to promote programs for space weather monitoring/prediction based on international cooperation. A possible GSICS structure for Space Weather was also proposed and discussed; an action has been assigned to WGII to determine how to implement the planning and development of Space Weather research and data management activities within the auspices of WGII.

Dohyeong Kim (KMA) reported on the recent advances and future plans of KMA Space Weather Service (**CGMS-44-KMA-WP-09/PPT**). Since its inception in April 2013, KMA has been focused to build the infrastructure in three fields of 1) the satellite operation, 2) the aviation, and 3) the ionospheric environment. Recent advances were made in the model development and Geo-Kompsat-2A space weather mission, KSEM. KMA has developed the space weather prediction models and most of them are now in transition phase from validation to operation. The status of the development of an aviation radiation dose model was discussed. The current cosmic radiation dose model is being expanded to include solar proton effects. The NOAA scale for solar radiation storms will be used to enhance the prediction accuracy of the cosmic radiation dose with aircraft altitude.

Elsayed Talaat (NASA) presented the NASA activities in space weather (**CGMS-44-NASA-WP-06/PPT**). NASA operates 32 spacecraft for heliophysics observations and implements a research program that includes data analysis, theory and model, instrumentation technology development, suborbital flights, and the development of space weather empirical and first principles modelling.

Tsutomu Nagatsuma (NICT, Japan) reported on space weather activities based on space-based observations (**CGMS-44-NICT-WP-01/PPT**). NICT provides the operational space weather forecast service in Japan. Many types of space weather activities based on space-based observations have been carried out under national and international collaborations with other agencies. In particular, high-energy particle data obtained from Japanese geostationary satellites are collected in near real time and NICT is developing a global map of a high-energy particle environment around GEO. An empirical model of relativistic electron flux at GEO and that of the outer radiation belt is also been developed. According to space-based observations and their platforms, NICT recommend data and

information sharing and the standardization of data format and processing. This was concurred by other members in the SWTT.

Terrance Onsager (NOAA/SWPC) gave an overview of NOAA/SWPC activities, including the status of space weather measurements on GOES-R, DSCOVR, and COSMIC-2 (**CGMS-44-NOAA-WP-19 PPT**). Improvements to NOAA space weather numerical models and services rely on cooperation with national (NASA, NSF, DoD, industry) and international research efforts. He noted that national and international partnerships are essential for improving worldwide resilience to space weather.

Konstantin Litovchenko (ROSHYDROMET) reported on Russian space weather monitoring carried out on board the sun-synchronous METEOR-M and geostationary ELECTRO-L satellites (**CGMS-44-ROSHYDROMET-WP-06**). Both platforms carry spectrometers that measure electron and proton fluxes at various energies. ELECTRO also carries a magnetometer and X-ray flux and sun flux constant sensor. In addition to future launches in the METEOR-M and ELECTRO-L series, Russia plans to include space weather monitoring onboard the "Zond" and "Ionosphera" spacecraft, planned with LEO orbits, and the "Arctica" mission, planned with a Molniya (high-latitude inclination, highly elliptical) orbit.

SWTT/ 4.1 UN COPUOS Update

Elsayed Talaat (NASA) reported on the recent meeting of the Space Weather Expert Group that was recently chartered within the United Nations (UN) Committee on Peaceful Uses of Outer Space (COPUOS) (**CGMS-44-NASA-WP-07 PPT**). A combined space weather workshop and meeting of the Space Weather Expert Group was organised on the margins of the 53rd session of the Scientific and Technical Subcommittee (STSC) of the UN COPOUS from 15-17 Feb 2016. The Expert Group examined the report and conclusions of the LTS Expert Group C on space weather and other information related to space weather including the recent report from the COSPAR-ILWS Roadmap team "Understanding Space Weather to Shield Society". The Expert Group endorsed the approach outlined in the COSPAR-ILWS report for the development of new activity, including new observations and modelling, targeting improved space weather data products and services.

SWTT/ 4.2 Update on National Space Weather Strategy

William Murtagh (NOAA/SWPC) presented an update on activities resulting from the newly adopted space weather strategy by the USA to raise space weather awareness and address the protection of critical infrastructures in the framework of strategic national risk assessment (**CGMS-44-NOAA-WP-18 PPT**). The strategy involves a coordinated effort among national agencies and identifies six high-level goals: (i) Establish space weather event benchmarks; (ii) Enhance space weather response and recovery capabilities; (iii) Improve protection and mitigation efforts; (iv) Improve assessment, modelling, and prediction of impacts in critical infrastructure; (v) Improve space weather services through advancing understanding and forecasting; (vi) Increase internal cooperation. The strategy is associated with an Action Plan. Goal #6 of the strategy (Increase international cooperation) is of particular relevance to WMO and CGMS. It includes the following objectives: to build international support at policy level; to promote a collaborative approach; to increase engagement in the

international community; to enable data sharing, to strengthen international coordination, and to develop international communication strategies.

SWTT/ 4.3 WMO Update on 4 Year Plan

Jérôme Lafeuille (WMO) recalled the WMO 4-year plan for space weather services (**CGMS-44-WMO-WP-16/PPT**). In the area of observations, the plan aims to ensure sustained availability, quality and interoperability of the observations that are essential for space weather warning and related. It also aims to optimize the overall cost of the observing system through integration of space weather observing capabilities within WIGOS. He then presented a quick overview of the key operational space weather observations from space, highlighting a few critical gaps, and introduced the strawman space-based observing system for space weather proposed in the draft Vision for the WIGOS space-based component in 2040 (WMO-WP-01). CGMS is viewed by WMO as the most appropriate forum to address the implementation of this vision.

SWTT/ 5 Other Space Weather-related matters of interest to CGMS

The SWTT listened to short discussion on recent WRC resolution 657, allocating spectrum for space weather services. We discussed the need to characterize space weather space based systems to facilitate analysis and identification of space weather allocated spectrum. It was decided that this activity needed to be managed within WGI.

SWTT/ 6 Review and updating of the HLPP

One of the most important outcomes of the SWTT activity has been the identification of near term goals that will be documented in the HLPP (**CGMS-44-CGMS-WP-25/26**). These goals were reviewed and edited by the SWTT to begin the inculcation of Space Weather activities into the four working groups. It was the consensus of the discussion that there was a need to continue the Space Weather Task Team to ensure that space weather activities will have reached a higher level of maturity within CGMS.

SWTT/ 7 Any other business

There were no other items discussed.

SWTT/ 8 Intersessional activities/meetings in 2016-2017 [CGMS-44 -> CGMS-45]

The SWTT identified three intersessional meeting dates:

- 14 September 2016
- 14 December 2016
- 15 March 2017

SWTT/ 9 Review of actions/conclusions, preparation of WG report for plenary

The following actions and recommendations were made following the CGMS-44 SWTT discussions:

CGMS-44 ACTIONS - SWTT						
Actionee	**AGN item**	**Action #**	**Description**	**Deadline**	**Status**	**HLPP ref**
SWTT		A44.01	SWTT to conduct a workshop with leadership from the various space weather communities that will benefit from CGMS coordination of space-based space weather observing systems.	15 Dec 2016	**OPEN**	5.2.1
SWTT members		A44.02	Members of SWTT review the current WIGOS 2040 vision to ensure inclusion of necessary space weather observations.	15 Dec 2016	**OPEN**	1.1.7
SWTT		A44.03	(From WGIII): SWTT members wishing to participate in the SETT activities are invited to participate in the SETT activities, and should provide their contact information to the SETT accordingly (Charles.wooldridge@noaa.gov).	1 Jul 2016	**OPEN**	4.1.1

The SWTT also placed an action on WGII to determine how to implement the planning and development of Space Weather research and data management activities within the auspices of WGII.

CGMS-44 RECOMMENDATIONS - SWTT							
"Actionee"	**AGN item**	**Rec #**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**	**HLPP ref**
CGMS-44 plenary	SWTT	R44.01	**On Space Weather Task Team:** Sustain the SWTT for another year in order to enable CGMS space weather integration.	Endorsed by CGMS-44 plenary.	9 Jun 2016	**CLOSED**	5.2

ANNEXES

CGMS Agenda and Working Papers

The agenda and Working Papers (WPs) are available at http://cgms.eumetsat.int/views/agendas.xhtml.

CGMS List Servers

There are currently six CGMS list servers for plenary, WGs I-IV and SWTT respectively. Information on points of contact and list servers is available upon request from the CGMS Secretariat at CGMSSec@eumetsat.int.

CGMS Charter, Members and Observers

Other information such as the CGMS Charter and the current list of Members and Observers are available at http://cgms-info.org.

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