Report of the 43rd Meeting

of the Coordination Group for Meteorological Satellites

18-22 May 2015, Boulder, Colorado, USA

CGMS

REPORT OF THE 43rd MEETING OF THE COORDINATION GROUP FOR METEOROLOGICAL SATELLITES

CGMS-43
Boulder, Colorado, USA
18-22 May 2015
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PLENARY SESSION

A OPENING SESSION

Dr. Stephen Volz, NOAA Assistant Administrator for Satellite and Information Services, welcomed the participants of the 43rd meeting of CGMS to Boulder, Colorado and thanked the CGMS Secretariat staff at EUMETSAT and the NOAA staff for the excellent arrangements for this year's meeting.

The full statement of Dr. Volz is provided in ANNEX I.

B APPROVAL OF AGENDA, ACTION REVIEW

B.1 Approval of the Agenda

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

B.2 Review of actions from CGMS-42

CGMS Secretariat provided an overview of the status of the list of actions and recommendations resulting from CGMS-42:

CGMS-42	Status	Open
WG I	All actions closed	None
WG II	All actions but 3 closed	3 actions open with revised deadlines
WG III	All actions but 2 closed	2 actions open with revised deadlines
WG IV	All actions but 8 closed	8 actions open with revised deadlines
Space weather	(from WGIII)	2 actions open with revised deadlines
Plenary	Several actions closed	1 action open with deadline of CGMS-44 (CEOS-CGMS Joint Working Group Climate) 1 action open with revised deadline 2 actions expected to be closed following CGMS-43 plenary discussions

One CGMS-42 plenary actions was given a new deadline following WGIII discussions:

CGMS-42 PLENARY actions with revised deadlines:							
Actionee	Action	#	Description	Action feedback/closing document	Deadline	Status	HLPP ref
WMO	Plen IV.4	40.06	WMO to coordinate impact studies, through the CBS, in order to update and refine its requirements for GNSS radio-occultation (e.g. number of occultations/day, distribution in space)	EUM plans to launch a study in 2014 with results available for the IROWG meeting in Apr 2015 to which CEOS agencies will be invited. Action deferred to CGMS-43. It also contributes to Action 40.23 "CGMS to convene through the IROWG an ad-hoc meeting on the global GNSS-RO constellation, inviting all interested CEOS agencies". (see also actions WGII 40.23, WGIII 41.35 and WGIII 41.37) EUM will present at Working Paper on the outcome of its study *CGMS-43 EUM-WP-12* Matter discussed at the IPET-OSDE-1, April 2014, and CBS-Ext(2014). CBS recommended conducting Observing System Simulation Experiments (OSSEs) in support of satellite system design criteria such as orbit optimization for GPS-RO satellites, or configurations for hypersperspectral IR sounders on geostationary orbit. *Following WGIII discussions, the action will be kept open until CGMS-44. WMO and NOAA to report on their activities at CGMS-44.*	(CGMS-41, -42, -43) **New deadline CGMS-44**	OPEN	HLPP #1.1.4

One CGMS-42 plenary action is maintained (the initial deadlines were for both CGMS-43 and CGMS-44):

CGMS-42 PLENARY actions still open							
Actionee	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 for 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 WGClimate. CMA and KMA have been invited to participate in these efforts. *Status reports were provided tor WGII and plenary at CGMS-43. The next reports will be provided at CGMS-44.*	CGMS-43, CGMS-44	**OPEN**	HLPP # 5

The following two CGMS-42 plenary actions were left open pending CGMS-43 plenary discussions:

PLENARY actions open at the start of CGMS-43 pending closure							
Actionee	Action	#	Description	Action feedback/closing document	Deadline	Status	HLPP ref
WMO	Plen C.3	A42.02	WMO to establish a dialogue among CGMS satellite operators and the WMO Disaster Risk Reduction (DRR) programme to identify regional pilot actions for enhancing the use of satellites in support of DRR.	Dialogue initiated, will be reported at CGMS-43.under plenary item D. WMO to host a workshop in autumn 2015 to which space agencies will be invited *Closed following CGMS-43 plenary actions with a new action raised (CGMS-43 A43.01)*	CGMS-43	**OPEN**	HLPP # 2.4
WGI and WGIV	Plen E.1.3 (for WGI and WGIV)	A42.07	Following the revised scope of WGI and WGIV, the WGs to update the "Terms of Reference" of both WGs for endorsement by CGMS	This will be concluded by WGI and WGIV and be presented to CGMS-43 plenary for endorsement. (CGMS-43 EUM-WP-02). NOAA will provide feedback in CGMS-43 WGI and WGIV *ToRs agreed by WGI and WGIV at CGMS-43. Closure expected following plenary endorsement agenda items F.1.2 and F.3.1*	CGMS-43	**OPEN**	-

The final status of CGMS-42 plenary actions and recommendations resulting from CGMS-43 discussions is available here.

The status of CGMS-43 plenary actions and recommendations are provided in section L of the report.

The CGMS-43 actions will be maintained on the CGMS website under MEETINGS and CGMS-43.

C CGMS MEMBERSHIP

C.1 ISRO CGMS Membership

ISRO is eligible for CGMS membership since its satellite systems have shown the potential to contribute to WMO and supported programmes, fulfilling the Charter of the CGMS. More specifically, the application is based on ISRO's existing and planned contributions in a number of areas relevant to the objectives of CGMS:

- Indian Meteorological Satellite Missions
- International Collaboration/Joint Missions
- Satellite Data Archival and Dissemination
- Support to Operational Agencies
- CALVAL, GSICS, CEOS
- Disaster Management Support
- Training/Capacity building
- Instrument Development and Support
- Climate Research

Some expected benefits to ISRO from the membership are:

- Participation in the global meteorologist's platform as an official member for preparation of global observation strategy
- Provide information on the Indian missions to the global community starting from the conception stage itself
- Planning of ISRO's satellite missions to complement and supplement the global data requirements
- Use of the CGMS platform for developing collaborative missions with other space-faring agencies
- Working out joint calibration strategies

The Director-General of EUMETSAT was very pleased that ISRO has requested to be a member of CGMS. NOAA supported and agreed on the contribution of ISRO to CGMS activities. WMO also expressed support for ISRO joining CGMS.

C.2 CGMS Charter amendment

Working Paper **CGMS-43-CGMS-WP-21,** proposed on behalf of the CGMS Secretariat, the required amendments to the CGMS Charter to enable ISRO to become a CGMS member. The document was circulated among the CMGS Members for consideration one month prior to the 43rd plenary session of CGMS, in accordance with the relevant provision of the CGMS Charter.

CGMS members were invited to consider the proposed amendments of the Charter as proposed in **CGMS-43 EUM-WP-21**.

The CGMS plenary expressed its strong support for ISRO's membership and looked forward with anticipation to the future contributions of ISRO to the CGMS activities. The plenary agreed on the revised charter and welcomed ISRO as a CGMS member by consensus and with acclamation.

D USER REQUIREMENTS

D.1 WMO Space Programme role as a bridge between satellite operators and users

CGMS-43-WMO-WP-01 described the objectives of the WMO Space programme and its organisational context in WMO.

The 16th WMO Congress in 2011 defined the high-level goals of the Space programme, which are to:

- promote wide availability and utilization of satellite data & products for weather, water, climate and related applications of WMO Members
- provide a framework for dialogue, develop a shared vision, foster interoperability, share best practices & resources. Through this joint undertaking, satellite operators contribute to the global picture in a cost-effective way and best meet their goals to serve users, and users are assisted to consolidate their requirements, and informed and trained to take advantage of satellite systems.
- The WMO Space programme has four main components:
    - Develop an integrated observing system
    - Enhance data & product accessibility, interoperability and quality
    - Ensure user information and training
    - Coordinate space weather operations.
    - The progress of the Programme relies on partnerships with space agencies, including CGMS and CEOS, with International science groups, and with other relevant international bodies.

At CGMS-43 a large number of discussions triggered through WMO working papers contribute significantly towards the objectives of the Space Programme:

- Observing systems
    - WP-02: Vision of WIGOS/Space in 2040
    - WP-04: Satellite data user needs in the Indian Ocean region

- WP-05: Observation requirements of the GAW
- WP-06: GSICS in the architecture for climate monitoring
- WP-07: GCOS
- WP-14: Gap Analysis
- WP-16: GSICS Report
- WP-17: OSCAR/Space new functionality

- Access to data and products
  - WP-08: Draft WMO Resolution on Exchange of Data & Products
  - WP-09: Satellite Data Dissemination Strategy
  - WP-13: Direct Broadcast Network (DBNet)
  - WP-15: Operational data requirements from RA III/RA IV

- User Information and training
  - WP-03: User preparation (SATURN)
  - WP-12: VLab

- Cross-cutting Areas:
  - WP-10:Socioeconomic benefits;
  - WP-11:Space weather

EUMETSAT thanked WMO for the presentation and the reminder as to how WMO activities fits within CGMS activities.

NOAA also thanked WMO for the global framework that it offers for addressing meteorological matters.

It was noted that the WMO strategic priority of Disaster Risk Reduction was not addressed explicitly at CGMS-43, and the following action was agreed in this regard.

CGMS-43 actions – PLENARY						
Actionee	AGN item	#	Description	Deadline	Status	HLPP ref
WMO	D.1	A43.01	WMO to report at CGMS-44 on engagement with satellite agencies via the planned "Joint RA-II/V Workshop on WIGOS for Disaster Risk Reduction" to be held in Indonesia in October 2015.	CGMS-44	OPEN	HLPP # 2.4

The CGMS-42 action A42.02 was closed as a consequence.

D.2 Development of a vision for the WIGOS Space based component in 2040

The WMO Space Programme – through the Commission for Basic Systems (CBS) Expert Team on Satellite Systems (ET-SAT) - has initiated the development of a "Vision for the Space Based Component of WIGOS in 2040" in response to the request from CBS in September 2014. In **CGMS-43-WMO-WP-02** WMO reported on the development.

The development of a Vision is approached from three different angles:

- First of all, the new vision should aim to respond to the anticipated societal needs of 2040, in the context of WIGOS and of the Global Framework for Climate Services (GFCS). A starting point is to address the unfulfilled requirements expressed in the Statements of Guidance of WMO application areas in the Rolling Review of Requirements. Looking ahead, the vision should consider the increasing maturity of some space applications and the emerging requirements of new application areas which are not fully addressed by current plans.
- The vision should consider the opportunities opened or anticipated from advances in satellite and instrument technology, including the lessons learnt from demonstration missions that, by 2040, will be mature for transition from R&D or a demonstration stage, to an operational stage (e.g. GPM, Doppler lidar), and possible new concepts. Rapid progress in technological capabilities will allow improved performances in terms of spectral and temporal resolution, which also has a bearing on the amount of data to be exchanged.
- Finally, attention should be paid to emerging changes in the provider community considering the increased number of space-faring nations, the range of possible approaches between large and very small satellite programmes, and the balance to be found between an increasing capability of the private sector to contribute to the system and the specific responsibilities of governmental entities.

Opportunities and risks should be carefully analysed considering the possible technological evolution, as well as the key strategies for optimal integration of space-based and surface-based observation capabilities.

A WIGOS Space 2040 Workshop is planned on 18-20 November in Geneva to support the dialogue between space agencies and major user communities. WMO stressed the importance of the participation of space agencies in the workshop.

The new draft vision will be presented to CBS in 2016.

IOC noted that support to seasonal prediction is a particular priority area and was pleased to see importance of ocean observations in the update of WIGOS.

NOAA noted that space agencies have 10-year or longer development plans and that adaptation is necessary to ensure that these plans, as far as is possible, fit together with the timeframe of the WIGOS vision.

The following action on CGMS members was agreed:

CGMS-43 recommendations – PLENARY						
Actionee	AGN item	#	Description	Deadline	Status	HLPP ref
CGMS members	D.2	A43.02	CGMS members to consider the preliminary considerations on the Vision of WIGOS space-based components in 2040 and provide feedback to WMO through their representative in ET-SAT (or directly to jlafeuille@wmo.int if they are not represented in ET-SAT). Ref. CGMS-43, WMO-WP-02	30 Sept 15	OPEN	HLPP # 1.1

D.3 User preparation for new generation satellites including SATURN, Vlab and critical transition issues

In **CGMS-43-WP-03**, WMO reported on user preparation for the new generation of satellites.

The online portal SATURN (SATellite User Readiness Navigator) was launched for public access in June 2014 and now provides up-to-date information supporting user readiness activities, primarily for Himawari-8 and GOES-R. Preliminary content is available for MTG, Electro-L and FY-4. Continued support from the task team of CGMS focal points to develop and maintain the SATURN content remains vital to ensure its currency.

The initial scope of SATURN has been the new generation of GEO satellites, but it is planned in 2015 to extend the scope of the portal to the core meteorological satellites in low-earth orbit: NPP/JPSS from NOAA, Metop from EUMETSAT, FY-3 from CMA and (if feasible) Meteor-M from Roshydromet.

To support and guide satellite operators and users in their respective preparation activities, a Reference User Readiness Project has been developed, and is presented in detail. The Project provides a typical breakdown of user readiness activities and a timeline of deliverables that are needed from satellite development programmes to support user readiness activities.

In collaboration with the VLab and the COMET/MetEd programme, online training material on aspects of Himawari-8 and GOES-R has been made available through SATURN in English and Spanish (where available). The VLab strategy 2015-2019 places high emphasis on building capacity in understanding and exploiting data from the new generation satellites (see WMO WP-12 under item I.1).

The WMO Space Programme is continuing to develop SATURN and the Reference User Readiness Project, supported by experts from the WMO Expert Team IPET-SUP and by the CGMS focal points.

NOAA noted that the reference satellite system development approach is the result of many years of experience, and that direct involvement of users in the development process may result in increased risk.

EUMETSAT thanked WMO for the effort to share experience from GOES-R and Himawari-8. SATURN is a valuable tool for EUMETSAT and we will continue to support this activity. At the EUMETSAT Users Conference in September 2015, there will be a special session on user preparedness, offering an opportunity to discuss this effort further.

WMO strongly encouraged CGMS members operating new-generation GEO satellites to continue and strengthen their support to the SATURN portal.

The following actions were agreed:

CGMS-43 actions – PLENARY						
Actionee	AGN item	#	Description	Deadline	Status	HLPP ref
CGMS members	D.3	A43.03	CGMS members to provide review comments on the Reference User Readiness Project, noting that the Project will be presented to CGMS-44 for endorsement as CGMS best practice (Ref. CGMS-43, WMO-WP-03)	30 Sept 2015	OPEN	HLPP # 5.3
CMA, EUM, NOAA, ROSH	D.3	A43.04	CMA, EUM, NOAA, ROSH to appoint/reconfirm points of contact for including LEO satellites in the SATURN	15 June 2015	OPEN	HLPP # 5.3

D.4 Satellite data User needs in the Indian Ocean

To inform the discussion on satellite data coverage services over the Indian Ocean region, WMO carried out in February/March 2015 a survey among key users of satellite data. **CGMS-43-WMO-WP-04** presents the preliminary results of this survey. Responses from eleven countries were received, regarding baseline requirements for satellite data (L1 and L2) needed for routine operations, and additional requirements in case of an emergency or a severe event.

Key conclusions from the survey are that

- requirements are dominated by the need to monitor and forecast tropical cyclones and monsoon-related phenomena;
- requirements are not limited to the need for observing the Indian Ocean but also address land applications, such as fire detection;
- some redundancy in satellite coverage of the region is needed;
- according to the majority of responses, the required baseline repeat cycle for GEO imagery over the region is 30 minutes;
- GEO has higher importance in case of emergencies or severe events due to its higher repeat cycle; most users require additional GEO imagery in such cases, with the majority requiring rapid-scan imagery every 10 minutes or less;
- several users expressed a requirement for GEO lightning products (both as a baseline and as an additional requirement).

The requirements identified in the survey have not yet been validated by the broader user community in the Indian Ocean region, nor matched against existing or planned capabilities. Further refinement and consolidation of the requirements need to be discussed.

In response to the presentation, IOC reminded the plenary that CGMS-43 occurs in the 50th anniversary year of the conclusion of the 1962-1965 observing phase of the International Indian Ocean Expedition (IIOE). IIOE was instrumental in generating extensive new knowledge about a highly under sampled region of the global integrated Earth system, fostered new long-standing international partnerships, and supported the development of advanced infrastructure, including India's establishment of the National Institute of Oceanography in Goa. IOC, in partnership with the Scientific Committee on Oceanic Research (SCOR), the U.S. National Academy of Sciences, and other agencies, contributed leadership for the outstanding success of IIOE. IOC is a leading sponsor of the Second IIOE (IIOE-2) to be launched at the International Symposium on the Indian Ocean on 30 November – 4 December 2015 in Goa, India. The IOC, in its statement announcing the launch of the IIOE-2 initiative, called the ambitious five-year effort "truly collaborative and socially relevant" and one that will "provide an exciting platform for knowledge transfer and capacity building," raising global awareness about the importance of the Indian Ocean.

In this regard, IOC encouraged CGMS Members to enhance satellite data acquisition capabilities over the Indian Ocean during the IIOE-2 Observing Phase from January 2016 to December 2020, make available satellite measurements in accordance with the Group on Earth Observations (GEO) Data Sharing Principles, and preserve satellite observations in accordance with GEO Data Management Principles.

IOC would be pleased to describe the status of IIOE-2 at CGMS-44.

CMA noted that the Indian Ocean coverage is very important for China as precipitation and the monsoons originate from this region. After the launch of FY-2G, CMA agreed to follow the CGMS recommendation to relocate FY-2E to the current position of FY-2D (86.5°E) providing much better observations on that part of the IO, in particular providing better calibration and products.

WMO thanked the satellite operators for their support over the Indian Ocean region.

The following actions were agreed:

CGMS-43 actions - PLENARY						
Actionee	AGN item	#	Description	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 and report results to CGMS-44.	CGMS-44	OPEN	HLPP # 1.1.6

CGMS-43 actions - PLENARY						
Actionee	AGN item	#	Description	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	OPEN	HLPP # 1.1.6

D.5 Requirements of the global atmospheric watch (GAW)

WMO in collaboration with the atmospheric composition community and satellite experts has initiated an update of the WMO observation requirements for atmospheric composition parameters, in support of the WMO Rolling Review of Requirements (RRR) process. The last update in the RRR framework in 2004 was based on the IGACO report, and identified only one "Atmospheric Chemistry" application area. Formulating internationally-agreed, technology-free observation requirements that relate to chemistry and composition of the atmosphere is important information for CGMS agency mission planning, to inform the Vision for WIGOS surface/space components in 2040, and for a subsequent update of the CGMS baseline.

A WMO Global Atmosphere Watch (GAW) Task Team on Observational Requirements and Satellite Measurements as regards Atmospheric Composition and Related Physical Parameters was established and held its first meeting on 10-13 November 2014.

Three main application areas for observations of atmospheric composition were identified:

- Forecasting atmospheric composition
- Monitoring atmospheric composition
- Providing atmospheric composition information to support services in urban and populated areas

For each of the three applications, detailed and quantitative observation requirements for the necessary parameters will be established by autumn 2015, and entered into the WMO RRR database (which is part of OSCAR) by the end of 2015. The Task Team collaborates with the GAW Scientific Advisory Groups and other experts from CGMS, CEOS and WMO CBS on this task. A set of priority variables that cut across several application areas of atmospheric composition observations will also be identified. This process will inform the Vision for WIGOS component systems in 2040, and subsequent updates of the CGMS baseline.

CGMS-43-WMO-WP-05 contains the report of the Task Team report in November 2014, and related URLs.

The following action was agreed:

CGMS-43 actions - PLENARY						
Actionee	AGN item	#	Description	Deadline	Status	HLPP ref
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	OPEN	HLPP # 1.1

D.6 WMO four-year plan for space weather

In **CGMS-43-WMO-WP-11** WMO reported on its space weather activities. The WMO Inter-Programme Coordination Team for Space Weather (ICTSW) involves now experts from 26 WMO Members and 7 international organizations. Over its five years of existence, ICTSW has performed a review of observation requirements, engaged pilot actions for space weather data exchange on the WIS, selected space weather products made available on a portal, and provided considerable support to the ICAO-WMO discussions on the definition of future space weather services to aviation. These activities have demonstrated the value that can be added by WMO in facilitating the international coordination of space weather activities and their evolution to full operational status.

A four-year plan has been developed in order to provide a clear framework for these activities, to increase their visibility within and outside WMO, to mobilize more WMO Members, to formalize the interactions with the relevant Technical Commissions, to strengthen the overall efforts and maximize the benefits. The plan which addresses the 2016-2019 timeframe will be submitted to the 17th Congress before consideration by the relevant Technical Commissions (CBS and CAeM). It is available as document 4.2.4(2) of the 17th Congress:

https://docs.google.com/a/wmo.int/file/d/0B8DhC1GSWSmxVU80M3JZY2lwZ1U/edit?usp=drivesdk

The plan defines first and second priority tasks at three levels:

- at the system level, including observations, data exchange and modelling;
- at the services level, to evaluate the end-user requirements and develop best practices to respond to these needs, in particular for aviation, emergency management, impacts on space and ground infrastructure;
- at the strategic level, to maintain close coordination with other international entities involved in space weather covering various aspects (research, policy, operational warning, training, regional organizations, etc.).

CGMS members provide a significant contribution to space weather observations by flying space environment monitors or other sensors (e.g. solar imagers) on-board meteorological satellites. Assuming that the plan is approved by Cg-17, and noting that Space Weather is mentioned in the CGMS HLPP, WMO looks forward to the participation of CGMS in this new framework of activities.

CGMS satellite operators were invited to consider the four-year plan for the space weather coordination activities of WMO and to consider flying space weather payload to fill gaps in space weather observations.

D.7 Aquarius and SMOS sea surface salinity measurements: a review of initial results

In **CGMS-43-IOC-WP-01**, IOC provided an analysis of first results from sea surface salinity measurements from SMOS and Aquarius.

The global water balance and the relative magnitudes of its global and regional components are of fundamental importance to society and are largely unmeasured over the ocean. The advent of satellite sea surface salinity (SSS) measurements by the Soil Moisture and Ocean Salinity (SMOS) mission launched in November 2009 and the Aquarius on the fourth Argentine Satélite de Aplicaciones Cientificas (SAC-D) satellite mission launched in June 2011, opened a new era in ocean sciences. This paper outlines the new measurement systems, including a preliminary assessment of the technological challenges, and provides an overview of results, including the salt budget in the North Atlantic, tropical instability waves, Rossby waves, mesoscale motions, freshening of surface coastal waters from riverine outflow and impact on hurricane forecasting in northwest Atlantic, and SSS response to La Niña. As the SSS time series lengthen with continued mission operations, SSS data will receive additional attention in numerous studies, including the El Niño/La Niña phenomenon, Gulf Stream meanders, and global salt budget of the water balance.

For the planning of future missions, IOC encouraged:

- CGMS to support sustained high spatial and high frequency SSS measurements for improved weather and climate applications.
- CGMS to support the assimilation of measurements of satellite SSS, sea surface temperature, and ocean surface topography, together with in-situ measurement, into ocean general circulation models to improve estimates of vertical profiles of ocean currents and ocean heat transport.

It was agreed that relevant themes for an IOC contribution to CGMS-44 would be sensing of Sea Ice from space as well as a report from the Second International Indian Ocean Expedition (IIOE-2), and the following actions were agreed in this regard:

CGMS-43 actions - PLENARY						
Actionee	AGN item	#	Description	Deadline	Status	HLPP ref
IOC-UNESCO	D.7	A43.08	IOC-UNESCO to provide a paper on guidance to CGMS members on sea ice observations	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)	CGMS-44	OPEN	HLPP # 1.1

E REPORTS FROM THE SPACE AGENCIES

E.1 Report on the status of current and future satellite systems by Members (Operational Agencies)

In **CGMS-43-CMA-WP-02**, CMA reported on the status of current and future satellite systems.

In **CGMS-43-EUMETSAT-WP-22**, EUMETSAT reported on the status of its current and future satellite systems.

Regarding current satellites:

The geostationary Meteosat-7 satellite will continue to support the Indian Ocean Data Coverage mission at 57.5 °E until March/April 2017 and will be de-orbited in April/May of that year.

The three Meteosat Second Generation (MSG) satellites are continuing to support the prime 0° service (Meteosat-10) and the 9.5 °E Rapid Scanning service (Meteosat-9), with Meteosat-8 as a shared standby satellite.

The Low Earth Orbit satellites Metop-A and -B continued to perform well, with Metop-A being significantly beyond its nominal lifetime. The primary Metop-B data stream benefits from the best possible timeliness based on acquisition of dumps at both Svalbard and McMurdo, the latter through the Antarctic Data Acquisition Service (ADA) provided through NOAA.

The Jason-2 satellite has performed well, even though the satellite is significantly beyond its nominal lifetime. A one-day outage of the Advanced Microwave Radiometer, on 18-19 December, resulted in degraded sea surface height measurements due to missing humidity corrections. An extension of the Jason-2 mission until end of 2017 is expected to enter into force this summer.

Regarding future satellites:

The geostationary MSG-4 satellite is on track for a launch early July on Ariane 5 from Kourou. It is planned to store MSG-4 in orbit for about 2.5 years once the commissioning is successfully completed.

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

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 planned for 2019. 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 mid-2021.

The Low Earth Orbit EPS-SG programme is in the final stages of full approval by the EUMETSAT Member States and the overall EPS-SG system is in phase B. 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 shipment of the Jason-3 satellite to Vandenberg is planned for June 2015, to achieve readiness for a Falcon-9 launch in early August.

The EUMETSAT Jason-CS optional programme including two satellites that will ensure continuity of reference ocean altimetry after Jason-3 is under consideration by EUMETSAT Member States. The launch of the first Jason-CS satellite is planned for 2020.

The planned launch date for the first Copernicus ocean observation satellite Sentinel-3A is the end of October 2015. The handover of the Sentinel-3A satellite to EUMETSAT and the start of routine operations will take place following the commissioning phase currently foreseen for early 2016.

IOC recognised Alain Ratier and Jean-Louis Fellous for their contributions to Oceanography through the efforts to make Ocean Surface Topography missions operational since the launch of Topex-Poseidon, and commended EUMETSAT for its efforts to secure continuity of OST through Jason-CS. WMO commented positively on the plans to fly a UVN sounder on MTG.

In **CGMS-43-JMA-WP-02** JMA reported on the status of its current and future satellite systems.

MTSAT-2 (145°E) is currently undertaking operational imaging over the East Asia and Western Pacific regions with a backup from MTSAT-1R (140°E), which has continued to perform imagery dissemination and data collection services even after its imaging function was switched over to MTSAT-2 on 1 July 2010. Its DCS (Data Collection System) has functioned properly since the satellite began operations.

JMA successfully launched the next-generation Himawari-8 satellite on 7 October 2014, and plans to start its operation in July 2015 as a replacement for MTSAT-2.

Himawari-8 is the world's first next-generation geostationary meteorological satellite, and features a new imager with 16 bands (as opposed to the 5 bands of the current MTSAT series). Full-disk imagery will be obtained every 10 minutes, and rapid scanning at 2.5-minute intervals will be conducted over several regions. The unit's horizontal resolution will also be double that of the MTSAT series. These significant improvements will bring unprecedented levels of performance in the monitoring of tropical cyclones, rapidly developing cumulonimbus clouds and volcanic ash clouds.

WMO thanked JMA for the important contribution to the GOS and the support to RA-V, and also for the introduction of the HimawariCast/Cloud services. The Himawari-8 results will be presented at WMO Congress side-event on user preparedness.

CGMS congratulated JMA and expressed its deep appreciation for the successful launch and commissioning and early data availability for Himawari-8, stressing the importance of the Advanced Himawari Imager for the preparations of the global user community for the new generation of geostationary satellites, including GOES-R.

In **CGMS-43-KMA-WP-01**, KMA reported on the status of current and future satellites.

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

The progress of the development of GEO-KOMPSAT-2A (meteorological mission) and -2B (ocean and environmental mission) scheduled to be launched in May 2018 and March 2019 respectively, was summarised.

IOC commended Korea for making the GEO ocean colour data from GOCI available to the ocean community, as this is a globally unique capability.

In **CGMS-43-NOAA-WP-01**, NOAA provided an overview of its current and future satellite systems describing its missions and priorities.

NOAA informed CGMS of the status of its geostationary satellite constellation, including plans for the placement and operation of its next generation satellite, GOES-R. NOAA's polar-orbiting constellation was described, as well as the latest plans for its next generation satellite, the JPSS series.

Additionally, an update on the DSCOVR space weather mission was provided. It is on its way to L1 after a successful launch earlier this year to replace NASA's ACE satellite. Jason-3, a joint US-European ocean altimetry mission was also described, which is scheduled for launch later in 2015.

NOAA discussed recent organizational changes, including a push for greater internal engineering expertise and a consolidation of the administrative functions of its data centres into a new National Center for Environmental Intelligence.

NOAA also spoke a bit about some of its early future planning, beyond their next generation JPSS and GOES-R satellites. NOAA will keep CGMS up to date as it begins exploring different constellations and approaches to collecting critical meteorological satellite data.

NOAA stated that the process for defining the long-term future satellite scenario has started in the US and that NOAA will contribute actively to the WIGOS 2040 process.

In **CGMS-43-ROSHYDROMET-WP-01** ROSCOSMOS and ROSHYDROMET jointly reported on status of current and future Russian satellite systems.

Meteor-M N2 polar-orbiting meteorological satellite was launched on 8 July, 2014 and Electro-L N1 geostationary meteorological satellite was launched on 20 January, 2011.

The future Russian geostationary meteorological constellation will consist of three Electro-L satellites. The location of Electro-L satellites in orbit will be 14,5W, 76E and 166E. The mission objectives, payload and ground segment matters are provided. An overview was provided of the future Meteor-3M polar-orbiting satellite system, which will include three meteorological and one oceanographic satellite, and also forthcoming series of Meteor-MP and Ocean satellites.

The Arctica-M constellation of highly elliptical orbit satellites is now under development. The system will include 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 was presented.

Considering ROSHYDROMET's geostationary and polar-orbiting missions, but also the strong potential of highly elliptical orbit satellites for cross-calibration with other satellites, EUMETSAT strongly encouraged ROSHYDROMET to actively participate in GSICS activities and the following action was agreed in this regard:

CGMS-43 actions - PLENARY						
Actionee	AGN item	#	Description	Deadline	Status	HLPP ref
ROSH	E.1	A43.10	ROSHYDROMET to nominate a point of contact for GSICS related matters	CGMS-44	OPEN	HLPP # 3.1

IOC also encouraged ROSHYDROMET participation in International Ocean Colour Coordination Group (IOCCG), in light of the capabilities of Meteor-2 Microwave Sounder for OC. ROSHYDROMET and ROSCOSMOS will consider this, and also consider participation in Ocean Surface Wind coordination.

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

In **CGMS-43-CNSA-WP-01**, CNSA presented the status of current and future satellite systems.

China National Space Administration (CNSA) currently operates FY operational satellite system and 4 R&D satellite systems, including HY, HJ, ZY, and GF series satellite. China will be launching several satellite systems in the near future.

CNSA continues to construct an Earth observing system (EOS) for the sustained and stable observation of the Earth from the space, including meteorological satellite series, ocean satellite series, resource satellite series, environment and disaster small constellation (HJ) satellite series, and high-resolution (GF) satellite series. CNSA is making great efforts to actively enhance the construction of space-earth integrating system, to boost the EOS serving capability, and improve the services of EOS data provision and sharing. In the current stage, the EOS datasets and products have been used in a diversity of applications, such as metrology, ocean monitoring, national land resource survey, ecosystem environment protection, disaster detection, city management, et al.

China EOS is now enhancing its operational service capability. A set of R&D satellites are transforming gradually to operational mode after in-orbit tests. Using this excellent platform of CGMS, CNSA is very glad to communicate and share our experiences with other members , explore new EOS technology and sensors, and to make more contributions for the optimization of the global EOS.

In **CGMS-43-ESA-WP-01**, ESA presented the status of current and future ESA EO missions and programmes.

The plenary 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 Gravity field and steady-state Ocean Circulation Explorer, GOCE, the first Explorer satellite launched on 17 March 2009, ended its mission in November 2013, exceeding its predicted lifetime. The SMOS satellite was launched on 2 November 2009. All reprocessed Level 1 and 2 data are 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 scientific community is on-going on. 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 data 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.

The plenary 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 start of the Copernicus pre-operational services took place in 2008, with the provision of the relevant data. The first Copernicus dedicated satellite ("Sentinel-1A") was launched on 3 April 2014, other Sentinels will follow in 2015 onwards. Sentinel missions are developed in partnership with the European Union

The plenary 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 thirteen existing project teams have made significant progress on algorithm development and on specifying a future operational system. The Programme achieved its phase 1 objectives end-2013 and continues in Phase 2 starting since early 2014.

NOAA encouraged ESA to consider NRT real-time data dissemination early in the programmes. ESA responded that NRT dissemination will be considered by the satellite programmes where it is feasible and beneficial for the user community.

WMO urged efforts to ensure a data policy and data access provisions for Copernicus, which will allow the global meteorological community to benefit fully from the Copernicus data and products.

In **CGMS-43-ISRO-WP-02,** ISRO and IMD reported on the status of current and future satellites.

Presently, three geostationary meteorological satellites INSAT-3A, Kalpana and INSAT-3D are operational. INSAT-3D launched in July 2013, is now fully operational with products being generated regularly at the INSAT Meteorological Data Processing System (IMDPS) and available to the users from IMD and ISRO.

INSAT-3D derived AMVs are regularly monitored by NCMRWF and ECMWF and quality of the products are found to be good. These AMVs are operationally assimilated at NCMRWF and IMD. INSAT-3D products have been extensively used for various weather applications. The clear-sky radiance products from INSAT-3D Sounder are now being routinely generated and NCMRWF has started assimilating these products in operational models after examining the biases for three months. Based on RT model, the bias correction procedure was included in the Sounder processing using 6-month collocated RAOB and Sounder observations.

Polar orbiting satellites Oceansat-2, SARAL, RISAT and low-inclination satellite Megha-Tropiques (MT) are presently operational. The Oceansat-2 scatterometer was switched off in March 2014 and only OCM and ROSA are presently functioning. The MADRAS payload onboard MT worked only for 18 months after launch in 2011. SAPHIR and SCARAB data products are operational. SARAL-AltiKa data is being used operationally in ocean state forecast models for improved prediction. Prototype coastal products of sea level, wave height and wind speed are ready to be made available to researchers for scientific studies. A land hydrology product (inland water level) has been hosted on MOSDAC.

The future satellite INSAT-3DR, a repeat mission for INSAT-3D, is planned to be launched towards the end of 2015. GISAT, which will be launched in 2017, will enhance the nowcasting capability with the repeat cycle of 10 minutes over Indian landmass and the adjoining areas at spatial resolution of 1.5 km. The polar orbiting satellite SCATSAT-1 is planned in late 2016 as a replacement for Oceansat-2 Scatterometer. Oceansat-3 is scheduled for launch in 2018, and will provide continuity for Scatterometer besides proving sea surface temperature measurements. A joint NASA- ISRO mission NISAR having a dual frequency Synthetic Aperture Radar (SAR) will be launched around 2020. A dedicated satellite NEMO-AM aimed at measuring and monitoring atmospheric aerosol is planned to be launched in 2016.

IOC thanked ISRO for joining the International science ocean community.

NOAA noted that ROSA data from Oceansat-2 are currently not usable. ISRO recognized these problems and responded that the issues are being addressed.

In **CGMS-43-NASA-WP-01**, NASA presented the status of its current and future Earth Science satellite systems.

NASA currently supports the operations of 19 Earth Science missions. Over a 15- month period from February 2014 through April 2015, NASA's Earth Science Program successfully launched 5 new missions, and decommissioned 2. Although all missions were conceived as research missions, it has turned out that the efficiency of the communications and ground data handling systems has

supported operational and near-real-time applications. All missions are currently producing data, but several also show signs of aging, and 2 are currently scheduled for decommissioning in the next 12 months.

NASA's Earth Science Program is implementing a balanced and robust plan to accomplish a broad set of critical Earth observation measurements from space. The program advances knowledge of the integrated Earth system, the global atmosphere, oceans (including sea ice), land surfaces, ecosystems, and interactions between all elements, including the impacts of humans. A balance of satellite measurements, science research, technology development and applications are needed to address a complex global Earth system. NASA's plans include the launch of 11 missions and 4 instruments (on host missions) in the future.

WMO urged NASA to plan for NRT access to future research satellite mission data. NASA responded that this is being addressed internally and with users.

In **CGMS-43-JAXA-WP-01**, JAXA reported on the status of current and future satellite systems.

JAXA currently is operating ALOS-2 (Daichi-2), DPR on GPM Core, GCOM-W (Shizuku) and GOSAT (Ibuki), and is preparing GCOM-C, GOSAT-2, and the CPR instrument on EarthCARE.

ALOS-2 was successfully launched from Tanegashima on May 24, 2014. The first image from the ALOS-2 was successfully received on 19th June, and data provision though a commercial provider has started from 25th November 2014. ALOS-2 will contribute to climate change monitoring though the observation of land cover changes.

GPM Core Observatory was successfully launched from Tanegashima Space Center on Feb. 28. The first image of the DPR received on 10th March provides a 3D image of the precipitation in a growing low pressure system. GPM Core/DPR successfully replaces the TRMM/PR whose operation has been terminated after its 17-year long service.

Distribution of the DPR products started on 2 September 2014. Users are able to access the data from the G-Portal.

The AMSR-2 (on GCOM-W1) products are available at the GCOM-W1 Data Providing Service website. NOAA has started direct data reception of AMSR-2 and uses the data regularly for weather forecasting.

The GOSAT data products are distributed through the GOSAT User Interface Gateway (GUIG), a website for GOSAT data distribution. GOSAT operation will continue in order to provide a bridge with the follow-on GOSAT-2 mission scheduled to launch in 2017.

The developments of EarthCARE/CPR and GCOM-C are under way. EarthCARE and GCOM-C will be launched in JFY2016.

F WORKING GROUPS REPORTS

F.1 Satellite data and products (WGII)

F.1.1 Working group II report

The Working Group held its session as part of the CGMS-43 meeting on Monday, 18 May 2015 from 09:00-18:00 and Tuesday, 19 May 2015 from 09:00-16:00. The Group discussed 65 Working Papers and had 40 participants. Stephan Bojinski (WMO) and Toshiyuki Kurino (JMA) served as group co-chairs served. The list of participants is provided in Annex III.
Toshiyuki Kurino (JMA) expressed his thanks to NOAA NESDIS and special thanks to UCAR for providing the facility, and highlighted the necessity for CGMS cooperation in introducing the new generation of satellites, and to facilitate user uptake.

Stephan Bojinski (WMO) stressed the role of the WG for identifying actions by CGMS operators related to satellite data and products, and for the exchange of information.

The full report from WGII is provided in the chapter Parallel Working Group Sessions.

F.1.2 Summary of highlights and request for guidance from GSICS Executive Panel

CGMS-43-WMO-WP-16 reported the outcome of the GSICS Executive Panel meeting in Boulder, Colorado, 15-16 May 2015.

CGMS members are collaborating in the framework of GSICS to develop and apply “best practices” for state-of-the-art and homogeneous calibration.

Upon its 10th anniversary the GSICS community is gradually encompassing all CGMS members. GSICS proves to be a great capacity building and collaboration opportunity. Its products are increasing in maturity. The practical value of GSICS was demonstrated in the role played to facilitate the commissioning operations of several satellite programmes in the most recent years. GSICS benefits on the one hand to satellite operators, through sharing of resources and best practices, and on the other hand to satellite data users, through improved calibration, assessments, and traceability to common references.

Several challenges were identified and led to specific recommendations to CGMS Members:

- All satellite operators should participate in GSICS Working Groups, including GDWG (as a target, it is recommended that every GRWG or GDWG member plans a yearly contribution at the level of at least one man-month).
- All satellite operators to evaluate their requirements for GSICS resources, products and services to serve the needs of their users
- Procedures, best practices and calibration resources required to ensure the consistency of data records through accurate and homogeneous calibration should be defined by GSICS and CEOS WGCV as an input to the Architecture for Climate Monitoring from Space.
- Give increased attention to ground calibration sites

- Consider enhancing ground-based Moon observatories in order to reduce the absolute uncertainty of satellite instrument calibration by lunar observation.

On the occasion of the 10th anniversary of GSICS, the CGMS plenary expressed its appreciation of the achievements of GSICS and in particular the contributions of Dr. Mitch Goldberg, NOAA, who has been a driving force in the project.

ROSCOSMOS noted that work is ongoing regarding LEO-GEO cross-calibration between Meteor and Meteosat and announced that it will join GSICS on an observer basis.

F.1.3 Summary of highlights and request for guidance from IWWG-12

CGMS-43-IWWG-WP-07 summarizes the outcomes of the 12th International Winds Workshop (IWW12). The workshop was hosted by the University of Copenhagen and took place in Copenhagen, Denmark from 16-20 June 2014. There was a good cross-spectrum of attendance (65 participants) from a wide range of satellite producers, NWP centres, and research centres.

The paper:

- recalls recommendations from CGMS-42 to IWW12
- highlights the outcomes and recommendations from IWW12

CGMS expressed its appreciation of the excellent contributions of Dr. Johannes Schmetz, who is stepping down from his role as rapporteur for IWWG. Dr. Schmetz has been a driving force behind the efforts to develop harmonized methodologies for AMV derivation since the first International Winds Workshop in 1991.

F.1.3 Summary of highlights and request for guidance from IPWG7

The IPWG-7 was held at the Tsukuba International Congress Center and hosted by the Japanese Aerospace Exploration Agency (JAXA) Earth Observation Research Center (EORC), Tsukuba, Japan during 17-21 November 2014, attended by 125 participants from over 20 countries. It included a special session dedicated to Dr. Arthur Hou, NASA Global Precipitation Measurement (GPM) Project Scientist, who passed away in late 2013. In parallel, a satellite training course was given with 28 participants.

Two new co-chairs were selected; Remy Roca (CNRS, France) and Tufa Dinku (IRI, USA). IPWG-8 will be held in the fall of 2016, with an African venue being targeted.

IPWG encouraged CGMS to continue to provide financial support for the activities related to IPWG, including workshop support and associated travel for new participants (including those at any associated training activity), travel support for CGMS member participation, and support for IPWG co-chairs (or designated representatives) to participate at other relevant meetings (e.g., WMO, CEOS, etc.).

F.1.5 Future radio occultation constellation

F.1.5.1 Summary of highlights and request for guidance from IROWG-4

CGMS-43-IROWG-WP-13 summarizes the outcome of the IROWG Workshop No. 4 (IROWG-4) of the International Radio Occultation (RO) Working Group. The workshop was organized by the Bureau of Meteorology (http://www.bom.gov.au/) and the Centre for Australian Weather and Climate Research (http://www.cawcr.gov.au/) in Melbourne, Victoria, Australia; the meeting was held at the Bureau of Meteorology from the 16th to 22nd of April 2015.

The main recommendations of the fourth IROWG meeting were presented by Lidia Cucurull, NOAA and IROWG Co-chair- only a short and concise working paper could be provided to CGMS-43 since IROWG-4 and CGMS-43 occurred only a few weeks apart. The full set of recommendations, relevant at CGMS, at satellite operator, and at IROWG level will be made available at http://www.irowg.org.

The Plenary endorsed the following four main IROWG-4 recommendations, for consideration by CGMS members in their future plans for Radio Occultation measurements:

CGMS-43 recommendations – PLENARY						
Actionee	AGN item	#	Description	Deadline	Status	HLPP ref
CGMS (space agencies)	F.1.5.1	R.43.01	IROWG requests 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	Long-term	OPEN	HLPP # 1.1.4
CGMS members (space agencies)	F.1.5.1	R.43.02	IROWG recommends targeting at least 20,000 occultations/day to be made available to the operational and research communities of Numerical Weather Prediction, Climate, and Space Weather	Long-term	OPEN	HLPP # 1.1.4
CGMS members (space agencies)	F.1.5.1	R.43.03	IROWG recommends that the RO receiver design includes sufficient software/firmware flexibility to allow changes in the signal processing including processing of new GNSS signals/constellations as they become available; all receiver measurements should cover the ionosphere as well	Long-term	OPEN	HLPP # 1.1.4
CGMS members (space agencies)	F.1.5.1	R.43.04	International space/research agencies (e.g. NASA, ESA, CMA, CSA, NSF, NOAA, EUMETSAT and others) to hold an interagency workshop to define cooperation options for implementing the next steps towards a LEO-LEO research and demonstration mission	Long-term	OPEN	HLPP # 1.1.4

All presentations, as well as minutes, from IROWG-4 will be made available at http://www.irowg.org

F.1.5.2 EUMETSAT radio occultation study outcome

In **CGMS-43-EUMETSAT-WP-12** the first results of a study currently running at ECMWF were presented. The study looks at saturation effects when assimilating RO observations, where RO observation positions are simulated using realistic LEO and GNSS orbits. This study is thus a refinement of an earlier study that assumed RO occultations to be randomly distributed in space and time.

An Ensemble of Data Assimilation (EDA) approach, using 10 (+1) members in a 4D-Var modern NWP system, was used. Within this study, the following 3 main issues are addressed:

- Refine the earlier, random occultation position, study with realistic future satellite orbits;
- Assess which observation constellation is best suited to achieve the best distribution in space and time;
- Provide guidance on RO instrument deployments on future LEO satellites.

Regarding Point 1, it has been found that although realistic orbits affect occultation positions significantly, a modern NWP system can still effectively use any observations, thus the impact of realistic orbits is small. Regarding Point 2, the more observations are available, the lower forecasting spreads are found; constellations that provide most observations at low latitudes are particularly useful, since here, per area the least occultations are available from polar orbiting RO instruments and the model errors are the largest. Regarding Point 3, it again can be concluded that the more observations, the lower the forecast spread, even if additional instruments are provided in orbits that are already populated with RO instruments.

The study itself is formally finishing by August 2015, with a final presentation at EUMETSAT about 1 month earlier. Underlying EDA runs are already completed, they have been run over the last year. Shown results and discussions, conclusions are thus also entering the final report. The study results have also been presented and discussed at IROWG-4 in April 2015.

F.1.5.3 CMA future prospects for radio occultation

CGMS-43-CMA-WP-05 provides an overview of status and future plans for radio occultation measurements of CMA.

The GNOS instrument was launched for the first time on FY-3C in 2013. Summary of the instrument capabilities:

- Daily profiles can be up to ~500 for GNOS/GPS
- FY-3C/GNOS shows good data quality between 5-30 km altitude.
- F-3C/GNOS/ data have a neutral or positive impact on GRAPES forecast skill.

The next GNOS instrument on FY-3D and follow-on will be improved with respect to antenna gain, number of channels and B1 open loop tracking ability.

Future Work:

- More elaborated experiments on the assimilation of GNOS
- Promote operation of the occultation data from Bei Dou System (BDS)
- International Cooperation

IROWG encouraged CMA to provide GNOS data in near real-time on the GTS. The following action was agreed:

CGMS-43 actions - PLENARY						
Actionee	AGN item	#	Description	Deadline	Status	HLPP ref
CMA	F.1.5.3	A43.11	CMA to consider providing GNOS data in near real-time on the GTS.	CGMS-44	OPEN	HLPP # 1.1.4

F.1.6 Applications using VIIRS Day-Night band and RGB composites

CGMS-43-NOAA-WP-13 provided to the CGMS community a sampling of the emerging capabilities in nocturnal characterization enabled by the Day/Night Band (DNB) sensor on Suomi NPP, part of the Visible/Infrared Imaging Radiometer Suite (VIIRS). A growing collection of research papers is giving evidence to the DNB's far-reaching utility, well beyond the originally envisioned scope of 'imagery.' Quantitative applications are becoming possible with the conversion of DNB radiances to reflectance and combining with other VIIRS spectral bands. Unexpected sensitivity to nightglow is revealing tantalizing new scientific potential for the study of upper atmospheric dynamics.

CGMS was encouraged to explore the new and complementary information content of the DNB for night-time applications, and where appropriate, advocate for the inclusion of such measurements as baseline requirement of future low-earth orbiting and geostationary environmental satellites.

F.1.7 First results and products from Himawari-8

In **CGMS-43-JMA-WP-09**, JMA presented first results and products from HImawari-8. The next-generation geostationary meteorological satellite of the Japan Meteorological Agency (JMA), Himawari-8, was successfully launched on 7 October 2014 and will start operation in July 2015. Himawari-8 features the new 16-band Advanced Himawari Imager (AHI), whose spatial resolution and observation frequency are improved over those of its predecessor MTSAT-series satellites. These improvements will bring unprecedented levels of performance in nowcasting services and short-range weather forecasting systems. In view of the essential nature of navigation and radiometric calibration in fully leveraging the imager's potential, the working paper reports on the current status of navigation and calibration for the AHI and outlines related products.

WMO noted the fact that the Himawari-8 imager employs detector arrays and requested JMA to provide more information on the imaging technology and characterisation of the multi-detector channels.

F.2 Global issues on satellite systems and telecommunications coordination (WGI)

F.2.1 Endorsement of WGI Terms of Reference

CGMS-43-EUMETSAT-WP-02 presented the proposed revision of the Terms of Reference for WG I and WG IV.

CGMS Working Group I on "Global issues on satellite systems and telecommunication coordination" was set up in 1989.

CGMS Working Group IV on "Global Data Dissemination" was created in 2001.

During the existence of the working groups a considerable evolution in telecommunication systems and associated services took place, leading to an expansion of the scope in each working group.

With the implementation of ATOVS Retransmission Services (RARS) and wider use of DVB dissemination services it became necessary to redefine the scope of WGI and WGIV to avoid unnecessary overlap in both groups.

CGMS-43 plenary agreed to the revised Terms of Reference for WGI and WGIV and CGMS-42, Plen E.1.3, A42.07 was closed as a consequence.

F.2.2 Report from Working Group I

Working Group I (WGI) on Global issues on satellite systems and telecommunications coordination convened on Monday 18 May 2015 at 08:30.

The Working Group held its session on Tuesday 19 May from 08.30-15:30. Vanessa Griffin from NOAA and Lars-Peter Riishojgaard from WMO served as co-chairs and Joaquin Gonzalez from EUMETSAT as rapporteur. Representatives of the following organisations attended the session: CMA, EUMETSAT, JMA, KMA, NOAA, ROSCOSMOS, and WMO as Members, and GEO and KARI as Observers (the list of participants is included in the Annex).

The full report from the meeting of WGI is provided in the chapter Parallel Working Group Sessions.

The Plenary discussed the detrimental effect of radio frequency interference on SMAP and SMOS measurements. There was a general agreement that a letter should be sent from CGMS to ITU, supported by WMO in its Observer capacity at ITU, reiterating the protected status of these frequencies. In addition Agencies shall also use their national Points of Contact to address RFI issues.

In this regard, the following action was agreed:

CGMS-43 actions - PLENARY						
Actionee	AGN item	#	Description	Deadline	Status	HLPP ref
WGI co-chairs	F.2.2	A43.12	WGI Co-chairs, with the support of IOC-UNESCO, ESA and GEO to draft a CGMS letter to ITU, reminding the societal benefits and importance of all MetSats, EESS and Science Satellite Services , and need for enhancing the protection of the corresponding radio frequency bands	30 Jun 2015	OPEN	HLPP # 1.3.4

F.2.3 Transition from GVAR-R GRB – service continuity

CGMS-43-NOAA-WP-02 presented the planning for the transition from GOES Variable (GVAR) to the GOES-ReBroadcast (GRB).

GRB allows real time distribution of all Level-1b GOES-R data products for direct read-out users. Direct Readout users need to upgrade their equipment for GOES-R. GRB provides significant increase in data rate and a new data format

GRB downlink specifications and data format specifications have been published and updates will be posted on the GOES-R web site: http://www.goes-r.gov/.

F.3 Global data dissemination (WGIV)

F.3.1 Endorsement of WGIV Terms of Reference

The revised Terms of Reference for WGIV were endorsed by CGMS-43 plenary (see also section F.2.1).

F.3.2 Report from Working Group IV

Working Group IV (WGIV) on Global Data Dissemination convened on Monday 18 May 2015 at 08:30.

The Working Group held its session on Monday 18 May from 08.30-14:30. Jae-Dong Jang from KMA served as chair and Klaus-Peter Renner from EUMETSAT as rapporteur. Representatives of the following organisations attended the session: CMA, EUMETSAT, ISRO, JMA, KMA, NOAA, WMO as Members, and KARI as Observer (the list of participants is included in the Annex).

The full report from the meeting of WGIV is provided in the chapter Parallel Working Group Sessions.

The following action was agreed during the discussion of the report from WGIV.

CGMS-43 actions - PLENARY						
Actionee	AGN item	#	Description	Deadline	Status	HLPP ref
CGMSSEC	F.3.2	A43.13	CGMS Secretariat to send a letter to JCOMM requesting that the JCOMM Cross-Cutting Task Team on Satellite Data Requirements reports on the definition of satellite data for the ocean community to CGMS-44 (ref. CGMS-43 WGIV/6.2 discussions)	30 June 2015, CGMS-44	OPEN	HLPP # 2.5

F.3.3 GOES-R global data exchange

In **CGMS-43-NOAA-WP-37**, NOAA reported how GOES-R data will be obtained without a GRB receiving station:

Near-Real Time (NRT):

- PDA: New NOAA enterprise system for Product Distribution and Acquisition. GOES-R data will be available on PDA 1 minute after real-time
- GEONETCast: NOAA will work with its technical personnel and the user community to replace GOES-13 imagery on GEONETCast Americas with roughly equivalent amounts GOES-R imagery when it becomes the operational East satellite
- HRIT/EMWIN: The GOES-R HRIT/EMWIN service combines LRIT and EMWIN with GOES-DCS on a single ~ 1 meter Antenna

Non Near-Real Time:

- GOES-R level 1b and level 2+ data will be available on CLASS 3-4 hours after real-time NetCDF4 files
- All 16 ABI channels
- Registration process will be the same as today: https://www.nsof.class.noaa.gov/saa/products/user_profile.

WMO thanked NOAA for the commitment to work with the user community to explore the effective transition to GOES-R, including efforts to make Lightning Mapper data available on GEONETCast-Americas.

F.3.4 PDA Product distribution and acquisition

In **CGMS-43-NOAA-WP-03** NOAA provided an overview of its new primary system for distribution of near-real-time data to users, PDA. In the working paper NOAA provides contact information in case CGMS Members require additional information.

WMO inquired about the process for gaining access to PDA NRT data, and in particular about the needed justification for NRT access. NOAA responded that applications are judged on a case-by-case

basis, looking at the justification for NRT data via PDA, but that operational users including Weather Services would in any case be granted access.

F.3.5 WMO Satellite Data Dissemination Strategy

In **CGMS-43-WMO-WP-09** WMO presented the WMO Satellite Data Dissemination Strategy.

Ensuring the operational access to, and use of, satellite data and products for a growing number of WMO Members in the coming decade is a major objective for both WMO and CGMS. In achieving this, we are faced with major technical challenges including the exponential growth of data rates for new satellites, the requirement for improved latency (e.g. for NWP) and the threat to radio frequency allocations for meteorological satellites. There are also strategic and organisational challenges including the digital divide between most and least advanced users, and the need to ensure interoperability and standardisation of evolving systems, and their integration into WIS. At the same time, a number of opportunities are opened by the constant progress in information and communication technology (e.g. the Cloud).

Following earlier discussions at CGMS-42 and CBS-Ext.(2014), a medium-term Satellite Data Dissemination Strategy is proposed. This Strategy calls for active support of CGMS members in particular in the following areas:

- Enhancing data availability
  - Global Coverage of LEO Direct Broadcast Acquisition, Processing and Distribution Systems
  - Bilateral Exchange of Data and Products
  - Routine Availability of Data and Products from R&D Satellites
- Description and Registration of Satellite Data and Products
  - Making Satellite Data and Products Discoverable on the WIS
  - Standardized Data Formats
- Dissemination and user access
  - Standardized Direct Broadcast
  - Global Access to Data and Products on the Core WIS Network
  - Full Integration and Operation of DVB Broadcast Services
  - On-demand Access to Satellite Data and Products

EUMETSAT thanked WMO for the efforts going into the strategy. The new strategy needs to be assimilated. It is important to take time to review this in detail and to distinguish between what is the strategy and what is the implementation.

GEO stressed the importance of cloud technologies, including private clouds. WMO responded that the emerging cloud technologies and their application in the WIS context are being considered by appropriate expert teams like ET-CTS.

The Chair stressed that the strategy should not drill down too much into implementation details.

CGMS members were invited to the following action:

CGMS-43 recommendations – PLENARY						
Actionee	AGN item	#	Description	Deadline	Status	HLPP ref
CGMS members	F.3.5	R43.05	CGMS members to - comment on the WMO medium-term strategy for satellite data dissemination - support the implementation of the strategy in contributing to the identified strategic targets and actions, as appropriate, and in taking the proposed strategic targets into account in their own dissemination plans	CGMS-44	OPEN	HLPP# 2

F.4 Operational continuity and contingency planning (WGIII)

F.4.1 Report from Working Group III

Working Group III (WGIII) on Operational Continuity and Contingency Planning convened on Tuesday 19 May 2015 10:00-16:00.

Dr. Zhang Peng from CMA and Suzanne Hilding from NOAA served as co-chairs and Derek Hanson from NOAA as rapporteur. Representatives of the following organisations attended the session: CMA, EUMETSAT, ISRO, JMA, KMA, NASA, NOAA, ROSCOSMOS and WMO (the list of participants is included in Annex III). The Co-Chairs were pleased to note the large number of participants in this year's WGIII meeting.

The full report from the meeting of WGIII is provided in the chapter Parallel Working Group Sessions.

F.4.2 Indian Ocean Data Coverage (IODC) – CGMS roadmap

In **CGMS-43-EUMETSAT-WP-14**, EUMETSAT proposed a way forward for the provision of Indian Ocean Data Coverage (Services) after re-orbiting of Meteosat-7 in 2017, based on the analysis of the current status of CGMS partner satellite systems (CMA, EUM, ISRO and ROSHYDROMET) in the region.

The combination of satellites and services should lead to an overall resilient multi-partner IODC service, for which a requirements baseline has been agreed at CGMS-42.

The paper proposed a scenario and roadmap for approval by the CGMS partners contributing to future IODC services.

IOC was pleased to see the continuous response of the CGMS community to the aftermath of the Tsunami of 2004 with the DCPs, and commended the support to the Tsunami Warning System.

IPWG was highly supportive of the plan proposed, as observation gaps over the Indian Ocean are a major concern to the precipitation community.

WMO asked if an additional iteration with user community was needed in this area. EUMETSAT responded that surveys are important but we have a critical timeline and we need to make do with what we have. Thanks to the coordination we have a robust system with 4 partners, which is a solid basis for some years to come. It is particularly important that the contributors confirm their support to the roadmap, as CGMS needs to give a signal to WMO Congress.

The Chairperson noted that the proposal represents a robust and resilient approach providing a better long-term solution that what has been available in the past and asked the partners to state their commitment to the proposal

EUMETSAT informed Plenary that it was not yet in a position to fully approve the relocation of Meteosat-8, as the MSG-4 launch in July and the commissioning needs to be completed successfully by the end of 2015. Pending EUMETSAT Council approval in mid-2016, EUMETSAT is confident that if all things go well it will be able to move Meteosat-8 in 2016. EUMETSAT noted that the new IODC roadmap will provide an excellent system, which will be much more robust than what was possible in the past.

ISRO informed plenary that INSAT-3D has been launched and ISRO is making all data available through the ISRO Website, as well as contributing to GSICS. ISRO is committed to launch INSAT-3DR (end of 2015/2016) and INSAT-3DS in 2022, and is also looking at the GISAT satellite (2017) that will support nowcasting.

ROSCOSMOS/ROSHYDROMET will support the roadmap proposed by EUMETSAT. Electro LN1 has limitations and we are planning to launch LN2 in the same orbital position to cover IODC. Electro LN2 data will be made available after commissioning. DCS are available from LN1 and LN2.

CMA informed that FY-2G has been launched successfully and commissioned and was moved to Operational Status in April. In response to CGMS roadmap, CMA plans to move FY-2E to replace FY-2D with better radiance calibration and S/N for observations. The replacement is planned to be completed by the end of June.

WMO stated that this is a wonderful step forward and a historical achievement for CGMS. CGMS however now needs to look at the implementation details and in particular at actions to be taken for the dissemination of the data.

WMO drew a parallel with another historical achievement announced at this CGMS plenary session, which was CMA's decision on the deployment of FY-3E in the Early Morning orbit, and emphasised that these two achievements alone would justify the existence of CGMS.

The Chair stated he was impressed by the level of coordination achieved by CGMS on these matters.

The partners agreed to report to the next plenary session of CGMS:

CGMS-43 actions - PLENARY						
Actionee	AGN item	#	Description	Deadline	Status	HLPP ref
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	CGMS-44	OPEN	HLPP # 1.1.6

F.4.3 CGMS and socio economic benefits issues

F.4.3.1 Outcome of WMO CM-12 discussion on socio-economic benefits

CGMS-43-WMO-WP-10 reported on the discussion at the 12th session of WMO Consultative Meetings on High-level Policy on Satellite Matters (CM) on socio-economic benefits of space programmes. The CM serves as a forum for satellite operators and WMO management to discuss the strategic direction that WMO takes in relation to space. The session received briefings by the chair of the CGMS Socio-Economic Benefits Tiger Team (SETT), EUMETSAT, CMA, NOAA, and JMA. Participants recognized the importance of socio-economic benefit studies for satellite programmes, to justify investments and to meet communication demands, and provided perspectives on the conduct of such studies and related challenges.

The CM session recommended that the WMO workshops on assessing the impact of various observing systems on NWP be extended or emulated to other application areas, such as climate.

F.4.3.2 Socio-economic benefits of weather information

Jeff Lazo from UCAR Societal Impacts Programme provided the keynote speech on Socio-Economic Benefits of Weather Information.

CGMS-43-UCAR-WP-02 provided a brief overview of socio-economic approaches to weather information including discussing why economics is needed and what detail of economic analysis is required. An exercise based on the benchmarking approach used by the World Bank was provided to illustrate a very basic approach to valuing weather information. This was followed by an illustration of the weather information value chain for improved irradiance forecasting for use by utility scale solar power generation indicating the complexity of more advanced valuation efforts. The weather information value chain concept was then discussed as a tool for understanding the value creation process and economic methods. An overview of some key economic concepts and a taxonomy of benefits assessment methods were presented.

Information was also provided on some available resources on economic analysis for hydro-met services including the new USAID/WMO/World Bank book on socio-economic benefits assessment. Some thoughts on the CGMS SETT were provided from the viewpoint of an economist, and recommendations were made for future socio-economic benefits work including showing results from a study on the value of improved hurricane forecasts and an illustration of the potential importance of a study of values to the general public of improved weather information.

The importance of social science in communicating the information from Weather forecasts was emphasised.

Jeff Lazo commented that the UCAR programme provides training to National Hydrometeorological Services, noting that there is a large amount of economic analysis going on in the private sector (i.e. aviation sector), but for obvious strategic reasons with no links to other efforts.

F.4.3.3 Report from Socio-Economic Tiger Team (SETT)

In **CGMS-43-NOAA-WP-04** NOAA as chair of the CGMS Socioeconomic Benefits Tiger Team (SETT) provided a status report from SETT and its plans for the next year. The report discussed the outcome of Workshop #2, including the work being done on the case study on "Understanding and Assessing the Value of Improved Satellite Data for the Users of Operational Sea Ice Products and Information". CGMS SETT is also developing a guidance document for use by CGMS Members considering their own socioeconomic benefit studies.

F.4.4 Report from the ad hoc Group on Space Weather

The ad-hoc Group on Space Weather convened on Tuesday 19 May 2015 16:00-18:30.

Suzanne Hilding from NOAA chaired the session and Jerome Lafeuille from WMO acted as rapporteur. Representatives of the following organisations attended the session: CMA, ESA, EUMETSAT, JMA, KMA, NASA, NICT, NOAA, ROSCOSMOS and WMO (the list of participants is included in Annex III).

The full report from the meeting of the ad-hoc Group on Space Weather is provided in the chapter Parallel Working Group Sessions.

The CGMS Plenary endorsed the recommendation from the ad-hoc Group to create a dedicated CGMS Space Weather Task Team (SWTT), chaired by Suzanne Hilding from NOAA, and noted that an inter-sessional meeting of SWTT will be convened to translate the Terms of Reference (ToR) into specific objectives for the HLPP and to define next steps for action until CGMS-44. The initial membership of SWTT is based on the list server CGMSspaceweather@wmo.int.

CGMS-43 actions - PLENARY						
Actionee	AGN item	#	Description	Deadline	Status	HLPP ref
SWTT	F.4.4	A43.15	The Space Weather Task Team (SWTT) to report on progress at CGMS-44	CGMS-44	OPEN	HLPP # 5.2

G CLIMATE

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

In **CGMS-43-JWGCLIM-WP-01** the COES-CGMS Joint Working Group on Climate presented an update on activities.

The Fifth meeting of the CEOS-CGMS Working Group on Climate took place 25-27 March in Geneva, Switzerland. Main foci of the meeting were: 1) progress and plans for the Essential Climate Variable (ECV) inventory assessment and gap analysis, 2) update of activities to support climate applications and decision making and the related WMO report on these activities, and 3) plans and reporting to the Global Climate Observing System (GCOS) and the UN Framework Convention on Climate Change (UNFCCC) Committee of the Parties Subsidiary Body on Scientific and Technological Advice (COP/SBSTA). The ECV inventory and gap analysis will move forward on selected records and feedback will be provided on input by Agencies to all records. The WMO report, 'Establishing an Architecture for Climate Monitoring from Space through Climate Service Case Studies' is expected to be published and presented at the WMO Congress in June 2015. The report to GCOS is being finalized and the content of the COP/SBSTA report was established.

IOC Representative noted the importance of the in situ community in the implementation of the architecture for climate monitoring from space. It was noted that some of the tools and processes developed will be made available to the in situ community.

Although the Working Group has made progress, most of the work has been accomplished by a limited number of Agencies. Thus, the Working Group encourages CGMS Agencies to renew their commitment to success of the Working Group by ensuring their agency participation. WGClimate also requested CGMS Plenary to approve Jörg Schulz of EUMETSTAT as incoming Vice-Chair. Pascal Lecomte of ESA is the incoming Chair.

On a question from IPWG, the JWGClimate chair noted that Interim Climate Data Records are captured in the Inventory.

CMA asked if NRT data were considered part of the Climate architecture. JWGClimate confirmed that this is not the case.

The CGMS plenary endorsed the appointment of Jörg Schulz of EUMETSAT as the incoming Vice-Chair of JWGClimate.

G.2 Further CGMS Contributions to the climate architecture from the GSICS Executive Panel

In **CGMS-43-WMO-WP-06**, Dr. Holmlund from the GSICS Executive Panel presented considerations on calibration and the role of GSICS in the Architecture for Climate Monitoring from Space.

Calibration contributes significantly to the end-to-end Architecture for climate monitoring from space:

- The sensing level (Pillar 1) drives the *potential* to generate ECVs
- The climate record creation (Pillar 2) is the *actual* use of this potential
- The ECV inventory addresses Pillar 2 => helps maximize the use of data
- Calibration activities must be addressed in both Pillars 1 and 2 :
  - Space segment (pre-launch and on-board calibration, space/ground references)
  - Applying inter-calibration corrections, re-calibration of archived data

Calibration should be considered in the architecture by:

- Calibration infrastructure to be implemented and shared
  - In-orbit references for traceability
  - Ground-based calibration sites
  - Databases and software tools

- Calibration processes to be addressed by operators
  - Best practices for pre-launch calibration
  - Procedures for in-orbit calibration with uncertainty estimation
  - Procedures for in-orbit comparison and inter-calibration
  - Procedures for vicarious calibration with ground targets
  - Algorithms/tools for re-calibration of archived data
  - Communication and capacity building (incl. QA4EO)

- These activities are conducted by GSICS together with CEOS/WG on Calibration and Validation

GSICS will continue the work with CEOS/WGCV:

CGMS-43 actions - PLENARY						
Actionee	AGN item	#	Description	Deadline	Status	HLPP ref
GSICS	G.2	A43.16	GSICS to work with CEOS/WGCV to: – Describe the processes to be followed to ensure consistent calibration meeting climate requirements, – Describe the required infrastructure (space-based and surface-based) supporting these processes, – Review the analysis of calibration-related tasks in the logical analysis of the Architecture, (with a view to provide a joint input to the Architecture for Climate Monitoring from Space) and report to CGMS-44	CGMS-44	OPEN	HLPP # 5.1

G.3 Briefing on the GCOS status report and progress including the new GCOS implementation plan

The 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 will be available to the public in November 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 the light of the

evolving Global Framework for Climate Services (GFCS). The new Implementation Plan will be launched at the GCOS Science Conference 2 – 4 March 2016, and published at the end of 2016.

CGMS members have the opportunity to contribute to the public review of the Status Report and to the process of drafting and launching the new Implementation Plan. Regarding the new GCOS IP content, CGMS members expressed satisfaction for the inclusion of supporting observations such as gravity, DEMs and orbit restitution.

G.4 Key outcomes of the Symposium on Climate Research and Earth Observation from Space

CGMS-43-EUMETSAT-WP-28 provided a report from the Symposium on Climate Research and Earth Observation from Space, held 13-17 Oct 2014 in Darmstadt, Germany.

The Symposium was organised by EUMETSAT and WCRP, on 13-17 October 2014, in Darmstadt, Germany, with support of EU, ESA and other CEOS/CGMS agencies. Around 500 participants from 50 countries, representing over 200 organisations, attended with another 500 following remotely via live-streaming.

The findings and recommendations are organized according to the following themes: i) Research and Process Understanding; ii) Observations; and iii) Coordination and Integration of Observations. Mr. Ratier summarized the key conclusions of the Symposium on needs and contributions of space-based observations and on coordination and integration of observations.

The consolidated set of outcomes of the Symposium will be published in the AMS bulletin. The full proceedings, including streaming and presentations, can be found at:
http://www.theclimatesymposium2014.com

CGMS members expressed congratulations to Symposium organizers for support for next generation scientists. This was noted as a unique benefit of the Symposium.

G.5 WMO draft resolution on exchange of data and products to support the implementation of the global framework for climate services (GFCS)

CGMS-43-WMO-WP-08 presented the Draft Resolution on International Exchange of Climate Data and Products to Support the Implementation of the Global Framework for Climate Services (GFCS), which was discussed at the 66th session of the WMO Executive Council and which is submitted in a revised version to the 17th World Meteorological Congress for adoption (Cg-17/Doc. 8.1(2), REV. 1).

From the perspective of the architecture for climate monitoring from space, the WMO informed space agencies of CGMS and CEOS of this draft resolution to solicit feedback. The draft resolution was presented at the 12th Consultative Meetings on High-level Policy on Satellite Matters (CM-12) and at the 9th session of the Expert Team on Satellite Systems (ET-SAT-9). The draft resolution, after recalling essential principles of the GFCS, would decide in particular to adopt the policies and practices of Resolution 40 (Cg-XII) and Resolution 25 (Cg-XIII) for the exchange of climate relevant data and products, and "that Members shall provide, on a free and unrestricted basis, the climate relevant data and products described in Annex I to this resolution to enable society to manage better the risks and opportunities arising from climate variability and change for all nations,

especially for those who are most vulnerable to climate-related hazards". The data listed in Annex 1 include in particular "All available climate relevant satellite data and products".

CGMS Satellite Operators are invited to communicate their support to this draft resolution to their relevant delegation at the seventeenth session of the World Meteorological Congress, which will open on Monday 25 May 2015.

CGMS members questioned the definition of climate data as: "meteorological observations that are older than 24 hours." Note this definition is footnoted in Annex 1 and appears to apply to "historical climate time series from the RBCN and GCOS Surface Network. Members cautioned that this could be used to limit or constrain access. WMO explained that consistent with the history and rationale behind Resolution 40 on meteorological data, the intention was not to restrict access to climate data but to expand or improve it. WMO informed members that any change to this draft resolution would have to be proposed by national delegations at the WMO Congress when the resolution is addressed.

IOC urged that climate data should be available for ships doing oceanographic surveys and asked whether this Resolution could hamper the download of data that are less than 24 hours. WMO responded that this is not the case. Access to recent data is addressed by WMO Resolution 40.

CGMS-43 recommendations – PLENARY						
Actionee	AGN item	#	Description	Deadline	Status	HLPP ref
CGMSSEC	G.5	R43.06	CGMS Secretariat to express the common position of CGMS members on the WMO draft resolution on data and products (CGMS-43 plen R43.03) at the WMO Cg-17	27 May 2015	OPEN	HLPP # 5.1

H GEO

H.1 Status of GEO work plan, the next 10 year strategic plan and potential CGMS contributions (provided by the GEO Secretariat)

On behalf of the GEO Implementation Plan Working Group, Osamu Ochiai from the GEO Secretariat introduced the GEO Work Plan, Structure, and Implementation Mechanisms for the period 2016-2025.

As GEO approaches the end of its first 10-year 2005-2015 mandate, the Ministers from GEO Member governments and leaders from GEO Participating Organizations gathered at the Geneva Ministerial Summit on 17 January 2014, and decided to extend their political commitment to the GEO vision through 2025.

The Geneva Summit Declaration witnesses this renewed commitment and confirms the willingness to further leverage GEO's substantial accomplishments to improve Earth observations, as well as to increase the availability of Earth observations, data, and information to leaders in government, science, industry, civic society, and the public at large.

The declaration also requests that "…a new Implementation Plan through 2025 be prepared for endorsement at the next GEO Ministerial Summit …". To respond to the Ministers' request, an Implementation Plan Working Group (IPWG) has been set up to draft a new 10-year Implementation Plan (2016-2025) for initial review at the GEO-XI Plenary in November 2014, for acceptance at the GEO-XII Plenary, and subsequent endorsement at the associated Ministerial Summit, at the end of 2015.

The Group is composed by 25 Members, 15 Experts and 10 Writing Team Members, representing the five GEO caucuses (Africa, Americas, Asia-Oceania, Europe and Commonwealth of Independent States), with three Experts and two Writing Team Members per caucus. Nominations to the IPWG were forwarded by each caucus; the GEO Co-Chairs reviewed these nominations and proposed the composition of the Group that was then endorsed by the GEO Executive Committee.

The GEO Executive Committee and GEO Co-Chairs received the mandate from the GEO-X Plenary to oversee and steer the process of developing the new 10-year Implementation Plan. They agreed to a two-phase approach to guide the IPWG work; an initial reflective phase, followed by a longer 'synthesis and formulation' phase.

The initial phase – or 'fresh perspectives' exercise - lasts from the 1st IPWG meeting in April 2014 until the middle of June 2014, when a summary report will be submitted to the GEO Executive Committee. The second 'synthesis and formulation' phase begins immediately following the 8-9 July meeting of Executive Committee and lasts until the end of the exercise with the acceptance of the Implementation Plan including 2016 transitional Work Program by the GEO-XII Plenary and endorsement at the 2015 Ministerial Summit.

In terms of potential CGMS contributions to these efforts, Mr. Ochiai outlined three specific opportunities:

- Feedback to the GEO Strategic Plan 2016-2025 : GEOSS Implementation (including 2016 transitional Work Program)
- Coordination to best restructure the Foundation Tasks (e.g., GEONETCast, Radio Frequency Protection)
- New activity ideas (June 10th and onward) on the GEO 2016 transitional work program (e.g., new technologies direct readout, broadcast)

An action was placed accordingly:

CGMS-43 actions - PLENARY						
Actionee	AGN item	#	Description	Deadline	Status	HLPP ref
CGMS members	H.1	A43.17	CGMS members are invited to provide feedback to the GEO Strategic Plan 2016-2025: GEOSS Implementation (including 2016 transitional Work Program) after issued the next version in the end of June 2015 to cgmssec@eumetsat.int. Proposals are welcomed, in particular to GEONETCast and Radio Frequency Protection as candidate Foundational Tasks, as well as new activities with regard to the activities on new technology, weather and beyond.	10 July 2015	OPEN	-

With respect to GEONETCast (GNC), Charles Wooldridge of NOAA informed CGMS members of a meeting hosted by EUMETSAT on May 4th to discuss positioning GNC in the 2016-2016 GEO Work Plan. The regional GNC operators developed a set of principles that will be incorporated into a statement reconfirming their commitment as the operators of the GNC system. This statement will be given on behalf of the group at the November 2015 GEO Ministerial Meeting.

I EDUCATION AND TRAINING

I.1 The VLab Global Infrastructure for Education and Training: New 2015-2019 strategy and update on activities

In **CGMS-43-WMO-WP-12**, an update on activity for the VLab was provided by the VLab co-chair Kathy-Ann Ceasar, as well as a proposed update to the VLab 4-year strategy.

Since January 2014, VLab Training Centres of Excellence has offered a total of 66 courses and 41 Regional Focus Group sessions.

Furthermore, important developments have taken place since CGMS-42, including the change in VLab co-chairmanship, the Seventh Virtual Laboratory Management Group meeting (VLMG-7) in July 2014 in Saint Petersburg, Russian Federation, and the elaboration of the new Five-year Strategy document for VLab activities 2015-2019.

The focus of the new VLab strategy is on preparing users to the new generation of meteorological satellites, and on training on the use of satellite data and products on a broadening range of weather, climate and related environmental applications. Also Regional Focus Groups and the creation of a repository of sessions is being considered. The VLab is a solution to address key challenges in satellite-related training, capacity building, satellite applications development and operational services.

The VLab as an experienced, versatile and cost-effective global infrastructure will strive to deliver training in line with WMO and GFCS strategic priorities and GEO societal benefit areas, while also strongly engaging in the areas of climate monitoring; marine, ocean and coastal monitoring; dust, ash and smoke monitoring; and space weather.

An update on the WMO VLab Trust Fund shows that although contributions to the WMO VLab Trust Fund are matching expenses through 2015, the Fund's reserves are low and little progress has been made in the level and spread of funding by CGMS Members following the call for contributions sent by CGMS and WMO Secretariats in September 2014 (Action 42.08). Kathy-Ann Ceasar stressed the importance of the Technical Support Officer, due to the overall relatively low number of personnel dedicated to training.

IOC commended the VLab for including training modules on ocean applications, and offered potential collaboration of IOC, as IOC has been strongly involved in delivering training. The VLab was strongly encouraged to collaborate with IOC-UNESCO on the generation and delivery of training related to ocean applications.

GEO commended VLab for its intention to interact with GEO in addressing capacity building needs in its frameworks (e.g. AfriGEOSS). GEO could provide leverage and looks forward to collaborating with the VLab.

The CGMS plenary expressed its appreciation of the progress of the VLab and of the continued efforts of the VLab team and in particular of the co-chairs Kathy Ann Ceasar (Caribbean Institute for Meteorology and Hydrology) and Prof. Grigory Chichasov (Director of the WMO Regional Training Centre in the Russian Federation).

CGMS endorsed the new VLab strategy for the timeframe 2015-2019.

The following actions and recommendation were agreed following the discussions:

CGMS-43 actions - PLENARY						
Actionee	AGN item	#	Description	Deadline	Status	HLPP ref
WMO, CGMSSEC	I.1	A43.18	WMO and CGMSSEC to write a letter to all satellite operators in VLab (once receiving the revised expectations documents in August 2015) to: - Recall the urgency for more training giving increasing service reliance on satellites, and the upcoming generation of new satellite technology, - Recall expectations from operators, - Mention results of a VLab internal evaluation indicating that some expectations are better met than others and that there are urgent needs for ramping up support, - Suggesting that effective technical	15 Sept 2015	OPEN	HLPP # 4.2.3

			focal point be nominated / confirmed that will help CoEs address issues, - Recall the need for sustained financial support to the VLab Trust Fund.			
CGMS members	I.1	A43.19	CGMS members to respond to the WMO/CGMSSEC letter on VLab (reference CGMS-43 action I.1, A43.18)	15 Dec 2015	OPEN	HLPP # 4.2.3

CGMS-43 recommendations – PLENARY						
Actionee	AGN item	#	Description	Deadline	Status	HLPP ref
CGMS members	I.1	R43.07	CGMS members that are sponsors of VLab Centres of Excellence to review and where possible augment their support to these Centres, as per the "Procedure for establishing Virtual Laboratory Centres of Excellence for Training in Satellite Meteorology" (section 2.2, http://www.wmo-sat.info/vlab/wp-content/uploads/2012/02/Procedures-for-New-CoEs_LV2012.pdf)	CGMS-44	OPEN	HLPP # 4.2.3

I.2 Development of online educational resources for satellite applications

In **CGMS-43-UCAR-WP-01** UCAR provided an overview of COMET's Online Satellite Meteorology Educational Resources

The COMET® Program (www.comet.ucar.edu), a part of the UCAR Community Programs (UCP), receives funding from NOAA NESDIS, EUMETSAT, and the Meteorological Service of Canada to support education and training in satellite meteorology. These partnerships enable COMET to create educational materials of global interest on geostationary and polar-orbiting remote sensing platforms. Over the last several years, COMET's satellite education programs have focused on the capabilities and applications of current and next-generation operational environmental satellites and their relevance to operational forecasters and other user communities.

By partnering with experts from EUMETSAT, NOAA-NESDIS and its Cooperative Institutes, Meteorological Service of Canada, and other user communities, COMET stimulates greater use of current and future satellite data observations and products. The impact is evident in the large number of users from international meteorological services and universities. The translation of lessons into a number of languages further broadens the accessibility of COMET's learning materials.

This presentation provides an overview of COMET's self-paced satellite training and education lessons. It will focus on how to access the materials and on some of the latest offerings that are helping users prepare for using SNPP, the arrival of data and products from the next-generation GOES-R+ series, and the recently launched Himawari-8 satellite.

Over 100 satellite-focused, self-paced, online sets of material are freely available on the MetEd Web site via the "Education & Training", "Satellite" topic area http://meted.ucar.edu/topics/satellite in English, Spanish and French. Over 20 000 satellite lesson user sessions are held per year in English.

Recent modules added to the site include "How Satellite Observations Impact NWP", "GOES-R ABI: Next Generation Satellite Imaging", "Suomi-NPP: A New Generation of Environmental Monitoring Satellites", and "GOES-R Geostationary Lightning Mapper". In collaboration with MSC, a course on Water Vapour Interpretation for Forecasters was created.

Courses sponsored by EUMETSAT include the ASMET modules which have been very successful for building capacity with users in Africa. COMET/MetEd has more than 300 000 users around the world.

EUMETSAT commended UCAR/COMET for the great utility of these modules. These are very important in preparing users for the new generation of satellites.

I.3 Information papers on training matters

In **CGMS-43-EUMETSAT-WP-25** EUMETSAT presented the EUMETSAT benefits from, and contributions to, the CGMS-WMO Virtual Training Laboratory on Satellite Meteorology.

WMO-CGMS VLab is a major conduit to enhance the use of EUMETSAT data and products outside its 31 Member and Cooperating States, including preparedness for the next generation satellites. The natural logic is that:

- The application of the satellite data contributes to the official duty mandates of the National Meteorological and Hydrological Services, i.e. greater protection of life and property;
- User training activities are required in order to fully exploit the investment in the satellite observing system;
- The training is most effectively and efficiently delivered through regional actors, who have the skill, mandate, and logistical capacity.

The principle benefits for EUMETSAT from the VLab work are:

- Working in partnership with Regional Centres of Excellence leads to training that is more relevant and efficient;
- Working with the Centres also provides a structure for channelling user feedback and innovation;
- Knowledge and experience is shared across the partnership;
- Distance learning techniques are effective in reaching out to large audiences.

The Technical Support Officer (TSO) role is crucial, particularly in the online and distance learning elements.

At this time, the principal contributions to the VLab are:

- Sharing knowledge and experiences, particularly in online and distance teaching – which enables greater accessibility to training;
- Active support to the Centres of Excellence in Africa and the Middle East;
- Financial support to the TSO Trust Fund.

EUMETSAT commended VLab on its new strategy, noting the potential challenges in addressing the broadening of scope, requiring the support of the entire VLab network in this effort. EUMETSAT emphasized the Technical Support Officer (TSO) role, funded through a WMO Trust Fund, which is crucial particularly for organizing and maintaining the online and distance learning elements. EUMETSAT encouraged further CGMS operators to contribute to the WMO Trust Fund for supporting the VLab Technical Support Officer.

KMA supported the VLab and the TSO recognizing the importance of training in satellite meteorology. KMA expects that more users and countries can use the VLab since it is very important for supporting NMHSs and to train the next generation of meteorologists.

CGMS-43-KMA-WP-02, presented jointly with JMA, provided a progress report on the RA II WIGOS project to develop support for NHMSs in satellite data, products and training. The Project serves as a bridge between the six satellite operators in RA II and users through a coordination group, representing a number of RA II member countries.

The paper outlined the background and mission of the WIGOS Project to Develop Support for NMHSs in Satellite Data, Products and Training, and detailed recent accomplishments as well as future plans:

- Newsletters to RA II Members: Quarterly newsletters have been issued to share recent satellite-related information on topics such as imagery data, products and training;
- 5th Asia/Oceania Meteorological Satellite Users' Conference and VLab training event: The conference was preceded by a two day training event at CMA training facilities and brought together participants from Region II and V;
- Support activities to prepare satellite data users for the new generation of geostationary meteorological satellites: The RA II WIGOS Project to Develop Support for NMHSs in Satellite Data, Products and Training will support preparations by NMHSs in RA II, especially in LDCs and other developing nations, for the new satellites;
- 6th Asia/Oceania Meteorological Satellite Users' Conference and training event: JMA will host the sixth AOMSUC in Japan in 9-13 November 2015 (http://www.jma-net.go.jp/msc/en/aomsuc6/). A two-day training event is also planned to coincide with the the meeting. It is suggested to continue such a cooperative training event in conjunction with future AOMSUC sessions;
- The third meeting of the Coordinating Group of the RA II WIGOS Project will be held in 2015 in Japan on the occasion of AOMSUC-6.

J OUTREACH ACTIVITIES

J.1 6th Asia/Oceania Meteorological Satellite Users Conference and 3rd meeting of the Coordination Group the RAII WIGOS Project

In **CGMS-43-JMA-WP-10**, JMA announced the 6th Asia/Oceania Meteorological Satellite Users' Conference from 9 to 13 November 2015 in Tokyo, Japan. Satellite users and operators in the Asia and Oceania regions were warmly invited to attend.

In conjunction with AOMSUC-6, JMA plans to hold a two-day training event for representatives from National Meteorological and Hydrological Services (NMHSs) in the Asia and Oceania regions. The 3rd Meeting of the Coordinating Group of the RA II WIGOS Project is also scheduled for the day after AOMSUC-6. The attendance of Coordinating Group members is requested.

The latest information and the initial announcement of the conference are provided on the following web pages:

http://www.jma-net.go.jp/msc/en/aomsuc6/
http://www.jma-net.go.jp/msc/en/aomsuc6/1stannounce.html

K HLPP

K.1 Proposed update to the CGMS High-Level Priority Plan for the period 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 2015-2019. The update is based on the following inter-sessional activities:

- IWWG and IPWG meetings in 2014
- Other revisions identified by WG chairs and co-chairs

WGs I, II, III and IV considered the status of implementation of the HLPP (**CGMS-43-CGMS-WP-29,** Annex 1) and addressed whether priorities within their area of focus can be considered achieved and should be removed from the HLPP.

WGI proposed that the target 1.4.1 on the Direct Broadcast specifications should be considered achieved. New Direct Broadcast Global Specifications (GEO HRIT/LRIT and LEO Direct Readout (HRPT/AHRPT) have been published within 2013 and 2014 by CGMS on its web site. These Direct Broadcast specifications are applicable to existing and planned GEO and LEO systems. In this context it should be noted, that work continues led by WG I to assess the need for an update the GEO global specification in view of newly available and used standards on telecommunications and file formats. To reflect this, the HLPP target 2.6 is proposed to be moved from WG IV to WG I.

WGIII recommended that the HLPP target on the organisation of Space Weather matters in CGMS is considered achieved.

WGII further proposed a number of amendments to the HLPP based on inputs from and discussions with IPWG.

WGs I, II, III, IV confirmed that the proposed revised HLPP represent high level priorities to guide CGMS activities for a four-year period.

CGMS-43 plenary endorsed the overall proposal for an HLPP covering the period 2015-2019.

Following CGMS-43, a final version of the updated HLPP will be published on the CGMS website.

L REVIEW OF CGMS-43 ACTIONS AND RECOMMENDATIONS

L.1 Review of summary list actions and recommendations

CGMS-42 actions and recommendations:

The final status of all CGMS-42 actions and recommendations (plenary and working groups) following CGMS-43 discussions is available here (http://www.cgms-info.org/documents/CGMS-42_LoAandLoR_final.pdf).

Plenary actions open following CGMS-43 deliberations:

PLENARY action to remain open following CGMS-43 discussions							
Actionee	Action	#	Description	Action feedback/closing document	Deadline	Status	HLPP ref
WMO	Plen IV.4	A40.06	WMO to coordinate impact studies, through the CBS, in order to update and refine its requirements for GNSS radio-occultation (e.g. number of occultations/day, distribution in space)	EUM plans to launch a study in 2014 with results available for the IROWG meeting in Apr 2015 to which CEOS agencies will be invited. Action deferred to CGMS-43. It also contributes to Action 40.23 "CGMS to convene through the IROWG, an ad-hoc meeting on the global GNSS-RO constellation, inviting all interested CEOS agencies". (see also actions WGII 40.23, WGIII 41.35 and WGIII 41.37) EUM will present at Working Paper on the outcome of its study *CGMS-43 EUM-WP-12* Matter discussed at the IPET-OSDE-1, April 2014, and CBS-Ext(2014). CBS recommended conducting Observing System Simulation Experiments (OSSEs) in support of satellite system design criteria such as orbit optimization for GPS-RO satellites, or configurations for hypersperspectral IR sounders on geostationary orbit. *Following WGIII discussions, the action will be kept open until CGMS-44. WMO and NOAA to report on their activities at CGMS-44.*	(CGMS-41, -42, -43) **New deadline CGMS-44**	OPEN	HLPP #1.1.4

Plenary actions open following CGMS-43 deliberations:

PLENARY action maintained following CGMS-43 discussions							
Actionee	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 for 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 WGClimate. 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-43, CGMS-44	**OPEN**	HLPP # 5.1

Plenary actions open following CGMS-43 deliberations:

CGMS-43 actions - PLENARY						
Actionee	AGN item	#	Description	Deadline	Status	HLPP ref
WMO	D.1	A43.01	WMO to report at CGMS-44 on engagement with satellite agencies via the planned "Joint RA-II/V Workshop on WIGOS for Disaster Risk Reduction" to be held in Indonesia in October 2015.	CGMS-44	OPEN	HLPP # 2.4
CGMS members	D.2	A43.02	CGMS members to consider the preliminary considerations on the Vision of WIGOS space-based components in 2040 and provide feedback to WMO through their representative in ET-SAT (or directly to jlafeuille@wmo.int if they are not represented in ET-SAT). Ref. CGMS-43, WMO-WP-02	30 Sept 15	OPEN	HLPP # 1.1
CGMS members	D.3	A43.03	CGMS members to provide review comments on the Reference User Readiness Project, noting that the Project will be presented to CGMS-44 for endorsement as CGMS best practice (Ref. CGMS-43, WMO-WP-03)	30 Sept 2015	OPEN	HLPP # 5.3
CMA, EUM, NOAA, ROSH	D.3	A43.04	CMA, EUM, NOAA, ROSH to appoint/reconfirm points of contact for including LEO satellites in the SATURN (CMA and NOAA provided their pocs at the meeting: tangshihao@nsmc.cma.gov.cn and Mitch.goldberg@noaa.gov)	15 June 2015	OPEN	HLPP # 5.3
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 and report results to CGMS-44.	CGMS-44	OPEN	HLPP # 1.1.6
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	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	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	OPEN	HLPP # 1.1

Plenary actions open following CGMS-43 deliberations:

CGMS-43 actions - PLENARY						
Actionee	AGN item	#	Description	Deadline	Status	HLPP ref
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	OPEN	HLPP # 1.1
ROSH	E.1	A43.10	ROSHYDROMET to nominate a point of contact for GSICS related matters	CGMS-44	OPEN	HLPP # 3.1
CMA	F.1.5.3	A43.11	CMA to consider providing GNOS data in near real-time on the GTS.	CGMS-44	OPEN	HLPP # 1.1.4
WGI co-chairs	F.2.2	A43.12	WGI Co-chairs, with the support of IOC-UNESCO, ESA and GEO to draft a CGMS letter to ITU, reminding the societal benefits and importance of all MetSats, EESS and Science Satellite Services , and need for enhancing the protection of the corresponding radio frequency bands	30 Jun 2015	OPEN	HLPP # 1.3.4
CGMSSEC	F.3.1	A43.13	CGMS Secretariat to send a letter to JCOMM requesting that the JCOMM Cross-Cutting Task Team on Satellite Data Requirements reports on the definition of satellite data for the ocean community to CGMS-44 (ref. CGMS-43 WGIV/6.2 discussions)	30 June 2015, CGMS-44	OPEN	HLPP # 2.5
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	CGMS-44	OPEN	HLPP # 1.1.6
SWTT	F.4.4	A43.15	The Space Weather Task Team (SWTT) to report on progress at CGMS-44	CGMS-44	OPEN	HLPP # 5.2
GSICS	G.2	A43.16	GSICS to work with CEOS/WGCV to: – Describe the processes to be followed to ensure consistent calibration meeting climate requirements – Describe the required infrastructure (space-based and surface-based) supporting these processes – Review the analysis of calibration-related tasks in the logical analysis of the Architecture (with a view to provide a joint input to the Architecture for Climate Monitoring from Space) and report to CGMS-44	CGMS-44	OPEN	HLPP # 5.1

Plenary actions open following CGMS-43 deliberations:

CGMS-43 actions - PLENARY						
Actionee	AGN item	#	Description	Deadline	Status	HLPP ref
CGMS members	H.1	A43.17	CGMS members are invited to provide feedback to the GEO Strategic Plan 2016-2025: GEOSS Implementation (including 2016 transitional Work Program) after issued the next version in the end of June 2015 to cgmssec@eumetsat.int. Proposals are welcomed, in particular to GEONETCast and Radio Frequency Protection as candidate Foundational Tasks, as well as new activities with regard to the activities on new technology, weather and beyond.	10 July 2015	OPEN	-
WMO, CGMSSEC	I.1	A43.18	WMO and CGMSSEC to write a letter to all satellite operators in VLab (once receiving the revised expectations documents in August 2015) to: - Recall the urgency for more training giving increasing service reliance on satellites, and the upcoming generation of new satellite technology, - Recall expectations from operators, - Mention results of a VLab internal evaluation indicating that some expectations are better met than others and that there are urgent needs for ramping up support, - Suggesting that effective technical focal point be nominated / confirmed that will help CoEs address issues, - Recall the need for sustained financial support to the VLab Trust Fund.	15 Sept 2015	OPEN	HLPP # 4.2.3
CGMS members	I.1	A43.19	CGMS members to respond to the WMO/CGMSSEC letter on VLab (reference CGMS-43 action I.1, A43.18)	15 Dec 2015	OPEN	HLPP # 4.2.3

Plenary recommendations open following CGMS-43 deliberations:

CGMS-43 recommendations – PLENARY						
Actionee	AGN item	#	Description	Deadline	Status	HLPP ref
CGMS (space agencies)	F.1.5.1	R43.01	IROWG requests 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	Long-term	OPEN	HLPP # 1.1.4
CGMS members (space agencies)	F.1.5.1	R43.02	IROWG recommends targeting at least 20,000 occultations/day to be made available to the operational and research communities of Numerical Weather Prediction, Climate, and Space Weather	Long-term	OPEN	HLPP # 1.1.4
CGMS members (space agencies)	F.1.5.1	R43.03	IROWG recommends that the RO receiver design includes sufficient software/firmware flexibility to allow changes in the signal processing including processing of new GNSS signals/constellations as they become available; all receiver measurements should cover the ionosphere as well	Long-term	OPEN	HLPP # 1.1.4
CGMS members (space agencies)	F.1.5.1	R43.04	International space/research agencies (e.g. NASA, ESA, CMA, CSA, NSF, NOAA, EUMETSAT and others) to hold an interagency workshop to define cooperation options for implementing the next steps towards a LEO-LEO research and demonstration mission	Long-term	OPEN	HLPP # 1.1.4
CGMS members	F.3.5	R43.05	CGMS members to - comment on the WMO medium-term strategy for satellite data dissemination - support the implementation of the strategy in contributing to the identified strategic targets and actions, as appropriate, and in taking the proposed strategic targets into account in their own dissemination plans	CGMS-44	OPEN	HLPP # 2
CGMSSEC	G.5	R43.06	CGMS Secretariat to express the common position of CGMS members on the WMO draft resolution on data and products (CGMS-43 plen R43.03) at the WMO Cg-17 (25 May – 12 June 2015)	27 May 2015	OPEN	HLPP # 5.1

Plenary recommendations open following CGMS-43 deliberations:

CGMS-43 recommendations – PLENARY						
Actionee	AGN item	#	Description	Deadline	Status	HLPP ref
CGMS members	I.1	R43.07	CGMS members that are sponsors of VLab Centres of Excellence to review and where possible augment their support to these Centres, as per the "Procedure for establishing Virtual Laboratory Centres of Excellence for Training in Satellite Meteorology" (section 2.2, http://www.wmo-sat.info/vlab/wp-content/uploads/2012/02/Procedures-for-New-CoEs_LV2012.pdf)	CGMS-44	OPEN	HLPP # 4.2.3

The actions and recommendations resulting from the working groups I to IV and the ad hoc space weather group deliberations are provided in the relevant section/report of each working group.

(The status of CGMS-43 actions and recommendations will be maintained on the CGMS website under MEETINGS and CGMS-43).

M CLOSING SESSION

M.1 CGMS nominations and representatives at meetings

In **CGMS-43-CGMS-WP-31** the CGMS secretariat proposed nominations for chairs and rapporteurs for CGMS working groups as well as CGMS representatives for different international meetings. The proposals were discussed and agreed as follows:

CGMS Working Groups – WGI, WGII, WGIII and WGIV

- Working Group I: Global issues on satellite systems and telecommunication coordination
  Co-chairs: Vanessa Griffin, NOAA/Sergey Uspensky, SRC-PLANETA-ROSHYDROMET
  Rapporteur: Joaquin Gonzalez, EUMETSAT

- Working Group II: Satellite data and products
  Co-chairs: Stephan Bojinski, WMO/Toshiyuki Kurino, JMA
  Rapporteurs: Mitch Goldberg, NOAA/Kenneth Holmlund, EUMETSAT

- Working Group III: Operational continuity and contingency planning
  Co-chairs: Suzanne Hilding, NOAA/Peng Zhang, CMA
  Rapporteur: Lars Peter Riishojgaard, WMO

- Working Group IV: Global data dissemination
  Co-chairs: Vasily Asmus, SRC PLANETA-ROSHYDROMET/Jae-Dong Jang, KMA
  Rapporteur: Klaus-Peter Renner, EUMETSAT

- CGMS Space Weather Task Team
  Chair: Suzanne Hilding, NOAA
  Rapporteur: Elsayed Talaat, NASA

CGMS International Science Working Groups (ISWGs)

- ICWG – International Cloud Working Group
  Co-chairs: Rob Roebling, EUMETSAT/Bryan Baum, SSEC, Wisconsin
  Rapporteur: Dong Wu, NASA

- IPWG – International Precipitation Working Group
  Co-chairs: Remy Roca, OMP/LEGOS/Tufa Dinku, IRI
  Rapporteur: Ralph Ferraro, NOAA

- IROWG – International Radio Occultation Working Group
  Current co-chairs; David Ector, UCAR/vacant
  Rapporteur: Anthony Manucci, NOAA

- ITWG – International TOVS Working Group
  Co-chairs: Mitch Goldberg, NOAA/Niels Bormann, ECMWF
  Rapporteur: Mitch Goldberg, NOAA
- IWWG – International Winds Working Group
  Co-chairs: Jaime Daniels, NOAA/Mary Forsythe/Met Office UK
  Rapporteur: Kenneth Holmlund, EUMETSAT

- From mid 2016 (following IWWS13):
  Incoming Co-chairs: Regis Borde, EUMETSAT/Steven Wanzong (University of Wisconsin/CIMSS)

Other Working Groups

CGMS plenary confirmed the following Groups:

- CEOS/CGMS Joint Working Group on Climate
  Current Chair: John Bates, NOAA
  Current Vice-chair: Pascal Lecomte, ESA
  From November 2015:
  Incoming Chair: Pascal Lecomte, ESA
  Incoming Vice-chair: Joerg Schulz, EUMETSAT
  (to be reconfirmed by CEOS plenary in November 2015).

- CGMS SFCG interface
  CGMS Secretariat (through Markus Dreis, EUMETSAT)
  (Reference is also made to CGMS-39 and WGI action 39.22 and the corresponding report).

- CGMS Representative at SATCOM Forum
  Sean Burns (EUMETSAT)

Other international meetings

Meeting	CGMS Representative
WMO Executive Council, Congress	CGMS Secretariat (EUMETSAT)
WMO Commission for Basic Systems	CGMS Secretariat (EUMETSAT)
Inter-Commission Coordination Group on WIGOS (ICG-WIGOS)	Suzanne Hilding, NOAA
CEOS	CGMS Secretariat (EUMETSAT)
GEO	CGMS Secretariat (EUMETSAT)

M.2 Any other business

There was no other business discussed.

M.3 Closing

M.3.1 Schedule of future CGMS plenary sessions

CGMS-44 is being hosted by EUMETSAT and will be held on 13-17 June 2016 in Reading, United Kingdom. The venue selected is conveniently located close to London's Heathrow Airport allowing for easy travel connections. Meeting venue and recommended hotel(s) are on the same site.

The *tentative* plan for CGMS plenary sessions in the 2017-2026 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

M.3.2 Handover of CGMS flag

NOAA handed over the CGMS flag to EUMETSAT who will host the 44th CGMS plenary session.

M.3.3 Closing words

Concluding the meeting, Dr Steven Volz, NOAA, declared that CGMS-43 had been a successful and fruitful meeting. As a newcomer to the community, he thanked the representatives of all members and observers for their dedication, which ensured that the meeting had been a success.

Over the two days of the plenary, all agenda items had been handled with encouraging results, and the discussions on the proposal and updates of the High Level Priority Plan (HLPP) will guide CGMS on the way forward over the next five years.

The Chairman thanked all those who contributed to organising the meeting so successfully with their outstanding work before and during the meeting, namely the Working Group Chairs and rapporteurs, the CGMS Secretariat, and the local organising committee.

Finally, he hoped to see everyone at the 44th CGMS plenary session in Reading, UK, in 2016.

The 43rd plenary session of CGMS was closed at 16:00 on Friday 22 May 2015.

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