

**WORLD METEOROLOGICAL ORGANIZATION**  
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**CONSULTATIVE MEETINGS ON HIGH-LEVEL POLICY ON SATELLITE MATTERS**

**NINTH SESSION**

**PORT OF SPAIN, TRINIDAD AND TOBAGO**

**23-24 JANUARY 2009**

**FINAL REPORT**





## **1. ORGANIZATION OF THE SESSION**

### **1.1 Opening of the session**

1.1.1 The ninth session of the WMO Consultative Meetings on High-level Policy on Satellite Matters (CM-9) was held in Port of Spain, Trinidad and Tobago, from 23 to 24 January 2009 under the Chairmanship of the President of WMO, Dr A.I. Bedritsky. The session was opened at 09h30 on Friday, 23 January 2009.

1.1.2 In his opening remarks, the Chairman not only recalled that the Consultative Meetings provide guidance and oversight for the WMO Space Programme, but highlighted the many changes that occurred within the Space Programme in 2008. He noted that after a long and productive career Donald Hinsman retired. The Chairman acknowledged Don's commitment to the WMO Space Programme and his many contributions. The Chairman also thanked Mr Jerome Lafeuille who provided the continuity of leadership for the Programme after Don's departure. Mr Bedritsky also thanked Dr Wenjian Zhang who served as Director of the Space Programme for several months in the summer of 2008 before becoming the new Director of the WMO Observing and Information Systems (OBS) Department. And the last change that the Chairman reported was the appointment of Ms Barbara Ryan in October 2008 as the new Director of the WMO Space Programme.

1.1.3 The Chairman thanked the Secretariat, the Consultative Meeting participants and their Organizations for the 2008 accomplishments, and noted that it was a very good example of international collaboration at its best.

1.1.4 He noted that the sixtieth session of the WMO Executive Council (EC-LX) reaffirmed that satellites from both operational and research space agencies supporting the WMO Global Observing System (GOS) provide everyday vital information to WMO Members for carrying out their official duties. Associated with the development of a Vision to 2025 for the GOS, the Council confirmed the high-level goal that there should be no gap in the satellite-based climate records, and in accordance with the Global Climate Observing System (GCOS) Climate Monitoring Principles, the homogeneity of such records should be secured. The Chairman went on to say that the Council also recalled the importance of ensuring data exchange, of inter-calibration of satellite sensors to ensure global consistency of space-based datasets, and of the network of Regional/Specialized Satellite Centres for Climate Monitoring (R/SSC-CM) to deliver suitable climate products.

1.1.5 The Chairman noted that participants in the WMO Consultative Meetings are either contributing to, or have the potential to contribute to the WMO Global Observing System (GOS), and thereby represent both operational, and research and development space agencies. The cooperation and collaboration established among the participants is essential if the satellite community is going to make a substantial impact on issues affecting the globe -- issues like climate change, water availability, disaster mitigation, and many of the other Societal Benefit Areas (SBAs) as identified by the Group on Earth Observations (GEO). The Chairman also reminded the session that the WMO GOS was one of the first "systems" in the Global Earth Observation System of Systems (GEOSS).

1.1.6 The Chairman asked the participants to focus their efforts on the highest-priority and most strategic agenda items. He suggested that the research to operations transition, as discussed in the Vision to 2025 document, and the way forward for the R/SSC-CMs are two of the agenda items which touch on high-level policy on satellite matters. He concluded his remarks by again, stressing that the WMO Members are deeply indebted to the CM participants, and their organizations, for their many accomplishments.

1.1.7 In his welcome address the Secretary-General of WMO, Mr Michel Jarraud, briefly described the restructuring within WMO such that all observing and information systems are being managed within one department to improve integration of WMO's plans and programmes, optimize resources and streamline management and decision making. In the case of OBS, these

benefits are intended to enable both the WMO Integrated Global Observing Systems (WIGOS), and the WMO Information System (WIS) to better meet users' needs and expectations – of which satellite observations play a critical role.

1.1.8 The Secretary-General requested that appropriate mechanisms be established and maintained to facilitate full access to data and products from space-based observations, and that WMO's experience with Resolutions 25 and 40 for sharing hydrological and meteorological data, respectively, has increased the use and benefits of these data many fold. He also mentioned that WMO was one of the first United Nations Organizations to develop a data policy, and that participants should continue to reinforce open data policies while being mindful of the technological barriers preventing wider use of these observations and products.

1.1.9 The Secretary-General thanked EUMETSAT, and in particular, Dr Lars Prahm for his strong support and leadership in the area of the Regional/Specialized Satellite Centres for Climate Monitoring (R/SSC-CM) and acknowledged that if implemented successfully, the concept and centres could make a substantial difference in the understanding of climate change. He went on to say that further involvement of the research community in the R/SSC-CM implementation is important.

1.1.10 The Secretary-General concluded his remarks by thanking the CM participants personally and their organizations for the major contributions made over the years to WMO. He also expressed his deep appreciation to the Chairman, Dr. Bedritsky, for his leadership in the Consultative Meetings – e.g. from the beginning to propose at the CM-2 meeting the formal establishment of the WMO Space Programme which was approved at the Cg-XIV in 2003, and then having conducted the Consultative Meetings since then. He assured participants that the WMO Secretariat would provide all support necessary for a successful session outcome. Lastly he would look forward to the recommendations and conclusions of this meeting, and wished all a pleasant stay in Port of Spain.

## **1.2 Adoption of the agenda**

1.2.1 The agenda for the session was adopted with the addition of an update on satellite activities for the International Polar Year (IPY) discussed under "Any Other Business." The agenda is reproduced in Annex I. The list of participants for the session is reproduced in Annex II.

## **2. ACTIONS DERIVING FROM CM-8**

2.1 The Secretariat summarized the actions undertaken in response to the conclusions of the eighth session. The meeting was pleased to note that all actions or recommendations from CM-8 had been addressed, and completed to the extent possible, with the exception of increasing the staff and financial resources of the WMO Space Programme Office.

2.2 It was acknowledged that the conclusions of the Consultative Meetings were providing effective and valuable guidance to the Space Programme.

## **3. WMO SPACE PROGRAMME ACTIVITY REPORT**

3.1 The document summarized the major activities and achievements of the Space Programme in 2008 in three main areas – enhancing the space-based GOS, enhancing access to satellite data, and enhancing users' capability to benefit from satellites or capacity building.

3.2 Highlights in the first area included: the dossier on the GOS-2008 comprised of four volumes including both an instrument inventory and a gap analysis, the Vision for the GOS in 2025 and related guidelines for the research to operations transition, progress on the Global Space-based Inter-calibration System (GSICS) including algorithm development, operational procedures, software and tools, and a product roster, progress on the R/SSC-CMs and Space Weather. ISRO expressed interest in joining GSICS with particular focus on inter-calibration of INSAT with other geostationary

satellites. The increasing linkage between GSICS and the CEOS Working Group on Calibration and Validation (WGCal/Val) was welcomed. INPE informed CM-9 of its activity in Space Weather, including the delivery of real-time information.

3.3 Activities and achievements in the area of “Enhancing timely access to satellite data” include the implementation of WMO Information System (WIS) standards, collection of regional data access requirements, and establishment of the Task Force on Satellite Data Codes – all of which are part of the Integrated Global Data Dissemination Strategy (IGDDS). Statistics regarding the timeliness of polar-orbiting satellite soundings through the Regional ATOVS Retransmission Service (RARS) showed that the goal of less than 30 minutes between observation and data availability was met. Progress of the RARS implementation in 2008 included the start of the South American RARS and consideration of extending the RARS concept for ATMS and CRIS from NPP/NPOESS. The global RARS network should cover 80% of the globe in 2009 (holes remain in the Pacific and South Atlantic) and all data should soon be on the GTS. ROSHYDROMET recalled the Russian Federation’s development of the Mitra system that contributed to the IGDDS.

3.4 Progress in the area of capacity building includes the new five-year strategy of the Virtual Laboratory for training in satellite meteorology, new Centres of Excellence (CoE) sponsored by space agencies and monitoring the use of satellites by WMO Members through a biennial enquiry. This enquiry conducted in 2008 covered the 2006-2007 time frame, had a 44% response rate, and showed an increase in data access through DVB-S services, more use of R&D satellites and increased use of products generated by specialized centres. User support activities were noted as particularly needed to raise awareness of satellite data in Africa, as follow-on to the important efforts made by EUMETSAT and the EU through the PUMA and AMESD projects. CM-9 also noted scope for increasing coordination and communication with the Servir Project. ISRO informed the meeting on its training activity in relation with the UN-OOSA, as a UN centre for Space Science and Technology Education (UNCSSTE) in Ahmedabad for the Asia Pacific Region, and proposed to support the efforts with relevant training modules. ROSHYDROMET recalled the implementation of a Russian version of the VL in 2008.

3.5 Appreciation was expressed to participating research agencies for their willingness to cooperate on training and data access issues. It was suggested that the Secretariat organize a dialogue regarding access mechanisms and training opportunities for R&D data so that ongoing efforts by both research and operational agencies in each of these areas could be better leveraged, including the relevant activities of CGMS and the CEOS Working Group on Education, Training and Capacity Building (WG Edu). Results will be presented at CM-10.

**Action:** The Secretariat will initiate a dialogue with research and operational agencies regarding ongoing R&D data access mechanisms and related training opportunities.

#### **4. STATUS OF THE SPACE-BASED COMPONENT OF THE GLOBAL OBSERVING SYSTEM**

4.1 An update was first provided on the agencies that had been formally declared as contributing, or planning to contribute to the space-based GOS, as well as potential contributions that had not yet been confirmed. The GOS includes operational missions of CMA, EUMETSAT, IMD, JMA, KMA (planned in 2009), NOAA and ROSHYDROMET (planned in 2009). R&D or other agencies contributing to the GOS are CNES, CNSA, DLR, ESA, INPE, ISRO, JAXA, NASA, ROSCOSMOS and USGS. It was recalled that missions were said to be contributing to the GOS when they provided data satisfying some of the WMO observing requirements; and when the responsible agency agreed to make the data available to WMO Members, to provide information on how to access the data, and to assist in training for the use of this data.

4.2 It was recalled that in 2008 CMA had successfully launched FY-3A (May 2008) and FY-2E (December 2008); the CNES, NASA, EUMETSAT, NOAA mission OSTM/Jason-2 had been launched, and marked a key achievement in the transition of ocean radar altimetry to operational status. The meeting also applauded Japan for having successfully launched the GOSAT (Ibuki)

satellite during the night preceding CM-9. It was furthermore noted that up to five operational satellites and nine R&D satellites were planned for launch during the rest of 2009 and would add their contribution to the space-based GOS. Satellite operators were thanked for this tremendous contribution to the GOS.

4.3 Reviewing the status of operational missions in geostationary orbit, the Secretariat reported that nominal coverage was actually ensured, with additional capabilities deployed over South America (GOES-10), Europe (Meteosat rapid scan), and Asia (second FY-2 satellite). As pointed out by CGMS-36, however, the 15-minute cycle coverage of South America provided by GOES-10 would have to be terminated by the end of 2009 when the satellite will be deorbited. Whether NOAA can move a satellite to replace GOES-10 will be dependent on the health of the other GOES satellites and must be investigated. Operational meteorological satellites in polar-orbit are currently Metop-A, NOAA-18 and FY-1D complemented by secondary satellites. Reference observation of ocean surface altimetry from 66° orbit was provided by OSTM/Jason-2. It was reported that among the satellites from R&D agencies contributing to the GOS, Aqua, Terra, Quikscat, Envisat, and TRMM were extensively used in support of operational activities.

4.4 The Chairman invited the representatives of Space Agencies to inform the meeting on the latest update of their plans.

4.5 Mr A. Dudkin reported on the future contributions to the GOS planned by ROSCOSMOS, that included the geostationary satellites Elektro-L1 (end 2009), Elektro-L2 (2011) and M1 (2018), the polar-orbiting satellites Meteor-M1 (May 2009) and M2 (2012), the environmental disaster and resource monitoring Canopus and Resurs, and the Arktica constellation in Highly Elliptical Orbit comprising Arktica-M1, M2, R1 and R2.

4.6 Dr Brent Smith informed the meeting that NOAA planned the launch of NOAA-N prime in early February and GOES-O in late April 2009, was investigating with JAXA the possibility to fly a US scatterometer aboard GCOM-W spacecraft, and was planning for the Jason-3 mission with its European partners.

4.7 Mr Kawazu informed the meeting that the budget for MTSAT-Follow-on 1 and 2 (Himawari 8 and 9) was firmly approved, towards a first launch in 2014.

4.8 Mr Yang Jun informed the meeting that the new-generation polar orbiting meteorological satellite FY-3A, launched on 27 May 2008, had been handed over to CMA on 12 January 2009 after completion of commissioning tests. CMA continued to apply an open data policy for FY-3A and reaffirmed its willingness to provide technical support to users in data receiving and pre-processing. The launch of FY-3B was planned for 2010. FY-2E geostationary satellite was successfully launched on 23 December 2008 and would be kept in in-orbit storage after commissioning until it replaces FY-2C in its operational position at 105E in the second half of 2009. Follow-on plans include another three satellites, FY-2F, -G, -H that shall ensure a continued and stable operation until the next generation geostationary meteorological satellite comes into operation. A feasibility study for this next generation of geostationary satellite, FY-4, was completed. The programme is expected to be approved and established this year. The first FY-4 satellite shall carry a multi-spectral imager, an IR hyperspectral atmospheric sounder, and a lightning mapper, and was expected to be launched in 2014.

4.9 Dr B. Manikiam informed CM-9 that ISRO's contribution to the GOS shall include INSAT-3D, planned for launch by the end of 2009, and would carry a 6-channel imager and a 19-channel sounder with the potential to provide high-resolution upper-air atmospheric observations in the tropics.

4.10 Dr J. Kaye underlined that the OSTM/Jason-2, launched in June 2008, continued the ocean altimetry time series, and represented an important step in research to operation transitions

as the traditional NASA/CNES partnership had been joined by NOAA and EUMETSAT. OCO is planned for launch on 23 February 2009; the Glory launch being now scheduled for the latter part of 2009. The launch schedule for the NPOESS Preparatory Project (NPP) is subject to review (likely delay) driven by the readiness of the imager (VIIRS). Current expectation is that while VIIRS will do most of its measurements as desired, it will not be able to provide climate-quality observations of ocean colour, and climate-quality aerosol observations are also questionable. NASA has initiated significant activity on two of the first tier missions identified by the US National Research Council in its Decadal Survey – the SMAP (soil moisture) mission and the ICESat II mission (ice sheet thickness). Lower level activity has been initiated on the two remaining "first tier" missions of the Decadal Survey (DESDynI, CLARREO), with less attention going to the five "second tier" missions. He underlined that NASA had refocused its Earth Science Technology Office (ESTO) activities in accordance with the Decadal Survey missions, and that significant investments were thus being made in both the tier 2 and tier 3 missions. The currently operating ICESat mission has experienced an anomaly recently in that the laser (#3) failed, so operation of laser #2 was reinstated. Since this is operating at lower panel than laser #3 and some degradation is expected, it is quite likely that the campaign being planned for spring 2009 may be the last such campaign. NASA is looking at the possibility of implementing a series of airborne campaigns to continue a subset of the high priority measurements made by ICESat, the first installment of which could take place this spring coincident with the laser campaign. NASA will carry out its biennial senior review of operating missions to make informed decisions about mission extension. This is done since nearly all of NASA's earth observing missions will be beyond their prime operating period during the period covered by the senior review (FY10-FY13). In the last such senior review, all missions were extended for two years (FY08-FY09).

4.11 Dr M. Rattenborg indicated that since May 2008, EUMETSAT was operating Meteosat-8 in addition to Meteosat-9 to perform rapid scan with a five-minute refresh cycle over Europe, the Middle East and Northern Africa. The payload complement of the Meteosat Third Generation (MTG) was now confirmed and would include a High Resolution Imager, an Infrared Hyperspectral sounder and a Lightning Imager. In addition, the formal subscription process for the Jason-3 programme had been initiated.

4.12 Dr E. Oriol-Pibernat confirmed the forthcoming launches of GOCE, SMOS, and Cryosat-2, and the confirmation, of the space element of GMES by the recent ESA Ministerial Council.

4.13 Mr H. Fraga informed the meeting on the planned launch of CBERS-3 in 2010 and Amazonia-1 in 2011. He thanked NOAA for the operation of GOES-10 at 60 deg W, that provided unprecedented information for South American users, with sounding capabilities and 15-minute imaging cycle. Derived operational products had been developed, and were used operationally, providing essential benefit to the population in the continent. It was stressed however that the end of GOES-10 operation at the end of 2009 would be a step back for the geostationary coverage of South America and that a data gap was likely to occur over the south of the continent for a significant time period (maybe some months).

**Action:** CM-9 recommended organizing a discussion among the relevant satellite operators and WMO Secretariat in order to analyze possible solutions to avoid any geostationary coverage gap over South America upon termination of GOES-10 operation.

4.14 In light of the statements made by the space agencies, the session was pleased to note the numerous missions contributing to the GOS and the confirmation by the relevant space agencies that data from all these missions would be made available to WMO Members. Dr E. Oriol-Pibernat recalled that ESA had informed WMO that data from the ESA Earth Explorer missions were available for experimental applications through a simple registration procedure, and invited WMO to forward this information to the meteorological community.

**Action:** WMO Secretariat to consider publishing information on the conditions of access to data from GOS satellites.

## 5. INTERNATIONAL GEOSTATIONARY LABORATORY'S FUTURE MISSIONS (IGEOLAB)

5.1 The session recalled that IGEOLAB was a framework for international cooperation to set up demonstration missions, initially in geostationary orbit with the concept then being extended to Highly Elliptical Orbits. It reviewed the status of the three IGEOLAB candidate projects.

- The interest of an Infrared (IR) hyperspectral early demonstration mission was confirmed for frequent profiling of temperature, humidity and wind in clear air. No initiative was taken in 2008 towards a demonstration mission, since priority had been given to consolidation of satellite operators' plans for the new-generation geostationary programmes. Plans had been confirmed by EUMETSAT and CMA for their future operational series tentatively by 2014 (CMA) and 2017 (EUMETSAT), and the matter was envisaged by JMA and NOAA for future satellites. The ET-SAT had suggested several scenarios based either on a descoped version of HES for GOES-S, or on a demonstration-flight version of the GIFTS engineering model.
- The scope of the microwave project was to allow frequent observation of precipitation by microwave sounding in the millimetre/submillimeter range, and possibly contribute to temperature and humidity all-weather sounding. A proposal for a Geostationary Microwave (GEO-MW) mission was presented to the fifth IGeoLab GEO-MW Focus Group convened within IPWG-4, in Beijing, China in October 2008. IPWG reaffirmed a strong interest in a GEO-MW demonstration mission; but, noting that the FY-4M programme has not yet been approved, no agency can take the lead on this project now. CGMS-36 thus agreed that activities should be suspended, the Focus Group be disbanded and the results of preliminary studies be kept available for possible future projects.
- The concept of a Highly Elliptical Orbit (HEO) mission, for quasi-permanent monitoring of high-latitudes and polar regions, has been discussed in two HEO Focus Group meetings. The third meeting was postponed upon suggestion of the Co-chairs, but significant progress has been reported both by the Russian Federation on the Arktica project and by Canada on the Polar Communications and Weather Satellite (PolarSat) project. It was suggested to convene the third Focus Group meeting in early 2009 to examine a consolidated set of requirements, identify potential mission architectures and models for collaboration among interested parties.

5.2 The meeting agreed that the conditions for setting up a demonstration mission for hyperspectral sounding from the geostationary orbit were unlikely to be met in the remaining time before the first planned operational missions. It also acknowledged that while there was interest for cooperating on technological development on geostationary microwave, no agency was currently in a position to take the lead for a demonstration mission. The meeting thus concluded to close activities related to the first and second candidate projects. At the same time, the meeting felt that the HEO candidate project was very promising and agreed that the IGEOLAB initiative should now be focused on the HEO project. Dr J. Paquette confirmed that CSA had completed the requirements analysis for a Polarsat mission and started Phase A studies, to be pursued until 2011. The meeting welcomed the offer from CSA to host the third HEO FG meeting in April-May 2009.

**Action:** CSA to coordinate with WMO Secretariat and the HEO Focus Group Co-chairs to convene the third meeting of the IGEOLAB Focus Group in Canada in the April-May 2009 time frame with a view to consolidate international requirements for an HEO mission and to explore mission architecture and collaboration concepts.



## 6. SATELLITE PILOT PROJECT FOR WIGOS

6.1 The Secretariat recalled the scope and status of the WMO Integrated Global Observing Systems (WIGOS), and the WIGOS Concept of Operations that identified three levels of integration: (1) instrument standardization, (2) information infrastructure, and (3) end-product quality assurance. It also briefly introduced the WIGOS Development and Implementation Plan (WDIP) that foresees Pilot Projects (of a thematic nature) and Demonstration Projects (of a regional nature). CM-8 had stressed the need for a stronger involvement of space agencies and space-based observation in the WIGOS process.

6.2 The meeting recalled the integrated nature of the space-based GOS, bearing in mind the global operational coordination achieved within CGMS over the past 36 years. It was furthermore acknowledged that currently several Space Programme projects were directly contributing to further integration, namely:

- GSICS, contributing to level 1 (instrument standardization);
- IGDDS and RARS, contributing to level 2 (information infrastructure);
- R/SSC-CM, contributing to level 3 (end-product quality assurance);
- The Vision of the GOS and related optimization efforts.

6.3 Following the discussion held at CGMS-36 and within the GSICS Executive Panel, a proposal for a WIGOS Pilot Project on GSICS is being prepared, a draft of which was provided for information. CM-9 supported the proposal to reinforce the involvement of space-based observation components in the WIGOS process through a Pilot Project based on GSICS, in order to capitalize the experience gained in GSICS, to provide evaluation of GSICS with respect to WIGOS, ensure greater involvement of space aspects in WIGOS and facilitate user involvement in an end-to-end demonstration. It thus encouraged the GSICS Executive Panel to finalize its proposal for a Pilot Project, noting that the Pilot Project proposal should reflect the role of CEOS WGCV on best practices for calibration/validation.

**Action:** The GSICS Executive Panel to finalize its Pilot Project proposal for WIGOS taking into account guidance from CM-9.

6.4 Comment was made that integration should ultimately be pursued at the other levels as well, including the end-product level that is of direct interest for the user community. Attention was drawn to the need to define standards and inter-calibration methods of surface- and space-based observation. In the long term, integration should enable generating time series of weather data, starting with specific variables such as rainfall, wind or cloud cover as a demonstration stage.

## 7. GLOBAL EARTH OBSERVATION SYSTEM OF SYSTEMS (GEOSS) UPDATE

7.1 The session was provided an update on the Global Earth Observation System of Systems (GEOSS) as related to the GEO Plenary held in Bucharest, Romania in November 2008. Major issues and outcomes included the development of a new version of the GEO Work Plan covering the period 2009-2011, the need for the WMO sponsored or co-sponsored observing programmes to be viewed as transverse tasks, supporting more than just the climate tasks – a position supported by Australia, ICSU, and the Russian Federation, and progress on the GEO Data Sharing Principles.

7.2 CM-9 noted the substantial role that the WMO sponsored and/or co-sponsored observing systems play in GEOSS where they support multiple SBAs. There also seemed to be agreement from CM-9 that the experience with WMO Resolutions 25 and 40 which concern the broad sharing of hydrological and meteorological data, respectively, could prove useful to the new GEO Task Force on Data Sharing Principles.

## 8. WMO VISION FOR THE GOS IN 2025

8.1 The Secretariat recalled the background of the Vision of the GOS to 2025 that was developed in response to a request from the Commission for Basic Systems (CBS). Following optimization workshops, meetings of CGMS and CEOS and other consultations performed over the past two years, the WMO Vision for the Global Observing System (GOS) in 2025 has been refined and would be submitted to CBS-XIV for endorsement.

8.2 Attention was drawn to the overall process framing the evolution of the GOS:

- Collection and updating of user requirements (currently 500 requirements addressing 13 application areas);
- Definition of a vision including observing strategies and high-level architecture;
- Development of an implementation plan in close consultation with space agencies;
- Periodic gap analysis and subsequent update of the implementation plan.

8.3 Focusing in particular on its space-based component, the Vision calls upon optimizing the existing operational GEO and LEO components, ensuring IR hyperspectral sensors and lightning detection aboard operational GEOs, consolidating the altimetry measurement strategy, enhancing atmospheric sounding with an operational radio occultation constellation, refining sea surface wind observation, establishing global precipitation measurement, and bringing several climate-oriented missions to an operational status: Earth radiation budget; atmospheric composition; specific imagery for ocean colour and vegetation monitoring. It also calls for Synthetic Aperture Radar (SAR) observation, Space Weather monitoring and operational pathfinders including high latitude observation from Highly Elliptical Orbits (HEO).

8.4 It was stressed that the wider scope of this new Vision and the substantial enhancements of the GOS it called for would reinforce the space-based GOS as the space component of the WMO Integrated Global Observing Systems (WIGOS) as well as being a major component of the Group on Earth Observations (GEO) Global Earth Observation System of Systems (GEOSS).

8.5 The meeting was informed that at CGMS-36, CGMS Satellite Operators commented that the Vision provided a valuable roadmap for their activities in the years to come, and recommended that satellite operators consider the Vision of GOS when developing their own planning, and report on their respective initiatives that respond and contribute to its implementation. At the 22<sup>nd</sup> CEOS Plenary in George, South Africa, there was discussion on ensuring linkages with GEOSS. Subsequent to the CEOS Plenary, the Secretariat forwarded to CEOS the Vision document and invited CEOS to consider partnership opportunities in implementing this Vision.

8.6 In the discussion, the Consultative Meetings were seen as an essential forum for the necessary dialogue at the policy level among space agencies and WMO bodies in order to properly identify and address the challenges and opportunities entailed by implementation of the Vision, bearing in mind:

- The complex architecture involving a diversity of orbit scenarios;
- The increased cost, requiring mobilization of all potential satellite programme contributors;
- The increased need for cooperation to secure interoperability of the various components;
- The necessary commitment on long-term continuity for missions that had been performed so far on a R&D basis. This latter point was seen as a key challenge, which implied a transition from Research to Operations (R2O) for a number of essential missions.

8.7 The meeting expressed its appreciation for the Vision in order to help individual agencies position their programmes in a global perspective. The proposed analysis of implementation challenges was found to be relevant, and it was felt that WMO was in a good position to help address these challenges with the various parties involved.

8.8 The question was raised whether the Vision had reached a proper balance between ambition and affordability. On one hand, it was noted that some of the required missions would be at least partly implemented well in advance of 2025; on the other hand, it was acknowledged that some specific challenges linked to the R2O transition could only be met in a stepwise manner, which would require time. Since the most difficult challenges were of a policy nature, the meeting suggested that the Vision be put in a broader and higher-level context. It was emphasized that satellite measurements should be seen as part of an Earth observation function that should include the adequate processing up to a level comparable with surface observation, and also include the integration and optimization of surface- and space-based observation. Observation should be viewed along with data exchange systems, data assimilation, science and applications. In this respect, CM-9 recalled the three levels of integration of the WIGOS Concept of Operations that included end-product quality considerations. Furthermore, the proposed observation strategy should be presented along with the expected deliverables and resulting benefits to society.

8.9 As concerns the implementation of the Vision, CM-9 stressed the essential dimension of partnership for implementing the Vision, including collaboration with CEOS and CGMS, and recommended to make explicit reference to the WIGOS and GEO frameworks. Regarding this specific point, Dr B. Smith and Dr E. Oriol-Pibernat reported that a dialogue between the CEOS Secretariat and the WMO Space Programme was ongoing and open. CM-9 supported the proposed guidelines for R2O (WMO (CM-9)/Doc. 8 Appendix B) that summarized useful ways for WMO to facilitate this process.

8.10 The President of CBS recalled that this draft Vision had been elaborated by OPAG-IOIS with a view of replacing the previous vision document adopted by CBS in 2002. The present document would be submitted to CBS-XIV in March 2009 for endorsement, though it could evolve through future discussions. It was highlighted that future evolution of the Vision should be seen as consistent with the implementation of the WIGOS concept and the WMO Strategic Plan.

8.11 CM-9 thus advised that a preamble to the Vision be prepared and brought to the attention of CBS, and used as a basis for a revised document to be submitted to the EC, with a view to incorporate considerations of a wider systems approach, user benefits, implementation partnerships, and an implementation roadmap with milestones. The outcome of the discussion should be reflected in the material submitted to CBS-XIV and EC-LXI.

**Action:** The WMO Secretariat to prepare for CBS a preamble to the Vision of the GOS in 2025 reflecting the outcome of CM-9.

**Action:** The WMO Secretariat to prepare for EC-LXI a revision of the WMO GOS Vision to 2025, in consultation with CM Members, to include considerations of wider systems approach, user benefits, implementation partnerships, and an implementation roadmap with milestones.

## 9. REGIONAL/SPECIALIZED SATELLITE CENTRES ON CLIMATE MONITORING

9.1 The session was provided a document recalling guidance from previous Consultative Meetings (CM-6, 7, and 8) and a description of progress to date on implementing the Regional/Specialized Satellite Centres for Climate Monitoring (R/SSC-CM). The intent of the R/SSC-CM concept is to create a network of centres of excellence in satellite data processing for sustained climate monitoring. These centres would share the goal (and the workload) of a sustained operational capability of high-quality global products addressing the GCOS requirements – i.e. the Essential Climate Variables (ECVs). The paper also reinforced the role of both the concept and the centres as a mechanism to foster, where appropriate, a research to operations transition for the

generation of thematic climate data records. The paper advocated that if successfully implemented, the R/SSC-CMs could, within the next decade, represent one of the most important contributions of satellite Earth observations to the study of global climate change.

9.2 Progress since CM-8 included a planning meeting in April which identified five topical areas for which Pilot Project proposals would be sought – cloud and aerosol properties, water vapour and precipitation, surface albedo, atmospheric motion vectors, and upper tropospheric humidity. A teleconference of the Executive Panel was held in January 2009 where the implementation plan was reviewed, Terms of Reference were refined, linkages with CBS and other WMO bodies was discussed, and next steps for the pilot project proposals were determined.

9.3 CM-9 was invited to provide additional guidance in the following areas – the role of R&D, and specifically the increased involvement of research agencies in the process; the research to operations transition of climate product generation; linkages to the WMO structure, extension to new areas, i.e. disasters, water, etc.; the regional versus global nature of the centres/products; and the related confusion regarding the acronym, and recommendations to CBS-XIV. Participants were also invited to support the meetings planned for 2009, the first of which will be 25-26 February in Geneva, where the pilot project proposals will be discussed in more detail.

9.4 Specific guidance from CM-9 urged both clarity with the terminology of “operational” climate monitoring products and the important role of research in the generation of these products. Concern regarding the potential increased reporting responsibilities, and uncertainty of specific benefits from research agencies was expressed. It was suggested that the WCRP/GEWEX product production effort be integrated into the R/SSC-CM concept, and that as the GCOS requirements evolve, the WMO Space Programme and CEOS coordinate their respective efforts to ensure maximum complementarity. CMA confirmed their readiness to name a person to the R/SSC-CM Executive Panel.

9.5 Further discussion regarding the role of research agencies occurred, and CM-9 requested that early results from one, or more, of the pilot projects be presented at CM-10. This action would respond to guidance issued from the President for more clarity regarding specific results/products of the centres.

9.6 CM-9 furthermore encouraged the R/SSC-CM Executive Panel to consider renaming this initiative.

## **10. SPACE WEATHER**

10.1 The meeting was informed on preliminary WMO activities regarding Space Weather. As requested by CM-8, a report was prepared in April 2008 on the potential scope, cost and benefit of WMO involvement in support of international coordination of Space Weather services ([The potential role of WMO in Space Weather, WMO, April 2008](#)) and brought to the attention of the sixtieth Executive Council (EC-LX).

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

10.3 Pending the provision of resources to support this activity, only preliminary contacts have been made with external partners and an initial roadmap has been defined that foresees inter alia

the establishment of an Inter-Commission CBS-CAeM Expert Team on Space Weather, and contacting all WMO Members to investigate their interest in contributing to this activity.

## **11. GCOS SATELLITE MATTERS**

11.1 The document presented to CM-9 reaffirmed the importance of the GCOS satellite requirements, and provided an update on the actions taken by space agencies in response to these requirements. The meeting was informed that current plans still have some possible future gaps, but these have been identified by the space agencies and they are looking at ways of avoiding them. Overall, significant initial progress has been made in responding to climate needs in the mission planning, but owing to the long end-to-end time scales of satellite missions, full implementation will inevitably take some years to establish. The document stressed that more emphasis was needed on systematic reprocessing of past satellite data records for climate studies.

11.2 CM-9 was invited to: (a) continue to support agency involvement in addressing climate requirements, in light of the endorsement by WMO EC-LX of the high-level goal that “there should be no gap in the satellite-based climate records for GCOS Essential Climate Variables”; (b) note continued emphasis on continuity and quality of satellite observations for climate, including reprocessing of past records; and (c) continue working on implementation of GCOS Implementation Plan and Satellite Supplement, in collaboration with all relevant partners, including CEOS and CGMS.

11.3 CM-9 discussion on this topic was conducted in concert with the discussion on the R/SSC-CM agenda item.

## **12. ANY OTHER BUSINESS**

12.1 The meeting was informed on the activities of the Space Task Group (STG) of the Subcommittee on Observations of the ICSU/WMO Joint Committee for the International Polar Year (IPY), comprised of nominated representatives of 13 Space Agencies (ASI, CMA, CNES, CSA, DLR, ESA, EUMETSAT, INPE, JAXA, NASA, NOAA, ROSHYDROMET, and USGS) with secretarial support provided by WMO. Significant progress was achieved during the IPY in acquiring comprehensive Arctic and Antarctic snapshots, and in building a space-borne component of the IPY data legacy. The main challenges were coordination and synchronization of acquisitions of overlapping multi-satellite datasets; ensuring access to data products and focussing on developing higher level scientific products for benefit to polar science. The resulting IPY Earth observation data legacy will serve as an invaluable scientific resource for decades to come.

12.2 According to its Terms of Reference the Space Task Group on IPY 2007-2008 was established for the purpose of space agency planning, processing and archiving of the IPY Earth observation legacy dataset to cover the term 2007–2010. After that period and in view of the recent establishment of the Panel on Polar Observations, Research and Services by WMO Executive Council; it would be highly desirable if STG could join the Panel to continue their coordination of international efforts in securing collection of space-borne “snapshots” of the Polar Regions with the goal to achieve a Polar Satellite Constellation as a significant part of the IPY legacy.

12.3 The meeting took note of this important effort, and commended agencies for their active involvement in creating both products and a legacy for the IPY.

## **13. CLOSURE OF THE SESSION**

13.1 The conclusions of the session were reviewed and adopted, subject to editorial finalization by the Secretariat.

13.2 In concluding the meeting, the Chairman underlined the effectiveness of the Consultative Meetings that proved to provide very important guidance for WMO activities. He emphasized that the Space Programme could not be implemented without such a strong involvement of satellite agencies and expressed his gratitude to the participants and their Organizations. The Chairman

thanked the WMO Secretariat and the interpreters for their support to the meeting. He expressed special thanks to Mr Tyrone Sutherland, Second Vice-President of WMO, and the Caribbean Meteorological Organization (CMO) for the outstanding support and hospitality enjoyed by this meeting.

13.3 The meeting was adjourned on 24 January at 12h45.

## ANNEX I

### AGENDA

1. ORGANIZATION OF THE SESSION
    - 1.1 Opening of the session
    - 1.2 Adoption of the agenda
  2. ACTIONS DERIVING FROM CM-8
  3. WMO SPACE PROGRAMME ACTIVITY REPORT
  4. STATUS OF THE SPACE-BASED COMPONENT OF THE GLOBAL OBSERVING SYSTEM
  5. INTERNATIONAL GEOSTATIONARY LABORATORY'S FUTURE MISSIONS (IGEOLAB)
  6. SATELLITE PILOT PROJECT FOR WIGOS
  7. GLOBAL EARTH OBSERVATION SYSTEM OF SYSTEMS (GEOSS) UPDATE
  8. WMO VISION FOR THE GOS IN 2025
  9. REGIONAL SPECIALIZED SATELLITE CENTRES ON CLIMATE MONITORING
  10. SPACE WEATHER
  11. GCOS SATELLITE MATTERS
  12. ANY OTHER BUSINESS
  13. CLOSURE OF THE SESSION
-

ANNEX II

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