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COMMISSION FOR BASIC SYSTEMS

OPAG ON INTEGRATED OBSERVING SYSTEMS

**EXPERT TEAM ON EVOLUTION OF
GLOBAL OBSERVING SYSTEMS**
Sixth Session

Geneva, Switzerland, 14 – 17 June 2011

FINAL REPORT



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EXECUTIVE SUMMARY

The Sixth Session of the CBS Expert Team on the Evolution of Global Observing Systems (ET-EGOS-6) was held at the WMO Headquarters in Geneva, Switzerland, from 14 to 17 June 2011, and was chaired by Dr John Eyre (United Kingdom). A key issue discussed at the meeting was the preparation of the new Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP) responding to the Vision of the Global Observing System in 2025 (approved by EC-LXI in 2009) and requirements from the WMO Integrated Global Observing System (WIGOS) and the Global Framework for Climate Services (GFCS). The EGOS-IP will be a key document providing Members with clear and focused guidelines and recommended actions in order to stimulate cost-effective evolution of the observing systems to address in an integrated way the requirements of WMO programmes and co-sponsored programmes.

In this context, the ET-EGOS has been reviewing the latest observational data requirements of WMO Application Areas, including Global Numerical Weather Prediction (NWP), High Resolution NWP, Aeronautical Meteorology, Nowcasting and Very Short Range Forecasting, Atmospheric Chemistry, Ocean Applications, Agricultural Meteorology, Hydrology and Water Resources, Seasonal to Inter-Annual Climate Prediction, Climate Monitoring (GCOS), Climate (other aspects, CCI), Space Weather, and Global Terrestrial Observing System (GTOS - non GCOS requirements of GTOS).

The Team reviewed several activities related to Integrated Observing System, such as the Observing System Research and Predictability Experiment (THORPEX), WMO Polar Activities, including the development of the Global Cryosphere Watch (GCW), the African Monsoon Multidisciplinary Analysis (AMMA) and the new AMMA Science Plan for 2010-2020, recent developments of the WMO AMDAR Programme, and EUMETNET activities. It received a report from the CBS Rapporteur on GCOS matters, and discussed how the 2010 update of the GCOS Implementation Plan is considered as part of the Rolling Review of Requirements (RRR), noting the development of the 2011 update of the supplement to the satellite-based component of the GCOS-IP/2010. It considered the consequences of these for its own activities.

The Team discussed the outcome of the WMO Sixteenth Congress, and its implications for the work of ET-EGOS, and the conduct of the RRR. In particular, the implementation of WIGOS in 2012-2015, the development of the GFCS, and the GCW were presented and discussed, and recommendations were made accordingly for the updating of the Statements of Guidance (SoGs, gap analyses) for individual Application Areas, and for the preparation of the new draft EGOS-IP.

As part of the RRR process, the meeting reviewed the status of the WMO database of user requirements for observations and of observing system capabilities. According to the strategy proposed by the ICT/IOS, specifications for the overall RRR database and its management have been prepared by the Secretariat in consultation with the ICT-IOS *ad hoc* task group on the RRR Database. The Secretariat made a demonstration of a preliminary version of the observing requirements database, which has been recently developed using open source software tools. The status of the content of the user requirements database and the observing systems capabilities database was reviewed.. Some adjustment to the strategy for the evolution of the RRR database was proposed using a new "distributed" approach, consisting of initial development and hosting centrally, with information collection provided by volunteer agencies. The CBS Management Group is invited to comment on this proposal.

The Team reviewed available updates on individual Statements of Guidance (SoGs) as provided by the nominated expert Points of Contact within all application areas. The Team considered proposals on whether/how the process should be improved and considered which SoGs need revision. This is summarized in the table below.

Application Area	New version reviewed	To be updated
Global Numerical Weather Prediction (NWP)	√	
High Resolution NWP	√	√
Aeronautical Meteorology	√	√
Nowcasting and Very Short Range Forecasting	√	√
Atmospheric Chemistry		√
Ocean Applications		√
Agricultural Meteorology	√	√
Hydrology and Water Resources	√	√
Seasonal to Inter-Annual Climate Prediction	√	√
Climate monitoring (GCOS)	√ (GCOS-IP/2010)	√ (Satellite supplement)
Climate (other aspects, CCI)	√	√
Space Weather		√
GTOS (non GCOS requirements of GTOS)		√

The Team noted that the GCW is not an application area, and therefore agreed that the GCW requirements had to be considered in the RRR but not as part of a new Application Area. SoGs of existing Application Areas will be updated to reflect the GCW requirements and gaps

The Team reviewed recent activities with OSEs/OSSEs with emphasis on the design of the future of global observing systems. It reviewed, and concurred with the plan to organize the fifth Workshop on the impact of observational data on NWP, in Sedona, Arizona, USA, 22-25 May 2012. An updated proposal for OSEs and OSSEs of particular interest to ET-EGOS has been developed as part of the preparations for this workshop.

The Team reviewed feedback from National Focal Points concerning the EGOS-IP and considered the information collected when updating the EGOS-IP. It reviewed the progress and actions related to the surface-based and space-based sub-systems parts of the current EGOS-IP – responding to the vision of the GOS for 2015.

The Team adopted a workplan so that the new EGOS-IP can be submitted to the CBS-XV (2012) for consideration, and to EC-LXV (2013) for approval.

The Team agreed on its action plan until the next ET-EGOS meeting, as well as plans for preparing a draft report that will be presented to the seventh session of ICT-IOS to be held in late June 2012.

GENERAL SUMMARY

1. ORGANIZATION OF THE SESSION

1.1 *Opening of the meeting*

1.1.1 The Meeting of the Expert Team on the Evolution of Global Observing Systems (ET-EGOS) of the Open Programme Area Group for Integrated Observing Systems (OPAG/IOS) of the Commission for Basic Systems (CBS) opened at 10.00 hours on Tuesday, 14 June 2011, at the WMO Headquarters in Geneva, Switzerland.

1.1.2 Dr Wenjian Zhang, Director, WMO Observing and Information Systems Department, opened the meeting on behalf of WMO. He welcomed the participants and explained the significant developments relevant to CBS and especially OPAG-IOS since the fifth ET-EGOS meeting in late 2009.

1.1.7 Dr Zhang drew the Team's attention also to the deliberations of the Sixteenth Congress (Cg-XVI). He recalled that as part of the WMO Strategic Planning for 2012 to 2015, the WMO Sixteenth Cg-XVI decided on five Strategic Thrusts and eight Expected Results, one of them, Expected Result No. 4 being of direct relevance to the work of the ET-EGOS, i.e. *“Enhanced capabilities of Members to access, develop, implement and use integrated and interoperable Earth- and space-based systems for weather, climate and hydrological observations, as well as related environmental observations, based on world standards set by WMO”*.

1.1.8 Dr Zhang also recalled that Congress also decided on priority-funded voluntary resources to include (i) the Global Framework for Climate Services (GFCS)¹, (ii) Aviation meteorological services, (iii) Capacity-building for the developing and least developed countries, (iv) Implementation of the WMO Integrated Global Observing System (WIGOS) and WMO Information System (WIS), and (v) Disaster Risk Reduction. While all these activities are relevant to ET-EGOS, Dr Zhang stressed the need to address GFCS and WIGOS requirements, as well as Capacity Building.

1.1.9 He explained that in the WIGOS framework, the ET-EGOS is expected to play a crucial role by running the Rolling Review of Requirements (RRR), which promotes a cost-effective management of the existing resources through optimization of, and recommendations for, the deployment of observing systems that are believed to substantially impact the end products for each application area of the WMO. ET-EGOS analysis of the results of impact studies, and the critical review and Statements of Guidance (SoGs) by the ET-EGOS Points of Contact (PoC) for each of the Application Area, as well as recommendations for new impact studies will be paramount in this respect. Dr Zhang invited the Team to be targeting endorsement and approval of the new Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP) by the Fifteenth Session of the Commission for Basic Systems (CBS-XV) in 2012 and the Sixty-Fifth session of the WMO Executive Council (EC-LXV) in 2013 respectively.

1.1.10 In closing, Dr Zhang wished for a successful and productive session and an agreeable stay in Geneva.

1.1.11 Dr John Eyre (United Kingdom), Chairperson of ET-EGOS, also greeted the participants and expressed his confidence that the session would work hard to fulfil its obligations.

1.1.12 The Team acknowledged apologies from Team members Mr Frank Grooters (the

¹ In 2009, the World Climate Conference-3 (WCC-3) decided to establish a Global Framework for Climate Services (GFCS), to strengthen production, availability, delivery and application of science-based climate prediction and services. The World Meteorological Organization (WMO) subsequently convened an intergovernmental meeting which established a High-level Taskforce (HLT). The HLT developed a significant report: 'Climate Knowledge for Action: a Global Framework for Climate Services – Empowering the most vulnerable', including recommendations for GFCS implementation (available at: http://www.wmo.int/hlt-gfcs/downloads/HLT_book_full.pdf). At its Sixteenth World Meteorological Congress (Cg-XVI, 2011), WMO endorsed the broad thrust of the HLT report and, inter alia, agreed that WMO, with the participation of all relevant stakeholders including other UN bodies, would develop a draft implementation plan for the GFCS. The GFCS is designed with five major components, including one focused on observations and monitoring. The other components are research, modelling and prediction, the Climate Services Information System, the User Interface Platform, and capacity building.

Netherlands) and Mr Malamine Sonko (Senegal) for not being able to attend the meeting. The list of participants is given in [Annex I](#).

1.2 Adoption of the agenda

1.2.1 The Team adopted the Agenda for the meeting, which is reproduced at the beginning of this report.

1.3 Working arrangements

1.3.1 The Team agreed on its working hours and adopted a tentative time table for consideration of the various agenda items.

1.3.2 The Team established the following working groups for the duration of this ET-EGOS Session:

Break out groups related to updating the new draft EGOS Implementation Plan (EGOS-IP), which is responding to the Vision of the GOS in 2025:

- Review/Update the new EGOS-IP for the surface-based observing systems: Dr Jochen Dibbern (lead), Mr Jean Pailleux, Mr Russell Stringer, Mr Stefan Klink, Mr Heng Zhou, Dr Aurora Bell, Mr Jay Lawrimore, Dr William Wright, Dr Jitze van der Meulen, Dr Miroslav Ondráš, and Mr Dean Lockett. See action items from this breakout session in [Annex XII](#).
- Review/Update the new EGOS-IP for the space-based observing systems, and address feedback and comments received from the CBS Expert Team on Satellite (ET-SAT): Mr Jerome Lafeuille (lead), Dr Lars Peter Riishojgaard, Dr John Eyre, Dr Rosemary Munro, Dr Luiz Machado. See outcome of this breakout session in [Annex XI](#).
- Atmospheric Composition – to discuss and address the WMO Congress request to establish a GAW ad-hoc Task Team to review the needs for GAW regarding satellite measurements: Dr Wolfgang Fricke (lead), Ms Barbara Ryan (rapporteur), Ms Liisa Jalkanen, Ms Oksana Tarasova, Dr Rosemary Munro. See outcome of this session in [Annex XIII](#).
- Climate aspects (addressing the mapping of recommendation from the 2010 update of the GCOS Implementation Plan into the new EGOS-IP): Mr Jay Lawrimore (lead), Dr William Wright & GCOS Secretariat.
- Making sure that key gaps are reflected in the new draft EGOS-IP: PoC (or their representatives) for
 - o Aeronautical Meteorology
 - o Nowcasting and Very Short Range Forecasting
 - o Ocean Applications
 - o Agricultural Meteorology
 - o Hydrology and Water Resources
 - o Space Weather
 - o Cryosphere

Other break out group:

- Other issues: RRR Database, User Requirements open issues. Solve as much as possible through the break out groups: Mr Jerome Lafeuille (lead), Dr John Eyre, Dr Jitze van der Meulen, Dr Lars Peter Riishojgaard, and Mr Etienne Charpentier. See the outcome of this breakout session in [Annex VIII](#).

2. REPORT OF THE CHAIRPERSON

2.1 Dr John Eyre (United Kingdom), recalled the Terms of Reference of the Team (*Annex II*), welcomed new members of the Team, as well as new PoCs for some Application Areas, and reported on activities related to the work of ET-EGOS since its last meeting, ET-EGOS-5 (Geneva, Switzerland, 30 November – 4 December 2009). He reported that there has been progress in many areas as addressed in the ET-EGOS Work Plan and Actions list, and addressed some of the key challenges for this Session and beyond.

2.2 Dr Eyre represented ET-EGOS at the Sixth Session of the OPAG/IOS Implementation/Coordination Team (ICT-IOS-6, Geneva, 28 June - 2 July 2010) where he presented the work of ET-EGOS, including achievement, issues, and ET-EGOS recommendations, and focusing on the progress as summarized in the report from ET-EGOS-5. One of the main topics under discussion at ICT-IOS-6 was the preparatory work for the new EGOS-IP. CBS-Ext.(2010), Windhoek, Namibia, 17-24 November 2010 endorsed the recommendations of ICT-IOS-6 in relation to the work of ET-EGOS. This included the endorsement of two small but significant changes of name of the ET to take into account WIGOS requirements and the need to consider multiple observing systems in the RRR, including those co-sponsored with partner International Organizations:

- ET-EGOS to be renamed the **Expert Team on the Evolution of Global Observing Systems**.
- EGOS-IP to be renamed the **Implementation Plan for the Evolution of Global Observing Systems**.

2.3 At CBS-Ext.(2010), the Commission agreed on a mechanism for the development of observing practices for the GCOS Upper-Air Reference Network (GRUAN) stations. It also agreed that an expert meeting should be organized to finalize these practices with a view of submitting them to CBS-XV, and it requested the chairs of some expert teams, including ET-EGOS, to nominate a representative. The Team thanked Mr Russell Stringer for volunteering to represent ET-EGOS on this activity. It was noted that GCOS Secretariat should be in charge of coordinating these activities. CBS-Ext (2010) also agreed on a strategy regarding the future of the WMO Database of observational user requirements and observing system capabilities (RRR Database) following recommendations by the ICT-IOS and the ET-EGOS.

2.4 The Chair also provided written input on behalf of the Team to the GCOS expert meeting on the Update of the Satellite Supplement to the GCOS-IP (10-12 January 2011), and the Workshop on Continuity and Architecture Requirements for Climate Monitoring (13-14 January 2011). In April 2011, the Team also provided a response to the new “International Science Plan for AMMA, phase II (2010-2020)” which was made available in January 2011.

2.5 The Chair proposed to give particular attention to the following issues:

- ET-EGOS should continue to devote significant attention to the development of the new EGOS-IP (see agenda item 10). The Team should have a critical look at the draft EGOS-IP, and cover the full spectrum of Application Areas. The draft EGOS-IP shall be submitted for review to other Expert Teams, in particular the OPAG-IOS Expert Teams, but also to other groups with interest in the ET-EGOS activities;
- The Team should review all SoGs for identifying the gaps in the observing systems, and make sure these are reflected in the EGOS-IP;
- ET-EGOS should advise on the planning of the next WMO Impacts Studies Workshop, Sedona, Arizona, USA, 22-25 May 2012 under the leadership of Dr Erik Andersson (see agenda item 9);
- The next session of CBS is planned for late 2012, and it will be preceded by a meeting of ICT-IOS. Therefore it will be important for ET-EGOS to consider how it adequately prepares for forthcoming meetings of ICT-IOS and CBS. It will need to consider whether an additional meeting of ET-EGOS will be needed before this and, if so, when. In any case, it will need to consider carefully its inter-sessional action plan, in order to achieve satisfactory outcomes on all elements of its Work Plan in time for the next CBS meeting.

3 GUIDANCE FROM CHAIRPERSON OF THE OPAG-IOS

3.1 The Team considered guidance from the Chairperson of the OPAG-IOS, Dr Lars Peter Riishojgaard (USA) in the light of recommendations and resolutions of CBS-Ext. (2010), and of relevant resolutions by EC-LXII (June 2010), Cg-XVI (16 May – 3 June 2011), EC-LXIII (6-8 June 2011), and preparation of ET report to the ICT-IO-7 and CBS-XV. Special consideration was given to the role and responsibilities of CBS and its expert teams vis-à-vis WIGOS. Dr Riishojgaard highlighted some of the decisions and discussions from these meetings as well as point out some general development trends that are relevant to the work of ET-EGOS.

3.2 He recalled that the CBS-Ext. (2010) requested that OPAG-IOS organize the Fifth “WMO Workshop on the Impact of the Global Observing System on Numerical Weather Prediction” during the first half of 2012. An offer of the US Delegation to host the meeting was accepted by the Session. A Scientific Organizing Committee has been formed under the leadership of one of the WMO Rapporteurs on Scientific Assessment of Impact Studies, Dr. Erik Andersson from ECMWF. It is clear that CBS expects the work of ET-EGOS to become increasingly intertwined with the progress toward WIGOS. It is still unclear exactly how this will impact the next Work Plan for ET-EGOS, but at a minimum it is likely to lead to increased emphasis on some of the non-traditional application areas discussed in the SoGs and other RRR related material. The CBS Management Group will be providing further guidance in this regard.

3.3 Dr Riishojgaard reported on the outcome of the first Workshop on Space-based Architecture for Climate in Geneva on January 13-14 2011. The need for contingency planning was one of the focal points of the meeting, and it was noted repeatedly that this is especially relevant for those ECVs (Essential Climate Variables) that do not have direct weather applications, e.g. Earth radiation balance. It was also noted that climate sensors be considered candidates for being hosted on operational satellites. Finally, it was noted that space deployment of high-quality reference instruments coupled with a robust intercalibration effort such as GSICS would increase the climate value of operational weather sensors. The development of such architecture is further discussed under agenda item 8.3.2. ET-EGOS is invited to follow this development as there will likely be a role to play for the team in this in the future.

3.4 The Team was briefed on key outcomes from the sixth Session of the CBS Expert Team on Satellite Systems (ET-SAT-6, Geneva, April 12-15, 2011), including (i) a proposed revised baseline for CGMS contribution to the space-based Global Observing System, comprising a description of the available or firmly planned capabilities and services on geostationary or low-Earth orbit, as well as contingency planning, intercalibration, and data availability aspects (Appendix III of the Final Report from ET-SAT-6); and (ii) a thorough review of the draft EGOS-IP including detailed comments and suggestions for its cross-cutting and space-related actions and recommendations (Appendix IV of the Final Report from ET-SAT-6).

3.5 Dr Riishojgaard reported that Cg-XVI decided to proceed with the implementation phase of WIGOS during the coming financial period. Cg-XVI request to develop guidance for the design and evolution of observing components of WIGOS will be of particular relevance to ET-EGOS or its successor following the CBS-XV. Congress featured several side events on issues that are of relevance to ET-EGOS. A side event on Space Weather gave rise to a Statement of strong support for an increased role of WMO in coordinating space weather activities including observational data requirements. At the side event on the Development of a Space-based Architecture for Climate Monitoring, strong support was likewise expressed for WMO’s role in this regard.

3.6 Dr Riishojgaard stressed the following points:

- Regulatory aspects, ownership aspects are not to be taken care of by ET-EGOS but by the new Inter-Programme Coordination Group on WIGOS (ICG-WIGOS).
- WIGOS Implementation at the regional level will be important, and the Regional Associations

(RAs) will have to play a role. The role of ET-EGOS with regard to the RAs will have to be clarified noting that RAs are represented in the ICG-WIGOS. Guideline concerning the RRR process for the regions will have to be proposed by the ET-EGOS

- ET-EGOS will continue to do the work that it is normally doing, but these activities will be part of WIGOS.
- Many integration aspects of WIGOS are related to WIS.

3.7 Further WIGOS aspects are discussed under item 7 below.

3.8 The Team noted that the cancellation of the US National Polar-orbiting Operational Environmental Satellite System (NPOESS) program and the subsequent creation of separate civilian and military meteorological satellite programs in the US (JPSS and DWSS, respectively) has led to an increase in the risk of WMO members not having access to data from microwave and IR sounding missions in an early-morning orbital plane as called for in the “WMO Vision for the GOS in 2025” (see [Annex V](#)). The Team was informed that ET-SAT had raised this concern to the CBS and that the Secretary-General of WMO had requested the USA, in July 2010, to clarify the status of the DWSS mission with respect to the GOS. ET-EGOS invited the WMO Space Programme to reiterate the request for clarification about data policy for the future DWSS mission (**action; WMO Secretariat; ASAP**).

3.9 The Team also noted that NASA is developing a replacement mission for the Orbiting Carbon Observatory (OCO), a hyperspectral near-IR technology demonstration mission aimed at very accurate measurements of the total column of CO₂. The original mission was lost due to a launch failure. The team noted this development, and the potential impact of having low-latency OCO-2 data made available to WMO users. The Team further recalled that the requirement for measuring surface pressure in near real-time has been expressed by ET-EGOS, and noted that the OCO-2 mission might be refocused on this measurement as well (with cost implications). The Team agreed that the “Impact” workshop (see item 9.3) should comment on the need for surface pressure observations (**action; E. Andersson; 2012**).

4. PROGRESS ON ET-EGOS WORK PLAN FOR CBS

4.1 Dr Eyre introduced the progress regarding the detailed ET-EGOS Work Plan proposed by the CBS-XIV (2009) for the period 2009-2012 and based on the guidance of CBS-Ext. (2010). He recalled that the previous ET-EGOS meeting had updated the workplan by assigning responsibilities to Team members, specific deadlines, and status information where appropriate.

4.2 The Team again reviewed the ET-EGOS workplan for progress and further action. The Team noted the following achievements:

- new requirements have been submitted to the WMO database, which has been restructured and rationalized;
- some SoGs have been updated;
- the new EGOS-IP responding to the Vision of the GOS in 2025² has been drafted, submitted for review to the wider community, and many comments have already been received.

4.3 The Team agreed the following aspects had to be considered during this ET-EGOS Session:

- the need to further review the SoGs, consider WIGOS implementation aspects, the requirements arising from the GFCS, and observational requirements in polar regions,
- to take into account comments received on the first draft of EGOS-IP in order to draft the next version.

4.4 The updated workplan is reproduced in [Annex III](#) and progress against this plan will be submitted to the next CBS Session.

2: See [Annex V](#) for the Vision of the GOS in 2025

5. REVIEW OF ACTIONS

5.1 The Chairperson reported on progress on actions from the ET-EGOS-5. These actions were structured as follows:

- I. RRR Process – general
- II. RRR Process – User Requirements (URs) and SoGs
- III. RRR Process – observing system capabilities
- IV. Impact Studies, OSEs, OSSEs
- V. Preparation of the new EGOS-IP
- VI. Other issues

5.2 The Team reviewed progress made against each item, and updated further the actions, closed them or forward them to the actions resulting from the ET-EGOS-6, as appropriate. These, together with additional actions decided by this meeting, are listed in [Annex IV](#).

6. REVIEW OF OTHER ACTIVITIES RELATED TO ET-EGOS AND OPAG-IOS

6.0 The Team was informed by designated experts and the WMO Secretariat on the activities within WMO and other international programmes / projects relevant to the OPAG-IOS and ET-EGOS.

6.1 THORPEX

6.1.1 Mr Tetsuo Nakazawa (WMO Secretariat) reported on the activities of the Observing System Research and Predictability Experiment (THORPEX) relevant to the Rolling Review of Requirements.

6.1.2 The Team recalled the main objectives of the THORPEX Data Assimilation and Observing Strategies (DAOS) Working Group to (i) address data assimilation issues including the development of improved understanding of the sources and growth of errors in analyses and forecasts; (ii) promote research activities that lead to a better use of observations and the understanding of their value; and (iii) provide input and guidance for THORPEX regional campaigns for the deployment of observations to achieve scientific objectives.

6.1.3 The Team reviewed a brief summary of recent activities relevant to the ET-EGOS. The following developments in the global observing systems for NWP were noted by the DAOS Working Group:

- Demonstrating benefits with satellite rapid scan atmospheric motion winds in regional NWP models.
- Using more satellite data over land for example clear sky radiances.
- Extending the use of advanced IR sounder radiances over cloudy regions.
- A proposal for a Canadian Polar Communications and Weather Mission in a Molniya orbit for improved coverage of the northern polar latitudes.
- Raman lidar provides vertical profiles of water vapour at very high time and vertical resolution and can be available 24 hrs a day which is of interest for high resolution mesoscale models.
- The 2010 CIMO radiosonde intercomparison in China, included MODEM, Vaisala and Chinese radiosondes. A report is in preparation on the characteristics of each radiosonde type.
- The formats of rain radar data from different countries should be harmonised to allow easy exploitation of these data on regional and global scales.
- In September and October 2010 as part of the ConcordIASI campaign, 19 balloons were deployed from McMurdo, 6 with a scientific payload sounding the stratosphere, and 13 of the driftsonde type. From the 13 driftsondes, around 640 dropsondes were dropped over Antarctica and the surrounding seas. Most of these were transmitted in real-time on the Global Telecommunication System, for use by the Numerical Weather Prediction centres.

6.1.4 During the first half of THORPEX, the emphasis has been on the evaluation of the impact of observations, including targeted observations, based on results from field experiments (ATReC, AMMA, IPY, T-PARC) and OSEs. The DAOS Working Group has undertaken to summarize the main outcomes from these impact studies which may be summarized as follows:

- The value of extra-tropical targeted data has been found to be positive but small on average
- Observations taken in sensitive areas have more value than observations deployed randomly
- Past experiments do not provide evidence of a major impact obtained from just a few observations (when averaged over a large sample of cases)
- There are limitations to the current assimilation methods to be able to detect the small signal associated with precursors to the development of meteorological systems
- The methods employed to identify sensitive areas do not appear to be a major problem in targeting
- Additional observations around tropical cyclones have proven to be useful

6.1.5 These studies also suggest that additional benefit may be obtained from (i) regional and systematic targeting during low predictability flow regimes on a continuous basis (periods of days to weeks), and (ii) adaptive processing and data selection of satellite data (e.g. Bormann and Bauer, 2010). This review of adaptive observations has been written up as a paper for BAMS which is being submitted for publication. The aim is it will serve as a guide for the design of any future field campaigns making targeted observations.

6.1.6 The Team noted that the DAOS Working Group promoted an intercomparison experiment to evaluate the robustness of new adjoint sensitivity tools to measure the impact of observations in NWP forecasts. The results indicated that these new approaches provide more detailed information on the impact of observations which is extremely valuable in the evaluation of the global observing systems. It was also shown that these tools are complementary to OSEs and permit the evaluation of the influence of other observations on the impact of a particular observation type. A paper³ has been published in *Monthly Weather Review* which presents the results from this intercomparison in which three centres took part. Other centres are now starting to use the same tools and the DAOS intercomparison is being used as the reference dataset to expand the number of participants in this comparison. Based on the results from A-TREC, T-PARC, AMMA (in the form of OSEs, adjoint-based observation impact studies, and analysis uncertainty estimates), and to improve NWP forecasts in the 2-5 day timeframe, the DAOS Working Group recommends, if feasible, increases in observations from (i) *commercial aircraft over the N. Pacific, N. Atlantic, and the S. Hemisphere in general; and (ii) additional soundings from certain coastal radiosondes, including those in eastern Siberia, and perhaps selected stations in polar regions, Africa, and South America.*

6.1.7 The Team noted that there have been various new developments in recent years noted by the DAOS Working Group and specifically (i) results from hybrid 4D-Var and EnKF assimilation trials reported by Environment Canada look promising as they address the problem of cycling a 4D-Var data assimilation and show significantly positive results; and (ii) the development of the weak constraint 4D-Var is being pursued by some groups and some first results at ECMWF are encouraging.

6.1.8 Of the studies reviewed by the DAOS Working Group it is clear that global data assimilation, to provide lateral boundary conditions and background fields for example, is an essential ingredient of any regional forecasting scheme. Currently downscaled 4D-Var analyses provide better results than mesoscale data assimilation systems employing 3D-Var and it is clear that more work needs to be carried out to assess what is really required for mesoscale data assimilation. However, there are potential benefits: (i) higher resolution gives better representation of high-impact weather; (ii) higher resolution allows better assimilation and forecast of observed detail, (iii) affordable timely forecasts

3: Gelaro, Ronald, Rolf H. Langland, Simon Pellerin, Ricardo Todling, 2010: The THORPEX Observation Impact Intercomparison Experiment. *Mon. Wea. Rev.*, **138**, 4009–4025.

can be made with regional systems with the most recent observations; and (iv) regional systems provide a basis for tailored numerical weather prediction.

6.1.9 The Team noted that there is still much research to be carried out into the optimal configurations for data assimilation in regional and mesoscale NWP models.

6.1.10 The Team noted the following recommendations from THORPEX:

- Seek to further optimize existing resources: commercial aircraft, rawinsonde network, satellite radiances, atmospheric motion vectors;
- Account for data assimilation scheme in targeting strategy; quantitatively predict effects of observations;
- Further evaluations with common cases and multiple models/DA would strengthen conclusions;
- Targeting for longer-range forecasts is interesting topic, but results are not mature enough to make an authoritative statement. Broader-scale regime-based targeting seems the most promising approach.

6.1.11 The Team noted that the fourth meeting of the DAOS Working Group was planned in Exeter, United Kingdom, 27-28 June 2011, and that the ET-EGOS Chair was planning to attend.

6.2 WMO Polar Activities, including IPY Legacy

6.2.1 Dr Barry Goodison (Secretariat) reported on WMO Polar activities, including IPY Legacy as guided by the Executive Council Panel of Experts on Polar Observations, Research and Services (EC-PORS). The (Cg-XVI) agreed that WMO needs to continue to have a focus on polar observations, research and services to meet its responsibilities on regional and global weather, climate, water and related environmental matters, and adopted Res.11.9/4 (Cg-XVI) - WMO Polar Activities. EC-LXIII re-established EC-PORS to continue these activities. Congress adopted six resolutions related to polar observing networks or IPY legacy topics:

- **Res.11.9/1 (Cg-XVI) - The Antarctic Observing Network (AntON).** It was agreed to integrate all Antarctic networks into an Antarctic Observing Network (AntON) that will comprise all operational stations, all of which should produce climate messages.
- **Res.11.9/2 (Cg-XVI) - Amendments to the *Manual on the GOS, Volume II - Regional Aspects - The Antarctic.***
- **Res.11.9/3 (Cg-XVI) – Global Integrated Polar Prediction System (GIPPS).** Congress agreed to embark on a multi-year endeavour to develop a GIPPS, capable of providing information to meet user needs for decision making on timescales from hours to centuries. In this regard, EC-PORS should develop a scalable, detailed strategic plan.
- **Res. 11.9/4 (Cg-XVI) - WMO Polar Activities.** Cg-XVI decided that an integrated approach is needed to understand global impact of changes in Polar Regions so that required services may be provided to users and that governments may be advised on aspects of adaptation and mitigation. Operational and research observing networks in Polar Regions (including the Antarctic AntON) should be integrated within the framework of WIGOS and WIS and be enhanced to include cryosphere related variables. Concerted effort should be made to engage WMO Members, technical commissions and regional associations, as well as relevant research and international organizations and bodies, to improve predictive capability in Polar Regions on timescales from hours to centuries.
- **Res. 11.9/5 (Cg-XVI) – International Polar Decade Initiative.** Congress approved the WMO participation in the International Polar Decade should this initiative be endorsed by relevant international organizations as key stakeholders. It requested EC, through EC-PORS, to review and approve the IPD Concept Document at its sixty-fourth session with a view of determining modalities and the level of WMO participation in the initiative. Topics suggested as part of the scientific focus of an IPD included optimization and development of observational methods, systems and networks in the Polar Regions.
- **Res.11.9/6 (Cg-XVI) - Global Cryosphere Watch (GCW).** Congress agreed that WMO needs

to have a focus on global cryosphere issues to provide authoritative information to meet Members' responsibilities on regional and global weather, climate, water and related environmental matters. The GCW Implementation Strategy was approved by Cg-XVI. Congress also noted that GCW would be an important contribution of WMO to a potential IPD, if this were to be initiated, and to GFCS. GCW will be a component of WIGOS and be WIS compliant. EC-PORS will continue oversight of GCW.

6.2.2 In particular, Cg-XVI supported the need to establish an observational framework for Polar Regions, including the "Third Pole" (Himalaya and Tibetan Plateau) that balances space-based observations with in situ measurements while developing a methodology to address new observational requirements, including the identification of key polar variables from both a research and services perspective. Congress agreed that operational and research observing networks in Polar Regions should be integrated within the frameworks of the WIGOS and the WIS, be enhanced to include cryosphere related variables, especially as related to the development of the GCW.

6.2.3 Cg-XVI also supported the establishment of a Polar Space Task Group (PSTG) for coordinating, across research and operational agencies, the planning, processing and archiving of Earth observation data sets. EC-PORS will oversee these future developments.

6.2.4 Cg-VI had concern that data from many Antarctic stations funded by research agencies are not available in real-time and, therefore, are not available to NWP systems. Congress noted that the high communication cost involved in using Iridium satellites is also a limiting factor. EC and the Secretary-General, in collaboration with CBS and JCOMM, are to investigate possible ways to reduce such costs through an international forum of users of satellite data telecommunication systems. It was also recognized that WIS would provide a suitable environment for collection and dissemination of data from research observing stations.

6.2.5 The Team noted that "Services" to be developed as part of GIPPS are an important driver that anchors the work of WMO Polar Activities and EC-PORS will develop a comprehensive description of the global community's polar service requirements and articulate the value to be delivered. Service requirements will impact both observational and modelling requirements in Polar Regions, and through mechanisms such as Polar Regional Climate Centres and Polar Climate Outlook Forums contribute to GFCS and by the GIPPS.

6.2.6 The Team noted that the GCW will be contributing to WIGOS, and agreed that the GCW requirements had to be considered in the RRR but not as part of a new independent and self contained Application Area. The Team noted that some variables required by the GCW are not covered by any Application Area. It proposed that each Application Area should look at its requirements and SoG in the view to address the GCW requirements more specifically on a case by case basis. For example, missing gaps on polar requirements from the SoG need to be identified, and solution proposed.

6.2.7 The Team agreed that the RRR, SoGs, and EGOS-IP should be more visible on the WMO website, and requested the Secretariat to investigate how this could be realized (**action; Secretariat; ASAP**).

6.3 African Monsoon Multidisciplinary Analysis (AMMA)

6.3.1 The WMO Secretariat reported on behalf of Mr Mohammed Kadi (Director-General of ACMAD, Algeria) and Mr Malamine Sonko (RA I Rapporteur on the Regional Aspects of the GOS) on AMMA activities since the last ET-EGOS meeting.

6.3.2 The Team recalled that the AMMA International Science Plan for 2010 to 2020 (ISP) was published in early 2011, that the ET-EGOS Chair has reviewed the plan, consulted with the Team and the Secretariat, and submitted ET-EGOS comments to the AMMA ISP to the Chair of the AMMA International Scientific Steering Committee, Dr Jean-Luc Redelsperger. The AMMA response to the ET-EGOS comments have been received prior to this ET-EGOS meeting.

6.3.3 The Team agreed that ET-EGOS should make the case that the lack of observations in RA I is an issue for all WMO members, not just for the RA I. It agreed that (i) the flow of humidity from the Atlantic, and (ii) the establishment and strength of the heat low, are scientific issues that require routine observational support to enable good forecast in the region. The Team agreed that observation impact in RA I, related to AMMA, could become one theme for the 5th WMO “impact” workshop in 2012. The workshop will encourage presentations on observation impact over the AMMA region, and also the impact of satellite observations over land (*action; E. Andersson; end 2011*).

6.3.4 The Team agreed that according to the plan, AMMA had highlighted problems of sustaining the observing networks. The Team requested the secretariat to approach AMMA and seek action and feedback on the following issues (*action; Secretariat; end 2011*):

- (i) AMMA should be approached by the Secretariat with the view to improving the situation regarding the sustainability of the relevant observing networks. In particular, AMMA is invited to discuss with the CBS possibilities to sustain the operation of the radiosonde observations in West Africa, with assistance from the CBS.
- (ii) AMMA is invited to review User Requirements and Statements of Guidance to check whether the AMMA requirements have been captured.
- (iii) It would be useful to submit the draft EGOS-IP to AMMA for review and comment.

6.3.5 The Team agreed that AMMA could be seen as a successful example for demonstrating the value of working at the regional level, and sub-regional level.

6.4 AMDAR

6.4.1 Dr Miroslav Ondráš (WMO Secretariat) reported on behalf of Mr Frank Grooters (the Netherlands) on AMDAR activities since ET-EGOS-5. Since ET-EGOS-5 (30 November – 4 December 2009) the WMO AMDAR Panel has continued to coordinate global AMDAR activities and to consolidate AMDAR as a cost effective upper-air observing system. The global AMDAR Programme has continued to make progress on implementing national and regional AMDAR programmes, improve global AMDAR data coverage and to better integrate AMDAR into WIGOS.

6.4.2 Dr Ondráš reported that existing programmes in Australia, China, Southern Africa, Republic of Korea, Hong Kong China, Japan, the United States of America and Europe are continuing to expand AMDAR coverage both domestically and internationally. The number of profiles available in data sparse regions of Africa, Eastern Europe, parts of the Russian Federation, the Middle East, South and East Asia, South America and even (occasionally) in the Arctic and Antarctic region has increased. The AMDAR Programme now exchanges between 300,000 and 400,000 observations per day on the GTS. A small drop was noted during the Global Financial Crisis, but also because of the optimization scheme introduced by some Members.

6.4.3 The WIGOS Pilot Project for AMDAR is focusing on facilitating the governance, standardization and interoperability of AMDAR and on improving the practices impacting AMDAR data collection, processing, archiving and dissemination. The governance of WMO AMDAR Panel was addressed by the successful transfer of the AMDAR Technical Coordinator’s responsibility into WMO and the WMO Secretariat structural and organizational change. Very recently the new Scientific Officer came in post as the Secretariat lead for the Aeronautical and In-situ Remote Sensing Observations within the WMO Observing Systems Division (OSD).

6.4.4 Six sub-projects of the AMDAR Pilot Project for WIGOS were developed: (i) development of a BUFR Template for AMDAR; (ii) application of WMO Metadata relevant to AMDAR; (iii) development standardized procedure for Quality Management of AMDAR data; (iv) validation and preparation for intercomparison of available Water Vapour sensor performance; (v) update of the AMDAR Reference Manual, WMO-No.958; and (vi) development of the framework for generic software specification for AMDAR.

6.4.5 The E-AMDAR Programme has evaluated the 2009 version of the WVSS-II (WVSS-IIv3) humidity measurement instrument. It was tested in the climate chamber of the DWD. The test has shown that the relative accuracy is better than $\pm 10\%$. Additional climate chamber testing of the WVSS-IIv3 humidity sensor at the Research Centre Jülich has shown excellent result. Since early 2011 two WVSS-IIv3 sensors are installed and being tested against standard instruments in the UK Facility for Airborne Atmospheric Measurements (FAAM) BAE-146 Research Aircraft. First flight results show a very good relation with the standard comparison instruments. Final results of this trial will probably be made available towards the end of 2011.

6.4.6 In the USA AMDAR Programme 25 WVSS-IIv3 units are installed on UPS B757 aircraft and 13 units on SWA B737 aircraft. Contracts are in place for the installation in 2012 of an additional 49 units on SWA B737 aircraft with an option for 18 more installations. The manufacturer is active in obtaining certification for additional aircraft types (B737/300, B737/700 and B737/800). Each WVSS-II equipped aircraft provides between 200 and 600 observations daily. With the 38+ sensors currently operational, between 7,600 and 23,000 moisture observations are received daily.

6.4.7 Regarding onboard software and alternative aircraft measurement technologies, the Australian Bureau of Meteorology developed AAAv3 software has shown a minor fault with the some data resulting in navigation errors. An updated version of the AAAv3 software providing a correction for the Base40 encoding error was developed and is being installed on some aircrafts. International monitoring centres have verified that the software update has rectified the issue for the Australian fleets.

6.4.8 The Team noted that a business case for showing the benefit of AMDAR data in aeronautical service provision for Schiphol Airport, has shown improvement in the quality of the short term forecasting and in the service provision, in particular during specific meteorological events.

6.4.9 The development and refining of the E-AMDAR data optimisation scheme (E-ADOS) continues to show positive benefits to the European AMDAR Programme. These benefits do increase significantly from the moment the E-AMDAR Programme incorporates additional airlines and is extending the Programme through targeting programmes in Central and Eastern Europe and in the Far East. E-AMDAR is serving now over 120 airports daily in Europe, resulting in over hourly 1000 profiles, provided by 11 airlines. Contracts for targeted E-AMDAR data are signed with India, South Africa, Singapore and ASECNA.

6.4.10 The Australian AMDAR Programme has developed and is now operating its own AMDAR Optimisation System (A-ADOS) which is regarded as an essential component to the Australian AMDAR Programme and is expected to better manage the Australian upper-air data requirements.

6.4.11 The United States of America is reviewing the need for optimizing AMDAR data from South West Airlines.

6.4.12 The Team noted that the gaps in the availability of AMDAR profiles are mostly over Developing Countries, extensive and uninhabited regions and oceans where no or not enough radiosoundings are available for the provision of upper air data or no AMDAR equipped aircraft or airports are located. The AMDAR Panel is particularly interested in activating existing AMDAR aircraft for extending national and regional AMDAR programmes providing targeted AMDAR data.

6.4.13 The majority of the aircraft have the capability to use HF communication. In certain regions AMDAR data is transmitted to the ground only by using HF. AMDAR data from sensitive regions like the Arctic and the Antarctic is currently very scarce but could be increased for special programmes (like Polar Year) by activating existing AMDAR aircraft. Additional information has given that many HF equipped aircraft⁴ are flying over the Polar Regions (in particular the Arctic Region, above 80N). These flights could be considered as potential AMDAR flights, but only if the aircraft concerned can be AMDAR equipped (e.g. carrying the right avionics for implementing AMDAR software).

4 AirCanada, Continental-United, Cathay Pacific, Singapore/Singapore Cargo, Aeroflot, Lufthansa Cargo

6.4.14 The Team agreed that this is a major issue to convince airline companies to participate in AMDAR, and go through the certification process. The benefits of the AMDAR programme have therefore to be demonstrated and well communicated. The Team stressed that the right actions need to be included in the new EGOS-IP.

6.4.15 Regarding developing AMDAR for developing countries, the Team recognized that the fleets used in some countries were not compatible with AMDAR, and that there are cost implications. The Team nevertheless noted the value of organizing training workshop.

6.5 GCOS

6.5.1 The CBS Rapporteur for GCOS Matters, Mr Jay Lawrimore (USA) recalled that the *Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC (GCOS-92)* has been updated in 2010, and new version, hereafter referred to as GCOS-IP/2010, published as GCOS Report No. 138⁵. The GCOS-IP/2010 focuses on the timeframe 2010-2015 and recommends a set of 138 actions required to implement and maintain a comprehensive global observing system for climate. It identifies appropriate “agents for implementation,” timelines, performance indicators, and estimated annual costs. The total cost estimate is also broken down into satellite-related and open ocean-related costs, and costs for enhancements in developing and developed countries.

6.5.2 The Team noted that the GCOS-IP/2010 includes a revised list of now 50 GCOS Essential Climate Variables (ECVs) and takes account of recent progress in science and technology, the increasing focus on adaptation, the demand to optimize mitigation measures, and other evolving requirements on systematic observation of the climate system. Overall, GCOS-IP/2010 places stronger emphasis on Earth system cycles, and clearly states the need for sustained and coordinated reanalysis and reprocessing in support of climate research, monitoring and the analysis of trends. In addition, GCOS-IP/2010 makes a first step in identifying basic regional needs for observations in support of adaptation planning.

6.5.3 The Team recalled that at its second session in 2006, it agreed that the Second Report on the Adequacy of the Global Observing Systems for Climate in Support of the UNFCCC (GCOS-82, 2003), the 2004 published GCOS implementation plan (GCOS-92), and the supplement to the satellite-based component of the 2004 published GCOS implementation (GCOS-107, 2006) provided an adequate Statement of Guidance (SoG) for climate monitoring, covering climate change and climate variability.

6.5.4 The Team noted that the 2011 update of the supplement to the satellite-based component of the GCOS-IP/2010 is currently underway. The draft document is opened for public review from 9 May to 1 July 2011. In light of the recent update of the ECV list to now 50 variables (published in the 2010 Update of the GCOS Implementation Plan), the document takes into account given advances in science, technology and emerging user needs.

6.5.5 The Team again considered the following documents to be regarded as updated SoG for Climate Monitoring, covering climate change and climate variability:

- Second Report on the Adequacy of the Global Observing Systems for Climate in Support of the UNFCCC (GCOS-82, 2003)
- Supplement to the satellite-based component of the 2004 published GCOS implementation (GCOS-107, 2006)
- Progress Report on the Implementation of the Global Observing System for Climate in support of the UNFCCC 2004-2008 (GCOS-129, 2009),
- The GCOS-IP/2010
- The 2011 update of the supplement to the satellite-based component of the GCOS-IP/2010, once published.

⁵: <http://www.wmo.int/pages/prog/gcos/Publications/gcos-138.pdf>

6.5.6 In 2010, GCOS experts were invited to review the draft of the new EGOS-IP and to comment in particular on its sections 5 and 6. The draft EGOS-IP is supposed to take note of and also respond to the GCOS-IP/2010.

6.5.7 The Team decided to look at the GCOS-IP/2010, and where appropriate to reflect appropriate actions in the new EGOS-IP (i.e. where a response from CBS and WMO Members is needed). The Team set up a small sub-group during the course of this ET-EGOS Session to address this issue, and requested ET-EGOS members to then review the results of the small group and provide feedback through the CBS Rapporteur on GCOS matters, Mr Lawrimore by July 2011 (comments included in the draft EGOS-IP in July 2011 by the consultant) (**action; ET-EGOS & J. Lawrimore; July 2011**). Following consolidation of these changes, the Team requested the CBS Rapporteur on GCOS matters to seek feedback from AOPC, CCI, and Regional Associations (**action; J. Lawrimore; Oct 2011**).

6.5.8 The Team also requested its members to review the draft update of satellite supplement to the GCOS-IP/2010, and provide comments to the GCOS Secretariat (**action; ET-EGOS members; 1 July 2011**).

6.5.9 The GCOS Secretariat, in collaboration with the CBS Rapporteur on GCOS Matters, continues to provide guidance and support to GOS RBSN/RBCN networks and systems contributing to GCOS, such as GCOS Surface Network (GSN), GCOS Upper-Air Network (GUAN) and GCOS Reference Upper-Air Network (GRUAN), as well as networks and systems from the oceanic and terrestrial domain. A regular dialogue with space agencies, through Committee on Earth Observation Satellites (CEOS) and Coordination Group for Meteorological Satellites (CGMS) ensures that GCOS requirements and concerns are being considered by the agencies in the evolution of the space-based component of the GOS.

6.5.10 The Team noted that a 2010 Update of the Guide to the GCOS Surface Network and GCOS Upper-Air Network was published in late 2010 (GCOS-144). It describes the organization of the GSN and GUAN, and the implications for stations that are included. *Guideline for the Generation of Datasets and Products Meeting GCOS Requirements* (GCOS-143, 2010) was also recently published. The Team agreed that the GUAN network should be protected for climate purposes whatever evolution is realized for other observing systems. It further agreed that results of comparisons between radiosondes and AMDAR data should be reported to ET-EGOS and GCOS.

6.5.11 The Team also noted with concern that some GRUAN stations are facing severe funding problems. Essential support has been provided by the US GCOS programme. Augmenting capacities and continuous support will be necessary in particular for southern hemisphere stations and when expanding the network to its foreseen extent of 30-40 stations worldwide.

6.5.12 Noting the importance for the Global Ocean Observing System (GOOS), the 'OceanObs'09' conference (Venice, Italy, September 2009) invited governments and organizations to embrace a framework for planning and moving forward with an enhanced global sustained ocean observing system over the next decade, integrating new physical, biogeochemical, biological observations while sustaining present observations (see the conference statement⁶). Recommendations⁷ on this Integrated Framework for Sustained Ocean Observations (IFSOO), considering how to best take advantage of existing structures, were developed by a post-Conference working group. Priority goals for the global ocean observing systems are (i) 100% implementation of initial system by 2015, as called for by OceanObs'09; (ii) deep ocean observations to address gap in monitoring of net transports of mass, heat and freshwater; (iii) ocean reference stations; and (iv) biogeochemical observations for carbon uptake and ecosystems – and the eternal note about improved coordination between satellite and *in situ* observations of key ECVs.

6.5.13 It was reported that the establishment of several Global Terrestrial Networks (GTNs) as part of the Terrestrial Observation Panel for Climate (TOPC) in a number of areas (e.g. Hydrology, Glaciers,

6: www.oceanobs09.net/statement/

7: <http://www.oceanobs09.net/wg/outputs.php>

Permafrost), where data collection takes place largely through *in situ* measurements has significantly improved the coordination and global coverage of these observations. There has been significant progress in defining internationally accepted standards for the terrestrial ECVs and efforts are undertaken by GTOS to move towards ISO standardization. In contrast to this, progress in establishing institutional support for *in situ* networks has been slow. Also the problem that observations taken for purposes other than climate, but with climate relevance, are often not made available persists in many areas.

6.5.14 The Team noted that another continuing, yet still a largely unmet challenge is the objective of creating a comprehensive and well coordinated reference network for *in situ* observations of the fullest possible range of terrestrial ECVs (Supersites). The Chairman of TOPC liaises with WCRP Observations and Assimilation Panel (WOAP) on FLUXNET and water and energy global datasets for this purpose.

6.5.15 Good progress has been made in guaranteeing short-term continuity in the availability of high-resolution optical observations from satellites. The increasing commitment of space agencies to produce fundamental climate data records from existing systems has led to improved availability of global datasets, such as burned area and land cover (now also glaciers with ESA Climate Change Initiative). The analysis of historical records, both *in situ* and satellite based, has been progressing slowly and needs the urgent consideration of space agencies together with the potential users.

6.5.16 Soil moisture, a key parameter in land-surface processes, became a terrestrial ECV in the GCOS-IP/2010 as its measurement technique was now considered mature. Satellite remote-sensing observations from ESA/NASA missions (SMOS/SMAP) can provide spatial averaged global coverage, while *in situ* networks are being organized. Notably the University of Vienna set up a free accessible global database. The Team agreed that a standard for soil moisture is needed as soil moisture is useful for satellite calval. The Team also noted the important contribution of EUMETSAT missions (ASCAT on Metop satellites) to the operational monitoring of soil moisture.

6.6 EUCOS

6.6.1 Mr Stefan Klink (Germany) reported on EUCOS activities related to ET-EGOS and on relevant recent developments. He recalled that the general objective of the EUCOS Operational Programme is to optimise the composite observing system, aiming at an increase of data collection from significant data sparse areas to improve forecast quality.

6.6.2 As the Programme progresses, the objectives will require further consideration responding, for example, to new findings from OSEs that help to define the contributions made by the various components of the terrestrial composite observing system and the performance of a revised upper-air design. It will also be vital to take into account the increasingly important contribution made by the space segment, therefore the EUCOS network must be designed to best complement the operational space segment, and this should be an ongoing process. Since summer 2010 and until the end of the current programme phase which has been prolonged until 31st December 2012 the EUCOS will also coordinate its activities with the Observing Programmes E-GVAP and OPERA and with any other Observation related working group of EUMETNET.

6.6.3 The Team noted that EUMETNET is currently developing roadmaps for its capability areas Forecasting, Climate and Observations and for the two priority policy areas EU and Aviation for the period 2012-2020. EUMETNET has defined the following two Observation goals:

O1. EUMETNET will develop an integrated composite observing system for Global, Regional and 1 km Scale Convection Resolving Models and for Climate, building on existing infrastructure;

O2. EUMETNET will ensure that observational and climate data gathered by the composite observing system will be of appropriate quality to meet the requirements of NWP and climate by working with Members to share and implement best practice and methodologies within the

system.

6.6.4 The Team also noted with interest the following EUCOS activities with regard to network design and Studies Programme:

- Based on the results of Observing System Experiments (OSEs), EUMETNET is now working towards a denser network of upper-air observations by combining radiosonde and E-AMDAR networks. This integrated network comprises of the existing roughly 90 operational radiosonde sites of EUMETNET Members and airports visited 3 hourly by E-AMDAR aircraft.
- An OSE study by ECMWF on the impact of sea level pressure measurements from drifting buoys and voluntary observing ships (VOS) on numerical weather prediction over Europe – conducted in combination with OSEs on the impact of GPS Radio Occultation (GPSRO) data during 2009 – showed a clear positive impact of buoy data, strongest at 1000 hPa but lasting up to 500 hPa. The impact is stronger and lasts longer when GPSRO data are used. The present density of additional buoys – compared to the situation before E-SURFMAR started – has a visible but moderate impact in terms of forecast scores. The impact of E-SURFMAR observations was clearly visible in cases of severe weather events like the winter storms 'Klaus' (January 2009) and 'Xynthia' (February 2010). The influence was slightly positive for 24h forecasts but remarkable for 48h and 96h predictions.

6.6.5 Mr Klink reported on EUCOS status and plans regarding the operations and development of the EUCOS component observing networks, including E-AMDAR (aircraft observations), E-ASAP (ship-based aerological profiles), E-SURFMAR (surface marine observations), E-WINPROF (wind profilers), E-GVAP (GPS water vapour observations), OPERA (weather radars). Regarding EUCOS developments planned for 2011, the Team noted the following:

- i. Important tasks for EUCOS are to finalize the EUMETNET Observation roadmap development, to evaluate the Data Targeting System trials from 2008 and 2009 and to further improve the central EUCOS Quality Monitoring tools.
- ii. The E-AMDAR extended humidity trial will continue. The Programme will carry out an experiment with increased resolution in profiles, provided by one airline.
- iii. Pending verification tests of the new WMO AMDAR BUFR Template, and subsequent formal adoption of the Template by WMO, E-AMDAR will cease processing data to GTS in FM42 format and use BUFR only.
- iv. There shall be no change to the current ASAP fleet of 18 ships and one land station.
- v. A few more BaTos (integrated S-AWS) stations and a few BaRos (autonomous S-AWS, measuring SLP only) will be installed during 2011. The latter especially in the Mediterranean Sea thanks to the collaboration with MOON Members.
- vi. E-WINPROF intends to implement a technical support team during 2011. This team will actually improve sharing knowledge among Members running wind profilers.
- vii. Another functionality to be developed and implemented on E-WINPROF servers is the ability to block data dissemination of questionable/poor quality observations and the management of the necessary support/resources to resolve issues in a timely manner.
- viii. Central aspects for 2011 are to make AQC operational, to make operational the E-GVAP component of the common EUCOS Quality Monitoring Portal, to address a timeliness issue by enabling more frequent, non hourly, data upload and to attempt getting access to data from member countries with currently poor or no EGVAP coverage.

- ix. During 2011 the central task for OPERA is to work towards increasing the number of radars contributing to the Odyssey composites and towards increasing the composite quality. Another deliverable is to draft documents reporting on the ongoing OPERA projects on radar data quality, dual polarization and X-band radars. Furthermore OPERA is trying to increase the number of WRWP reaching the quality standard set by EUCOS and to complete the harmonization of data formats being used operationally (OPERA BUFR template). The Team noted that for radar composite prototype, data quality is not good enough for NWP in terms of rainfall estimate.

6.6.6 The Team recalled its agreement at ET-EGOS-5 that the issue of data exchange between countries (e.g. through MoUs or other mechanisms) should be addressed. Regional consortia should be encouraged. On data policy, Members should be encouraged to reach agreement and define what radar data should be internationally exchanged (raw data; e.g. reflectivity), and such data be eventually classified as “essential” or “additional” per WMO Resolution 40 (Cg-XII). See also items 11.1 to 11.13 below.

7. WMO INTEGRATED GLOBAL OBSERVING SYSTEM (WIGOS)

7.1 Dr Igor Zahumenský (Secretariat) reported on the status of the development of WIGOS concept and outcomes of Cg-XVI, in particular that Congress decided to implement WIGOS during the next financial period by adopting Resolution 11.3/1 (Cg-XVI).

7.2 ET-EGOS-6 noted the following topics, which are of particular relevance to the work of ET-EGOS:

WIGOS Vision

- Congress agreed with the WIGOS vision specified in the WDIS that calls for an integrated, coordinated and comprehensive observing system to satisfy, in a cost-effective and sustained manner, the evolving observing requirements of Members in delivering their weather, climate, water and related environmental services. WIGOS will enhance the coordination of WMO observing systems with those of partner organizations for the benefit of society.
- Further, WIGOS will provide *a framework for enabling the integration and optimized evolution of WMO observing systems*, and of WMO’s contribution to co-sponsored systems. Together with the WIS, this will allow continuous and reliable access to an expanded set of environmental data and products, and associated metadata, resulting in increased knowledge and enhanced services across all WMO Programmes.
- The WIGOS vision provides *a roadmap to guide the orderly evolution of the WMO observing systems operated by Members into an integrated system*. Establishing the effective and sustained organizational, programmatic, governance and procedural structures is needed for a common standardization process facilitating interoperability of WIGOS observing components, and for implementation of quality management procedures. It will enable those user requirements for various application areas to be met at national, regional and global levels.

Benefits

- Congress agreed that WIGOS will significantly enhance observing capabilities of Members by maximizing their administrative and operational efficiencies, through *a more coordinated, collaborative and cost-effective approach to the planning and operation of an integrated global observing system*.

Implementation

- Congress stressed the importance of *the development of an implementation plan for the evolution of WIGOS beyond 2015* including *technical guidance on how to design, develop and implement integrated national observing systems* to provide comprehensive observations in response to the needs of all WMO Members and Programmes.

- Congress decided that the WIGOS implementation be undertaken in *an active and prudent manner* in the sixteenth financial period and will focus on a framework for improved governance, management, integration and optimization of the multiple observing systems coordinated by WMO, so as to achieve a smooth transition, and no effort should be spared to make WIGOS operational by 2016.
- Congress requested the Secretary-General to provide *documentation on the benefits, efficiency and cost-effectiveness of WIGOS*, as well as *guidance on the implementation activities by Members*, to be available also to funding agencies, such as the World Bank and EU to gain their support.

7.3 ET-EGOS-6 further discussed the impact of WIGOS implementation on the work of the ET-EGOS. It noted that governance and regulatory aspects of WIGOS are outside of responsibility of ET-EGOS. WIGOS Implementation activities with roles and responsibilities will be specified in the WIGOS Implementation Plan (WIP), which is to be finalized by the end of 2012.

7.4 In the WIGOS framework, ET-EGOS is expected to play a crucial role by providing technical guidance to Members on how to design, develop and implement integrated observing systems at the national and regional levels utilizing the RRR process, the SoGs and the EGOS-IP.

7.5 The Team requested the WIGOS Planning Office of the Secretariat to identify relevant issues from the WIGOS Implementation Plan to be included in the EGOS-IP in order to link the EGOS-IP with the WIGOS-IP (*action; I. Zahumensky; End Aug. 2011*).

8. ROLLING REVIEW OF REQUIREMENTS AND STATEMENTS OF GUIDANCE

8.1 *Review database of User Requirements*

8.1.1 The Secretariat recalled the concept and structure of WMO Database of Observational user requirements⁸ and observing system capabilities (RRR Database) and its on-going updating process in the context of RRR. The Team recalled that the database is a key element of the RRR process, in particular in the context of WIGOS. The database is available for consultation on the WMO web site⁹, where explanations on the mechanism for collecting requirements and the concept of goal, breakthrough and threshold are provided.

8.1.2 The Team recalled that following recommendations from the previous ET-EGOS meeting, the sixth Session of the ICT-IOS (Geneva, Switzerland, 28 June – 2 July 2010) established an *ad hoc* task group – lead by Dr Lars Peter Riishojgaard (USA, OPAG-IOS Chairperson) – on the RRR Database in particular to develop a strategy for developing, maintaining, operating, and hosting the RRR database, including rationale, timeline, funding requirements, and possible funding sources. The strategy proposed by the *ad hoc* group has then been reviewed and endorsed by the CBS-Ext. (2010).

8.1.3 According to the strategy, specifications for the overall RRR database and its management has been prepared by the Secretariat in consultation with the ICT-IOS *ad hoc* task group on the RRR Database.

8.1.4 The Team reviewed several preliminary proposals for the development, hosting, maintenance, and operations of the database noting that they were non-binding at this point. These included (i) JCOMMOPS, (ii) the Systems Engineering Office (SEO) at NASA Langley Research Center (Hampton, Virginia, USA), and (iii) EUMETSAT based on the Dynamic Object-Oriented

8: User requirements refer to the observational data requirements for the Application Areas identified in the Rolling Review of Requirements.

9: <http://www.wmo.int/pages/prog/sat/Databases.html#UserRequirements>

Requirements System¹⁰ (DOORS®).

8.1.5 In October 2010, EUMETSAT provided a detailed response¹¹ to an Action Item from the fifth Session of the Expert-Team on Satellite Systems (ET-SAT-5, Geneva, 26-29 April 2010), calling to perform an initial evaluation of the use of DOORS or other tools to support the migration of the information contained in the “GOS Dossier” to a suitable requirements management system, and facilitate its further handling and updating.

8.1.6 CBS-Ext.(2010) requested OPAG-IOS to invite potential candidates willing to host the RRR database and to evaluate candidates according to a process to be defined by ICT-IOS. The CBS-Ext.(2010) also requested the OPAG-IOS to ensure that any particular requirements of Polar Meteorology, are captured through the ongoing RRR process.

8.1.7 The WMO Secretariat has proposed the detailed functionalities of the requirements database and circulated them to the ad-hoc task group for review on 30 March 2011. After this review, the Secretariat has started the development of the observing requirements database using open source software tools (PHP, MySQL). The Secretariat made a demonstration of a preliminary version of this database at this ET-EGOS-6 meeting (see <http://www.wmo-sat.info/db>). The database will be fully available on-line via the web, and users will be able to query information from it based on standard query forms. The database will include a central user management, including specific access rights for different user groups, recognizing the different roles of agencies committed to maintain the different parts of it. It will provide tools for managing all content online, i.e. password protected interfaces permitting designated experts to edit the database and make small changes as required. The Team congratulated the Secretariat for the development of the prototype. The Team requested Team members and the PoCs to review the new database implementation following completion of the new web-based version (**action; ET-EGOS & PoCs; end Aug 2011**)

8.1.8 Due to different constraints on the hosting side for the observing system capabilities part, after thorough review, the Team concurred with the WMO Secretariat proposal to keep a distributed approach in general (i.e. specific centres being responsible for specific components of the database), but concentrate initial development and hosting of the Database in one point. Information Collection regarding the observing system capabilities would be taken care of by responsible agencies on behalf of the WMO. This evolution from the original strategy is described in the *Technical Specification for the Evolution and Future hosting of the WMO Database of Observational User Requirements and Observing System Capabilities*, version 1.2, 4 March 2011. As all 3 parts of the database (requirements, space-based capabilities, surface-based capabilities) are heavily interdependent, it is important to have one common (software) infrastructure, which allows queries across these parts, by one single interface. This approach also reduces development time and costs by avoiding unnecessary duplication. However, maintenance of the three parts is still following the distributed approach and becomes the responsibility of the respective agency/institution committing to it. Appropriate interfaces allowing these agencies full and direct access to the respective parts of the database are to be provided. The Team invited the CBS Management Group (MG) to endorse the new “distributed” approach for the strategy for the evolution of the RRR Database and provide further guidance in this regard, and invited the chair OPAG/IOS to bring this to the attention of the CBS MG (**action; L.P. Riishojgaard; July 2011**).

8.1.9 As a parallel exercise to the strategy for the evolution of the database described above, the overall consistency and organization of the requirements has been substantially reviewed by the Secretariat, the contents consolidated and made available to the focal points via an Excel file; and restructured in such a way that it can easily be imported into a new future database. In particular, the management of Variables, Layers (low troposphere, high troposphere, surface, etc), Themes (e.g. basic atmospheric, ocean and sea ice, land surface, solid Earth), and Application areas has been

10: DOORS® is an application software using a database that is used for managing complex projects and related requirements. It particularly supports document requirements, and link them to project elements, design items, test cases etc. so that compliance and traceability can be monitored, and gap analysis automatically derived. It is a multi-user web enabled application permitting collaborative work that provides a user interface and tools to edit and update requirements.

11: http://www.wmo.int/pages/prog/sat/meetings/documents/ET-SAT-6_Doc04_Add-EUM_response_GOS-dossier.pdf

rationalized and standardized.

8.1.10 The Team noted with appreciation the good progress made regarding the standardization of the list of Variables. With guidance from the Chair, the new list of Variables has been reviewed by the Application Area PoCs, and some Expert Teams with the goal to have it agreed widely within the user community, and the list to then be used in the RRR with unambiguous designation, definition, and units. In February 2011, in the course of the requirements updating process, the application areas focal points were reminded to use the new set of variables. At this stage, contributions were received on Atmospheric Chemistry, Agriculture Meteorology and - from JCOMM – on Ocean Applications. The Team requested the Secretariat to provide information on variables from the CIMO Guide and the ET-AWS (functional specifications) to ET-EGOS members and PoCs to be aware of its content (**action; Secretariat; ASAP**).

8.1.11 Regarding the current version of the User Requirements Database (UR DB), the Team noted that significant effort is still required to « clean up » and structure the contents. Content needs to be validated before the UR DB can go online. It noted with appreciation that significant feedback has been received from some applications. However, some questions still need to be resolved, e.g. (i) how to address Sub-applications of Application Areas, (ii) the choice of variables, and (iii) consistency of requirements with definitions and units. The Team set up a small working group during the course of this Session to address these issues. The Team requested its members and the PoCs for the Application Areas to review the user requirements in the database, address the open issues (see list of actions in *Annex VIII*) and report feedback to the Chair (**action; ET-EGOS & PoCs; Sept. 2011**). The next version of the UR DB will be a relational database with on-line editing capability. This will ensure smooth updates in the future. The Team agreed to investigate how some flexibility could be introduced in the database to address specificities of Application Areas with regard to the requirements for some specific variables (e.g. possibility to choosing units, using footnotes).

8.1.12 Noting that the GOOS requirements had not been updated for a long period, that JCOMM is in charge of the coordination of the GOOS implementation, that JCOMM is responsible for the Ocean Application Area where user requirements have been recently submitted, and noting the potential overlap between the GOOS and Ocean Applications, the Team requested the Secretariat to write to the GOOS Project Office and ask about the status of the GOOS requirements as part of the RRR Database (once the JCOMM requirements are clean in the database) (**action; Secretariat; end 2011**). The Team agreed that it should be the responsibility of GOOS to decide whether the GOOS user requirements should be deleted from the database, or to keep them in such a way that they would complement the Ocean Application ones. In case the GOOS User Requirements have to be kept in the database, then the GOOS shall be in charge of their updating on a regular basis.

8.1.13 The Team noted that the WCRP has been contacted and has expressed no interest in having their User Requirements reflected in the RRR Database. The WCRP requirements should therefore be removed from future updates (**action; Secretariat; ASAP**). The Team agreed that some research requirements (e.g. for campaigns, process studies) are not in principle covered in the database.

8.1.14 The Team agreed that it should eventually be possible for interested experts from the scientific community to contribute to the database, and invited the Secretariat to investigate feasibility to permit feedback being provided to the National Focal Points through the online database (**action; Secretariat; end 2012**).

8.2 Review database of Observing System Capabilities

8.2.1 Mr Lafeuille (Secretariat) reported on the status of the Space-Based Observing System Capabilities part of the RRR Database. He recalled that the capabilities are described in the first two volumes of the “Dossier on the Space-based GOS”, which is regularly updated and available for download from the WMO web site¹², and includes five volumes¹³. A main purpose of the Dossier and

12: <ftp://ftp.wmo.int/Documents/PublicWeb/sat/DossierGOS/>

of the planned related databases is to enable a critical review of the adequacy of observing systems to meet observing requirements, and to support subsequent gap analyses and SoGs.

8.2.2 As the Dossier includes more and more information related to environmental satellites that are not strictly meteorological satellites, and as more of these environmental missions tend to have an “operational” or “sustained” status, the traditional classification between “meteorological” and “R&D satellites” is no longer relevant. The next edition, to be issued by July 2011, will have a new structure and will include a number of additional material since its scope will be extended to also include for example Space Weather missions.

8.2.3 The Team noted that the core information related to instruments, satellites, programmes and agencies has been structured and stored in a set of Excel files for internal use in order to support consistency checks in the updating process. These files should ultimately facilitate the migration of this information to the future database of space-based capabilities as described under agenda item 8.1.

8.2.4 The Team noted that in the case of space-based remote-sensing, the instrument capabilities generally cannot be directly compared to the requirements: the physical variable (referred to as level 2 data) must be derived from the instrument output (referred to as level 0 or level 1 data) through a specific processing. Furthermore, most of the sensors provide multispectral radiometric measurements that support the derivation of several physical variables. It is thus a huge and complicated task to analyze the contribution of all sensors to all potentially relevant variables.

8.2.5 In practice two approaches are pursued to reduce the problem of performing gap analyses:

- A target configuration of space-based observing system (or “baseline”) is defined on an expert basis to respond to the requirements; then it is easy to compare the actual or planned capabilities to these baseline capabilities. This approach is effective, to the extent that the “baseline” is properly defined. Such baseline must therefore be regularly reviewed, updated, and optimized. The analysis should be supported by an evaluation of the theoretical performance of specific classes of instruments for the various parameters. This is the approach pursued in Volume 3, 4 and 5 of the Dossier.
- The performance of the relevant individual instruments for the derivation of specific variables can be evaluated and compared to the requirements. Since this requires a substantial work, and needs to be regularly updated, it is either focusing on a particular theme of interest (e.g. ocean surface, atmospheric chemistry, atmospheric dynamics), or performed across all applications but in a simplified way in defining some rough classes of performances. For example, a mapping of individual instrument performances and limitations is being developed for the (around 100) variables that are measurable from space.

8.2.6 The Team requested the Secretariat to write to the EUMETNET Secretariat, and request whether EUMETNET would be interested to play an active role regarding the collection of parts of the surface-based observing system capabilities as a contribution to the distributed database detailed in section 8.1 above (**action; Secretariat; ASAP**).

8.2.7 Similarly, the Team requested the Secretariat to write to the JCOMM Co-President, and request whether JCOMMOPS would be interested to play an active role regarding the collection of the ocean part of the surface-based observing system capabilities as a contribution to the distributed database detailed in section 8.1 above (**action; Secretariat; ASAP**).

8.3 Statements of Guidance (SoGs)

13: Vol. 1: Satellite programmes description; Vol. 2: Earth observation satellites and their instruments; Vol. 3: Gap analysis in the space-based component of GOS; Vol. 4: Estimated quality of products from typical satellite instruments; Vol. 5: Compliance analysis of potential product quality with user requirements.

8.3.1 Overview of status

8.3.1.1 The ET Chairperson recalled that the SoG is a gap analysis and is meant to help CBS formulate plans to address gaps in the observing system with respect to user requirements. Recommendations derived from these gap analyses eventually go into the Implementation Plan and the Vision for the GOS. The RRR process informs Members on the extent to which their requirements are met by present systems, will be met by planned systems, or would be met by proposed systems. This would also allow Members, through the Technical Commissions, to check whether their requirements have been correctly interpreted and update them, if needed, through the RRR process. The procedure agreed by the Team for update, validation, and approval of SoGs is provided in [Annex IX](#).

8.3.1.2 The Team noted that following ET-EGOS-5 recommendations and further guidance from the Chair, some of SoGs have been updated during the last intersessional period. The Team reviewed available updates on individual SoGs as provided by the nominated expert PoCs and as held by the WMO Secretariat within the application areas. Current status of SoG is summarized in [Annex XIV](#).

8.3.2 Consider newly revised SoGs

8.3.2.1 The Meeting reviewed available updates on individual SoGs as provided by the nominated Pont of Contacts within specific application areas.

Global Numerical Weather Prediction (NWP)

8.3.2.2 Global NWP SoG was prepared and presented by the PoC, Dr Erik Andersson (ECMWF). Updates proposed by the meeting, included:

- Summary of SoG: value of GPS RO to be added. Other elements to be added.
- Some minor comments by the Chair to be passed.
- Importance of timeliness to be added.
- Interface with SIAF to be considered.

8.3.2.3 The meeting approved the new version of the SoG for publication on the web (**action: Secretariat; ASAP**). Any additional comments from the Team should be fed back to the PoC.

High Resolution NWP

8.3.2.4 High Resolution NWP SoG was prepared by the PoC, Mr Thibaut Montmerle (France) and presented by Dr John Eyre (UK). The Team noted that the new version was approved by the Chair in May 2010 and posted on the web.

8.3.2.5 The Team agreed that the User Requirements need to be reviewed for consistency with the GNWP requirements, and requested the PoC to submit an update version of the requirements to the Secretariat (**action; T. Montmerle; Oct. 2011**). Minor comments on the SoG from ET members were noted and will be passed back to the PoC for SoG update (**action; J. Eyre; Oct 2011**).

Aeronautical Meteorology

8.3.2.6 Aeronautical Meteorology SoG was prepared and presented by the PoC, Dr Jitze van der Meulen (the Netherlands). The Team recalled that the SoG has been updated in May 2011, including for user requirements for meteorological services at airports (the terminal zone). It requested the PoC to further update the SoG to take into account the following elements (**action; J. vd Meulen; end 2011**):

- SoG needs to be revised as a gap analysis
- Addressing “icing on the wings” (supercool liquid water) based on the use the existing “Icing potential” variable from the Database;

- Turbulence.

8.3.2.7 The Team also requested the Secretariat to add the list of new variables proposed by the PoC to the list of variables of the RRR Database (**action; Secretariat; ASAP**).

Nowcasting and Very Short Range Forecasting

8.3.2.8 The Nowcasting and VSRF SoG was prepared and presented by PoC, Dr Aurora Bell (Romania). The June 2008 version of the SoG for Synoptic Meteorology has been merged into this application area, and the SoG for VSRF updated accordingly. The Team noted that the PoC has consulted with experts on lightning detection, and updated the relevant section of the SoG. The issue of data exchange between countries has now been addressed in the SoG.

8.3.2.9 The Team requested the PoC to further update the SoG to take into account the following elements (**action; A. Bell; July 2011**):

- The SoG will be reorganized as following: (i) Gaps in quantity and quality; (ii) New developments; and (iii) Gaps in Capacity Building;
- Duplication to be removed;
- Meteorological concepts/features to be considered;
- Encouraging met services to be more open regarding data policy for cross-border data exchange (not only global data exchange);
- Adding new variables: e.g. fresh deposit of snow;
- New issues as proposed by the PoC to be added.

8.3.2.10 The Team requested the PoC to identify issues that will have to be included in the new EGOS-IP (**action; A. Bell; Oct. 2011**)

8.3.2.11 The Team invited its members to review and comment the SoG with the view to post an updated version of the SoG on the web with the Chair's approval (**action; ET-EGOS; Oct. 2011**).

Atmospheric Chemistry

8.3.2.12 Latest developments with regard to the further updating of the Atmospheric Chemistry SoG, prepared by Len Barrie (WMO Secretariat), was presented by the new PoC, Ms Oksana Tarasova (WMO Secretariat).

8.3.2.13 The Team recognized that the need for atmospheric chemical observations is driven by a number of challenges, including air quality, climate change, oxidation capacity of the atmosphere and stratospheric ozone depletion. These challenges are addressed in the IGACO strategy (GAW Report No. 159, Sept. 2004) which forms the basis for the current SoG in Atmospheric Chemistry. The Global Atmosphere Watch (GAW) Programme of the World Meteorological Organization (WMO) is the framework for the implementation of the IGACO strategy.

8.3.2.14 The Team noted the limitations of the current version of the SoG for Atmospheric Chemistry due to its origin in the IGACO strategy. These limitations were discussed, in particular, during the meeting of the Joint Scientific Committee of the Open Programme Area Group on Environment Pollution and Atmospheric Chemistry (JSC OPAG-EPAC) held in Geneva, from 27 to 29 April 2011. The Team agreed that the following issues had to be addressed by the GAW community to update the current SoG in Atmospheric Chemistry:

- The GAW report 140 ("WMO/CEOS Report on a Strategy for Integrating Satellite and Ground-based Observations of Ozone") from 2001 lead to the formulation and publication of the IGACO strategy in 2004. Current developments of the observational system (ground based, aircraft and satellite) are not reflected in the IGACO report and hence the SoG is out of date from the observational point of view.

- Requirements for a number of parameters are not properly formulated in the SoG as the main focus of original report 140 was on ozone and hence driven by scientific questions related with this compound (basically with stratospheric ozone depletion, and only partly with other three environmental issues). This especially the description of the non-ozone compounds addressed in the GAW Programme (greenhouse and reactive gases) needs updating as the environmental issues connected with these components were not addressed directly.
- The presentation of aerosol parameters is very limited, the list of aerosol variables in the current SoG is incomplete and the requirements for many variables need a major revision.
- The IGACO report emphasizes the importance of an observation and analysis system that integrates space-based, non satellite in-situ and remote sensing measurements and numerical models. The current SoG focuses on satellite measurements, and does not provide appropriate guidance for the other components of the integrated observing system.

8.3.2.15 The Team noted with appreciation that taking into consideration the issues summarized above, the JSC OPAG-EPAC decided that a review should be performed for the GAW variables with the current SoG as a starting point. To implement this review, the task to establish RRR processes for different GAW focal areas was included in the Addendum to the GAW Strategic Plan: 2008-2015 as follows: "*Begin to establish the rolling review of requirements (RRR) 4-stages process for each GAW focal area, starting with a review of scientifically defensible users' requirements, with the objective of updating the statement of guidance, considering both satellite and non-satellite observations*", to be implemented during 2012-2015.

8.3.2.16 The Team requested the PoC to liaise with the GAW community in the view to further update the SoG taking into account the considerations above and the conclusions from the breakout group as detailed in [Annex XIII](#) (**action; O. Tarasova; Apr. 2012**).

Ocean Applications

8.3.2.17 The Ocean Applications SoG was prepared by the former PoC, Ms Alice Soares (WMO Secretariat), and presented by Mr Etienne Charpentier (WMO Secretariat) on behalf of the PoC Dr Ali Mafimbo (Kenya). The Team noted that no changes have been proposed by JCOMM to the December 2009 version of the SoG. However, the Team recalled its recommendations from the previous ET-EGOS Session, and agreed that these remained valid:

- There is a critical need for waves and sea level observations (sea level requirements for climate and for warning systems differ substantially, e.g. more frequent data are required for warning systems);
- Operational requirements for data in polar regions where gaps have been identified was stressed;
- Satellites need to provide non climate variables to support NWP and marine services;
- Replace details about some requirements for some variables as documented in the current version of the SoG by proper references to well documented JCOMM user requirements.

8.3.2.18 The Team requested JCOMM to update the SoG accordingly, and submit a new version before to the Chair for approval (**action; A. Mafimbo; Oct. 2011**). The Team agreed that the new version, once revised, and approved by the Chair; should be adequate for publication on the WMO website.

8.3.2.19 The Team also requested the PoC to identify key gaps from the SoG and propose changes to the new EGOS-IP so that these gaps are properly reflected (**action; A. Mafimbo; end 2011**).

8.3.2.20 The Team noted that there is a relatively large number of sub-applications within the Ocean Applications Area, and that the number should be reduced for the purpose of providing User Requirements to the database. The Team invited JCOMM to group sub-applications into a smaller

number (**action; A. Mafimbo; end 2011**). For example should coastal requirements be separated from the global requirements, or should we be using “coastal area” as a layer.

Agricultural Meteorology

8.3.2.21 Agricultural Meteorology SoG was prepared and presented by the PoC, Mr Robert Stefanski (WMO Secretariat).

8.3.2.22 Mr Stefanski reported that per recommendation from the Fifth Session of the ET-EGOS, the PoC for Agricultural Meteorology has significantly revised the SoG for Agricultural Meteorology with assistance from a consultant, Mr Brian O'Donnell (Canada) and selected experts, including several from the CAgM. This review group reviewed the procedures and current data available for agricultural meteorology in the WMO RRR. It also reviewed and compared the Requirement statements for other applications upon which the agricultural meteorology application is also dependent.

8.3.2.23 In March 2011, the draft SoG and table of requirements for observational variables was sent to the Chair of the ET-EGOS for comments. The Chair noted several inconsistencies between the SoG and the table of requirements. The PoC for Agricultural Meteorology then revised both the SoG and requirements table. However, there are several outstanding issues that still need to be reviewed or revised by the CAgM review group. These issues are provided in Appendix B of ET-EGOS-6 document No. 8.3.2(7).

8.3.2.24 The Team noted that during the next 1-2 years, a CAgM Expert Team on the Weather, Climate and Fisheries will undertake a review of requirements for the fisheries side of the Agricultural Meteorology Programme and therefore these have not been included in this SoG but it is anticipated that the SoG will be updated once the fisheries review is completed.

8.3.2.25 The Team agreed that the current version of the SoG could now be posted on the web (**action; Secretariat; ASAP**).

8.3.2.26 The Team requested the PoC to address the outstanding issues detailed in ET-EGOS-6 doc 8.3.2(7) in the view to produce an updated version of the SoG (**action; R. Stefanski; Apr 2012**).

8.3.2.27 The Team noted that the following new variables should be considered: soil temperature & soil moisture.

Hydrology

8.3.2.28 The Team noted the updated version of the SoG submitted by the PoC, Mr Bruce Stewart (WMO Secretariat) in June 2011. The Team agreed that SoG required further review and updating by the CHy, and its Advisory Working Group (AWG), taking into account the following elements (**action; W Grabs; deadline TBD according to when the AWG meets**):

- The Section “identification of gaps” needs to be completed;
- The statement on S-Band Doppler radar needs to be addressed and written in a more generic way (following correspondence with Vaisala).

8.3.2.29 The Team noted that the CHy and JCOMM are currently addressing the ocean aspects of hydrology, and that these will be documented at a later stage.

8.3.2.30 The Team invited its members to review the SoG and provide comments back to the PoC (**action; ET-EGOS; Apr. 2012**).

Seasonal to Inter-annual Forecasts

8.3.2.31 Seasonal to Inter-Annual Forecasts SoG was prepared by the PoC, Dr Laura Ferranti

(ECMWF) and presented by Dr John Eyre (UK) and Dr Erik Andersson (ECMWF). The Team recalled that the following changes were incorporated in a revised version dated 13 May 2011:

- A brief introduction to the physical basis for seasonal and inter-annual climate prediction (for outside reader);
- Information on data needs for long-range forecasting;
- References to requirements for GFCS (i.e. the operational part of the climate requirements);
- References to the requirements for the GNWP;
- Requirements for sub-seasonal predictions.

8.3.2.32 It requested the PoC to further update the SoG to take into account the following elements (**action; L. Ferranti; Apr 2012**):

- There is a gap between the GNWP and the SIAF around the monthly prediction;
- Adding a paragraph in the SoG so that it is addressing the monthly requirements (PoC to confirm that it does not introduce additional requirements in the database).

Climate Monitoring - GCOS

8.3.2.33 Dr Carolin Richter (GCOS Secretariat) reported on the development of the 2010 update of the GCOS-IP, and its satellite supplement.

8.3.2.34 The Team agreed that the 2010 update of the GCOS-IP shall be treated as an updated element of the SoG for Climate Monitoring (GCOS). The Team supported the following GCOS recommendations:

- Recommendation I: It is recommended that experts on space based observations for climate participate at the open review process and ensure the implementation of the tasks implied in the 2011 update of supplemental details to the satellite based component of the 2010 updated GCOS implementation plan.
 - ⇒ The Team encouraged its members to review the satellite supplement.
- Recommendation II: It is recommended that experts support any follow-up on initiatives with regard to the evaluation of GCOS ECV data sets. The support of this assessment process would be considered as a contribution to the «GCOS Improvement and Assessment Cycle».
- Recommendation III: It is recommended that experts continue to closely cooperate with GCOS on future progress reports with regard to the actions of the 2010 updated GCOS implementation plan and on reviewing the adequacy of observing systems for climate.
 - ⇒ EGOS-IP should keep in mind these developments and look at the future update of the progress report; pick up issues of the GCOS-IP/2010 where action by CBS and WMO operational users is required, and transfer them as appropriate in the new EGOS-IP.
- Recommendation IV: It is recommended that space agencies, NMHS and operational marine services support the improvement of in situ networks through all domains (atmosphere, ocean and land), needed for validation and ground truth for space based observations, supporting also the concept of reference and super site networks discussed in the 2010 updated GCOS implementation plan. Those agencies should feed back their requirements for ground-truth observations to the GCOS expert panels.
 - ⇒ ET-EGOS supports the development of an *in situ* supplement to be published in 2012. ET-EGOS supports the requirement for the data to be exchanged.
- Recommendation V: It is recommended that experts take part in future regional workshops and that they assist in encouraging regional cooperation at those meetings. NMHS should support actions proposed in the updated GCOS regional action plans, specifically with regard to in situ climate observations on a regional scale.

Architecture for Climate Monitoring from Space

8.3.2.35 Ms Barbara Ryan (WMO Secretariat) reported on progress on developing an architecture for climate monitoring from space. She reported that over the last decade, an increasing amount of attention has been given to climate monitoring, and in particular, the role that satellites can play in global monitoring of the Earth's climate and its variability and change. This shall be a component of the future WIGOS and GFCS.

8.3.2.36 Following guidance from the Consultative Meeting on High-level Policy on Satellite Matters, and the WMO Executive Council, the WMO Space Programme developed first a draft outline, and subsequently an initial concept document for an architecture for climate monitoring from space.

8.3.2.37 The draft outline was circulated to CGMS, CEOS and submitted to the Commission for Basic Systems (CBS) Ext.(10) in November 2010. CBS agreed that the proposed architecture should enhance, and be modelled after, the end-to-end system which has been created for weather observations, research, modelling, forecasting, and services, and that it should be part of the space-based component of the WIGOS. Other components of this end-to-end system would include the inter-calibration activities of the Global Space-based Inter-calibration System (GSICS), additional calibration and validation activities to be conducted in coordination with the Commission for Instruments and Methods of Observation (CIMO), the product generation efforts as done within the Sustained Co-Ordinated Processing of Environmental satellite data for Climate Monitoring (SCOPE-CM) and the training and capacity building activities of the WMO/CGMS Virtual Laboratory (VLab).

8.3.2.38 The WMO/GCOS-sponsored Workshop on Continuity and Architecture Requirements for Climate Monitoring (January 2011) established an *ad hoc* Writing Team comprised of representatives from CEOS, CGMS and the WMO Secretariat to prepare a report describing a coordinated strategy for an architecture for climate monitoring from space. Drafting of the report is underway, and will be completed by September 2011, such that the report can be delivered to both CEOS and CGMS in time for their plenary meetings in October and November 2011.

8.3.2.39 The sixth meeting of the Expert Team on Satellite Systems (ET-SAT-6) expressed strong support to the proposed process to develop an architecture for climate monitoring from space, as a joint effort with space agencies, CEOS, CGMS, GCOS, GEO and WCRP. ET-SAT-6 expressed the wish to review the draft document from the Writing Team in parallel with the review by GCOS, GEO and WCRP. Cg-XVI adopted Resolution 3.7/1 - Development of an Architecture for Climate Monitoring from Space.

8.3.2.40 The Team noted that the WMO user requirements analysis part of the Strategy for an Architecture for Climate Monitoring from Space will be taken care of by the ET-EGOS.

8.3.2.41 The Team invited its members to review the draft Strategy for an Architecture for Climate Monitoring from Space document and provide comments to the WMO Secretariat when it's available (**action; ET-EGOS; 10 Sept. 2011**).

Climate Applications (other aspects - CCI)

8.3.2.42 Climate Applications SoG was prepared and presented by the PoC, Dr William J. Wright (CCI OPACE 1, Australia). He reported that CCI, at its Fifteenth Session (CCI-XV, Antalya, Turkey, 19-24 February 2010) established an Open Panel of CCI Experts on Climate Information for Adaptation and Risk Management (OPACE-4). Subsequently the CCI Management Group established a Task Team on User Interface (TT-UI) with Terms of Reference that include identification of the susceptibility of various sectors to climate variations and change, and collection of information on user's requirements for climate information for risk management. OPACE-4 (which has approximately 90 members, including experts with significant global expertise in applications of climate information to users in key socio-economic sectors) was invited to review the 2010 version of the SoG on climate applications. The TT-UI also reviewed the document, and provided a significant revision to the earlier

SoG, using the inputs of CCI OPACE 4. CCI OPACE 1 (Climate Data Management), through Dr William Wright, also contributed important revisions to the SoG, as the SoG in its current design is broader than the applications areas. The OPACE 4 contribution was then forwarded to Dr Wright, and included in the new May 2011 version of the SoG presented to ET-EGOS-6.

8.3.2.43 The Team noted that under the GFCS, provision of effective, operational climate services will require extensive understanding of user's susceptibility to climate and identification (in a collaborative effort) of the user's¹⁴ requirements for meteorological and other data. Climate services for risk management and adaptation will be needed at local scales, and therefore there will very likely be a demand for observations that will challenge all existing observational systems to improve not only what is measured and how the measurements are taken, but where and how often they are taken – the spatial density required for all the observations needed for operational climate services will need to be assessed as the GFCS Implementation Plan is developed in near future. In addition, there will clearly be user's observational requirements that go beyond the ECVs, which are largely intended for meeting the needs of UNFCCC. For example, Indigenous peoples in the far north require measurement of fast ice, for their livelihoods and safety. Users are already demanding improved density of observations for remote places (e.g. high latitude or altitude sites, arctic deserts, etc.), in sensitive ecosystems, in urban areas, etc). NMHS have the tools and the capability for such measurements, but often struggle with the costs of such enhancements of the systems. Once the GFCS User Interface Platform is established, there may even be requirements for new observations. While the GCOS IP will, if implemented, ensure a substantial improvement on observational capability for climate services, it does set priorities for GCOS implementation for the next 10 years. These priorities set an initial emphasis on the full implementation of baseline networks, which include, as subsets of the WMO WWW/GOS networks, the GSN and GUAN and phased establishment of GAW. The network enhancements at local scales required for operational GFCS climate services will likely require additional consideration by all parties concerned.

8.3.2.44 Noting the CCI efforts with appreciation, the Team requested the PoC to further update the SoG to take into account the following elements (**action; W. Wright; Jul. 2011**):

- The climate community is invited to look at new data sources (AMDAR, wind profilers, remote sensing) and document their value (and consider what will be required in order to retain the data from these systems, assure their homogeneity and their completeness for longer term, high-quality climate studies, and to evaluate how to manage datasets that, as for AMDAR) that are not 'site-specific' – may some form of gridding be required for climate purposes?);
- Surface observations: manual observations (visual, phenomenon) which are not ECV should be addressed;
- Automatic observations should be addressed (costs and benefits; quality for long-term climate purposes, utility for operational climate services; etc.);
- Regional requirements not covered by GCOS should be addressed;
- Additional GFCS requirements not already covered by GCOS should be addressed;
- Data rescue should be covered (although this is not an evolution of the observing systems, data rescue can be seen as an evolution of the historical observational data that can be made available to the Application Area in the future, and as such is relevant to the SoG and the EGOS-IP);
- The current SoG document is a requirements document more than a gap analysis. A new section on gaps needs to be annexed to the document.

8.3.2.45 Once the SoG with gap analysis is updated, the Team also requested the PoC to propose changes to the new EGOS-IP so that these gaps are properly reflected (**action; W. Wright; end 2011**).

Space Weather

14: Users include policymakers, managers, engineers, researchers, students and the public at large, in all sectors and socio-economic systems (including agriculture, water, health, construction, Disaster risk reduction, environment, tourism, transportation, etc).

8.3.2.46 The latest developments with regard to the SoG for Space Weather were presented by Mr Jerome Lafeuille (WMO Secretariat) on behalf of the PoC, Mr Terry Onsager (USA). The PoC for Space Weather Application Area has been discussing the variable names, user requirements, and issues with the ET-EGOS Chair in early 2011.

8.3.2.47 The Inter-Programme Coordination Team on Space Weather (ICTSW) is now finalizing the initial requirements for Space Weather observations, and anticipates to conduct the requirements review and gap analysis over the next year in the view to eventually submit the SoG.

8.3.2.48 The Team thanked the PoC, and the experts involved in this work for the good progress and their valuable and encouraging contribution so far in the RRR.

GTOS (i.e. the non GCOS requirements of GTOS)

8.3.2.49 The Team noted that no SoG is available for this new Applications Area yet.

Summary

8.3.2.50 The Team agreed on a number of actions regarding the SoGs above to be updated. These are reflected in ***Annex IV***. The Team in particular requested All PoCs to identify key gaps from their respective Application Area SoG, and relevant issues that will have to be included in the new EGOS-IP, and propose changes to the EGOS-IP accordingly (***action; all PoCs; Oct. 2011***).

8.3.3 Consider areas requiring revised SoGs

8.3.3.1 The meeting considered areas requiring revised SoGs. In particular, the Team responded to the requirements of CBS-Ext.(2010) to ensure that any particular requirements of Polar Meteorology are captured through the ongoing RRR process.

8.3.3.2 The Team agreed that the GCW should not to be regarded as this stage as a specific Application Area. Instead, the Team requested the PoCs of all Application Areas to review the information provided by the Secretariat during the meeting (ET-EGOS-6 doc 8.3.2(10/3)) and revise their user requirements and SoGs if necessary (***action; all PoC; Apr 2012***).

8.3.3.3 The Team proposed to adopt the same approach as for GCOS, i.e. regarding a list of documents maintained by the GCW as SoG. Such documents include for example the Integrated Global Observing Strategy (IGOS) Cryosphere Theme ("CryOS") report. The Team requested the Secretariat to provide a link to appropriate GCW documents from the SoG web page (***action; Secretariat; ASAP***).

8.3.3.4 The Team requested the Secretariat to consult with the GCW community in the view to check terminology, and either remove obsolete requirements from the database, or update them (***action; Secretariat; end 2011***), The Team agreed that research requirements such as campaigns, process studies, or requirements that do not fall within the WMO Programmes and Co-sponsored programmes could be ignored.

8.3.3.5 The Team requested the Secretariat to identify a PoC for the GCW (***action; Secretariat; ASAP***).

8.3.3.6 See also discussion under agenda item 6.2.

8.3.4 Consider other areas requiring new SoGs, including new elements of WIGOS responding to GFCS requirements

8.3.4.1 The Team discussed how the requirements of the GFCS are also captured through RRR process. In this regards, ET-EGOS discussed whether there was a need to define new application areas. No new Application Area was proposed at this point.

8.3.4.2 The Team requested the Secretariat to identify a contact point for the GFCS (***action; Secretariat; ASAP***).

9. OBSERVING SYSTEM STUDIES

9.1 *Update on recent OSEs/OSSEs*

9.1.1 Dr Erik Andersson (ECMWF) presented an overview of the current activities with Observing System Experiments (OSEs), and Observing System Simulation Experiments (OSSEs) with emphasis on the design of the future of the GOS, including (refer to ET-EGOS-6 doc. 9 for details):

- Adjoint-based sensitivity to forecast error
- Ensemble-based sensitivity to forecast error
- The International Joint OSSE collaboration centred on the use of NASA's and NOAA's data assimilation systems.
- Radio occultation data
- Horizontal density of satellite radiance data
- Use of the Chinese FY-3A data
- Composite LEO/GEO Winds
- Accuracy of humidity observations from aircraft
- Impact of radar reflectivity and surface-based GPS
- The impact of future developments of the space-based observing system on Numerical Weather Prediction impact of reduced ground-based observing systems on satellite data assimilation
- Study to quantify the interaction between terrestrial and space-based observing systems
- Impact of targeting
- The EUCOS upper-air network design study

9.1.2 The Team noted the results of those activities and studies, and agreed that the findings (see ET-EGOS-6 doc 9) had to be taken into account for updating relevant SoGs, and the new draft EGOS-IP (***action; GNWP & HRNWP PoCs; end 2011***).

9.2 *Proposal for new OSEs/OSSEs to be promoted by ET-EGOS*

9.2.1 Dr Erik Andersson (ECMWF) recalled that the list of OSEs/OSSEs presented to CBS-Ext.(10) (2010) consisted of those specified in the Annex to paragraph 6.1.32 of the general summary of the Abridged Final Report with Resolutions and Recommendations of CBS-XIV (2009) and in addition the following OSEs/OSSEs which the ICT-IOG requested Members to conduct:

- (a) In the presence of dense satellite observations of ocean surface wind, what is the requirement for the density of in-situ surface pressure observations?
- (b) Guidance is needed on desirable coverage of Automated Ship-borne Aerological Programme (ASAP) soundings over oceans;
- (c) In support of Regional NWP, what observations are needed for the planetary boundary layer - which variables, and what space/time resolution?
- (d) Studies are needed to address identification of critical locations for surface-based stations.

9.2.2 Based on this list and subsequent new results, an updated proposal for OSEs and OSSEs of particular interest to ET-EGOS has been developed as part of the preparations for the fifth workshop on the Impact of Various Observing Systems on Numerical Weather Prediction. The Team agreed with this list of specific studies and science questions which is reproduced in ***Annex X***.

9.2.3 The Team noted that it could be useful to recommend an OSSE (or OSE once the Meghatropic satellite data are available) to address the impact of low inclination orbit for microwave data (e.g. temperature, precipitation) in tropical regions. The Team invited its members to propose additional OSE/OSSE studies if needed, and make such recommendation through the ET-EGOS Chair, and E. Anderson (*action; ET-EGOS; Nov. 2011*). OSSE for assessing impact of expanding AMDAR could also be considered in the future.

9.3 *Next OSE/OSSE workshop*

9.3.1 Based on the successful outcome of the fourth WMO Workshop on the Impact of Various Observing Systems on NWP (Geneva, Switzerland, from 19 to 21 May 2008), the last ET-EGOS meeting agreed organizing the Fifth NWP “Impact” Workshop in second half of 2012, and requested Dr Andersson to propose an Organizing Committee for approval by the President of CBS and develop an action plan for organizing the Workshop.

9.3.2 Dr Andersson reported on these developments. He recalled that the CBS-Ext.(10) (2010) requested the OPAG-IOIS to develop the scope of the fifth workshop as soon as possible, including exact dates for holding the Workshop in 2012. It welcomed the proposal from the USA representative to host this workshop. The Organizing Committee, chaired by Dr Erik Andersson (ECMWF), comprises Carla Cardinali (ECMWF), Dr John Eyre (chair ET-EGOS, Met Office, UK), Ron Gelaro (NOAA/GMAO, the US), Ms Florence Rabier (Météo-France), Dr Lars-Peter Riishojgaard (Chair, ICT/IOIS, NOAA/JCSDA, the US) and Yoshiako Sato (JMA, Japan). The local organizing committee is chaired by Dr Lars-Peter Riishojgaard.

9.3.3 The Team concurred with the US’ offer to organize the fifth workshop in USA (exact place to be decided), from 22 to 25 May 2012. Participants are expected to come from all the major NWP centres which are active in the area of impact studies. The workshop will be conducted in English. As on the first four workshops¹⁵ it is planned to produce a workshop report to be published as a WMO Technical Report that will include the papers submitted by the participants. The Team agreed to organize the workshop in the following sessions:

- Session 1: Global forecast impact studies
- Session 2: Regional forecast impact studies
- Session 3: Specific scientific areas (including network design)
- Session 4: Workshop discussions and conclusions.

9.3.4 The Team thanked the USA for its offer to host the workshop. The Team requested Dr Erik Andersson to finalize the workshop announcement, in liaison with the Secretariat. The Team agreed with the plan and time table proposed by the organizing committee for the organization of the workshop as documented in ET-EGOS-6 doc 9 (*action; E. Anderson; ASAP*).

10. IMPLEMENTATION PLAN FOR THE EVOLUTION OF GLOBAL OBSERVING SYSTEMS (EGOS-IP)

10.1 *Review of Guidance from ECs and Congress on WIGOS*

10.1.1 The meeting reviewed Guidance from the last Executive Councils and the Sixteenth Congress on issues related to WIGOS for consideration as part of the new EGOS-IP. In particular, the Team noted the following decisions of the WMO Sixteenth Congress:

- Cg-XVI decision to implement WIGOS through Resolution 11.3/1 (Cg-XVI) “Implementation of the WMO Integrated Global Observing System (WIGOS)”, see agenda item 7 for details.
- Cg-XVI recognized that the WWW continues to be the “core” operational infrastructure facility for all WMO Programmes as well as for many international programmes of other agencies. It

15: See reports of previous workshop at <http://www.wmo.int/pages/prog/www/CBS-Reports/IOIS-index.html>

reaffirmed that the WWW Programme, with the evolving development of its observing, information and data-processing and forecasting components, continues to be the backbone Programme of WMO that not only accomplishes its goals through the coordinated efforts of Members, but also directly contributes to cross-cutting activities. Congress agreed that the WWW should provide a fundamental contribution to all WMO priority areas, namely, the GFCS, Disaster Risk Reduction, the WIGOS, the WIS, Capacity Building and Aeronautical Meteorology, and considered updated description of the WWW Programme. GOS purpose and scope being:

- (a) The GOS provides, from the Earth and from outer space, observations of the state of the atmosphere and ocean surface for the preparation of weather analyses, forecasts, advisories and warnings, and for climate and environmental studies and activities carried out under programmes implemented by WMO and by other relevant international organizations. It is operated by National Meteorological Services (NMSs), national or international satellite agencies, and involves several consortia¹⁶ dealing with specific observing systems or specific geographic regions;
 - (b) GOS systematically evolves, through the RRR process, into a composite cost-effective system with its subsystems providing interoperable data and information based on the agreed upon standard practices. GOS is services driven observing system in support of the NMSs mandates;
 - (c) GOS put special emphasis on meeting the requirements of monitoring the climate and the environment, in collaboration with partner organizations, to improve understanding of climate processes and to enable increasingly beneficial climate and environmental studies and services;
 - (d) Areas of emphasis in the implementation of GOS may differ in individual countries, but common standards, cost-effectiveness, data interoperability, long-term sustainability and innovative collaborative arrangements among Members are the key aspects of the future design and operation of the observing networks.
- Cg-XVI stressed the need to ensure that support for the WWW Programme reflects the highest priority attributed to that Programme and is sufficient to carry out its important activities in order to fulfil and sustain the core activities of the Organization. It agreed on the purpose, scope and main long-term objectives of the WWW and adopted Resolution 3.1/1 (Cg-XVI) “World Weather Watch Programme for 2012-2015”. Through this resolution, Congress requested the Commission for Basic Systems:
 - (a) To pursue the technical planning and further development of the WWW Programme in accordance with the WMO Strategic Plan, taking into account any adjustments and directives from the Executive Council;
 - (b) To take a leading role, together with the Commission for Instruments and Methods of Observation, in the technical development and implementation of the Global Observing System (GOS), as the key component of the WIGOS, to meet, in an optimal way, the requirements of all WMO and co-sponsored Programmes.
 - Cg-XVI noted that CBS had reviewed its specific Terms of Reference, with guidance provided by the Executive Council, and had recommended amendments to its Terms of Reference. Congress adopted Resolution 3.1/2 (Cg-XVI), which provides these amended Terms of Reference.
 - Cg-XVI reaffirmed that GOS should continue its fundamental mission in providing, through coordinated efforts of Members, timely, reliable and consistent meteorological data to meet the national, regional and global requirements. It emphasized that GOS would become one of the core components of the WIGOS and that implementation of WIGOS would build upon and add value to it in fulfilling requirements of WMO and WMO co-sponsored Programmes in an effective and efficient way. In view of the growing significance of the GOS operations, Congress adopted Resolution 3.1.1/1 (Cg-XVI). It requested the Commission for Basic Systems:

¹⁶ Examples are EUMETNET, AMDAR, ASAP, DBCP, EUMETSAT

- (a) To develop the new EGOS-IP, taking into account the Vision for the GOS in 2025 ([Annex V](#)), WIGOS and GFCS, to guide Members in the implementation of their national observational programmes;
 - (b) To pursue its leading role in the technical planning and development of the GOS in close collaboration with relevant technical commissions in support of all WMO and related international Programmes and initiatives;
 - (c) To assist Members and regional associations in continued evolution of the global observing systems;
 - (d) To develop a mechanism to assess the performance of OSEs and OSSEs undertaken by Member countries and to communicate the benefits earned thereby, to other Member countries.
- Cg-XVI welcomed that the evolution of the global observing systems was systematically adapted to user requirements and observing systems' capabilities and was coordinated with Members so that it can provide the best possible value for investment. In this regard, the RRR expanded to cover new application areas and the OSEs and OSSEs addressed new impact studies. In this context, Cg-XVI noted that Members will take into account the cost of individual observing systems, particularly radiosounding systems, in the design of their national or regional observing networks. The Fifth Workshop on the Impact of Various Observing Systems on Numerical Weather Prediction, to be held in USA in 2012, will assist in addressing this issue.
 - Cg-XVI requested CBS to consider adding new application areas to RRR that are important from the WIGOS and climate perspectives, such as Polar Meteorology, including cryosphere, the global carbon cycle and Space Weather.
 - Cg-XVI welcomed the decision of CBS to address the evolution of global observing systems in general and to rename the Expert Team for Evolution of the GOS to the Expert Team for Evolution of Global Observing Systems. In this regard, it noted development of the new EGOS-IP and underlined the necessity that the new plans take into account not only the newly approved Vision for the GOS in 2025 and also WIGOS, GFCS and GAW and GCW developments. Cg-XVI noted that the CBS strategy for the evolution and future hosting of WMO databases of observational user requirements and observing systems' capability is addressing sustainable solution of further development and maintenance of the RRR Database.
 - In discussing the WMO Polar Activities, Cg-XVI approved, through the resolutions, three new initiatives, namely (a) Resolution 11.9/3 (Cg-XVI) "Global Integrated Polar Prediction System (GIPPS)", (b) Resolution 11.9/5 (Cg-XVI) "International Polar Decade Initiative"; and (c) Resolution 11.9/6 (Cg-XVI) "Global Cryosphere Watch"; and requested technical commissions to support WMO Polar Activities and to include these activities in their respective work programmes.

10.2 Review of feedback from NFPs

10.2.1 Mr Russell Stringer (Australia) reported on National reports for 2009 on Progress and Plans related to EGOS-IP based on the feedback received from the National Focal Points (NFPs) concerning EGOS-IP.

10.2.2 Mr Stringer noted that the analysis provided in [Annex VI](#) had been completed based on NFP reports for 2009 only. His presentation to the meeting also included preliminary 2010 information, noting that further reports were still arriving. Of the 78 Member countries that have nominated an NFP, 39 have submitted an annual report of progress on the EGOS-IP for at least one year. However only 19 NFPs have reported for two or more years, only 9 for 3 or more years and a small dedicated group of 6 NFPs who have reported in each of the four years.

10.2.3 The new reporting template that was developed at ET-EGOS-5 was used for the 2009 and 2010 annual reports, rather than free-form text that was the case previously. This had been very effective in achieving the goals of:

- making it easier for NFPs to complete the report. In some cases the reports were prepared with great simplicity, involving just a few ticks;
- guiding NFPs on which Recommendations are highest priority for response. This resulted in a much reduced rate of “no comment” with respect to the “highest priority” (8% no comment) and “next priority” (22% no comment) groups of Recommendations;
- providing some additional explanation and background for some of the Recommendations; and
- collecting responses in a structured way to better enable their collation and analysis and to remove the subjective interpretation that was necessary in the past to decide (i) which Recommendation was being commented on and (ii) whether the comment represented a positive action on the Recommendation.

10.2.4 The Team recalled that it was speculated in previous years that the absence of comment on a given Recommendation was mostly an indicator that the country was not responding to the Recommendation. This has been confirmed by the increased rate of “not responding” reports in association with reduced “no comment” reports in 2009.

10.2.5 A bar graph was presented showing the number of countries “responding to”, “not responding to” or providing “no comment on” each Recommendation. The preliminary distribution of 2010 reports was also presented and was very similar to the 2009 distribution. The first four Recommendations (G1 to G4) relate to improved data coverage, quality management, distribution and coding. NFP reports reveal a very high rate of addressing these matters. The Recommendation for enhanced AWS operations (G21) also had a very positive response, attracting the second highest reported rate of countries “responding to the Recommendation”. Enhancements reported included additional stations, improved communication and reporting frequency, and expanded range of measured parameters. On the other hand some Recommendations were not receiving much response, particularly those requiring investment in radiosonde programmes (G20 – more profiles in the tropics, G7 – targeted observations) or technology development (G10, G11, G12 – AMDAR humidity sensors, alternative systems, and optimisation of reporting). A key topic for surface-based systems has been to provide radiosonde observations in a new format which includes the full resolution (2 second) data with lat./long./time information for each data point. Many countries reported plans in this respect but very few have so far successfully completed the change.

10.2.6 In exploring themes and issues, attention was turned towards the effective launch and engagement with the new EGOS-IP. It was agreed that the proposals below be taken into account when developing the workplan for the further development of the new EGOS-IP:

- “Actions” in the new EGOS-IP must more clearly specify exactly who is being called on to take actions and specifically what those actions are. Some examples were discussed;
- Actions aimed only at interactions between technical groups of WMO seemed a bit out of place in an “implementation” plan. Again some examples were discussed;
- The aim should not be just to issue an implementation plan but to achieve an implementation. In this respect it is important to identify in advance:
 - which aspects of the plan call for actions by WMO Members individually or through the WMO Regional Associations;
 - how these calls for action will be conveyed to Member countries and how NFPs will be engaged in the process;
 - how feedback will be obtained about the active planning and progress on implementation by Member countries; and
 - how will EGOS-IP be represented to Members as a part of the bigger picture which includes calls for action on WIGOS, WIS, GCOS Implementation Plan and the GFCS, and so on;
- A Communication Strategy is needed.

10.2.7 There was some discussion on the question of whether a round of reporting for 2011 should be undertaken in early 2012. On the one hand the current EGOS-IP will not be updated and the new EGOS-IP will be close to fully developed. On the other hand many of the Recommendations remain very relevant and continuing the momentum of interactions with NFPs will be helpful in the lead up to the release of the new EGOS-IP. It was decided that a further round of reporting for 2011 should be undertaken in early 2012.

10.2.8 The Team agreed that a communication strategy about the new EGOS-IP once approved ought to be produced. The communication strategy should target not only its primary audience, i.e. WMO Members, but also other stakeholders such as Regional Associations, and parties implementing the networks. The initiation of the strategy should be a task for ET-EGOS-7.

10.2.9 The Team invited the ET-AIR, ET-AWS and ET-SBRISO to review the new EGOS-IP. In particular, in its review the ET-AWS was invited to consider important issues for AWS observations such as standards for coding (**action; & Secretariat; Oct. 2011**).

10.3 Review of progress and actions on the current EGOS-IP (2015)

10.3.1 The Meeting reviewed the progress and actions related to the surface-based and space-based sub-systems parts of the current EGOS-IP – responding to the vision of the GOS for 2015.

10.3.2 The Team reviewed progress and actions concerning EGOS-IP in the WMO Regions.

10.3.3 The Team recognized that the progress and actions related to the surface-based and space-based sub-systems parts of the current EGOS-IP was difficult to update while the priority is given to the development of the new EGOS-IP. Things could be delayed until the new EGOS-IP is approved, or some progress could be recorded while the new EGOS-IP is being reviewed and updated.

10.3.4 The Team requested Mr Russell Stringer (Australia) to review and propose a revision of the template for National Focal Points feedback (**action; R. Stringer; end 2011**).

10.3.5 Recalling the discussion under item 10.2 above, the Team requested the Secretariat to request the National Focal Points to provide feedback for 2011 on plans and actions related to the current EGOS-IP, using the revised template (Secretariat to provide responses to Mr Stringer as soon as they are received) (**action; Secretariat & R. Stringer; Jan 2012**).

10.4 Development of the new EGOS-IP (2025)

10.4.1 The meeting reviewed and discussed the draft of the new EGOS-IP based on new Vision for the GOS in 2025 and WIGOS needs as prepared by the Consultant, Mr Jean Pailleux (France, retired, former ET-EGOS member) according to the guidelines agreed upon at ET-EGOS-5, and the schedule proposed by ICT-IOS-5. The Team recalled that the EGOS-IP will be a key document providing Members with clear and focused guidelines and recommended actions in order to stimulate cost-effective evolution of the observing systems to address better the requirements of WMO programmes and co-sponsored programmes.

10.4.2 The Team recalled that following some iterations with the Secretariat and the ET-EGOS Chairperson, a version was released for review in 17 January 2011. At the time of ET-EGOS-6, comments on this draft have been received as follows:

a) From the WMO Space Programme, including preliminary comments by Mr Jerome Lafeuille (WMO) on behalf of WMO Space Programme Office from the CBS Expert Team on Satellite Systems (ET-SAT).

b) From Dr Adrian Simmons (ECMWF) on behalf of GCOS. This review raised some

important general issues which are addressed in the reply from ET-EGOS Chairperson to Dr Simmons.

c) From Dr Peter Dexter (Bureau of Meteorology, Australia) on behalf of JCOMM. This review contains many detailed comments as an annotated version of the text.

d) From Dr Bertrand Calpini (Switzerland) on behalf of CIMO.

10.4.3 The Team noted that the current version of the Plan takes account of issues raised in the SoGs of some application areas, but not all. It agreed to perform a thorough trawl of all SoGs, to identify significant issues that should be represented in EGOS-IP by appropriate Recommendations and Actions. The Team set up small *ad hoc* break-out working groups (see item 1.3) during this ET-EGOS Session to consider the current draft, review the comments, and make proposals on how to develop the Plan further to meet the goal of a submission to CBS-XV in 2012. The break out groups were requested to address the following issues amongst others:

- Keeping a good balance between operational meteorology and climate.
- Introductory sections:
 - This section should provide appropriate balance between Application Areas, and address sensitivities.
 - There is emphasis on climate monitoring and GCOS but climate services (and non ECVs) are not well reflected.
 - GCOS Monitoring Principles apply to all climate stations, not just GCOS. They should be spelled out in the EGOS-IP.
 - There is a need to illustrate the different observing systems and their roles, mandate, so that the EGOS-IP becomes intelligible to its audiences.
- Other aspects to be considered in the EGOS-IP
 - Some guidance on Quality Management & Quality Assurance, and Standardization referring to appropriate WIGOS activities and QMF (e.g. in Overarching cross cutting actions)
 - Relationship to WIGOS and coming activities. Links to the WIGOS Implementation Plan; the Overarching IP is the WIGOS IP: Key points are part of the WIGOS Strategy and should be reflected in the EGOS-IP. References to the new WIGOS Manual that is being developed to be added.
 - The section dealing with “Considerations for the evolution of observing systems in developing countries” needs to be re-written. References to technical guidance to Developing Countries as proposed by CBS and Cg-XIV need to be added. A strategy is needed to assist developing countries in the automation of observing stations.
 - There is a need to translate appropriate GCOS-IP recommendations into clear specific actions to WMO Members.
 - References to the GAW Strategic Plan for 2008-2015 (WMO No. 172) and addendum to be added.
 - Add a section on Remote Sensing and Weather Radar in a way consistent with the corresponding elements from the Vision of the GOS in 2025. For example processing data to an appropriate product level needs to be added.

10.4.4 The Team agreed with the proposals from the *ad hoc* working groups.

- Action Items from the surface-based observing systems breakout group are recorded in ***Annex XII (action; J. Pailleux, J. Eyre, M. Ondráš, and Secretariat; see deadlines in Annex XII)***.
- The outcome of the breakout group on the satellite aspects of the EGOS-IP is provided in ***Annex XI***.
- The outcome of the breakout group on Atmospheric Composition is provided in ***Annex XIII (action; W. Fricke; ASAP)***.

10.4.5 The Team agreed that there is a need for the Regional Associations to review the new draft

EGOS-IP, and provide feedback. Secretariat was requested to send the draft EGOS-IP to the Regional Association contact points for review (**action; Secretariat; Aug. 2011**). The Team invited the CBS Management Group to address this issue and make further recommendations in this regard. It therefore requested the Chair of the OPAG/IOS to bring this issue to the CBS Management Group (**action; L.P. Riishojgaard; July 2011**).

10.4.6 The Team agreed that most of the remaining work will be completed subsequent to the meeting through tasks assigned to consultant(s), to ET-EGOS members and to the Secretariat, as well as through review by other IOS ETs and other stakeholders as reflected partly in **Annex IV**.

10.4.7 Starting from the timetable proposed by ICT-IOS, the Team prepared and agreed on the timetable provided in **Annex VII** for completion of this work. The plan is to eventually submit the EGOS-IP to the CBS-XV in 2012 for consideration, and EC-LXV in 2013 for approval.

10.4.8 The Team agreed that a new document is needed for extending the Vision to keep track of additions, and to provide references to the source of the actions proposed in the EGOS-IP. The Team requested the Secretariat to initiate and maintain such a document, keep it consistent with the corresponding web page¹⁷, and make it available from that web page (**action; Secretariat; ongoing**).

11. ANY OTHER BUSINESS

Global exchange of radar data

11.1 The Chair referred to a message he received from Tom Keenan (Australia) in his capacity as former Chair of the World Weather Research Programme (WWRP) Working Group for Nowcasting Research asking about the process for establishing standard formats for global radar data exchange. The Team noted that a need for global exchange of radar data was recognized by both operational meteorological and research communities. It was recognized that the process starts with a definition of user requirements (UR) and observing systems capabilities (OSC). While generic user requirements for some applications have been stated, there is a need to specify those requirements in more technical details, i.e., on the level of "raw data" to be globally exchanged. Main NWP Centres and research community should be invited to do so. PoC for Global and High Resolution NWP should be involved. Further, the CIMO ET on Operational Remote-Sensing (ET-ORS) should assess whether (or to which extent) the current global/regional radar networks can provide information that are needed with required quality and to suggest how to extract required "raw data" from current radar systems. Based on this assessment, CBS ET on the Surface-Based Remotely Sensed Observations (ET-SBRSO) should develop a plan for implementation of the global exchange for the consideration by OPAG-ICT-IOS and CBS. This should take into account data policies, best practices, risks and benefits, timeline, etc. ET-SBRSO should coordinate with OPAG ISS and its Inter-Programme Expert Team on Data Representation and Codes (IPET-DRC) to adapt the current WMO code formats (BUFR) to accommodate the requirements for global radar data exchange. OPAG-ISS will be responsible for ensuring data exchange through WIS/GTS. Finally, CBS through EC should address respective Members to provide required data for global exchange in a defined format and frequency. The Team requested the Secretariat to coordinate and collect the diverse contributions to this exercise (**action; Secretariat; Apr. 2012**).

11.2 Due to national legislation, some countries are not in a position to exchange radar data globally. In Europe, EUMETNET has agreed on a data policy allowing for exchange of radar products between the EUMETNET Members. Members may use the product for official duty, but not deliver them free of charge to third party.

11.3 The Team invited the Chair to provide feedback to the WWRP Working Group for Nowcasting Research through Tom Keenan (Australia) in this regard (**action; J. Eyre; ASAP**).

17: <http://www.wmo.int/pages/prog/www/OSY/Documentation/Vision2025.html>

12. PREPARATION FOR THE FORTHCOMING CBS MEETINGS

12.1 Action Plan

12.1.1 The Meeting recalled the action plan for the new EGOS-IP as detailed under item 10.4 above.

The plan will be reviewed and further discussed at the seventh ET-EGOS meeting (provisionally June 2012), and then presented to the seventh session of ICT-IOS to be held shortly after.

12.1.2 The Team requested the Chair to identify key actions to be submitted to the CBS in preparation to ET-EGOS-7 (**action; J. Eyre; Mar 2012**)

12.1.3 The meeting agreed to have the Seventh Session of the Et-EGOS in Geneva, Switzerland, from 7 to 11 May 2012.

12.1.4 Actions decided by this meeting, are recorded in [Annex IV](#).

13. CLOSURE OF THE SESSION

13.1 The session closed at 16h00 on Friday, 17 June 2011.

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TERMS OF REFERENCE AND MEMBERSHIP OF THE EXPERT TEAM ON THE EVOLUTION OF GLOBAL OBSERVING SYSTEMS (ET-EGOS)

The Terms of Reference below were approved by the Fourteenth Session of the CBS (Dubrovnik, Croatia, 25 March–2 April 2009). The CBS Extraordinary Session in 2010 decided to change the name of the Expert Team from Expert Team on the Evolution of the Global Observing System to Expert Team on the evolution of global observing systems while keeping the same terms of reference, acronym ET-EGOS, and membership.

1) Terms of Reference

Expert Team on the Evolution of global observing systems (ET-EGOS)

- (a) Update and report on observational data requirements of the WWW as well as other WMO and international programmes supported by WMO;
- (b) Review and report on the capability of both surface-based and space-based systems that are candidate components of the evolving composite GOS;
- (c) Carry out the rolling requirements review of several application areas using subject area experts (including atmospheric chemistry through liaison with CAS, marine meteorology and oceanography through liaison with JCOMM, aeronautical meteorology through liaison with CAeM, agrometeorology through liaison with CAgM, hydrology through liaison with CHy, and climate variability and change detection through liaison with CCI and GCOS);
- (d) Review the implications of the Statements of Guidance concerning the strengths and deficiencies in the existing GOS and evaluate the capabilities of new observing systems and possibilities for improvements and efficiencies in the GOS;
- (e) Carry out studies of real and hypothetical changes to the GOS with the assistance of NWP centres;
- (f) Develop new version of the Implementation Plan for Evolution of the GOS based on the Vision for the GOS in 2025, taking into account developments with respect to WIGOS and GEOSS; monitor progress against the Plan, report progress and updated Plan through the ICT-IO to CBS;
- (g) Prepare documents to assist Members, summarizing the results from the above activities;
- (h) Provide advice and support to the Chairperson of OPAG-IO on development and implementation of WIGOS concept.

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EXPERT TEAM ON THE EVOLUTION OF GLOBAL OBSERVING SYSTEMS (ET-EGOS) WORK PLAN FOR 2009-2012*(this workplan was approved by CBS-Ext. (2010), then updated by ET-EGOS-6 to assign responsibilities, deadlines, and indicate status)*

No.	Task	Deliverable/Activity	Due	Responsible	Status	Comment
1	To contribute to the development and implementation of concept of WIGOS and provide relevant advice and support to the chairperson of ICT-IOS	Address relevant items of WIGOS Implementation Activities agreed by EC-WG/WIGOS-WIS-2	Ongoing	John Eyre	CONOPS and WDIP reviewed at ET-EGOS-5; provided comments to the EC-WG WIGOS WIS	ICG-WIGOS to suggest how ET-EGOS will have to be involved in this regard.
2	Survey and collate user requirements for observations for WMO and WMO-sponsored programmes	Review and update CEOS/WMO database of user requirements for observations, through Points of Contact for application areas.	Ongoing / Annual review	John Eyre	Reviewed at ET-EGOS-6 and recommendations made	Action continuing
3	Survey and collate observing systems capabilities for surface-based and space-based systems that are candidate components of WIGOS	Review and update CEOS/WMO database of observing system capabilities, in collaboration with other OPAG IOS ETs.	Ongoing / Annual review	John Eyre	Reviewed at ET-EGOS-6 and recommendations made	Action continuing
4	Maintain Rolling Review of Requirements (RRR) for observations in several application areas, using subject area experts, including appropriate liaison with CAS, JCOMM, CAeM, CAgM, CHy, CCI and GCOS.	Continue RRR process for 12 application areas and expand to new areas as required: review and update as necessary Statements of Guidance on the extent to which present/ planned observing system capabilities meet user requirements, through Points of Contact on application areas.	Ongoing / Annual review	John Eyre	Reviewed at ET-EGOS-6; identified 2 new areas requiring SoGs	Action continuing
5	Prepare and maintain reviews of OSEs, OSSEs and other studies undertaken by NWP centres and to provide information for consideration by ET-EGOS and OPAG-IOS	Rapporteurs on Impact Studies and NWP experts, review results of impact studies relevant to the evolution of GOS. Organize and hold next NWP Impact Studies Workshop in 2012.	End April 2010 (organization planning)	Erik Andersson	Recent OSEs and OSSEs reviewed at ET-EGOS-6; Plans for next Workshop agreed at ET-EGOS-6	Action continuing; to be discussed at ICT-IOS-7; 2 nd half of 2012 See ET-EGOS-6 item 9

6	Promote CBS activities in support of GCOS goals	Review the implications of the 2010 update of the GCOS Implementation Plan for the activities of CBS. Bring relevant issues to the attention of the ET-EGOS	End Jan 2010 (Impl. Plan) July 2010 (review GRUAN Guide)	Jay Lawrimore	GCOS-IP reviewed by ET-EGOS following ET-EGOS-5	Transfer of items from GCOS-IP into EGOS-IP has started; action continuing. See ET-EGOS-6 item 8. Aspects of GCOS-IP that require action from the CBS members will have to be picked up by ET-EGOS
7	Prepare a new version of the Implementation Plan for the Evolution of the global observing systems (EGOS-IP), fully responding to the "Vision for the GOS in 2025" Update current version of the IP during this transition period.	Based upon monitoring of the progress in the Evolution of the GOS and after successful endorsement of the "Vision for the GOS in 2025" by CBS-XIV, that the ET-EGOS prepare a new version of the EGOS-IP that will incorporate the information included in the Vision.	End 2010 (initial version of new EGOS-IP)	John Eyre	ToRs for consultant and guidelines for the new EGOS-IP proposed by ET-EGOS-5; EGOS-IP renamed to the "Implementation Plan for the evolution of global observing systems" adopted by CBS.Ext(2010)	Consultant recruited, draft EGOS-IP produced and being reviewed by experts & ET-EGOS-6. Plan to be approved by CBS Session in 2012

ACTION SHEET RESULTING FROM ET-EGOS-6¹

No.	Ref ²	TOR ³	WP ⁴	Action	By	Deadline	Comment
				I. RRR PROCESS – general			
1	E6/6.2.7	(a) (b)	1,2,3, 4	to investigate how the RRR, SoGs, and EGOS-IP could be more visible on the WMO website	Secretariat	ASAP	
				II. RRR process – User Requirements (URs) and Statements of Guidance (SoGs)			
				1) General actions			
2	E6/8.1.7	(a)	2	to review the new database implementation following completion of the new web-based version	ET-EGOS & PoCs	End Aug. 2011	
3	E6/8.1.10	(a)	2	to provide information on variables from the CIMO Guide and the ET-AWS (functional specifications) to ET-EGOS members and PoCs to be aware of its content	Secretariat	ASAP	
4	E6/8.1.11	(a)	2	To review the user requirements in the database, address the open issues (see list of actions in Annex VIII) and report feedback to the Chair	ET-EGOS & PoCs	Sept. 2011	
5	E6/8.1.12	(a)	2	to write to the GOOS Project Office and ask about the status of the GOOS requirements as part of the RRR Database (once the JCOMM requirements are clean in the database)	Secretariat	End 2011	
6	E6/8.1.14	(a) (b)	2	to investigate feasibility to permit feedback being provided to the National Focal Points through the online database	Secretariat	end 2012	
7	E6/8.2.6	(b)	3	to write to the EUMETNET Secretariat, and request whether EUMETNET would be interested to play an active role regarding the collection of parts of the surface-based observing system capabilities as a contribution to the distributed database.	Secretariat	ASAP	
8	E6/8.2.7	(b)	3	to write to the JCOMM Co-President, and request whether JCOMMOPS would be interested to play an active role regarding the collection of the ocean part of the surface-based observing system	Secretariat	ASAP	

1 : Pending action items from ET-EGOS-5 have been merged in this table. ET-EGOS-6 action are highlighted in blue.

2 : Ref: reference to paragraph number of ET-EGOS meeting reports as appropriate (e.g. E6/8.1.11 = Para 8.1.11 of ET-EGOS-6 Final Report).

3 : TOR: reference to the ET-EGOS Terms of Reference to which the action item applies

4 : WP: reference to the item number of the CBS work programme for ET-EGOS to which this action item applies.

No.	Ref ²	TOR ³	WP ⁴	Action	By	Deadline	Comment
				capabilities as a contribution to the distributed database.			
9	E5/8.1.8	(a)	2	Update the current version of the UR database which is on-line on the web	Secretariat	ongoing	
10	E4	(c)	4	Review all revised SoG	J.Eyre	ongoing	
11	E4	(c)	4	Refer revised SoGs to appropriate "owners" for endorsement	J.Eyre	ongoing	
				2) Global NWP			
12	E6/8.3.2.3	(c)	4	to publish the new version of the GNWP SoG on the web	Secretariat	ASAP	
13	E5/8.3.2.4	(c)	4	Consider comments by the OceanOBS'09 review team and propose a response	E.Andersson	Aug. 2011	Not done
14	E6/9.1.2	(c)	4	to update the SoG for GNWP, and the new EGOS-IP taking into account the findings of recent OSE/OSSE activities and studies (see ET-EGOS-6 doc 9)	E. Andersson	end 2011	
				3) High Resolution NWP			
15	E6/8.3.2.5	(c)	4	to provide comments from ET on SoG to the PoC and request update	J. Eyre	Oct. 2011	
16	E6/8.3.2.5	(a)		to review the HRNWP User Requirements for consistency with the GNWP requirements, submit an update version of the requirements to the Secretariat	T. Montmerle	Oct. 2011	
17	E6/9.1.2	(c)	4	to update the SoG for HRNWP, and the new EGOS-IP taking into account the findings of recent OSE/OSSE activities and studies (see ET-EGOS-6 doc 9)	T. Montmerle	end 2011	
				4) Nowcasting and very short range forecasting			
18	E6/8.3.2.9	(c)	4	to further update the SoG for NVSRF to take into account the issues identified by ET-EGOS-6.	A. Bell	July 2011	
19	E6/8.3.2.11	(c)	4	to review and comment the SoG for NVSRF with the view to post an updated version of the SoG on the web with the Chair's approval	ET-EGOS	Oct. 2011	
				5) Seasonal to inter-annual forecasting			
20	E6/8.3.2.32	(c)	4	to further update the SoG for SIAF to take into account the issues identified by ET-EGOS-6	L. Ferranti	Apr 2012	
				6) Aeronautical Meteorology			
21	E6/8.3.2.	(c)	4	to further update the Aeronautical Meteorology SoG	J. vd	end 2011	Some discussions with the new Poc, Dr

No.	Ref ²	TOR ³	WP ⁴	Action	By	Deadline	Comment
	6 E5/8.3.2. 16-19 E5/8.3.1. 2 (6), 8.3.2.13			to take into issues identified by ET-EGOS-6, and consistency with new URs	Meulen		Jitze van der Meulen in early 2011; who then requested feedback from aero experts. URs to be submitted (& how to capture URs)
22	E6/8.3.2. 7	(a)	2	to add the list of new variables proposed by the PoC for Aeronautical Meteorology to the list of variables of the RRR Database	Secretariat	ASAP	
23	E5/8.3.1. 2 (6), 8.3.2.13	(c)	4	Add a new set of requirements for users at airports. Also the URs need to be made consistent with the statement in the SoG that it addresses requirements *additional* to those for NWP and Nowcasting	J. van der Meulen	30 Jun 2010	Not done
7) Atmospheric Chemistry							
24	E6/8.3.2. 16	(c)	4	to liaise with the GAW community in the view to further update the SoG taking into account the ET-EGOS-6 considerations and the conclusions from the breakout group.	O. Tarasova	Apr. 2012	
25	E5/8.3.2. 29	(c)	4	Cross-check available user requirements for space-based operational AC monitoring measurements for consistency, including the Dossier on the Space-Based Component of the GOS.	R.Munro	End 2011	How far requirements have evolved compared to the Dossier; evolutions in the community to be addressed. URs to be updated by GAW (are 10 years old, and only satellite driven; not adequate; not addressing scientific questions). CAS Scientific Advisory Group. Break out group addressed mechanism for updating the URs.
8) Ocean Applications							
26	E6/8.3.2. 18	(c)	4	to update the SoG for Ocean Applications according to ET-EGOS-5 guidance, and submit a new version before to the Chair for approval. The Team agreed that the new version, once revised, and approved by the Chair; should be adequate for publication on the WMO website.	A. Mafimbo	Apr. 2012	
27	E6/1.3.2, 8.1.11, 8.3.2.20	(a) (c)	4	to group sub-applications of the Ocean Application area into a smaller number. (see the 4 actions from <i>Annex VIII</i> under the Ocean Applications section)	A. Mafimbo	end 2011	

No.	Ref ²	TOR ³	WP ⁴	Action	By	Deadline	Comment
9) Agricultural Meteorology							
28	E6/8.3.2.25	(c)	4	to publish the current version of the SoG for Agricultural Meteorology on the web	Secretariat	ASAP	
29	E6/8.3.2.26	(c)	4	to address the outstanding issues detailed in ET-EGOS-6 doc 8.3.2(7) in the view to produce an updated version of the SoG. New variables to be considered: soil temperature & soil moisture.	R. Stefanski	Apr 2012	
30	E5/8.3.1.2 (9)	(c)	4	Complete the User Requirements	R. Stefanski	Apr 2012	March 2011: URs also provided to the WMO Secretariat for the DB in late March 2011. Comments provided by Chair to the PoC in late March 2011. Open for completing the URs
10) Hydrology							
31	E6/8.3.2.28 E5/8.3.1.2 (10)	(c)	4	to further review the SoG for Hydrology, taking into account the issues identified by ET-EGOS-6. Prepare proposal for revised URs	W Grabs	TBD according to when AWG meets	
32	E6/8.3.2.30	(c)	4	to review the SoG for hydrology and provide comments back to the PoC	ET-EGOS	Apr 2012	
11) Climate monitoring (GCOS)							
12) Climate Applications (other aspects – CCI)							
33	E6/8.3.2.44 E5/8.3.2.26-27	(c)	4	to further update the SoG for Climate Applications (other aspects, CCI) to take into account the issues identified by ET-EGOS-6.	W. Wright	Jul. 2011	Extraordinary Congress in 2012 on GFCS will be an opportunity to get guidance regarding the requirements for GFCS
13) GTOS							
34	E5/8.2.4.2	(c)	4	to provide User Requirements and updated SoG to the WMO Database	J. Latham	End 2011	GCOS Secretariat proposed Dr John Latham, Programme Director, Global Terrestrial observing System (GTOS) Ongoing SoG yet to be drafted
14) Space weather							
35	E5/3.6, 8.2.4.3	(a)	2	Inter-programme Coordination Team on Space Weather (ICTSW) to provide the ET-EGOS (through the Chair, J. Eyre) with SoG	T. Osanger	End 2011	The latest Space Weather requirements have been communicated to J.Eyre on 1 June

No.	Ref ²	TOR ³	WP ⁴	Action	By	Deadline	Comment
							2010 Response from J.Eyre (14 June 2010) UR: available, accepted by ET-SAT, but have not been posted on the web yet.
				15) Global Cryosphere Watch			
36	E6/8.3.3. 2	(a) (c)	2, 4	to review the information provided by the Secretariat on the Global Cryosphere Watch (GCW) during the meeting (ET-EGOS-6 doc 8.3.2(10/3)) and revise their user requirements and SoGs if necessary.	all PoCs	Apr 2012	
37	E6/8.3.3. 3	(a) (c)	4	to provide a link to appropriate GCW documents from the SoG web page	Secretariat	ASAP	
38	E6/8.3.3. 4	(a)	2	to consult with the GCW community in the view to check terminology, and either remove obsolete requirements from the database, or update them.	Secretariat	end 2011	
39	E6/8.3.3. 5	(c)	4	to identify a PoC for the GCW	Secretariat	ASAP	
				16) Global Framework for Climate Services			
40	E6/8.3.4. 2	(c)	4	to identify a PoC for the GFCS	Secretariat	ASAP	
				III. RRR PROCESS – observing system capabilities			
41	E4	(b)	3	Update of Observing System Capabilities by space agencies – seek review by ET-SAT and ET-EGOS	J.Lafeuille	Ongoing	When available Ok
42	E5/6.9.5	(b)	3	Review weather radar database (a result from the questionnaires from ET-SBRSO) on behalf of ET-EGOS	A.Bell, M. Ondráš	Dec 2011	Questionnaire was distributed; info was collected Web-based Database is being designed by Turkey ET-SBRSO will review the database at its next meeting
43	E4	(b)	3	Pursue updates of observing capability database for remaining elements with 1st priority on WIN PROF, RADARs, AMDAR, continuing (as an interim arrangement pending the outcome of action 2 of ET-EGOS-5, and new ET-EGOS-6 actions 7 and 8) to use the WMO/CEOS Database to store surface based observing systems capabilities	R.Stringer in collab. with ICT-IOS ETs, ET-AIR, ET-SBRSO	Mar 2012	The MS-Access format of the WMO/CEOS database included a complex set of tables that proved difficult to work with, so an Excel spreadsheet is being used. A standard reference point was chosen to be the extracted list in Doc.6.1 of ET-EGOS-3 (July 2007) following the advice of

No.	Ref ²	TOR ³	WP ⁴	Action	By	Deadline	Comment
							former consultant Richard Francis. ET-SBRSO has actions to provide updates on WIN PROF, RADARs and other systems. ET-AIR has been approached in relation to AMDAR system capabilities
				IV. IMPACT STUDIES, OSEs, OSSEs			
44	E6/6.3.3	(e)	5	to introduce "observation impact in RA I, related to AMMA" as one theme for the 5 th WMO "impact" workshop in 2012; encourage presentations on observation impact over the AMMA region, and also the impact of satellite observations over land.	E. Andersson	end 2011	
45	E6/9.2.3	(e)	5	to propose additional OSE/OSSE studies if needed, and make such recommendation through the ET-EGOS Chair, and E. Anderson. OSSE for assessing impact of expanding AMDAR could also be considered in the future.	ET-EGOS	Nov. 2011	
46	E6/9.3.4	(e)	5	to finalize the "impact" workshop announcement, in liaison with the Secretariat. The Team agreed with the plan and time table proposed by the organizing committee for the organisation of the workshop as documented in ET-EGOS-6 doc 9	E. Anderson	ASAP	
47	E6/3.9	(e)	5	to develop the programme of the "Impact" workshop (see items 3.9 and 9.3) so that the workshop will be able to comment on the need for surface pressure observations.	E. Andersson	2012	
				V. PREPARATION OF THE NEW EGOS-IP			
48	E6/8.3.2.50	(c) (d) (f)	7	to identify key gaps from their respective Application Area SoG, and relevant issues that will have to be included in the new EGOS-IP, and propose changes to the EGOS-IP accordingly	All PoCs	Oct. 2011	
49	E6/3.8	(f)	7	The WMO Space Programme to reiterate the request for clarification about data policy for the future DWSS mission.	WMO Secretariat	ASAP	
50	E6/6.5.7	(d) (f)	6, 7	to review the results of the "climate" breakout group and provide feedback through the CBS Rapporteur on GCOS matters, Mr Jay Lawrimore (USA) by July 2011	ET-EGOS & J. Lawrimore	July 2011	

No.	Ref ²	TOR ³	WP ⁴	Action	By	Deadline	Comment
51	E6/6.5.7	(d) (f)	6, 7	to seek feedback from AOPC, CCI, and Regional Associations	J. Lawrimore	Oct. 2011	
52	E6/7	(f) (h)	1, 7	to identify relevant issues from the WIGOS Implementation Plan to be included in the EGOS-IP in order to link the EGOS-IP with the WIGOS-IP	I. Zahumensky	End Aug 2011	
53	E6/8.3.2.41	(f) (g)	7	to review the draft Strategy for an Architecture for Climate Monitoring from Space document and provide comments to the WMO Secretariat when it's available.	ET-EGOS	10 Sept 2011	
54	E6/10.2.9	(f)	7	to request the ET-AIR, ET-AWS and ET-SBRSO to review the new EGOS-IP. In particular, in its review the ET-AWS was invited to consider important issues for AWS observations such as standards for coding.	Secretariat	Oct. 2011	
55	E6/10.3.4 E5/10.1.13	(f)	7	to review and propose a revision of the template for National Focal Points feedback	R. Stringer	End 2011	
56	E6/10.3.5 E5/10.1.10	(d) (f)	7	to request the National Focal Points to provide feedback for 2011 on plans and actions related to the current EGOS-IP, using the revised template (Secretariat to provide responses to R. Stringer as soon as they are received) Write to PRs of countries with no NFP.	Secretariat & R. Stringer	Jan 2012	
57	E6/10.4.4 (1)	(d) (f)	7	To address the action items from the breakout group on the review of the surface based part of the EGOS-IP (see <i>Annex XII</i>)	J. Pailleux, J. Eyre, M. Ondráš, Secretariat	See deadlines in <i>Annex XII</i>	
58	E6/10.4.4 (2)	(d) (f)	7	To address the recommendations from the breakout group on the review of the Atmospheric Composition (see <i>Annex XIII</i>)	Secretariat (O. Tarasova) & Wolfgang Fricke	ASAP	
59	E6/10.4.5	(f)	7	to send the draft EGOS-IP to the Regional Association contact points for review.	Secretariat	Aug. 2011	
VI. OTHER ISSUES							
60	E6/6.3.4	(c) (d) (f)	1,5,6	to approach AMMA and seek action and feedback on identified issues.	Secretariat	end 2011	
61	E6/6.5.8,	(a) (f)	6	to review the draft update of satellite supplement	ET-EGOS	1 July	

No.	Ref ²	TOR ³	WP ⁴	Action	By	Deadline	Comment
	8.3.2.34	(g)		to the GCOS-IP/2010, and provide comments to the GCOS Secretariat	members	2011	
62	E6/8.1.8, 10.4.5	(a) (b) (f)	1,2,7	to bring to the attention of the CBS MG the need for the CBS MG: (i) to endorse the new "distributed" approach for the strategy for the evolution of the RRR Database and provide further guidance in this regard; and (ii) to advise on a mechanism for Regional Association feedback regarding the new EGOS-IP	L.P. Riishojgaard	July 2011).	
63	E6/10.4.8	(c) (d) (f) (g)	7	to initiate and maintain a document to keep track of additions to the Vision of the GOS in 2025, and to provide references to the source of the actions proposed in the EGOS-IP (the document shall be based on content of the existing web page, while keeping the web page consistent with the document)	Secretariat	Ongoing	
64	E6/11.1	(c) (d) (f) (g)	7	to coordinate and collect the diverse contributions regarding ET-EGOS proposed actions regarding the global exchange of radar data	Secretariat	Apr. 2012	
65	E6/11.3	(d) (e)	7	to provide feedback on the issue of global exchange of radar data to Tom Keenan	J. Eyre	ASAP	
66	E6/12.1.2	(g)	4,7	to identify key actions to be submitted to the CBS in preparation to ET-EGOS-7	J. Eyre	Mar. 2012	
67	E5/11.3	(c) (d)	6	Coordinate responses to any issue regarding GRUAN implementation with regard to CBS	Secretariat with L.P. Riishojgaard, J.Eyre, and M. Menne	Ongoing	Ongoing. Recommendations will be made in late 2010 to the CBS for inclusion of information in the manual on the GOS and based on the draft guide on how to run the GRUAN network (see ET-EGOS-5 action 68) Ongoing as draft has not been circulated (see ET-EGOS-5 action 68)
Post ET-EGOS-5 actions resulting from the ET-EGOS action plan							
68		(d)	7	to seek feedback from the NFPs on what is being done by Members regarding the transmission of High Resolution aerological profiles (radio-sondes, AMDAR).	Secretariat	Apr. 2012	Only 2 countries in Europe are transmitting the HR data: Need communicated to Members through EC, Congress. Some Members don't want the BUFR package proposed by the manufacturers for the transmission of the HR data. => NFPs need to report on what is

	Ref ²	TOR ³	WP ⁴	Action	By	Deadline	Comment
							being done by Members in this regard. AMDAR also to be addressed.

VISION FOR THE GOS IN 2025
(as approved by EC LXI, Geneva, 2009)

PREAMBLE

This Vision provides high-level goals to guide the evolution of the Global Observing System in the coming decades. These goals are intended to be challenging but achievable.

The future GOS will build upon existing sub-systems, both surface- and space-based, and capitalize on existing, new and emerging observing technologies not presently incorporated or fully exploited. Incremental additions to the GOS will be reflected in better data, products and services from the National Meteorological and Hydrological Services (NMHSs); this will be particularly true for developing countries and LDCs.

The future GOS will play a central role within the WMO Integrated Global Observing System (WIGOS)¹. This evolved integrated observing system will be a comprehensive “system of systems” interfaced with WMO co-sponsored and other non-WMO observing systems, making major contributions to the Global Earth Observation System of Systems (GEOSS); and will be delivered through enhanced involvement of WMO Members, Regions and technical commissions. The space-based component will rely on enhanced collaboration through partnerships such as the Coordination Group for Meteorological Satellites (CGMS) and the Committee on Earth Observation Satellites (CEOS). Portions of the surface and space-based sub-systems will rely on WMO partner organizations: the Global Terrestrial Observing System (GTOS), the Global Ocean Observing System (GOOS), the Global Climate Observing System (GCOS), and others.

The scope of these changes to the GOS will be major and will involve new approaches in science, data handling, product development and utilization, and training.

1. GENERAL TRENDS AND ISSUES**Response to user needs**

- The GOS will provide comprehensive observations in response to the needs of all WMO Members and Programmes for improved data products and services, for weather, water and climate;
- It will continue to provide effective global collaboration in the making and dissemination of observations, through a composite and increasingly complementary system of observing systems;
- It will provide observations when and where they are needed in a reliable, stable, sustained and cost-effective manner;
- It will routinely respond to user requirements for observations of specified spatial and temporal resolution, accuracy and timeliness; and,
- It will evolve in response to a rapidly changing user and technological environment, based on improved scientific understanding and advances in observational and data-processing technologies.

Integration

- The GOS will have evolved to become part of the WIGOS¹, which will integrate current GOS functionalities, which are intended primarily to support operational weather forecasting, with those of other applications: climate monitoring, oceanography, atmospheric composition, hydrology, and weather and climate research;

¹ : Assuming WIGOS is adopted at Cg-XVI

- Integration will be developed through the analysis of requirements and, where appropriate, through sharing observational infrastructure, platforms and sensors, across systems and with WMO Members and other partners;
- Surface and space-based observing systems will be planned in a coordinated manner to cost-effectively serve variety of user needs with appropriate spatial and temporal resolutions.

Expansion

- There will be an expansion in both the user applications served and the variables observed;
- This will include observations to support the production of Essential Climate Variables, adhering to the GCOS climate monitoring principles;
- Sustainability of new components of the GOS will be secured, with some R&D systems integrated as operational systems;
- The range and volume of observations exchanged globally (rather than locally) will be increased;
- Some level of targeted observations will be achieved, whereby additional observations are acquired or usual observations are not acquired, in response to the local meteorological situation.

Automation

- The trend to develop fully automatic observing systems, using new observing and information technologies will continue, where it can be shown to be cost-effective;
- Access to real-time and raw data will be improved;
- Observing system test-beds will be used to intercompare and evaluate new systems and develop guidelines for integration of observing platforms and their implementation; and
- Observational data will be collected and transmitted in digital forms, highly compressed where necessary. Data processing will be highly computerized.

Consistency and homogeneity

- There will be increased standardization of instruments and observing methods;
- There will be improvements in calibration of observations and the provision of metadata, to ensure data consistency and traceability to absolute standards;
- There will be improved methods of quality control and characterization of errors of all observations;
- There will be increased interoperability, between existing observing systems and with newly implemented systems; and,
- There will be improved homogeneity of data formats and dissemination via the WIS.

2. THE SPACE-BASED COMPONENT

Instruments:	Geophysical variables and phenomena:
<i>Operational geostationary satellites. At least 6, separated by no more than 70 deg longitude</i>	
High-resolution multi-spectral Vis/IR imagers	Cloud amount, type, top height/temperature; wind (through tracking cloud and water vapour features); sea/land surface temperature; precipitation; aerosols; snow cover; vegetation cover; albedo; atmospheric stability; fires; volcanic ash
IR hyper-spectral sounders	Atmospheric temperature, humidity; wind (through tracking cloud and water vapour features); rapidly evolving mesoscale features; sea/land surface temperature; cloud amount and top height/temperature; atmospheric composition
Lightning imagers	Lightning (in particular cloud to cloud), location of intense convection.
<i>Operational polar-orbiting sun-synchronous satellites distributed within 3 orbital planes (~13:30, 17:30, 21:30 ECT)</i>	
IR hyper-spectral sounders	Atmospheric temperature, humidity and wind; sea/land surface temperature; cloud amount, water content and top height/temperature; atmospheric composition
MW sounders	

High-resolution multi-spectral Vis/IR imagers (including thermal IR water vapour absorption channel)	Cloud amount, type, top height/temperature; wind (high latitudes, through tracking cloud and water vapour features); sea/land surface temperature; precipitation; aerosols; snow and ice cover; vegetation cover; albedo; atmospheric stability
Additional operational missions in appropriate orbits (classical polar-orbiting, geostationary, others)	
MW imagers – at least 3 – some polarimetric	Sea ice; total column water vapour; precipitation; sea surface wind speed [and direction]; cloud liquid water; sea/land surface temperature; soil moisture
Scatterometers - at least 2 on well separated orbital planes	Sea surface wind speed and direction; sea ice; soil moisture
Radio occultation constellation – at least 8 receivers	Atmospheric temperature and humidity; ionospheric electron density
Altimeter constellation including a reference mission in a precise orbit, and polar-orbiting altimeters for global coverage	Ocean surface topography; sea level; ocean wave height; lake levels; sea and land ice topography
IR dual-angle view imager	Sea surface temperature (of climate monitoring quality); aerosols; cloud properties
Narrow-band high-spectral and hyperspectral resolution Vis/NIR imagers	Ocean colour; vegetation (including burnt areas); aerosols; cloud properties; albedo
High-resolution multi-spectral Vis/IR imagers – constellation	Land-surface imaging for land use and vegetation; flood monitoring
Precipitation radars operated in conjunction with passive MW imagers in various orbits	Precipitation (liquid and solid)
Broad-band Vis/IR radiometer + total solar irradiance sensor - at least 1	Earth radiation budget (supported by imagers and sounders on polar-orbiting and geostationary satellites) and collocated aerosols and cloud properties measurements
Atmospheric composition instruments constellation, including high spectral resolution UV sounder on geostationary orbit and at least a UV sounder on am + pm orbit	Ozone; other atmospheric chemical species; aerosols – for greenhouse gas monitoring, ozone/UV monitoring, air quality monitoring
Synthetic aperture radar	Wave heights, directions and spectra; floods; sea ice leads; ice shelf and icebergs
Operational pathfinders and technology demonstrators, including	
Doppler wind lidar on LEO	Wind; aerosol; cloud-top height [and base]
Low-frequency MW radiometer on LEO	Ocean surface salinity; soil moisture
MW imager/sounder on GEO	Precipitation; cloud water/ice; atmospheric humidity and temperature
High-resolution, multi-spectral narrow-band Vis/NIR and CCD imagers on GEOs	Ocean colour, cloud studies and disaster monitoring
Vis/IR imagers on satellites in high inclination, highly elliptical orbits (HEO)	Winds and clouds at high latitudes; sea ice; high latitude volcanic ash plumes; snow cover; vegetation; fires
Gravimetric sensors	Water volume in lakes, rivers, ground, etc.
Polar and geo platforms / instruments for space weather	
Solar imagery Particle detection Electron density	Solar radiation storms, high-energy particle rain, ionospheric and geomagnetic storms, radio black-out by X-ray photons

3. THE SURFACE-BASED COMPONENT

Station type:	Geophysical variables and phenomena:
Land – upper-air	
Upper-air synoptic and reference stations	Wind, temperature, humidity, pressure
Remote sensing upper-air profiling remote stations	Wind, cloud base and top, cloud water, temperature, humidity, aerosols
Aircraft	Wind, temperature, pressure, humidity, turbulence, icing, thunderstorms, dust/sandstorms, volcanic ash/activity, and atmospheric composition variables (aerosols, greenhouse gases, ozone, air quality, precipitation chemistry, reactive gases)
Atmospheric composition stations	Aerosol optical depth, atmospheric composition variables

	(aerosols, greenhouse gases, ozone, air quality, precipitation chemistry, reactive gases)
GNSS receiver stations	water vapour
Land – surface	
Surface synoptic and climate reference stations	Surface pressure, temperature, humidity, wind; visibility; clouds; precipitation; present and past weather; radiation; soil temperature; evaporation; soil moisture; obscurations
Atmospheric composition stations	Atmospheric composition variables (aerosols, greenhouse gases, ozone, air quality, precipitation chemistry, reactive gases)
Lightning detection system stations	Lightning (location, density, rate of discharge, polarity, volumetric distribution)
Application specific stations (road weather, airport / heliport weather stations, agromet stations, urban meteorology, etc)	Application specific observations
Land – hydrology	
Hydrological reference stations	Water level
National hydrological network stations	Precipitation, snow depth, snow water content, lake and river ice thickness/date of freezing and break-up, water level, water flow, water quality, soil moisture, soil temperature, sediment loads
Ground water stations	Ground water measurements
Land – weather radar	
Weather radar station	Precipitation (hydrometeor size distribution, phase, type), wind, humidity (from refractivity), sand and dust storms
Ocean – upper air	
Automated Shipboard Aerological Platform (ASAP) ships	Wind, temperature, humidity, pressure
Ocean – surface	
HF Coastal Radars	Surface currents, waves
Synoptic sea stations (ocean, island, coastal and fixed platform)	Surface pressure, temperature, humidity, wind; visibility; cloud amount, type and base-height; precipitation; weather; sea-surface temperature; wave direction, period and height; sea ice
Ships	Surface pressure, temperature, humidity, wind; visibility; cloud amount, type and base-height; precipitation; weather; sea surface temperature; wave direction, period and height; sea ice
Buoys – moored and drifting	Surface pressure, temperature, humidity, wind; visibility; sea surface temperature; 3D & 2D wave spectrum, wave direction, period and height
Ice buoys	Surface pressure, temperature, wind, ice thickness
Tide stations	Sea water height, surface air pressure, wind, salinity, water temperature
Ocean – sub-surface	
Profiling floats	Temperature, salinity, current, dissolved oxygen, CO ₂ concentration
Ice tethered platforms	Temperature, salinity, current
Ships of opportunity	Temperature
R&D and Operational pathfinders – examples	
UAVs	Wind, temperature, humidity, atmospheric composition
Gondolas	Wind, temperature, humidity
GRUAN stations	Reference quality climate variables, cloud structure
Aircraft	Chemistry, aerosol, wind (lidar)
Instrumented marine animals	Temperature
Ocean gliders	Temperature, salinity, current, dissolved oxygen, CO ₂ concentration

4. SYSTEM-SPECIFIC TRENDS AND ISSUES

4.1 Space-based

- There will be an **expanded** space-based observing **capability** both on operational and research satellites;

- There will be an **expanded community** of space agencies contributing to the GOS;
- There will be **increased collaboration** between space agencies, to ensure that a broad spectrum of user requirements for observations are met in the most cost-effective manner, and that system reliability is assured through arrangements for mutual back-up;
- Observational capability demonstrated on **R&D** satellites will be progressively transferred to **operational** platforms, to assure the reliability and sustainability of measurements;
- **R&D satellites** will continue to play an important role in the GOS; although they cannot guarantee continuity of observations, they offer important contributions beyond the current means of operational systems. Partnerships will be developed between agencies to extend the operation of functional **R&D** and other satellites to the maximum useful period;
- Some user requirements will be met through **constellations** of satellite, often involving collaboration between space agencies. Expected constellations include: altimetry, precipitation, radio occultation, atmospheric composition and Earth radiation budget;
- **Higher spatial, temporal and spectral resolution** will considerably enhance the information available, particularly to monitor and predict rapidly-evolving, small-scale phenomena, whilst increasing the demand on data exchange, management and processing capability;
- **Improved availability and timeliness** will be achieved through operational cooperation among agencies and new communications infrastructure;
- **Improved calibration and inter-calibration** will be achieved through mechanisms such as GSICS.

4.2 Surface-based

The surface-based GOS will provide:

- Improved detection of meso-scale phenomena;
- Data that cannot be measured by space-based component;
- Data for calibration and validation of space-based data;
- Enhanced data exchange of regional scale observing data and product from weather radar, hydrological networks, etc.;
- High vertical resolution profiles from radiosondes and other ground based remote-sensing systems, integrated with other observations to represent the atmospheric structure;
- Improved data quality with defined standards on availability, accuracy and quality control;
- Long-term datasets for the detection and understanding of environmental trends and changes to complement those derived from space-based systems;
- Maintenance of stations with long historically-uninterrupted observing records.

Radiosondes networks will:

- Be optimized, particularly in terms of horizontal spacing which will increase in data-dense areas, and taking account of observations available from other profiling systems;
- Be complemented by the **aircraft (AMDAR)** ascent/descents profiles and other ground-based profiling systems;
- Maintain the **GUAN** subset of stations for climate monitoring;
- Include a **GCOS Reference Upper-Air Network (GRUAN)** to serve as a reference network for other radiosonde sites, for calibration and validation of satellite records, and for other applications.

Aircraft observing systems

- Will be available from most airport locations, in all regions of the world;
- Flight-level and ascent/descent data will be available at user-selected temporal resolution;
- Will observe humidity and some components of atmospheric composition, in addition to temperature, pressure and wind;
- Will also be developed for smaller, regional aircraft with flight levels in the mid-troposphere and providing ascent/descent profiles into additional airports.

Land-surface observations systems

- Will come from a wider variety of surface networks (e.g., road networks, mobile platforms) and multi-application networks;
- Will be primarily automated and capable of reproducing or substituting for measurements previously obtained subjectively (weather phenomena, cloud type, etc.);
- Will include the **GSN** subset of surface stations for climate monitoring.

Surface marine observations

- From drifting buoys, moored buoys, ice buoys and Voluntary Observing Ships will complement satellite observations;
- With improved temporal resolution and timeliness, through reliable and cost-effective satellite data communication systems;

Ocean sub-surface observing technology will be improved, including cost-effective multi-purpose *in-situ* observing platforms, ocean gliders, and instrumented marine animals.

Remote-Sensing observing systems:

- **Weather radar** systems will provide enhanced precipitation products but with increased data coverage. They will increasingly provide information on other atmospheric variables. There will be much improved data consistency and new radar technology. Collaborative multi-national networks will deliver composite products;
- **Coastal HF Radars** will provide for ocean currents and wave data;
- **Profilers** will be developed and used by more applications. A wider variety of technologies will be used, including lidars, radars and microwave radiometers. These observing systems will be developed into coherent networks and integrated with other surface networks;
- **Global Navigation Satellite System** (e.g., GPS, GLONASS and GALILEO) receiver networks, for observing total column water vapour, will be extended;
- These systems will be integrated into “intelligent” profiling systems and integrated with other surface observing technologies.

Lightning detection systems

- **Long-range lightning detection systems** will provide cost-effective, homogenized, global data with a high location accuracy, significantly improving coverage in data sparse regions including oceanic and polar areas;
- **High-resolution lightning detection systems** with a higher location accuracy, cloud-to-cloud and cloud-to-ground discrimination for special applications.

Surface-based observations of **atmospheric composition** (complemented by balloon- and aircraft-borne measurements) will contribute to an integrated three-dimensional global atmospheric chemistry measurement network, together with a space-based component. New measurement strategies will be combined to provide near real-time data delivery.

Surface-based observations will support **nowcasting and very short-range forecasting** through the widespread integration of radar, lightning and other detection systems, with extension to continental and global scales of the networks.

SYNTHESIS OF THE REVIEW OF FEEDBACK FROM NATIONAL FOCAL POINTS (2009)

NATIONAL REPORTS FOR 2009 ON PROGRESS AND PLANS RELATED TO IMPLEMENTATION PLAN FOR EVOLUTION OF SPACE AND SURFACE-BASED SUB-SYSTEMS OF THE GOS (EGOS-IP)

CONTENTS

1. Introduction
2. Background
3. Member Engagement through National Focal Points (NFPs)
4. Pattern of Reports for 2009
5. Content of Reports for 2009
6. Themes and Issues

1. INTRODUCTION

1.1 This is the third year of reporting by National Focal Points and the third analysis undertaken based on those reports. A new reporting template was used and successfully achieved a higher rate of replies against the group of Recommendations that are most relevant to WMO Member countries.

1.2 While some progress is being made against all Recommendations, most elements are also beyond the scope, capacity or aspiration of at least some Members. It is evident that not all Members can contribute to the GOS at the same level, particularly due to differing levels of resources and expertise. One response should be to highlight and encourage technical cooperation and capacity building amongst Members, aiming to enable all Members to contribute to the GOS and its evolution through EGOS-IP to the greatest extent possible.

1.3 With a new EGOS-IP under development it would be timely to contemplate how that plan is to be launched and how NFPs will be involved.

2. BACKGROUND

2.1 The "Implementation Plan for Evolution of Space and Surface-Based Sub-Systems of the GOS" was developed by the CBS Open Programme Area Group on the Integrated Observing Systems (OPAG-IOS) and published as WMO Technical Document WMO/TD No. 126723. It provides a set of specific recommendations for action in support of the "Vision for the GOS in 2015"²⁴.

2.2 The Expert Team on Evolution of Global Observing Systems (ET-EGOS) reviews progress against the plan when it meets every year or two. It updates and adds some elaboration to the plan, and records that in the final report of each meeting. These reports are accessible at the WMO web site²⁵. The latest update, extracted from the December 2009 meeting report, is accessible at the WMO web site²⁶.

2.3 A new "Vision for the GOS in 2025" has been adopted by WMO²⁷ and a new Implementation Plan for Evolution of Global Observing Systems is under development. The current EGOS-IP will eventually be replaced by that new plan.

3. MEMBER ENGAGEMENT THROUGH NATIONAL FOCAL POINTS (NFPs)

²³ http://www.wmo.int/pages/prog/www/OSY/Publications/TD1267_Impl-Plan_Evol-GOS.pdf

²⁴ http://www.wmo.int/pages/prog/www/OSY/Documentation/CBS-2002_Vision-GOS-2015.pdf

²⁵ <http://www.wmo.int/pages/prog/www/CBS-Reports/IOS-index.html>

²⁶ http://www.wmo.int/pages/prog/www/OSY/WorkingStructure/documents/ET-EGOS-5_ImplPlan.doc

²⁷ http://www.wmo.int/pages/prog/www/OSY/WorkingStructure/documents/CBS-2009_Vision-GOS-2025.pdf

3.1 Since 2007, Members of WMO have been invited to nominate a National Focal Point (NFP) for reporting progress and plans related to EGOS-IP. In particular, NFPs are asked to:

- Report annually on the status of the national components of the Surface- and Space-Based Sub Systems of the Global Observing System vis-à-vis recommendations of the EGOS-IP; and
- Report annually on national plans for the evolution of the national components of the Surface- and Space-Based Sub Systems of the Global Observing System taking into account recommendations of the EGOS-IP.

3.2 Reports received from NFPs for 2007 were analysed in a paper for the 4th meeting of ET-EGOS in July 2008 (Doc 9.3(7))²⁸. Reports received from NFPs for 2008 were analysed in a paper for the 5th meeting of ET-EGOS in December 2009 (Doc 10.1)²⁹.

3.3 As at April 2011, 78 countries have nominated an NFP. These are listed in Table 1 along with an indication of reports received from NFPs for 2009.

Country	NMHS	2009 Report
Algeria	Office National de la Meteorologie	yes
Argentina	Servicio Meteorológico Nacional	yes
Armenia	Armenian State Hydrometeorological and Monitoring Service	yes
Australia	Australian Bureau of Meteorology	yes
Brazil	Instituto Nacional de Meteorologia	
Belgium	Institut Royal Météorologique	
Bosnia and Hercegovina	Hydro-meteorological Service of the Federation of Bosnia and Herzegovina	yes
Botswana	Botswana Meteorological Services	
Bulgaria	National Institute of Meteorology and Hydrology	
Cameroon	Direction de la Meteorologie Nationale	
Canada	Environment Canada - Meteorological Service of Canada	yes
Chad	Direction des Ressources en Eau et de la Météorologie	
Chile	Direction Meteorologica De Chile	
China	China Meteorological Administration	yes
Colombia	Instituto de Hidrología y Estudios Ambientales	
Costa Rica	Instituto Meteorologico Nacional	yes
Cyprus	Meteorological Service	
Czech Republic	Czech Hydrometeorological Institute	yes
Denmark	Danish Meteorological Institute	yes
Egypt	Egyptian Meteorological Authority (EMA)	
Ethiopia	National Meteorological Agency	
Finland	Finnish Meteorological Institute	
France	Météo-France	
Gabon	Direction de la Météorologie Nationale	
Germany	DWD	
Ghana	Ghana Meteorological Agency	
Greece	Hellenic National Meteorological Service	
Guinea-Bissau	Direcção Geral de Meteorologia Nacional	yes
Hong Kong, China	Hong Kong Observatory	yes
Hungary	Hungarian Meteorological Service	
India	India Meteorological Department	
Ireland	Met Éireann - The Irish Meteorological Service	
Islamic Republic of Iran	Islamic Republic of Iran Meteorological Organization (IRIMO)	
Italy	Stato Maggiore dell'Aeronautica	
Japan	Japan Meteorological Agency	yes
Jordan	Meteorological Department	

²⁸ http://www.wmo.int/pages/prog/www/OSY/Meetings/ET-EGOS_Geneva2008/documents/Doc.9.3.7.doc

²⁹ http://www.wmo.int/pages/prog/www/OSY/Meetings/ET-EGOS_Geneva2009/documents/Doc10.1-Feedback-NFP.doc

Kenya	Kenya Meteorological Services	
Lao P.D.R.	Department of Meteorology and Hydrology	
Latvia	Latvian Environment, Geology and Meteorology Agency	yes
Lesotho	Lesotho Meteorological Services	
Lithuania	Lithuanian Hydrometeorological Service	
Madagascar		
Malaysia	Malaysian Meteorological Department	yes
Mali	Direction Nationale de la Météorologie du Mali	
Mauritania	Office National de Meteorologie	
Morocco	Direction de la Meteorologie Nationale	
Mozambique	Instituto Nacional de Meteorologia	
Netherlands	KNMI	
Nepal	Department of Hydrology and Meteorology	
New Zealand	Meteorological Service of New Zealand	
Niger	Direction de la Météorologie Nationale (DMN)	
Nigeria	Nigerian Meteorological Agency	
Pakistan	Pakistan Meteorological Department	
Panama	Hidrometeorología	yes
Peru	Servicio Nacional de Meteorología e Hidrología	
Portugal	Instituto de Meteorologia, I.P. Portugal	
Republic of Korea	Korea Meteorological Administration	
Russian Federation	Russian Federal Service for Hydrometeorology and Environmental Monitoring	
Saint Lucia	Saint Lucia Meteorological Services	
Senegal	Agence Nationale de la Meteorologie du Senegal	
Seychelles	Department of Environment	
Slovakia	Slovak Hydrometeorological Institute	
Slovenia	Ministry for Environment and Spatial Planning, Environmental Agency of the Republic of Slovenia	yes
Sudan	Sudan Meteorological Authority	yes
Sweden	Swedish Meteorological and Hydrological Institute	yes
Switzerland	Meteo Swiss	
Syria	Meteorological Department	
Thailand	The Thai Meteorological Department	
The Former Yugoslav Republic of Macedonia	Hydrometeorological Service	
Togo	Direction Générale de la Météorologie Nationale	
Trinidad & Tobago	Meteorological Services, PIARCO	
Tunisia	Institut National de la Meteorologie	
Turkey	Turkish State Meteorological Service	
Ukraine	State Hydrometeorological Service	
United Kingdom	Met Office	
United Republic of Tanzania	Tanzania Meteorological Agency	yes
United States of America	National Oceanic and Atmospheric Administration (NOAA), National Weather Service	
Uzbekistan	The Centre of Hydrometeorological Service at Cabinet of Minister's of Republic of Uzbekistan (UZHYDROMET)	

Table 1: List of NMHS for which a National Focal Point (NFP) for reporting progress and plans related to EGOS-IP has been nominated, showing reports received for 2009.

4. PATTERN OF REPORTS FOR 2009

4.1 New template for NFP reports

4.1.1 In previous years NFP annual reports were submitted as a free-form commentary, which allowed flexibility for respondents but had some shortcomings as outlined in previous analyses. At the

5th meeting of ET-EGOS a new template was composed and included in the report of the meeting³⁰. It was subsequently provided to NFPs as part of the request for 2009 reports. The template had several goals including:

- to make it easier for NFPs to compose a report;
- to guide NFPs on which Recommendations are the highest priority for response;
- to provide some additional explanation and background for some of the Recommendations; and
- to collect responses in a structured way to better enable their collation and analysis.

The effects that the template had on submissions received for 2009 included:

- in some cases the reports were prepared with great simplicity, involving just a few ticks against boxes;
- for the EGOS-IP Recommendations most relevant to NMHS, there was a more complete response rate than previous years where a large number of “no comment” responses were inferred. Conversely, there was a reduced response rate for the Recommendations on the space-based sub-system of the GOS, which is appropriate given that they call for action by bodies other than individual NMHS;
- less interpretation of the reports was needed in order to complete the collation and analysis.

4.2 Number and representativeness of reports

4.2.1 Twenty NFP reports were received for 2009 (see Table 1), compared to twenty-three for 2008 and thirteen for 2007. This is a useful but not comprehensive level of reporting from the list of 78 NFPs. Even full reporting from the 78 NFPs would provide a useful but not comprehensive view of the progress of WMO Members who all contribute to the operation and evolution of the GOS. Nevertheless, the 78 NFPs and the twenty reports received provide an informative cross section including some larger and smaller countries, plus developed and developing countries.

<i>Number of countries</i>		yes_2007	yes_2007	no_2007	no_2007
<i>Reporting</i>		yes_2008	no_2008	yes_2008	no_2008
yes_2009	20	6	0	6	8
no_2009	16	2	5	9	X
	36	8	5	15	8

Table 2: Number of countries that reported for 2009, or have reported for previous years (2007 and 2008), with a breakdown by the years of previous reports.

4.2.2 Table 2 shows that, of the twenty countries that reported for 2009, eight were reporting for the first time, another six had commenced reporting the previous year, while the other six had reported for all three years. Another sixteen countries that had reported for previous years did not report for 2009.

4.2.3 In total thirty-six countries have reported for at least one year. Of those, twenty-two countries have reported for one year, eight countries have reported for two years, and six further countries have reported for all three years.

4.2.4 The responses by NFPs against many of the Recommendations are unlikely to change significantly from one year to the next and this may be a reason why at least some of the sixteen “drop outs” that reported previously did not report for 2009.

4.3 Responses against the EGOS-IP Recommendations

4.3.1 Figures 1 and 2 show the distribution of responses received against the EGOS-IP Recommendations. The category labels have been updated from those used previously:

³⁰ <http://www.wmo.int/pages/prog/www/OSY/Reports/ET-EGOS-5-Final-Report.doc>

- where the NFP report for 2009 made no reference to the Recommendation – the label remains “no comment”;
- where the NFP report for 2009 indicated that national observing systems are currently involved in the activity and responding to the recommendation, or have capacity and plans that will lead to progress on the recommendation – the label is “responding to the Rec.” in place of the previous label “positive comment”;
- where the NFP report for 2009 indicated that national observing systems are currently not involved in the activity, and/or have no capacity or plans for evolution as indicated in the recommendation – the label is “not responding to Rec.” in place of the previous label “negative comment”.

4.3.2 The report template provided priorities for NFPs, framed in three groups as follows:

“The template for responses is set out below in three sections:

- *Section A (highest priority for reply) – these recommendations are relevant to all or many of the WMO Member countries, and have received the most replies in previous reports by NFPs;*
- *Section B (next priority for reply) – these recommendations have relevance for a smaller subset of WMO Member countries, have received fewer replies in previous reports by NFPs, or are not directed to WMO Member countries but nevertheless have attracted some interest and response from NFPs in previous reports; and*
- *Section C (other items) – NFPs may comment against these recommendations if they wish to, however the recommendations are not directed to WMO Member countries or the progress and plans for implementation can be monitored in other ways (for example through various groups dealing with satellite activities, or the WMO/IOC Joint Commission for Marine Meteorology, JCOMM).”*

4.3.3 In previous years many reports omitted reference to many of the Recommendations, resulting in a high rate of “no comment” classifications. The new template successfully increased the rate of comment on the higher priority Recommendations. For the highest priority group of Recommendations there was a less than ten per cent rate of “no comment”. For the next priority group the rate was just over twenty per cent. This is a significant improvement compared to previous years.

4.3.4 It was hypothesised in previous analyses that the absence of comment was mostly an indicator that the country was not responding to the Recommendation. This is confirmed by the increased rate of “not responding” reports in 2009. Across the highest and next priority reporting groups (see Table 3), the number of “responding” reports (151) only slightly exceeds the number of “not responding” reports (140). In 2008 the number of “positive comments” far exceeded the number of “negative comments”, while there was a higher rate of “no comments”.

<i>Distribution of NFP reports for 2009</i>	Highest priority reporting group of Recommendations	Next priority reporting group of Recommendations
responding to the Rec.	57% (103)	30% (48)
not responding to Rec.	35% (63)	48% (77)
No comment	8% (14)	22% (35)

Table 3: Distribution of NFP responses for the highest and next priority reporting groups.

4.3.5 Only one of the EGOS-IP space-based Recommendations calls upon WMO Members explicitly to contribute to the identified Action. That is S5 LEO data timeliness, which calls upon “WMO Space Programme to plan, with Members and CGMS, the development of Advanced Dissemination Methods (ADMs) and an Integrated Global Data Dissemination Service (IGDDS)....”.

4.3.6 Consequently, NFP reports are not the most suitable mechanism for monitoring action and progress against the space-based Recommendations. Figure 2 is included to illustrate the entire set of reports submitted, however it is Figure 1 which provides the most relevant and useful information.

4.3.7 The greatest number of “responding to the Rec.” reports were made about:

- G2 (documentation – metadata, QC, monitoring);
- G21 (enhanced AWS operations);
- G1 (distribution of more frequent data and more/different types of data); then
- G3 (timeliness and completeness);

Followed by:

- G4 (baseline system – 12 hour profiles, winds important in tropics);
- O1 (observing system studies).

In each case, half or more of the NFP reports indicated they were responding to the Recommendation.

The greatest number of “not responding to Rec.” reports were made about:

- G20 (more atmospheric profiles in tropics);
- G12 (alternative AMDAR systems);

Followed by:

- G11 (humidity sensors on AMDAR);
- G7 (targeted observations);
- G13 (ground-based GPS measurement of total water vapour); and
- G10 (AMDAR optimized reporting).

In each case, half or more of the NFP reports indicated they were not responding to the Recommendation.

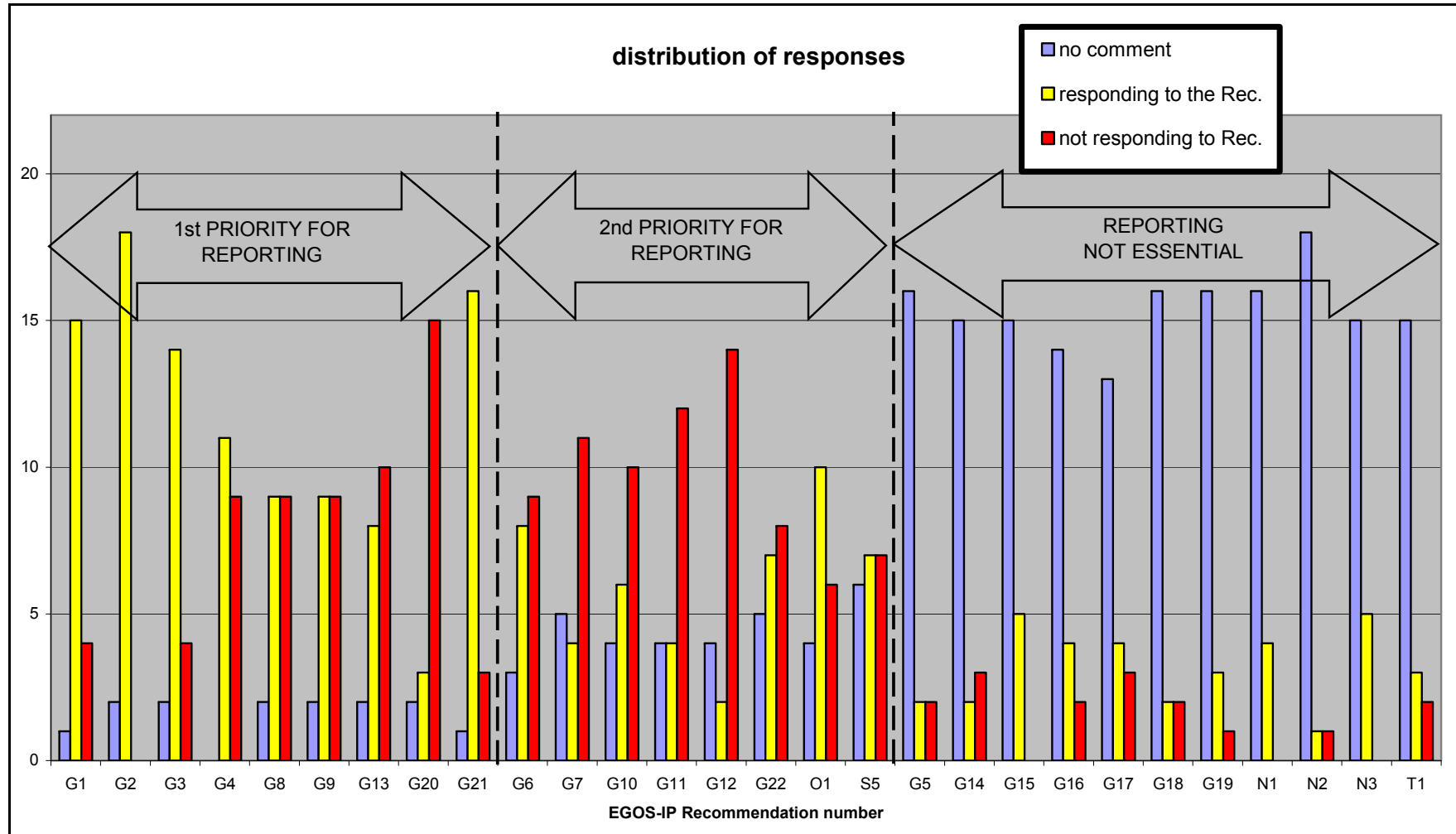


Figure 1: Distribution of responses against selected EGOS-IP Recommendations (highest priority group for reporting, followed by the next priority group for reporting and finally the optional group for reporting, not showing space-based sub-system Recommendations other than S5), classified as either “no comment” (where there was no reference to the recommendation), “responding to the Rec.” (where the report indicated that national observing systems are currently involved in the activity and responding to the recommendation, or have capacity and plans that will lead to progress on the recommendation) or “not responding to Rec.” (where the report indicated that national observing systems are currently not involved in the activity, and/or have no capacity or plans for evolution as indicated in the recommendation).

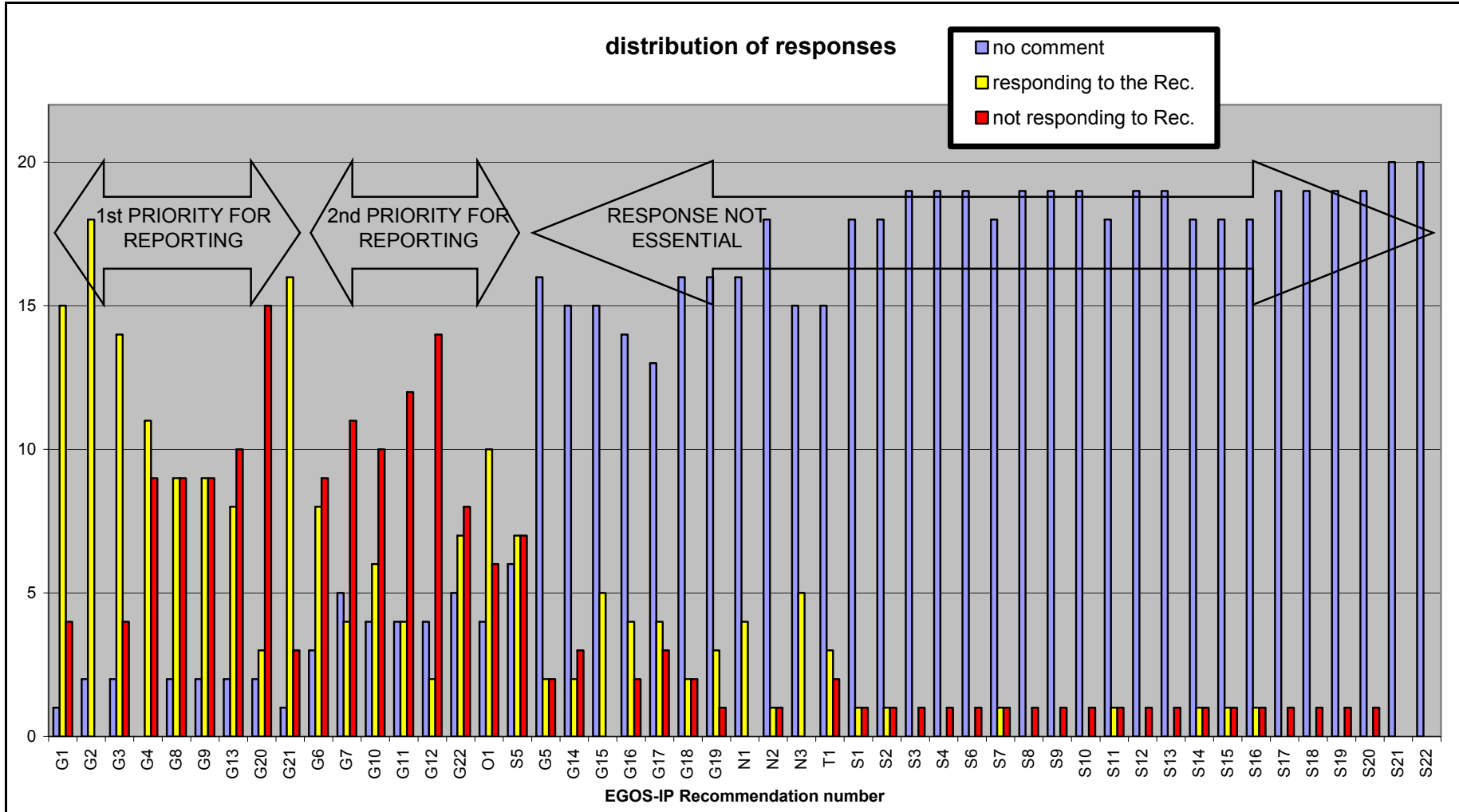


Figure 2: Distribution of responses against all EGOS-IP Recommendations (highest priority group for reporting, followed by the next priority group for reporting and finally the optional group for reporting), classified as either “no comment” (where there was no reference to the recommendation), “responding to the Rec.” (where the report indicated that national observing systems are currently involved in the activity and responding to the recommendation, or have capacity and plans that will lead to progress on the recommendation) or “not responding to Rec.” (where the report indicated that national observing systems are currently not involved in the activity, and/or have no capacity or plans for evolution as indicated in the recommendation).

5. CONTENT OF REPORTS FOR 2009

5.1 “Highest priority for reporting” group of Recommendations

G1 (distribution of more frequent data and more/different types of data)

NFP reports indicated a response to this Recommendation in 15 cases and no response in 4 cases. The types of responses described included:

- hourly synoptic data is exchanged via the GTS;
- the national network is made up of several networks which observe different parameters with varying observational frequencies and distribution characteristics. Elements distributed on the GTS hourly include surface weather (synoptic) reports, AMDAR data, and data from moored and drifting buoys;
- more frequent data collection and distribution, inclusion of additional observations types is a slow evolution but is gradually happening;
- planning to provide high resolution data, recommend sharing of similar data observed in countries located upstream;
- sending SYNOP reports hourly;
- observations are distributed at least hourly, eg from SYNOP systems;
- 3 hourly SYNOPs and 6 hourly VOS reports are increased to hourly and 3 hourly respectively during tropical cyclone events. 1-minute tide data are collected and distributed on the GTS every 10 minutes;
- Synoptic observations are distributed in BUFR format every 10 minutes. Weather radar scan sequence has been modified to allow a 5-minute observation interval. Hourly observations are provided from five research vessels in the western Pacific;
- Stations make observations with the frequency and precision specified in WMO regulatory documents, contributing to RBSN/RBCN surface and upper-air networks;
- Mechanisms aren't available to share AWS data, but efforts are being made to improve the distribution;
- AWS data are distributed hourly on the GTS. Radar derived wind profiles and radar reflectivity (pseudo CAPPI) are distributed on the GTS;
- Some surface observations in SYNOP and METAR format are transmitted regularly through the GTS. Incremental progress is being made on both the frequency and types of data distributed. Other AWS stations are undergoing improvements to enable regular data transmission. A project is underway to establish four radars.

The explanations for not responding to the Recommendation included:

- the distribution of observations for RBSN/RBCN and GSN/GUAN networks has not changed;
- while synoptic data are distributed on the GTS, there is no capacity for distribution of hourly data;
- meteorological systems were destroyed during military conflict, making collection and concentration of data at a national level now difficult.

G2 (documentation – metadata, QC, monitoring)

NFP reports indicated a response to this Recommendation in 18 cases. The types of responses described included:

- the functioning of surface stations is monitored. The National Climatic Data Bank regularly sends documentation for GSN and GUAN networks;
- CLICOM database system is used, with plans to install CLIWARE which supports metadata and QC processes. Station metadata are reported to WMO for inclusion in Volume A. Migration to TDCF is underway;
- Historical climate data and metadata are being entered and quality-controlled in the CLIDATA database. Real time data is quality-controlled at three levels (at the station when observed, then by the controller in the national centre, then finally by an automated DBMS system);

- Procedures are documented. A new Station Sensor Management System is about to replace the prior Station Information System. A Quality Management System has been implemented in accordance with the requirements of the ISO 9001:2008 International Standard;
- Efforts are made to ensure that all observational data can be accompanied by good documentation;
- Good documentation is only available for the data that is distributed via the GEONetcast service;
- A Quality Management System has been implemented in accordance with the requirements of the ISO 9001:2008 International Standard;
- Metadata for all observing stations are documented. All data obtained from AWS undergo a process of automatic QC, followed by human analysis where necessary;
- Metadata is reported to WMO for all stations, including quarterly updates to VOS metadata;
- The centre has been accredited according to the ISO 9001:2008 standard. The metrological laboratory has been accredited in accordance with ISO/IEC 17025:2005 standard. The national quality management system has been based on the relevant WMO manuals and guides. Data flows into the CLIDATA database and plans are in place to refine this with automated data quality control;
- All documentation on surface based systems are currently being compiled, including metadata, QC methods, monitoring techniques and algorithms used;
- Work is underway to update and improve the quality of metadata;
- As a member of EUMETNET, plans are to implement the INSPIRE directive (relating to metadata) and to promote recommendations in line with WMO and WIS;
- A QMS includes extensive documentation on stations, procedures and quality assurance. The ISO 9001:2008 standard has been adopted and external audits are soon to take place for a pilot project on aeronautical meteorological services.

G3 (timeliness and completeness)

NFP reports indicated a response to this Recommendation in 14 cases and no response in 4 cases. The types of responses described included:

- Upper air radiosonde data are maintained relative to stringent standards and coded and distributed globally via the GTS;
- Plans are in place for a new radiosonde program. Data will be reported at high resolution, each 2 seconds;
- Radiosonde data is currently distributed in TEMP and BUFR. The high resolution message will be produced soon;
- Full radiosonde sounding data is now distributed in BUFR format;
- Radiosonde data are distributed in TEMP format. There are plans to improve the radiosonde stations;
- Soundings currently exchanged in TEMP format, but plans are to generate BUFR messages;
- Observations follow guidelines as specified in WMO regulatory material;
- Trying to achieve this but with a launch only once per day;
- Plan to move to high resolution BUFR code, waiting for a new BUFR code via EUMETNET EUCOS;
- Radiosonde profile data are coded and distributed globally via the GTS in accordance with WMO standards. Migration to BUFR format is underway.

The explanations for not responding to the Recommendation included:

- the distribution of radiosonde data is done using the TEMP and PILOT messages through the GTS;
- no radiosonde observations are performed and there are no plans for future improvement;
- lack of consumables to continue a radiosonde program.

G4 (baseline system – 12 hour profiles, winds important in tropics)

NFP reports indicated a response to this Recommendation in 11 cases and no response in 9 cases. The types of responses described included:

- GUAN stations continue to operate daily radiosonde launches. There are plans to increase the number of radiosondes and to renovate hydrogen generators;
- The radiosonde network provides twice daily profile data via the GTS;
- The baseline system includes a radiosonde program supplemented by 4 wind profilers with RASS;
- The baseline system includes twice-daily radiosonde profiles from 16 stations supplemented with data from 31 wind profilers;
- One upper air station provides a radiosonde profile every second day;
- Following the guidance given in the EUMETNET EUCOS program;
- One radiosonde station is sustained. It provides a daily profile on the GTS.

The explanations for not responding to the Recommendation included:

- not applicable (no radiosonde program);
- Australia's upper air network includes 38 radiosonde stations of which only a third do soundings with 12 hour frequency, the others follow a once-per-day schedule or do wind-only profiles at other times;
- radiosonde system needs rehabilitation;
- no technology available to perform these measurements;
- wind only profiles are observed. No radiosondes are available to collect temperature profiles.

G8 (Optimization of rawinsonde distribution and launches)

NFP reports indicated a response to this Recommendation in 9 cases and no response in 9 cases. The types of responses described included:

- regularity is maintained in the release of radiosondes in time and in the five designated stations;
- radiosonde profiles are obtained twice daily;
- radiosonde profiles are obtained twice daily with additional flights in significant weather events;
- radiosonde profiles are obtained twice daily with additional flights when a typhoon is in the area;
- Following the guidance given in the EUMETNET EUCOS program;
- One radiosonde station is currently operational.

The explanations for not responding to the Recommendation included:

- not applicable (no radiosonde program);
- radiosonde system needs rehabilitation;
- no radiosonde observations.

G9 (AMDAR participation)

NFP reports indicated a response to this Recommendation in 9 cases and no response in 9 cases. The types of responses described included:

- a national program is running and providing data on the GTS, but not expected to expand in the next few years;
- a national program is running. High resolution data supports a wind shear detection and reporting service for Hong Kong International Airport. There are plans to expand the program over the next few years and to develop new services using that data;
- a national program is running and providing data on the GTS;
- discussions are underway with airlines to implement a national program;
- participating in and following plans provided by E-AMDAR;

- currently no national program in place, but planning to explore opportunities to establish a program.

The explanations for not responding to the Recommendation included:

- aeroplanes not equipped for AMDAR reporting;
- no AMDAR reports available;
- exchange of information with the aircraft is controlled by the Civil Aviation Authority. No mechanism is available to collect these measurements;
- no observations are available.

G13 (ground-based GPS measurement of total water vapour)

NFP reports indicated a response to this Recommendation in 8 cases and no response in 10 cases. The types of responses described included:

- acquiring ground-based GPS data from neighbours but no plans for a national network;
- establishing a nation-wide network of about 400 stations. Standardisation and global exchange is encouraged;
- data obtained through close cooperation with relevant geoscience agencies;
- installing a GPS processing system to use data from the Hong Kong network and information from the International GNSS Service;
- data is obtained from the GPS network of the Geographical Survey Institute and is limited to use within the NMHS;
- data are shared in the Nordic GNSS data centre, processed into Zenith Total Delay (ZTD) and sent to the data hub at UKMO within the E-GVAP program under EUMETNET. The plan is to include more and more GPS ground-based stations;
- one GPS station is operational.

The explanations for not responding to the Recommendation included:

- no observations available.

G20 (more atmospheric profiles in tropics)

NFP reports indicated a response to this Recommendation in 3 cases and no response in 15 cases. The types of responses described included:

- in addition to one radiosonde station, efforts are being made to reintroduce a pilot balloon station.

The explanations for not responding to the Recommendation included:

- nothing to report on additional profiles in the tropics;
- no current plans for more profiles, but recognise the importance and willing to implement programs;
- no profiles due to lack of consumables.

G21 (enhanced AWS operations)

NFP reports indicated a response to this Recommendation in 16 cases and no response in 3 cases. The types of responses described included:

- currently there are only three AWS and they pose problems for maintenance. There are plans to broaden the network with new AWS and provide training for maintenance staff;
- modernisation of MSC surface networks is ongoing. The changing emphasis from human to automatic observations enables increased observation frequency;
- planning to expand range of measured parameters, such as visibility. Codes and reporting standards are under development;
- AWS comply with WMO standards (for reporting, quality management, metadata, range of measured parameters);

- WMO guides and recommendations are followed for quality management of AWS data and collection of metadata. The range of measured parameters is increasing, with a number of new instruments in operation including wet-bulb globe temperature, a network of weather cameras and a carbon dioxide measurement system;
- An extensive national network is maintained. Data are transmitted to JMA where they are quality controlled then distributed;
- AWS observations have been supplemented with one UV radiation measurement station and there are plans to add automated precipitation and snow depth on 4 AWS;
- All coding and reporting, quality management and metadata, follows WMO specifications. Currently looking into the possibility of adding extra parameters to the systems;
- The network of AWS is being expanded, however guidelines/procedures for standardised reporting is lacking;
- Appropriate code standards are absolutely necessary, the advice from ET-AWS is being followed;
- The network of AWS is running with minor interrogation problems.

The explanations for not responding to the Recommendation included:

- operations are difficult due to a lack of equipment. Coastal marine stations are needed to support safety of life services.

5.2 “Next priority for reporting” group of Recommendations

G6 (ozone sonde data distribution)

NFP reports indicated a response to this Recommendation in 8 cases and no response in 9 cases. The types of responses described included:

- an operational program of ozonesondes in the Antarctic is being maintained;
- the ozonesonde network of 10 stations across Canada is being maintained, with a standard frequency of a weekly launch. The ability to distribute ozonesonde data in near real-time (less than 12 hours after a flight) via the GTS is in development;
- CMA is planning to trial the ozone sonde developed by a domestic Chinese manufacturer;
- The Czech (CHMI) ozone sonde data are distributed within an hour after the end of the flight and are used for ENVISAT calibration;
- Hong Kong currently makes an ozone sonde sounding about once a week. There are plans to disseminate the data in BUFR format in near real-time;
- JMA is preparing to report the ozone sonde data from its three stations in CREX format soon.

The explanations for not responding to the Recommendation included:

- no observations are made;
- not applicable.

G7 (targeted observations)

NFP reports indicated a response to this Recommendation in 4 cases and no response in 11 cases. The types of responses described included:

- actively investigating means to conduct targeted observations, including participation in trial of pre-operational Data Targeting System (DTS) and involvement in THORPEX T-PARC campaigns;
- following the work done in the EUCOS framework, including participation in NA-TreC, FP7 PREVIEW DTS, and MEDEX DTS campaign. Now waiting for evaluation of how DTS might be implemented.

The explanations for not responding to the Recommendation included:

- although not having an operational program, Algeria contributed to the MEDEX project to conduct NWP studies to identify sensitive areas where the addition of observations would most likely lead to improved forecasts;
- no targeting of observations;
- not applicable.

G10 (AMDAR optimized reporting)

NFP reports indicated a response to this Recommendation in 6 cases and no response in 10 cases. The types of responses described included:

- the transmission of AMDAR reports in the Canadian network can be changed on a whole of program basis in non realtime. A data optimisation system is not needed until further airlines participate in the program and there is redundancy of data coverage;
- the AMDAR data of Hong Kong, China is subdivided into twelve geographical regions in accordance with the AMDAR Reference Manual before it is exchanged in BUFR code, enabling NMHSs to receive only the AMDAR data of direct interest to them;
- discussions are underway with Malaysian airlines to implement this recommendation;
- following the developments within the E-AMDAR program.

The explanations for not responding to the Recommendation included:

- no AMDAR observations;
- not applicable.

G11 (humidity sensors on AMDAR)

NFP reports indicated a response to this Recommendation in 4 cases and no response in 12 cases. The types of responses described included:

- although Canada has the capacity to assimilate humidity observations from aircraft there are no current plans introduce humidity sensors;
- discussions are underway with Malaysian airlines to implement this recommendation;
- following the developments within the E-AMDAR program.

The explanations for not responding to the Recommendation included:

- Australia recently suffered a setback when the proposed operational trial of water vapour sensors on QANTAS aircraft did not proceed, however further efforts will be made to pursue this capability;
- no plan to install humidity sensors on aircraft in the Hong Kong program at this stage;
- no AMDAR observations;
- not applicable.

G12 (alternative AMDAR systems)

NFP reports indicated a response to this Recommendation in 2 cases and no response in 14 cases. The types of responses described included:

- a number of investigations of AFIRS systems were made by Canada.

The explanations for not responding to the Recommendation included:

- no plan to implement TAMDAR or an AFIRS based system on aircraft in the Hong Kong program at this stage;
- no AMDAR observations;
- following the developments within the E-AMDAR program;
- not applicable.

G22 (new systems)

NFP reports indicated a response to this Recommendation in 7 cases and no response in 8 cases.

The types of responses described included:

- a number of new systems have been explored by Canada including aircraft mounted wind lidar and water vapour differential lidar (DIAL);
- lidars are supporting a windshear alerting service for Hong Kong International Airport, and a surface based radiometer is providing temperature and humidity profiles every 10 minutes for reference by weather forecasters;
- the Doppler weather radar system and a range of data from satellite receiving stations are being used in Latvia;
- the new systems have not yet been considered, but in the medium term it may be possible to install one;
- some tests/validation campaigns using lidars, UAVs have been tested within the EUCOS studies program.

The explanations for not responding to the Recommendation included:

- involved in THORPEX-Afrique project, but that isn't evolved enough to achieve special observations yet;
- no involvement with THORPEX;
- not applicable.

O1 (observing system studies)

NFP reports indicated a response to this Recommendation in 10 cases and no response in 6 cases. The types of responses described included:

- in an ongoing process of redesign, weather observing stations in China have been equipped with AWS and will in future have automatic measurements of cloud, weather phenomena, and visibility. The establishment of a solid precipitation network is underway;
- CHMI (Czech) is constantly examining observing systems, comparisons are made before or during modernisation to ensure data homogeneity;
- The transition from conventional to Doppler radar is progressing in Japan, with the first 11 upgrades being followed by a further five. The program enhances the ability to monitor severe weather causing strong winds and improves the accuracy of NWP products;
- Latvia participates in observing system studies in the framework of the EUMETNET program EUCOS;
- AWS systems have been designed and developed internally or in collaboration locally in Malaysia. Documentation is being compiled and will be published;
- We are following the specific OSE's carried out under the umbrella of EUCOS together with EUMETSAT and ECMWF. A new upper-air design will be defined in EUCOS, which we then will follow.

The explanations for not responding to the Recommendation included:

- nothing to report at this time;
- have no capacity for evolution.

S5 (LEO data timeliness):

NFP reports indicated a response to this Recommendation in 7 cases and no response in 7 cases. The types of responses described included:

- it is planned to integrate satellite data into NWP in Armenia;
- Canada operates 3 HRPT stations for direct reception, and contributes sounder data to the EUMETSAT EARS retransmission service to improve global access to timely data. The value of this contribution to EARS is under evaluation by EUMETSAT;
- The data processing centre in Beijing and the four ground receiving stations are working day and night to provide reliable and timely access to FY satellite data;
- ATOVS data from LEO satellite are received at Hong Kong and processed then transmitted to RTH (Tokyo) under the Regional ATOVS Re-transmission System (RARS) project;

- ATOVS data has been exchanged via the GTS for the Asia-Pacific Regional ATOVS Re-transmission Service (A-P RARS). JMA also receives ATOVS data via RARS which has a positive impact on NWP analysis and forecasts. JMA has also been providing ATOVS data received at two stations (Kiyose in Japan and the Syowa Station in Antarctica) and maintains a dedicated web site to provide operational information about the ATOVS data received at these sites.
- Handled via EUMETSAT and its various bodies;
- SUMO software is used to process 15-minute satellite imagery.

No explanations were provided by those not responding to this Recommendation.

5.3 “Optional reporting” group of Recommendations

The new template relieved NFPs from reporting on the Recommendations below unless they had some specific comments to make.

G5 (stratospheric observations)

NFP reports indicated a response to this Recommendation in 2 cases and no response in 2 cases. The responses included:

- Continuing to use 500 gram balloons at GUAN stations to reach radiosonde heights above 50 hPa.

The explanations for not responding to the Recommendation included:

- no specific information to report.

G14 (more atmospheric profiles over ocean)

NFP reports indicated a response to this Recommendation in 2 cases and no response in 3 cases. The responses included:

- Japan: about 300 upper-air profiles were reported in 2009 from four research vessels in the western Pacific, plus over 100 profiles from a research vessel of the Japan Agency for Marine-Earth Science and Technology (JAMSTEC).

The explanations for not responding to the Recommendation included:

- Canada does not currently have an ASAP program.

G15 (improved telecommunications for marine/ocean observations)

NFP reports indicated a response to this Recommendation in 5 cases. There were no reports that indicated no response to the Recommendation. The responses included:

- A new Meteorological Message Switch is enabling the migration to TDCF in Argentina;
- Australia has participated in trial and demonstration of the new iridium based communications as an improvement over the previous system;
- Pilot projects using Iridium communications demonstrated greater timeliness and reduced cost. Hence Canada is transitioning the AVOS network and future drifting buoys to Iridium, and investigating use for other marine data. Arrangements are in place to defend access to the electromagnetic spectrum, an activity which requires constant effort.

G16 (tropical moorings)

NFP reports indicated a response to this Recommendation in 4 cases and no response in 2 cases. The responses included:

- five near-shore AWS have been installed in Hong Kong, China, mounted on moored buoys located around Hong Kong International Airport;
- Japan's JAMSTEC has been operating the mooring array in the tropical ocean. One new buoy was deployed in 2009 and a total of 18 are operated in the western tropical Pacific and the eastern Indian Ocean.

The explanations for not responding to the Recommendation included:

- Canada has no tropical moorings.

G17 (drifting buoys)

NFP reports indicated a response to this Recommendation in 4 cases and no response in 3 cases. The responses included:

- Argentina operates 153 surface drifting buoys (type SVP) with satellite tracking between 40S and the Antarctic Circle. 120 of them are equipped with barometer;
- Australia continues to deploy and get value from drifting buoys in our Region;
- JMA operates drifting buoys in seas in the vicinity of Japan, reporting pressure, sea surface temperature, wave and position data through the GTS. There were 22 new deployments in 2009. The Japan Coast Guard operates drifting buoys in the Antarctic Ocean, reporting sea surface temperature and position data through the GTS, and 3 new buoys were deployed in 2009.

The explanations for not responding to the Recommendation included:

- no deployment of drifting buoys in Southern Ocean area;
- current no equipment but buoy data needed to support marine services.

G18 (XBT and ARGO)

NFP reports indicated a response to this Recommendation in 2 cases and no response in 2 cases. The responses included:

- Japan: temperature and salinity profiles are obtained from systems operated by JMA and national marine research institutes. As at December 2009, 286 Japanese Argo floats had reported about 13,000 profiles (TESAC reports) through the GTS in 2009, more than 90 per cent within 24 hours after observation. XBT, CTD and XCTD provided more than 10,000 profiles (BATHY/TESAC reports) through the GTS in 2009;
- Australia continues to deploy and get value from XBT and ARGO float ocean profiles.

The explanations for not responding to the Recommendation included:

- Canada does not own or operate any XBT probes or ARGO floats.

G19 (ice buoys)

NFP reports indicated a response to this Recommendation in 3 cases and no response in 1 case. The responses included:

- Canada has 10 operational buoys in the Arctic, transmitting data hourly in WMO formats, available once a polar orbiting satellite receives the data from the buoy. Four more ice buoys will be deployed. New capabilities to investigate include survival of the freeze thaw cycle, and deployment by air (to open water);
- Japan's JAMSTEC operates drifting ice buoys, with two deployed buoys in the Arctic Ocean as at December 2009.

N1 (new data for NWP centres)

NFP reports indicated a response to this Recommendation in 4 cases. There were no reports that indicated no response to the Recommendation. The responses included:

- The Canadian NWP centre (CMC) receives early test data and observations, though details vary with different data sources;
- Sweden plans to continue with an active role in the HIRLAM-A and SRNWP programme of EUMETNET, including effective use of new data types.

N2 (data from research satellites)

NFP reports indicated one response to this Recommendation and a single "no response". The responses included:

- The Canadian NWP centre (CMC) receives experimental data streams from research satellites.

N3 (NWP data cut-off times)

NFP reports indicated a response to this Recommendation in 5 cases. There were no reports that indicated no response to the Recommendation. The responses included:

- Canadian is tackling the challenge of meeting the NWP requirement of 30 minutes data availability. The greatest challenge is sounding data from polar orbiting satellites, for which data latency issues are due to the need for line of sight communication with a ground station;
- Processing and delivery of AWS data in Latvia meets the requirement of 30 minutes. Weather radar data are available within the time span of 10 minutes.

T1 (training)

NFP reports indicated a response to this Recommendation in 3 cases and no response in 2 cases. The responses included:

- a range of training is undertaken in Latvia including local staff training and use of the EUMETNET and EUMETSAT training opportunities.

The explanations for not responding to the Recommendation included:

- nothing to report at this time;
- more training is needed.

S1 to S20, excluding S5 (other Recommendations relating to the Space-Based Sub-System of the GOS)

The effectiveness of Recommendations S7 (LEO Sea Surface Wind), S15 (LEO Synthetic Aperture Radar) and S16 (LEO aerosol) is reinforced by a number of applications of the data in Hong Kong, China, including monitoring of tropical cyclones and aerosol monitoring.

Japan highlighted the response to: S1 (Calibration) through long standing participation in the GSICS; S2 (GEO Imager) through plans for follow-on satellites in the MT-SAT series plus dissemination through HRIT, LRIT and landline alternatives while exploring the feasibility of alternative methods; S11 (Global Precipitation Measurement) through launch of the core satellite and improvements to instruments; and S14 (LEO microwave) through the AMSR-E sensor, onboard the Aqua satellite, which was developed by JAXA and is performing water-related global observations, as well as AMSR2, the successor to AMSR-E, which will observe microwaves using six frequency bands ranging from 7 to 89 GHz and is planned for launch in the first quarter of 2012.

Sweden is responding to almost all space-based Recommendations as a member of EUMETSAT and through its various bodies. Great interest is also placed in initiatives like Canada's Polar Communications and Weather (PCW) Mission, in Molniya orbit.

6. THEMES AND ISSUES

6.1 "Highest priority for reporting" group of Recommendations

6.1.1 This group of nine Recommendations includes those which are relevant to all or many of the WMO Member countries and have received the most replies in previous reports by NFPs.

6.1.2 The first four EGOS-IP recommendations relate to improved data coverage, quality management, distribution and coding. NFP reports reveal a very high rate of addressing these matters.

6.1.3 Fifteen out of twenty reports indicated some action to distribute more frequent data and more/different types of data. The majority of reported actions involved higher frequency of surface

synoptic observations, particularly taking advantage of automatic systems to exchange hourly data. Other observations mentioned in this context were AMDAR data, data from moored and drifting buoys, VOS and research vessel observations, and weather radar reflectivity and velocity data.

6.1.4 Eighteen out of twenty reports indicated some action on metadata and quality control, including the capture of metadata on databases used nationally (CLICOM, CLIDATA, etc) and provision to WMO in line with the regulatory documents. Four countries specifically mentioned implementation of ISO 9001:2008 and one metrological laboratory referred to accreditation in accordance with ISO/IEC 17025:2005.

6.1.5 Fourteen out of twenty reports indicated some action on observations timeliness and completeness. A key target of this Recommendation has been the adoption by Member countries of a new BUFR format to enable radiosonde profiles to be reported in higher resolution (2 second data) together with lat./long./time for each data point. While many of the reports expressed a positive effort on this, the number who report having achieved the change remains relatively small. Four NFP reports indicated that no response was being made to this Recommendation. At least two of these are not operating a radiosonde program at all.

6.1.5 With respect to the Recommendation on baseline systems, which emphasises continued 12 hour profiles, there was a split of the reports into eleven which indicated action is being taken and nine which indicated no action is being taken. Some stations acquire profile observations only once per day while other radiosonde stations are unable operate because they need rehabilitation or a supply of consumables.

6.1.7 Recommendation G8 calls for optimization of rawinsonde distribution and launches. There was an even split of NFP reports into nine responding to this Recommendation and nine not responding to it. Those responding explained that they were maintaining regularity of radiosonde profiles, with some countries collecting additional profiles in significant weather such as typhoon events. Members of EUCOS will follow the guidance emerging from OSE's including a new upper-air design. Those not responding to this Recommendation explained that they have no radiosonde program, or their system needs rehabilitation.

6.1.8 The Recommendation for AMDAR participation (G9) also attracted an even split of NFP reports into nine responding and nine not responding to it. Those responding explained that a national program is running, or they are contributing through E-AMDAR, or discussions and planning are underway with the aim of introducing national AMDAR programs. Those not responding to this Recommendation explained that they don't have access to AMDAR data or aeroplanes equipped to report AMDAR or the communication linkages needed to collect AMDAR data.

6.1.9 The Recommendation for ground-based GPS measurement of total water vapour attracted reports showing eight countries responding and ten countries not responding. It is evident that many Members depend on collaboration with relevant mapping and/or seismic agencies for access to data from their GPS ground stations.

6.1.10 The Recommendation for more atmospheric profiles over the tropics (G20) appears not to be securing much response. There were just three reports of responding, one of these indicating an effort to reintroduce a pilot balloon station. The 15 countries not responding provided little explanation other than lack of consumables.

6.1.11 The Recommendation for enhanced AWS operations (G21), on the other hand, appears to be securing extensive response. Sixteen out of twenty NFP reports indicated that the country was responding to this Recommendation, with a range of enhancements occurring such as additional stations, improved communication and reporting frequency, and expanded range of measured parameters.

6.2 “Next priority for reporting” group of Recommendations

6.2.1 This group of eight Recommendations includes those which have relevance for a smaller subset of WMO Member countries, have received fewer replies in previous reports by NFPs, or are not directed to WMO Member Countries but nevertheless have attracted some interest and response from NFPs in previous reports.

6.2.2 The recommendation for more immediate ozone sonde data distribution (G6) attracted 8 reports indicating some action and 9 reports indicating no action on the topic.

6.2.3 The recommendation for greater targeting of observations (G7) has drawn a small number of Members to take action, notably through participation in THORPEX campaigns. EUCOS studies may lead to a better appreciation of how to get value from a Data Targeting System (DTS).

6.2.4 Recommendations for AMDAR enhancements such as optimised reporting, humidity sensors, and alternative AMDAR systems (G10, G11, G12) are reported to receive little attention. Some data optimisation systems have been implemented.

6.2.5 The recommendation to adopt new systems (G22) has a split between those seven countries who reported that they are pursuing the evaluation of new systems and another eight who aren't.

6.2.6 Ten out of twenty responses indicated some pursuit of observing systems studies (O1). Although the various concepts of what constitutes an observing system study appeared very broad, it does suggest that a proactive and evidence-based approach exists in the design of networks.

6.2.7 It remains clear, continuing a theme from previous years, that ATOVS Retransmission Services are attracting active collaboration and results both in the European context and in the Asia-Pacific region.

6.3 “Optional reporting” group of Recommendations

6.3.1 This third group of Recommendations includes those which do not call for action by WMO Member countries and/or for which the progress and plans for implementation can be monitored in other ways. This includes seven of the ground-based Recommendations, four of the five “additional” high priority recommendations, together with 19 of the 20 space-based recommendations.

6.3.2 From the relatively small number of reports in 2009 against these Recommendations, the following points can be made:

- GUAN stations continue to make special efforts to fly radiosondes into the stratosphere;
- Atmospheric profiles over ocean are difficult and expensive to obtain and very few countries contribute to this globally. Only two of the twenty NFP reports indicated they were able to respond to this Recommendation;
- NFP reports about telecommunications for marine/ocean observations gave a very strong indication that new Iridium communications offered greater timeliness and reduced cost. It seems likely that the subset of WMO Members that are actively involved in collecting observations from remote marine and ocean platforms will migrate to such services;
- Tropical moorings are difficult and expensive to sustain and very few countries contribute to this globally. Only four of the twenty NFP reports indicated they were able to respond to this Recommendation;
- As with the other recommendations for marine/ocean observations, few reports indicated any response for the increased coverage by drifting buoys (four reports), XBT and ARGO profiles (two reports) or ice buoys (three reports);
- Data producers appear to be mindful of the need to provide to NWP centres early test data from new systems and from R&D satellites;

- There were 5 reports indicating an effort to respond to NWP data cut-off times. While much data is supplied in a timely manner, the 30-minute cut-off poses a challenge in some respects (for example sounding data from polar orbiting satellites);
- The recommendation for more sustained training for access to and utilisation of all the available GOS data received little comment.

6.3.3 With respect to the space-based recommendations (S1 to S20 excluding S5) it may simply be noted that Japan, as a satellite operating country, and Sweden, as a member of the EUMETSAT satellite operating consortium, provided a few comments and one other country indicated it is not responding to these recommendations because it is not a satellite operator.

6.4 Arrangements for collecting national reports

6.4.1 National reports from NFPs are very informative and helpful in assessing progress and plans relating to the EGOS-IP.

6.4.2 A new template was distributed, conveying guidance on the structure of reports and the priority items to report against. This had a significant impact on the reports that were received:

- a much more complete rate of reporting than in previous years was achieved against the identified priority Recommendations. The rate of “no comment” was only 8 percent for the highest priority group and 22 percent for the next priority group;
- one consequence of this was a higher rate of reports indicating no response to a Recommendation. This effectively clarified that the majority of “no comment” reports in previous years were indicators that there was no response to the Recommendation;
- a reduced rate of reporting than in previous years was experienced for the “optional reporting” group of Recommendations, which is appropriate;
- the template allowed for very brief reports to be made by simply ticking a box to indicate the country is responding to a particular Recommendation. The addition of explanatory text was optional. As a result there was an overall decline in the amount of explanatory text received compared to previous years. That is good to the extent that it avoids discouraging NFPs from reporting but is unfortunate if it reduces the ability to understand the driving forces behind the pattern of reports;
- an important result of the structured format was that the analysis involved much less re-interpretation of the reports to decide which Recommendation the comments were aimed at and whether they were positive or negative in nature.

6.4.3 The template itself could be improved. For example, supplementary text boxes were intended to provide additional explanation and background to assist NFPs to understand and interpret some of the Recommendations. Not all of these boxes had been drafted at the time the template was circulated.

6.4.4 Responses were received from 20 of 78 NFPs. It should be possible to improve significantly on this rate of reporting – the starting point might be to develop a communication strategy for ET-EGOS with the NFPs.

6.5 Influence of EGOS-IP on national plans and priorities

6.5.1 The observations made in the 2008 analysis apply again in 2009 – it shows a good degree of alignment of national plans with elements of the EGOS-IP. The many actions addressing individual recommendations provide evidence that Members are involved, capable, and/or making plans relevant to the EGOS-IP.

6.5.2 Where Recommendations are not being responded to, the NFP reports indicated a limitation to the scope or capacity of the Member’s network, rather than a lack of agreement with or priority on the

recommendations of the EGOS-IP.

6.5.3 The extent to which the EGOS-IP has influenced the priorities of Members, as distinct from being in agreement with the priorities of Members, remains unclear. It would be interesting to seek comments in this regard in future reports from NFPs.

6.5.4 With a new EGOS-IP under development it would be timely to contemplate how that plan is to be launched, for example:

- which aspects of the plan call for actions by WMO Members individually or through the WMO Regional Associations;
- how will these calls for action be conveyed to Member countries and how will NFPs be engaged in the process;
- how will feedback be obtained about the active planning and implementation by Member countries;
- how will EGOS-IP be represented to Members as a part of the bigger picture which includes calls for action on WIGOS, WIS, GCOS Implementation Plan and the Global Framework for Climate Services, and so on.

6.5.5 As suggested in previous reports, the process could be supplemented by a campaign on one or more selected Recommendations for special attention. This might be a concerted effort focussed on the global uptake of high resolution BUFR format reporting of radiosonde profiles, the collection of data from AMDAR enabled aircraft when they visit regions beyond their normal reporting region, GTS distribution of ozone sonde data, or something new identified in the new EGOS-IP.

6.5.6 As well as contributing directly to progress on EGOS-IP, such a campaign may contribute to the broader awareness amongst Members and stimulate progress on a broader front.

6.6 Overall state of progress and planning related to EGOS-IP

6.6.1 As noted in the 2008 analysis, most elements of EGOS-IP have been achieved or are being pursued by at least some Members. However most elements are also beyond the scope, capacity or aspiration of at least some Members. It is evident that not all Members can contribute to the GOS at the same level, particularly due to differing levels of resources and expertise.

6.6.2 One response should be to highlight and encourage technical cooperation and capacity building amongst Members, aiming to enable all Members to contribute to the GOS and its evolution through EGOS-IP to the greatest extent possible. Some good examples have been seen in the NFP reports over the past three years, such as support for upper air stations.

6.6.3 Even where there is a widespread positive commitment to a recommendation of EGOS-IP, a long time period is typically required for enough Members to make enough progress to produce a noticeable improvement in the GOS. For example, the global introduction of AMDAR programmes by WMO Members appears to be a multi-decade evolutionary change to the GOS. The adoption of a BUFR reporting format for radiosonde data that includes high resolution as well as time and location details is another change that continues to take some time. In these circumstances it is helpful to have persistence and clear goals.

ACTION PLAN FOR THE NEW EGOS-IP

- a) June-2011 - August 2011: The version reviewed by ET-EGOS-6, and amended by the consultant in July 2011 is circulated to other CBS Expert Teams and Points of Contact of Application Areas (including GCW) for review and further changes as necessary;
- b) July – December 2011: A new consultancy activity is initiated to include the suggested changes and finalize a new draft version;
- c) Oct. 2011, ICG-WIGOS: The draft EGOS-IP is presented to the ICG-WIGOS for information and comment;
- d) End 2011: The ET-EGOS Chairperson makes a final review, and then circulates it for review to ET-EGOS, the previous review group, Application Area Points of Contact, the National Focal Points, AMMA, and regional representatives as advised by the CBS Management Group;
- e) Dec 2011: The Chair investigates whether a dedicated meeting before ET-EGOS-7 will be needed to review the draft EGOS-IP;
- f) 15 March 2012: Comments received are collated, and prepared for submission to ET-EGOS-7;
- g) 7-11 May 2012, ET-EGOS-7: Prepare a revised version for consideration by the ICT-IOS; Prepare a communication strategy about the new EGOS-IP (see item 10.2.8);
- h) June 2012, ICT-IOS-7: The new EGOS-IP is submitted to the seventh Session of the ICT-IOS for approval;
- i) Fall 2012, CBS-XV: The new EGOS-IP is submitted to the CBS Fifteenth Session for approval;
- j) Mid-2013, WMO EC-LXV: The new EGOS-IP is submitted to the sixty-fifth Session of the Executive Council for final approval;
- k) July 2013: Implement strategy for the communication of the new EGOS-IP to stakeholders (see item 10.2.8), including interaction with the NFP and request them to respond to the EGOS-IP. Monitor progress.

Note: The WIGOS Planning Office is expected to provide the draft WIGOS-IP in June 2012 to the ICT/IOS-7 meeting.

RECOMMENDATIONS FROM THE ET-EGOS-6 BREAKOUT SESSION ON USER REQUIREMENTS DATABASE

Participants: John Eyre, Etienne Charpentier, Jitze van der Meulen, Wolfgang Fricke, Oksana Tarasova, Nils Hettich, Lars-Peter Riishojgaard, Jerome Lafeuille (Chair and Rapporteur)

Concepts of “Accuracy” and “Uncertainty”:

In accordance with guidelines from BIPM it is agreed that “Accuracy” should be replaced by “Uncertainty” throughout the requirements database. Furthermore, some explanatory text should be developed.

- **Action:** Secretariat will replace “Accuracy” by “Uncertainty” throughout the requirements database.
- **Action:** J.van der Meulen to propose some explanatory text on “Uncertainty” and related terms, to be made accessible through the on line database.

Updates to the list and definitions of variables

Common to several applications

Cloud imagery	Not to be included. Can be addressed by a requirement for e.g. “Cloud type” or “Cloud cover”.
Atmospheric stability index	Not to be included. Derived from temperature and humidity profiles. Should be addressed by a corresponding requirement on “Atmospheric temperature” and on “Specific Humidity”, with coarse vertical resolution. Action: Aurora Bell, as the Nowcasting PoC, to confirm that this is suitable, and indicate the appropriate layers and vertical resolution.
Precipitation rate at the surface (liquid)	Not to be included. Already addressed by “Precipitation rate (liquid or solid)” and “Precipitation rate (solid)”. Action: Replace “Precipitation rate” by “Precipitation intensity”.
Accumulated precipitation (over 24h)	Action: Replace unit “mm/d” by “mm”
Precipitation type	Action: To be added. See definition in CIMO Guide (snow, rain, mixed, hail, dew, rime, hoar, frost and fog precipitation...)
Soil moisture	Uncertainty unit to be clarified, since it is recommended in m^3/m^3 but requirements are still provided in g/Kg. Action: John Eyre to consult the NWP community about “g/kg” as the unit to express the uncertainty.

Agriculture

CO ₂ flux	Action: To be added (Unit : $nmol/m^2.s^{-1}$)
Delta-T	Not to be included. To be addressed by the relevant elementary variables (soil moisture?)

Evapotranspiration	Action: To be added . See definition and units in CIMO Guide
Hail	Not to be included. See: Precipitation type
Pan evaporation	Not to be included. To be addressed by a physical variable (Water vapour flux?)
Soil temperature	Action: To be added. See definition and units in CIMO Guide
Wind gust	Proposed to be addressed by wind speed, with a very short observing cycle to ensure sufficient temporal resolution to capture the instantaneous maximum. Action: R. Stefanski, as PoC for Agriculture Met., to confirm whether the requirement for Wind Gust can be expressed by Wind Speed

Hydrology

Land surface imagery	Not to be included. Requirement to be addressed by vegetation variables and “Lake area”.
Snow status (wet/dry)	Need to adjust the uncertainty unit, in “Hit Rate / False Alarm rate

Atmospheric Chemistry

Downward/Upward Terrestrial irradiance	Action: See CIMO Guide to confirm whether we should use “terrestrial” instead of “long-wave” noting that the long-wave irradiance includes radiation not only from the Earth but also from the atmosphere and (for downward irradiance) from the sun. Note: The CIMO Guide refers to “long-wave” rather than terrestrial radiation
Downward/Upward Solar irradiance	Action: See CIMO Guide to confirm whether we should use “solar” instead of “short-wave” noting that the short-wave irradiance includes radiation from the sun and reflection by the atmosphere. Note: The CIMO Guide refers to “solar” radiation but acknowledges also “short-wave”, and assimilates solar radiation with short-wave (below 3000 nm)
Earth’s surface SW bidirectional reflectance distribution function (BRDF)	Action: Replace “bidirectional reflectance distribution function” by “bidirectional reflectance”.
Aerosol optical depth	ET-EGOS confirms the use of “Aerosol Optical Depth” instead of “Aerosol Optical Thickness”, which depends on viewing conditions. Action: O. Tarasova to consult John Olgren to clarify how to express the spectral dependence: <ul style="list-style-type: none"> - AOD at one reference wavelength (e.g. 0.6 µm) - AOD as a function of λ - AOD in particular bands (VIS, VIS+IR, IR, ...?) Action : Inform other PoCs (including GCOS AOPC) of the conclusions and the need to convert the existing requirements in the new variables.
Cloud optical depth	Similarly, use “Cloud Optical Depth” instead of “Cloud Optical Thickness”. The Cloud Optical Depth represents the impact of the cloud water column on radiation propagation. $OD = \exp(-K \Delta z)$ where K is the extinction coefficient [km ⁻¹], Δz the optical path [km] between the base and the top of the cloud.
Aerosol species mole	Confirmed.

fraction, Aerosol species total column burden	
Aerosol mass mixing ratio	Confirmed.
Trace gas profiles	The proposed uncertainty unit is “mol/mol” for most species, or “ 1.3×10^{15} molecules/cm ² » for two of them, but the available requirements are all expressed in “%”. Action: To keep the uncertainty requirements in “%” in the Database until updated figures are available in proper units.

Ocean Applications

Snow depth	cm	Snow depth	Action: To be added
Sea surface heat flux	W/m ²	Sea surface heat flux	Action: To be added
Sea surface mass flux	mm/h	Sea surface mass flux	Action: To be added
Sea-ice motion	km.d ⁻¹	Sea-ice motion	Action: To be added
2D frequency spectral wave energy density	m ² ·Hz ⁻¹ ·rad ⁻¹	1D or 2D wave energy density	Renamed “Wave directional energy frequency spectrum”. 2D variable colloquially referred to as “wave spectrum”. Describes the wave energy traveling in each direction and frequency band (e.g., 24 distinct azimuth sectors each 15° wide, and 25 frequency bands)
1D Frequency spectral wave energy density	m ² /Hz	1D or 2D wave energy density	Renamed: “Wave 1D energy frequency spectrum”. 1D variable colloquially referred to as “wave spectrum”. Describes the wave energy in each frequency band (e.g. 25 frequency bands) regardless of the direction of propagation
Sea Surface Height Anomaly	m	Sea Surface Height Anomaly	Not to be included. Identical to “Ocean Dynamic Topography”
Sea-ice concentration	%	Sea-ice concentration	Not to be included. Can be addressed by “Sea-ice cover”
Sea-ice leads/polynyas	km	Sea-ice leads/polynyas	Not to be included. Can be addressed by “Sea ice cover”, or “Sea-ice type” with suitable horizontal resolution.
Sea-ice melt onset, duration of melt	d	Sea-ice melt onset, duration of melt	Not to be included. This is derived from a time series of observations of sea-ice surface status. Can be addressed either by “Snow status (wet/dry)” or by “Sea-ice surface temperature”.
Sea-ice stage of development	%	Sea-ice stage of development (ice age)	Not to be included. Can be addressed by “Sea-ice type”
Sea-ice surface characteristics	%	Sea-ice surface characteristics (albedo, meltpond, dust, snow)	Not to be included. Can be addressed by specific requirements for albedo, snow status (wet/dry), sea-ice

		properties, temperature)	surface temperature, etc.
Sea-ice volume/mass flux	km ³ .d ⁻¹	Sea-ice volume/mass flux	Not to be included. should be addressed by "Sea-ice motion" combined with "Sea ice thickness".
Wave period	s	Time between the passage of two successive wave crests past a fixed point. It is equal to the wave length divided by the wave speed	Not to be included. Identical to "Dominant Wave period"
Ocean surface currents	cm/s		Since it is a surface (2D) parameter, there should be no vertical resolution. The "1m" indication might be an indication of the layer rather than a vertical resolution.
Sea surface temperature	K		Since it is a surface (2D) parameter, there should be no vertical resolution. The "0.5m" indication might be an indication of the layer rather than a vertical resolution.
Wind vector over the surface	m/s		Since it is a surface (2D) parameter, there should be no vertical resolution. The "10m" indication might be an indication of the layer rather than a vertical resolution.
Significant wave height	m		Two values are provided for each of the accuracy requirements (e.g. 1% / 0.05 m), but the proposed unit for accuracy is "m". One unit should be adopted, either "%" or "m", and only one value provided.
River discharge	m ³ .s ⁻¹		There should be no "vertical resolution" if it is not a vertically distributed variable.

- **Action:** The Secretariat to communicate the conclusions above to the Point of Contact for Ocean Applications and invite him to reformulate the requirements using as far as possible the agreed variables.

Aeronautical Meteorology

The following variables mentioned in the updated Statement of Guidance should be included:

Meteorological Optical Range (MOR) (surface)	Length of path in the atmosphere required to reduce the luminous flux in a collimated beam from an incandescent lamp, at a colour temperature of 2 700 K, to 5 per cent of its original value, the luminous flux being evaluated by means of the photometric luminosity function of the International Commission on Illumination. For aeronautical purposes, the surface MOR is measured at a height of 2.5 m above the surface. (Unit: m)
Background Luminance (surface)	Luminous flux emitted from the background, per unit solid angle and per unit area. The Luminous flux is derived from radiant flux by evaluating the radiation according to its action upon the International Commission on Illumination standard photometric observer. (Unit: lm.m ⁻² .sr ⁻¹ = cd.m ⁻²)
Dust concentration	Concentration of dust in the atmosphere (g/kg)

Space weather

- **Action:** The variables and Themes proposed for Space Weather should be included.

Applications and sub-applications

- **Action:** Etienne Charpentier, Boram Lee to consult the PoC (Ali Mafimbo) with a proposal to identify the smallest number of uses that would need to be treated as different applications. The PoC should then coordinate with JCOMM Expert Teams, and provide feedback. The distinction between *coast* and *open ocean* should be addressed through the concept of “layer” (possibly renamed) rather than by defining a specific application. Applications covered by other application areas should be removed. Applications such as “modelling” should be removed or more appropriate application to which the “modelling” is contributing should be proposed.

GOOS

- **Action:** Noting the links between GOOS and JCOMM, the Secretariat should consult GOOS and ask whether there are GOOS requirements beyond the Ocean Applications requirements from JCOMM. (Action to be done once the Ocean Applications requirements have been clarified.

New database

- **Action:** As soon as the updates above are implemented, the PoCs should use the new database to prepare the updates. The Secretariat shall inform the PoCs accordingly.
 - **Action:** Secretariat to replace the Excel file by the new database, on the web, once the contents are validated by the ET-EGOS Chair.
-

**THE PROCEDURE FOR UPDATE, VALIDATION AND APPROVAL
OF STATEMENTS OF GUIDANCE WITHIN THE WMO ROLLING
REVIEW OF REQUIREMENTS PROCESS**

(As of: 17 June 2011)

1. The Point-of-Contact (PoC) for the Application Area reviews the latest version of the SoG and proposes amendments, in the form of a Microsoft Word document using the “track changes” option. (If there is no pre-existing version, then the PoC drafts the first version of the SoG.) In performing this update, the PoC is expected to refer to some or all of the following: (i) the latest version of the user requirements for the Application Area; (ii) the latest version of the database Observing System Capabilities; (iii) his / her own expertise on the Application Area; and (iv) advice from other international experts on the Application Area;
 2. The PoC refers the new draft version of the SoG to the Chair of the ET-EGOS, with copy to the WMO Secretariat staff responsible for ET-EGOS;
 3. The Chairperson of the ET-EGOS decides the appropriate review process for the new draft. If a meeting of ET-EGOS is imminent, the new draft becomes a document for this meeting and is reviewed by the Meeting. If a meeting is not imminent, the new draft may be referred to the ET-EGOS for comment(s) by correspondence;
 4. The Chairperson of the ET-EGOS refers the comments of the ET-EGOS to the PoC, either by reference to the report of an ET-EGOS meeting or otherwise, as appropriate;
 5. The PoC updates the draft to take account of comments received. Contentious issues are discussed with the Chairperson of ET-EGOS, as necessary. Microsoft Word “track changes” option continues to be used at this stage;
 6. The PoC refers the revised draft version of the SoG to Chairperson of ET-EGOS, with copy to WMO Secretariat staff responsible for the ET-EGOS;
 7. The Chairperson of the ET-EGOS considers the revised draft and approves it, or refers it back to the PoC with comments for further revision (by steps 5 and 6 mentioned above);
 8. The Chairperson of the ET-EGOS informs the WMO Secretariat staff responsible for the ET-EGOS when the revised version has been approved;
 9. The WMO Secretariat staff responsible for the ET-EGOS updates the WMO documentation (website, etc.) with the new version of the SoG, with due attention to version control procedures; and
 10. At each ET-EGOS meeting, the WMO Secretariat staff responsible for the ET-EGOS reports to the ET on changes since the last meeting, in relation to the SoG version and its approval status.
-

**PROPOSED TOPICS FOR NWP IMPACT STUDIES RELEVANT TO THE EVOLUTION OF
GLOBAL OBSERVING SYSTEMS**

Short name: Full name	Science question
Surface-based	
S1MarinePs: Surface pressure over ocean	What density of surface pressure observations over ocean is needed to complement high-density surface wind observations from satellites? Suggestions: (a) network density reduction OSE in N.Atlantic, (b) southern oceans OSSE.
S2Strat: In situ observations of the stratosphere	What network of in situ observations is needed in the stratosphere to complement current satellite observations (including radio occultation)? What about the tropics?
S3AMDAR: Coverage of AMDAR	What is the impact of current AMDAR observations? What are the priorities for expansion of the network?
S4ASAP: Coverage of ASAP	What is the impact of current coverage of profiles from the Automated Shipboard Aerological Programme (ASAP)? How might coverage be optimised for a given level of resources?
S5Radar: Radar observations	What are the impacts of current radar observations, including radial winds and reflectivities?
Space-based	
S6RO: Radio occultation saturation	At what level, in terms of profiles per day, does the impact of radio occultation observations start to saturate?
S7SatLand: Satellite radiances over land	What is the impact of new developments in the assimilation of radiance data over land?
S8Sounders: Impact of multiple satellite sounders	What benefits are found when data from more than one passive sounder are available from satellite in complementary orbits, e.g. multiple AMSU-As, AIRS + IASI ?
S9AMVs: AMVs	What impacts are currently found from AMVs?
General	
S10Thinning: Data density and data thinning	What impacts/benefits are found from data density/thinning strategies from various observation types?
S11PBL: Observations of the PBL for regional / high-resolution NWP	What should be the focus of improvements for observations of the PBL in support of regional/high-resolution NWP? Which variables and what space-time resolution?
S12UA: EUCOS-like upper air OSEs	Can EUCOS-like upper air studies be performed for other regions?
S13AdjEns: Regional application and adjoint and ensemble methods	What insights can be gained from more tailored use of adjoint- and ensemble-based measures of observation impact, for example, in the tropics or at the meso-scale where metrics other than global energy may be appropriate?

S14ExtRange: Impact of observations on extended range forecasts	Which observations are particularly important for the 7-14 day forecast range?
S15Targeting: Targeted observations	What do experiments on targeted observations tell us about observing system design?
S16aAMMA, S16bIPY: AMMA and IPY legacy	What impacts/benefits could be expected by sustained components of the AMMA and IPY special observing systems?

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OUTCOME OF THE BREAKOUT SESSION ON SATELLITE ASPECTS FOR THE NEW EGOS-IP

General comments

Traceability to the Vision: Since the EGOS-IP responds to the “Vision for the GOS in 2025” its plan should broadly follow the plan of the Vision; however, there may be deviations (e.g. because some points of the Vision may need to be updated or clarified, or require prior implementation actions). There should be a table providing traceability between the IP and the Vision in order to:

- Check that all actions are logically linked to the Vision,
- Check that all elements of the Vision are addressed.

Need for actions: As a rule, there should be an action for each item, unless the text indicates that the current or planned situation is meeting the requirements (in the latter case no action required but situation needs to be kept under review.)

Section 3.1

Action C1: Whatever is the success of an R&D mission, there is not necessarily an operational follow-on. Transition from R&D to operations does not necessary apply to ALL R&D missions, even if technology and applications are mature enough.

Reword such as “**Whenever relevant and feasible, encourage** the sustained operation of research-based observing systems, once their validation has shown they are mature enough”
or

“...sustained operation of **relevant** research-based observing systems, once their validation has shown that they are mature enough **and their cost-effectiveness is assessed.**”

Action C2: the action requests observing components (should be defined) to adhere to WIS standards. Several data providers agencies, which are not NMHSs, are using well defined international standards that might differ completely / slightly from those used in WIS.

Recommendation: 1) better define what is meant by “**observing components**” 2) replace “**adhere to WIS Standards**” by “**encourage to adhere to WIS standards**”

Action C3

Asking such investigation for EACH observing system is too demanding. Furthermore “side effects” of operating in adaptive mode should also be looked at.

1) Replace “**each observing system**” by “**relevant observing system**”.

2) Replace “**feasibility and cost-effectiveness**” by “**feasibility, cost-effectiveness and side effects on the continuity of climate data records**”.

Section 3.3 Expansion:

An action should be added to cope with the increased volume of data to be processed, disseminated, etc.

Action: To evaluate the future evolution of data volumes to be exchanged and handled, based on the projected data volumes generated by the future satellite sources. (Action on WIS)

Section 3.x Radio-frequency spectrum:

A new section should be introduced in the over-arching cross-cutting part (Section 3.) about radio-frequency spectrum allocations which are essential for the implementation of the GOS, especially its space-based component.

Section 3.x Data policy: The operating paradigm for the Global Observing System is built on WMO data sharing principles under which all essential data are shared openly among the WMO members. This has been facilitated by the fact that in the past, observational data have been provided primarily by national governments and international agencies. However, the potential for an increased role in the future for commercial entities - offering e.g. hosting of instrument payloads or “data buys” and similar mechanisms - raises important issues regarding the continued availability to all WMO members of data obtained under such arrangements. A new section should be introduced in the over-arching cross-cutting part (Section 3.) about data availability, with the following action:

Action: For new observing systems, including satellite systems, ensure continued adherence to WMO data sharing principles irrespective of origin of data, including data provided by commercial entities.

Who: WMO members, space agencies.

Time-frame: Continuous.

Performance indicator: Continued availability of all essential observational data to all WMO members.

Section 6.2

Lines 2204-2219: This part is at the wrong place, should belong to section 6.3.2

Action S1: The action refers to “all LEO satellites”. It would be better to refer more specifically to “the core meteorological missions in LEO orbit” to which Action S1 really applies.

Action S2 : the action shall reinforce the operational character of an activity that is currently pre-operational, it shall recognize the necessary commitment and resources of the GSICS partner agencies.

Recommendation: Add “*on an operational basis*”, and the actionee (“Who”) shall be limited to *GSICS* only.

Lines 2247-2251: Remove paragraph on CLARREO, replace by generic sentences such as : *“Instruments should be inter-calibrated on a routine basis against reference instruments or calibration targets, using common methodologies. At least two Infrared and two high-quality Visible and, ultimately, UV and Microwave instruments should be maintained in LEO orbits to provide reference measurements for intercalibration of operational instruments in geostationary or LEO orbit.”*

Lines 2253-2254: Make reference to the GCOS Climate Monitoring Principles for satellite missions. Mention the need for (1) continuity of observations and (2) overlap of key reference sensors that are needed to provide traceability, in order to ensure continuity and consistency of data records

Action S3: should focus on the overlap of key reference sensors for consistency of climate data records

Section 6.3.1 : Action S4

The main deviation from the Vision is the 80-85° interval between GOES-W and MTSAT (which still provides full coverage of the Pacific with overlap between 50 N and 50 S). If the interval is a matter of concern (because of viewing angle), the action should require improvement of the geostationary coverage over the Pacific. However the coverage is not only a matter of satellite locations, but also depends on the scanning mode. GOES-R imager will enable wind vector derivation over the full disc every 15 minutes.

Recommendation: 1) the concern above the Pacific (interval of 80-85°) shall be added to the

paragraph (2270 to 2276) preceding the description of action S4 ;
2) the action shall call for an ***improvement for the spatial and temporal coverage with GEO satellites over the Pacific***

Section 6.3.1.1

Action S5 : the action is described as a goal not an action, and more details are needed.

- 1) The text should precise that the “***2km resolution is at sub-satellite point***”.
- 2) The action could be more specific in spectral requirements (the new baseline imagers will all have typically around 16 bands) “***with at least 16 channels***”.
- 3) Replace “***Ensure and maintain***” by “***Implement and maintain***”
- 4) Add ***full disk coverage*** as an additional requirement

Action S6: the acquisition scheduling is critical for AMVs but this is not reflected in the text of the action

Replace “***organize the processing of the imagery ...***” by “***organize the scanning strategy and processing of the imagery ...***”

Section 6.3.2

Insert the lines 2204-2219

Action S9: There will be more than one spacecraft in some of the 3 orbital planes: European and Chinese on AM, US and Chinese on PM, and possibly one Russian satellites in either AM or PM.

- 1) Replace “***the three basic polar orbiting platforms***” by “***the core meteorological missions on the three orbital planes***”
- 2) Replace “the European EARS” by “the RARS network”
- 3) Remove reference to NPOESS

New action: Action S9 is relevant for global or regional data. There is scope for an additional action on Direct Readout to provide real time access to local data.

Section 6.3.2.1

Second paragraph, second sentence needs to be reworded as follows: “... Each user is interested in the information from a specific subset of this huge volume, and this subset varies from one application to another. For example, global NWP is interested in a representation of the data that gives most information on the temperature and humidity profiles, whilst the atmospheric composition community is interested in information on specific atmospheric constituents. It is a challenge for the centres pre-processing these observations to provide a satisfactory data delivery to all users in an operational context.”

Action S10 needs to be reworded along the following lines : “To define and implement a data reduction strategy in order to optimize the information content accessible within the timeliness constraints”.

Section 6.3.2.2

New Action needed to fill the gap on MW sounding on the early morning orbit.

Section 6.3.2.3

Action S11 is OK, but a new action should be added “***to implement a WV channel (e.g. 6.7 μm) on all core meteorological polar-orbiting satellites to facilitate the derivation of polar winds from water vapour motion***”

Section 6.3.3.1

In accordance with the proposed new CGMS baseline, this mission could be included in the core meteorological LEO missions (Move to section 6.3.2.).

Action S12: Keep this action as a heading and indicate “According to current plans the requirements are expected to be met. No action required at present, but to be kept under annual review”.

Section 6.3.3.2

Action S13: Keep this action as a heading and indicate “According to current plans the requirements are expected to be met. No action required at present, but to be kept under annual review.”

Section 6.3.3.4 : Altimeter constellation

Action S15: To be consistent with the generally admitted strategy, indicate: “***Implement an altimeter constellation comprising a reference mission on high-precision, not sun-synchronous, inclined orbit, and two instruments on well separated sun-synchronous orbits***”.

Section 6.3.3.6 VIS and NIR narrow bands Imagers

- 1) (Line 2700): the list is not complete. OCM on the ISRO Oceansat-1 and Oceansat-2 satellites should be mentioned as well.
- 2) Add sentence to indicate that this mission is well covered by LEO satellites. (The GEO component of this mission belongs to section 6.3.4 pathfinders)
- 3) Remove action S17

Section 6.3.3.8

GPM constellation: After Line 2772, add one sentence on usefulness of near-real time availability of data for Nowcasting and operational hydrology (flood warning).
Note: may need an explanation on what is meant by real time or near-real time

Replace Action S18 by two actions:

- 1) “In support of GPM , implement at least one passive MW mission on a low-inclination orbit”.
- 2) “Organize the delivery of GPM data in near-real time to support nowcasting and operational hydrology requirements.”

Section 6.3.3.10

Instruments contributing to GHG monitoring (2835) : Mention also SCIAMACHY is a major instrument for atmospheric composition. We could also add AIRS and IASI.

Section 6.3.3.11 : Synthetic Aperture Radar (SAR) (2870)

After line 2876 : Add a sentence such as “The future Radarsat Constellation Mission (RCM) planned for 2015-2023 will include 3 satellites phased on the same orbit, enabling a 4-day revisit time. “

Put a placeholder for an Action here. ET-SUP to investigate whether future SAR data will be sufficiently accessible within the GOS, and determine whether an action will have to be added here in the EGOS-IP.

Section 6.3.4.1 (a) Doppler wind lidars

First and third lines: remove the text within brackets.

Second paragraph (line 2914):

- Change dates to “2013 to 2015”.
- Remove last sentence and the 2 bullets (“A very significant improvement..” etc.)

Action S21 : The first sentence of action S21 should be dropped. Start with “Use the experience of the ADM-Aeolus demonstration mission to plan ...”

Section 6.3.4.1 (b) Cloud and aerosol lidars :

Add rationale about the near-real time use of this data in order to introduce the action. Also, it should be added that “these data are required for climate monitoring and for climate model validation - to improve our understanding of the climatology of clouds and to monitor its change over time. Model validation is facilitated if the data are available in NRT to operational centres.”

Section 6.3.4.6 : 2nd line, replace “gravimetric sounders” by “gravimetric sensors”.

**ACTION ITEMS FROM THE BREAK OUT GROUP FOR
SURFACE BASED OBSERVING SYSTEMS FOR THE EGOS-IP**

<i>Item</i>	<i>By</i>	<i>Deadline</i>
Add a new paragraph on radio frequency coordination to Section 3.	Jean Pailleux	Sept 2011
Data policy: add a small paragraph on the need for more open data access in the preamble, including a reference to Resolution 40 and the need for more data to be exchanged in the category of "additional data" and in the longer term in the category of "essential data.	Jean Pailleux	Sept 2011
Look for the right balance between NWP, climate and all the other application area requirements in the final draft.	John Eyre	Dec 2011
Aircraft measurements: instead of TAMDAR use "AMDAR on small commercial aircraft" throughout the text.	Jean Pailleux	Sept 2011
The traceability of measurements to international standards. Text to be delivered.	Miro Ondráš	Sept 2011
Discussion on owners of actions: use consistent terminology such as NMSs, NMHSs, RAs, in cooperation with CBS, international programs and agencies through the text. Identify a single "lead" for each action and who the other contributing action parties are.	Jean Pailleux	Sept 2011
Surface observing systems over land: make sure to get feedback from ET-AWS chair since there are only few identified actions (e.g. see ET-EGOS-6 action 54 and para 10.2.9, and Annex VII step (a)).	John Eyre	Dec 2011
Coming ET meetings in autumn 2011: Agenda should include enough time to discuss EGOS-IP draft.	Secretariat	asap
Importance of OSE/OSSE as a continuous task for the development of the observing system. If necessary include a separate paragraph in Section 2.	John Eyre	Dec 2011
Data policy for GNSS data; the owner of the data are the Geodetic Institutions, free distribution on GTS might be a problem. Make a reference in the text.	Jean Pailleux	Sept 2011
Value of manual versus automated observations: add text from the ET-AWS documentation to section 3.4 covering the pros and cons of each method, to replace the incomplete description drafted at lines 1333-1336.	Miro Ondráš	Sept 2011
Impact on regulatory material: give an explanation in the cross cutting section.	Miro Ondráš	Sept 2011

**OUTCOME OF THE BREAKOUT SESSION ON ATMOSPHERIC COMPOSITION
16 JUNE 2011**

Participants: Barbara Ryan (rapporteur), Liisa Jalkanen, Oksana Tarasova, Rosemary Munro, Wolfgang Fricke (Chair).

Background: "...WMO Congress XVI (Cg-XVI) recommended for GAW to set up an ad-hoc Task Team to review the needs for GAW regarding satellite measurements and the IGACO recommendations on these that date back to 2004. Cg-XVI further recommended for this work to be done in coordination with the CBS Expert Team on Satellite Systems (ET-SAT) and the Expert Team on Evolution of the Global Observing Systems (ET-EGOS), the Committee on Earth Observation Satellites (CEOS) Atmospheric Composition Constellation group and the Coordination Group for Meteorological Satellites (CGMS) and also taking into consideration GCOS requirements and the vision for the GOS in 2025."

The secretariat is planning to establish the ad hoc task team recommended by Cg-XVI to bring together experts from the satellite and the GAW communities. We discussed possible members of this task team and its terms of reference. Rosemary Munro from EUMETSAT will serve as the primary point person for linkages back to ET-EGOS. Also, Richard Eckman (NASA) will be invited to participate as he is leading the CEOS Virtual Constellation for Atmospheric Composition, and is also participating on the ad hoc Writing Team for developing a space-based architecture for climate monitoring. To ensure long-term linkages with the Expert Team on Satellite Systems (ET-SAT) and the Expert Team on Satellite Utilization and Products (ET-SUP) and GAW, it was suggested that a technical expert with this atmospheric chemistry (or composition) expertise be added to ET-SUP. It was further discussed that one expert from each GAW Scientific Advisory Group (GAW-SAG) should join the ad hoc Task Team, each of them representing one GAW parameter group.

Action 1: Invite Rosemary Munro and Richard Eckman to be part of the GAW ad hoc Task Team on satellite measurements (Liisa Jalkanen/ Barbara Ryan).

Action 2: Name and invite a technical expert as a long run link between ET-SAT and ET-SUP with GAW. (to be determined at the first meeting of the ad hoc Task Team).

Action 3: Name and invite one expert from each GAW-SAG (GAW SAG Chairs).

STATUS OF EXISTING STATEMENTS OF GUIDANCE
(17-06-2011)

This document provides for an overview of the status of statements of guidance regarding the WMO Application Areas.

No.	Application	Contact	Formal version – web (date)	New version (date)	Comment
1	Global NWP	Erik Andersson (ECMWF)	10 May 2011 (approved by ET-EGOS-6)		The new version includes increased emphasis on surface variables such as soil moisture and vegetation, following the decision to extend the time scale for global NWP to 15 days. It provides for an updated description of modern data assimilation systems and the benefits of NWP to users, and is acknowledging the increasing importance of radio occultation data in the stratosphere, and its (minor) contribution to surface pressure as well as the increasing coverage and importance of aircraft data. The value of scatterometers with respect to winds derived from passive microwave is emphasized. References to NPOESS have been removed and replaced with JPSS. Comments were introduced on lacking international distribution of some important observational data sets, based on discussions at the recent North America – Europe Data Exchange meeting held jointly with the Asia – Pacific Satellite Data Exchange and Utilisation meeting, Boulder, 2-6 May 2011.
2	High Resolution NWP (previously Regional NWP)	Thibaut Montmerle (France)	May 2010 (approved by Chair)		ET-EGOS-5 agreed to rename “Regional NWP” Application area to “High Resolution NWP”, and the Statement of Guidance has been updated by the Point of Contact to reflect this decision. The new version was approved by the Chair in May 2010 and posted on the web. ET-EGOS-6 requested the PoC to review the User Requirements for consistency with those of GNWP. Chair to pass some comments from M. Ondráš and Chair to PoC.
3	Nowcasting and Very Short Range Forecasting	Aurora Bell (Romania)	26 Jan 2009 Approved ET-EGOS-5 (Dec 2009)	June 2011	ET-EGOS-5 recommended to consider a possible merging of the applications areas of Synoptic Meteorology with Nowcasting and Very Short Range Forecasting, (2) revise the URs accordingly, and (3) amend application descriptions and SoGs accordingly. In particular, a new version of the SoG for Nowcasting and Very Short Range Forecasting has been produced by the Point of Contact in May 2011, and include the following elements per ET-EGOS-5 recommendations: (i) the sections dealing with nowcasting techniques applicable to aeronautical meteorology have been discussed with the PoC for Aeronautical Meteorology and information from both statements of guidance made consistent and merged; (ii) lightning detection has been discussed with ET-SBR SO experts; (iii) the issue of data exchange between countries (e.g.

					<p>through MoUs or other mechanisms) has been addressed in the SoG. ET-EGOS-6 requested PoC to further update the SoG to take into account the following elements:</p> <ul style="list-style-type: none"> • The SoG will be reorganized as following: (i) Gaps in quantity and quality; (ii) New developments; and (iii) Gaps in Capacity Building; • Duplication to be removed; • Meteorological concepts/features to be considered; • Encouraging met services to be more open regarding data policy for cross-border data exchange (not only global data exchange); • Adding new variables: e.g. fresh deposit of snow; • New issues as proposed by the PoC to be added.
4	Seasonal to Inter-annual Forecasts	Laura Ferranti (ECMWF)	April 06/April 08 Approved ET-EGOS-4 (July 2008)	13 May 2011	<p>Information on data needs for long-range forecasting has been added, as well as a brief introduction to the physical basis for seasonal and inter-annual climate prediction for outside reader. References to requirements for GFCS have been added (i.e. the operational part of the climate requirements), as well as References to the requirements for the global Numerical weather prediction. In the recent years the capabilities in sub-seasonal predictions have developed substantially, and a paragraph added to reflect those needs. These changes were incorporated in a revised version (dated 13 May 2011). ET-EGOS-6 requested the PoC to further update the SoG to take into account the following elements: (i) there is a gap between the GNWP and the SIAF around the monthly prediction; and (ii) adding a paragraph in the SoG so that it is addressing the monthly requirements (PoC to confirm that it does not introduce additional requirements in the database).</p>
5	Aeronautical Meteorology	Jitze van der Meulen (NL)	August 2009 (approved by ET-EGOS-5)	May 2011	<p>There has been discussions between the ET-EGOS Chair and the new Point of Contact, Dr Jitze van der Meulen (Netherlands) on how to take ET-EGOS-5 recommendations into account, including (i) the consideration of new set of localized requirements for airports, (ii) new deficiencies to be included in the EGOS IP, and (iii) making the SoG and associated user requirements consistent with the statement in the SoG that it addresses requirements additional to those for NWP and Nowcasting. The SoG has been updated in May 2011, including for user requirements for meteorological services at airports (the terminal zone). The database table is extended with user requirements, specific for meteorological services at airports. Some variables had to be introduced for the EGOS table of variables. The update/extension is largely based on existing Standards and Recommended Practices (SARPs) as documented in the WMO Technical Regulations and the knowledge and experience of the author. Requests to a number of recommended experts to supply comments and additional material did not result in any reply. As a consequence a second try</p>

					shall be taken to complete the table (in particular issues stated with 'To Be Delivered', TBD). ET-EGOS-6 requested the PoC to update the SoG so that (i) SoG is a true gap analysis; (ii) "icing on the wings" (supercool liquid water) requirements are added; and (iii) turbulence requirements are added.
6	Atmospheric Chemistry	Oksana Tarasova (WMO)	July 2004 Approved ET-EGOS-1 (Dec 2005)	No	Discussions took place between Len Barrie (WMO Secretariat) and the Chair on how to handle the URs and SoG for Atmospheric Chemistry in future. A mechanism similar to that used for Climate Monitoring has been proposed. ET-EGOS-5 agreed that (i) the GCOS model should be used (i.e. the adequacy report being seen as a SoG) to address Atmospheric Chemistry and avoid duplication of work; (ii) the WMO database needs to be updated with Atmospheric Chemistry requirements and observing systems capabilities; and (iii) a dedicated study should be made for the impact of the space based component of the GOS (virtual constellations). Further guidance was provided by the Chair in March 2010. The new Point of Contact, Oksana Tarasova (WMO Secretariat) has been nominated in early 2011 and has been communicating with the CAS community in order to revise the SoG. ET-EGOS-6 requested the Poc to liaise with the GAW community and update the SoG with some recommendations.
7	Ocean Applications	Ali Mafimbo (Kenia)	Nov 2009 (approved by ET-EGOS-5)	No	Requirements for Ocean Application were submitted to the Database in May 2011. The current version of the SoG (December 2009) needs some revisions per ET-EGOS-5 & ET-EGOS-6 recommendations (waves, sea-level, polar regions, satellite data for non-climate variables, make ref. to requirements).
8	Agricultural Meteorology	Mr Robert Stefanski (WMO)	Mar 2011 (approved by ET-EGOS-6)	No	ET-EGOS-5 requested ET-EGOS Chairperson to review the SoG and address to what extent (i) is this a gap analysis; and (ii) this an homogeneous application area. Some dialogue on how the new SoG might be restructured, and guidance was provided by the Chair in February 2010. A consultant has been recruited to produce a new SoG, which was then sent to the Chair in March 2011 for review. User Requirements have also been provided to the WMO Secretariat for the Database in late March 2011. The March 2011 version was approved by ET-EGOS-6. ET-EGOS-6 requested the PoC to address outstanding issues and produce an updated version of the SoG.
9	Hydrology	Wolfgang Grabs (WMO)	July 2008 Approved ET-EGOS-4 (July 2008)	June 2011	ET-EGOS-5 requested the Point of Contact to address the following needs: (i) Appropriate terminology with regard to hydrological radars; and (ii) Small basins which can also produce flash floods. The Chairperson reviewed the SoG and addressed to what extent it is a gap analysis, and an homogeneous application area. Some dialogue then took place between the Chair and the Point of Contact on how the new SoG might be restructured, and guidance was provided by the Chair in Feb 2010. The Issue was raised at the Advisory Working Group (AWG)

					<p>of CHy in April 2010³¹. It appears that regional aspects easier to address than global ones. There are also significant gap between the local and regional needs of the operational NMHS and the aspirations and goals of the atmospheric modelling community. The Team noted with concern that the SoG is regarded as low priority issue by the CHy. The AWG asked the WMO Secretariat to make proposal (with resource requirements) at the next AWG meeting. A new updated version was proposed by the Point of Contact in June 2011 taking into account the comments from the ET-EGOS Chair.</p> <p>ET-EGOS-6 agreed that SoG required further review and updating by the CHy, and its Advisory Working Group (AWG), taking into account the following elements: (i) the Section "identification of gaps" needs to be completed; and (ii) the statement on S-Band Doppler radar needs to be addressed and written in a more generic way (following correspondence with Vaisala).</p>
10	Climate Monitoring	GCOS Secretariat	ET-EGOS-2 (July 2006) accepted GCOS Adequacy Reports and the Implementation Plan as SOG	2010	<p>ET-EGOS-2 (July 2006) accepted as SOG the following documents: (i) GCOS Report on the Adequacy of the global climate observing systems (GCOS-48, October 1998); (ii) GCOS Second Adequacy Report (GCOS-82, 2nd, April 2003) GCOS Implementation Plan (GCOS-92, October 2004); (iii) Satellite Supplement to the GCOS Implementation Plan (GCOS-107, September 2006); and (iv) Progress Report on the Implementation of the Global Observing System for Climate in Support of the UNFCCC 2004-2008 (GCOS-129, August 2009). The 2010 update of the GCOS-IP is treated as an updated element of the SoG. ET-EGOS drafted a response to make sure the EGOS-IP reflects the GCOS IP-10. AOPV-XVI (2/2011) noted that revision would be necessitated in part from the updating of the Satellite Supplement but that there were other matters to be clarified. The AOPC Chair undertook to discuss these with other interested parties.</p>
11	Climate Applications (other aspects - CCI)	William Wright (Australia)	April 2010	June 2011	<p>ET-EGOS-5 noted that for the quantification of user requirements, the CCI would adopt the GCOS requirements. Hence the GCOS adequacy report and GCOS IP would provide for the SoG for that part. ET-EGOS-5 also noted that the updated 2010 GCOS IP includes elements of regional requirements for climate data and observations but is not complete in that regard. A new draft SoG was circulated in February 2010 among selected CCI experts before CCI-XV. It was also reviewed by the ECSN Advisory Committee in mid-March 2010. A revised SoG was then provided by R Heino in March 2010, and approved by John Eyre in April 2010. That revised SoG stated that GCOS User Requirements cover CCI</p>

31 : <http://www.wmo.int/pages/prog/hwrrp/chy/documents/AWG-2FinalReport.pdf>

					<p>requirements. Some queries were raised at ICT-IOG about whether GCOS material adequately covers regional climate applications. The CCI OPACE-4³² was invited to review the 2010 version of the SoG on climate applications. The CCI Task Team on User Interface (TT-UI) also reviewed the document in April 2011, and provided a significant revision to the earlier SoG, using the inputs of CCI OPACE 4. CCI OPACE 1³³, through Dr William Wright, also contributed important revisions to the SoG, as the SoG in its current design is broader than the applications areas. This new version has been submitted in May 2011 prior to ET-EGOS-6. Aspects of CCI requirements not already addressed by GCOS have been identified and included in the SoG.</p> <p>ET-EGOS-6 requested the PoC to further update the SoG taking into account new data sources (e.g. AMDAR, wind profilers, remote sensing), surface manual observations which are not ECVs, automated observations, regional requirements not covered by GCOS, additional GFCS requirements, data rescue. The SoG should be turned into a true gap analysis.</p>
12	GTOS	John Latham (GTOS Programme Director)	No	No	<p>These requirements include the non GCOS requirements of GTOS. The Point of Contact was asked to provide User Requirements and a Statement of Guidance but no feedback has been received so far.</p>
13	Space Weather	Terry Onsager (USA)	No	No	<p>ET-EGOS-5 proposed to add Space Weather as a new Application Area. Mr Terry Onsager (NOAA, USA) has been nominated as Point of Contact for Space Weather Application Area, and has been discussing the variable names, user requirements, and issues with the ET-EGOS Chair in early 2011. The Inter-Programme Coordination Team on Space Weather (ICTSW) is now finalizing the initial requirements for Space Weather observations, and anticipates to conduct the requirements review and gap analysis over the next year in the view to eventually submit the Statement of Guidance.</p>

Notes:

ET-EGOS-6 responded to the requirements of CBS-Ext.(2010) to ensure that any particular requirements of Polar Meteorology are captured through the ongoing RRR process. The Team agreed that the Global Cryosphere Watch (GCW) should not be regarded at this stage as a specific Application Area. Instead, the Team requested the Points of Contact of all Application Areas to review the information provided by the Secretariat during the meeting (ET-EGOS-6 doc 8.3.2(10/3)) and revise their user requirements and SoGs if necessary. ET-EGOS-6 proposed to adopt the same approach than for GCOS, i.e. regarding a list of documents maintained by the GCW as Statement of Guidance. Such documents include for example the Integrated Global Observing

32: OPACE-4: Open Panel of CCI experts on Climate Information for Adaptation and Risk Management

33: OPACE-1: Open Panel of CCI experts on Climate Data Management

Strategy (IGOS) Cryosphere Theme (“CryOS”) report.

Per ET-EGOS-5 recommendation, the Synoptic Meteorology Application Area has been merged into the Nowcasting and Very Short Range Forecasting Application Area.

ET-EGOS-5 suggested that the following applications should be addressed:

- (i.) Space Weather. Space weather events affect the meteorological infrastructure through their impact on environmental satellites, navigation satellites (e.g. GPS) and space-based telecommunication systems; they also represent a potential hazard for aviation and some large ground-based facilities. Critical phenomena to be monitored include solar radiation storms, high-energy particle rain, ionospheric and geomagnetic storms, and radio black-out by X-ray photons. This requires permanent measurements in the area of e.g. Solar imagery, High- and Low-energy particle detection, and Electron density. Refining these observation requirements is a prerequisite towards the standardization of Space Weather instruments that WMO is now expected to support.;
- (ii.) GTOS requirements for understanding the global carbon cycle and related climate change issues. For consistent and comprehensive monitoring of the carbon cycle, ecosystems, forests and land dynamics in general, both long-term sustained observations of Essential Climate Variables as well as regionally-focussed, intermittent measurements of other variables (and their fluxes) for process-type studies are required. A comprehensive gap analysis of existing capabilities in relation to needs is yet to be undertaken. Such an analysis should build on the existing SoG for Climate Monitoring (ie. the GCOS Second Adequacy Report, the GCOS IP and its 2010 Update) as well as the status reports on the development of standards for terrestrial ECV (<http://www.fao.org/gtos/topcECV.html>).

ET-EGOS-5 recognized that many GTOS requirements are being already considered by GCOS, but not all of them. The Team requested the Secretariat to identify PoC who should be invited to identify those requirements that are not covered by GCOS (i.e. the non GCOS requirements of GTOS) (action; Secretariat; Mar 2010).

ET-EGOS-5 invited the Inter-programme Coordination Team on Space Weather (ICTSW) to address user requirements on space weather, and provide feedback to the ET-EGOS Chairperson on the list of relevant Applications.

Reference: Current versions of Statements of Guidance
<http://www.wmo.int/pages/prog/sat/RRR-and-SOG.html>
