W O R L D M E T E O R O L O G I C A L O R G A N I Z A T I O N

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COMMISSION FOR BASIC SYSTEMS

OPEN PROGRAMME AREA GROUP ON INTEGRATED OBSERVING SYSTEMS

EXPERT TEAM
ON SATELLITE UTILIZATION AND PRODUCTS

FIRST SESSION

GENEVA, SWITZERLAND

17 – 21 OCTOBER 2005

FINAL REPORT

Regulation 42

Recommendations of working groups shall have no status within the Organization until they have been approved by the responsible constituent body. In the case of joint working groups the recommendations must be concurred with by the presidents of the constituent bodies concerned before being submitted to the designated constituent body.

Regulation 43

In the case of a recommendation made by a working group between sessions of the responsible constituent body, either in a session of a working group or by correspondence, the president of the body may, as an exceptional measure, approve the recommendation of behalf of the constituent body when the matter is, in his opinion, urgent and does not appear to imply new obligations for Members. He may then submit this recommendation for adoption by the Executive Council or to the President of the Organization for action in accordance with Regulation 9(5).

EXECUTIVE SUMMARY

The first session of the Expert Team on Satellite Utilization and Products met in Geneva, Switzerland, 17–21 October 2005. Primary objectives for the meeting were to: analyze the biennial questionnaire as the first step in the Strategy to Improve Satellite Utilization (discussion starts in Chapter 4); discuss the use of Advanced Dissemination Methods (ADM) and Regional ATOVS Retransmission Service (RARS) towards the establishment of an Integrated Global Data Dissemination Service (discussion starts in Chapter 5); a review of present and future R&D satellite data and products availability and application (discussion starts in paragraph 6.1); and to review the current status of the Virtual Laboratory for Education and Training in Satellite Meteorology (VL) and its Management Group (discussion starts in paragraph 7.1).

There were three major outcomes resulting from the session: affirmation of the summary analysis on the status of the availability and use of satellite data and products by WMO Members that will be included in a new WMO Space Programme Technical Document (SP-2) as well as a revised structure for future versions of the questionnaire; a refinement of the concept for a WMO Integrated Global Data Dissemination Service (IGDDS) through the integration of regional Advanced Dissemination Methods (ADM); and advancement of the Virtual Laboratory for Education and Training in Satellite Meteorology through a high profile training event. Conclusions and recommendations resulting from the summary analysis of status of the availability and use of satellite data and products for 2003 can be found in paragraphs 4.2. The refined IGDDS concept and relationships to ADM can be found in paragraphs 5.11. A description of the VL high profile training event can be found in paragraphs 7.9 and 7.10.

First row, right to left: Dr Donald Hinsman, Dr Alexander V. Nerushev, Dr Masami Tokuno, Mr Richard Francis, Dr Vilma Castro, Mr Sory Diallo, Mr Wolfgang Benesch, Mr Anthony Mostek, Dr Jian Liu, and Mr Xiaoxiang Zhu

Second row, right to left: Mr Jeff Wilson, Mr L.A. Toledo Machado, Mr Jérôme Lafeuille (Chairman), Dr Natália Archinard, Dr Robert Husband, Dr Col Paolo Pagano, Dr James Purdom, and Dr Volker Gärtner

1. ORGANIZATION OF THE SESSION (*agenda item 1)*

1.1 Opening of the session (*agenda item 1.1*)

The first session of the Expert Team on Satellite Utilization and Products was held at the Headquarters of the World Meteorological Organization (WMO) in Geneva, Switzerland, from 17 to 21 October 2005.

The session was opened at 09h30 on Monday, 17 October 2005 by Prof. Hong Yan, Deputy Secretary-General. In his opening remarks, he described the decision by the Fourteenth WMO Congress in May 2003 to establish a new major cross cutting Programme, the WMO Space Programme. The Fourteenth Congress also assigned lead responsibility for the WMO Space Programme to the Commission for Basic Systems. He noted that the establishment of a new major WMO Programme was a reflection of the great importance placed on the exploitation of satellite data, product and services by WMO Members.

He also informed the session that in January 2004 the fourth session of the WMO Consultative Meetings on High-level Policy on Satellite Matters had recommended that CBS establish a new OPAG IOS Expert Team on Satellite Systems (ET-SAT) while retaining the Expert Team on Satellite Utilization and Products (ET-SUP). ET-SAT was identified as important in order to provide advice on satellite system level needs for WMO Programmes in response to the new WMO Space Programme. ET-SUP will focus on improving satellite system utilization and products. Both Expert Teams will work within the CBS Open Programme Area Group on Integrated Observing Systems thus ensuring close coordination across WMO programmes.

In his concluding remarks, he thanked the session participants for their expertise as well as their organizations for the contributions made over the years in support of the objectives of the World Meteorological Organization.

1.2 Adoption of the agenda *(agenda item 1.2)*

The agenda for the session was adopted and is reproduced in Appendix II. Appendix I contains a list of participants for the session.

1.3 Working arrangements for the session

The working arrangements for the session were agreed upon. It was also agreed that the work of the session would be conducted mainly in Plenary and Working Groups as appropriate.

2. CHAIRMAN'S REPORT (*agenda item 2*)

2.1 The Chairman noted that this was the first session of ET-SUP since its establishment by CBS-XIII in St Petersburg in February 2005. The Chairman expected to focus the team's activities on user aspects, i.e., to analyse the actual use of satellite data and products, identify limiting factors and propose actions to alleviate them. CBS had explicitly tasked ET-SUP to review in particular two issues that were known to be critical for the usability of satellite systems: user training through the Virtual Laboratory for Education and Training in Satellite Meteorology (VL), and data dissemination mechanisms, aiming at implementing an Integrated Global Data Dissemination System (IGDDS).

2.2 The Chairman indicated that the session would address all the items listed in the work programme prescribed by the CBS, although not necessarily with the same emphasis. In particular, he anticipated the following:

- A review of the outcomes of the questionnaire on the use of satellite data with a discussion on how to improve the representativity of such a survey in future;

- Elaboration for a “high-profile training event” in 2006;

- A refinement of the concepts for Integrated Data Dissemination Service (IGDDS) building on rapid development of Advanced Dissemination Methods (ADM) and Regional ATOVS Retransmission Service (RARS).

2.3 Discussions should also be initiated, at least at a preliminary stage, on issues related to R&D satellite data, to the evolution of the space-based GOS and to GCOS implementation plan.

3. RELEVANT ACTIVITIES OCCURRING AT THE WMO CONGRESS, CONSULTATIVE MEETINGS, CGMS AND GEO *(agenda item 3)*

3.1 The session reviewed activities relevant to the work of the Expert Team on Satellite Utilization and Products (ET-SUP) that occurred at: the Fourteenth WMO Congress (Cg-XIV); sessions of the WMO Consultative Meetings on High-level Policy on Satellite Matters (CM); the Coordination Group for Meteorological Satellites (CGMS); the thirteenth session of CBS (CBS XIII); and within the process established at the Third Earth Observation Summit (EOS-III) including activities by the intergovernmental Group on Earth Observations (GEO) to implement a Global Earth Observation System of Systems (GEOSS).

3.2 The session also reviewed action items resulting from ET-SSUP-5 and noted that while most had been completed, the actions that remained open related to the biennial questionnaire. The session agreed to consider the open action items during consideration of the analysis of the biennial questionnaire under agenda item 4.

3.3 The Chairman underlined that the GEOSS context reinforced the importance of the WMO Space Programme and pointed out that the outcome of the previous Expert Team on Satellite System Utilization and Products had been regularly taken into account by the WMO Executive Council (EC) and Congress which reflects the value and impact of the work expected from this session.

4. REVIEW STRATEGY TO IMPROVE SATELLITE SYSTEM UTILIZATION *(agenda item 4)*

4.1 The session reviewed an analysis of responses to a questionnaire that was distributed in 2003 to WMO Members in order to assess the status of the availability and use of satellite data and products by WMO Members. The session agreed to the comments and main recommendations that should be reflected in the new Technical Document entitled “Status of the Availability and Use of Satellite Data and Products by WMO Members, 2005”, (WMO/TD No. 1296 SP-2). These comments and recommendations are provided in Appendix VI.

4.2 The session emphasized the importance of the questionnaire which is felt as an essential tool to collect user feedback, to monitor the progress in the use of satellite data, identify issues and thus provides the ground to define actions in order to further improve the usability of satellite products and the user ability to take benefit from them. The session extensively discussed the biennial questionnaire with a view to improve its representativity, and decided to establish a working group focusing on this issue.

4.3 Based on the recommendation to improve the number of responses to the biennial questionnaire, the session proposed a formulation and schedule of activities for the next editions of the biennial questionnaire taking into account the views of the session as expressed during the discussion of the analysis of the last questionnaire.

In general, the session felt that the questionnaire should be constructed and carried out so as to further the agreed Strategy to Improve the Utilization of Satellite Data, and in particular:

- To promote wider availability and meaningful utilization of satellite data round the globe from both operational and R&D satellites;
- To monitor these aspects in order to identify limiting factors, design relevant actions and priorities and check the outcome of these actions.

4.4 Several potential changes to the next questionnaire in order to improve the level of response were discussed. It was concluded that some could be incorporated in the next edition whereas practical difficulties would mean that others could only be considered for future editions.

4.5 The next edition of the questionnaire (in 2006) would be distributed, as in the past, in the English language only. The questionnaire should be made available in electronic form via the WMO web server. From the 2008 edition onwards, the questionnaire should be available in each of the 6 official languages of WMO and should be accessible in a web-based version enabling direct online input.

4.6 Bearing in mind the effort that is likely to be required to implement a fully functional web-based online questionnaire, the session recommended that the WMO Secretariat consider beginning the associated work as soon as practical.

ACTION 1.1 WMO Secretariat to establish and implement as soon as practical a fully functional web-based online questionnaire.

4.7 It was agreed that some new and important elements should be introduced into the questionnaire process as follows:

- Permanent Representatives should be requested to acknowledge receipt of the Questionnaire, indicating their willingness (or otherwise) to take part and notify WMO of the name of a local person to act as national coordinator of the activity;
- The WMO Space Programme should implement a Helpdesk function to provide help and guidance to national coordinators as requested;
- The WMO Space Programme should issue a reminder to the national coordinator in the event that no completed questionnaire is received by the due date;
- Each national coordinator should be positively encouraged to gather information from all relevant institutions within the country (possibly by distributing copies of the questionnaire as appropriate) and to forward all responses to WMO via the PR.

Proposed Schedule of Activities

4.8 The following table contains the proposed schedule of activities associated with the preparation, release and analysis for the 2006 questionnaire.

Table 1

Date	Event
20 October 05	Final principle structure
Mid-November 05	First draft (by R. Francis)
ca 25 November 05	Feedback from all members of the working group, J. Lafeuille and others
30 November 05	Second draft (by R. Francis)

Date	Event
1 December 05	Coordination, e.g., sub-group meeting with teleconference
12 December 05	Final version
Mid-January 06	Send out questionnaire + letter to PRs
Early February 06	Acknowledgement + Info on coordinator
End March 06	Due date for responses and analysis tools
End April 06	Reminder period + update the database
End May 06	Draft version analysis
Early June 06	ET SUP-2

ACTION 1.2 ET-SUP and WMO Space Programme Office to follow the timetable for the preparation of the next questionnaire and associated analysis and technical document.

Generic Approach to the Questionnaire Structure

4.9 Since the drafting of the questionnaire will occur after ET-SUP-1, the session felt it important to agree on a structural basis for the questionnaire in order that the drafting process could meet the broad expectations of the ET. To that end the following was proposed.

4.10 One unique version of the questionnaire will be sent both to the WMO Permanent Representatives and to the Centres of Excellence. The CoE would be invited to fill only the relevant sections.

4.11 The questionnaire will be based on a generic approach in which each section contains questions aimed at:

- Quantifying the subject (e.g., yes/no, how many, how much);
- Characterizing the subject (e.g. in what way);
- Estimating the change in the level of the subject (e.g., increase / decrease / same over past 2 years);
- Identifying the success / adequacy / sufficiency (or otherwise) of the subject (e.g., any data / functionality / knowledge needed that is not available,

Outline of the Cover Letter to the Permanent Representatives (PRs)

4.12 The following points should be covered in the cover letter to the questionnaire addressed to WMO PRs:

- The questionnaire and its purpose should be introduced including:
  - Population of the related WMO database;
  - Tracking trends in data access and usage;
  - Detecting areas for potential improvements;

- Some potential benefits should be described with examples of what has already been achieved, for example:
  - New products have been introduced that meet the user needs expressed in previous Questionnaires (e.g., rainfall estimate);

  - Increased training effort has been supported to enhance the user knowledge base needed for effective data exploitation;
  - The Virtual Laboratory for Training in Satellite Meteorology has been continuously enhanced to meet stated user training needs;
  - New methods of data access (e.g., ADMs) have been introduced and are continually under review to widen and simplify user access to satellite data.

- An assurance on confidentiality should be provided including:
  - Information will be used only for intended purposes;
  - No information will be conveyed to other parties without the expressed consent of the user;
  - Indications of deficiencies are valuable responses, they are not admissions of failure.

- The role and importance of the country coordinator should be explained;
- The acknowledgement letter & its purpose should be explained;
- The means to access an electronic version of the Questionnaire should be described;
- The Helpdesk function should be described;
- The due date for responses should be given;

Outline of the Acknowledgement Letter

4.13 The acknowledgement letter from the PR to the WMO Secretary-General should be provided in 'skeleton form' and contain the following points:

  - We (*country*) are pleased to acknowledge ….
  - I confirm (country)'s intention to take part … and … I would like to inform you of our national coordinator
    - Name
    - Email

OR

  - I regret that we will be unable to take part …

Guidance for the National Coordinator

4.14 It was felt that the National Coordinator would benefit from being given some guidance as to his/her role. The following should be included in such guidance notes.

4.15 The National Coordinator should be requested to gather responses from entities in his/her country which would be governmental authorities with operational activities using, or with the potential to use, satellite data, products and services in the areas of:

- Meteorology,
- Hydrology,
- Ocean,
- Climate,
- Environment,
- Disaster monitoring and risk reduction,
- Security,
- Others as appropriate.

4.16 When he/she has gathered the response(s) for his/her country then he/she should return it/them to WMO through his/her Permanent Representative. In addition, he/she should send the response(s) by electronic means (e.g., email attachment) to the WMO Space Programme

Helpdesk. The Helpdesk may offer assistance if a response has not been received by the due date.

Open Actions from ET-SSUP-5

4.17 All open actions from ET SSUP-5 relating to the Biennial Questionnaire were considered and most of them could be closed. Those remaining open will be closed by the next edition of the Questionnaire in 2006, with the exception of the action regarding an interactive online version that will remain open until the 2008 Questionnaire.

5. EXTEND THE ADM CONCEPT TO AN IGDDS *(agenda item 5)*

5.1 The session reviewed Regional ATOVS Retransmission Service (RARS) activities during 2004. It noted that a CGMS/WMO RARS workshop had been held on 16-17 December 2004 and hosted by EUMETSAT at its Headquarters in Darmstadt, Germany to discuss possibilities towards the development of RARS and IGDDS. At the workshop, a number of currently unfulfilled user requirements for ATOVS data were identified around the globe. In order to meet some of these unfulfilled user requirements, two RARS were proposed during the workshop: South American RARS; and Asia-Pacific RARS.

5.2 The session also noted at the Sixth Asia-Pacific Satellite Data Exchange and Utilization (APSDEU) meeting held in Seoul, Republic of Korea in June 2005, that the architecture of the Asia-Pacific RARS was further consolidated, an Asia-Pacific RARS coordinator was nominated and an implementation plan was sketched. In the short-term, APSDEU decided to implement a first phase including a baseline network of 12 HRPT stations and up to 4 processing nodes (Melbourne, Tokyo, Beijing and Seoul), with data concentration and dissemination via FTP over the GTS. This telecommunications solution should meet the immediate needs of the ATOVS user community. In a second phase, further stations would be added and other dissemination modes would be considered. A third phase could involve the expansion of the Asia-Pacific RARS to include other data types beyond ATOVS. Advanced dissemination methods would be a prerequisite if the scope of the system were to be expanded to include additional products, such as AVHRR data, with its more diverse user community.

5.3 The session then noted that a WMO RA III RARS Workshop had been held in Buenos Aires, Argentina, 6-7 September 2005. The purpose of that workshop was to further define the proposal for a South American RARS that had been tentatively outlined at the CGMS/WMO RARS workshop held in Darmstadt, 16-17 December 2004. At this workshop in Buenos Aires, a further 9 HRPT stations (6 in Brazil and 3 in Chile) were identified for possible inclusion within the RA III RARS collection network. Also, Brazil kindly offered to host a RARS processing and distribution centre. In addition, the participants of the workshop clearly recognized the need to appoint an RA III RARS Coordinator who could represent the RA III RARS on matters relating to the global RARS network (and would participate in the global RARS workshops). Finally, the session was informed that at a forthcoming global RARS workshop, to be held in Geneva on 1-2 December 2005, it was envisaged that the following issues would be addressed:

- further refinement of regional data requirements;
- implementation status of the South American RARS;
- implementation status of the Asia-Pacific RARS;
- discussion of proposed standards for RARS operators;
- documentation of the global RARS architecture
- possible evolutions of the global architecture to accommodate new observing systems (e.g., NPP, NPOESS and Metop).

5.4 The session also addressed the wider issue of the Integrated Global Data Dissemination Service (IGDDS) and reviewed its present description. The session noted the WMO Executive Council had agreed that the IGDDS should integrate all the aspects of satellite data exchange and dissemination required by WMO programmes. This would potentially include the following data sources:

- Imagery and other data from GEO satellites operated in the region;
- Global data dumped from LEO satellites operated within the region;
- Sounding data from LEO satellites collected and processed by a RARS within the region;
- Other data from LEO satellites collected and processed through a mechanism similar to RARS;
- Products derived by the satellite operator(s) or other processing centres in the region;
- Data from R&D satellites operated and/or processed within the region.

5.5 In order to progress with the long-term vision of the IGDDS, the session discussed the IGDDS as a collection of regional data dissemination services, each of them being in charge of one or several WMO Regions, and thus being responsible for:

- ensuring that the data needs of the relevant WMO Region(s) are fulfilled, either by internal data (acquired/generated within the region) or by external data (received through exchange with other regions);
- making available to other regions the relevant data acquired or generated within the region.

5.6 Inter-regional data exchange requirements would result from the comparison of data sources and data needs of each region.

5.7 The increasing need to access global sets of data would require to considerably expand the inter-regional data exchange mechanisms beyond the existing arrangements such as:

- global sounding or radiance data from NOAA/NESDIS sent to Europe and Asia-Pacific;
- Foreign Satellite Data Service collecting GOES and MTSAT imagery for EUMETSAT users;
- operational link between NOAA/NESDIS and EUMETSAT for the Initial Joint Polar System.

5.8 The session stressed that the development of efficient data dissemination services had to be pursued with the highest priority in order to meet the increasing needs for satellite data from operational and R&D satellites. It considered that IGDDS should take into account the collection, management and dissemination of satellite data up to a level that met the user requirements of the different communities.

5.9 The session recognized that ADMs used for the dissemination of satellite and other data would have a regional coverage and confirmed that the dissemination function should be provided over regional dissemination areas. The satellite operators of operational geostationary and polar satellite systems within a region would be the main data and product providers. These satellite operators are expected to take responsibility for implementing and operating regional dissemination services, relying in most cases on commercial service providers. They would thus play the role of Data Collection and Product Centres (DCPC) with reference to the WMO Information System (WIS).

5.10 The session concluded further that, for the implementation of the IGDDS, four discrete dissemination service areas might be sufficient, which would be a slight evolution from the IGDDS

description in the WMO Space Programme Implementation Plan. It considered that each dissemination service coverage should be defined with reference to the location of the primary users of geostationary services, and thus be consistent with the field of view of the different geostationary meteorological satellite systems.

5.11 The session highlighted the fact that the scalability of the ADMs would be an essential feature to ensure the flexibility to adapt the systems for changing user requirements in terms of additional user communities and additional data sources. It was anticipated that not only the amount of satellite data, but also the amount of processed data into intermediate and final products would increase significantly in the years to come. As an example the gradual availability of the multi satellite products generated by EUMETSAT's SAFs was given. ADMs would be of special value for providing an operational infrastructure for data distribution from R & D satellites. Furthermore, non-satellite information such as the basic meteorological data in WMO Regional Association VI was becoming an important add-on to the satellite data and products within the IGDDS.

5.12 The session emphasized the need to proceed with the implementation of the regional ADMs. It was recognized for the European, Africa and North Atlantic area that the EUMETCast service as operated by EUMETSAT was an already existing ADM. It would be highly advisable to aim for an operational implementation of the remaining ADMs for the other regions by January 2007. This timeframe would be compatible with the previous discussions of ET-SSUP-5 and the establishment of the first component of the Initial Joint Polar System (IJPS) of NOAA and EUMETSAT, operating NOAA-18 and METOP-A, thus enabling agreed global exchange of these data.

5.13 It was also noted that "the APSDEU-6 meeting in Seoul in June 2005 invited WMO to investigate possible options for trials of alternative dissemination mechanisms in the Asia-Pacific region." This implementation should be seen as the next priority for implementation because in that area a multitude of satellites (e.g., FY-2, MTSAT, Korean COMSAT) exist. A single dissemination system would be a distinct advantage to RA II and RA V Members, where a large user community existed.

5.14 It was also noted that the implementation of the WMO RARS service could pave the way for the operational implementation of the IGDDS.

5.15 Concerning the relation of the IGDDS and the WIS the session concluded that the implementation of the IGDDS would constitute a core contributor to WIS.

5.16 Finally, the session also commented that for the provision of satellite and other data by means of IGDDS in due time, service level agreements with the operators of the ADMs would have to be agreed. It was assumed that generally the operational satellite operators within CGMS could take up these obligations.

5.17 The session refined the description of IGDDS as contained in the WMO Space Programme Implementation Plan 2004-2007, as well as a definition proposed by WMO Secretariat. The agreed definition is contained in Appendix VIII. The updates to the Implementation Plan are described in Appendix IX.

ACTION 1.3 WMO Space Programme to report to CGMS on the outcome of ET-SUP discussions on IGDDS; in particular the goal to implement by January 2007 remaining ADMs with high priority for the Asia-Pacific region.

6. REVIEW PRESENT AND FUTURE R&D SATELLITE DATA AND PRODUCT AVAILABILITY AND APPLICATION *(agenda item 6)*

6.1 The session reviewed a draft list of R&D satellite data and product availability and application that reflect operational user needs. The session agreed to base recommendations not

only from R&D satellites now participating in the space-based component of the GOS but also from R&D missions that would be of value to WMO Members but not yet part of the space-based component of the GOS.

6.2 The session agreed on several key areas for satellite observations based on responses from the questionnaire for high-priority geophysical parameters not available to WMO Members included R&D missions that would be of great value if included in the space-based component of the GOS.

Precipitation

6.3 Precipitation is a key variable for many areas of environmental monitoring, prediction and climate. Spatial and temporal rainfall variability and occurrence of extreme events at regional scales require high-density observations. Assimilation of precipitation data contributes to improving numerical weather prediction.
GPM constellation (JAXA/NASA) would be very important for operational use for climate, hydrology and meteorology.

Cloud Microphysics

6.4 Understanding cloud water content, its properties and characteristics is important to parameterize and validate cloud/precipitation processes in numerical weather and global climate models and to determine the earth's radiation balance.
Missions – see Aerosols and Trace Gases

Aerosols and Trace Gases

6.5 (Atmospheric Chemistry and Air Quality) - These observations are important components for climate models and studies, radiation budget, and to monitor and forecast atmospheric pollution. Important products include total column and profile of aerosols, particle size and optical properties. Examples of operational use include assimilation into Numerical Weather Prediction and Climate models and for air quality monitoring.
Examples of Current R&D Missions
AQUA/TERRA – MODIS & AIRS (NASA)
Missions with LIDAR - PARASOL (CNES)
Examples of Future R&D Missions
Glory (NASA)

Winds - Atmospheric Motion Vectors (AMVs)

6.6 AMVs are critical to many areas of environmental monitoring and prediction. Some applications include: Coupled Models, Numerical Oceanic and Weather Predictions Models, Tropical Weather Analysis and Warnings, Aviation, Fire Weather. New missions including Doppler Wind Lidar sensors will provide three-dimensional observations of winds.
Missions – QuikSCAT (NASA with NESDIS support) is a very positive example.
ERS (ESA) – very positive
ADM-Aeolus (ESA) – wind mission with active Doppler Wind Lidar
ENVISAT (ESA) – if data could be available in near real-time, would be very valuable for many users

Land Surface and Ocean Parameters (Soil Moisture, etc.)

6.7 Land and Ocean Surface parameters (Soil moisture) are important for many applications such as agriculture, identification of potential famine areas, irrigation management, and land use monitoring (erosion and desertification) and for Environmental and NWP models. Operational use can provide substantial contribution to NWP models and environmental monitoring. Passive

microwave sensors that detect surface emission are used, although signal is very small. Active microwave instruments based on SAR are needed to measure soil moisture at high spatial resolution.
Missions – AQUA /AMSR/E (NASA), FY-3/MWRI (China), SMOS (ESA), ALOS (JAXA), ASAR/ENVISAT (ESA)

Disaster Monitoring

6.8 Real-time disaster monitoring is required across large areas, in all weather conditions, day and night. Examples of disaster monitoring include flood, drought, fires, earthquake/landslide, sand/dust storms, tsunami, volcanoes, snow/ice cover, red tide, etc.
Missions - Earth monitoring satellites (Vulkan-Kompas-2 (Russia) and others (LANDSAT, SPOT, CBERS)).
ENVISAT (ESA) – if data could be available in near real-time, would be very valuable for many users – especially for disaster monitoring/mitigation.
Disaster Monitoring Constellation (DMC) (CNSA, China) includes 2 optical satellites and 1 SAR satellite plus another DMC with 4 optical satellites and 4 SAR satellites.

6.9 The session reiterated the interest for R&D satellite data listed above. It recalled difficulties experienced in the past to access such data in near-real-time data from missions contributing to the global observing system and agreed to the following actions:

ACTION 1.4 WMO Space Programme to inform satellite operators attending the 6th Consultative Meetings on High-level Policy on Satellite Matters (CM-6) on the requirement for near-real-time access to R/D satellite missions.

ACTION 1.5 WMO Space Programme to inform CM-6 of R&D satellite missions that would be of value to WMO Members and should become part of the space-based component of the global observing system

ACTION 1.6 The Chairman of ET-SUP to inform the next session of ET-SAT of the requirements for new R&D satellite missions as indicated above.

7. REVIEW CGMS/WMO VIRTUAL LABORATORY FOR EDUCATION AND TRAINING IN SATELLITE METEOROLOGY (VL) ACTIVITIES *(agenda item 7)*

7.1 The session reviewed the evolution, latest status and plans for the Virtual Laboratory for Education and Training in Satellite Meteorology (VL) including the results from the Pre-session meeting, Geneva, 13-14 October 2005 for the High-Profile Training Event (HPTE) planned for October 2006.

Evolution, Status and Plans for the VL

7.2 The session noted that the VL was presently a collaboration between four operational satellite operators and seven training centres (of whom five are WMO Regional Meteorological Training Centres). Two research and development satellite agencies were also members of the VL but neither sponsored a training partner.

7.3 The session noted that the activities and direction of the VL were overseen by the VL Management Group (VLMG) composed of at least one representative from each partner. The session also noted that it was expected to provide some guidance to the VLMG on WMO Member requirements.

7.4 The session noted the composition, languages and geographical distribution of the VL partners as depicted in the table below.

Table 2

Satellite Operator	Centre of Excellence	Primary language	WMO Region
EUMETSAT	Niamey (Niger) Nairobi (Kenya)	French English	RA I RA I
EUMETSAT and IMD	Oman	Arabic and English	RA II
NOAA NESDIS	CIMH (Barbados) UCR (Costa Rica)	English Spanish	RA IV RAIII & RA IV
CMA	Nanjing (China)	Chinese & English	RA II & RA V
JMA	BMTC (Australia)	English	RA V
ESA			
NASA			

7.5 The session noted two activities of particular interest: the success of the Regional Focus groups in RA III and RA IV, and the trial of the VL Electronic Notebook computers at, and, following the Regional Training Seminar held in Costa Rica in March 2005. The electronic notebook (a laptop computer) with all of the seminar tools, lectures and workshops was provided to each participant country through WMO to allow the participants to consolidate the learning from the Seminar, take part in the regional focus groups and train other staff. The electronic notebooks were provided through a funding grant from NOAA, and CIRA's offer to develop notebooks that include content from the Virtual Resource Library.

7.6 During the months following the Costa Rica training event electronic notebooks were provided to the RMTC's at Barbados, Niamey and Nairobi, and the sponsoring agency NSMC. Copies of the electronic notebook contents were also provided to other VL participants: EUMETSAT, the WMO Space Programme and the Australian Bureau of Meteorology (ABoM) Training Centre. In addition, the CIRA VL web site now mirrors the electronic notebook contents. The session noted that with the assistance of a grant from the Australian Government the participants from the South West Pacific on the APSATS Training Seminar (October 2006) will also be able to take VL notebooks back to their Member countries, and that for the global training event electronic notebooks, portable hard drives or web access to contents will be made available to WMO Members. The session noted with pleasure the strong positive impact of the VL notebooks found in a post Seminar survey of the users (Annex A)

7.7 The session was informed that EUMETSAT has also been very active in providing training with its two formal Centres of Excellence (Niamey and Nairobi), as well as with the South African Weather Service. The session noted that in line with the actions laid down by the second meeting of the VLFG the material on the EUMETSAT VRL has recently been updated and the VL partners will be invited to review the content to make sure all of the required metadata is present and correct and the material is still relevant.

7.8 The session was informed that the Japan Meteorological Agency (JMA) and the Bureau of Meteorology (Australia) have been operating a near real-time data server for SATAID for nearly two years. From the server it is possible to access near real-time data for MTSAT 1R and FY2C. The RMTC at Costa Rica is also investigating whether they can run a SATAID data server for the GOES E and GOES W satellites.

High Profile Training Event(HPTE)

7.9 The session was informed of the successful outcome from the Pre-session Meeting for a High-Profile Training Event (HPTE). The Pre-Session meeting had developed firm plans for the HPTE to be held in conjunction with the APSATS workshop in Melbourne and Regional Training Seminar in Nanjing, China, in October 2006. Conceptually the HPTE will work on three levels:

- providing a focus for a number of face to face training events around the globe;
- Linking the face to face events for some sessions (global image discussion and key presentation(s);
- providing a mix of face to face and online training with the NMHSs in the area of each Centre of Excellence.

7.10 Full details of the HPTE covering objectives, anticipated outcomes, core lecture content, interested parties, key milestones and risk minimization are provided in the HPTE Project Development Plan (Appendix IV). The session noted and agreed with the plans and asked the OPAG IOS Chair to provide CGMS with details at CGMS-XXXIII in Tokyo in November 2005.

ACTION 1.7 To provide CGMS with details of the HPTE Project Development Plan (IOS Chair).

ACTION 1.8 Co-Chairs of the VLMG to prepare a cover letter for the WMO Space Programme to send to all VLMG members regarding the HPTE. The letter should cover technical requirements to participate in the HPTE and include the Project Development Plan as an appendix.

Proposal for additional Centres of Excellence

7.11 The session was informed that the Permanent Representative of Argentina with WMO had written to WMO indicating that Argentina would formally nominate the RMTC in Buenos Aires to be recognized as a VL Centre of Excellence. Additionally, the Argentine Space Agency (CONAE) had indicated its interest in co-sponsorship of the RMTC in Buenos Aires as a Centre of Excellence. NOAA/NESDIS has also indicated its willingness to be a co-sponsor of this Centre of Excellence. Based on the combined knowledge of the members the session expressed initial impressions that the two components of the RMTC (University of Buenos Aires and the NMHS training institution) could meet all the necessary criteria to become a "Centre of Excellence"(see Appendix V). In this regard, the session reviewed a formal proposal for the new “Centre of Excellence”. The session agreed that the proposal conformed to the requirements to become a Centre of Excellence. It requested the WMO Space Programme to confirm to Argentina the expectations for a CoE, as well as the need for CONAE to become a contributing member to the space-based component of the Global Observing System. It expected that with the confirmation and in accordance with the approval process for the designations of a CoE that it would be able to make a formal recommendation to CBS at its next session.

ACTION 1.9 WMO Space Programme to confirm to Argentina the “expectations from the Centres of Excellence”.

ACTION 1.10 WMO Space Programme to invite CONAE to become a contributing member to the space-based component of the global observing system.

7.12 The session also noted the early development for a proposal for a Centre of Excellence in the Russian Federation. The establishment of Centres of Excellence in this area would provide a Centre of Excellence for each WMO Region as well as cover all WMO official languages.

7.13 The session was informed of training activities conducted at INPE/CPTEC (Brazil) for Portuguese-speaking meteorologists of WMO Members and of the willingness of INPE/CPTEC to

contribute to the Education and Training activities as a CoE. The session welcomed this statement of interest by CPTEC and encouraged CPTEC to consider further this possibility in coordination with the Permanent Representative of Brazil, and to follow the formal steps indicated in Appendix V. The session also welcomed this opportunity of a closer relationship with INPE towards its participation in the space-based component of the GOS. EUMETSAT took note of the statement by CPTEC to initiate the creation of another CoE for Portuguese-speaking WMO Members.

ACTION 1.11 To initiate discussions on INPE/CPTEC contribution to training activities as a Centre of Excellence, subject to confirmation of the proposals by the PR of Brazil.

8. REPORT FROM THE EXPERT TEAM ON EVOLUTION OF THE GLOBAL OBSERVING SYSTEM (ET-EGOS)

8.1 The session was informed of the status in the implementation for the evolution of the space-based component of the GOS with regard to satellite data and product utilization by WMO Members. The status was based on the 20 recommendations approved by CBS, at its thirteenth session held in St Petersburg, Russian Federation in February 2005 (CBS-XIII).

8.2 The twenty recommendations built upon known plans of the operational and R&D satellite operators and called for rigorous calibration of remotely sensed radiances, as well as improved spatial, spectral, temporal, radiometric accuracies. The wind profiling and global precipitation measurement missions were singled out for their importance to the GOS. Implementation of most of these recommendations would be realized through the WMO Space Programme working with space agencies, via CGMS.

8.3 The session noted the progress for the twenty recommendations, as well as activities for further implementation as indicated in Appendix VII. The session was of the opinion that considerable progress had already been achieved and activities planned for the near future would ensure a continued advancement of the evolution of space-based sub-system of the GOS. The session recognized that these recommendations should serve as a reference when discussing the potential operational use of R&D satellite data.

9. GCOS IMPLEMENTATION PLAN *(agenda item 9)*

The session reviewed the GCOS Implementation Plan with regard to satellite data and products. It noted that its recommendations under agenda item 6 were also applicable to many climate needs and recommended that appropriate recommendations from agenda item 6 be utilized in the development of a WMO response that should be coordinated with the ET-SAT for satellite systems for utilization by GCOS.

10. FUTURE WORK PLAN *(agenda item 10)*

The session agreed that its inter-sessional work would be as described in Appendix X, with the expectation that the second ET-SUP would be held in early June 2006.

11. ANY OTHER BUSINESS *(agenda item 11)*

11.1 The session was informed by EUMETSAT that it had produced a new precipitation product that was derived from a combination of DMSP microwave data and image data from the first generation Meteosat (Meteosat-7 and Meteosat-5). This product was meant to help especially the user community in the African continent to obtain additional precipitation estimations. The

product is available in graphical form on the EUMETSAT Web site <http://www.eumetsat.int/idcplg?IdcService=SS_GET_PAGE&ssDocName=SP_1119538666663&l=en&ssTargetNodeId=522>. This information has also been made available to WMO Members through the WWW Operational Newsletter. It can also be accessed from the EUMETSAT Home Page by selecting:

- Access to data
- Access Meteosat meteorological products
- Access Product list
- Access Multi-sensor precipitation estimate

11.2 The session welcomed this development since precipitation rate is a crucial parameter, as indicated by the user survey, and noted that the International Precipitation Working Group (IPWG) was kept informed. It encouraged EUMETSAT to perform validation actions and to consider adapting the product to the new generation of Meteosat satellites.

11.3 The session also discussed the topic for RGB compositing of multi-channel imagery, as a complement to discrete classification. It recalled that first generation imagers on geostationary satellites were limited to 2-3 spectral channels, i.e., VIS, IR (and WV). While more recent ones offered additional channels, e.g., 3.9 micron and split window. Forecasters were able to view displays of images in black-and-white rendering or through colour look-up tables enhancing particular features, typically cold clouds. The session noted that many schemes existed for displaying the imagery, and interpretation was sometimes difficult for forecasters who may not be acquainted with the particular colouring. The session discussed a possible approach in the long-term towards standardization of RGB compositing

11.4 RGB compositing methods are particularly useful to visualize cloud coverage and cloud motion as well as to highlight particular features such as water/ice phase, convection, dust or smoke plumes, air mass and land cover. Appropriate triplets of channel combinations can be selected on a physical basis for each purpose and associated to a triplet of colours. The session thus discussed the relevance of trying to harmonize these selections of channels and the associated colours. It recognized that for operational forecasters such harmonization would facilitate the adaptation to the use of RGB composites from different origins. As a consequence, training would be considerably facilitated. The session also noted that such harmonization would result in providing a “toolbox” of methods, which was fully in-line with the objectives of the WMO Space Programme. The session concluded that there would be a benefit in harmonizing the correspondence between colours and meteorological features. It also recognized the relevance of the overall approach, being based on physical consideration of the atmospheric absorption spectrum infrared emission and scattering of solar radiation. It underlined, however, that because different satellites have different instruments with different spectral characteristics, the channel combination would need some specific tuning for each RGB compositing with a new satellite. It also expressed the view that harmonization should not inhibit future developments that would improve the usefulness of such RGB compositing. The session concluded in expressing thanks to EUMETSAT and all the experts involved in this work and suggested that an international workshop be held to discuss this issue further and ensure a wide acceptance of any potential standards by the user community.

ACTION 1.12 WMO Space Programme to report to CGMS on RGB compositing harmonization.

ACTION 1.13 WMO Space Programme to convene a workshop on RGB compositing.

11.5 The session also discussed the topic for the introduction of new operational satellites and their associated data and products. It noted that the practice generally adopted by satellite operators was that new satellites achieve “operational” status after a period of in-orbit testing and that the declaration of the achievement of this status was the responsibility of the operator concerned with the routine operation of the satellite. However, some variability had been

experienced by the user community in how such satellite changes were implemented in the space-based Global Observing System. The scope of the session's discussion was limited to the case in which a new satellite replaced an existing one.

11.6 The session noted that the decision to declare data and products operational typically depended on the verification of a priori requirements on attributes such as accuracy, stability and availability. Such requirements, if they existed, were typically formulated well in advance of the in-orbit testing phase and hence did not usually take into account advances in techniques and improvements in the quality of the data and products that they would replace. For example, in the case of AMV products, quality was measured primarily via comparison with independent measurements (e.g., radiosondes) and with model analysis fields. In the scenario when new products were declared operational and predecessor products withdrawn there existed the potential to degrade NWP model performance if the new products were of a lower quality than the predecessor ones.

11.7 Thus, the session recommended that satellite operators assign a period of time during which AMV products from new satellites would be distributed in parallel with those from predecessor satellites and moreover activities would be initiated during this period to ensure new products achieved at least the quality of predecessor products (by common agreement) before the latter were withdrawn. The session also noted that the common agreement concerning AMV quality required that satellite operators engage NWP centres in these activities in order that the impact of the new products on NWP models formed part of the decision-making process. The session recalled that several NWP centres already monitored AMV quality as a routine activity (although not always in real time).

11.8 The session also requested that WMO, through its Space Programme, bring the recommendation to the attention of CGMS satellite operators at the forthcoming session CGMS (CGMS XXXIII) to be held 1-4 November 2005 in Tokyo, Japan.

ACTION 1.14 WMO Space Programme to raise the issues with CGMS satellite operators of the transition to new operational products upon satellite changes and submit the recommendation that satellite operators assign a period of time during which AMV products from new satellites would be distributed in parallel with those from predecessor satellites and moreover that activities would be initiated during this period to ensure new products achieved at least the quality of predecessor products (by common agreement) before the latter were withdrawn, and NWP centres are involved in these validation activities

12. CLOSURE OF THE SESSION *(agenda item 12)*

The Chairman thanked the Expert Team members and session participants for their excellent preparation, cooperation and dedication. The Chairman closed the session at 12:15 on Friday, 21 October 2005.

APPENDIX I

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APPENDIX II

AGENDA

1. ORGANIZATION OF THE SESSION
- 1.1 Opening of the session
- 1.2 Adoption of the agenda
- 1.3 Working arrangements for the session

2. CHAIRMAN'S REPORT

3. RELEVANT ACTIVITIES OCCURRING AT THE WMO CONGRESS, CONSULTATIVE MEETINGS, CGMS AND GEO

4. REVIEW STRATEGY TO IMPROVE SATELLITE SYSTEM UTILIZATION

5. EXTEND THE ADM CONCEPT TO AN IGDDS

6. REVIEW PRESENT AND FUTURE R&D SATELLITE DATA AND PRODUCT AVAILABILITY AND APPLICATION

7. REVIEW CGMS/WMO VIRTUAL LABORATORY FOR EDUCATION AND TRAINING IN SATELLITE METEOROLOGY (VL) ACTIVITES

8. MONITOR THE IMPLEMENTATION OF THE EVOLUTION OF THE SPACE-BASED COMPONENT THE GOS

9. GCOS IMPLEMENTATION PLAN

10. FUTURE WORK PROGRAMME

11. ANY OTHER BUSINESS

12. CLOSURE OF THE SESSION

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	Peru (Clara Oria)	**Paraguay (Oscar Rodríguez)**	**Ecuador (Homero Jacome)**	**Chile (Juan Quintana)**
Have you done training or presentations with the Weather Notebook?	Yes, about WMO's Space Programme activities, GOES/ POES, MODIS images, principles of remote sensing, programs and tools, applications of VISITVIEW, HYDRA,	Yes, but I have not used it to its full potential.	Reports by INAMHI on adverse situations: El Niño, volcanic ash (Reventador), climatic conditions over the Río Paute watershed, etc.	Yes, only informative presentations
What material did you use?	MCIDAS, case studies presented by participants, demonstrations on the use of the Weather Notebook	Mainly satellite imagery interpretation and detection of frontal systems.	Web addresses, e.g. for the analysis and publication of climatological conditions of the country, based on satellite imagery and products from NOAA.	Power-point and other presentations from the web, the book on satellite meteorology by Paul Menzel
Who received the training or the presentations?	About 60 people in the Service, some have used material to create presentations and to extend the reach of a training course to 4 offices in remote places using visit.	A colleague going to a training in Colombia, more than 35 in an observer's course in Ciudad del Este. Soon: a demo in a Radar at INAC	General public	Meteorology students at Valparaíso University: information about meteorological satellites
What material have you found more interesting or useful?	All of it. Personally I like the book by Dr Menzel, as well as the tutorials in the Virtual Library	Due to our infrastructure: satellite imagery interpretation using RAMSDIS	To obtain satellite images for the 24 and 48 hour forecast and to observe what is going on over the country and in other regions of the continent	The material provided by Dr. Paul Menzel and Dr. Jim Purdom
Have you required material not included in the Weather Notebook?	No, with the web addresses provided it is possible to get more information than it is possible to read	Yes, due to the requirements of the course in which I acted as instructor		Other web addresses
Without the Notebook, would you have been able to participate in the international weather discussions?	It would have been very difficult, it makes me independent on the availability of a computer, and it can be taken to the audience wherever it is.	It would have been very difficult, it is not always possible to get an appropriate machine		No, the PC in my office is inadequate
Has the responsibility of the Weather Notebook produced any kind of conflict to you?	No, it is always available to anybody who needs it, I only take care of its administration and care.	No, though I've had to face pressure for it to be used for purposes other than intended by the satellite virtual lab.	Yes, I've had to face strong pressure for it to be used for purposes other than intended by the satellite virtual lab.	No, on the contrary, I like the subject of meteorological satellites and I would like to continue working on it.

	El Salvador (Luis García)	**Colombia (Ruth Mayorga)**	**Venezuela (Alex Quintero)**	**Costa Rica (Evelyn Quirós)**
Have you done training or presentations with the Weather Notebook?	Yes, training and presentations	Yes, on 7 occasions, on the Virtual Lab and the Notebook resource, on applications, products and new technology on satellite imagery	No, I have not had the opportunity to do it.	Yes, in the international weather discussions, Visit demos, to explain the forecast process an the resources in the Notebook
What material did you use?	Applications of the software VISITVIEW, demonstrations on the use of the Weather Notebook, satellite imagery interpretation.	Power point presentations, tutorials, texts, internet addresses, case studies (Barbados, El Salvador)	Tutorials, Ppt presentations related to convection and MCCs	Power point presentations, tutorials, texts, internet addresses, case studies, applications of the software VISITVIEW, satellite imagery interpretation.
Who received the training or the presentations?	Colleagues at SNET.	16 people at IDEAM, on the resources of the Notebook, to refresh the use of the tephigram, to develop a synoptic climatology.		Personnel at IMN (headquarters and two airports), Emergency Commission, UCR students, hydrology at ICE, rice and palm oil farms
What material have you found more interesting or useful?	The case studies, COMET's modules, the tutorials, the software VISITview, the web addresses, McIdas software.	Paul Menzel' s book, the case studies, the tutorials, the software VisitView, the tephigram applications.	Jim Purdom's material on convection, the software VisitView.	Case studies, tutorials, VisitView y McIdas software, web addresses.
Have you required material not included in the Weather Notebook?				
Without the Notebook, would you have been able to participate in the international weather discussions?	It would have been very difficult, it allows me to participate when I am away from the office and to make demos, e.g. involvement of Panama	It would have been very difficult	Yes.	It would have been very difficult, to participate it has been necessary to move to a location with appropriate internet access
Has the responsibility of the Weather Notebook produced any kind of conflict to you?	No, but I suggest that the letter of commitment indicating my responsibility should be renewed.	No.	No.	No.

	Dominican Rep. (Caridad P.)	Honduras (J.Gomez)	Bolivia (E. Peñarrieta)	Argentina (R. Valenti)
Have you done training or presentations with the Weather Notebook?	Yes, training and presentations	Yes, training and presentations.	Yes, training and presentations on WMO's Space Program, virtual resource library, the software VISITview, Hydra, McIdas & Sataid	Yes, training and presentations
What material did you use?	Definition of meteorological satellites, participant's case studies (Katchan, Guirola), Bernie's presentations.	COMET and EUROMET modules on Forecast Process	Multispectral analysis and hydra, Forecast Process modules, ATOVS, fire detection	Info. on meteorological satellites & soundings, MODIS products, fire detection, training modules
Who received the training or the presentations?	Forecasters in charge of training at the school of meteorology, Climatology Dept. personnel	Training courses for observers & forecasters, 4 conferences at Univ. of Honduras, 1 to UNDP, satellite course Cartagena	Climate and forecast personnel at SENAMHI, satellite course in Cartagena	Students at the RMTC, personnel at CONAE and the Met. Service, self instruction of personnel
What material have you found more interesting or useful?	Case studies including COMET modules, images from different channels, identification of weather situations and clouds.	Forecast process, hurricane topics	Multispectral analysis, fire detection and SATAID, though I couldn't use it operationally	The notebook as a training tool, with an easily available and adaptable material for different course at the RMTC
Have you required material not included in the Weather Notebook?	No	Yes, particularly for the observers training course	Yes	
Without the Notebook, would you have been able to participate in the international weather discussions?	No. I had to go to an internet café with the notebook to be able to participate.	No, we have very few computers available at the met. Service, most of them are very old.	No, all computers at the forecast unit are busy all the time.	
Has the responsibility of the Weather Notebook produced any kind of conflict to you?	No	Did not answer	Yes, at the beginning.	No.

APPENDIX IV

WMO / CGMS
Virtual Laboratory
High Profile Training Event
Project Development Plan

VIRTUAL LABORATORY MANAGEMENT GROUP

Version 1.0
14 October 2005

APPENDIX IV

Version Control

Versions	Author of Changes	Comments
1.0	VLMG	Initial PDP

APPENDIX IV

Contents

EXECUTIVE SUMMARY

The High Profile Training Event (HPTE) is a major milestone in the evolution of the WMO / CGMS Virtual Laboratory for Satellite Meteorology. It will provide a unique education and training opportunity to WMO Members through the presentation of a series of interactive, online, presentations in the period 16 to 27 October 2006.

The HPTE will provide training on three different levels in this period:

- Classroom training for at least 50 people in RA II and RA V through the regular WMO Regional Training Seminars in Nanjing, China, and Melbourne, Australia;
- Interactive online lectures to WMO Members in each Region through the local WMO Centre of Excellence (Niger, Oman, Kenya, Barbados, Costa Rica, China and Australia);
- At least one inter regional image and product discussion between WMO Members and the VL Partners in those regions.

Additionally, the HPTE provides the impetus for the formation of regional focus groups of WMO Members (along the lines of the very successful focus groups in RA III and RA IV) to participate in ongoing online training and, near real time image and product discussions, at regular intervals after the event, from each of the Centres of Excellence.

It is anticipated that the successful running of the HPTE will lead to further co-ordinated online VL training events and will point the way forward for the provision of training for other WMO Programmes, and initiatives such as GEOSS and JCOMM.

This document outlines the Project Development Plan developed by the Virtual Laboratory Management Group to guide the successful planning and running of this event. The event is rated as a low risk event provided due care is taken to minimise the risks involved with the complex co-ordination, co-operation and technical issues.

DESCRIPTION

The second meeting of the Virtual Laboratory Management Group (VLMG)[1] in Barbados in December 2003 proposed that the VLMG organise and run a global high profile VL training event in a 2 to 3 year time frame (see Annex A).

Conceptually the HPTE is providing learning opportunities for WMO Members at three different levels

- A class room level;
- A regional level utilising tools such as VISITview and internet audio where the hub is based around a CoE and / or one of the satellite partners;
- An inter regional level whereby at least two or more CoE / Sat Ops collaborate via the internet for either shared lectures or image discussions.

Review of the original proposal

The original proposal for the HPTE was based on the premise that VL notebooks would be provided to each WMO Member prior to the training event. Additionally, the Costa Rica experience (Regional Training Seminar March 2005) with the notebooks indicates that the notebook users benefit strongly from having direct instruction on the applications and use of the machines. Feedback obtained from a recent survey on the use of the notebooks by Dr Vilma Castro from UCR indicates that it is much better to have the notebook directly provided to a person who is committed to using it as it is intended, rather than sent anonymously to the NMS.

Despite concerted effort by the Co-Chairs and the Space Program it seems unlikely that we will be able to achieve the goal of providing electronic notebooks for all participants at this time. Rather than using electronic notebooks EUMETSAT plans to provide RA I Members with a portable hard-drive that contains the contents of the notebook. Other Sponsors are considering their options. The provision of electronic notebook functionality to all WMO Members still remains a goal but likely not be fully implemented for this event.

The original proposal outlined a series of benefits associated with running the event. This document further expands on those benefits and outlines the purpose, objectives and the range of anticipated outcomes.

The premise of holding a high profile global training event remains sound and well worth undertaking. It will be open to all WMO Members.

GOALS OF THE HPTE

The purpose of the HPTE is to support the training component of the WMO Strategy to Improve the Utilisation of Satellite Data and Products by WMO Members. The HPTE is consistent with, and a logical extension, of the WMO Space Programme objectives.

- Open to all WMO Members, with maximum participation as technology allows;
- Accommodate for language, culture and technological capacity of the wide range of WMO Members;
- Meet the specific objectives of the HPTE as outlined below;
- Further the effectiveness of the VL as a training tool for use by WMO Members;
- Establish a paradigm for future training activities by GEOSS, JCOMM, CEOS and other entities as applicable.

[1] The Virtual Laboratory Focus Group (VLFG) was renamed to VLMG, Virtual Laboratory Management Group, in October 2005 to reduce confusion with the regional Focus Groups

OBJECTIVES OF THE HPTE

Pre-event objectives for the HPTE

- Well publicized through appropriate media circulars and Press Releases;
- Clearly indicate technical and other requirements in order to allow WMO Members to prepare and organize their staff;
- Testing all aspects of the HPTE, coordinated by the VLMG, and conduct sufficient test events to allow WMO Members the opportunity to test their capacity to participate and organize their staff;
- Starts ongoing online training to complement the continuing regional workshops focused on the trainers.

Event Objectives for the HPTE

- Utilize the full VL through all Centres of Excellence and their sponsor(s):
  - through testing the ability of the VLMG to plan, implement and deliver a globally co-ordinated series of training events. These events will occur over a period of several days. The successful completion of the initial HPTE will lead to further events that exercise the full resources of the VL, particularly the VL Notebook functionality;
  - by providing a focus for VLMG members to develop new learning resources and review existing ones relevant to their local and regional communities;
  - by providing a focus for VLMG members to engage with their regional communities in the delivery of face to face and online learning opportunities;
- To inform WMO Members of the current status and future plans for the space-based component of the Global Observing System:
  - with all WMO Members having the opportunity to partake in the HPTE and the lead up events;
- To update WMO Members knowledge of the potential applications and use of environmental data from the operational and research and development (R&D) satellites:
  - through the provision of a series of coordinated lectures and discussions covering;
  - Satellite capabilities (R&D and operational) and use of the Virtual Resource Library;
  - Spectral bands and their applications;
  - From digital data to satellite data and products;
  - Severe Convection and rainfall, as well as other topical areas.

ANTICIPATED OUTCOMES FOR THE HPTE

- VL capacity building:
  - Increased awareness and use of the VL;
  - Increased involvement in the VLMG by existing members and further proposals for Centres of Excellence (CoEs) and satellite partnerships;
  - New regional focus groups instigated;
  - Increased activity in the VL from the science groups (IPWG, ITWG, IWWW);
  - Increased Member participation in regional focus groups
- Improvements in Education and Training options:
  - Increased demand and use of collaborative online training sessions;

- Provide practical experience in planning, implementing and delivering online training events for WMO Members as well as other groups such as GEOSS, JCOMM and CEOS;
- Improved utilization of satellite data and products:
  - Improvements in the participants use of satellite data and products
  - Improvements in the WMO Members knowledge of the use and application of environmental satellite data and products from R&D and operational satellites

CLASSROOM AND ONLINE PRESENTATION CONTENT

The **classroom portion** of HPTE will build on lessons learnt from previous seminars and incorporate and expand on the VRL material.

The **online component** will consist of four core lectures with the option for additional regional presentations. To assist WMO Members with access to the online material each presentation will be repeated the following day. This allows people who could not participate in the first presentation to partake in the repeat presentation and thus increases the number of people who benefit from the HPTE. Each lecture should run for 60 to 90 minutes depending on how much interaction there is between the online participants and the presenter. The four core lectures to be presented in each region will be developed by teams of experts (translated into English, French, Spanish, Chinese and Arabic), complete with speakers notes and support papers and then converted to VISITview format for distribution to participants and presenters. Trial presentations with the registered participants will allow presenters and participants to practise their VISITview skills and build confidence in interacting in an online world. The four lectures selected for the HPTE are:

Lecture A: The WMO Space Programme, and satellite capabilities (R&D and operational) and use of the Virtual Resource Library.
Lecture B: Spectral bands and their applications
Lecture C: From digital data to products
Lecture D: Severe Convection and rainfall

Table 1
HPTE Core lecture timetable (additional material may also be delivered from one or more CoE)

	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Week 1 16 Oct 2006		**Lecture A**	**Lecture A (repeat)**	**Lecture B**	**Lecture B (repeat)**
Week 2 23 Oct 2006	**Lecture C**	**Lecture C (repeat)**	**Inter regional near real time image and products discussion**	**Lecture D**	**Lecture D (repeat)**

PARTIES INTERESTED IN THE HPTE

The following groups were identified as participants in the HPTE:

Participants

Meteorologists and scientists from all NMHSs.

Organizers

VLMG partners (CoE and satellite operators), IPWG, ITWG, IWWW.

Sponsors

CGMS, WMO.

MANAGEMENT ARRANGEMENTS

The day to day co-ordination for the HPTE will be done through the WMO Space Program. The direction will come from the Co-Chairs of the VLMG with guidance from the rest of the VLMG, via email and adhoc face to face opportunities. The WMO Space Programme to report to the VLMG on a monthly basis with summary update on the HPTE Website.

KEY MILESTONES

The HPTE can be separated into several sections:

- Publicize HPTE and register participants;
- Prepare classroom activity;
- Develop online materials;
- Formulate regional focus groups;
- Train online participants in VISITview;
- Conduct the HPTE;
- Assess the HPTE.

Further details on the key milestones are shown in Annex C.

TASK ANALYSIS

An analysis of the tasks required to implement the HPTE identifies the following minimum tasks:

WMO Space Programme:

- Serve as the focal point for the planning and coordination of the HPTE and follow-up actions;
- Publicize HPTE in a variety of fora;
- Establish HPTE website including ability for people to register for sessions with notification to be sent to appropriate VL partners. Target date for website 5 December 2005 and development of registration system 27 February 2006;
- Notify WMO Members of HPTE and arrange for registration for both classroom and on line portions;
- As customary, fund the Regional Training Seminars in Melbourne (APSATS) and Nanjing classroom events in October 2006.

Satellite Operators (Sponsors):

- Participate in the development and quality control of the core lecture material, and work with their sponsored CoE(s) to provide translation into the common language of the region by 5 June 2006;
- Together with the CoE(s) explore the possibility of providing some extra sessions (regional online sessions) for their region as well as participating in the regional weather discussions and the follow-up regional focus groups. 6 March 2006;
- Take lead role in ensuring that regional VISITview servers are set for use by the sat op / CoE partnership by 20 March 2006.

EUMETSAT:

- In addition EUMETSAT will be asked to schedule one or more of its annual satellite training workshops in RA I to occur during the HPTE period (or coordinate with an already ongoing event including the African Users Forum). Action by WMO Space Programme 5 December 2006;

- EUMETSAT will coordinate with EUMETRAIN Members (covering parts of RA VI) to participate in the HPTE.

Research Satellite Operators:

- Provide special lectures and associated training material to support the classroom training events;
- Through coordination with the appropriate sponsor present lectures during the regional online sessions.

Centres of Excellence:

- Participate in the global discussions and take a leading role in the regional online training sessions during the HPTE;
- Establish and support regional focus groups;
- As appropriate, plan, prepare and present classroom training event.

CGMS:

- Review the HPTE planning at the CGMS-XXXIII and place actions on Members as appropriate.

RISK EVALUATION

Annex B outlines the risks investigated by the planning group and deems the overall risk status as low. The risks will be managed by contingency planning and ongoing monitoring by the WMO Space Programme against the key milestones outlined in Annex C.

ANNEX A
PROPOSAL PAPER FROM SECOND VIRTUAL LABORATORY FOCUS GROUP MEETING, BARBADOS, DECEMBER 2003

A global high-profile VL training event

A major high level goal – a global high profile VL training event, 2-3 year timeframe with interim events testing the overall concept and its components. All "centres of excellence" and their regional NMHSs, satellite operators, focussed science groups and a globally distributed set of lecturers linked into a common training event. "Roll around the globe with the trainers" to link two or three of the "centres of excellence" at any one time.

Benefits:

- "Centres of excellence" would all achieve a comparable skill level;
- Leverages E&T events, not just a WMO event, and extra-budgetary resources to maximize the impact;
- The same set of expert lecturers that make presentations to an event at one "centre of excellence" could make the same presentations to all "centres of excellence";
- This would add the linking of NMHSs with their regional "centre of excellence" into the global event. Training would reach into the NMHSs at the same time as the global event;
- Preparing for the event and the event itself would exercise the VL addressing all proposed ways to increase VL effectiveness as discussed at the second session of the VL FG.

Action item:

Appoint a focal point (Mr Wilson as VL FG Co Chair) to coordinate the global high profile VL training event and it was anticipated that the focal point would convene an *ad hoc* working group to assist.

Action item:

Focal point to identify financial resources required to implement the event.

Action item:

CGMS VL Rapporteur to inform and seek agreement from CGMS-XXXII of the event and associated need for financial resources.

Action item:

WMO Space Programme Office to inform the 2004 Consultative Meeting of the event and associated need for financial resources.

<u>Important areas requiring further elaboration by the focal point.</u>

- VRL:
  - Case studies and lectures able to be downloaded, as well as found via the search engine;
  - Sat operators to provide online access to digital data for the standard VL tools (SATAID, RAMSDIS);
  - Improve search capabilities on the VRL;
  - Standardise meta data to allow more effective searching;
  - Provide a brief description of the material on the VRL that is available only on request;
  - Peer review mechanism**.**

- Institute routine coordination between “centres of excellence” and sat ops (at least 3 monthly) – Co-Chairs;
- Collaborate on series of training related projects (3 monthly for those who can);
- Common VL interface on the web pages (Mr Wilson to email to group);
- “What’s new and FAQ” to be added to the VL websites;
- Sat Operators to install the RAMSDIS-Online type system and tailor to meet their needs and those of the “centres of excellence” (CIRA to provide code);
- Have EUMETSAT investigate and report back on the feasibility of using EUMETCast to disseminate training material (by end of 2004)

ANNEX B
RISK MANAGEMENT FOR THE HPTE

	Risk	Likely	Degree of Impact	Estimated risk	Management Strategy	Final risk
	Technical					
1	Audio server fails on the HPTE day	Possible	Severe	High	Develop other options and have suitable accounts etc established and swap procedures	Low
2	VISITview servers fail on HPTE day	Rare	Severe	Medium	Alternative servers	Low
3	Global internet disruption on HPTE	Rare	Severe	Medium	Repeat presentations on alternate schedule	Low
4	NMS not having capability to participate because of effective internet bandwidth	Known regional problems	Severe for those NMSs	Extreme	Try to get rep from NMS to classroom course. EUMETSAT investigate back link on EUMETCAST	Medium
5	NMS not having capability to participate because of lack of suitable and available equipment	Locally, almost certain	Locally severe	Locally extreme	CoE do assessment of the capabilities in their regions and discuss mitigation possibilities with Sponsor	Low
	Human					
6	One or more key presenters unavailable	Possible	Major	Significant	Develop common lectures and have alternate ? understudy lecturers	Low
7	Core material unavailable	Unlikely	Major	Medium	Closely monitor development, options of VRL material	Low
8	Less than 50% of NMS provide training contact names	Possible	Major	Significant	Directly contact PRs through WMO SP and CoEs	Low
9	No WMO Space Program co-ordinator by 1 January 2006	Possible	Major	Significant	Use consultant to assist until filling of WMO SP positions complete	Negligible
	Procedural					
10	Translation not complete in ALL languages	Possible	Minor	Negligible	Partnership issue, will be monitored	Negligible

ANNEX C
KEY MILESTONES FOR THE HPTE

Milestone	Target date	Nominated group
HPTE start	16 October 06	
HPTE end	27 October 06	
HPTE general		
HPTE Website launched at WMO	5 December 05	WMO Space Programme
Monthly reports to VLMG Co-Chairs commence	9 January 06	WMO Space Programme
Participant registration capability added to website	27 February 06	WMO Space Programme
HPTE Publicity commences	6 march 06	WMO Space Programme
WMO Publicize HPTE	ongoing	WMO Space Programme
Initial HPTE report	4 December 06	VLMG Co-Chairs
Online evaluation capability added to website	2 October 06	WMO Space Programme
Complete HPTE assessment report	5 February 07	VLMG Co-Chairs
HPTE classroom events		
EUMETSAT requested to program at least one African seminar to coincide with HPTE	5 December 06	WMO Space Programme
Formal Seminar agreements signed (WMO - BoM, JMA, CMA)	6 March 06	Various
Nominations for APSATS / Nanjing seminars requested from Members	3 April 06	WMO Space Programme
Seminar Participants selected	3 July 06	WMO Space Programme and ETRD
Development of Online materials		
Core presentation development team formed	19 December 05	VLMG Co-Chairs
VL Partners agree on additional presentations for HPTE	6 March 06	VL Partners
Common training material developed	1 May 06	VLMG Co-Chairs
CIRA ftp site available for lodgement of training material	29 May 06	CIRA
Common training material translated	5 June 06	Sponsors
VRL material reviewed	5 June 06	VLMG Co-Chairs / CIRA
Common training material into VISITview format	3 July 06	Sponsors
Additional (regional) training material completed and incorporated into VRL	3 July 06	VL Partners
HPTE and VRL material despatched to participants	31 July 06	Sponsors
Formation of regional focus groups		
NMS ETR contacts sent to CoEs	30 January 06	WMO Space Programme
CoE publicize HPTE in their region	Ongoing	CoEs
VISITview servers established for each VL partnership	20 March 06	Sponsors
Details of first trial sent to registered participants	27 March 06	
Start of monthly online trials	10 April 06	VL Partners
Certificates sent to registered participants upon completion of online evaluation	20 November 06	CoEs

APPENDIX V

THE STEPS REQUIRED FOR A NEW PARTNER TO JOIN THE VL

- CBS /OPAG/IOS ET-SUP review that application meets the criteria (co-sponsored CoE and Satellite Operator(s), appropriate facilities and resources, and, agreement to VL Expectations);
- CBS endorse application;
- CGMS approve application.

Determination of CoE
Extracted from the Final Report of the WMO Executive Council Panel of Experts on Satellites

ftp://www.wmo.ch/Documents/www/sat/ecsatfrp.doc

EXECUTIVE COUNCIL PANEL OF EXPERTS ON SATELLITES

A STRATEGY FOR EDUCATION AND TRAINING
IN SATELLITE MATTERS

GENEVA, 9-10 MARCH 1993

Establish special training centres at six RMTCs

4.5 This strategy is designed to provide a minimum network, within the WMO's RMTC framework, of specialized satellite applications training centres ("centres of excellence") strategically located around the globe. This is the major strategy of the entire strategic plan and the activities required to support it should have the highest overall priority. It provides a focal point for all the other strategies in the plan and a focal point for directing funding, co-operative programmes and other scarce resources to obtain maximum overall cost-effectiveness.

4.6 It is proposed that each specialized RMTC would be:

- equipped with standard facilities for education and training in satellite data utilisation for meteorology and operational hydrology;
- provided with standard satellite applications training modules in the principal languages of the WMO Regional Association in which the RMTC is located;
- staffed with at least one instructor who is specially trained in satellite data utilisation;
- designated as the principal location for the training of instructors from all RMTC's in satellite data application techniques;
- designated as the principal location for the proposed rolling programme of special training seminars in satellite data utilisation, the attachment of international experts in special fields of satellite data applications for meteorology and operational hydrology, and the development of specially tailored satellite education and training modules to suit the WMO Regional Association in which the RMTC is located;

- supported by the training institutions of the national meteorological and hydrological services in the WMO Regional Association in which the RMTC is located; and

- linked to a satellite education and training information network to be developed within WMO with connections to the electronic bulletin boards and information services of the satellite operators and major relevant education and training agencies.

- sponsored by one satellite operator that participates in the space-based sub-system of the GOS with regard to the satellite training programme, facilities and expertise required.

4.7 The selection of 6 out of the 17 RMTCs is an arbitrary judgement based on the factors such as geographical location, capability to service the needs of the entire WMO Region, the need to strengthen satellite data utilisation and training in particular locations, and the more efficient overall use of scarce (and probably shrinking) resources. The other 11 RMTCs would still implement satellite data utilisation training programmes via their standard curricula but would not specialise in it. They could be designated as specialized training centres in other fields as appropriate. Some guidelines for this are given in Appendix XII. *(Jeff Wilson, note 15 September 2005. This appendix doesn't seem to be in the final report)*

DOCUMENTS FORWARDED TO RSGIS, OMAN

STRUCTURE AND GOALS FOR THE CGMS VIRTUAL LABORATORY FOCUS GROUP

Management structure

Co-chaired by one satellite operator and one representative from the "centres of excellence". Served by the WMO Satellite Activities Office as the Secretariat. Membership should include:

- representatives of science teams as appropriate;
- remaining satellite operators and "centres of excellence";
- other interested parties as appropriate.

VL Strategic Goals

(1) To provide high quality and up-to-date training resources on current and future meteorological and other environmental satellite systems, data, products and applications;
(2) To enable the "centres of excellence" to facilitate and foster research and the development of socio-economic applications at the local level by the NMHS through the provision of effective training and links to relevant science groups.

VL Immediate Goal

(1) To implement a baseline VL and to foster its logical growth.

VL Connectivity Goal

(1) To assure links between the 6 "centres of excellence" (and supporting satellite operators) with a **minimum** data rate of 56 kbs, to support communication (email, voice), the exchange of software and limited image data sets (e.g., case studies and some near real-time data sets);
(2) "Centres of excellence" to consider means to increase link capacity to a minimum of T-1 within 5 years;
(3) A preferred method in the short-term would be the direct insertion of data from a ground receiving station into the Virtual Laboratory servers. As an alternative, the Internet can be used to route data and products to the VL servers.

Virtual Resource Library (VRL) Goals

(1) To establish a list of usable training resources (includes image data sets, s/w, tools);
(2) To implement a structure for the depository of training resources which will allow easy access by the "centres of excellence" trainers;
(3) To populate this structure with a core set of material from the training resources list;
(4) To consider a more general access to the resource library by students (forecasters);
(5) To consider the provision of additional (enhanced) material from the resource library to all 6 "centres of excellence".

VL Utilization Goals

(1) To establish a VL user tracking and feed-back mechanism, from the outset, (for analysis, refinement, reporting to VL management, and to assess overall usefulness);
(2) To keep abreast of user requirements for the VL (baseline being WMO Pub No. 258). Assume: analysis of user responses focused on education and training to questionnaires

within their region and other user feed-back is carried out by “centres of excellence” and results are reported to VL management;

(3) To train meteorological students to an operational level of expertise as well as to allow daily weather discussions during training events, near real-time data and products are a strong requirement. Near real-time data are needed to train forecasters on the effective use of new satellite reception and processing systems. Depending on the application, the need for near real-time data availability may not be as stringent.

Long-Term Evaluation of the VL

- After five years, conduct a comprehensive review of the VL.

Typical activities to be undertaken to meet the goals

- Consolidate documentation of the range of skills/competencies for operational meteorologists and specialists;
- Examine which online (Web-based learning), Computer Aided Learning. CDs and hard copy learning materials are currently available for use in the Virtual Laboratory. This activity will include contacting groups such as ASMET, COMET, CIRA, EuroMET, BMTC and CIMSS who have complementary projects under way and relevant science groups (such as the EUMETSAT SAFs, the TOVS Working Group, the Winds Working Group and the proposed quantitative precipitation working group);
- Negotiate with the copyright holders of the training material rights to either link to their material and/or to acquire the rights to use their material at the designated centres of satellite training expertise (this includes the centres making the material available to on- and off-site users);
- Working with groups such as ASMET, COMET or EuroMET, design and test possible user interfaces, educational approaches for delivering the material, and examine methods for online tracking of student participation;
- On a trial basis, evaluate the proposed Virtual Laboratory material in conjunction with one of the WMO satellite training workshops for more user feedback;
- Incorporate user feedback into the educational approach and review the content of the Virtual Laboratory;
- Move to a wider implementation of the material;
- Undertake a periodic review of the Virtual Laboratory sites in conjunction with reviews of the skills and competencies of the operational meteorologists and specialists;
- Prepare sample data sets for the various data streams now being provided or planned for in the near future. The data sets would be used within the VL concept;

Provide for continuous monitoring of user requirements for Education and Training as well as the effectiveness of the Virtual Laboratory

Expectations for "centres of excellence", satellite operators, and WMO/CGMS

Expectations from the "centres of excellence"

Whilst recognizing that each "centre of excellence" has different administrative and financials structures, relationships with the sponsoring satellite operator and links with neighbouring NHMSs, the VL FG recommended the following:

- Nominate a focal point and an alternate within the CoE as the primary contact for all VL business:
  - Preferably this person should have some authority to make decisions regarding the use of the VL within the CoE;

- Run international training events that conform with the VL guides for organising and running training events;
- Maintain an up to date list of priority training needs for that region:
  - Links to SSUP ET coordination;

- Develop and maintain proficiency in providing online training using tools such as VISITView;
- Maintain regular contact with the other members of the VL Focus Group:
  - Co-chair responsibility to coordinate sessions;

- Provide the Co-Chairs (or designated people) a brief annual report at the end of August each year, relevant to the VL, outlining the training activities for the past 12 months, anticipated training activities for the next twelve months, priority training needs for the region for the next 12 months and their ability to meet the training needs, and other information they feel is relevant to the VL:
  - Co-chairs responsibilities to report to constituent bodies after receipt of information.

Expectations from the Satellite Operators

- Nominate a focal point and alternate for VL business:
  - Preferably this person should have some authority to make decisions about VL matters within the satellite operator and some delegation to assist the CoEs on a case by case basis;

- Make near real time data, products and/or selected case study data available for education and training purposes to CoE's in the correct data formats for use with the agreed VL tool sets;
- Maintain regular contact with the CoE(s) that the satellite operator is sponsoring, focusing in particular, but not solely on communications and data access issues. As appropriate, provide an alerting role for the CoE(s) on new training resources and material generated within or for the satellite operator;
- Maintain regular contact with the other VL satellite operators on data access and format issues and other matters as appropriate;
- Provide the Co-Chairs (or designated people) a brief annual report at the end of August each year, relevant to the VL, outlining the activities that the satellite operator has undertaken in the past 12 months for their sponsored CoE(s) and the VL in general, and plans relevant to the CoE and the VL for the next 12 months;
- Assist the CoE(s) to overcome resource constraints on VL related matters through advice, championing with other funding bodies and direct assistance as appropriate.

Expectations from WMO and CGMS

- Provide long term guidance and advice, and where appropriate, direction regarding global and regional priorities;
- Represent the VL partners at appropriate policy and resource for a;
- Assist with resource issues.

From: Co-Chairs of the WMO / CGMS Virtual Laboratory for Satellite Meteorology Focus Group

To: Prospective new Centres of Excellence

We would like to thank you for your interest in joining the WMO / CGMS Virtual Laboratory for Satellite Meteorology (VL) and wish you well with your application.

For your information we have attached several documents that describe the formation and initial review of the Virtual Laboratory and also several articles that describe the most recent training events run by VL partners. We hope that you are already aware of these documents and have at least some appreciation of the roles and responsibilities that come with being one of the VL partners. We understand that the WMO Space Programme Office will be providing you with more documents that fully outline the roles and responsibilities of being a VL partner.

The VL is a developing community of people and institutions who have volunteered to work together to improve the global utilization of satellite data and products by WMO Members from operational as well as research meteorological satellites. Our activities are wide ranging in time and scope. At this stage the most obvious activities are the regular face to face training courses where participants come to your centre from neighbouring countries to not only learn about satellite meteorology but to also develop skills for them to train others in their country upon return from the workshop.

What is not so obvious, from the outside, are the ongoing commitments expected from VL partners. These range from regular (3 to 4 weekly) online sessions with participants from recent training events utilising current satellite imagery and data to consolidate lessons from the training workshop, to development of local resources and review of material and resources from other VL partners, updating websites and online resources, to assisting other VL partners in their preparations for either face to face or online training events. Becoming a VL partner means agreeing to commit staff and, potentially, some financial resources to the activities but it does provide you with access to a growing range of resource material and tools and a community of very committed partners.

As we noted initially we thank you for your interest in joining the VL community and wish you all the best in your application.

Attachments
WMO Bulletin article on initial formation of the VL
WMO Bulletin article on APSATS 2002
WMO Bulletin article on Barbados 2003

APPENDIX VI

COMMENTS AND RECOMMENDATIONS BASED ON THE ANALYSIS OF THE REPLIES TO THE QUESTIONNAIRE

Participation in the 2003 edition of the questionnaire was about 35%. It was slightly more than in 1999 and slightly less than in 2001. It should be noted that the edition, which collected the most answers, was the first edition: in 1996, 46% of the Members returned the questionnaire. A high level of participation to the survey is the key for deducing from the answers a representative picture of the situation and constructive conclusions. It is also interesting to note that, in each region, more than half of the Members answered at least once to the questionnaire. It is, therefore, reasonable to seek 50% of participation level. Members should be made aware of the importance of returning the questionnaire for getting better support and services.

(1) **Recommendation:** Members should be encouraged to return a completed questionnaire in order to assure a more representative overall response. The importance of their participation and the benefits, which could result from a successful survey, should be pointed out to them;

(2) **Recommendation:** Members should be provided with support to address the possible problems they encounter.

The use of Internet for accessing satellite products has increased in all regions since 2001. During the same period, the use of GEO WEFAX, GEO HR, LEO APT and the MDD Systems have decreased. Replies show the early signs of development of ADM as a new way to access satellite data.

Recommendation: WMO Regional Associations should be encouraged to establish Advanced Dissemination Methods (ADMs) that would be linked into a global data dissemination service.

Most Members reported using satellite data. In each region, the tendency was to use digital satellite data rather than analogue satellite data. This is true for data from both geostationary and polar satellites.

Recommendation: WMO Members should use digital satellite data or products rather than analogue for operational applications.

Many Members process and exchange satellite data with other Members. In RA III both the processing of satellite data and the reception of processed satellite data from other Members were rather low.

Recommendation: WMO Members should keep each other informed of the products they process with regional coverage and consider sharing satellite data and products across their region, when relevant, e.g., via an ADM. This recommendation is particularly underlined for RA III.

Many Members extracted products derived from satellite data and, at the same time, received products elaborated in specialized centres. Since communication systems, such as Internet, ease the transmission of such products, it is disconcerting that the percentage of Members reporting a limitation in the capacity of communication systems was higher in 2003 than in the previous years.

Recommendation: Members should improve the capacity of their communication systems to take benefit of the availability of satellite data and products.

Less than 50% of the Members answering the questionnaire in 2003 utilized satellite soundings and products. One reason may be that only a few members operate their own NWP models, which

are the typical applications of soundings. However, soundings can be useful for monitoring the stability of the atmosphere for Nowcasting purposes.

> **Recommendation**: WMO Members should be informed of the benefits derived from the use of satellite soundings and products in operational applications.

Parameters related to cloud fields occupy the first five places of the most important parameters (considering all regions and all application areas). Precipitation rate was sixth and was also quoted as the most required but unavailable parameter with required accuracy. Hence, there was a need for assessing it with more accuracy and better resolution. Wind profiles and soil moisture were also quoted as most required parameters but unavailable with sufficient resolution and accuracy.

> **Recommendation:** Space agencies participating in the space-based component of the GOS should consider further efforts to improve the accuracy and resolution of precipitation rate, wind profiles and soil moisture derived products.

It is encouraging to see that significant efforts have been dedicated to training and continuing education. Adapted knowledge will be the key to making the best possible use of the research satellites that are now part of the space-based component of the Global Observing System (GOS), and of the new operational satellites that will be in orbit in the near future.

> **Recommendation** Training and education should continue in order to address both the limitations of knowledge already reported by Members and to anticipate the future needs linked to new technologies.

The average number of staff has increased in three regions (RA II, RA V, RA VI), has stayed almost stable in RA I and decreased in RA IV (for a technical reason) and RA III. The decrease in RA III was of concern, since the average number of staff was already quite low. In most regions, meteorologists form the largest category of staff working in satellite data reception and processing, but they tended to be less well represented in comparison to other staff categories.

> **Recommendation:** Members should be encouraged to maintain sufficient staff resources for satellite activities and promote staff education in order to meet the future needs of developing technologies.

APPENDIX VII

STATUS OF RECOMMENDATIONS FROM THE EXPERT TEAM ON OBSERVATIONAL DATA REQUIREMENTS AND REDESIGN OF THE GLOBAL OBSERVING SYSTEM (ET-ODRRGOS)

Calibration

S1. Calibration - There should be more common spectral bands on GEO and LEO sensors to facilitate inter-comparison and calibration adjustments; globally distributed GEO sensors should be routinely inter-calibrated using a given LEO sensor and a succession of LEO sensors in a given orbit (even with out the benefit of overlap) should be routinely inter-calibrated with a given GEO sensor.

Comment: A major issue for effective use of satellite data, especially for climate applications, is calibration. The advent of high spectral resolution infrared sensors will enhance accurate intercalibration.

Progress: CGMS-XXXI (2003) discussed GCOS Climate Monitoring Principles, inter-calibration of visible sensors, and inter-calibration of IR sensors on all GEOs with HIRS and AVHRR (reporting on the last item remains as a permanent action of CGMS). CGMS-XXXII (2004) considered improved infrared inter-calibration capabilities using AIRS data; the implications for GCOS Climate Monitoring Principles were discussed. The WMO Space Programme hosted a workshop in July 2005 in Darmstadt, Germany where a strategy for a global space-based inter-calibration system was drafted; it will be presented to space agencies for consideration, endorsement, and possible implementation. It was noted that the building blocks for a calibration / validation system include (1) on-board calibration devices (e.g., black bodies, solar diffusers), (2) in situ measurements of the state of the surface and atmosphere (e.g. the Cloud and Radiation Testbed (CART) site, aircraft instruments with NIST calibrations), (3) radiative transfer models that enable comparison of calculated and observed radiances, and (4) assimilation systems that merge all measurements into a cohesive consistent depiction of the earth-atmosphere system. A strategy was drafted.

Schedule: CGMS will continue inter-calibration activities with current sensors (e.g. AVHRR, HIRS, AIRS) and expand to IASI in 2006. The WMO Space Programme will present at CGMS in November 2005 a strategy for achieving operational intercalibration of the space component of the global observing system that addresses the climate and weather forecasting needs. Discussion and planning with space agencies will be continued via CGMS. .

GEO satellites

S2. GEO Imagers - Imagers of future geostationary satellites should have improved spatial and temporal resolution (appropriate to the phenomena being observed), in particular for those spectral bands relevant for depiction of rapidly developing small-scale events and retrieval of wind information.

Progress: The following geostationary satellite operators have reported at CGMS that they will have SEVIRI-like capability by 2015: NOAA (2012), EUMETSAT (present) and Russian Federation (2007).

Schedule: WMO Space Programme will continue discussions with space agencies, via CGMS especially with IMD, CMA and JMA.

S3. GEO Sounders - All meteorological geostationary satellites should be equipped with hyper-spectral infrared sensors for frequent temperature/humidity sounding as well as tracer wind profiling with adequately high resolution (horizontal, vertical and time).

Comment: This was to be demonstrated by GIFTS. However, for budgetary reasons, NASA has recently curtailed the GIFTS mission to assemble and vacuum test Engineering

Design Unit; realization of a GIFTS demonstration in geostationary orbit is a task to be undertaken by the international community, possibly within the International Geostationary Laboratory (IGeoLab).

Progress: All operators reported plans at CGMS in 2004: NOAA has firm plans including this capability for the GOES-R series; EUMETSAT has it under consideration for the MTG series; China and India have plans for capability similar to current GOES sounder before 2010. CGMS endorsed the concept of the International Geostationary Laboratory (IGeoLab) that would be a joint undertaking to provide a platform for demonstrations from geostationary orbit of new sensors and capabilities. GIFTS is one of two systems being considered for IGeoLab. Roshydromet and Roskosmos are negotiating with NOAA the possibility to install GIFTS on board of the subsequent geostationary satellite "ELEKTRO". A task team evaluating two test instrument proposals for IGeoLab met in early June 2005 in Silver Spring, MD. This meeting was the outgrowth of an action from the Consultative Meetings on High-level Policy on Satellite Matters (CM) hosted by WMO in January 2005, where the Space Agencies endorsed the concept of IGeoLab and requested that the two proposals (the Geostationary Imaging Fourier Transform Spectrometer – GIFTS and the Geostationary Observatory for Microwave Atmospheric Sounding - GOMAS) be further explored. These two instruments in geosynchronous orbit are high priority and necessary enhancements to the Global Observing System (GOS) for meeting existing user requirements in numerical weather prediction (NWP), nowcasting, hydrology and other applications areas. In September 2005 thermal vacuum testing of the GIFTS Engineering Design Unit (EDU) was started in Logan, Utah. This will demonstrate several key technologies working together (active cooling, Focal Plane Array detectors (FPA), Fourier Transform Systems (FTS), high speed Analog to Digital converters (A/D), lightweight optics, operation at cryogenic temperatures). Information from the GIFTS TV will be shared with international community to help with instrument performance specifications.

Schedule: WMO Space Programme is continuing pursuit of a GIFTS demonstration on IGeoLab with space agencies. See note in Schedule for S-13. Additionally, plans from all space agencies for hyperspectral geostationary sounding should be in place by CGMS 2006.

S4. GEO Imagers and Sounders - To maximize the information available from the geostationary satellite systems, they should be placed "nominally" at a 60-degree sub-point separation across the equatorial belt. This will provide global coverage without serious loss of spatial resolution (with the exception of Polar Regions). In addition this provides for a more substantial backup capability should one satellite fail. In particular, continuity of coverage over the Indian Ocean region is of concern.
Comment: In recent years, contingency planning has maintained a 5-satellite system, but this is not a desirable long-term solution.

Progress: WMO Space Programme will continue to discuss with space agencies, via CGMS and WMO Consultative Meetings on High-level Policy on Satellite Matters, the strategy for implementation towards a nominal configuration with attention to the problems of achieving required system reliability and product accuracy.

Schedule: Plan should be available by CGMS in 2006

LEO satellites

S5. LEO data timeliness - More timely data are needed. Improved communication and processing systems should be explored to meet the timeliness requirements in some applications areas (e.g. Regional NWP).

Progress: EARS data are now available with a delay of less than 30 minutes; the data are used operationally at some NWP centres and planned at others. NPOESS plans are for data delivery in less than 30 min and thus consistent with this requirement. The successful EUMETSAT ATOVS Retransmission Service has been renamed the EUMETSAT Advanced Retransmission Service and will carry AVHRR and ASCAT products in addition to ATOVS. Planning has begun for other Regional ATOVS Retransmission Systems (RARS) in Asia, Australia, and South America with a goal for an Integrated Global Data Dissemination Service (IGDDS).

Schedule: WMO will host a global RARS Workshop in December 2005 with participation by Europe/Americas and Asia-Pacific. WMO Space Programme is planning, with Members and CGMS, the development of Advanced Dissemination Methods (ADMs) and an Integrated Global Data Dissemination Service (IGDDS), to include: (1) the extension and enhancement of EARS; (2) the implementation of similar systems, with a goal of achieving timely retransmission of local data sets covering the globe; (3) an equivalent system for NPP data; (4) expansion of EARS and equivalent systems to include IASI data; and (5) establishment of equivalent systems for the LEO data from satellites of other agencies.

S6. LEO temporal coverage - Coordination of orbits for LEO missions is necessary to optimize temporal coverage while maintaining some orbit redundancy.

Progress: This is now the subject of a permanent action of CGMS. WMO Space Programme will collaborate with space agencies, via CGMS, on a target system that will be implemented and to take steps towards achieving it. Matters related for contingency planning in the AM and PM polar-orbits will be included.

Schedule: Target system agreed upon by CGMS in 2006.

S7. LEO Sea Surface Wind - Sea-surface wind data from R&D satellites should continue to be made available for operational use; 6-hourly coverage is required. In the NPOESS and METOP era, sea surface wind should be observed in a fully operational framework. Therefore it is urgent to assess whether the multi-polarisation passive MW radiometry is competitive with scatterometry.

Progress: 3 months of data has been made available to Windsat science team. Windsat data has been distributed to several NWP centres in 2005. Early assessments of its polarimetric capabilities to provide information on sea surface wind direction suggest that, while good information is available at high wind speed, this technology will not be competitive with scattering at low wind speed.

Schedule: The WMO Space Programme, via CGMS, will consider the implications for the GOS. WMO Space Programme will coordinate assessment of implications and provide feedback by late 2005.

S8. LEO Altimeter - Missions for ocean topography should become an integral part of the operational system.

Progress: Agreement has been reached to proceed with JASON-2.

Schedule: WMO Space Programme to discuss with space agencies, via CGMS and WMO Consultative Meetings on High-level Policy on Satellite Matters, the continuity of operational provision after JASON-2. Plans for operational follow-on should be reported at CGMS in 2006.

S9. LEO Earth Radiation Budget - Continuity of ERB type global measurements for climate records requires immediate planning to maintain broad-band radiometers on at least one LEO satellite.

Comment: There are no current plans for ERB-like measurements after Aqua. There are also concerns about the continuity of absolute measurements of incoming solar radiation.

Progress: WMO Space Programme to discuss with space agencies, via CGMS. NPOESS has announced that the second NPOESS satellite will carry the CERES instrument (likely launch in 2013).

Schedule: WMO Space Programme will advise CGMS of this development. Possible gaps in coverage should be discussed at CGMS in 2005.

R&D satellites

S10. LEO Doppler Winds - Wind profiles from Doppler lidar technology demonstration programme (such as Atmospheric Dynamics Mission - Aeolus) should be made available for initial operational testing; a follow-on long-standing technological programme is solicited to achieve improved coverage characteristics for operational implementation.

Comment: Plans for Aeolus demonstration are proceeding on schedule, but there are no plans for operational follow on.

Schedule: WMO Space Programme will discuss with space agencies, via CGMS and WMO Consultative Meetings on High-level Policy on Satellite Matters, to assure demonstration with Aeolus and initiation of operational systems for wind profile measurement. Plans for continuity of a Doppler Winds capability following Aeolus should be indicated by CGMS satellite operators in 2006.

S11. GPM - The concept of the Global Precipitation Measurement Missions (combining active precipitation measurements with a constellation of passive microwave imagers) should be supported and the data realized should be available for operational use, thereupon, arrangements should be sought to ensure long-term continuity to the system.

Progress: TRMM continues to provide valuable data for operational use. Early termination of TRMM after 2004 was averted after user community appeals for its continuation. NASA has assured continued operation into 2006. At CGMS-XXXII, NASA, ESA and JAXA reported plans for a GPM mission in 2008. In 2005, ESA's European GPM was not selected as the next Earth Observer Mission.

Schedule: WMO Space Programme is continuing discussions with space agencies, via CGMS and at CM-6 in 2005, regarding plans for a TRMM follow on.

S12. RO-Sounders - The opportunities for a constellation of radio occultation sounders should be explored and operational implementation planned. International sharing of ground network systems (necessary for accurate positioning in real time) should be achieved to minimize development and running costs.

Progress: CHAMP and SAC-C data have been available to some centres but not in near real time (NRT). NWP OSE has shown positive impact with small number of occultations. Climate applications are being explored. There has been good progress in planning for NRT distribution of METOP/GRAS and COSMIC data.

Schedule: WMO Space Programme will discuss with space agencies, via CGMS, (1) the proposal to develop a shared ground network system and (2) operational constellations

following COSMIC. Additionally, WMO will seek formal participation by CONAE in the space-based component of the GOS for the SAC-C mission and any relevant follow-on.

Schedule: Plan for shared ground network should be available by CGMS in 2006. Plan for operational follow-on should be drafted by CGMS in 2006.

S13. GEO Sub-mm - An early demonstration mission on the applicability of sub-mm radiometry for precipitation estimation and cloud property definition from geostationary orbit should be provided, with a view to possible operational follow-on.

Progress: EUMETSAT, NESDIS and WMO prepared a paper for CGMS on the International Geostationary Laboratory (IGeoLab) that would be a joint undertaking to provide a platform for demonstrations from geostationary orbit of new sensors and capabilities. Geo sub-mm is one of two systems being considered for IGeoLab. A task team evaluated the IGeoLab possibilities for a Geostationary Observatory for Microwave Atmospheric Sounding (GOMAS) as well as other possible instruments. The GOMAS instrument in geosynchronous orbit is high priority and a necessary enhancement to the Global Observing System (GOS) for meeting existing user requirements in numerical weather prediction (NWP), nowcasting, hydrology and other applications areas. The task team is pursuing definition of feasible options for a geo sub mm instrument; the WMO Space Programme will seek partners for development of the recommended Geo sub mm instrument with space agencies and will report progress at CGMS. An IGeoLab Focus Group meeting will be held on 24 October 2005 and the results will be reported to CGMS XXXIII.

Schedule: WMO Space Programme will continue dialogue with space agencies, via CGMS. Progress toward IGeoLab will be discussed at CGMS in 2005.

S14. LEO MW - The capability to observe ocean salinity and soil moisture for weather and climate applications (possibly with limited horizontal resolution) should be demonstrated in a research mode (as with ESA's SMOS and NASA's OCE) for possible operational follow-on. Note that the horizontal resolution from these instruments is unlikely to be adequate for salinity in coastal zones and soil moisture on the mesoscale.

Progress: ERS data sets have provided monthly global soil moisture maps since 1991 at 50 km resolution.

Schedule: WMO Space Programme will discuss with space agencies, via CGMS.

S15. LEO SAR - Data from SAR should be acquired from R&D satellite programmes and made available for operational observation of a range of geophysical parameters such as wave spectra, sea ice, land surface cover.

Progress: WMO Space Programme to discuss with space agencies, via CGMS, (1) access by WMO Members to ENVISAT SAR data, and (2) continuity of such missions.

Schedule: Assessment of status and plans completed by CGMS in 2006.

S16. LEO Aerosol - Data from process study missions on clouds and radiation as well as from R&D multi-purpose satellites addressing aerosol distribution and properties should be made available for operational use.

Progress: Cloudsat will carry a R&D aerosol instrument. NPOESS has added an aerosol instrument. This issue has been referred to CGMS.

Schedule: WMO Space Programme will continue discussions with space agencies, via CGMS and CEOS.

S17. Cloud Lidar - Given the potential of cloud lidar systems to provide accurate measurements of cloud top height and to observe cloud base height in some instances (stratocumulus, for example), data from R&D satellites should be made available for operational use.

Schedule: WMO Space Programme will discuss with space agencies, via CGMS.

S18. LEO Far IR - An exploratory mission should be implemented, to collect spectral information in the Far IR region, with a view to improve understanding of water vapour spectroscopy (and its effects on the radiation budget) and the radiative properties of ice clouds.

Schedule: WMO Space Programme to discuss with space agencies, via CGMS.

S19. Limb Sounders - Temperature profiles in the higher stratosphere from already planned missions oriented to atmospheric chemistry exploiting limb sounders should be made operationally available for environmental monitoring.

Schedule: WMO Space Programme will discuss with space agencies, via CGMS, progress/plans for distribution of data from MIPAS and SCIAMACHY on ENVISAT, from MLS and HIRDLS on AURA, and from similar instruments.

S20. Active Water Vapour Sensing - There is need for an exploratory mission demonstrating high-vertical resolution water vapour profiles by active remote sensing (for example by DIAL) for climate monitoring and, in combination with hyper-spectral passive sensing, for operational NWP.

Schedule: WMO Space Programme will discuss with space agencies, via CGMS.

APPENDIX VIII

IGDDS DEFINITION

The Integrated Data Dissemination Service (IGDDS) defines the **satellite data and products circulation scheme** that is expected to meet the needs of WMO Programmes, as agreed by WMO EC in the WMO Space Programme Implementation Plan.

Rather than an industrial project, which would refer to a global architectural design and detailed interface specifications, the IGDDS is primarily a **vision**, which is **gradually implemented in a pragmatic way by satellite operators** in cooperation among themselves and with WMO and external partners, in order to meet growing needs to provide access to large data volumes in near real time. The objective of the WMO Space Programme with respect to the IGDDS is to monitor and facilitate this implementation, in the broader framework of the WMO Information System and consistent with GEOSS objectives.

The IGDDS has the following particular features:

- Scope: *the IGDDS shall include the communication segments supporting the transfer of all data levels, i.e. raw data originating from data sources, higher level data disseminated to the users, as well as low or high level data exchanged between production centres within a region or at inter-regional scale. Although not explicitly mentioned in the acronym, IGDDS may thus include data collection and data exchange networks in addition to data dissemination means;*
- Integrated: *the service shall offer unified access to the various sources of data, including operational GEO or LEO satellites, R&D satellites, or higher level products. It should be sufficiently open to be able to deliver other types of data if appropriate, thus allowing non-satellite data to benefit from the service as well;*
- Global: *in view of increasing needs to access data from the whole globe IGDDS shall provide a mechanism for inter-regional data exchange in such a way that observational data from any region could be also available in any other region;*
- Dissemination: *a core functionality of the IGDDS is routine dissemination of satellite data in real time. A preferred method for this routine dissemination is to use commercially available technologies such as Digital Video Broadcast (DVB) via satellite. This is referred to as Advanced Dissemination Methods (ADM). In order to serve the needs of different user communities and regions having different contexts, IGDDS may have to rely on different and complementary data access mechanisms. Interactive access will complement the routine dissemination by ADM;*
- *Service*: each satellite operator within the IGDDS shall manage user requests and ensure and monitor a high quality of service.

IGDDS shall be part of the overall WMO Information System. This will imply in particular a harmonized approach of data and metadata management ensuring interoperability with the Global Information Service Centres (GISC). Having regard to the large volumes of data they are responsible for, it is expected that satellite operators will act within the WIS as Data Collection and Product Centres (DCPC) and satisfy the DCPC requirements as defined within WIS.

Figure 1: IGDDS including ADMs, RARS, in the context of WIS

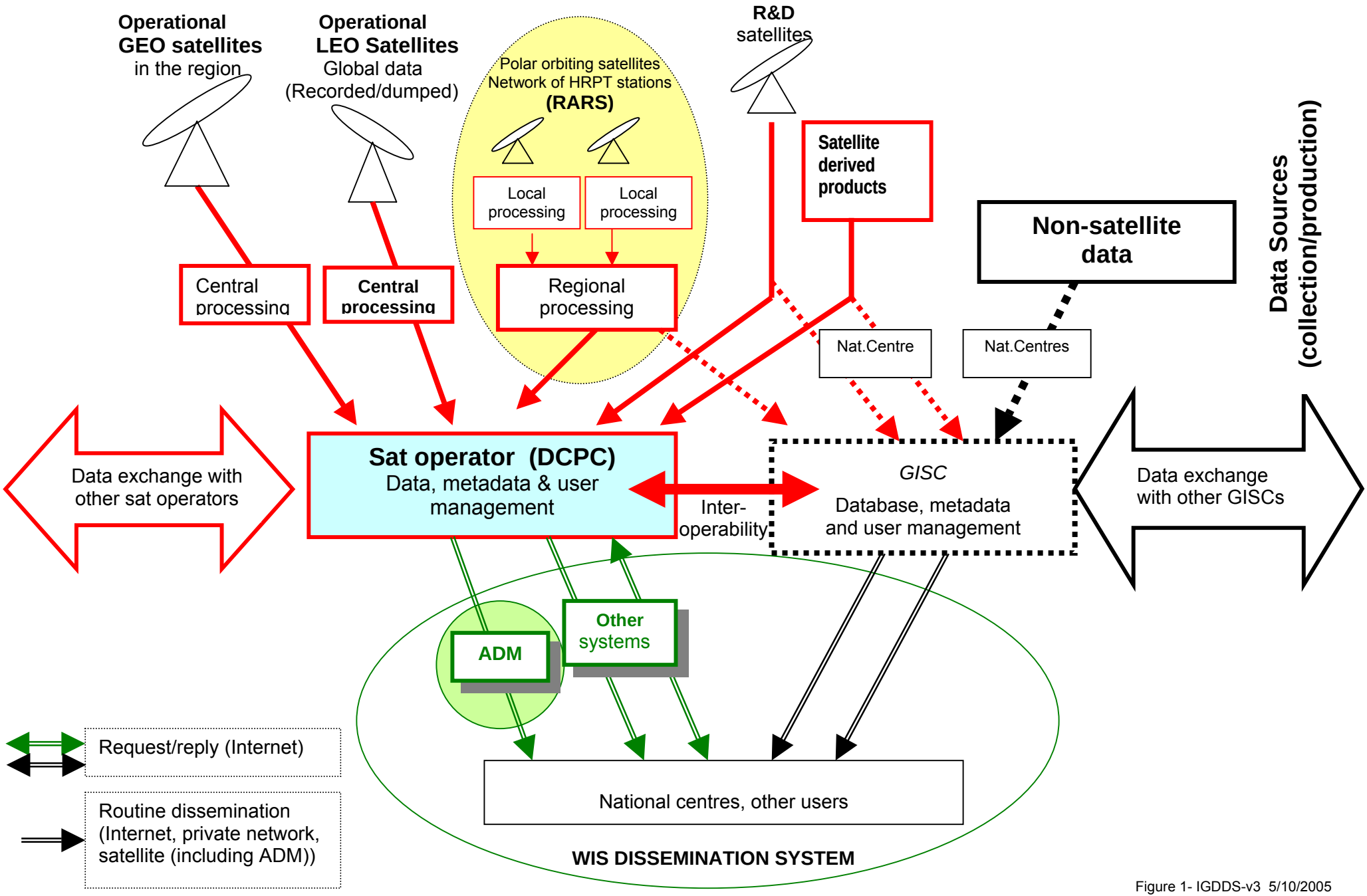

Figure 1- IGDDS-v3 5/10/2005

APPENDIX IX

IGDDS – UPDATES TO THE IMPLEMENTATION PLAN

The envisaged features of the IGDDS have been described in the WMO Space Programme Implementation plan 2004 – 2007 (Annexe III of CM-5, paragraphs 62 to 77). The ET-SUP-1 proposed the following updates to the Implementation Plan, taking into account the conclusions reached about IGDDS, and noting that the term ADM should be changed from its initial meaning of Alternative Dissemination Method to Advanced Dissemination Method (as approved at CBS Ext.(02) held in Cairns, Australia in 2002 and presently contained in the Manual on the Global Observing System) as reflected in paragraph 62, and that references to Future WMO Information System (FWIS) should be replaced by WMO Information System (WIS).

Extract from the WMO Space Programme Implementation Plan updated by ET-SUP-1 (changes are in bold)

*62. Bearing in mind the requirement for cost-optimized access to meteorological data/products, and the planned increases in associated data volumes, the concept of **Advanced** Dissemination Methods (ADM) has been developed.*

*69. It is envisaged that the Integrated Global Data Dissemination Service would be constructed from dissemination services provided in **four** discrete dissemination service areas which, taken together, would provide an integrated data dissemination service to all WMO members around the globe.*

71. A starting point for the configuration of a four dissemination service area system could be:

Dissemination Service Area	*Approximate Centre of Service Area*
*Europe, Africa and **East** Atlantic*	*0^{o}*
*Western Atlantic, **North-America**, South America and Eastern Pacific*	***90^{o} W***
Eastern Asia, Australia and Western Pacific	***120^{o} E***
Western Asia and Indian Ocean	*76^{o} E*

*75. Instead it is proposed that, based on "expressions of interest from satellite operators" for providing dissemination services for all, or part of, one of the **four** dissemination service areas, the CGMS would be invited to:*

- *Identify the precise boundaries of the dissemination areas, considering that:*
  - ***the coverage of each dissemination area should be consistent with the location of the primary user community of an operational geostationary meteorological satellites;***
  - *every WMO member should be adequately covered by an ADM service;*
  - *the boundaries of existing dissemination services need to be considered.*

- *Consolidate the data dissemination requirements in each dissemination service area, taking due account of:*
  - *the requirements for regional satellite observational data defined by the relevant WMO Regional Associations;*
  - *any other regional satellite observational data requirements for which a dissemination service is currently provided, or planned to be provided;*

- *the WMO requirements for global satellite observational data;*
- *any relevant obligations stemming from the **WMO Information System (WIS)** concept. For example, satellite operators providing a dissemination service may have to fulfil the role of a Data Collection or Product Centre (DCPC). The adoption of this role could have implications in the following areas:*
- *catalogue/metadata standards to ensure catalogue interoperability;*
- *protocols;*
- *the inclusion within the dissemination scheme of regional observation data not derived from satellites (e.g. data currently broadcast via the GTS).*

- *Identify the Satellite Operator(s) that will provide the dissemination service for each dissemination service area, noting that within one dissemination service area, responsibility for providing the service may be shared between satellite operators or, indeed, one satellite operator may cover more than one service area.*

- *Based on the identified dissemination service area boundaries, the satellite operators who have opted to provide a dissemination service would then be responsible for:*
  - *acquiring and disseminating regional data;*
  - *exchanging global data with other operators of the integrated global data dissemination service.*

- *Define the global architecture of the **four** dissemination services that, taken together, constitute the Integrated Global Data Dissemination Service (including a description of the communications means by which each WMO member will receive data from the service).*

- *When defining the global architecture, it is considered essential that:*
  - *the underlying requirement for standard, affordable user receptions stations is respected;*
  - *a co-ordinated approach is taken to:*
  - *communication standards;*
  - *data format standards;*
  - *encryption mechanisms;*
  - *user station operating systems.*

- *Identify actions that will enable global networking so as to ensure the smooth exchange of data and products between dissemination service operators, noting that:*
  - *the requirements for data exchange are expected to be restricted to satellite data;*
  - *data ownership and data protection issues may need to be addressed.*

- *Produce an overall schedule for the introduction of the Integrated Global Data Dissemination Service.*

APPENDIX X

ACTION ITEMS

ACTION 1.1 WMO Secretariat to establish and implement as soon as practical a fully functional web-based online questionnaire.

ACTION 1.2 ET-SUP and WMO Space Programme Office to follow the timetable for the preparation of the next questionnaire and associated analysis and technical document

ACTION 1.3 WMO Space Programme to report to CGMS on the outcome of ET-SUP discussions on IGDDS; in particular the goal to implement by January 2007 remaining ADMs with high priority for the Asia-Pacific region.

ACTION 1.4 WMO Space Programme to inform satellite operators attending the 6th Consultative Meetings on High-level Policy on Satellite Matters (CM-6) on the requirement for near-real-time access to R/D satellite missions.

ACTION 1.5 WMO Space Programme to inform CM-6 of R&D satellite missions that would be of value to WMO Members and should become part of the space-based component of the global observing system

ACTION 1.6 The Chairman of ET-SUP to inform the next session of ET-SAT of the requirements for new R&D satellite missions as indicated above.

ACTION 1.7 To provide CGMS with details of the HPTE Project Development Plan (IOS Chair)

ACTION 1.8 Co-Chairs of the VLMG to prepare a cover letter for the WMO Space Programme to send to all VLMG members regarding the HPTE. The letter should cover technical requirements to participate in the HPTE and include the Project Development Plan as an appendix.

ACTION 1.9 WMO Space Programme to confirm to Argentina the “expectations from Centres of Excellence”

ACTION 1.10 WMO Space Programme to invite CONAE to become a contributing member to the space-based component of the Global Observing System.

ACTION 1.11 To initiate discussions on INPE/CPTEC contribution to training activities as a Centre of Excellence, subject to confirmation of the proposals by the PR of Brazil.

ACTION 1.12 WMO Space Programme to report to CGMS on RGB compositing harmonization

ACTION 1.13 WMO Space Programme to convene a workshop on RGB compositing

ACTION 1.14 WMO Space Programme to raise the issues with CGMS satellite operators of the transition to new operational products upon satellite changes and submit the recommendation that satellite operators assign a period of time during which AMV products from new satellites would be distributed in parallel with those from predecessor satellites and moreover that activities would be initiated during this period to ensure new products achieved at least the quality of predecessor products (by common agreement) before the latter were withdrawn, and NWP centres are involved in these validation activities