CGMS HIGH LEVEL PRIORITY PLAN (HLPP)
2018 - 2022

Prepared by the CGMS Secretariat
following CGMS-46 deliberations

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INTRODUCTION

The main goals of the coordination activities of the Coordination Group for Meteorological Satellites are to support operational weather monitoring and forecasting as well as climate monitoring, in response to requirements formulated by WMO, its programmes and other programmes jointly supported by WMO and other international agencies.

It is the policy of CGMS to coordinate satellite systems of its members in an end-to-end perspective, including protection of in orbit assets and support to users - e.g. through appropriate training - as required to facilitate and develop shared access to and use of satellite data and products in various applications. This policy reflects in the structure of this 4-year High Level Priority Plan, which covers:

1. Operational Continuity and Contingency Planning
2. Coordination of Satellite Systems and Operations
3. Coordination of Data Access and End User Support
4. Enhancement of the quality of satellite-derived data and Products
5. Outreach and training activities
6. Cross-cutting issues and new challenges

CGMS reviews the HLPP on an annual basis, considering in particular new requirements and perspectives arising from interactions with the user and scientific communities, the development of applications, e.g. NWP, and relevant research activities. It ensures proper interaction with other space agencies and their relevant constituencies (e.g. CEOS including its working groups and virtual constellations).

HIGH LEVEL PRIORITY TASKS

The high level priority tasks are presented according to the logic of the CGMS end-to-end systems.

1 OPERATIONAL CONTINUITY AND CONTINGENCY PLANNING

1.1 Mitigate the impact of identified degradation or loss of capabilities of the CGMS baseline and ensure appropriate contingency measures are in place, in particular to:

- ensure continuity of passive microwave imager measurements; and
- ensure long-term continuity of the Early Morning orbit, in particular for IR/MW sounding;

1.2 Advance the response to the WIGOS 2040 vision for space, by the implementation of new capabilities beyond the CGMS baseline, in particular:

- advance the new generation of GEO satellites, including advanced imaging, lightning mapping and IR sounding for the whole geostationary ring;

- work towards ensuring low frequency microwave imagery for all-weather SST and ice monitoring from at least 2 sun-synchronous orbits;

- increase geographical altimetry coverage, for example through wide-swath altimetry;

- advance the atmospheric Radio Occultation constellation, with the long-term goal of providing 20000 occultations per day on a sustained basis;

- move towards an operational space weather monitoring capability from the Lagrangian Point L-5;

1.3 Support satellite impact studies, including in particular impact of data latency and the impact of the Early Morning orbit;

1.4 Investigate through IROWG how a coordinated and optimised system could be set up for radio occultation observations for ionosphere monitoring;

1.5 Identify partnership opportunities on space and ground segments and establish CGMS coordinated mechanisms;

2 COORDINATION OF SATELLITE SYSTEMS AND OPERATIONS

2.1 Coordination/Optimisation of data collection systems

2.1.1 Assess Data Collection Service (DCS) and Argos Data Collection System (A-DCS) status and evolutions including International channels, taking into account requirements of tsunami alert systems and in-situ ocean observations (e.g. buoys), and assess the utilisation of International DCS channels;

2.1.2 Establish International DCP design standards taking into account requirements of tsunami alert systems and in-situ ocean observations (e.g. buoys);

2.1.3 Establish best practices for DCP certification, including lessons learnt and shared experiences on certification of DCS platforms (especially High Rate DCPs);

2.1.4 Share information on the development of their High Rate DCPs and share lessons learned on mitigating interference between DCPs;

2.1.5 Establish Best Practices for Data Access, based on user requirements for sharing data/information delivered using DCS (outside the regional area) and evolve the mechanisms to share DCP data;

2.2 Radio Frequency (RF) Protection

2.2.1 Facilitate an effective preparation of national positions for the World Radio-communication Conference (WRC) 2019 favourable for the CGMS-related issues, in particular but not exclusively with regard to the protection of the band 400.15-403 MHz used for DCS systems, protection of the EESS downlink band 25.5-27 GHz, protection of passive sensing bands from out-of-band emissions and protection of the active sensing instruments using the 5GHz range;

2.3 Direct Broadcast Systems and Data Processing

2.3.1 To ensure the ease of use of data products, provide for dissemination of satellite-derived data and products in one of the four established formats (HRIT, BUFR/GRIB, NetCDF 4 and HDF 5). When a unique data format is used, use an open standard if possible or provide full documentation of the format to users along with the software to convert the data to one of the established formats;

2.3.2 Develop efficient standardized data handling for high-resolution imaging and hyperspectral instruments, employing novel methods like dissemination of hyperspectral infrared data based on Principal Component Analysis;

2.3.3 Facilitate the transition to new direct broadcast systems (GOES-R, GEO-KOMPSAT-2A JPSS, FY-3, Meteor-M, Metop-SG);

2.3.4 Advance the implementation of the CGMS Agency Best Practices in support to Local and Regional Processing of LEO Direct Broadcast data for operational satellites with DB capability;

2.3.5 Support the evolution of the DBNet services to include new satellites and the extension to advanced sounders for at least half of the globe;

2.4 Operational issues related to Space Weather

2.4.1 Evaluate existing operational space weather products and services in support of CGMS members' spacecraft operations and recommend additional services as appropriate;

3 COORDINATION OF DATA ACCESS AND END-USER SUPPORT

3.1 Support the user-provider dialogue on regional/continental scales through regional coordination groups maintaining requirements for dissemination of satellite data and products through the various broadcast services;

3.2 Prepare operational users for new generation of meteorological satellites through user readiness programmes, with coordinated contributions from CGMS members;

3.2.1 Advance the implementation of the Best Practices for Achieving User Readiness for New Meteorological Satellites, in as far as the apply to CGMS operators;

3.2.2 Provide up-to-date Information on these topics, to be synthesized and maintained by WMO in the SATURN portal, dynamically linked to resources of CGMS members, including the new generation of GEO satellites as well as new LEO satellites;

3.3 Support the coordination of the operational Digital Video Broadcast (DVB) satellite services for the Americas, Africa, Europe and the Asia Pacific regions;

3.4 Increase access to, and use of, data from R&D and pre-operational missions, including space weather missions;

3.5 Investigate the feasibility of utilizing existing dissemination infrastructure for meteorological information in helping to mitigate disasters;

3.6 Increase operational access to data and products in support to the ocean user community;

3.7 Utilise operationally the WIS infrastructure for satellite data provision and discovery;

3.8 Provide coordinated CGMS inputs to WMO on satellite and instrument identifiers for data representation and metadata within the WIS;

3.9 Harmonise the metadata (e.g. quality descriptors) and format of products to be exchanged, in adherence to the Service and Discovery metadata standards formulated in the context of WIGOS/WIS;

3.9.1 Support WIGOS in the definition of harmonized product metadata for satellite data and implement for CGMS missions;

3.9.2 Promote the product metadata standards within ocean communities, such as on SST, ocean colour, ocean vector surface wind and ocean surface topography, to facilitate

common data representation and near-real time exchange. This must be done in dialogue with the relevant CEOS Virtual Constellations;

3.10 Document current data formats for space weather observations;

3.11 Improve the near-real-time access to and global exchange of space weather data from instruments hosted on meteorological satellites;

3.12 Explore options for optimal data exchange of advanced data from new generation GEOs, in consultation with the global NWP centres through GODEX-NWP;

4 ENHANCE THE QUALITY OF SATELLITE-DERIVED DATA AND PRODUCTS

4.1 Establish a fully consistent calibration of relevant satellite instruments across CGMS agencies, recognising the importance of collaboration between operational and research CGMS agencies

4.1.1 Establish within GSICS a consistent inter-calibration for thermal IR channels using hyper-spectral sounders as reference. The implementation will be done successively by the individual satellite operators;

4.1.2 Establish within GSICS a consistent inter-calibration for solar channels using instruments with adequate in-orbit calibration and vicarious methods as reference. The implementation will be done successively by the individual satellite operators;

4.2 Establish commonality in the derivation of satellite products for global users where appropriate (e.g., through sharing of prototype algorithms)

4.2.1 Establish commonality in the derivation of AMV products for global users where appropriate (e.g., through sharing of prototype algorithms) and consider backwards compatibility when designing AMV algorithms for the 16-channel imagers, so that present state-of-the-art algorithms can be applied to old imagery;

4.2.2 Continue research into improved derivation and assimilation of high resolution winds for use in high resolution data assimilation and nowcasting, liaising with ICWG and IWWG as appropriate for the provision of further information characterising the AMV derivation for enhanced QC and error characterisation;

4.2.3 Establish a coherent development of volcanic ash products (notably from current and future geostationary imagers) utilising the JMA testbed;

4.2.4 Develop best practices for retrieving cloud properties, using the converging capabilities of next-generation geostationary imagers;

4.2.5 Using current and future geostationary imagers and sounders, generate and disseminate consistent basic nowcasting products, initially in pilot areas, as identified in SCOPE-Nowcasting;

4.2.6 Consider the full range of user capabilities (ranging from advanced Short range NWP to more conventional nowcasting) when planning data utilisation, products generation and dissemination strategies, in particular for the new geostationary satellites;

4.2.7 To establish together with the user community a commonly agreed approach for retrieval of Principal Component scores and associated parameters from hyperspectral infrared data, minimizing information loss including the mutually acceptable update strategy for the principal component basis and to implement such an approach in a coordinated manner;

4.3 Foster the continuous improvement of products through validation and inter-comparison through international working groups and SCOPE-type mechanisms

4.3.1 Apply the IPWG validation protocol (as defined on its web page) to precipitation combination datasets generated using multiple satellite and in-situ data sources, and expand the number of participating agencies to broaden the validation domain;

4.3.2 Provide updated SCOPE-CM Implementation Plan considering changed international context (CEOS/CGMS Working Group Climate) by 2018. Define transition scenario for SCOPE-CM Phase-2 projects into sustained multi-agency production by 2019;

4.3.3 Conduct an intercomparison study between the different methods to derive level 2 data from infrared hyperspectral sounders, recognising that there are several software packages available that utilize AIRS/IASI/CrIS data;

4.4 Maintain, enhance and improve the methods to describe the error characteristics of satellite data and products

4.4.1 Establish a common vocabulary and methodology with appropriate error propagation to include the errors associated with validation data (e.g. radiosonde temperature, water vapour, precipitation and winds);

4.4.2 Agree on standardized procedures to derive NedT estimates for microwave sounders, and include such estimates in the disseminated BUFR data;

4.5 Strengthen interaction with users in selected thematic areas by establishing a close relation with them as beta-testers and foster optimum use of satellite data

4.5.1 Establish a sustained interaction with the operational Nowcasting communities with a view to fully utilise the commonality of the future geostationary imagers and sounders;

4.5.2 Report on the progress within the Nowcasting community toward the use of hyperspectral sounders and work toward common products to serve the requirements of the global community;

4.5.3 Enhance the use of satellite precipitation datasets through an IPWG-led user workshop where training on visualization and analysis tools will be one of the topics;

4.5.4 Foster the coordinated development of novel products and applications of the new generation of geostationary imagers, initially for the areas of fire, aerosols and flood-mapping;

4.6 Foster and support research regarding enhanced radiative transfer capabilities, recognising the paramount importance of radiative transfer developments for satellite products

4.6.1 Continue support for line-by-line (LBL) reference model development and enhanced characterization of spectroscopy to ensure that product development teams and users of level 1 data have access to the latest updates in LBL forward modelling and the uncertainties involved;

4.6.2 Perform validation and intercomparison of LBL models/spectroscopy to assess the impact of spectroscopic uncertainties and the differences between line-by-line and fast radiative transfer models;

4.6.3 Through coordination between IPWG, ITWG and ICWG, continue to improve microwave radiative transfer models to include complex surfaces (e.g., snow, desert, etc.) and scattering atmospheres (e.g., frozen hydrometeors) to support improved algorithm development for current and future sensors;

4.7 Stimulate trade-off analyses for the development of future passive sounding instruments

4.7.2 Conduct studies to investigate the technical feasibility to reduce the field of view sizes for future microwave sounders to keep in line with the spatial resolution expected for future global NWP models;

5 OUTREACH AND TRAINING

5.1 Impact and benefit of CGMS satellite missions

5.1.1 Develop capacity to assess and communicate socio-economic benefits of CGMS satellite missions;

5.1.2 Engage in communication and outreach activities to promote EO and Space Weather observations benefits;

5.2 Training

5.2.1 Continue to foster optimum use of satellite data for weather forecasting, climate applications, and environmental assessments including hazardous events such as volcanic ash and flooding;

5.2.2 Update and develop new VLab training material where necessary, and in collaboration with partner institutions such as Collaboration among Education and Training Programmes (COMET) and Committee on Space Research (COSPAR);

5.2.3 Provide shared, regular support to funding the VLab Technical Support Officer function through the WMO VLab Trust Fund, and to the VLab Centres of Excellence as per agreed expectations;

5.3 User Conferences

Conduct regional satellite users' conferences to (i) share experience and foster the exchange of ideas; ii) promote better access, and improve the utilisation of, existing satellite data and products; (iii) prepare the user community on new satellite systems' data products and services, (iv) engage young people entering the field and (v) other items as appropriate;

6 CROSS CUTTING ISSUES AND NEW CHALLENGES

6.1 Advancing the architecture for climate monitoring from space (through the joint CEOS-CGMS Working Group on Climate)

6.1.1 Update ECV Inventory (with traceability to satellite CDR holdings), Gap Analysis and Action Plan of JWG Climate and report on status of JWG actions (This target is cyclic and all three parts are covered every year including endorsement by CEOS and CGMS);

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

6.1.3 Respond (via CEOS) to the GCOS IP after new versions of it issued by GCOS. Provide mid-term assessment on progress in time for GCOS adequacy report;

6.1.4 Foster the implementation of the architecture for climate monitoring from space by strengthening the analysis of use cases for climate data records to increase uptake by users;

6.2 Space Weather

6.2.1 Establish dialogue with Space Weather User Community and define the future framework for continuing this dialogue;

6.2.2 Investigate feasibility of a consistent inter-calibration for energetic particle measurements using instruments with adequate in-orbit calibration and vicarious methods, using GSICS methodology as reference;

6.3 Greenhouse Gas and Carbon monitoring from space

6.3.1 Provide a coordinated contribution to the planning of a future satellite-based carbon constellation and to related activities on mission coordination, data distribution, exchange, formatting, and on training and outreach;

6.3.2 Integrate specific activities related to space based GHG monitoring in the working structure of CGMS, in particular WGs I-IV.