GSICS-RDFOR

Global Satellite
Inter-Calibration System

FUNCTIONS AND ORGANIZATION

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# GSICS Functions and Organization

## Background

The Global Satellite Inter-calibration System (GSICS) was established in 2005 by WMO and the Coordination Group for Meteorological Satellites (CGMS). Its initial concept and strategy were submitted by WMO and endorsed by the 33rd CGMS meeting (Tokyo, Japan, 1-4 November 2005). On this basis, the Implementation Plan for a Global Space-Based Inter-Calibration System was developed in April 2006 and subsequently endorsed by WMO and CGMS.

GSICS was recognized in 2009-2011 as a Pilot Project in the Demonstration Phase of the WMO Integrated Global Observing System (WIGOS). It is now entering an operational phase and is referred to in the “Calibration and traceability” section of the Manual on WIGOS (Section 4.3.1).

The present document provides a high-level description of the purpose, targeted users, organizational structure, services and deliverables of GSICS. It replaces the initial GSICS Implementation Plan, which guided the early years of GSICS.

## Purpose and scope of GSICS

The aim of GSICS is to coordinate the production of satellite inter-calibration information enabling the use of space-based observations with improved and globally consistent accuracy for climate monitoring, weather forecasting, and environmental applications. GSICS is therefore an essential element for interoperability and traceability of observations within WIGOS.

Satellite operators and science teams are collaborating within GSICS to develop community-agreed best practices, standard procedures and tools. This enables to monitor, improve and harmonize the calibration of instruments aboard operational meteorological, climate and other environmental satellites of WIGOS. The focus of this activity is the systematic generation of in-orbit inter-calibration information to correct the individual calibration of Level 1 satellite data.

This routine production of in-orbit inter-calibration information is part of a comprehensive strategy, which involves a broader range of activities including:

• In-orbit instrument Level 1 data monitoring,

• In-orbit instrument comparison with references,

• Routine generation of intercalibration corrections for near real-time applications,

• Provision of algorithms enabling recalibration of archived data,

• Traceability to absolute measurement standards,

• Prelaunch instrument characterization

• Documentation of state-of-the-art calibration techniques.

## GSICS deliverables

* ***GSICS delivers inter-comparisons of space-based instruments with the GSICS references, and resulting calibration adjustments, which are commonly designated as “GSICS Products”***; the inter-comparison and calibration adjustments are performed by the GSICS member agencies in accordance with GSICS practices and standard procedures and are made available either in near real-time for current data, or as retrospective analyses or algorithms, for past data. The associated deliverables are either calibration coefficients, or correction functions to be applied by the user to the operational instrument calibration coefficients, or algorithms for the recalibration of archived data. A by-product is the monitoring of instrument Level 1 data;
* ***GSICS coordinates the definition and implementation of best practices and standard procedures*** for the comparison and inter-calibration of operational space-based instruments against the appropriate references. The associated deliverables are agreed procedures (such as inter-calibration algorithms), standards (such as data and metadata representation) and guidelines.
* ***GSICS maintains measurement references and tools.*** The references are either ground-based or space-based, to provide the best possible support to radiometric measurement calibration in the various spectral domains used by the WIGOS space-based component. The tools include software modules, data sets, infrastructure elements, which are shared among the GSICS member agencies to support inter-comparison and calibration activities in accordance with the agreed practices.
* ***GSICS delivers documentation and information*** on different media to assist satellite data users and GSICS member agencies in understanding GSICS activities and using GSICS services.

## GSICS users

Two main categories of users are expected to benefit from the deliverables above.

### The satellite data user community

Satellite data users are benefitting from the GSICS products and related documentation and information. GSICS Products are intended to support any application relying on accurate and globally consistent satellite data. This is the case of the generation of seamless composite satellite imagery products, or of stable quantitative Level 2 products such as cloud analysis, aerosol detection, or sea or land surface observations. It is also important for integrating surface and space observations. For Numerical Weather Prediction users it is useful to provide an understanding of the initial bias of the data and to remove most of the bias in the ingested data, thus enabling the linear bias correction to be more meaningful, and the data to have a better impact; absolute calibration also helps to anchor the model.

A particular use of GSICS products is climate change detection and monitoring. While climate applications normally do not require near real-time products they have stringent uncertainty and long-term stability requirements, as the monitoring of global climate change requires the detection of temperature changes as tiny as a few tenths of a degree per decade and e.g. ozone trends as small as 1% per decade. To support climate analysis and the creation of stable long-term climate data records it is necessary to monitor and inter-calibrate sensors on similar and different satellites, and inter-calibrate satellite observations with in-situ observations. In this respect, GSICS aims to serve as a building block of the Architecture for Climate Monitoring from Space, as described below.

Satisfying the needs of the NWP, climate and environmental monitoring communities for historical and current satellite data with reduced calibration uncertainties requires an integration of a diversity of approaches.

The User Requirements addressed by GSICS are summarized in the GSICS User Requirements Document [RDURD].

###  The GSICS Member agencies

GSICS members are both contributors and users, as they benefit from the best practices, standards and tools developed and promoted in the GSICS framework. In fostering sharing expertise and tools among satellite operators, GSICS contributes to capacity building, resource optimization, and improvement of calibration techniques.

## GSICS in the Architecture for Climate Monitoring from Space

The Strategy towards an Architecture for Climate Monitoring from Space[[1]](#footnote-1) has defined a logical view identifying four pillars illustrated in Figure 1.

Figure 2 illustrates GSICS activities, which are aiming at delivering intercalibration information and corrected calibration as part of the “Sensing” pillar. The use of this information for the re-processing of historical data series is part of the “Climate Record Creation” pillar.



Figure 1: Four pillars in the logical view of the Architecture for Climate Monitoring

***Corrected calibration***

Data acquisition
(Level 0)

**Calibration references and tools**

**Intercalibration procedures**

*Observations*

*Environment*

Operational calibration
(Level 1)

*Intercalibration information*

Figure 2: Calibration functions within the “Sensing” process.

## GSICS structure

WMO Members participate in GSICS through their satellite operating agencies and associated scientific and technical institutes. Participation in GSICS implies acceptance of the GSICS principles, practices and procedures. Details on accession to GSICS are provided in Annex 1.

GSICS Production and Research Centres (GPRC) are performing operational calibration, comparison and calibration adjustment of the instruments they are operating. They also contribute to GSICS research and development activities.

The GSICS Calibration Support Segments (CSS) provide tools, calibration references, and contributions to GSICS research and development activities.

The GSICS Coordination Centre (GCC) coordinates the definition of GSICS products and services, it maintains a repository of GSICS practices, procedures and tools, it coordinates the acceptance procedure of new products and the information exchange with the user community.

GSICS operates under the guidance of the GSICS Executive Panel composed of representatives designated by each participating organization. The WMO Secretariat serves as Secretary of the Panel. Representatives of partner organizations or potential future GSICS members can be invited to participate in the GSICS Executive Panel as Observers. The Executive Panel is advised by a Data Management Working Group (GDWG) and a Research Working Group (GRWG). The Terms of Reference and rules of procedure of GSICS bodies (GCC, Executive Panel, GDWG and GRWG) are contained in the Annexes to this document.



Figure 3: Structure of GSICS.

GSICS works in partnership with organizations pursuing complementary activities and organizations involved in the applications of calibrated data. An active collaboration is maintained with the Committee on Earth Observation Satellites (CEOS) Working Group on Calibration Validation (WGCV), in particular between its subgroup on Infrared and Visible Optical Sensors (IVOS) and the relevant GRWG subgroups.

GSICS reports to WMO through the Open Programme Area Group on Integrated Observing Systems (OPAG-IOS) of the Commission for Basic Systems (CBS) and to the Coordination Group for Meteorological Satellites (CGMS) through its annual report to the CGMS plenary.

## Calibration references

For the thermal infrared domain, a reference is chosen among the most accurate and stable of the available infrared spectrometers, in accordance with an agreed set of criteria. To the extent possible, the reference instrument should be SI traceable, for instance through the use of thermo-regulated black-bodies with phase-change cells.

For the near infrared and visible domains (solar channels) a reference is chosen among the most accurate and stable of the available short-wave spectrometers, in accordance with an agreed set of criteria. Natural targets such as the moon’s surface (together with a lunar model), deep convective clouds, ocean surface or desert targets are used as transfer standards. The radiometric and spectral character of Earth-reference targets, such as stable desert areas are determined using in-situ measurements from ground-, aircraft-, and balloon-based instruments. These in-situ measurements, made during long-term measurement projects and short-term special field campaigns, are used to monitor satellite instrument performance.

For the micro-wave domain, a reference is chosen among the most accurate and stable of the available microwave radiometers, in accordance with an agreed set of criteria, using an atmospheric Radiative Transfer Model as a transfer standard. Radiances computed from NWP analyses of atmospheric conditions can be compared with those observed from satellite.

Secondary references are defined in order to serve as transfer standards when the primary references are no longer available.

## GSICS production

###  High-level principles

The generation of calibration adjustments for Level 1 satellite sensor data is performed in accordance with the following principles:

* Calibration of satellite instruments is monitored and assessed by comparing their output with community references, using common methodologies, following international standards and community best practices, and, ultimately, tying these to SI-traceable standards.
* GSICS implements a continuous chain of comparisons, each with stated uncertainties, to ensure metrological traceability.
* Calibration corrections are generated with specified uncertainties, through well-documented, peer-reviewed procedures, based on various techniques aiming to ensure consistent and robust results, which are applicable over a broad range of observing conditions.
* These inter-calibration assessments, comparisons and corrections are delivered to users through free and open access, adopting community data standards.

###  Product acceptance

The recognition of a product as a GSICS product is subject to the GSICS Procedure for Product Acceptance (GPPA) which aims to assess the relevance, maturity, and availability of the products through a comprehensive review process coordinated by the GCC and under the responsibility of the Executive Panel. The GPPA foresees different stages: demonstration, pre-operational, operational.

The GPPA requires that each GSICS Product be delivered with an Algorithm Theoretical Baseline Document (ATBD) and an uncertainty analysis.

###  Intercalibration

Inter-calibration of satellite instruments involves relating the measurements of one instrument to those of another. Instruments can be inter-calibrated when they are viewing the same scenes at the same times from the same viewing angles. Or, for satellite time series data in an archive, when the overlapping records of two satellite instruments can be compared; generally, the time series of large-scale spatial and temporal means are inter-calibrated. The result of an inter-calibration is the consistency, and the absence of any bias, of one instrument’s measurements with respect to the other’s.

Furthermore, an inter-calibrated system which would not be tied to measurement reference standards based on the SI system of units would be prone to drift over time. The magnitude of such drift is hard to predict, but for climate measurements where small changes are of prime interest, it may become an issue for future generations trying to track changes over several decades. Therefore, development of procedures for linking the observations to the international SI system of units is highly desirable.

Whenever possible, the main approach for comparison of contemporaneous sensors is to use Simultaneous Nadir Observations (SNO), for nadir scanning instruments. A variant of SNO is the Simultaneous Conical Observations (SCO) for conical scanning instruments.

The ATBD describes the agreed practices for each step of the processing leading to a GSICS product, including:

* Subsetting: selecting portions of data collected by the two instruments that are likely to produce collocations.
* Collocating: identify the pixels that are spatially collocated, temporally concurrent, geometrically aligned and spectrally compatible and calculate the mean and variance of these radiances.
* Transforming: modifying the spectral, temporal and spatial characteristics of the observations, to account for differences in instrument characteristics. The outputs of this step are the best estimates of the channel radiances, together with estimates of their uncertainty.
* Filtering: if relevant, to remove certain data that should not be analyzed (quality control), and to add auxiliary data that will add further analysis.
* Monitoring: comparison of the collocated radiances produced in Steps 1-4, the production of statistics summarizing the results to be used in the Correcting step, and reporting any differences in ways meaningful to a range of users.
* Correcting: to calculate the GSICS Correction, allowing the calibration of one instrument’s observed data to be modified to become consistent with that of the reference instrument.

###  Product overview

GSICS products are referenced in an on-line [Product Catalogue](http://www.star.nesdis.noaa.gov/smcd/GCC/ProductCatalog.php) which is maintained by the GCC. The Guide to GSICS Products and Services provides details on the product categories, including their definition, detailed characteristics, access and usage.

The products fall into the broad categories listed in Table 1 depending on the spectral domain (UV, Visible, Infrared, Microwave), the orbit type (GEO, LEO) and the temporal approach:

* Near real-time products are calculated over a time window including the latest measurements;
* Retrospective corrections are calculated for measurements performed several days in the past, over a time window centered at the measurement;
* Recalibration algorithms are validated on a given data sample and made available to re-process historical data, often from recurrent instruments, for climate data records.

TABLE 1: GSICS Product Categories (to be updated !)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | NRT correction | Retrospective correction | Recalibration algorithm |
| Orbit type of the monitored instrument | Orbit type of the reference instrument | Spectral Domain |
| GEO - LEO | IR |  |  |  |
| GEO - LEO | VIS |  |  |  |
| GEO – LEO | UV |  |  |  |
| GEO - GEO | IR |  |  |  |
| GEO - LEO | IR |  |  |  |
| GEO - LEO | VIS |  |  |  |
| LEO - LEO | MW |  |  |  |
| LEO – LEO | UV |  |  |  |

## GSICS Data Management Services and Tools

Collaborative tools and services have been developed and implemented in order to support data exchange, development and usage of GSICS deliverables:

* Collaboration Servers for the exchange of calibration dataset and GSICS product download;
* Bias plotting tool for the visualization of GSICS products hosted on the GSICS collaboration servers;
* GSICS product subscription service for the automated downloading of new products as they become available (*to be available in 2016*);
* GSICS product generation framework and products format checker to simplify GSICS products development and their validation (*to be available in 2015/2016*);
* GSICS Implementation of the ROLO Model (GIRO) lunar calibration software and associated GSICS Lunar Observation Dataset (*to be available in 2015*).

## GSICS User Services

GSICS User Services include:

* GSICS portal maintained by WMO ([http://gsics.wmo.int](http://gsics.wmo.int/) ) with high-level information on GSICS and links to the GCC website maintained by the GCC, and related websites maintained by each GPRC;
* GSICS User Messaging Service managed by the GCC;
* GSICS Quarterly newsletter distributed electronically to all registered users;
* GSICS User Workshop organized in conjunction with major satellite user conferences;
* GSICS wiki providing access to technical documentation such as the Algorithm Theoretical Baseline Documents (ATBD) of each product.

## GSICS Reference Documents

The strategic and governance framework of GSICS is provided in the following documents, which are approved by the GSICS Executive Panel:

* GSICS Functions and Organization (*the present document*)
* Vision for GSICS in the 2020s “Shaping GSICS to meet future challenges”
* GSICS User Requirements Document (*Not yet available*)
* GSICS Science Plan (*TBC*)
* Guide to GSICS Products and Services (*In preparation)*.

Other key reference documents are:

* GSICS Operations Plan,
* GSICS Product Catalogue,
* GSICS Procedures, Standards and Technical Guidelines.

## ANNEXES

## Annex 1: Accession to GSICS Membership

Membership in GSICS is open to all satellite operators participating in the Coordination Group for Meteorological Satellites (CGMS). The GSICS members operating a satellite on an operational basis are invited to establish GSICS Production and Research Centres (GPRC). Other satellite operators can contribute to GSICS as Calibration Support Segment (CSS).

In order to apply to become a GSICS member, a satellite operator shall write a letter to WMO (Director of the Space Programme) indicating its intention to participate in GSICS and designating its representatives to the GSICS Executive Panel and the Research and Data Management Working Groups.

Applying as a Member implies agreement and support to the scope and high-level principles of GSICS as stipulated in the present GSICS Functions and Organization document [GSICS-BDFOR] and to the GSICS technical standards and procedures.

A CGMS satellite operator can also propose the participation of a partner public institute involved in satellite instrument calibration matters as a Calibration Support Segment.

A CGMS Satellite Operator or a partner organization which is not ready to participate in GSICS as a member can be invited to participate in GSICS activities as an Observer. Observers participate in all GSICS activities on a consultative and non-binding basis.

The chair, vice-chairs or co-chairs, of the Executive Panel and GSICS Working Groups are designated among the representatives and experts of GSICS members.

## Annex 2: GSICS Coordination Center (GCC)

### A2.1 Role of the GCC

The responsibilities of the GSICS Coordination Center (GCC) are the following:

1. Maintain the list of GSICS product and services, with definitions and explanations on how to access and use them;
2. Maintain a repository of GSICS standards, procedures, and tools, with related documentation;
3. Coordinate the GSICS product evaluation processes, considering the product theoretical basis, quality assurance, data protocols, and the associated documentation, in particular through developing and coordinating the implementation of the GSICS Procedure for Product Acceptance (GPPA);
4. Maintain a capability to run baseline intercalibration algorithms for software validation purposes;
5. Support GRWG and GDWG in their research and data management activities;
6. Track and update the progress of the GSICS Operations Plan;
7. Support GSICS end-to-end demonstrations and promote GSICS towards potential users;
8. Design and maintain the GCC web site;
9. Publish GSICS Quarterly newsletter, and support development of other GSICS publications;
10. Manage user consultation mechanisms, including the organization of GSICS Users Workshops and the GSICS User Messaging service, and maintain User Requirements documents;
11. Provide an annual report to the Executive Panel on the progress of GSICS standard practices and tools, the status of GSCS products, and user feedback.

### A2.2 Implementation of the GCC

The GCC function is assumed by a GPRC.

At present the GCC function is assumed by NOAA at its National Environmental Satellite Data and Information Service (NESDIS) Center for Satellite Application and Research (STAR).

## Annex 3: GSICS Executive Panel

### A3.1 Composition of the Executive Panel

The GSICS Executive Panel is the executive body of GSICS. It is composed of members designated by each participating organization, and of observers designated by invited partner organizations.

A representative of the WMO Secretariat serves as Secretary of the Executive Panel.

### A3.2 Terms of Reference of the Executive Panel

The Executive Panel shall:

1. Provide overall guidance for GSICS;
2. Monitor and evaluate the performance of GSICS components, including the activities of the GSICS Coordination Centre (GCC), GSICS Processing and Research Centers (GPRC), Calibration Support Segments (CSS), GSICS Research Working Group (GRWG) and the GSICS Data Working Group (GDWG);
3. Approve GSICS procedures and standards submitted by the GSICS Coordination Center in consultation with GRWG and GDWG;
4. Approve the definition of GSICS products and deliverables and the admission of GSICS products to the operational status;
5. Prepare an annual report to the CGMS and the Director, WMO Space Programme, on the status and accomplishments of GSICS;
6. Nominate the chairs, vice-chairs or co-chairs, of the GRWG and GDWG among the designated members of these groups , on a 3-year renewable basis;
7. Decide on appropriate actions such as workshops and sessions at scientific meetings in order to advance the objectives of GSICS, publicize GSICS achievements, and seek feedback from users of GSICS deliverables;
8. Review the GSICS Annual Operating Plan and provide guidance for its implementation;
9. Endorse GSICS Reference Documents such as the GSICS Functions and Organization, the GSICS Vision, GSICS User Requirements Document, the Guide to GSICS Products and Services and the GSICS Science Plan.

The Panel is convened once a year, if possible in conjunction with the annual meeting of the Coordination Group for Meteorological Satellites (CGMS), and holds virtual meetings as appropriate.

### A3.3 Role of the Executive Panel Chairperson

The EP Chair is designated for a term of two years, renewable, with a primary role to chair the sessions of the panel, to lead the progress of GSICS between sessions and to represent GSICS when necessary.

More specifically, the role of the EP Chair includes:

1. To conduct the work of the panel, defining the schedule and agenda, acting as moderator of the sessions, drawing conclusions with actions and recommendations reflecting the opinion of the Panel members, with the support of the WMO Secretariat;
2. To stimulate progress in implementing the agreed action plan, through regular intersession virtual meetings;
3. To lead the definition and update of the high-level objectives of GSICS, and to promote them, seeking the engagement of all members;
4. To represent GSICS with external parties as necessary, coordinate with relevant projects to identify and implement collaborative activities;
5. To report to CGMS on the progress, the challenges and the plans of GSICS.

The Chair is assisted by a Vice Chair, nominated for the same period, who can replace the Chair if necessary.

## Annex 4: GSICS Data Management Working Group (GDWG)

### A4.1 Composition of the GDWG

The GSICS Data Management Working Group (GDWG) is an advisory body of the GSICS Executive Panel (EP) for data management and exchange issues. It is composed of experts designated by GSICS member and observer organizations. All GSICS member organizations are encouraged to nominate at least one representative in the GDWG.

### A4.2 Terms of Reference of GDWG

The GDWG shall:

1. Oversee and coordinate the data management activities of GSICS and advise the EP on questions related to GSICS data management including information delivery services;
2. Coordinate the specification of data and metadata formats and procedures for data exchange between the satellite agencies, the GSICS Processing and Research Centers (GPRCs), and the GSICS Coordination Center (GCC);
3. Develop specifications for GSICS product catalogues, data archive systems and data servers in support of GCC;
4. Coordinate the development and evolution of GSICS software tools;
5. Review and validate GSICS deliverables from a data management perspective;
6. Provide guidance to the contents and appearance of the GSICS websites maintained by WMO, GCC, and each GPRC;
7. Maintain cooperation with the research and development activities at the GPRCs and assist with their data management activities, as appropriate;
8. Provide the GSICS Executive Panel with a report on GSICS data management activities including recommendations as appropriate. Submit report three weeks prior to the annual meeting of the GSICS Executive Panel, and present it to the Panel.

GDWG convenes at least annually, preferably in conjunction with GRWG, and more frequently if appropriate. GDWG is led by a Chair or two Co-chairs, nominated by the Executive Panel on a three-year basis.

### A4.3 Role of the GDWG Chair

The GDWG chair is designated for three years (renewable) with a primary role of organization, coordination, moderation and communication to ensure the GSICS Data management Working Group fulfills its role as defined in its Terms of Reference.

Specifically, the GDWG chair shall:

1. Coordinate development of GSICS data management activities including the identification of existing formats, standards and procedures to be adopted for GSICS Products, or the definition of GSICS-specific ones, in order to catalog, archive, exchange, visualize GSICS products and distribute them to GSICS users.
2. Coordinate technical support for the activities of the GRWG
3. Schedule and chair the GDWG annual meeting and regular teleconference meetings to continue the activity during the year, acting as moderator. In coordination with GRWG and sub-group chairs, define agenda, agree actions and recommendations from above meetings, and organize their follow-up.
4. Coordinate with external projects as necessary to identify and implement collaborative activities
5. Report to the Executive Panel.

The Chair can be assisted by at least one Vice-Chair. (Note: alternatively, there might be two Co-chairs instead of a Chair and a Vice-Chair.)

## Annex 5: GSICS Research Working Group (GRWG)

### A5.1 Composition of the GRWG

The GSICS Research Working Group (GRWG) is an advisory body of the GSICS Executive Panel (EP) for scientific and technical issues. It is composed of experts designated by GSICS member and observer organizations. All GSICS member organizations are invited to nominate representatives in the GRWG.

### A5.2 Terms of Reference of the GRWG

The GRWG shall:

1. Advise the EP on scientific and technical questions related to the technical specifications of GSICS products;
2. Foster the development of intercalibration scientific methods to be implemented in GSICS operations in order to advance the GSICS overarching goal of ensuring the comparability of satellite measurements;
3. Contribute to the development of applications of satellite intercalibration through cooperation with the user community;
4. In cooperation with, and with input from the GSICS Processing and Research Centres (GPRC) and other contributing parties, maintain a summary status of research projects supported under the GSICS distributed research component;
5. Convene at least an annual meeting to review the GSICS development activities and evaluate the results and methodologies with respect to their suitability for implementation as GSICS standard or recommended practices;
6. Provide the EP with an annual report on GSICS accomplishments and planned scientific activities, including outstanding issues and recommendations as appropriate to advance the objectives of GSICS. Submit report three weeks prior to the annual meeting of the GSICS Executive Panel, and present it to the Panel.

The GRWG shall establish sub-groups dedicated to specific areas of expertise. It is led by a Chairperson nominated on a three-year basis, assisted by two vice-chairs, one being the former Chair, and the other being the expected future Chair. The report to the EP shall be submitted three weeks prior to the annual meeting of the GSICS EP and presented to the Panel.

### A5.3 Role of the GRWG Chair

The GRWG chair is designated for three years (renewable) with a primary role of organization, coordination, moderation and communication, to ensure the GSICS Research Working Group fulfills its role as defined in its Terms of Reference.

Specifically, the GRWG chair shall:

1. Coordinate the development of inter-calibration products and methodologies, and related scientific issues, with delegation to Sub-Groups as appropriate, with a view to promote common standards and best practices ensuring comparability of satellite measurements;
2. Schedule and chair the GRWG session and plenary session of the annual GRWG-GDWG meeting and monthly web meetings, acting as moderator. In coordination with GDWG and Sub-Group Chairs, define agenda, approve invitation of non-members, agree conclusions, actions and recommendations from the meetings, and organize their follow up;
3. Represent the GRWG with external parties as necessary, coordinate with relevant projects to identify & implement collaborative activities;
4. Report to the Executive Panel.

 The Chair is assisted by two Vice Chairs who can replace the Chair in cases of unavailability. One of the Vice-Chairs may be the former Chair, the other Vice-Chair would be expected to ultimately become the next chair.

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