

Report from CGMS

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<https://www.cgms-info.org/agendas/agendas/CGMS-49>

CGMS Working Groups

WGI - Satellite systems and operations

WGII - Satellite data and products

WGIII - Operational continuity and contingency planning

WGIV - Data access and user support

WG II on “Satellite Data and Products”

WG II serves as important link between the annual CGMS meetings and the CGMS International Science Working Groups which provide regular reports and feedback to CGMS.

These are currently:

- International TOVS working group (ITWG)
- International Radio Occultation Working Group (IROWG)
- International Precipitation Working Group (IPWG)
- International Satellite Winds Working Group (IWWG)
- International Clouds Working Group (ICWG)

WG II is also the primary interface between CGMS and other international initiatives, such as CEOS-CGMS Joint WG Climate, GSICS and SCOPE-CM and user communities, such as those organized in the areas of oceanography and marine meteorology, and atmospheric composition.

Overview of Session

WGII/1: Welcome and opening

WGII/2: CGMS agency reports on highlights and issues in dataset and product generation **11 WPs**

WGII/3: CGMS International Science Working Groups

(IWWG, IPWG, ITWG, ICWG, IROWG, GSICS, SCOPE-CM, JWGCLIM, IG3IS, ISCCP and new proposed International Earth Surface Working Group) **5 WPs**

WGII/4: Arctic Observations **3 WP**

WGII/5: Working papers on climate **6 WP**

WGII/6: Agency response to the greenhouse gas initiative and applications **4 WPs**

WGII/7: Working papers on ocean monitoring **3 WPs**

WGII/8: Selected topics of high priority to members **5 WPs**

WGII/9: Working papers responding to or raising CGMS actions **0 WP**

WGII/10: AOB **2 WP**

WGII/11: Review and updating HLPP **2 WP**

WGII/12: Future CGMS plenary sessions **3 WP**

WGII/13: Review of actions/conclusions, preparation of WG report for plenary

In addition:

Joint Session with WGIII focused on second revision of the CGMS baseline & risk assessment with a specific focus on atmospheric composition and aerosol **10 WP**

$\Sigma = 54$ WPs (2020: 49; 2019: 44; 2018: 41; 2017: 36; 2016: 37; 2015: 64; 2014: 50)

Virtual meeting
112 registrations
April 26 - 28
11:00 – 15:30 UTC

WGI - Satellite systems and operations

WGI main outcomes and future work (1/4)

- **Frequency management, initial preparations for WRC23.** SFCG and WMO are, on a yearly basis defining and refining their positions for WRC-23 and provide CGMS with the latest status. relevant WRC-23 issues have been added in the HLPP.
- Practically WGI are setting up a Task Group to look mechanisms for detection and long-term monitoring of and mapping of RFI initially assessing the impact on the passive sensor measurements (for example, but not limited to, from IMT-2020/5G into the 24 GHz passive band) at satellite or instrument level, or any other means, as the knowledge base for assessing the impact on the passive sensor measurements.

WGI main outcomes and future work (2/4)

- WGI reviewed the implementation of CGMS agency best practices in support to local and regional processing of LEO direct broadcast data covering NOAA, EUM, CMA.
- The Direct Broadcast Systems Task Group will perform a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis on low latency access to LEO meteorological spacecraft and present the results at CGMS-50 – the aim is to give guidance to members on systems that could be used in the future, beyond the current generations of satellites

WGI main outcomes and future work (3/4)

- On **Data Collection Systems**, the Data Collection Services Task Group is working on a new/updated IDCS standard – which is a global standard, to allow the interoperability of systems and services. The DCS subgroup proposed a simplified approach to enhance an existing standard, rather than a completely new standard, taking into account user feedback and requirements.
- The Group will also perform a SWOT analysis on the Geostationary Meteorological satellites Data Collection Services as a basis to provide CGMS with a coordinated view on a proposed future of the service and report the outcome to CGMS-50.

WGI main outcomes and future work (4/4)

- WGI reviewed the progress in the area of the development and operations of LEO Satellite Systems with coordinated orbital phasing. The Task Group on the Coordination of LEO Orbits will perform a broad SWOT analysis for maximising the return / minimising the cost taking into account new mission and reference mission concepts and associated technologies, highlighting the potential for inter-Agency cooperation.
- WGI is discussed the need for the Task Team Space Debris and Collision Avoidance and the Group agreed on the value of creating such a group and working toward a Best Practice on Collision Avoidance

Working Group III



Top-Level Risk Assessment (2021)

Sensor	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Microwave Sounder	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Yellow
Hyperspectral Infrared Sounder	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Yellow
Radio Occultation	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Red
Multi-purpose Meteorological Imager	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Multi-viewing, Multi-channel, Multi-polarisation imager	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Lightning Mapper	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Broadband Short/Long Wave Radiometer	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Yellow
Visible/UV Radiometer	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
UV Limb Spectrometer	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
SWIR Imaging Spectrometer	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Precipitation Radar	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Red
Microwave Imager	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Narrow Band Visible & Near Infrared Imager	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Radar Altimetry	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Scatterometer	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Yellow
Sub-Millimeter Ice Cloud Imager	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Synthetic Aperture Radar	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
High Resolution Optical Imager	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Coronagraph	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
EUV Imager	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
X-ray Spectrograph	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Energetic Particle Sensor	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Yellow
Magnetometer	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Plasma Analyzer	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green

Risk in the early morning orbit after FY-3E; no planned low-inclination RO observations after COSMIC-2

Risk in the early morning orbit after FY-3E

Risk in continuity after FY-3G and GPM Core

Risk in the early morning and afternoon orbits after FY-3E and Oceansat-3A

Risk of near-term gap until SWFO-L1 is launched

Risk of near-term gap until SWFO-L1 and GOES-U are launched

ITWG Actions tracked at CGMS

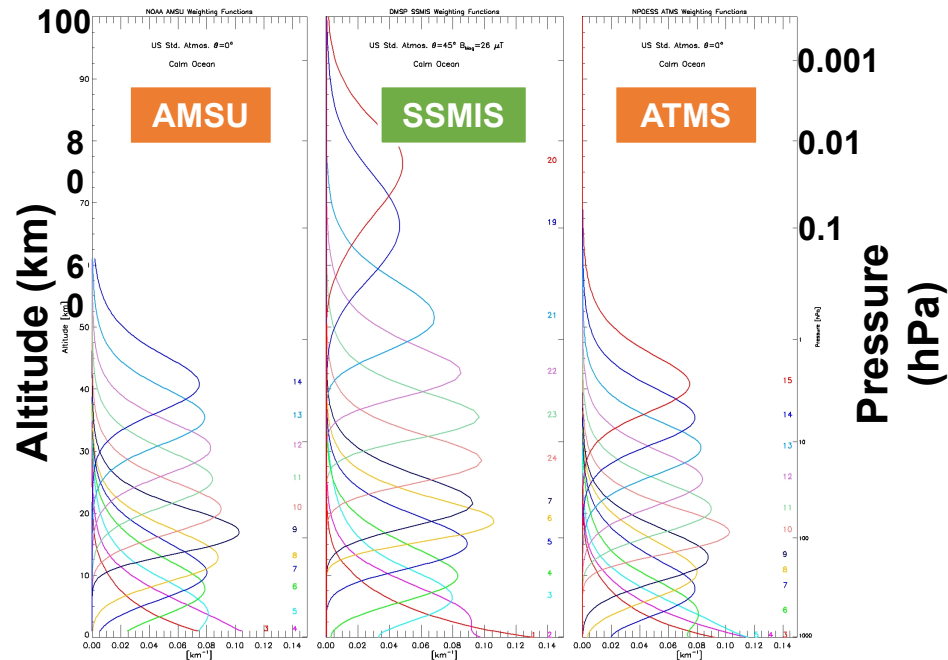
- CGMS members to provide a summary of their known unfilled spectroscopy needs, and to develop a means of facilitating interaction between laboratory spectroscopy groups to spur cooperation and mitigate the lack of resources (financial and persons).
- ITWG to send a report demonstrating the value of temperature sounding of the upper stratosphere and mesosphere (as for the SSMIS UAS channels).

Spectroscopy Action Response

- Dedicated support for both theoretical and laboratory spectroscopic studies with explicit intent to support satellite-relevant ICVS, DA, remote sensing, etc.
- Ensure physical consistency across spectral regions of interest, particularly covering UV - Visible - IR frequency ranges
- Expansion of spectroscopic databases up to 1 THz, to ensure adequate coverage of current and future MW sensors, such as the Ice Cloud Imager on EPS-SG. This also benefits other applications.
- Continuous support for development of community-driven spectroscopic line databases for use in line-by-line models.
- Recommend that spectroscopic databases have appropriate ranges and resolution at various pressures and temperatures to ensure minimal errors during interpolation / training.
- Spectroscopic database developers should have regular collaborative discussions with Line-by-Line and radiative transfer model developers. These sort of "vertical" discussions have been very informative.
- The HITRAN database is the critical foundation that most RT models rely on, especially the primary operational fast models: CRTM and RTTOV. We strongly encourage expanding funding for continuing HITRAN database improvements following the recommendations above.
- Expansion/refinement of spectroscopic databases in the Far-IR region in support of future missions (e.g., PREFIRE).
- Encourage dedicated support for uncertainty estimation and propagation from spectroscopy to RT model. This would necessarily be a community effort given the number of groups this would involve.

Value of Upper Atmospheric Sounding

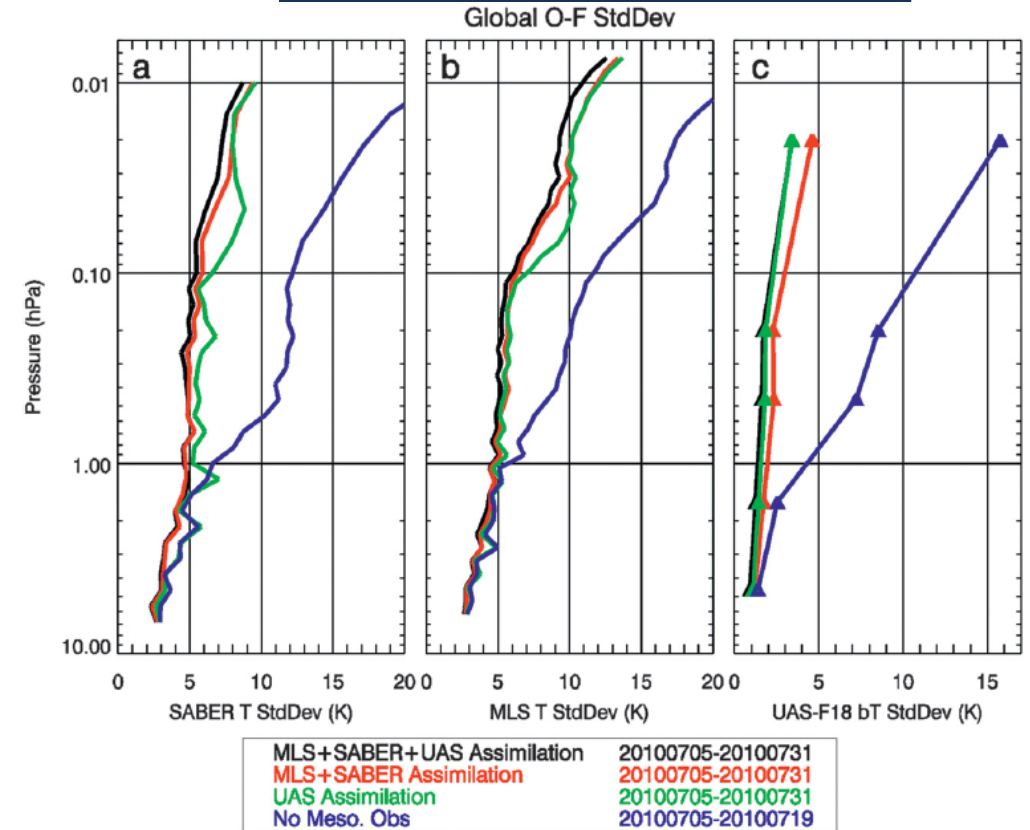
Current Microwave Sounders



Of the current Microwave Sounders only the **SSMIS Upper Atmospheric Sounder (UAS)** covers the mesosphere ~50-85km and lower thermosphere.

Hoppel et al. 2013. Evaluation of SSMIS Upper Atmosphere Sounding Channels for High-Altitude Data Assimilation. Mon. Wea. Rev., 141, 3314-3330. DOI: 10.1175/MWR-D-13-00003.1

Assimilation Works



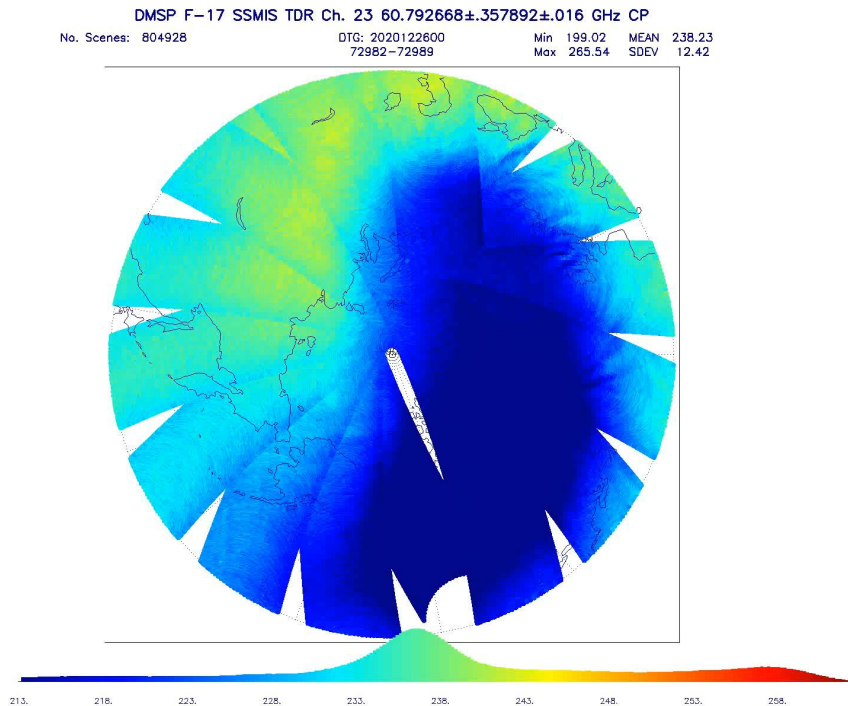
Assimilation of only the SSMIS UAS can bring modern NWP systems, with high altitude capability, comparable value to non-operational retrievals from MLS and SABER

MLS - Microwave Limb Sounder
SABER - Sounding of the Atmosphere using Broadband Emission Radiometry

Value of Upper Atmospheric Sounding

Why do we care?

Sudden Stratospheric Warming (SSW) can be predicted as they descend from the mesosphere.

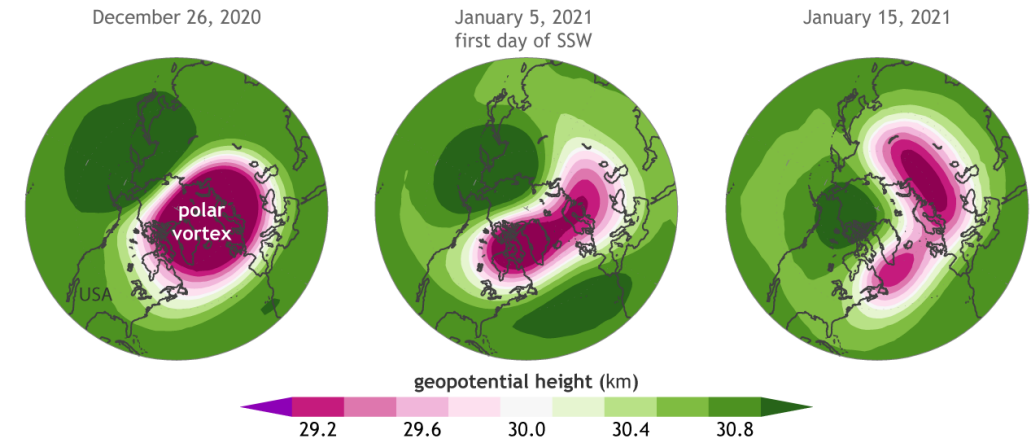


Mesosphere less understood than lower atmosphere. Wide ranging impacts, i.e. communications, rocketry and interaction with lower boundary of ionosphere.

SSW Jan 2021

<https://www.climate.gov/news-features/blogs/enso/sudden-stratospheric-warming-and-polar-vortex-early-2021>

Disruption of stratospheric polar vortex in early January 2021



Evolution of 10mb zonal mean winds (60° N) and polar cap (60-90° N) temperatures

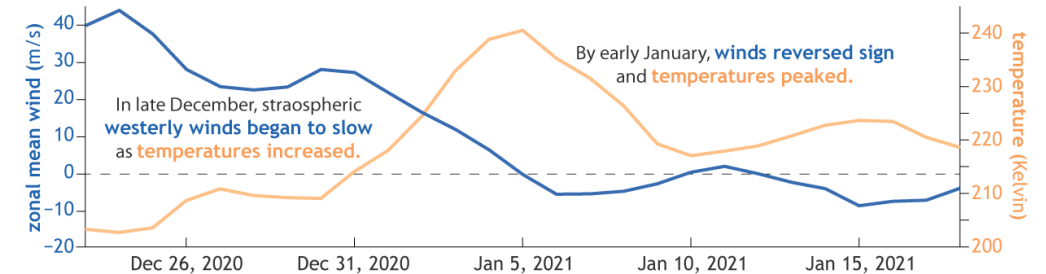


Figure courtesy of Lara Ciasto (NOAA CPC). Data from NCEP/NCAR Reanalysis.

IWWG Priority Discussion Topics

- IROWG-8 Virtual (7 – 13 April 2021 hosted by NOAA and UCAR)
- A detailed presentation from IWWG will be given to Plenary

WG II would like to highlight:

- WG II recommends to Plenary to address the gap of global 3D wind profile observations with high priority. Based on the Aeolus experience, a combination of lidar & IR missions can provide complimentary wind observations which look to be very promising.
- WG II supports the continued representation of Ocean Surface Winds (OSW) in the IWWG and supports the IWWG proposal to establish an OSW Task Group within the IWWG, that fills a gap currently not addressed by or within the mandate of other international initiatives
- WG II recommends to Plenary the adoption of the IWWG Terms of reference

CGMS-49 recommendations - WGII			
Actionee	AGN item	Rec	Description
Plenary		WGII49.	WG II recommends to Plenary the establishment of an Ocean Surface Wind Task Group (OSW TG) in the CGMS International Winds Working Group (IWWG) that coordinates its actions and recommendations with GSICS, CEOS and the IOVWST and other relevant entities.
Plenary		WGII49.	WG II recommends to Plenary to address the gap of global 3D wind profile observations with high priority. Based on the Aeolus experience, a combination of lidar & IR missions can provide complimentary wind observations which look to be very promising.”
Plenary		WGII49.	WG II recommends to Plenary the adoption of the IWWG Terms of reference.



IROWG Priority Discussion Topics

- IROWG-8 Virtual (7 – 13 April 2021 hosted by NOAA and UCAR)

WG II would like to highlight:

- IROWG continues to emphasize the value of and need to open and free access to RO data, including archived raw data.

Specifically:

CGMS-49 recommendations - WGII			
Actionee	AGN item	Rec	Description
Plenary		WGII49.	WG II recommends that Agencies when pursuing data buy clearly defines all aspects of the data, e.g. orbits and coverage, in order to optimise the benefits of the data.
Plenary			WG II recommends that Agencies consider data buy with an option for redistributing data to global NWP centres.

Discussion on the establishment of a new International Science Working Group

- Proposal of Terms of Reference of the International Earth Surface Working Group (IESWG)
- Working Group II supports the establishment of the new working group providing:
 - Demonstrated relevance to CGMS
 - Broad CGMS engagement
 - Clear definition of tasks demonstrating complementarity with respect to other international land/cryosphere surface initiatives
- Working Group II received during the meeting updated proposed name and ToRs addressing some of the points raised above
 - **WGII in principle endorses the proposed Terms of Reference**
- Noting the approach used for the establishment of other ISWGs (e.g. ICWG) WG II proposes that
 - CGMS Members expresses their interest in the new ISWG and provides Points of Contacts
 - Broad participation should be secured for the next workshop (planned for May 2022)
 - **WG II to evaluate the outcome of the next workshop and subsequently provides a recommendation to CGMS-50 Plenary on the establishment of an International Earth Surface Working Group**
- A detailed presentation from IESWG will be given to CGMS-49 Plenary

CGMS-49 recommendations - WGII			
Actionee	AGN item	Rec	Description
WG II		WGII49.	WG II to assess the organisation and CGMS participation of the planned IESWG workshop in May 2022 and to confirm its support for the establishment of a new ISWG.
Plenary		WGII49.	WG II recommends to Plenary to consider the establishment of a new International Science Working Group: "International Earth Surface Working Group" based on a successful organisation of the next IESWG workshop including broad CGMS Member participation.

State of Observing System Report

The Coordination Group on Meteorological Satellites (CGMS) and the World Meteorological Organization (WMO) recently mandated GSICS (A45.05) to provide an overarching annual assessment of (Satellite) observing system performance with respect to GSICS reference instruments

In the Plenary Members joined to contribute to the upcoming State of Observing System report Special issue of GSICS Quarterly Newsletter on State of Observing System being published

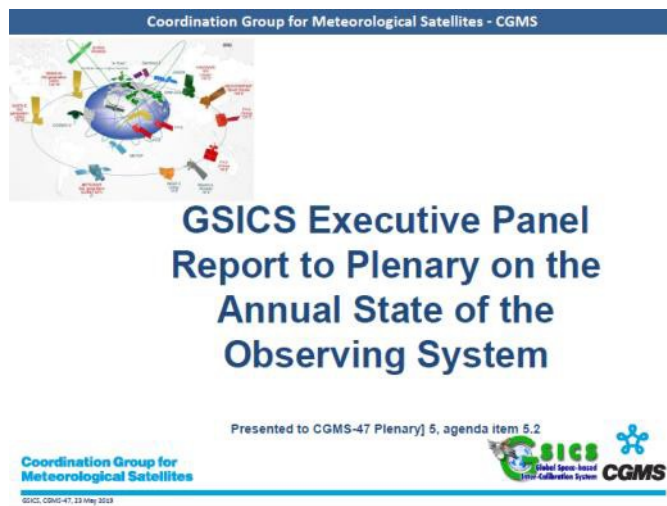


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Annual GSICS Calibration Report on the State of the Observing System

GSICS-EP-21, 18-19 May 2020

Articles

Part I: State of Observing System Status of GSICS References
By Mitch Goldberg (NOAA) and Manik Bali (ESSIC/UMD)

GSICS recommends NOAA 20 VIIRS as the reflective solar band (RSB) calibration reference
By David Doelling (NASA), Changyong Gao (NOAA) and Jack Xiong (NASA)

Performance of the CrIS instruments as a GSICS IR reference
By Iuribide Sanchez et. al. (NOAA)

IASI radiometric noise assessment based on Earth views
By Carmine Serio, Guido Masiello, and Pietro Mastro (SI Unibas, Italy)

Status of the Atmospheric Infrared Sounder on the EOS Aqua Spacecraft
By Thomas Pagano, Hartmut Aumann, Steven Broberg, Evan Manning and William Matthews (JPL, CALTECH)

Reference Microwave Sounder Instruments for FCDR Development
By Cheng Zhi Zou (NOAA), Hui Xu (UMD), and Xianjun Hao (GMU)

News in This Quarter

Outcome of the Third Joint GSICS/IVOS Lunar Calibration Workshop
By S. Wagner (EUMETSAT), V. Matiloli (EUMETSAT), T. Stone (USGS), X. Hu (CMA) and X. Wu (NOAA)

Announcements

2021 EUMETSAT Meteorological Satellite conference to be held virtually
By Tim Hewison, EUMETSAT

GSICS Related Publications

Part-I: GSICS Annual State of Observing System Status of GSICS References

By Mitch Goldberg (NOAA) and Manik Bali (ESSIC/UMD)

The Coordination Group on Meteorological Satellites (CGMS) and the World Meteorological Organization (WMO) recently mandated GSICS (A45.05) to provide an overarching annual assessment of (Satellite) observing system performance with respect to GSICS reference instruments. This issue is Part-I of a two-part series of special issues of the GSICS Quarterly dedicated to providing the most up-to-date assessment of the State of the Observing System. In this part, the performance of only a select set of instruments that are also GSICS references is covered. The next issue will cover some of the instruments monitored by using the GSICS in-orbit references.

GSICS references are selected from the pool of satellites of the observing system, mainly by consensus among member agencies. Reference instruments satisfy a selection criterion (Bali et al. 2016) that is derived from principals of QA4EO (Quality Assurance for Earth Observation) and ensures that instruments that are many times more stable than most of the concurrently flying instruments and deliver high quality measurements over long periods of time are selected as reference instruments.

This gives all member agencies the ability to compare their satellites with single (or multiple agreed upon) references and make assessments that are intercomparable among agencies.

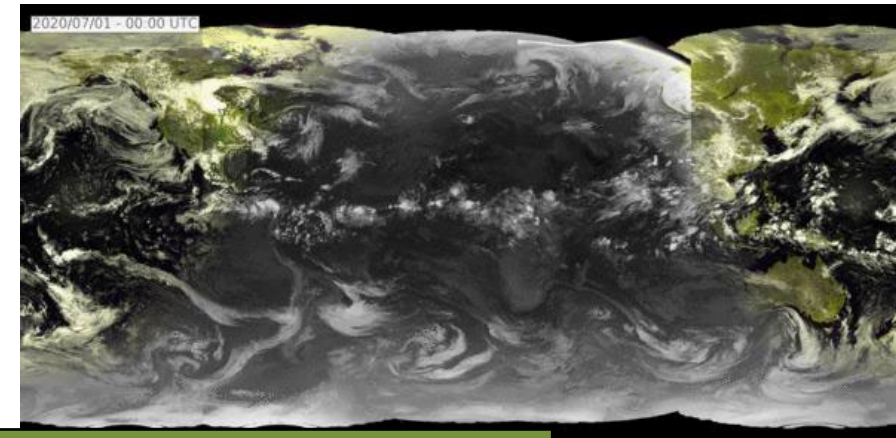
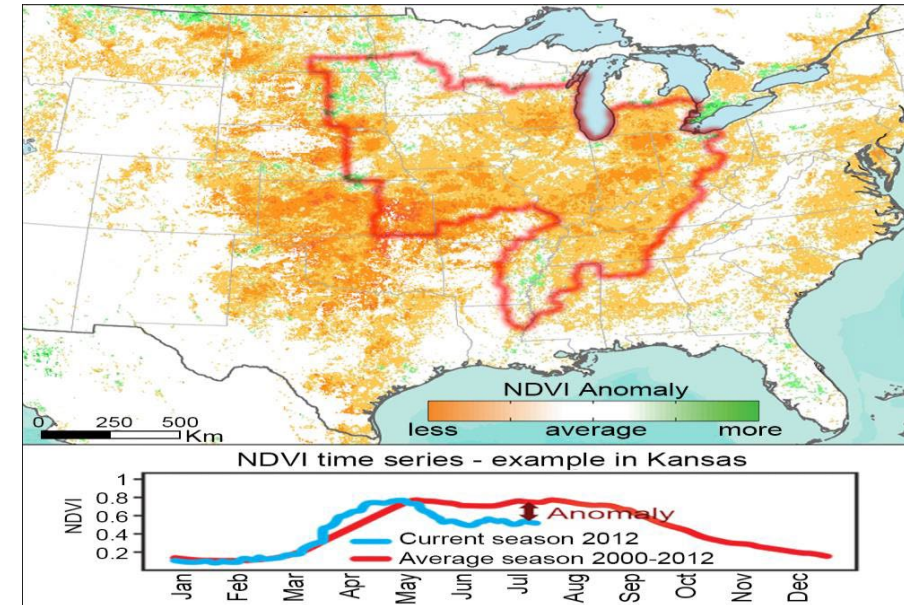
Using this selection criterion, GSICS member agencies identified VIIRS SNPP/T1 for assessing Visible and Near Infrared channels and IASI-A/B/C and CrIS SNPP/T1 for assessing Infrared channels. In addition, GSICS members are currently evaluating the use of Advanced Technology Microwave Sounder (ATMS) as an in-orbit reference for Microwave instruments.

In the second article Doelling et al. summarize the performance of the VIIRS on board the SNPP and T1. Following this VIIRS article, the next three articles are on Infrared references and examine the in-orbit health and performance of the IASI -A/B/C (Carmine et al.), AIRS (Pagano et al.) and CrIS - SNPP/T1 (Iuribide et al.). GSICS has more than 30 instruments in the IR, that are monitored by using these references. The last article discusses the use of ATMS (Zou et al.) as a reference for calibrating Microwave instruments that contribute to construction of Climate Data Records.

Conclusion
All the GSICS reference instruments covered here continue to satisfy reference criterion. They show a high stability over long periods of time and maintain performance within their design specifications. The authors recommend that calibration community migrate to using IASI-B/C and SNPP/T1 CrIS as existing references, as IASI-A and AIRS are nearing end-of-life scenarios in the near future.

Climate and GHG gas initiatives: Plenary Session

- Plenary:
 - GCOS and CEOS/CGMS JWGClimat
 - WG II summary report on GHG results
- Progress on FCDRs
 - CMA and EUMETSAT
- Use cases from NOAA CDRs
 - Assessing Drought over Agricultural Areas
- GEO Ring activities: ISCPP-NG
 - Generate one month of ISCCP-L1g Prototypes for ICWG Meeting in April
 - Develop L2 plan within ICWG in coordination with all participating space agencies and GSICS
 - Develop assessment plan with GEWEX-DAP
 - Generate one year of ISCCP-L1g by September 2021 supported by GSICS
 - **CGMS Member to consider derivation of Level-2 products using the new proposed Level-1g data.**



CGMS-49 recommendations - WGII

Actionee	AGN item	Rec	Description
CGMS Members		WGII49.	CGMS Member to consider derivation of Level-2 products using the new proposed Level-1g data.

Summary

- HLPP had minor updates.
- ITWG has two actions which needs formal response.
- Working Group 2 will document Science working group actions and recommendations in a best practice and needs document which will be then endorsed by CGMS plenary and can be used for identifying priorities for agency funding opportunities.

Thank you