GSICS Coordination Center Activities

Manik Bali (ESSIC/CISSES), Lawrence E Flynn and Mitch Goldberg(NOAA)

11th November 2019
CISESS Science Meeting

Outline

- Introduction
- GCC facilitates sharing of
    - Monitoring Algorithms
    - Monitoring Products
    - Monitoring Deliverable
    - Monitoring Tools (GIRO, SNO, Plotting tool)
- GSICS References
- In the making
    - Inter-operability platform
- Summary and Discussion

GSICS Global Space-based Inter-Calibration System

Global Space-based Inter-Calibration System

- **What is GSICS?**
  - Global Space-based Inter-Calibration System
  - Initiative of CGMS and WMO
  - Effort to produce consistent, well-calibrated data from the international constellation of Earth Observing satellites
- **What are the basic strategies of GSICS?**
  - Improve on-orbit calibration by developing an integrated inter-comparison system
    - Initially for GEO-LEO Inter-satellite calibration
    - Being extended to LEO-LEO
    - Using external references as necessary
  - Best practices for calibration & characterisation
- **This will allow us to:**
  - Improve consistency between instruments
  - Provide adjustment coefficients if needed.
  - Reduce bias in Level 1 and 2 products
  - Provide traceability of measurements
  - Retrospectively re-calibrate archived data
  - Better specify future instruments
  - Develop a cadre of experts in calibration
  - Easy access to the health of observing systems.

EUMETSAT CNES JMA

NOAA CMA KMA

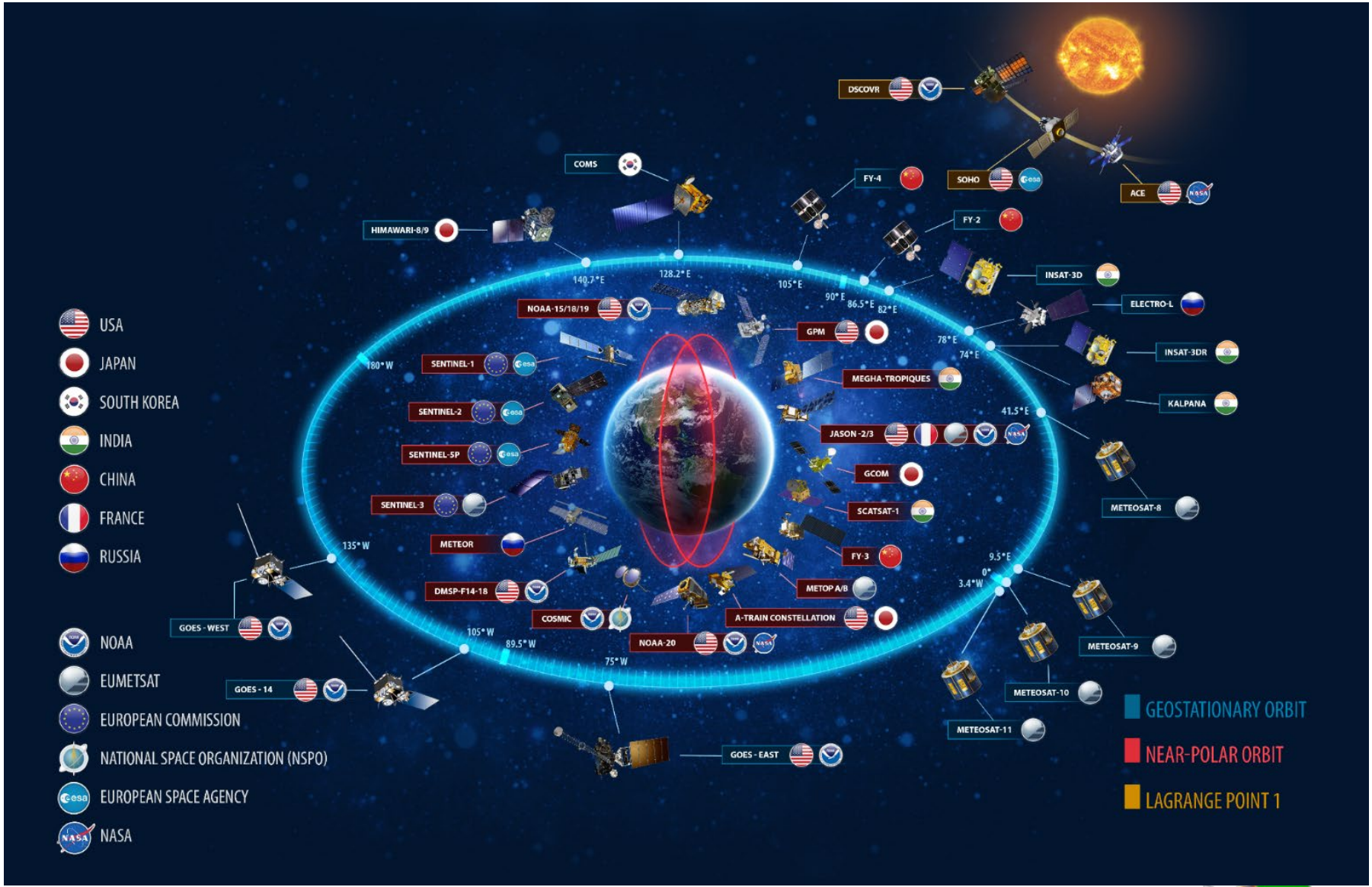
ISRO NASA WMO

USGS NIST JAXA

ESA ROSHYDROMET IMD ROSCOSMOS

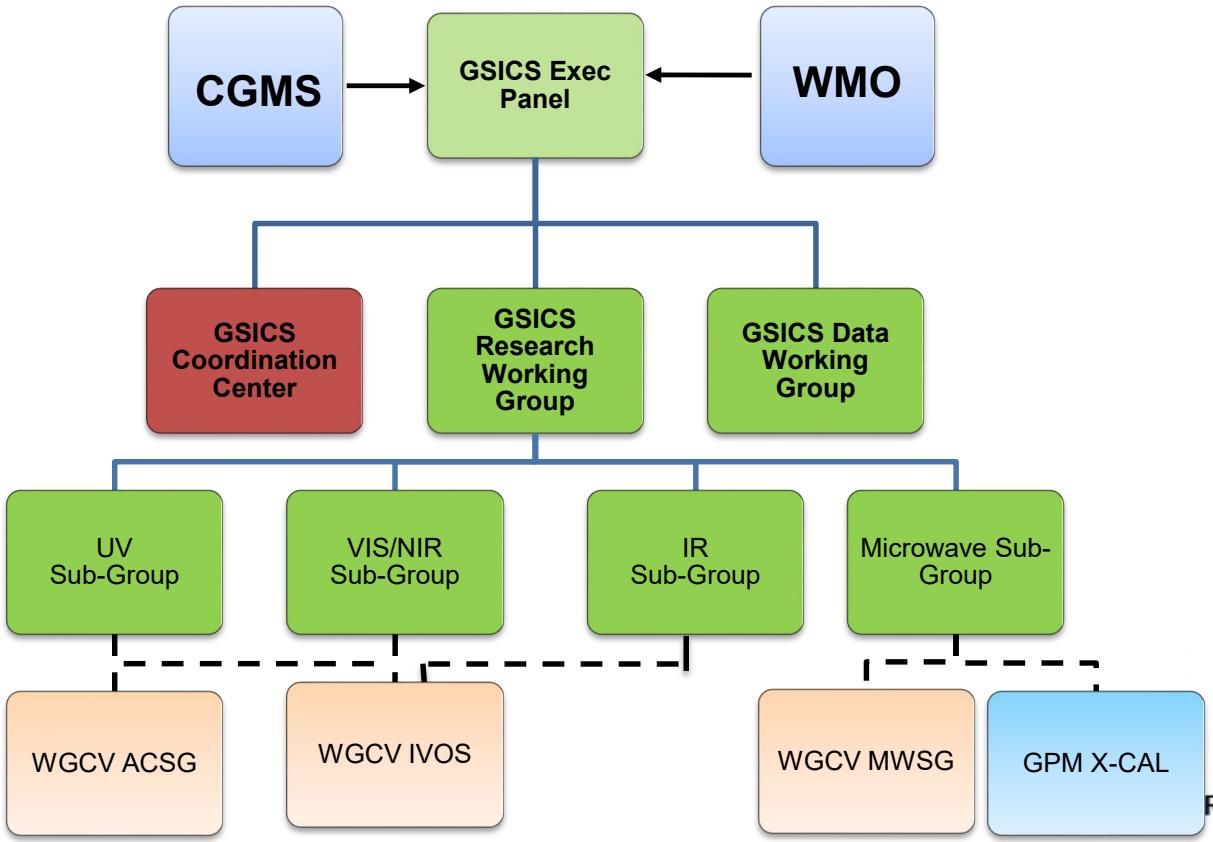
Global Space-based
Inter-Calibration System

Global Observing System



GSICS
Global Space-based Inter-Calibration System

GSICS Structure & Partnerships



EUMETSAT
CNES
JMA
NOAA
CMA
KMA
ISRO
NASA
WMO
USGS
NIST
JAXA
ROSHYDROMET
IMD
ESA
SITP

Do we Care about Satellite Biases in NWP?

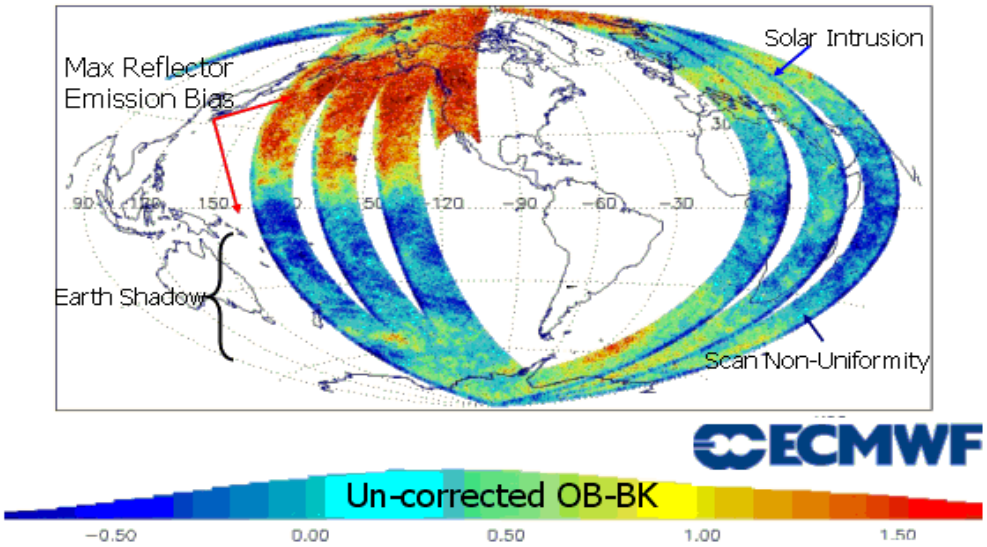
After McNally, Bell, et al. ECMWF, 2005 & 2009

Yes! Because:

1) We wish to understand the origin of the bias and ideally correct instrument / RT / NWP model at source

2) I*n principle* we do not wish to apply a correction to unbiased satellite data if it is the NWP model which is biased. Doing so is likely to:

- **Re-enforce the model bias and degrade the analysis fit to other observations**
- **Produce a biased analysis (bad for re-analysis / climate applications)**

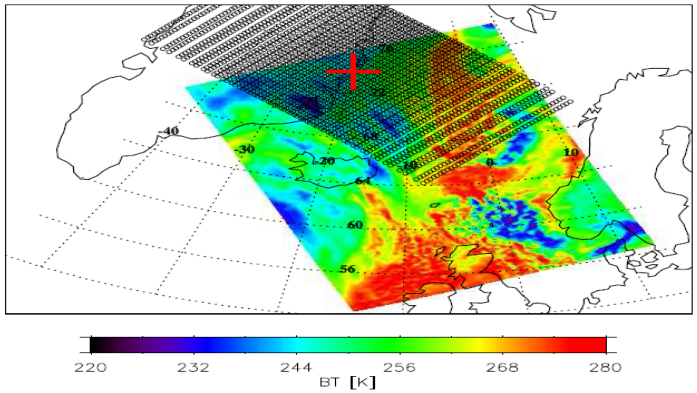


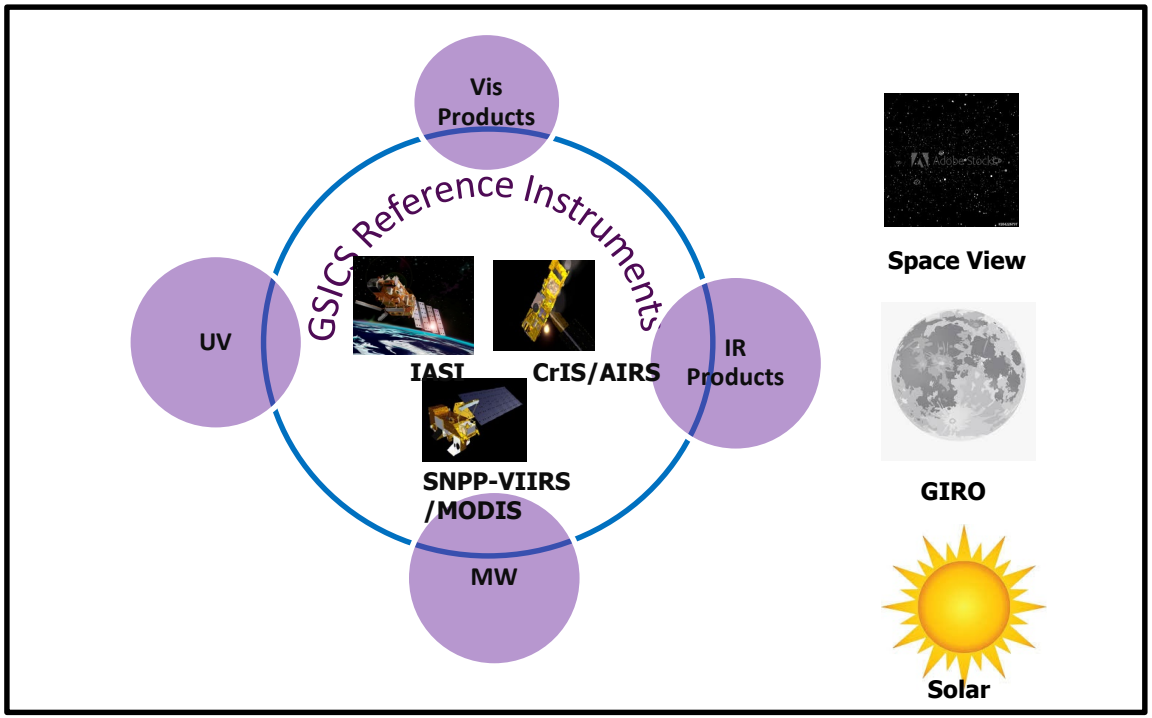
More accurate satellite observations will facilitate discovery of model errors and their correction. Additional gains in forecast accuracy can be expected.

GSICS Global Space-based Inter-Calibration System

GCC- Activities: GSICS Products Algorithms

Direct Satellite Comparison
Simultaneous Nadir Overpass





Indirect Satellite Inter-Comparison
Transfer targets, e.g., Deep Convective Clouds

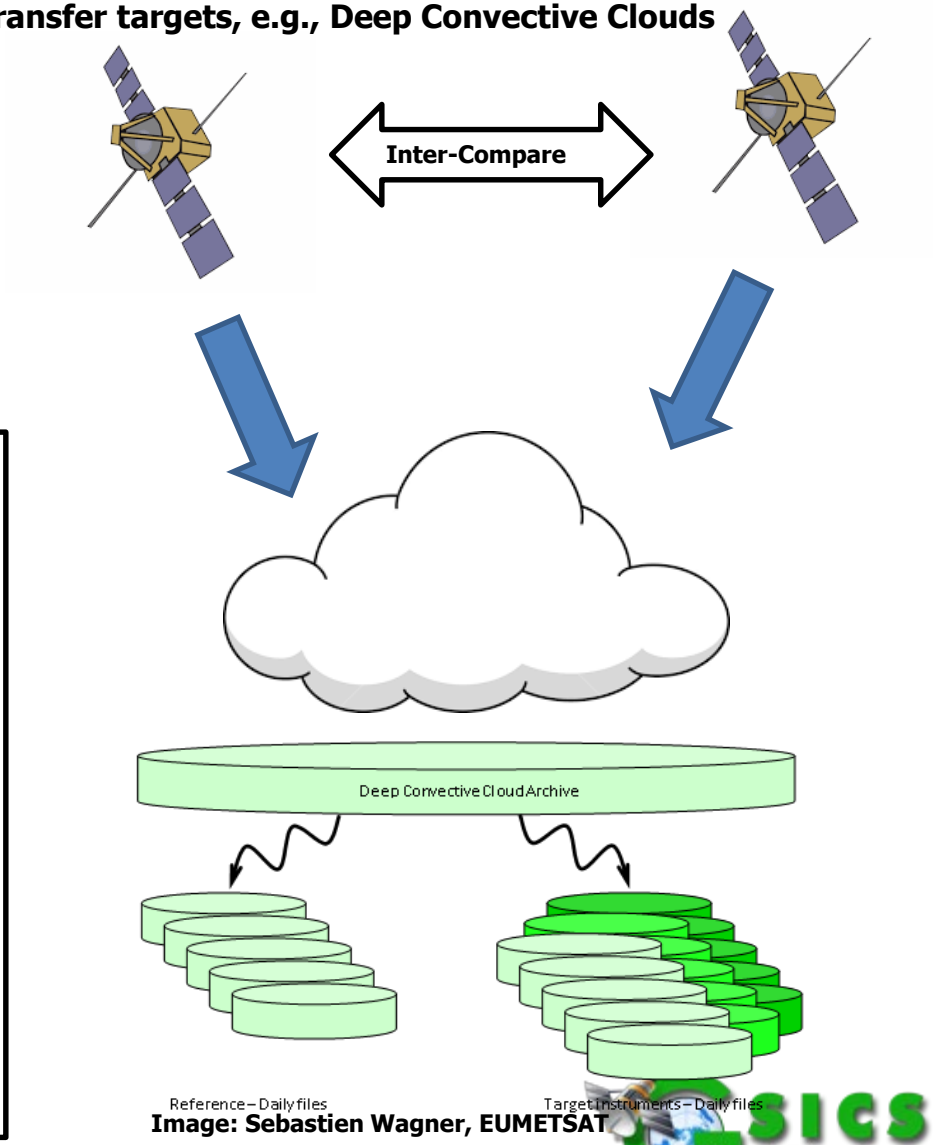


Image: Sebastien Wagner, EUMETSAT

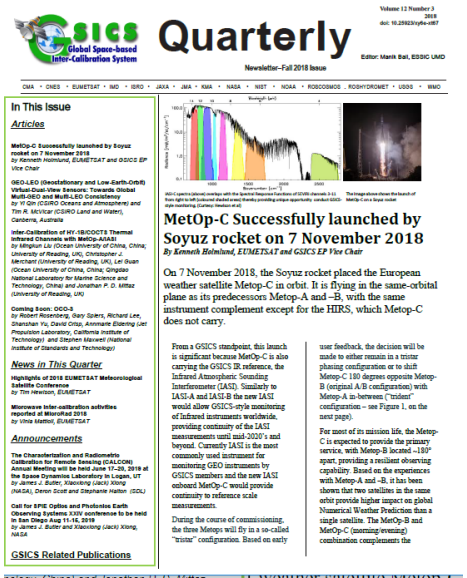
Products on GSICS product catalog use SNO and DCC method to inter-compare instruments

GSICS Global Space-based Inter-Calibration System

GSICS Activities: GSICS Newsletter

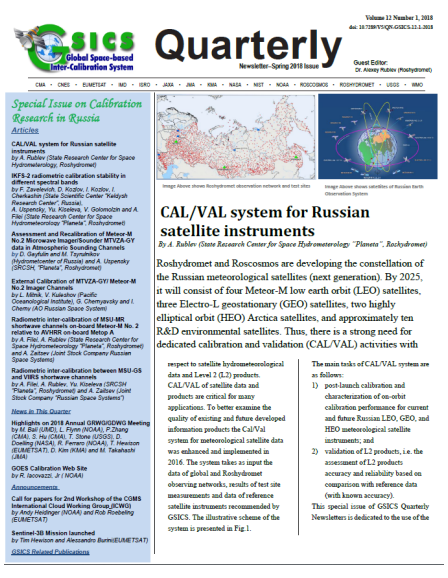
Over the last year, we published four New Issues of the GSICS Newsletter

- **Over 22 Research Articles, 15 Topics of News to which**
- **Nearly 70 Scientists contributed as Authors & Co-Authors.**
- **Contributions from non GSICS members has increased.**
- ***Special issue on CAL/VAL in Russia well received*.**

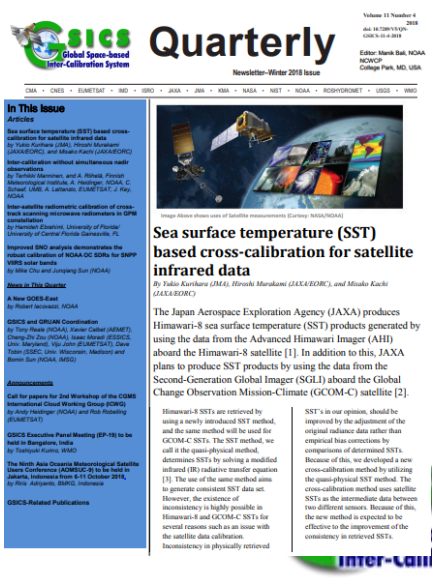

GSICS Quarterly
Newsletter–Fall 2018 Issue
Editor: Manik Bali, ESSIC UMD
In This Issue
Articles
MetOp-C Successfully launched by Soyuz rocket on 7 November 2018
By Kenneth Holmlund, EUMETSAT and GSICS EP Vice Chair
On 7 November 2018, the Soyuz rocket placed the European weather satellite Metop-C in orbit. It is flying in the same-orbital plane as its predecessors Metop-A and –B, with the same instrument complement except for the HIRS, which Metop-C does not carry.
From a GSICS standpoint, this launch is significant because MetOp-C is also carrying the GSICS IR reference, the Infrared Atmospheric Sounding Interferometer (IASI). Similarly to IASI-A and IASI-B the new IASI would allow GSICS-style monitoring of Infrared instruments worldwide, providing continuity of the IASI measurements until mid-2020's and beyond. Currently IASI is the most commonly used instrument for monitoring GEO instruments by GSICS members and the new IASI onboard MetOp-C would provide continuity to reference scale measurements.
During the course of commissioning, the three Metops will fly in a so-called "tristar" configuration. Based on early user feedback, the decision will be made to either remain in a tristar phasing configuration or to shift Metop-C 180 degrees opposite Metop-B (original A/B configuration) with Metop-A in-between ("trident" configuration – see Figure 1, on the next page).
For most of its mission life, the Metop-C is expected to provide the primary service, with Metop-B located ~180° apart, providing a resilient observing capability. Based on the experiences with Metop-A and –B, it has been shown that two satellites in the same orbit provide higher impact on global Numerical Weather Prediction than a single satellite. The MetOp-B and MetOp-C (morning/evening) combination complements the
News in This Quarter
Highlights of 2018 EUMETSAT Meteorological Satellite Conference
by Tim Hewison, EUMETSAT
Microwave inter-calibration activities reported at MicroRad 2018
by Viniia Mattioli, EUMETSAT
Announcements
The Characterization and Radiometric Calibration for Remote Sensing (CALCON) Annual Meeting will be held June 17–20, 2019 at the Space Dynamics Laboratory in Logan, UT
by James J. Butler, Xiaoxiong (Jack) Xiong (NASA), Denon Scott and Stephanie Hatton (SDL)
Call for SPIE Optics and Photonics Earth Observing Systems XXIV conference to be held in San Diego Aug 11-16, 2019
by James J. Butler and Xiaoxiong (Jack) Xiong, NASA
GSICS Related Publications


GSICS Quarterly
Newsletter–Summer 2018 Issue
Editor: Manik Bali, ESSIC UMD
In This Issue
Articles
GSICS recommends SNPP-VIIRS as the VIS/NIR calibration reference
by Dave Doelling (NASA), Chair GSICS VIS/NIR Subgroup
Performance of NOAA-20 VIIRS reflective solar bands revealed
by Junqiang Sun, NOAA
Improving S-NPP VIIRS Reflective Solar Band (RSB) Calibration Accuracy through Rapid Scanning
by Sirish Uprety (NOAA/UMD), Changyong Cao (NOAA), Xiaoxiong Xiong (NASA), Wenhui Wang (NOAA/ERT), Bin Zhang (NOAA/ERT), Taeyoung Choi (NOAA/ERT), Saeedmir Blonski (NOAA/ERT), and Xi Shao (NOAA/UMD)
COMS Visible Channel Calibration Using Moon Observation Data
by Tae-Hyeong Oh and Dohyeong Kim (KMA/NMSC)
Assessment of Microwave Radiometers on-board All/metry Missions: Comparison of measured brightness temperatures to simulations
by Bruno Picard, Marie-Laure Frery and Mathilde Simeon (CLS, France)
News in This Quarter
GSICS Nineteenth Executive Panel (EP-19) Meeting held in Bangalore, India
by Mitch Goldberg (NOAA), Kenneth Holmlund (EUMETSAT), Toshi Kurino (WMO), Lawrence E. Flynn (NOAA), Manik Bali (NOAA), Dohyeong Kim (KMA) and Masaya Takahashi (JMA)
GSICS and GRUAN Coordination: RIVAL to the Rescue?
by Tony Reale (NOAA) and Lori Borg (SSEC, UW)
Announcements
ROSCOSMOS joins as full member of GSICS Executive Panel
by Mitch Goldberg (NOAA), Toshi Kurino (WMO) and Lawrence E. Flynn (NOAA)
GSICS Annual Meeting to be held at ESA in Frascati, Italy
by Philippe Goryl, ESA
GSICS Related Publications

GSICS recommends SNPP-VIIRS as the VIS/NIR calibration reference
By Dave Doelling (NASA), Chair GSICS VIS/NIR Subgroup
The GSICS VIS/NIR subgroup has officially recommended that SNPP-VIIRS be the VIS/NIR calibration reference sensor to radiometrically scale and to monitor the stability of current operational sensors. It was recommended to select the VIIRS spectral channel that best matches the target sensor. For example, the MODIS band 1 (0.65μm) spectral response function
resembles the VIIRS I1 band more than the M5 band. The recommendations were agreed upon during the GSICS VIS/NIR web meeting held on July 5, 2018. The NOAA VIIRS IDPS L1B Version 2 (V2) dataset is the recommended calibrated VIIRS dataset. V2 is not available at the NOAA CLASS archive (www.class.noaa.gov) as it will take a year or two to reprocess the NPP VIIRS record. Changyong Cao, the NOAA VIIRS calibration lead, presented the VIIRS calibration improvements and invites any feedback regarding the VIIRS calibration effort. V2 mitigated the M1-M4 band calibration drifts contained in the V0 nominal calibrated dataset. GSICS will coordinate with NOAA to provide the calibration community with VIIRS L1B V2 granules over desert, DCC, SNO and other specific sites upon request, hopefully by this Fall. NASA-Langley will provide the GEO domain VIIRS DCC reference response, in the same manner as the Aqua-MODIS DCC reference response. The NOAA V3 calibration activities will be documented in order to provide the calibration community with a reference and calibration uncertainty. Both the MODIS and VIIRS instrument absolute calibrations based on the solar diffusers are reflectance based. To obtain radiance from the reflectance observations, a solar spectra is used. It must be noted, that the L1B MODIS, NPP-VIIRS, and NOAA-20, use the MCST, MODTRAN, and Thuiller solar spectra respectively.


GSICS Quarterly
Newsletter–Spring 2018 Issue
Guest Editor: Dr. Alexey Rublev (Roshydromet)
Special Issue on Calibration Research in Russia
Articles
CAL/VAL system for Russian satellite instruments
by A. Rublev (State Research Center for Space Hydrometeorology, Roshydromet)
IKFS-2 radiometric calibration stability in different spectral bands
by F. Zavelevich, D. Kozlov, I. Kozlov, I. Cherkashin (State Scientific Center "Keldysh Research Center", Russia),
A. Uspensky, Yu. Kiseleva, V. Golomolzin and A. Filei (State Research Center for Space Hydrometeorology "Planeta", Roshydromet)
Assessment and Recalibration of Meteor-M No.2 Microwave Imager/Sounder MTVZA-GY data in Atmospheric Sounding Channels
by D. Gayfullin and M. Tsymbilov (Hydrometeorological Center of Russia) and A. Uspensky (SRCSH, "Planeta", Roshydromet)
External Calibration of MTVZA-GY/ Meteor-M No.2 Imager Channels
by L. Mitnik, V. Kalashov (Pacific Oceanological Institute), G. Chernyavsky and I. Chetny (AO Russian Space System)
Radiometric inter-calibration of MSU-MS shortwave channels on-board Meteor-M No. 2 relative to AVHRR on-board Metop A
by A. Filei, A. Rublev (State Research Center for Space Hydrometeorology "Planeta", Roshydromet) and A. Zelteev (Joint Stock Company Russian Space Systems)
Radiometric inter-calibration between MSU-GS and VIRS shortwave channels
by A. Filei, A. Rublev, Yu. Kiseleva (SRCSH "Planeta", Roshydromet) and A. Zelteev (Joint Stock Company "Russian Space Systems")
News in This Quarter
Highlights on 2018 Annual GRWG/GDWG Meeting
by M. Bali (UMD), L. Flynn (NOAA), P.Zhang (CMA), S. Hu (CMA), T. Stone (USGS), D. Doelling (NASA), R. Ferraro (NOAA), T. Hewison (EUMETSAT), D. Kim (KMA) and M. Takahashi (JMA)
GOES Calibration Web Site
by R. Iacovazzi, Jr / NOAA
Announcements
Call for papers for 2nd Workshop of the CGMS International Cloud Working Group (ICWG)
by Andy Heidinger (NOAA) and Rob Roebeling (EUMETSAT)
Sentinel-3B Mission launched
by Tim Hewison and Alessandro Burini(EUMETSAT)
GSICS Related Publications

CAL/VAL system for Russian satellite instruments
By A. Rublev (State Research Center for Space Hydrometeorology "Planeta", Rockydromet)
Roshydromet and Roscosmos are developing the constellation of the Russian meteorological satellites (next generation). By 2025, it will consist of four Meteor-M low earth orbit (LEO) satellites, three Electro-L geostationary (GEO) satellites, two highly elliptical orbit (HEO) Arctica satellites, and approximately ten R&D environmental satellites. Thus, there is a strong need for dedicated calibration and validation (CAL/VAL) activities with respect to satellite hydrometeorological data and Level 2 (L2) products.
CAL/VAL of satellite data and products are critical for many applications. To better examine the quality of existing and future developed information products the Cal/Val system for meteorological satellite data was enhanced and implemented in 2016. The system takes as input the data of global and Roshydromet observing networks, results of test site measurements and data of reference satellite instruments recommended by GSICS. The illustrative scheme of the system is presented in Fig.1.
The main tasks of CAL/VAL system are as follows:
1) post-launch calibration and characterization of on-orbit calibration performance for current and future Russian LEO, GEO, and HEO meteorological satellite instruments; and
2) validation of L2 products, i.e. the assessment of L2 products accuracy and reliability based on comparison with reference data (with known accuracy).
This special issue of GSICS Quarterly Newsletters is dedicated to the use of the


GSICS Quarterly
Newsletter–Winter 2018 Issue
Editor: Manik Bali, NOAA NCWCP College Park, MD, USA
In This Issue
Articles
Sea surface temperature (SST) based cross-calibration for satellite infrared data
by Yuiko Kurihara (JMA), Hiroshi Murakami (JAXA/EORC), and Misako Kachi (JAXA/EORC)
Inter-calibration without simultaneous nadir observations
by Tomislav Marnimen, and A. Ricketa, Finnish Meteorological Institute, A. Heidinger, NOAA, C. Schaaf, UMB, A. Lattanzio, EUMETSAT, J. Key, NOAA
Inter-satellite radiometric calibration of cross-track scanning microwave radiometers in GPM constellation
by Hamideh Ebrahimi, University of Florida/ University of Central Florida Gainesville, FL
Improved SNO analysis demonstrates the robust calibration of NOAA OC SDRs for SNPP VIIRS solar bands
by Mike Chu and Junqiang Sun (NOAA)
News in This Quarter
A New GOES-East
by Robert Iacovazzi, NOAA
GSICS and GRUAN Coordination
by Tony Reale (NOAA), Xavier Calbet (AEMET), Cheng-Zhi Zou (NOAA), Isaac Moradi (ESSIC), Univ. Maryland), Viju John (EUMETSAT), Dave Tobin (SSEC, Univ. Wisconsin, Madison) and Bomin Sun (NOAA, IMSG)
Announcements
Call for papers for 2nd Workshop of the CGMS International Cloud Working Group (ICWG)
by Andy Heidinger (NOAA) and Rob Roebeling (EUMETSAT)
GSICS Executive Panel Meeting (EP-19) to be held in Bangalore, India
by Tsukiyuki Kurino, WMO
The Ninth Asia Oceania Meteorological Satellite Users Conference (AOMSUC-9) to be held in Jakarta, Indonesia from 8-11 October 2018,
by Rista Adriyanto, BMKG, Indonesia
GSICS-Related Publications
Sea surface temperature (SST) based cross-calibration for satellite infrared data
By Yuiko Kurihara (JMA), Hiroshi Murakami (JAXA/EORC), and Misako Kachi (JAXA/EORC)
The Japan Aerospace Exploration Agency (JAXA) produces Himawari-8 sea surface temperature (SST) products generated by using the data from the Advanced Himawari Imager (AHI) aboard the Himawari-8 satellite [1]. In addition to this, JAXA plans to produce SST products by using the data from the Second-Generation Global Imager (SGLI) aboard the Global Change Observation Mission-Climate (GCOM-C) satellite [2].
Himawari-8 SSTs are retrieved by using a newly introduced SST method, and the same method will be used for GCOM-C SSTs. The SST method, we call it the quasi-physical method, determines SSTs by solving a modified infrared (IR) radiative transfer equation [3]. The use of the same method aims to generate consistent SST data set. However, the existence of inconsistency is highly possible in Himawari-8 and GCOM-C SSTs for several reasons such as an issue with the satellite data calibration. Inconsistency in physically retrieved SST's in our opinion, should be improved by the adjustment of the original radiance data rather than empirical bias corrections by comparisons of determined SSTs. Because of this, we developed a new cross-calibration method by utilizing the quasi-physical SST method. The cross-calibration method uses satellite SSTs as the intermediate data between two different sensors. Because of this, the new method is expected to be effective to the improvement of the consistency in retrieved SSTs.

GCC Activities: Sharing GSICS Products

GCC GSICS Coordination Center
Establishing product quality assurance, charting progress, and communicating accomplishments across the GSICS program and beyond
Hosted for GSICS at the NOAA/NESDIS Center for Satellite Applications and Research

GSICS Global Space-based Inter-Calibration System

GCC Home > GSICS Product Catalog

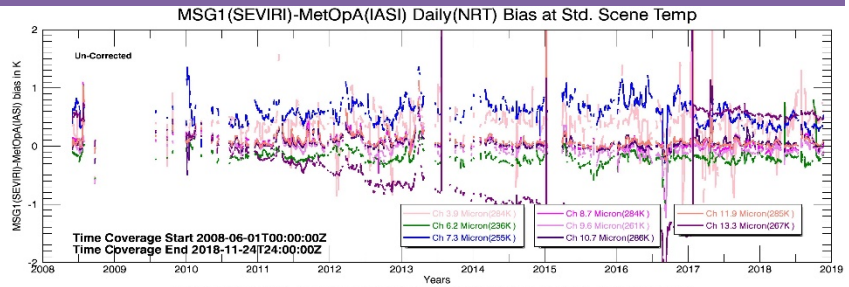
GSICS Product Catalog

Show 100 entries Search: Typing any text will filter displayed products

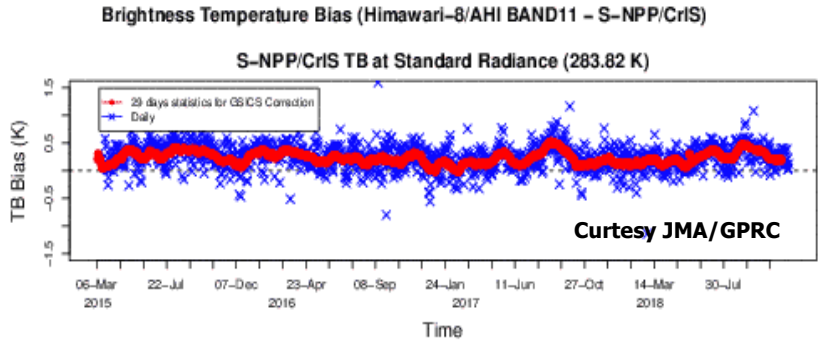
Product Type	Algorithm Type	Data Producer	Maturity Level	Monitored Instrument	Reference Instrument	Version	Data Start Date	Data End Date	Docs / Data Links
Near-Real Time Correction	GEO-LEO IR	JMA	Demonstration	Himawari-8 AHI	IASI-A	1	2017-10-30	Present	Docs Data
Near-Real Time Correction	GEO-LEO IR	JMA	Demonstration	Himawari-8 AHI	IASI-B	1	2017-10-30	Present	Docs Data
Near-Real Time Correction	GEO-LEO IR	JMA	Demonstration	Himawari-8 AHI	Aqua AIRS	1	2017-10-30	Present	Docs Data
Near-Real Time Correction	GEO-LEO IR	KMA	Demo	COMS Imager	IASI-A	1	2017-01-31	Present	Docs Data
Near-Real Time Correction	GEO-LEO IR	NESDIS	Preoperational	GOES-13 Imager	IASI-A	1	2013-01-16	Present	Docs Data
Near-Real Time Correction	GEO-LEO IR	NESDIS	Preoperational	GOES-15 Imager	IASI-A	1	2013-01-16	Present	Docs Data
Near-Real Time Correction	GEO-LEO IR	ISRO	Demonstration	INSAT-3D Imager	IASI-A	1	2016-02-19	Present	Docs Data
Near-Real Time Correction	GEO-LEO IR	ISRO	Demonstration	INSAT-3D Sounder	IASI-A	1	2016-02-19	Present	Docs Data
Near-Real Time Correction	GEO-LEO IR	EUMETSAT	Demonstration	Meteosat-7 MVIRI	IASI-A	3	2008-05-15	2017-03-27	Docs Data
Near-Real Time Correction	LEO-LEO IR	EUMETSAT	Prototype	Metop-A HIRS	IASI-A	3	2009-04-29	Present	Docs Data
Near-Real Time Correction	GEO-LEO IR	EUMETSAT	Demonstration	MSG-1 SEVIRI	IASI-A	3	2008-05-15	Present	Docs Data
Near-Real Time Correction	GEO-LEO IR	EUMETSAT	Operational	MSG-2 SEVIRI	IASI-A	1	2012-11-08	Present	Docs Data
Near-Real Time Correction	GEO-LEO IR	EUMETSAT	Operational	MSG-3 SEVIRI	IASI-A	1	2013-01-24	Present	Docs Data
Near-Real Time Correction	GEO-LEO IR	JMA	Demonstration	MTSAT-2 Imager	Aqua AIRS	1	2013-01-18	2016-03-23	Docs Data
Near-Real Time Correction	GEO-LEO IR	JMA	Demonstration	MTSAT-2 Imager	Aqua AIRS and IASI-A	1	2013-01-18	2016-03-23	Docs Data
Near-Real Time Correction	GEO-LEO IR	JMA	Demonstration	MTSAT-2 Imager	IASI-A	1	2013-01-18	2016-03-23	Docs Data
Near-Real Time Correction	GEO-LEO	EUMETSAT	Pre-Op	MSG-4 SEVIRI	IASI-A	0	2/9/2016	Present	Docs Data
Near-Real Time Correction	GEO-LEO	EUMETSAT	Pre-Op	MSG-4 SEVIRI	IASI-B	0	2/9/2016	Present	Docs Data

Potential Use

Bias Monitoring and bias correction. Eventually impact assimilation errors



Application of GSICS Coefficients corrects biases and trends in L1B Native scene.



- Majority of GSICS Products (35 out of 39 IR products) use IASI as a the Reference.
- CrIS and AIRS are GSICS references that complement the monitoring by providing Afternoon/Midnight monitoring in addition to Morning/Evening monitoring by IASI.

https://www.star.nesdis.noaa.gov/smcd/GCC/ProductCatalog.php

GSICS Activities: GSICS Deliverables

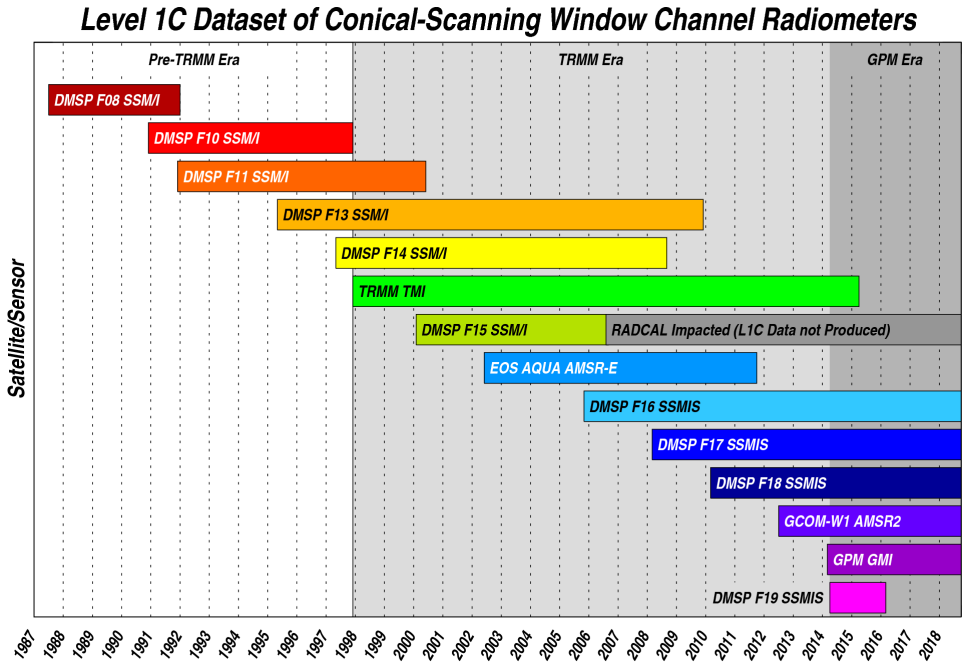
What is a GSICS Deliverable?

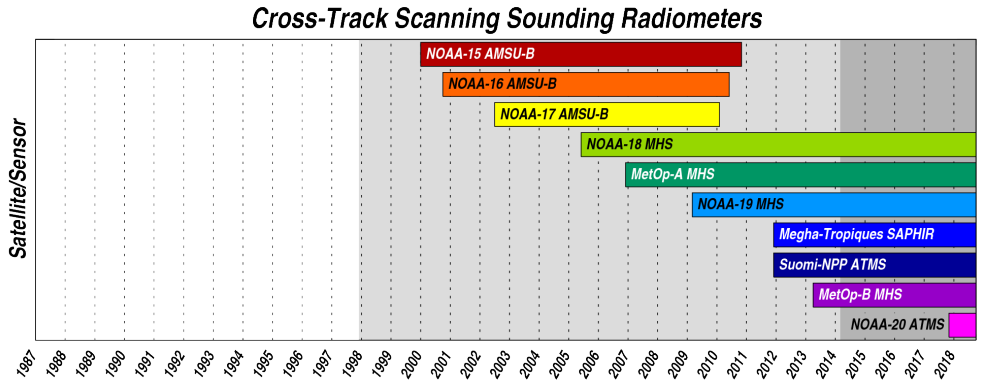
GSICS Deliverables are entities that are useful in instrument monitoring and calibration.
We currently have four deliverables:

- Hyperspectral Reference Radiance in NetCDF Format by *Masaya Takahashi (JMA)*
- GEO-LEO Intermediate Collocation (Himawari/MTSAT V Hyperspectral, IR) by *Masaya Takahashi (JMA)*
- Spectral Response Function for GIRO (VIS) by *Masaya Takahashi (JMA)*
- Level 1C Inter-Calibration Tables by *Wes Berg(CSU) and Racheal Kroodsma (NASA)*

GSICS Global Space-based Inter-Calibration System

Level 1C Inter-Calibration Tables





- GPM GMI used as the calibration standard for the constellation
- 13 imagers and 10 sounders intercalibrated to GMI

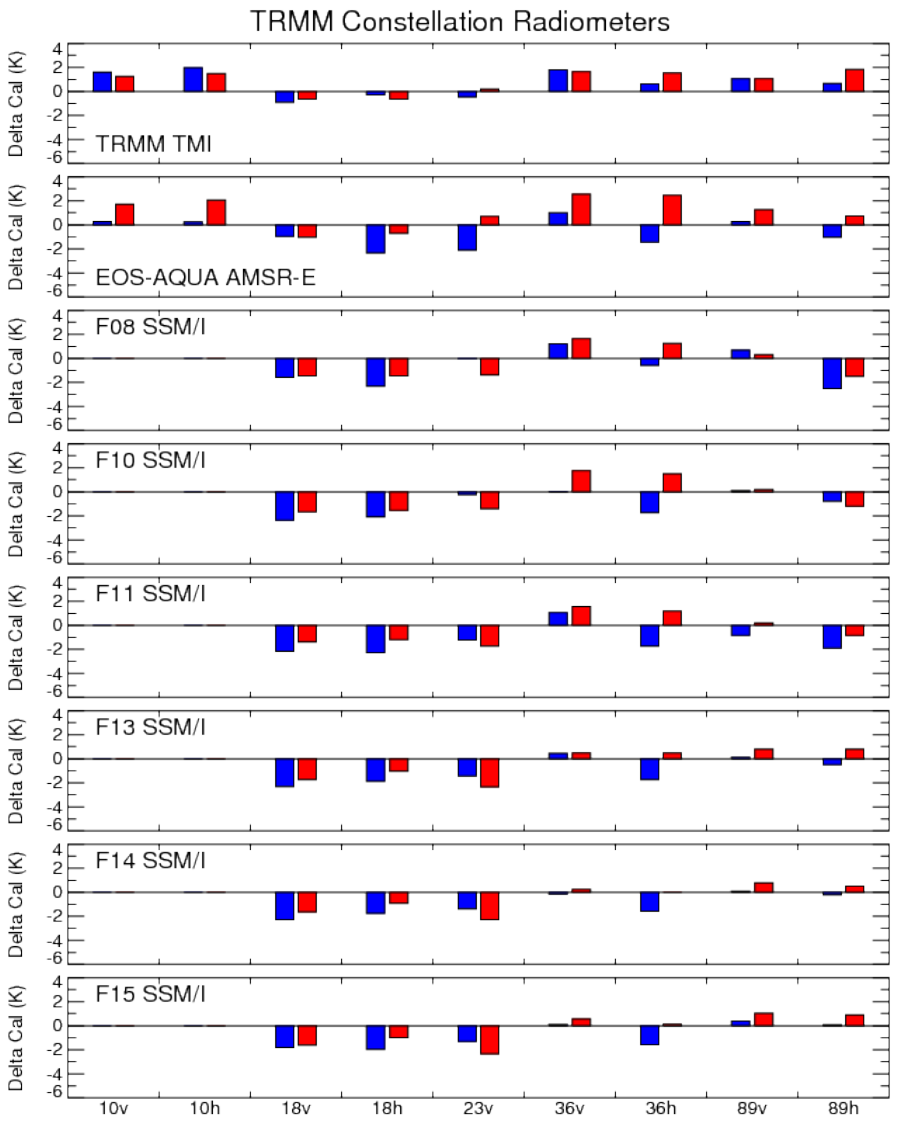
GMI calibration references

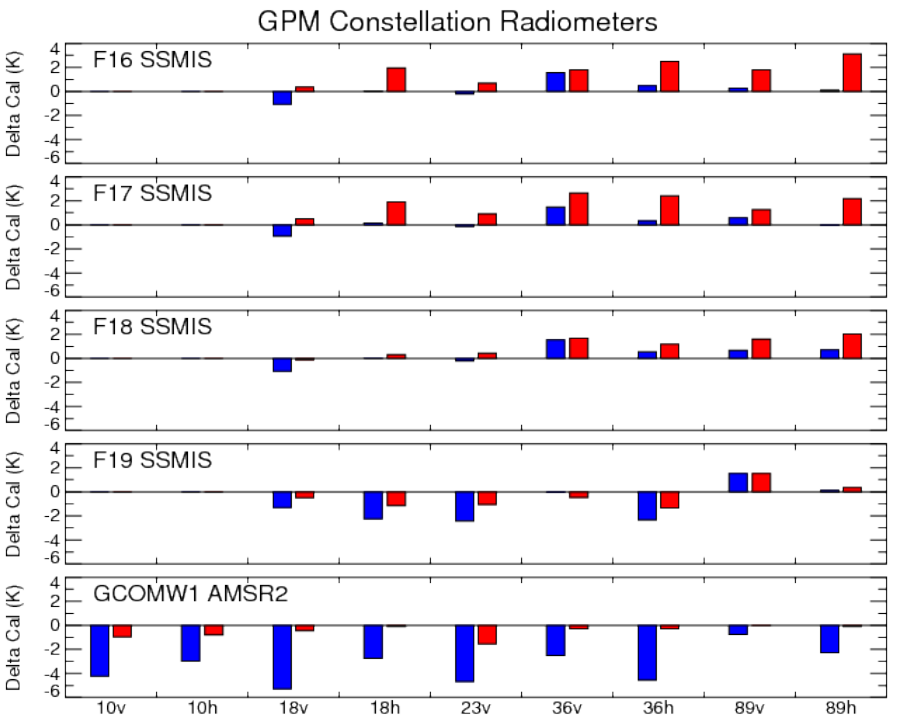
Draper, D. W., D. A. Newell, F. J. Wentz, S. Krimchansky, and G. Skofronick-Jackson, 2015: The Global Precipitation Measurement (GPM) Microwave Imager (GMI): Instrument overview and early on-orbit performance. *IEEE J. Sel. Top. Appl. Earth Obs. Remote Sens.*, 8, 3452–3462, doi:10.1109/JSTARS.2015.2403303.

Wentz, F. J. and D. Draper, 2016: On-orbit absolute calibration of the Global Precipitation Mission Microwave Imager, *J. Atmos. Oceanic Technol.*, 33, 1393–1412, doi:10.1175/JTECH-D-15-0212.1.

GSICS Global Space-based Inter-Calibration System

Intercalibration Table Values (Imagers)





Blue: Cold ocean scenes

Red: warm vegetated scenes

Potential Use

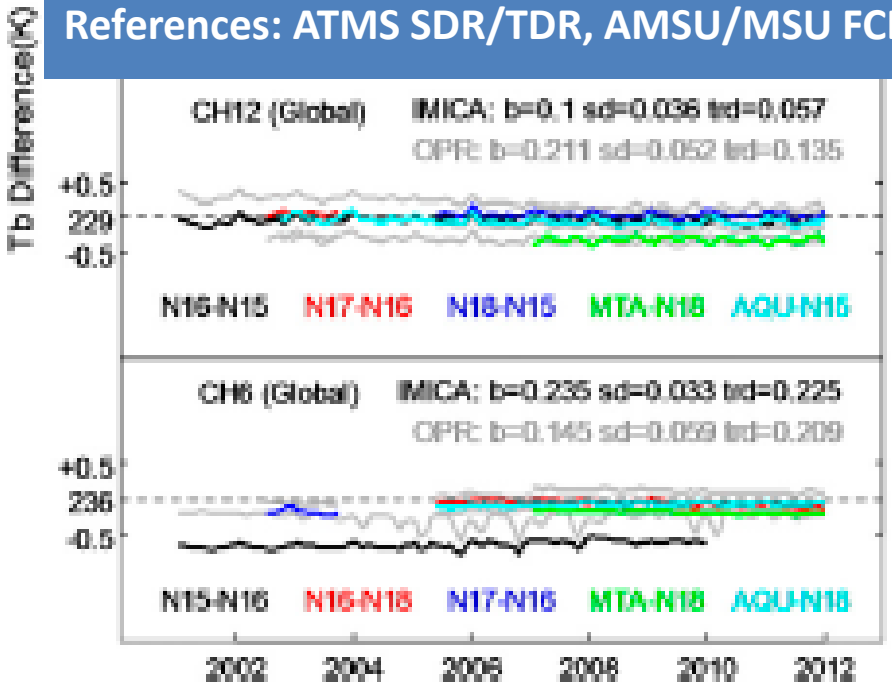
Monitoring and Re-Calibration

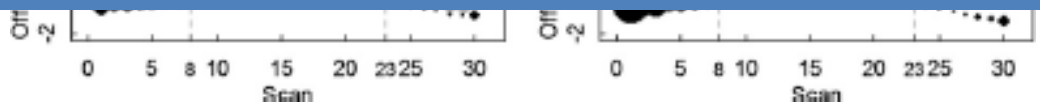
Stability of MW AMSU/MSU FCDR

MW sounder

1. Sensor performance stability
2. Field of view (FOV) consistency (ATMS has oversampling FOV and can be B-G to AMSU-A and MSU)
3. Error budgets (prelaunch characterization and postlaunch verification)
4. Geolocation accuracy
5. Data availability

References: ATMS SDR/TDR, AMSU/MSU FCDR





- **AMSU-A onboard six POES satellites were inter-calibrated using Integrated Microwave Inter-Calibration Approach (IMICA)**
- **Five calibration errors were removed/minimized: nonlinearity, bias drift, frequency shift, sun-heating induced temperature variability in radiances;**
- **Inter-satellite Biases were reduced to 0.1-0.2K**
- **19 years of swath data**
- **Dataset available from NCEI CDR website**

- **AMSU-A/MSU FCDR continuously monitored in Real time**
- **Scan Angle Dependence has been corrected**
- **Validated with GPSRO and instruments monitored at ICVS**
- **Typical data file resembles a native L1B data file**

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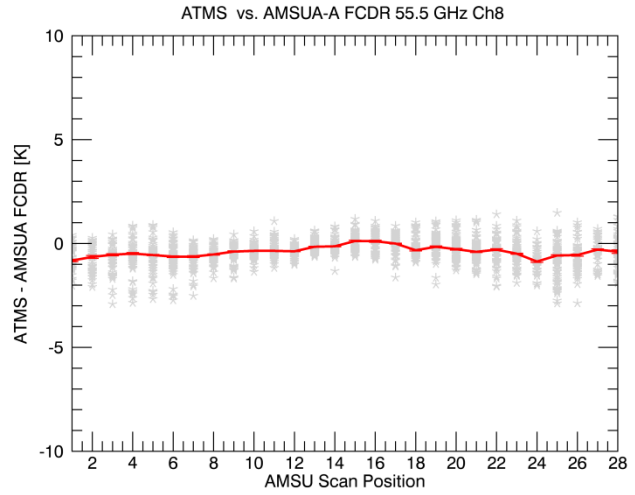
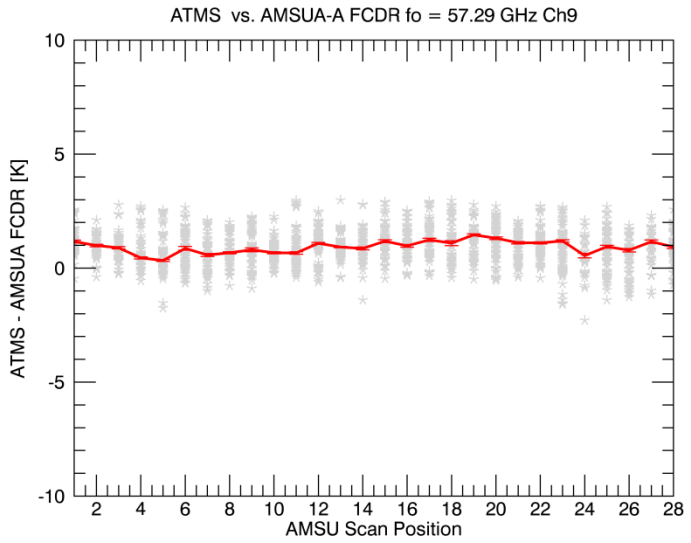
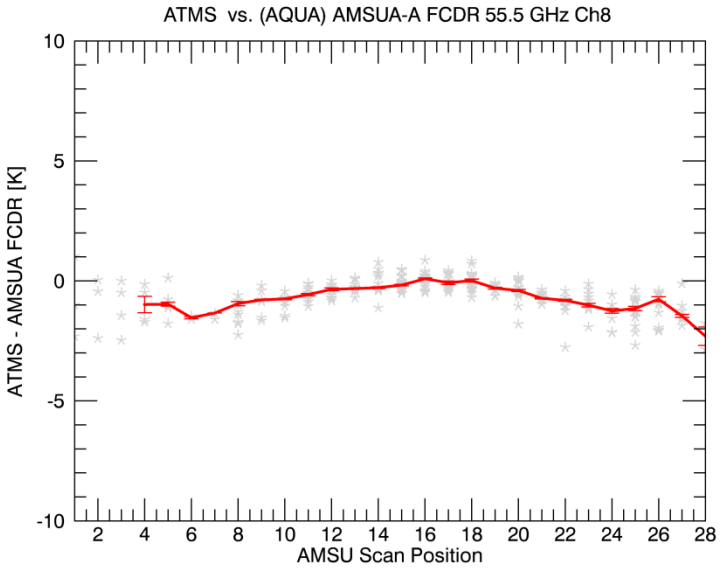
Inter-comparison of AMSU/MSU FCDR and ATMS-SDR-Scan Angle

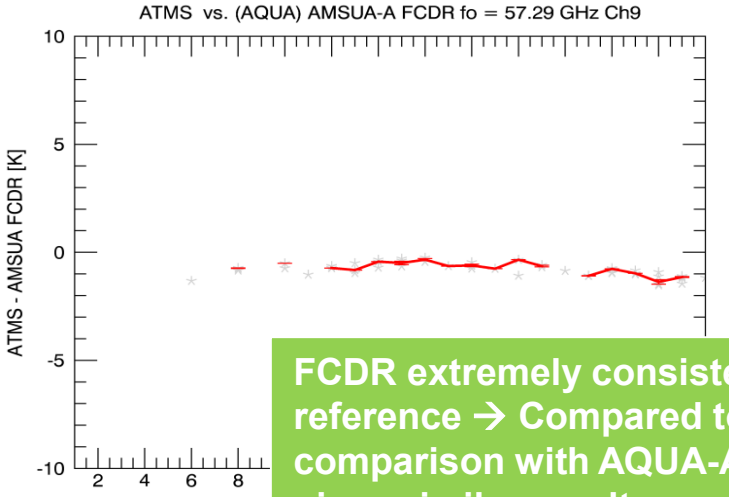
N18





Aqua





FCDR extremely consistent as a reference → Compared to N18, Inter-comparison with AQUA-AMSU FCDR gives similar results

In-Orbit Reference for VIS

VIS/NIR

- **The reference instrument must have an active instrument calibration team funded by the project over the lifetime of the satellite**
  - **Must have onboard calibration that is well characterized, preferably with Solar diffuser and lunar monitoring**
  - **The pre-launch and on orbit calibration must be well documented in journals.**
  - **The data must be publicly available and easy to order and download and be released in near real-time.**
  - **The instrument must have many users to verify the calibration and discover any calibration anomalies.**

References: Pre-2012 Aqua-MODIS, Post-2012 use S-NPP VIIRS, VIIRS onboard calibration is superior and better characterized than MODIS.

- **NOAA can provide small version 2 datasets over invariant and SNO targets, or can process on the fly, or provide the processing code**

- **This is just not a problem for VIIRS, but other datasets as well.**
- **In the future, is it best to let the user process the L1A dataset (much smaller than L1B) with a calibration module?**

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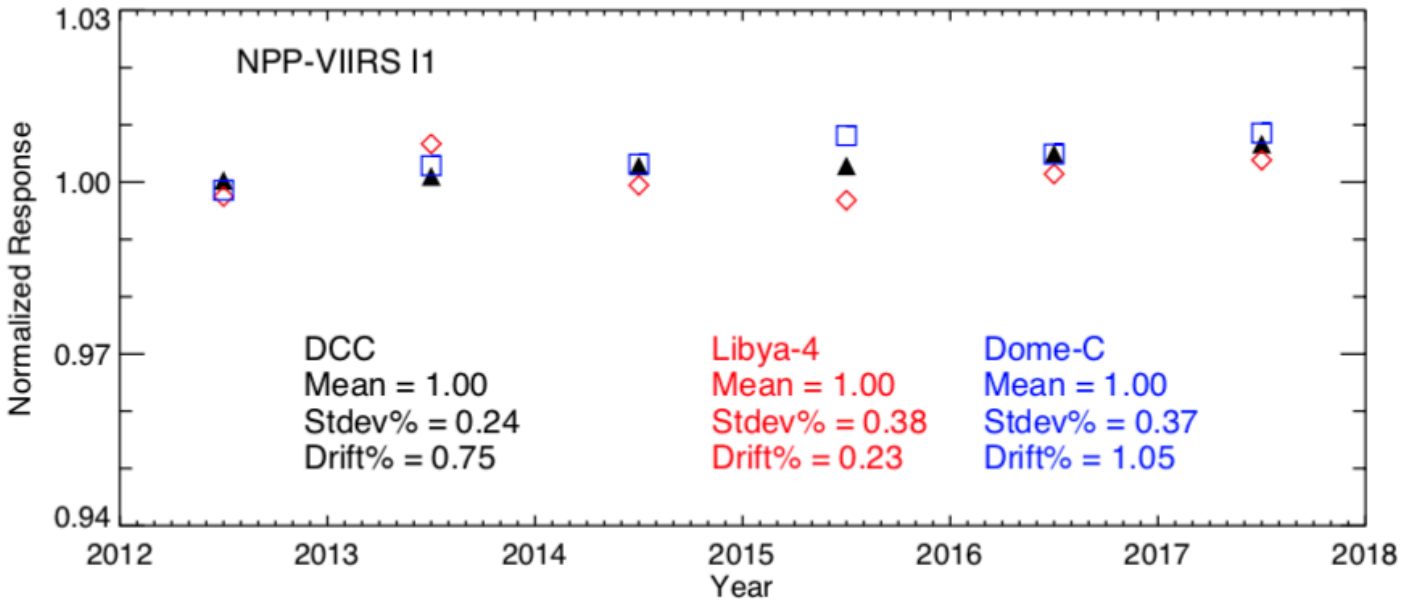
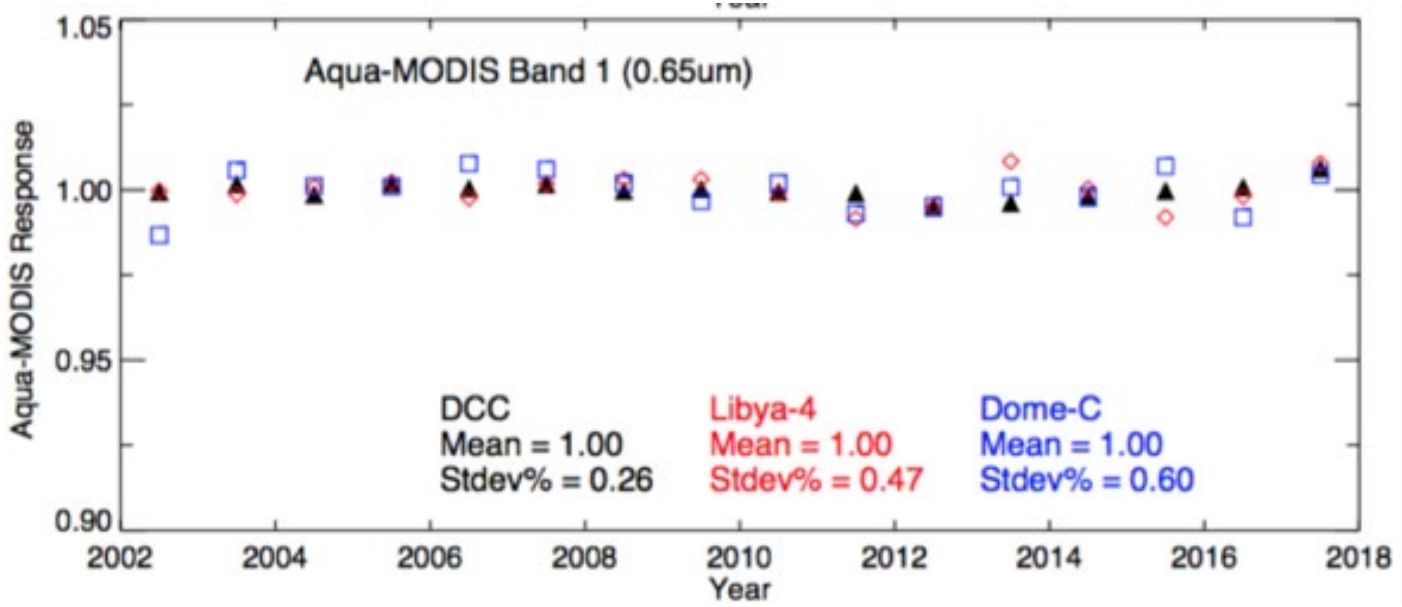
Stability of NPP-VIIRS In-Orbit Reference for VIS





NPP-VIIRS I1 (shown) and M5 (not shown) channel reflectances over deep convective clouds (DCC), Libya-4, and Dome-C, show that the annual standard deviation is less than 0.4%

The Aqua-MODIS annual standard deviation is within 0.6% among the Earth invariant targets.

GSICS recommends researchers use the VIIRS channel that most closely matches the channel to calibrate

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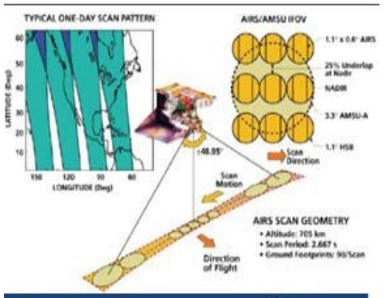
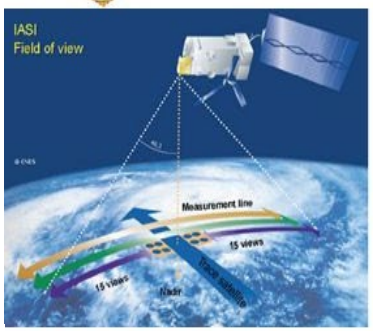
In-Orbit Reference for IR

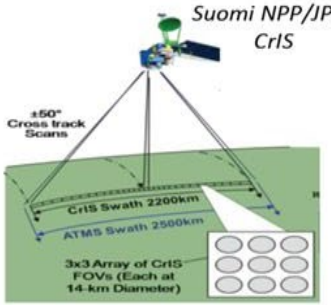
IR sounder considerations

1. Sensor performance stability
2. Spectral coverage/Spectral resolution
3. Error budgets (prelaunch characterization and post-launch verification)
4. Geo-location accuracy
5. Data availability

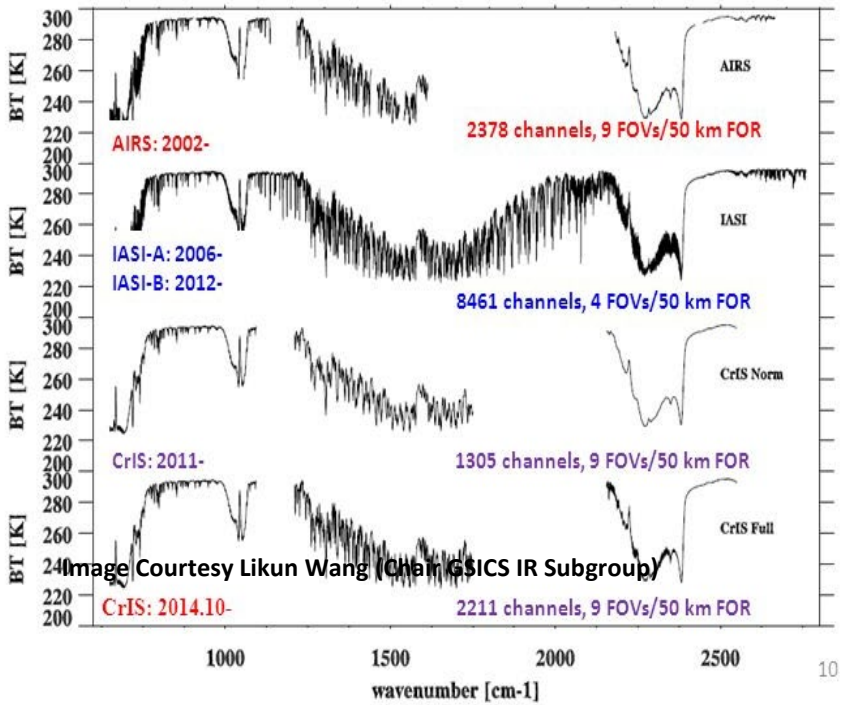
References: CrIS, AIRS IASI A/B/C all can be GSICS References (No Primary or Secondary distinction)



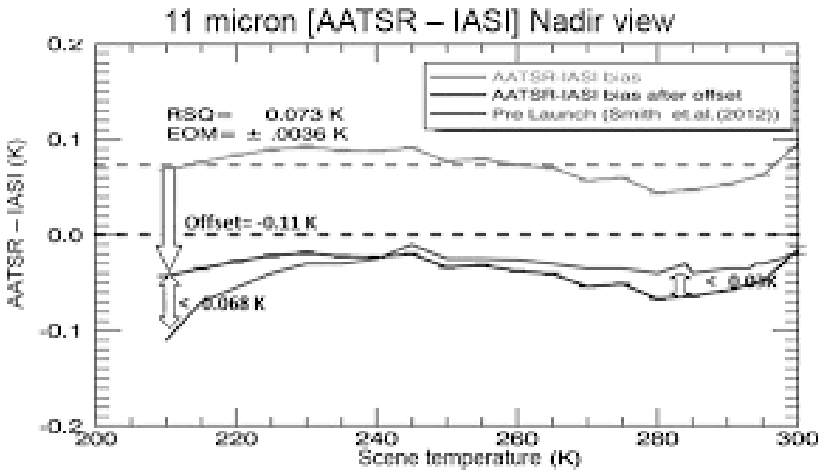




Spectral Coverage and Resolution of AIRS, IASI, and CrIS



- Image Courtesy Likun Wang (Chair GSICS IR Subgroup)



IASI-A (with a minor offset) acts like Pre-Launch reference for Monitored instrument.

Spectra of CrIS, AIRS and IASI Span most of the IR Broad band sensors

GSICS Global Space-based Inter-Calibration System

Interoperability Platform

The WMO Integrated Observing System (WIGOS) aims to integrate all the observing platforms and achieve interoperability.

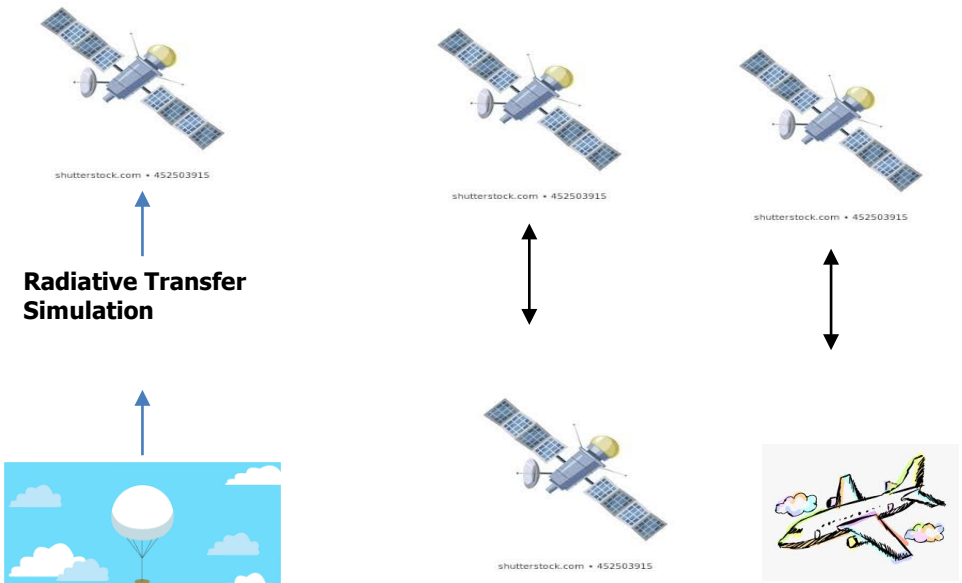
- GSICS is now a component of the WIGOS System.
- GSICS should be interoperable with other Measuring platform of the WIGOS System

NOAA building a python platform that can

1. Read in GTS data
2. Read in Satellite Level 1 data

Modules
SATPY+PYTROLL+PYGAC+TYPHON+CODA+MINICONDA+RT
MODELS (ARTS, CRTM)

3. Capable of performing Radiative Transfer Model simulations in ***IR, VIS, MW*** shall be in UV (with limb simulation)
4. ***Compare observing systems (Sat Vs Sat, Sat Vs Model, Sat Vs (Model+ Baloon), Satellites Vs Aircraft***



Suggestions

- **What additional tools do you need**
- **What profiles do you need**
- **Is there a possibility to provide login access to members ?**

Summary & Conclusion

- **GSICS has over 60 inter-comparision products that aim to monitor GEO and LEO instruments by comparing them with IASI, AIRS and CrIS for the IR and MODIS and VIIRs for the Visible.**
- **Potential use**
    - Bias Correction
    - Re-Calibration
    - Create FCDR
- **GSICS has four deliverables. These include GIRO SRF, SNO Intermediate products and SSMI series inter-comparision table**
- **GSICS References are CrIS family, IASI family , AIRS and VIIRS family**
- **A New inter-operability platform that has the capability to inter-compare components of the WIGOS system is being built on a python platform using public tools such as Pytroll, PyGAC, Satpy and Typhon.** ***Suggestions welcomed.***

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THANK YOU

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Deliverable – IASI-A Reference Radiance

1. **Objective of the Deliverable - Why the Group/Subgroup/Community needs it?**
Some GSICS agencies need to use reference LEO L1 subset for their GEO-LEO collocation to generate GSICS inter-calibration products.

2. **How is it created?**
Data provider (IASI L1C by EUMETSAT) creates and makes it available on the GSICS Collaboration Server based on user's requests.

3. **How do you use it?**
Use the file as an input for inter-calibration ATBD.

4. **References: Publications, websites etc.**
EUMETSAT GSICS Collaboration Server:
http://gsics.eumetsat.int/thredds/catalog.html

Potential Use
IASI Reference radiances can be used directly for monitoring instruments. Easy to read NetCDF format.

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Deliverable – GEO-LEO Intermediate Collocation Data

1. **Objective of the Deliverable - Why the Group/Subgroup/Community needs it?**
Input for deriving inter-calibration coefficients, which is mainly used by producers of GSICS products, but may be useful for other users.

2. **How is it created?**
Created by producers of GSICS Products (e.g. JMA)

3. **How do you use it?**
The data are used by the producers to generate GSICS Correction. Other users may want to replicate the process, or use them for their research purpose.

4. **References: Publications, websites etc.**
Convention (template):
http://gsics.atmos.umd.edu/bin/view/Development/NetcdfConvention#Collocation_Data
Data (example of JMA's data):
http://gsics.eumetsat.int/thredds/jmaIntermediate.html (Data transfer was stopped in 2018 due to slow FTP connection: root causes are under investigation)

Potential Use
Intermediate data can be used to understand the impact of apply thresholds on bias

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Spectral Response Function for GIRO

1. **Objective of the Deliverable - Why the Group/Subgroup/Community needs it?**
To support GSICS activities such as Lunar Calibration using GIRO (GSICS Implementation of the ROLO model)

2. **How is it created?**
GDWG Chair basically has created based on users' requests, but some users also generate the files by themselves by referring the following Convention or document.

3. **How do you use it?**
To use as an input file to execute GIRO and other applications for GSICS research

4. References:
Convention (document is attached on the page):
http://gsics.atmos.umd.edu/bin/view/Development/SrfNcdfConvention
Document for GIRO:
http://gsics.atmos.umd.edu/pub/Development/LunarWorkArea/GSICS_ROLO_HighLevDescript_IODefinition.pdf

5. Deliverable Location
http://gsics.atmos.umd.edu/bin/view/Development/Srf4Giro

Potential Use
SRF used by GIRO can be used for Lunar Radiance Simulation

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