

Science and Implementation Update

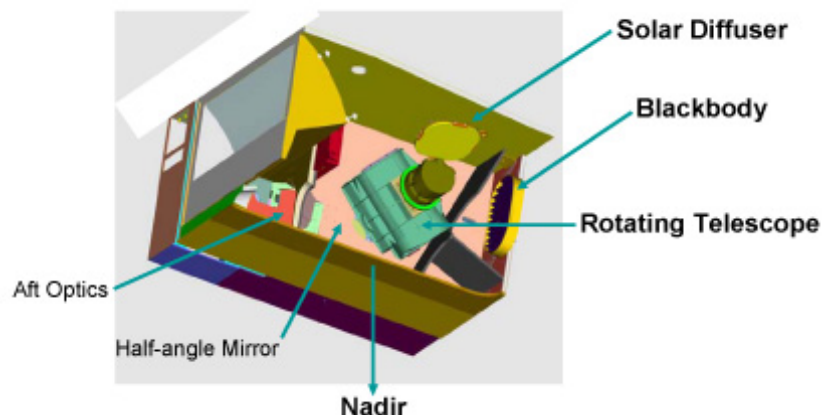
Suomi NPP VIIRS and Aqua MODIS Show Good agreement

Introduction

The Visible Infrared Imaging Radiometer Suite (VIIRS) onboard the Suomi National Polar-orbiting Partnership Satellite (S-NPP) marks a new era of moderate imaging capabilities for operational polar-orbiting environmental satellite programs. VIIRS succeeds the AVHRR, MODIS, SeaWiFS, and OLS, and provides global Earth observations twice daily for the production of more than 20 Environmental Data Records (EDR), including sea surface temperature, ocean color, cloud imagery, vegetation, aerosols, and others (Cao et al. 2013a). After a year and half of intensive calibration/validation by a team that consists of experts from NOAA, NASA, The Aerospace Corporation, University of Wisconsin, MIT/Lincoln Lab., Northrop Grumman, and Raytheon, the VIIRS sensor data records (SDR) have reached a higher level of maturity (from Beta to Provisional as of Jan 2013). Extensive comparisons have been performed between VIIRS and MODIS using several methods. After a number of issues were resolved in the process, VIIRS and MODIS now agree within 2% in reflectance for most reflective solar bands (RSB), and within 0.1 K for the thermal emissive bands (TEB) except for channels with large spectral differences or at extreme radiance levels. The unexpected large degradation in the Rotating Telescope Assembly mirror is gradually leveling off and its impact on products has been estimated to be negligible with the mitigations implemented.

The VIIRS onboard calibration

The heritage of the VIIRS onboard calibration derives from MODIS (Xiong et al. 2003). Its primary calibrators (Figure 1) include a solar diffuser for the RSB and a V-groove blackbody for the TEB. In addition, VIIRS also has a solar diffuser stability monitor (SDSM), which monitors the degradation of the solar diffuser. Differences from MODIS include the following: 1) VIIRS does not have a solar diffuser door, which leads to faster degradation in the solar diffuser due to more frequent solar exposure; and 2). VIIRS does not have the spectro-radiometric calibration assembly (SRCA),



Schematic of VIIRS calibration system

which is installed on MODIS. On the other hand, the response versus scan angle (RVS) effect in VIIRS is significantly reduced due to the use of the half angle mirror (HAM), compared to the paddle wheel mirror in MODIS. Like MODIS, lunar calibration is also performed regularly to independently track RSB calibration stability.

The VIIRS Day Night Bands (DNB) also takes advantage of the solar diffuser calibration, although dark earth scenes are used for offset, and a three gain stage aggregation is used to transfer the calibration at different radiance levels.

VIIRS validation

Several methods have been used to validate the VIIRS radiance, reflectance, and brightness temperature. Primary instruments used for comparison include MODIS on Aqua, CrIS on S-NPP, and IASI on MetOp-A. The comparisons are performed at the Simultaneous Nadir Overpass (SNO) sites in the polar regions, as well as extended SNOs in the low latitudes over both desert and ocean scenes. The comparison was also conducted at the Antarctic Dome C, and other CEOS endorsed cal/val sites, for the RSB, between collocated VIIRS and CrIS scenes for the TEB, and with Radiative Transfer Models. Validations are performed for sea surface temperature using the double differencing method, and for ocean color using in-situ measurements at the Marine Optical Buoy (MOBY) site. In general, the VIIRS SDR reflectance measurements agree with those of MODIS equivalent bands to within 2% for most RSB bands. A few exceptions include bands with large spectral differences between the two sensors, such as VIIRS M5 (0.67 μ m) and M13 (4.05 μ m), and a few

bands at extreme radiance values. For the TEB, VIIRS and CrIS agree well – to within 0.1 K – except for a bias at cold temperatures for the M15 (10.76 μm) band, which is still being investigated.

VIIRS geolocation accuracy is excellent, on the order of 80 meters. Minor drifts as small as 25 m have been detected and their root causes are being investigated.

Issues and further work

Both reflectance and radiance for the RSB are compared between VIIRS and MODIS. Reflectance comparisons agree well, indicating that the onboard calibrators for both instruments are performing well. However, unlike reflectance, which is based on the unitless ratio between earth view and solar diffuser view electrical signals, the computation of radiance also relies on the solar irradiance model. Larger radiance biases are expected due to the use of different solar irradiance models. For VIIRS, the Thuillier 2002 model was intended for operations as documented in the Algorithm Theoretical Basis Document (ATBD), but instead, our validation revealed that the solar spectrum from MODTRAN4.3 was used instead, and changing the solar model may have many implications. Therefore, it is recommended that for RSB intercomparisons, reflectance rather than radiance should be used. In cases where radiance comparison is necessary, users should derive the radiance based on the reflectance and the Esun (in-band solar spectral irradiance) values as published in Cao et al. 2013b, which are computed from the Thuillier 2002 solar spectra, following the CEOS recommendations.

Looking ahead, two major upgrades will be implemented this year. One is the automated RSB calibration module which will fully automate the process. Further validation will be required to ensure its performance after the implementation. The other module is the DNB straylight correction, which will require extensive validation across different seasons. Additional upgrades such as terrain corrected geolocation for the DNB are currently being investigated.

Summary

VIIRS is providing high quality SDR data to users worldwide for the production of more than 20 EDRs, and the instrument is performing very well. VIIRS RSB bands agree with MODIS equivalent bands within 2% for most bands, and within 0.1K for TEB bands with minor exceptions. Reflectance instead of radiance is recommended for intercomparison studies. Two new updates to the operational SDR processing are expected by the end of 2013, after which the data quality should achieve calibrated/validated maturity. Data users are encouraged to contact the VIIRS SDR team for any issues, questions, and comments.

References

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(Changyong Cao` NOAA/NESDIS/Center for Satellite Applications and Research, and Xiaoxiong Xiong, NASA/Goddard Spaceflight Center)

The Saharan Desert as an Absolute Calibration Reference

Introduction

In the past, simulated Top-Of-Atmosphere (TOA) Bidirectional Reflectance Factors (BRFs) over bright desert targets have been used as an absolute reference for the calibration of MSG/SEVIRI solar channels (Govaerts et al., 2004). The accuracy with which these TOA reflectances can be simulated depends on various parameters such as the radiative transfer model, the atmospheric and surface parameter characterization and the exo-atmospheric solar irradiance spectrum. This note summarizes several improvements to increase the accuracy of this absolute calibration reference in preparation for the PROBA-Vegetation mission. The accuracy of the upgraded method is evaluated by comparing the simulated TOA reflectances to the observations of several different satellite radiometers.

Improved radiative transfer modeling

Several improvements to the original methods proposed by Govaerts and Clerici (2004) have recently been achieved (Govaerts et al., 2013). Radiative transfer simulations are now based on the SIXSV code developed by

Table 1. Mean relative difference and standard deviation between satellite observed TOA BRFs and SIXSV radiative transfer simulations over Libya4 during the 2006–2009 period. Positive values indicate that simulations underestimate observations. STDEV is the standard deviation.

SENSORS	BANDS (µm)									
	0.44	0.55	0.66	0.84	1.62	0.44	0.55	0.66	0.84	1.62
	MEAN RELATIVE DIFFERENCE (%)					STDEV OF RELATIVE DIFFERENCE (%)				
VGT	0.79	–	-3.14	-2.46	-1.13	2.82	–	1.05	1.26	1.52
AATSR	–	3.89	2.81	4.21	3.82	–	1.32	1.06	1.42	0.85
PARASOL	3.08	0.71	-0.23	0.00	–	5.20	2.81	2.23	1.79	–
Aqua-MODIS	3.36	2.95	0.58	1.55	2.05	1.98	1.91	1.55	1.45	1.41
MERIS	2.60	2.80	1.41	1.50	–	1.57	1.43	1.07	1.25	–
MSG2	–	–	-4.05	-1.40	4.32	–	–	1.72	2.91	3.78

Kotchenova et al. (2006). This code accounts for radiation polarization through the calculation of four components of the Stokes vector. Additionally, an updated version of the surface BRF data set has been generated taking advantage of the availability of more than 10 years of surface BRF values derived from the MODIS (MOD09) and MISR (MISR-10) data sets. Finally, a new aerosol model composed of non-spherical particles and specifically applicable to the Sahara region has been generated based on a systematic analysis of AERONET data.

Satellite data

For the evaluation of the simulated TOA reflectance accuracy, a series of observations acquired over Libya4 between 2006 and 2009 by different radiometers – MSG2/SEVIRI, VEGETATION-2, PARASOL, Envisat MERIS and AATSR and finally Aqua-MODIS – has been processed. Except for SEVIRI observations, these data have been extracted from the ESA Database for Imaging Multi-spectral Instruments and Tools for Radiometric Intercomparison (DIMITRI) (Bouvet and Ramoino 2010). Almost all of these radiometers observe approximately in the 0.44, 0.55, 0.66, 0.84 and 1.62 µm spectral regions that are referred to here as the common spectral bands.

Results

The overall results of the mean relative difference and standard deviation in the common spectral bands between satellite TOA BRFs and SIXSV simulations over Libya4 are shown in Table 1.

Finally, figure 1 shows the value of the ratio $R_M = \text{observation/simulation}$ averaged over the entire period for all processed bands of each radiometer. This result confirms the

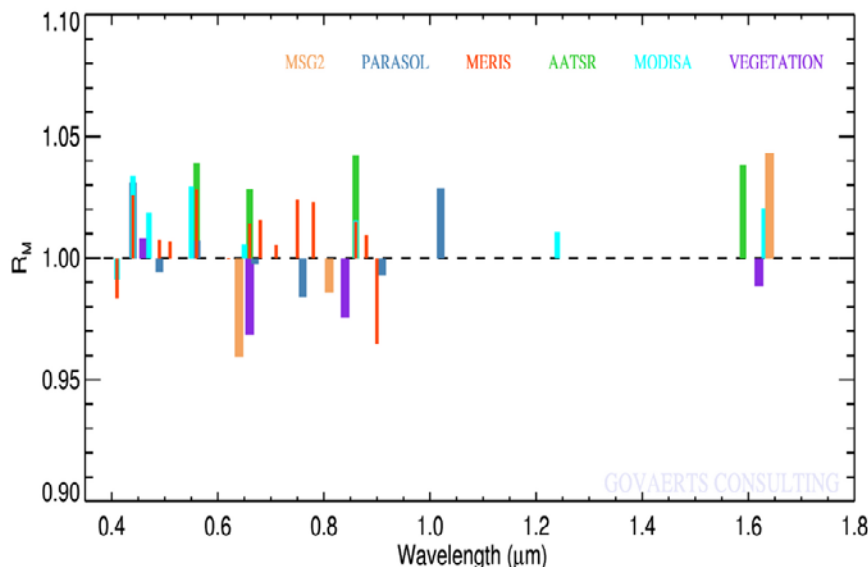


Fig. 1 Value of R_M (observation/simulation) averaged over the entire 2006 – 2009 period for each processed satellite data over the Libya4 site. Note the good agreement of the AQUA-MODIS, MERIS and PARASOL radiometers.

good agreement of the AQUA-MODIS, MERIS and PARASOL radiometers.

From these results it can be seen that, on the average, it is possible to simulate observations acquired by polar orbiting radiometers over Libya4 with an accuracy of about three to

four percent, the largest systematic error being observed in the blue spectral region. The reason for this discrepancy is still an open issue that requires further work. The use of this absolute calibration reference also reveals differences among the calibrations of some of these radiometers. It should be possible to reach the 2-3% accuracy range with this method, but it would require additional radiative transfer improvements and the simultaneous use of different desert targets.

Acknowledgement

This work has been funded by BELSPO under contract 071220.

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- (Yves Govaerts, Govaerts Consulting, Brussels, Belgium)

Other News

Larry Flynn Appointed Director, GSICS Coordination Center



Dr. Lawrence (Larry) E. Flynn of NOAA's Center for Satellite Applications and Research has been appointed as the new Director of the GSICS Coordination Center replacing Dr. Fuzhong Weng, who had capably served in that capacity for the last six years. The appointment was announced at the GSICS Executive Panel at its recent meeting in Tokyo (see the meeting summary on next page).

Larry received a BA in mathematics in 1978 from the University of Maryland, College Park, MD, an MA in mathematics in 1981 and a PhD in applied mathematics in 1987 both from the University of California, Davis CA. For the last 17 years, he has been a Research Scientist with NOAA in the NESDIS Center for Satellite Applications and Research (STAR). He is responsible for research and analysis for validation, algorithm development, and calibration of existing and next generation satellite ozone sensors including the Solar Backscatter Ultraviolet (SBUV/2) and Ozone Mapping and Profiler Suite (OMPS) instruments.

Larry has received five Department of Commerce Bronze Medals but, as his wife reminds him, three bronze medals cannot be traded for one gold medal.

He is long time devotee of the Washington Post's Style Invitational, a humor contest that appears in the Sunday edition of the newspaper. After many attempts, he finally was awarded a Washington Post Style Invitational Inker, the winner's trophy, for his entry for the Week 411 Contest titled "Examples of what you would NOT expect famous people to say." His winning submission: "Well, I'm no Einstein, but . . ." — *Einstein*.

The GSICS Coordination Center, operated by NOAA/NESDIS/STAR, coordinates GSICS product development and the activities of the GSICS Working Groups, supports end-to-end demonstration projects, updates the GSICS Operations Plan, maintains communications and outreach programs, and supports the GSICS Executive Panel.

Summary of GSICS Executive Panel Meeting-14



Executive Panel members and Japan Meteorological Agency staff at JMA headquarters during the 14th GSICS Executive Panel meeting on July 16, 2013

The 14th meeting of the GSICS Executive Panel was hosted by Japan Meteorological Agency in Tokyo, on 15 and 16 July 2013, with participation of CMA, EUMETSAT, JAXA, JMA, NASA, NOAA, Roshydromet, WMO and an invited representative of the Global Climate Observing System (GCOS). The Chair first noted that the role of GSICS was recognized in the Coordination Group for Meteorological Satellites (CGMS) High-Level Priority Plan (HLPP). WMO stressed the need to bring GSICS to a fully operational status, which implied product validation according to the GSICS Procedure for Product Acceptance (GPPA), routine availability of products and metadata, and dissemination of corrected calibration with Level 1 data; it also required further efforts on outreach and training on the operational use of GSICS products.

Reports were given by the GSICS Coordination Center, GSICS Data Working Group and GSICS Research Working Group. The Panel expressed its appreciation for the progress made and stressed that metadata and data management standardization were key issues to bring GSICS to a fully operational status. It highlighted the special issue of the IEEE TGRS journal on satellite intercalibration as a valuable achievement. Reports were presented by each member. (See presentations on the WMO's website at:

<http://www.wmo.int/pages/prog/sat/meetings/GSICS-EP-14.php>).

Table 1 (next page) is an update on GSICS product status presented at the meeting as part of the GSICS Progress Report.

GSICS and GCOS

Adrian Simmons, Chair of the GCOS Steering Committee briefed the panel on the calibration requirements for utilization of radiance data in climate analysis. He expected GSICS to help understand the root-cause of anomalies rather than reducing the bias by simply adjusting data series to each other. As regards the generation of Fundamental Climate Data Records (FCDRs), the Panel considered that GSICS should deliver methodology and tools enabling reprocessing for reanalysis. It discussed the potential for mutual benefits of the GCOS Reference Upper-Air Network (GRUAN) and GSICS activities, and took an action to define collocation criteria for GRUAN and satellite measurements.

Vision of GSICS

The Panel members discussed the role of GSICS in the space-based WMO Integrated Global Observing System (WIGOS)

Table 1. Status of GSICS GEO-LEO and LEO-LEO Correction Products (June 2013)

Algorithm Type	GPRC	Monitored Instrument	Reference Instrument	GSICS NRT Correction	GSICS Re-Analysis Correction
GEO-LEO IR	EUMETSAT	Meteosat	IASI	Pre-Operation	Pre-Operation
	JMA	MTSAT	IASI (+ AIRS)	Demo (close to Pre-Op)	Demo (close to Pre-Op)
	NOAA	GOES Imager	IASI (+ AIRS)	Pre-Operation	Pre-Operation
		GOES Sounder	IASI (+ AIRS)	In development	In development
	CMA	FY-2X	IASI (+ AIRS)	In development	In development
	KMA	COMS	IASI (+ AIRS)	In development	In development
GEO-LEO Vis/NIR DCC	EUMETSAT	Meteosat	Aqua MODIS	In development	In development
	JMA	MTSAT		In development	In development
	NOAA	GOES Imager		In development	In development
	CMA	FY-2X		In development	In development
	KMA	COMS		In development	In development
LEO-LEO Visible/NIR	NOAA	AVHRR	MODIS	Demonstration	Demonstration
LEO-LEO Microwave	NOAA	MSU, AMSU	MSU, AMSU	Demonstration	Demonstration

and the benefits it should deliver to satellite users and operators. Expected trends in satellite and instrument technology, information technology, and applications would result in new challenges and opportunities. The Panel recalled earlier conclusions on the scope and operating principles of GSICS. It emphasized that developing best practices within GSICS helped the GSICS member agencies in the Plan-Do-Check-Act quality improvement cycle. It anticipated that in the future there would be more opportunities for inter-calibration with high-quality instruments, but GSICS would need to address new instrument types, to respond to more demanding requirements, and to ensure traceability to absolute references. A balance will have to be found between expanding the scope of activity and fostering partnerships and interaction with adjacent communities such as those concerned with Radiative Transfer Modeling or thematic application. A white paper will be developed, based on this preliminary

discussion, for dialogue with GSICS partners and stakeholders.

With respect to the review of the GSICS Implementation Plan, the Panel agreed to distinguish:

- The “Vision” as an overarching document.
- The “Operations Plan” giving high-level characteristics of the GSICS system,
- A brief “Implementation Plan” with milestones towards the full implementation of GSICS.
- The science plan, to be maintained by the GRWG.

GSICS Management

The meeting discussed the role of the Executive Panel and Working Groups, their Chairs and Vice-chairs, and operating

modes, with a view to ensure broader and stronger international participation in GSICS activities and leadership. Masaya Takahashi (JMA) was nominated vice-chair of GDWG. The GRWG was encouraged to implement thematic sub-groups. Acknowledging that the participation in GRWG was very open, the Panel requested that Working Group and subgroup leads be designated among officially nominated GRWG members. The Panel also called for a candidate vice-chair (Shortly after the meeting, CMA nominated Peng Zhang as a candidate vice-chair). Finally, the Panel expressed its appreciation to Jo Schmetz for his longstanding contribution to GSICS since its inception. It also thanked Fuzhong Weng for his work as GCC Director and welcomed his successor, Larry Flynn (see profile of Larry in this Newsletter).

The Executive Panel agreed to hold future meetings on an annual basis, before the CGMS plenary, with inter-sessional web meetings. It would discuss at the next meeting the contribution of GSICS to the architecture for climate monitoring from space.

(Jerome Lafeuille, WMO)



Call for Papers: Special Issue of Remote Sensing

The following Special Issue will be published in Remote Sensing (ISSN 2072-4292, <http://www.mdpi.com/journal/remotesensing/>), and is now open to receive submissions of full research papers and comprehensive review articles for peer-review and possible publication:

Special Issue: Calibration and Verification of Remote Sensing Instruments and Observations

Website: <http://www.mdpi.com/si/remotesensing/calibration-verification-remote-sensing-instruments-observations/>

Guest Editor: Dr. Richard Müller

Deadline for manuscript submissions: 30 September 2013

You may send your manuscript now or up until the deadline. Submitted papers should not have been published previously, nor be under consideration for publication elsewhere. We also encourage authors to send us their tentative title and short abstract by e-mail for approval to the Editorial Office at: remotesensing@mdpi.com.

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Remote Sensing (ISSN 2072-4292) is an international open access journal of the science, technology and applications of remote sensing. Remote Sensing publishes reviews, research papers, and communications

GSICS-Related Publications (Compiled by EUMETSAT)

ARAI, K. (2013) Vicarious calibration based cross calibration of solar reflective channels of radiometers onboard remote sensing satellite and evaluation of cross calibration accuracy through band-to-band data comparisons. INTERNATIONAL JOURNAL OF ADVANCED COMPUTER SCIENCE AND APPLICATIONS, Vol. 4 No. 3

BINDLISH, R. Et al (2013) Intercomparison of Aquarius and SMOS brightness temperature observations. SMOS & AQUARIUS SCIENCE WORKSHOP

CABOT, F. Et al (2013) Intercalibration of SMOS and Aquarius over land, ice and ocean. SMOS & AQUARIUS SCIENCE WORKSHOP

CAO, C. Et al (2013) Calibrating a system of satellite instruments. SATELLITE-BASED APPLICATIONS ON CLIMATE CHANGE pp. 13-29

CHANDER G. ET AL (2013) Radiometric cross-calibration of EO-1 ALI with L7 ETM+ and Terra MODIS sensors using near-simultaneous desert observations. IEEE JOURNAL OF SELECTED TOPICS IN APPLIED EARTH OBSERVATIONS AND REMOTE SENSING Vol. 6 No. 2 pp. 386-399

DEVISSER, M.; MESSINA, J. (2013) Exploration of sensor comparability: a case study of composite MODIS Aqua and

Terra data. REMOTE SENSING LETTERS Vol. 4 No. 6 pp. 599-608

FERNANDES, J. Et al (2013) Inter-calibration of wet path delay datasets for the computation of the wet tropospheric correction for CryoSat-2 over ocean. EGU GENERAL ASSEMBLY 2013

GERO, J. Et al (2013) GOSAT TIR Band Inter-calibration with Satellite Infrared Sensors. THE 9TH INTERNATIONAL WORKSHOP ON GREENHOUSE GAS MEASUREMENTS FROM SPACE

GOVAERTS, Y.; STERCKX, S.; ADRIAENSEN, S. (2013) Use of simulated reflectances over bright desert target as an absolute calibration reference. REMOTE SENSING LETTERS Vol. 4 No. 6 pp. 523-531

HILBURN, K. Et al (2013) Assessment of Remote Sensing Systems Version-7 Rain Rates. EGU GENERAL ASSEMBLY 2013

HOFFMAN, R. Et al (2013) Error estimates for ocean surface winds: Applying Desroziers diagnostics to the Cross-Calibrated, Multi-Platform analysis of wind speed. EGU GENERAL ASSEMBLY 2013

LI, X. Et al (2013) Automatic intercalibration of night-time light imagery using robust regression. REMOTE SENSING LETTERS Vol. 4 No. 1 pp. 45-54

LINWOOD, J. Et al (2013) Inter-satellite Radiometric Calibration of Ocean Brightness Temperature between SMOS and Aquarius. SMOS & AQUARIUS SCIENCE WORKSHOP

MACELLONI, G. Et al (2013) L-Band brightness temperature at Dome-C Antarctica: Intercomparison between DOMEX-3, SMOS and Aquarius data. SMOS & AQUARIUS SCIENCE WORKSHOP

NGO PHONG, L. Et al (2013) Spaceborne linear arrays of 512x3 microbolometers. SPIE PROCEEDINGS Vol. 8614 86140N

OGUNBADEWA, E. (2013) A comparative assessment of UK-DMC and Landsat-7 ETM+satellite data. SENSOR REVIEW Vol. 33 No. 2 pp. 166-173

A Note from the Executive Panel Chair



I recently travelled to Japan to participate in meetings of the Coordination Group for Meteorological Satellites (CGMS) and the GSICS Executive Panel. The CGMS meeting was held July 8-12, 2013 and was hosted by the Japan Meteorological Agency (JMA) and Japan Aerospace Exploration Agency (JAXA). GSICS was highlighted as a key

enabler for the CGMS High Level Priority Plan (HLPP). The HLPP includes the two high priority tasks “Enhance the quality of satellite-derived data and products” and “Advancing the architecture for climate monitoring from space”. To carry out these two tasks the HLPP specifically calls for “GSICS to support a fully consistent calibration of relevant satellite instruments across operational CGMS agencies, recognizing the importance of collaboration between operational and research CGMS agencies”; and to “extend the use of GSICS and Sustained Co-Ordinated Processing of Environmental satellite data for Climate Monitoring (SCOPE-CM) frameworks”. GSICS through its coordination and capacity building efforts has made significant progress in arranging for CGMS agencies to adopt similar techniques for calibration/validation and intercalibration and in developing calibration expertise at these agencies. At CGMS, GSICS was given an action to coordinate efforts for real-time calibration monitoring and event logs, and make them easily accessible to the user community. This will enable users to obtain real-time and historical information on instrument performance. This information is valuable to both real-time users and developers of climate data records. Examples of web accessible real-time monitoring from NOAA for ATMS channel 6 and AMSU channel 5 are shown in figure 1(next page).

It is clear from the figure that both instruments are performing well. The ATMS channel 6 instrumental noise is well within specification and very stable, while the AMSU channel 5 noise, even though still within specification, is slowly increasing with time. The Chinese Meteorological Agency (CMA) has taken significant steps to provide a similar web-accessible capability.

Following the CGMS meeting, JMA sponsored the 14th GSICS Executive Panel (EP) Meeting. The meeting was well attended and, in addition to Panel members, included representation from GCOS and ECMWF

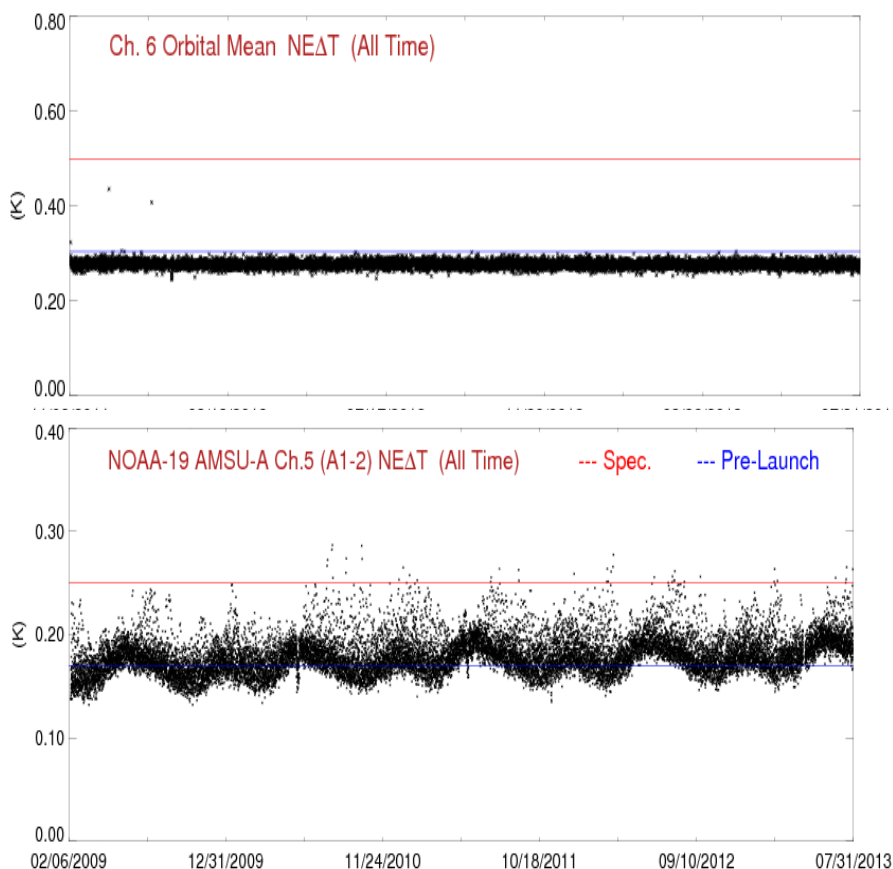


Figure 1. Instrumental noise (NE Δ T, K) of ATMS channel 6 (upper panel) and NOAA-19 AMSU-A channel 5 (lower panel) as a function of time. Red line: Specification; Blue line: pre-launch value. ATMS channel 6 is very stable and noise is well within specification. AMSU-A channel 5 is within specs, but noise is slowly increasing.

(Adrian Simmons) and the WMO Director for Observing and Information Systems (Wengian Zhang) The new GSICS Coordination Center (GCC) Director – Larry Flynn – was introduced to the Executive Panel. Larry, who is profiled elsewhere in the Newsletter, replaces Fuzhong Weng, whom I would like to thank for his six years of outstanding leadership. Agency reports were provided as well as updates from both the GSICS Research and Data Working Groups. A short summary of the EP meeting appears in this Newsletter and the full report will be available from the WMO GSICS Portal at <https://www.wmo.int/pages/prog/sat/GSICS/>. Another significant accomplishment I want to highlight again is the special issue of IEEE Transactions on Geoscience and Remote Sensing (TGRS) on satellite instrument calibration, which includes many of the intercalibration techniques developed by GSICS. The Panel commended Tim Hewison, Fred Wu, Gyanesh

Chander and the other GSICS Research Working Group members who coordinated this publication.

Mitch Goldberg, Chair, GSICS Executive Panel

Looking Ahead

Next Issue

The next edition of the GSICS Quarterly Newsletter will feature several science articles on the use of the moon as a calibration source. Be on the lookout for the Fall 2013 issue during the last half of October. .

GSICS-Related Meetings

- Annual CALCON Conference on Characterization and Radiometric Calibration for Remote Sensing, Utah State University, Logan ,Utah, August 19-22, 2013
- Instrument calibration and characterization session at 2013 EUMETSAT Meteorological Satellite Conference & the 19th Satellite Meteorology, Oceanography, and Climatology Conference of the American Meteorological Society, Sept. 16-20, Vienna.

With Help from our Friends:

The *GSICS Quarterly* Editor would like to thank those individuals who contributed articles and information to this newsletter. The Editor would also like to thank our European Correspondent, Dr. Tim Hewison of EUMETSAT, American Correspondent, Dr. Fangfang Yu of NOAA, and Asian Correspondent, Dr. Yuan Li of CMA, in helping to secure and edit articles for publication.

Submitting Articles to GSICS Quarterly Newsletter:

The *GSICS Quarterly* Press Crew is looking for short articles (~ 700 words with one or two key, simple illustrations), especially related to cal/val capabilities and how they have been used to positively impact weather and climate products. Unsolicited articles are accepted anytime, and will be published in the next available newsletter issue after approval/editing. **Please send articles to George.Ohring@noaa.gov.**