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GSICS Global Space-based Inter-Calibration System

Quarterly

Newsletter – Winter 2014 Issue

Manik Bali, Editor

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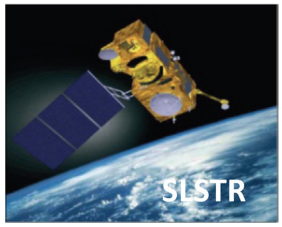
This Issue:

Exploring New Horizons in 2014

In This Issue



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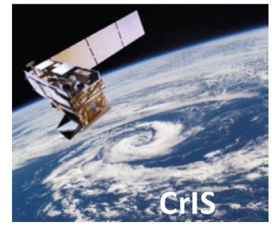

This issue of the Quarterly is first in many ways. It is the first issue of 2014. We start a feature where we invite you to meet other GSICS experts as they share their thoughts. For the first time, we introduce the GSICS community to results of self-validation analysis of a Gravity measuring instrument [the Gravity field and steady-state Ocean Circulation Explorer (GOCE)] and we highlight the pre-launch calibration plans for the Sentinel-3 Sea and Land Surface Temperature Radiometer (SLSTR). Rounding out our instrument articles are one on the on-orbit performance of the FY-3C Medium-Resolution Spectral Imager (MERSI) and another on the use of the Scanning High-resolution Interferometer Sounder (Scanning HIS) to verify the performance of the S-NPP Cross-track Infrared Sounder (CrIS). But to begin, we present an excerpt on traceability from a soon-to-be-published book authored by experts from NOAA, NIST and NASA.

All the best, Larry Flynn, GCC Director

Metrological Traceability and Remote Sensing Measurements

by Dr. Raju Datla, NOAA and Dr. Raghu Kacker, NIST

Metrological issues in remote sensing radiometric applications focus on assuring that measurements of the same quantity are metrologically comparable. Data sets collected by multiple sensors are often used together for various measurement functions, including studying changes in the earth's atmospheric and surface properties, and Department of Defense (DOD) applications. Use of multiple sensor data is rapidly increasing with the refinement in EO sensors and the need for more global data. Therefore, it has become extremely important that those data sets are calibrated with the same metrological traceability and that differences between instruments are clearly understood.

Measurements widely separated in time and space can be compared if they are traceable to the same reference, which is stable in time and space. The remote sensing community has been working toward this goal for the past 20 years. The experience at NASA in the measurement of Top of Atmosphere (TOA) Total Solar Irradiance (TSI) provides an example of this work. The Earth Radiation Budget (ERB) instrument on the NIMBUS 6 satellite launched in 1975 measured TSI to be 1389 W/m^2, a value 1.5 % higher than expected from ground measurements after correcting for atmospheric effects. NASA employed a team of engineers and scientists, including metrologists from NIST, to resolve the issue. Figure 1 shows the team working on the calibration effort.

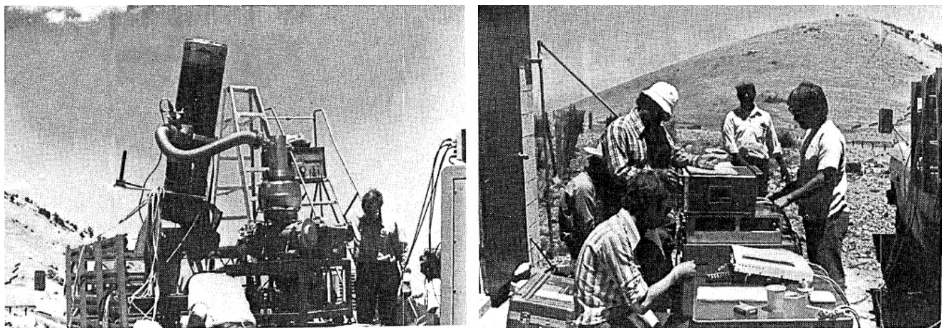

Figure 1: Rocket Calibration of the Nimbus 6 Solar Constant Measurements (Applied Optics/Vol. 16, No. 10/ October 1977).

Based on their recommendation, several electrical substitution-type radiometers (ESR) were built and flown on a rocket to TOA to measure TSI. The radiometer built by Jet Propulsion Laboratory (JPL), which was considered to be adequately calibrated, measured a TSI value of 1367 W/m^2, which was in the expected range (Duncan et al., 1977). NASA then flew the JPL radiometer called the *Active Cavity Radiometer Irradiance Monitor* (*ACRIM*) in a series of TSI measurements from space. This study found that on orbit measured values differed more than the quoted radiometer uncertainty. In addition, radiometers from other laboratories differed from each other. To resolve the issue, NASA funded the Laboratory of Atmospheric and Space Physics (LASP) to build an ESR of a slightly different design for TSI measurements. This radiometer, flown in 2003, measured lower TSI values (1361 W/m^2) than the ACRIM and other radiometer measurements. Figure 2 shows the TSI climate data record, which now spans 34 years. Instrument offsets are unresolved calibration differences, much of which are due to internal instrument scatter comparison of the various missions (Kopp and Lean 2011).

LASP has recently acquired an absolute cryogenic radiometer and built a facility under NASA funding to perform SI traceable calibrations of TSI radiometers. The cryogenic radiometer measures the optical power in watts by comparing the optical heating of a cavity in cryogenic conditions with electrical power to achieve the same heating when the optical power is shut off. The cryogenic conditions assure that there are no other heating effects, and provide very high accuracy equivalence to the electrical power measured in SI units. The results showed various systematic effects in the legacy instruments to be corrected for irradiance measurements, and there is now consistency reported in the TSI measurements from space (Kopp et al., 2012).

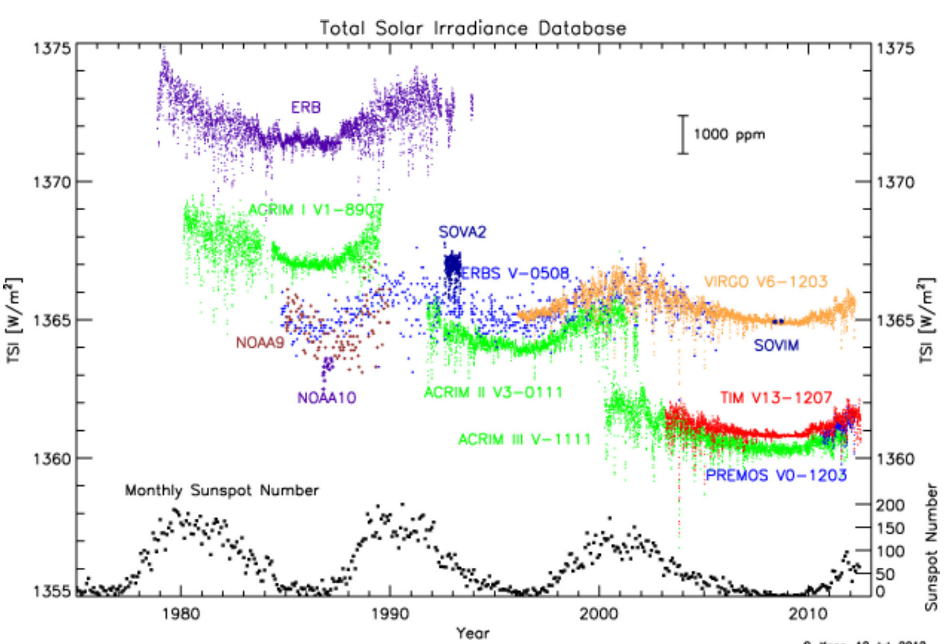

Figure 2: TSI Climate Data Record (http://spot.colorado.edu/~koppg/TSI/).

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Kopp, G., Fehlmann, A., Finsterle, W., Harber, D., Heuerman, K., and Wilson, 2012, Total solar irradiance data record accuracy and consistency improvements. *Metrologia*, 49, S29-S33.

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Excerpt from the forthcoming Handbook "Guidelines for radiometric calibration of electro-optical instruments for remote sensing" as a NIST publication with authors involved in remote sensing calibrations across government, industry and academia (2014).

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CrIS Radiometric Uncertainty and Recent Aircraft Underflights to Establish its On-Orbit Traceability

by Dave Tobin and Joe Taylor, CIMSS/SSEC/UW-Madison

Radiometric Uncertainty (RU) characterization of a sensor dataset describes the various sources of calibration uncertainty and their relevant dependencies. For infrared spectrometers, common examples include the uncertainty in the knowledge of the calibration blackbody temperature and resulting radiance uncertainty as a function of scene temperature, or, the uncertainties in the degree of polarization of a scan mirror and resulting radiance uncertainties as a function of wavelength, scan angle, and scene temperature. RU characterization is required for various applications and is particularly important for intercalibration studies, for sensors being intercalibrated as well as sensors serving as a reference. For high spectral resolution infrared sounders, RU estimates have been provided recently for the Atmospheric Infrared Sounder (AIRS) (Pagano, 2013) and for the Cross-track Infrared Sounder (CrIS) on Suomi-NPP (Tobin, 2013). Here, the CrIS RU results are summarized, and recent efforts to validate the RU estimates using high altitude aircraft underflights are described.

Lacking a sufficiently accurate and traceable on-orbit reference sensor, RU estimation for todays' infrared sounders typically requires a perturbation analysis of the sensor calibration algorithm and expert knowledge of the relevant calibration parameter uncertainties. For CrIS, the primary RU contributors include uncertainties in a) the on-board Internal Calibration Target (ICT, i.e. blackbody) temperature, b) the effective cavity emissivity of the ICT, c) the temperatures of mechanical and optical components surrounding the ICT, and d) detector nonlinearity correction coefficients (a2) for the longwave and midwave band detectors. The spectral calibration of CrIS is very good and does not contribute significantly to the overall RU. Other smaller radiometric contributions (not shown) include scan mirror induced polarization effects, potential low level nonlinearity for the shortwave detectors, and spectral ringing (Gibbs) effects. Resulting CrIS RU contributions and total RU are shown in Figure 1 as 3-sigma (not to exceed) brightness temperature uncertainties for

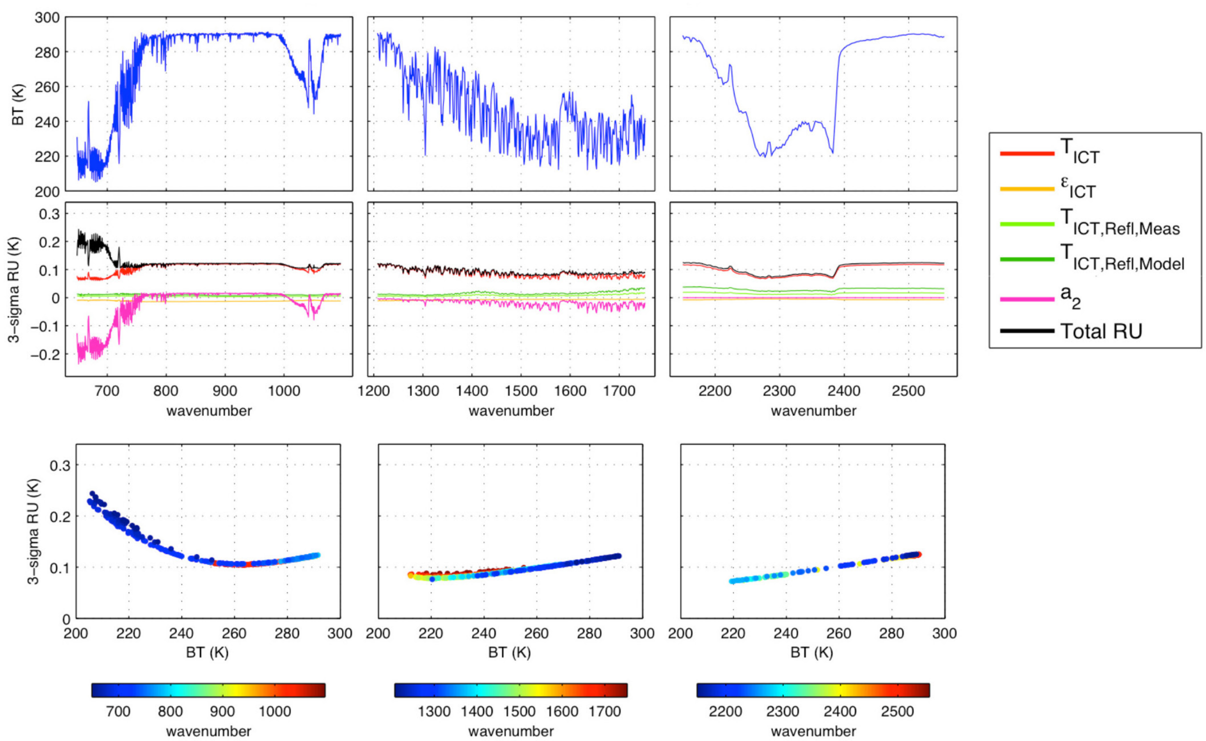

Figure 1: CrIS RU contributions and total RU for a typical clear sky Earth view spectrum, shown as 3-sigma brightness temperatures, for the CrIS longwave (left), midwave (middle) and shortwave (right) spectral bands.

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a typical clear sky Earth view spectrum. The uncertainty in the ICT temperature is 112.5 mK (3-sigma) and is a primary component of the RU for all wavelengths and warmer scene temperatures, while other ICT related terms contribute less to the total RU. For the longwave and midwave bands the nonlinearity contribution is also significant, and this varies according to the integrated signal and shape of the Earth view signal, but generally results in elevated RU values in the 15 µm CO_2 absorption region. Overall, considering a wide range of Earth views and all spectral channels, the 3-sigma RU of CrIS is less than 0.3 K for the longwave spectral band, and less than 0.15 K for the midwave and shortwave spectral bands, and has only small variations among the nine detectors per band.

A wide range of post-launch validation efforts have been conducted to assess the CrIS spectra and RU estimates. Here we present results from a high altitude aircraft campaign conducted in May 2013 supported by the NOAA JPSS program. The campaign was conducted out of Palmdale, CA with various sensors on the NASA ER-2, including the University of Wisconsin Scanning High-resolution Interferometer Sounder (S-HIS). For scene temperatures above 250 K, the S-HIS RU is approximately 0.15 K 3-sigma or better for all wavelengths. This accuracy, along with the ability to perform pre- and post-campaign calibration tests to confirm the S-HIS RU, make underflight comparisons like this uniquely capable of assessing the CrIS RU with sufficient accuracy and traceability. Using the double-observed-minus-calculated (DOMC) methodology developed originally for AIRS/S-HIS underflights, the results of the 2013

CrIS underflights are shown in Figure 3. This includes six nominally clear sky cases collected over the Pacific Ocean and Gulf of Mexico. Contributions to the DOMC uncertainty include the S-HIS RU, spatial variability of the scenes assessed with S-HIS and imager data, and uncertainty in the DOMC methodology used to account for altitude and scan angle differences between CrIS and S-HIS which account for the larger uncertainties in regions of the spectrum with significant absorption above the aircraft altitude, ~20 km. The results are very good, with the mean DOMC differences consistent with the CrIS RU estimates.

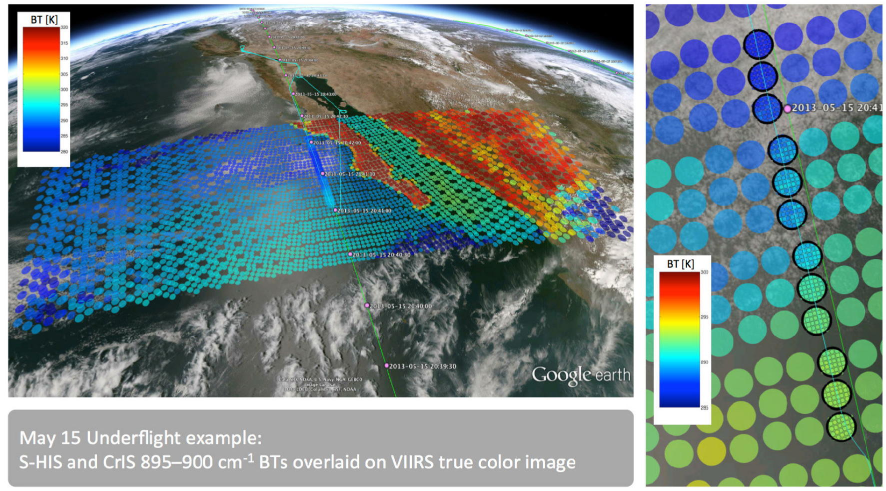

Figure 2: Underflight of Suomi-NPP by the NASA ER-2 on 15 May 2013 over the Pacific Ocean, with coincident near-nadir CrIS and S-HIS footprints shown.

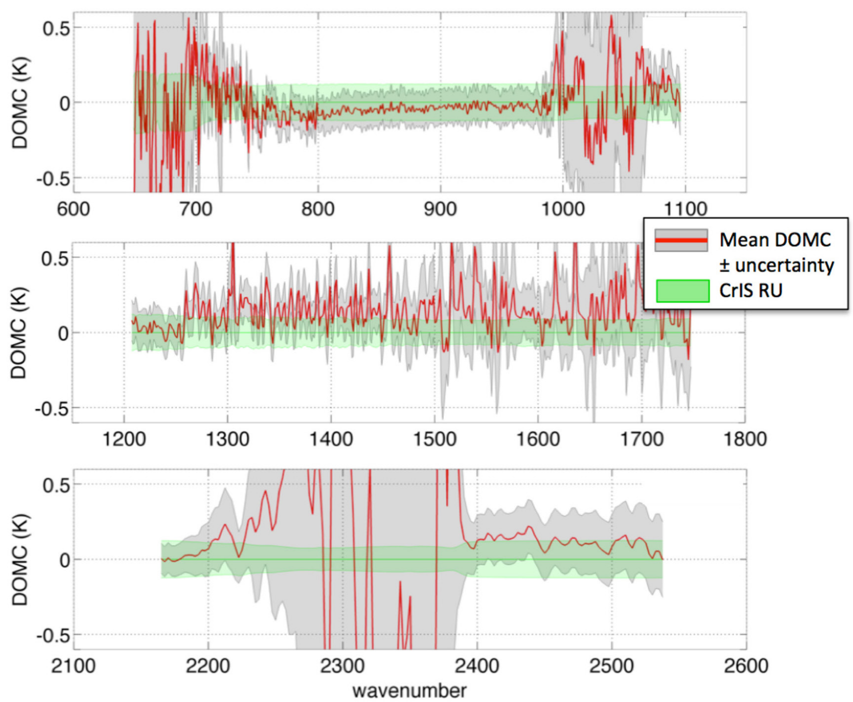

Figure 3: CrIS minus S-HIS Double Observed minus Calculated (DOMC) brightness temperature differences and CrIS RU values for the CrIS longwave (top), midwave (middle) and shortwave (bottom panel) spectral bands.

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GOCE Gradient Validation Using Cross-Overs

by Phillip Brieden and Jürgen Müller, Institute of Geodesy, Leibniz Universität Hannover

Introduction

The GOCE (Gravity field and steady-state Ocean Circulation Explorer) satellite was launched by the European Space Agency (ESA) in 2009 (end of mission 2013) with the aim to map the Earth's gravity field with unprecedented accuracy and spatial resolution (1-2 cm geoid globally at 100 km spatial resolution). To ensure high quality of the GOCE data products, the GOCE Cal/Val (calibration/validation) team was created well before the start of the mission. Under the leadership of Johannes Bouman (DGFI, Munich, Germany) a variety of methods have been collected (Bouman et al. 2010) in order to verify the quality of the GOCE products regularly. One of these methods is the validation of gravitational gradients in satellite track cross-overs, as it is illustrated here.

GOCE instrumentation and main data product

GOCE was the first satellite mission being equipped with a gravity gradiometer, a constellation of six capacitive accelerometers arranged orthogonally in pairs along each spatial axis. Measuring acceleration differences, GOCE's main observation is derived: the gravitational gradients that are 2nd derivatives of the Earth's gravitational potential. The data is provided at a rate of 1 Hz. For each instant of time, a gravitational gradient tensor V_{ij} with six independent tensor components V_{ij} with i = {x,y,z} and j = {x,y,z} is determined:

$$\mathbf{V} = \begin{bmatrix} V_{xx} & V_{xy} & V_{xz} \\ & V_{yy} & V_{yz} \\ sym. & & V_{zz} \end{bmatrix}.$$

The gradient tensor is given in the Gradiometer Reference Frame (GRF) which is fixed within the gradiometer and thus with the satellite's structure. Besides the gravitational gradient tensor, precise orbit (Bock et al. 2013) and attitude information (Stummer 2013) of the satellite is needed for this validation method. The GOCE data are provided by ESA.

Validation in cross-overs

The validation in cross-overs (XOs) is based on a simple idea: when the GOCE satellite crosses an identical point at the Earth's surface twice, the same gravitation should be observed. This situation occurs in satellite track XOs. In the case of the GOCE orbit, XOs arise between ascending and descending satellite arcs.

When two three-dimensional measurements like the gravitational gradient tensors shall be compared, one common coordinate system is required. As the satellite orbits the Earth on slightly different altitudes and orientation, the two GRFs differ from each other in each XO. Therefore, a transformation of one gravitational gradient tensor into the reference frame of the other has to be performed to overcome the differences in both attitude and altitude. For further details, we refer to Brieden and Müller (2014).

After transformation, the two gravitational gradient tensors are compared and the remaining residuals ΔV_{ij} are analyzed.

Analysis of XO residuals

The 'measured' gradients have amplitudes of a few Eötvös (E) with 1 E = 10^{-9} 1/s². XO-residuals reach values of up to 30…40 mE (milli-Eötvös: 1

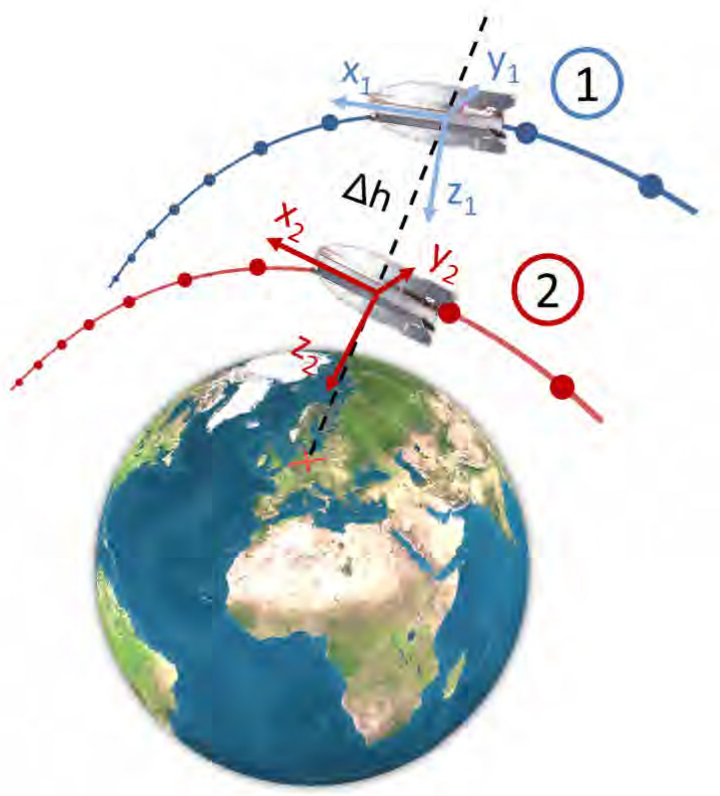

Figure 1: Crossing satellite arcs 1 and 2. The GOCE spacecraft crosses the identical point at the Earth's surface twice. Gradients ('THE' GOCE measurements) are compared taking into account differences in attitude and altitude between the two satellite systems ('local' GRF) involved (blue, red).

mE = 10^{-12} 1/s²) where the majority of the residuals is significantly smaller. Root mean square (RMS) values of the residuals in the order of 3 to 6 mE are well below the expected error range.

Given that individual gradient tensor components are derived from differential accelerations of different accelerometers, various factors influence their quality. Fig. 2 shows that tensor component V_{yy} (satellites cross-track direction) is obviously affected by the magnetic field. Note larger values around the magnetic poles, the strongest south of Australia and north of Canada. Other tensor components, like V_{zz} for instance as one of the most important components for gravity field processing, show uniform noise characteristics over the entire Earth.

The validation method of GOCE gradient validation in XOs represents a very appropriate tool to assess the quality of GOCE gravitational gradients directly in orbit altitude. For more results we refer to Brieden and Müller (2014).

Conclusions

In this contribution, a validation method for the main observation of ESA's satellite mission GOCE is introduced: The comparison of GOCE gravitational gradients in satellite track cross-overs. The resulting residuals are analyzed. Their RMS is 3 to 6 mE confirming the overall high quality of the gradients. The method is well suited to specify perturbations, e.g., from the magnetic field. The XO method is versatile; it can be used as a validation tool for future gravity field satellite missions and is very well suited for the validation of further satellite observation.

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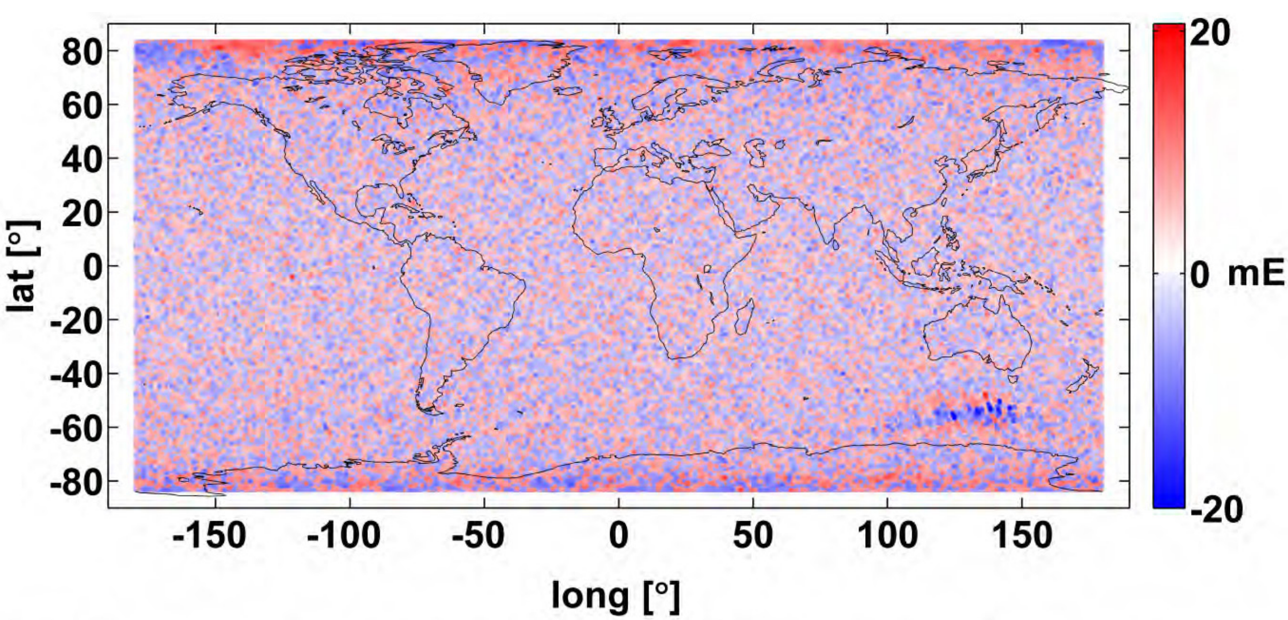

Figure 2: XO-residuals ΔV_{yy} show geographically correlated clusters of larger residuals around the Earth's magnetic poles (1 mE = 10^{-12} 1/s²).

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Pre-launch Calibration Plans for the Sentinel-3 SLSTR

by Soji Oduleye and David Smith, Rutherford Appelton Lab (RAL)

Introduction

The Sea and Land Surface Temperature Radiometer (SLSTR), is an infrared- radiometer to be flown on the Copernicus (formerly GMES) Sentinel-3 mission. The Level 0 and Level 1 products generation will be fulfilled jointly by ESA and EUMETSAT. The primary aim of the instrument is to extend the 21 year record of high accuracy Sea Surface Temperature, SST, measurements from the (Advanced) Along Track Scanning Radiometer, (A)ATSR instruments. The spectral channels for SLSTR shown in Table 1 include those for (A)ATSR but with additional channels for daytime cloud screening and for fire detection.

Table 1: SLSTR Spectral Bands. The highlighted cells refer to those existing on the previous ATSR sensors.

Band	Wavelength (μm)	Resolution (km)	
S1	0.555	0.5	Chlorophyll
S2	0.659	0.5	Veg Index
S3	0.865	0.5	Veg Index
S4	1.375	0.5	Cloud Clearing
S5	1.600	0.5	Cloud Clearing
S6	2.25	0.5	Cloud Clearing
S7	3.7	1.0	SST
S7F	3.7	1.0	Fire
S8	10.8	1.0	SST/LST
S8F	10.8	1.0	Fire
S9	12.0	1.0	SST/LST

In keeping with the ATSR concept, it has a conical scanning geometry to provide a dual-view to allow improved atmospheric corrections. A detailed description of SLSTR is provided in the paper by Coppo et al [1].

Calibration Facility

The pre-flight calibration of the SLSTR instrument will be performed out at the UK Centre for the Calibration Satellite Instrumentation at the Rutherford Appleton Laboratory with traceability of measurements to recognised national standards, and to the units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. To demonstrate that the calibration accuracy is achieved on orbit, a dedicated calibration rig has been designed and built that supports the instrument in a representative thermal environment while viewing the calibration sources, Figure 1.

InfraRed-Calibration

To achieve the primary instrument requirement for measuring SST to an uncertainty <0.3K, the radiometric calibration of the IR channels has a design goal of <0.1K traceable to ITS 90. As with AATSR, SLSTR is equipped with two accurate blackbody sources that are viewed every scan cycle. The pre-launch calibration tests will verify the on-board calibration using two external blackbody sources that operate over the range of scene temperatures from 210K to 330K with an uncertainty <0.05K. By performing calibration tests under a range of thermal environments following the best practice established for the (A)ATSR sensors [2].

Solar Channel Calibration

In addition to the thermal IR channels, SLSTR is equipped with channels in the VIS-SWIR range for daytime cloud, aerosol and vegetation monitoring. As with AATSR, these channels are calibrated on-orbit using a Sun-illuminated diffuser based VISCAL system. For the instrument level tests, the radiometric response, non-linearity, noise performance of the instrument and the reflectance factor of the VISCAL system will be calibrated using a large integrating sphere whose radiance will be calibrated by NPL.

Geometric Calibration

Geolocation of SLSTR data requires precise determination of pixel Line-of-Site (LoS) with respect to the satellite reference frame. SLSTR has two separate telescopes with a common rear-optics; a flip mirror is used to reflect the view of either telescope onto the Focal

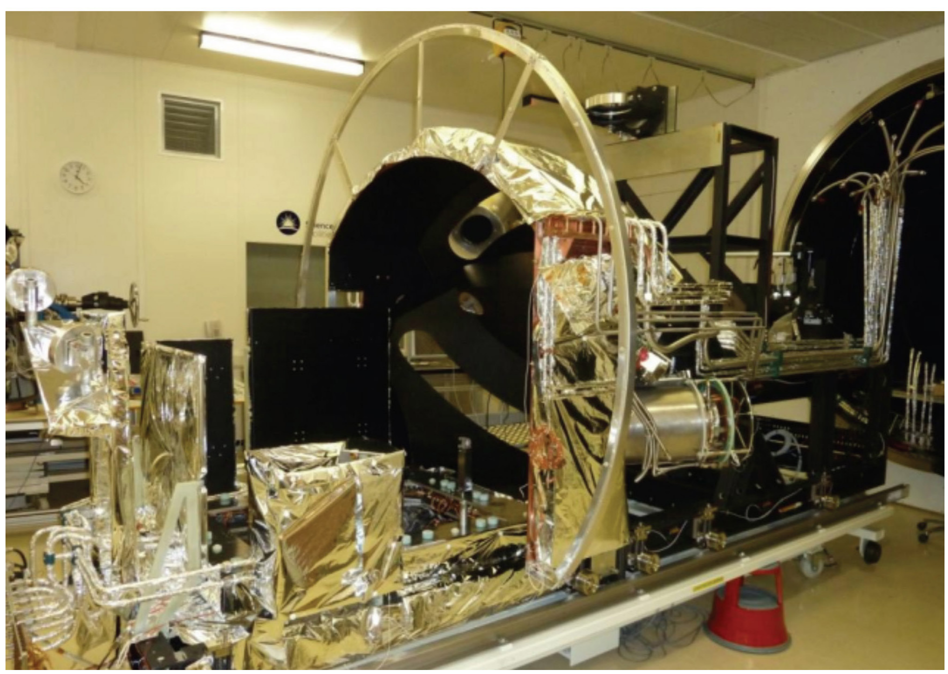

Figure 1: SLSTR Calibration facility at RAL during preparations for thermal testing.

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Plane Assembly (FPA) that houses the detectors. To improve the geo-location accuracy compared to AATSR, the scan position is given by precision optical encoders.

The following geometric performance characteristics of SLSTR will be measured or verified during the instrument level tests at RAL: Pointing Direction; Spatial Sampling Angle; Inter-channel co-registration; Instantaneous Field of View from which the Modulation Transfer Function will be derived.

Conclusion

At the time of writing the calibration facility for SLSTR has been fully integrated and tested to ensure that it can support the SLSTR calibration activities. At least two instruments will be tested with the first due to arrive at RAL during 2nd quarter 2014.

Acknowledgements

The authors acknowledge contributions to the calibration effort from the SLSTR team, in particular the instrument prime, Selex Electronic Systems in Florence Italy.

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Early on-Orbit Performance Assessment of FY-3C/MERSI

by Xiuqing Hu and Na Xu ,CMA

The successful launch of the FY-3C on 23 September 2013 with the key instrument Medium Resolution Imaging Spectrometer (MERSI) (X.Q. Hu et al, 2012) initiated the operational running era of China's second generation of polar-orbiting meteorological satellites FY-3 serials after two experimental satellites FY-3A and FY-3B. MERSI was turned on September 30, 2013 and open its solar reflective bands and then it's IR bands started to work on October 17, 2013. FY-3C/MERSI has some remarkable improvements with respect to the MERSI onboard on FY-3A and FY-3B. The first improvement is to enhance the consistency of the spectral response function (SRF) in different detectors within one band, especially for the thermal Infrared band (band 5). FY-3C/MERSI extended the field of viewing for space view (SV) and increase the sample number of SV (from 6 to 24). This leads to increase the probability of moon observation in SV windows for the lunar calibration (Figure 1). These lunar observation provide the possibility of lunar calibration for the MERSI's solar bands. The final improvement of FY-3C/MERSI is the radiometric response stability of solar bands compared with FY-3A and FY-3B which have great degradation in short wavelength bands (l<500nm).

In-orbit verification (IOV) of the instrument performance specification of FY-3C/MERSI started to be conducted in middle October, 2013. During the IOV commissioning phase, some key results that indicate the MERSI representative performance were derived, including the signal noise ratio (SNR), dynamic range, spatial resolution and modulation transfer function (MTF), band-to band registration, calibration bias, the consistency of the multiple detector, instrument stability, and saturation restore function. The SNRs (characterized by Noise equivalent reflectance, NEDr) at the solar bands (Bands 1–4 and 6-20) was largely beyond the specifications except for some detectors at band 6 and 7 as shown in Fig 2. Because there is no reliable onboard calibration device for solar bands, the in-flight calibration and verification for these bands are also heavily relied on the vicarious techniques such as cross-calibration, lunar calibration, DCC calibration, stability monitoring using Pseudo Invariant Cali-

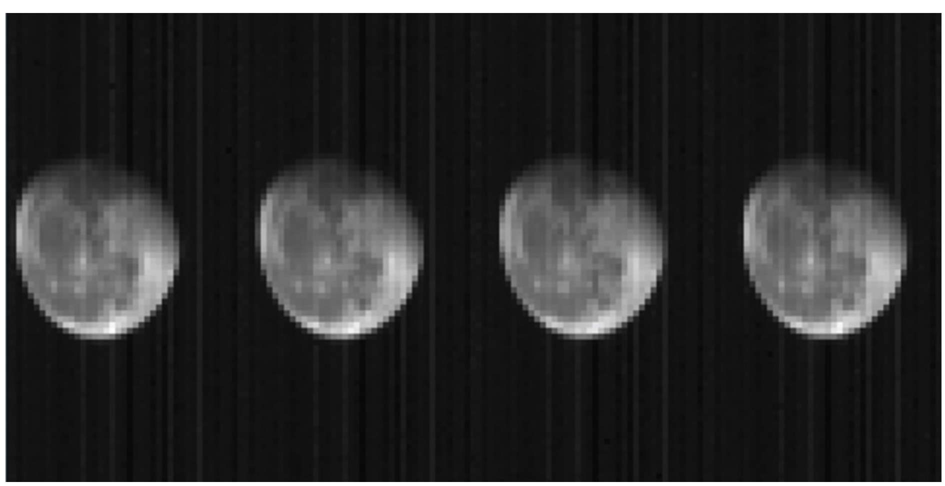

Figure 1: Moon Images in FY3/MERSI space viewing for four times on December 20, 2013.

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bration Sites (PICS) and global multi-site calibration (L. Sun et al, 2012). The field campaign for the FY-3C/MERSI absolute calibration using the China radiometric calibration sites (CRCS) (Hu X., 2010) is planning to be conducted in the summer of 2014.

The cross-calibration became the most important approach for the evaluation of FY-3C/MERSI calibration accuracy. We conducted the calibration evaluation for the solar bands using LEO-LEO SNO data from EOS/MODIS, NPP/VIIRS and Metop-A/GOME-2. It was found that the difference from different calibration methods need further analysis to provide the calibration coefficient update based on the integration of these methods. GSICS LEO-LEO IR method was used to MERSI band 5 based on Metop/IASI and NPP/CrIS. Figure 3 shows the bias of MERSI IR band is keeping within 0.5K with respect to CrIS.

The instrument performance monitoring (IPM) system for FY-3C/MERSI is also being developed using the telemetry and engineering data of the instrument and the earth viewing data of global PICS (deserts, salt lakes, snow and DCC). The current most information show the relatively stable status of the instrument operational running and there is no obvious degradation of FY-3C MERSI instrument radiometric response. Figure 5 show the long term stability monitoring using 4 deserts of Pseudo Invariant Calibration Sites (PICS) during the first three months from Oct. to Dec, 2013. The results indicate that FY-3C/MERSI is more stable than the previous instruments.

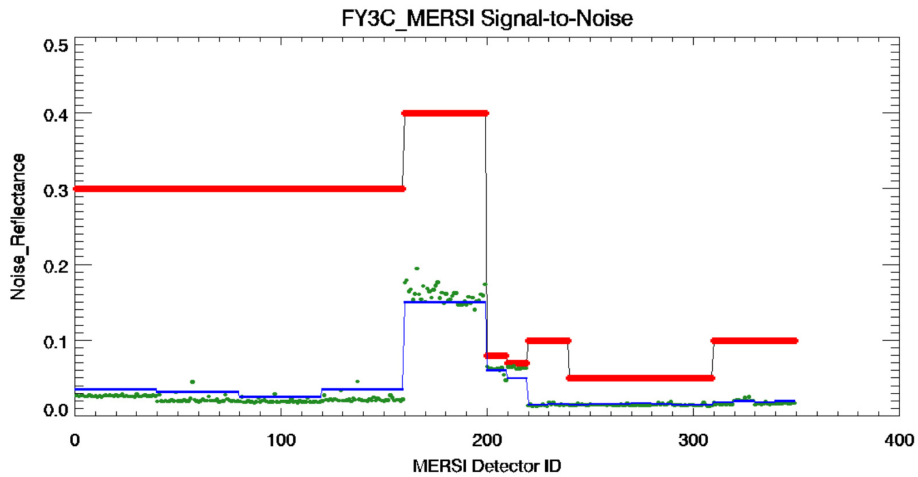

Figure 2: Noise equivalent reflectance (NEDr) or Noise equivalent temperature (NEdT) of each detector of FY-3A MERSI solar reflective bands on-orbit calculated using the space view data during the commissioning phase. Red lines are the required specification of NEDr and the blue lines are the results from preflight and the green ones are the testing results on orbit.

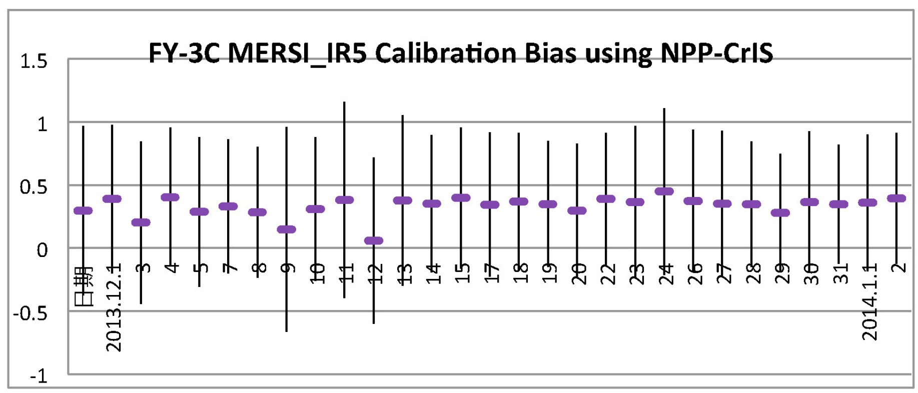

Figure 3: Calibration bias trend and standard deviation of MERSI band 5 using NPP/CrIS during December, 2013 based on the CMA GSICS platform.

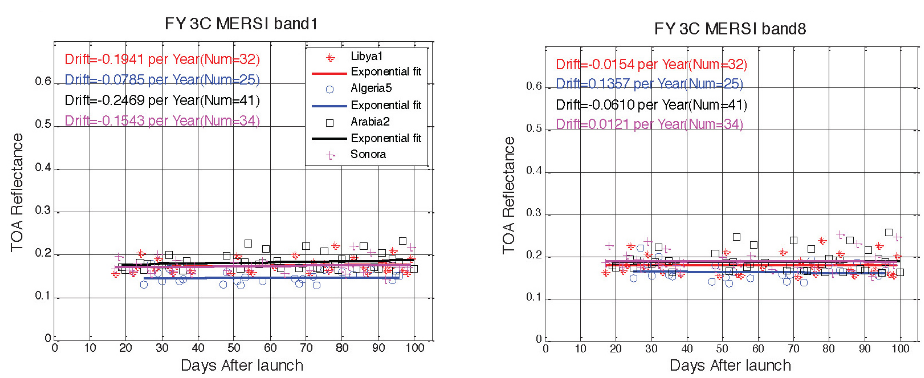

Figure 4: FY-3C/MERSI Long term stability monitoring using 4 deserts of PICS during the first three months from Oct. to Dec., 2013.

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News in this Quarter

by Manik Bali

GSICS gives WMO CGMS backed recognition certificates to reviewers

December 2nd, 2013 was a landmark day for GSICS. The event was the Microwave(MW) subgroup meeting and location was the web. This meeting was held to assess the review of the Microwave FCDR product. Six reviewers who had volunteered to review the FCDR product presented their assessment about the FCDR product. Based on the reviewers feedback the FCDR product was accepted by GSICS in 'Demonstration' phase. GSICS wishes to thank the reviewers of this product who completed the entire review within six weeks.

The review of the FCDR proved to be a technically demanding task. Reviewers not only had to evaluate the ATBD and related publications but also evaluated the real time FCDR product. GSICS decided to recognize their efforts.

After receiving the go ahead from the Executive Panel(Mitch Goldberg and Jerome Lafeuille), Group and subgroup chairs, the GCC Director Larry Flynn, presented appreciation certificates to reviewers of the MW FCDR product. The certificates were signed by Executive Panel Chair Mitch Goldberg, GCC Director Larry Flynn and MW Sub-Group Chair Cheng-Zhi Zou. These certificates were backed by WMO and CGMS.

The recipient of the awards are: Tanvir Islam (NOAA), Suleiman Alsweiss (NOAA), Chabitha Devaraj (SDU), Stephen Po-Chedley (UW), Tyler Thorsen (UW), Viju John (EUMETSAT), and Wenze Yang (ESSIC).

Meet GSICS Members

GSICS is not just a serious organization for exchanging scientific ideas. When we meet, we also exchange our likes, dislikes and maybe a laugh. We bring to you Tim Hewison, who shares a humorous experience while travelling, Masaya Takahashi, who is passionate about biking, and Yuan Li, who loves sea scenery. Finally we would tell you about Peter Miu who has been active in the GDWG. More members will be introduced in upcoming issues. Contact Manik Bali manik.bali@noaa.gov if you want to be one of them.

Tim Hewison

Tim Hewison has been a part of GSICS since 2007, when he started working for EUMETSAT, he now represents them on the Research Working Group, which he also chairs. During that time his involvement has been wide and varied - including organizing the first three GSICS User's Workshops, contributing to the GSICS Quarterly, establishing monthly web meetings of the working groups. Recently he has been instrumental in setting up Sub-Groups to develop new inter-calibration products for instruments with channels in the visible/near-infrared, microwave and ultraviolet. Despite living in Germany, Tim has preserved his British sense of humor and narrated this funny incident that can be best understood in his own words.

A Note from the Executive Panel Chair

Dr. Mitch Goldberg

Even though I cannot attend in person, I am looking forward to getting an update of progress from the GSICS research and data working groups, meeting at EUMETSAT in late March. This meeting will also bring together the new chairs of the subgroups we have established to cover the spectru. - from UV to Visible to Near-Infrared to Infrared and finally to Microwave. All of GSICS is wishing Aleksandar Jelenak, the former chair of the data-working group, the very best in his new position at HDF Group. Aleksandar was instrumental in the growth and the achievements of the data working group for the past three years. Aleksandar also received a special award from UCAR for his outstanding service to GSICS a couple of years ago. Thank you to Manik Bali for volunteering to be the interim data-working chair. I am happy to report that the MSU/AMSU FCDR has achieved pre-operational status, which means that the product now has received user feedback and all the associated documentation including theoretical basis documents and uncertainty analyses have been completed. The product will officially become operational in a few months. This product along with other datasets can be accessed from http://www.star.nesdis.noaa.gov/smcd/GCC/ProductCatalog.php. In early March, I will be representing GSICS at the GRUAN meeting. GRUAN provides benchmark radiosonde soundings for the satellite community to improve radiative transfer modeling. Improving applications requires not only well-calibrated satellite observations but also accurate radiative transfer models to enable downstream utilization including radiance data assimilation and retrievals.

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"Participating in GSICS occasionally requires travel to meetings hosted by our member organizations in different parts of the world. However, as the GRWG and GDWG meetings have been held in February and March, these are no summer holidays – and seem to be plagued by snow. At least it's consistent! Even for the 2009 meeting in the South of France, where our returning flight was cancelled due to snow. The EUMESAT delegation resorted to taking an overnight train back to Darmstadt, which was interrupted briefly by one exhausted delegate falling out of the upper bunk bed! Fortunately, no bones or traceability chains were broken by the fall."

Masaya Takahashi

Masaya Takahashi joined GSICS in April 2012 and represents the Japan Meteorological Agency. Initially he was responsible for inter-calibration of JMA's geostationary satellites and visible vicarious calibration based on the radiative transfer simulation. Since 2013, he has acted as the Vice Chair of the GSICS Data Working Group.

Masaya is very excited about the fact that some GSICS products are entering a mature phase and that GSICS products have many users. But he feels that more information activities will be needed to open up the world of GSICS to all works concerning satellite data processing. He believes that a lot of IT techniques to make better use of GSICS products (e.g., web-based dynamic data plotting tool, data casting and product catalogue for one-stop shopping) will play major roles.

From March 2014 to February 2015, he is working with EUMETSAT GSICS colleagues in Germany as a visiting scientist.

Masaya is passionate about bicycle touring, bird watching and is planning to visit all the GSICS participating countries and regions by his own bike.

Yuan (Lillian) Li

Yuan (Lillian) Li represents the National Satellite Meteorological Center (NSMC/CMA) in GSICS. Lillian has been one of the most active members of the GSICS as GCC often turns to her to galvanize our Asian partners and encourage them to participate in GSICS activities. She also collects articles for the GSICS Newsletter from Asia.

In GSICS Lillian has multiple roles. She is the CMA GPRC Points of Contact for operational matters, GSICS Quarterly Asian Correspondent GDWG Member and a member of UV sub-group.

Lillian is excited about GSICS products. She feels that ensuring quality and consistency of satellite-derived products, for nowcasting and climate monitoring is the way forward for GSICS.

Lillian loves the sea scenery and delicious food (Hunan cuisine, pasta from Northwest China, seafood, and so on) which she likes to share with friends.

Peter Miu

Peter Miu is EUMETSAT's representative in the GSICS Data Working Group (GDWG) since its first meeting in 2007. Although he has not officially taken the role as chair, he has none-the-less been pivotal in guiding the work of the group based on his extensive technical knowledge, experience of working with users and common sense.

His most notable achievements in the GDWG are he designed and supported the development of the GSICS Data and Products Servers. In addition to this, he worked closely with Tim Hewison to design and implement the first GSICS products using a self describing format that is popular in the GPRC's user community and following established international standards from the WMO, ISO and CF. His work has been instrumental in providing a platform for close collaboration between the GRWG partners in the development of GSICS products.

Peter sees the GSICS achievements as a shining example of how the international community can work together for the common good and he is very proud to be involved in GSICs (even though the scars of falling out of the upper bunk bed have not completely healed).

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Announcements

Larry Flynn to act as interim Chair for the GRWG UV sub-group

The second meeting of the newly formed UV subgroup was held on 6th February 2014 via web. Members from EUMETSAT, SRON, NASA, ESA, KMA CMA and NOAA gathered to select the Chair of the subgroup and chart out a plan of action for the subgroup in the times to come.

GCC Director Larry Flynn accepted to chair the UV sub group. Larry also proposed four projects. These projects are envisaged to compare reflectivity and aerosol comparisons, Solar measurement comparisons, radiance/irradiance comparisons and identify calibration requirements and capabilities. Each project will have a team lead.

Larry Flynn has agreed to be team lead for Project 3 and Ruediger Lang is considering acting as lead for Project 4.

Manik Bali to act as interim Chair for the GSICS Data Working Group

Manik Bali Deputy Director, GCC has accepted to Chair the GSICS Data Working group (GDWG). The GSICS Data Working group is a critical organ of GSICS. Management, Design of GSICS products and data services is the main focus of this group.

Special Thanks to Aleksandar Jelenak

GSICS wishes to thank our outgoing member Dr. Aleksandar Jelenak for the contribution he has made to GSICS, first as a member of the GSICS Data Working Group (GDWG) since 2007 and then as the Chair of GDWG since 2010. It is difficult to put in a few words or sentences his immense contribution in laying the foundations of GSICS in its initial years as he has contributed in various roles. Roles ranged from advising International teams and meeting goals of GSICS, to that of a Highly Technical programmer, to being a proof reader of the GSICS Quarterly, and advising the GCC Director and Deputy Director.

As the Chair of GDWG he was responsible for all the data management activities in the NOAA GPRC. He set up the first GSICS data server at NOAA, established the GSICS wiki, contributed to the development of the GSICS file naming and NetCDF conventions, contributed towards getting a doi number for the GSICS quarterly, the procedure for product acceptance, common directory structure and THREDDS configuration for GSICS data servers, and various practices for making GSICS data compliant with various international metadata standards.

Dr. Jelenak's contributions will always be remembered by GSICS and we would like to wish Dr. Jelenak all the success in his future endeavors.

GSICS-Related Publications

Chen, L., et al., 2013, The application of deep convective clouds in the calibration and response monitoring of the reflective solar bands of FY-3A/MERSI (medium resolution spectral imager). *REMOTE SENSING*, 5(12), 6958–6975.

Ehrangi, A., and Aumann, H., 2013, Intercalibration and concatenation of climate quality infrared cloudy radiances from multiple instruments. *SPIE Proceedings,* Vol. 8866 88660I.

Elyouncha, A., and Neyt, X., 2013, Inter-calibration of Metop-A and Metop-B scatterometers using ocean measurements. *SPIE Proceedings,* Vol. 8888 888806.

Park, E.-B., et al., 2013, An influence assessment of GSICS correction using sea surface temperature from geostationary satellite. *COMS SPIE PROCEEDINGS,* Vol. 8893 88931N.

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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. Note the upcoming spring issue would be a special issue on Microwave. You are welcome to submit articles on Microwave instruments." Please send articles to manik.bali@noaa.gov.

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, Larry Flynn, GCC Director in helping to secure and edit articles for publication.

GCC team welcomes your feedback and suggestions about the GSICS Newsletter.