



# GSICS Coordination Centre

Supported by JPSS Mission

**Manik Bali and Lawrence E Flynn**



# Introduction

## GSICS Coordination Center(GCC)

- ✓ *GSICS Quarterly Newsletter*
- ✓ *( 3 Special Issues + 2 General)*
- ✓ *Meeting Support*
- ✓ *(User Workshop Shanghai)*
- ✓ *GPPA and Product Acceptance (Timeliness, WGCV).*
- ✓ *Definition of GSICS Products and Deliverables.*
- ✓ *Awards and Outreach ( Call issued for awards )*
- ✓ *How good are GSICS References*

## GCC and JPSS Mission

- ✓ *OMPS EDR SDR*
- ✓ *CrIS as a reference*
- ✓ *ATMS- Inter comparison with MSU/AMSU\*\**
- ✓ *Selection of In-orbit References.*
- ✓ *VIS Integrated method to improve calibration accuracy from multiple vicarious method*
- ✓ *SSU recalibration for CDR development.*

## GSICS Data Working Group

- ✓ *Past-Chaired the GDWG*
- ✓ *Satellite 'Instrument Event Logging*
- ✓ *Archiving GSICS Products.*
- ✓ *Evaluation of doi for GSICS Products*
- ✓ *MW metadata and filenaming conventions*
- ✓ *Support Lunar Calibration WS in Darmstadt ( code sharing).*
- ✓ *Proposed Document Management plan to GSICS.*

\*\*\*\*Contributes to JPSS mission contributes towards JPSS goals and initiatives\*\*\*\*

**OMPS CrIS ATMS**



# GCC – GSICS Quarterly Newsletter



**This Issue:**  
**Lunar Calibration**

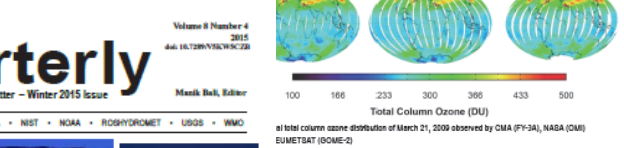
## In This Issue

**Articles**  
Moon as a Calibration Source  
by Tom Stone  
Absolute Calibration of Lunar  
Remotely Sensed  
by Claire Gruber  
Lunar Calibration of MODIS  
Solar Bands  
by Antonino Viscusi, Alexander Wagner,  
Tim Hansen and Tom Stone  
Polar Orbiting Lunar Observations (POLO) -  
Interim Study of the Moon  
by Sophie Lachézie  
On the Phase-Angle Dependence of the  
Moon Calibration Results  
by Sophie Lachézie, Antonino Viscusi,  
Tim Stone, Laurent Lefebvre, Alexander Wagner, and  
Tim Hansen  
Calibration Validation of Suomi NPP VIIRS Day-  
Night Band using Moon Light  
by Ji Chen, Changping Cao, and Shuangyong  
Angular Variation of NOAA-20 SeaWiFS Near-Minor  
Visible Reflectivity  
by Fangping Yu, Shengping Wu, Sun Stone, and  
Gordon Smith-Roe

**News in This Quarter**  
A Note from the Executive Panel Chair  
by Mark Ball  
2013 Annual Meeting of the NOAA-NESDIS  
Calibration Process Oversight Panel (COPOP)  
by Shengping Wu, NOAA  
2013 Field Campaign of Radiometer Calibration  
for FY Resumes Held at CRCS Dushanbe Site  
by Samir G. Durr  
Improved Accessibility to EUMETSAT  
GOME-2 Products  
by Tim Hansen, EUMETSAT  
FY-4 Satellite Successfully Launched  
by Samir G. Durr  
EUMETSAT Begins Providing Alternative  
Calibration Coefficients for Meteosat-10  
by Tim Hansen, EUMETSAT  
**Announcements**  
Mark Ball Takes Over as Deputy  
Director of NESDIS Calibration Center  
CRCS Form UVA Progress  
Upcoming CRCS-Related Meetings  
CRCS-Related Publications  
Special Thanks to Fangping Yu and George Ching



**This Issue:**  
**Special Issue on Ultraviolet**



at total column ozone distribution of March 21, 2009 observed by CMA (FY-3A), NASA (OMI), EUMETSAT (GOME-2)

**Other Energy Photons Arrive at GSICS**  
by Flynn, NOAA

Issue of *GSICS Quarterly* features a new area of the for GSICS work, the *ultraviolet*. Unlike some other regions, the primary products for the *backscatter* (*BUV*) measurements are the ratios of earth to solar irradiances. These ratios provide information on atmospheric absorption and scattering, and on cloud surface reflectivity for product retrieval algorithms.

ratios has inherent cancellation throughout the instrument response and the primary products for the *backscatter* (*BUV*) measurements are the ratios of earth to solar irradiances. These ratios provide information on atmospheric absorption and scattering, and on cloud surface reflectivity for product retrieval algorithms.

where  $AD(t)$  adjusts for the changes in the Earth-Sun distance, while the GOME-2 series of instruments use onboard sources to monitor the solar diffuser changes over time,  $SDC(t)$ , independent of the rest of the optical and sensor changes, and make daily solar measurements. The simplistic representation of the adjusted ratios has the form

$$\frac{Earth\_radiance(t)}{[Solar\_irradiance(t) * 1/SDC(t)]}$$

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## GSICS Quarterly Newsletter Features

- Since Fall 2013, brand new format .
- Since Winter 2014, the Newsletter has a doi.
- Accepts articles on topics related to calibration (Pre and Post launch).
- New Landing page on the GCC website.
- Rate and Comment section: readers and authors can interact.
- Articles are reviewed by subject experts
- Help available to non native English speaking contributors.
- Since Fall 2014, new navigation features added to the Cover Letter.

*Journal of Physics and Chemistry of Earth  
Invited Authors of GSICS Microwave issue  
to submit articles based on their  
submission to GSICS Newsletter .*



Special Thanks to Alexander Jelenak  
GSICS-Related Publications

differences between instruments are  
clearly understood.  
Measurements widely separated in  
time and space can be compared if they

the measurement of Top of Atmosphere  
(TOA) Total Solar Irradiance (TSI)  
provides an example of this work.  
The Earth Radiation Budget (ERB)

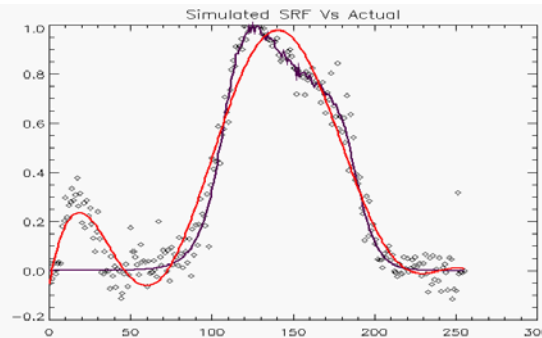
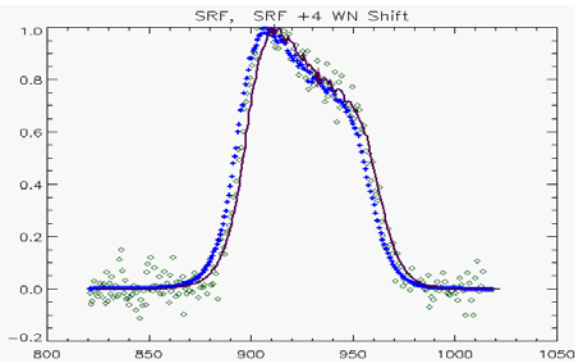
# Retrieval of Spectral Response Function using Hyper-Spectral Radiances

Developed a Method to retrieve spectral response functions using In-Orbit Inter- Comparison with CrIS/IASI/AIRS

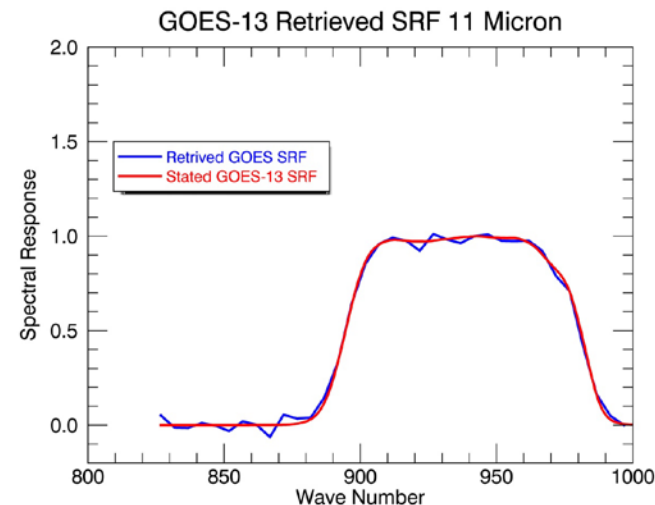
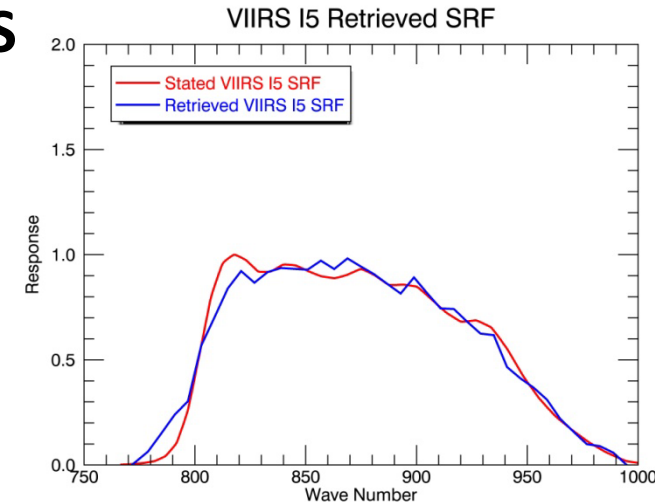
$$\begin{bmatrix} a_{1,1} & \cdots & a_{1,n} \\ \vdots & \ddots & \vdots \\ a_{n,1} & \cdots & a_{n,n} \end{bmatrix} \begin{bmatrix} x_1 \\ \vdots \\ x_n \end{bmatrix} = \begin{bmatrix} b_1 \\ \vdots \\ b_n \end{bmatrix}$$

$$\text{SRF}(b_i) = A^{-1} B$$

Validation

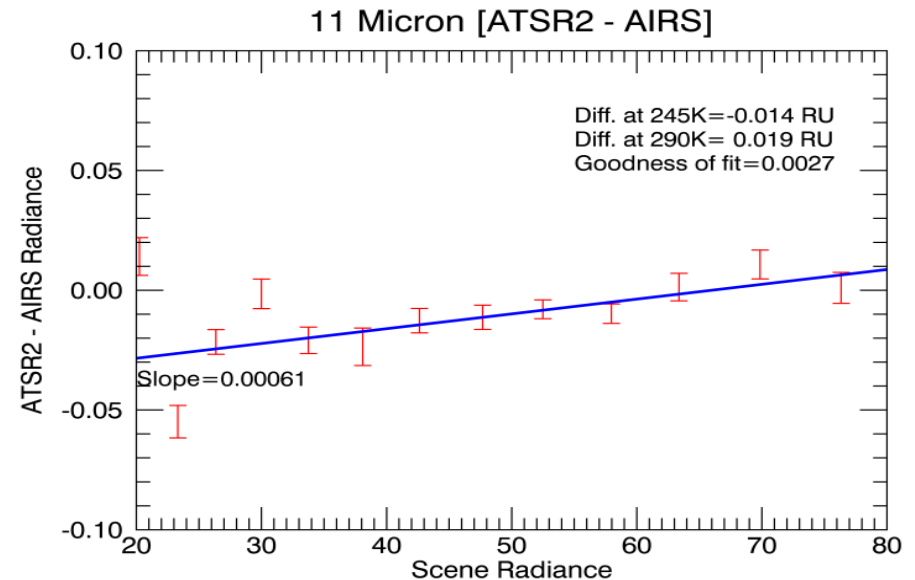
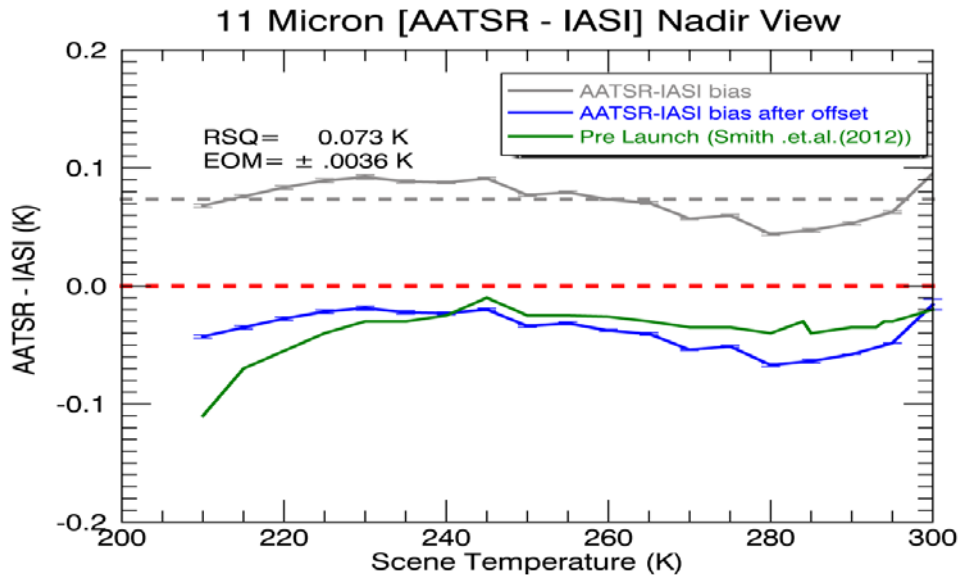


Method Detects shift and leaks in SRF



# GCC- How good are GSICS References IASI and AIRS

Study was done at GCC/NOAA to investigate the reliability of GSICS references instruments by comparing with extremely accurate instrument ( A/ATSR , Climate Satellite by design ).

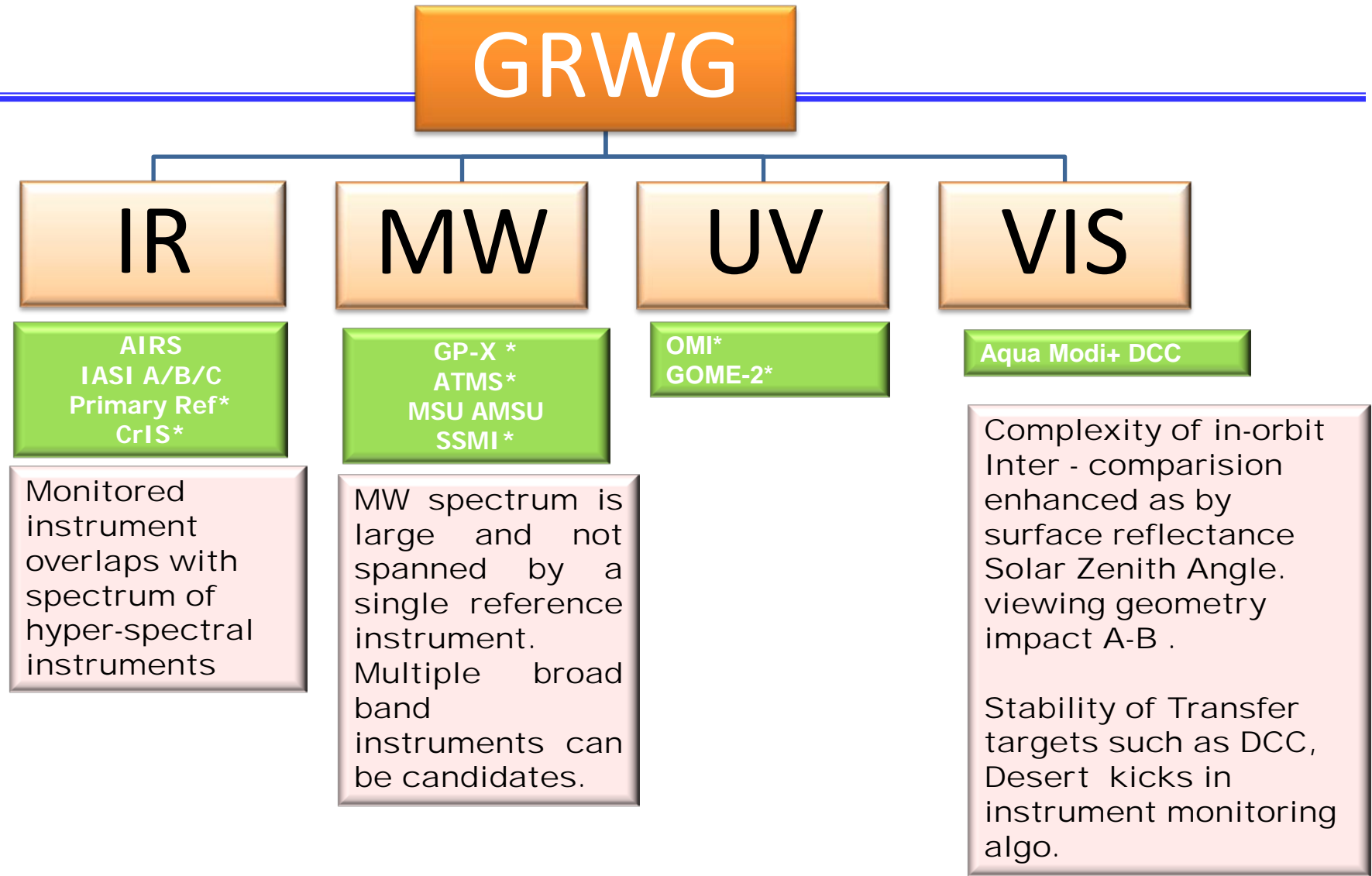


Top left image shows that IASI and AIRS ( right ) are nearly as good as pre-launch references.  
While the IASI has an offset of nearly 0.073K the AIRS seems to have an offset of nearly 0.

Bali, Mittaz, Goldberg, 2015, Submitted to AMT

IASI and AIRS nearly as good as Pre-Launch reference  
**Growing need to use instruments that yield climate scale corrections**

# Selection of Reference Instruments-Future Monitoring



Diverse requirements across ( even within subgroups )



# Selecting Reference Instrument Process and a Scoring Scheme

## Selection Process Reference for MW

A sub-group meeting is organized to identify instrument to be monitored

Group wishes to monitor GPM satellites spread over a range of roughly 25S to 25N ( for eg. SAPHIR)

Group evaluates ATMS and SAPHIR.

Group considers that SAPHIR are the first radiometers in the 183 GhZ in low inclination orbit ( Wilheit)

Instrument info on OSCAR and NRT monitoring on ICVS is considered

Despite not presenting global observations SAPHIR also scores higher because the intended goal is to inter-calibrate low inclination instruments. Input from scoring is considered.

On the other hand if goal would have been to monitor Polar instruments ATMS could have been a better choice.

OSCAR provides limited but critical information on instruments. (spectral, temporal and geographical coverage)  
Detailed information is obtained via ATBD

Both SAPHIR and ATMS can score the same marks



Table for GSICS Re-Analysis Correction for Meteosat Second Generation IR Channels

Threshold	Saturation		Weight	MetopA/IASI				Score
	Min	Max		Min	Max	Compliant	%Perfect	
1	1	1	1	1	1	Pass		
113	2013	2006	100	2007	2020	Pass	63%	63.4
-10	10	-90	2	-90	90	Pass	100%	2.0
-10	10	-180	2	-180	180	Pass	100%	2.0
270	300	180	5	180	310	Pass	67%	3.3
746	2564	650	10	645	2760	Pass	92%	9.2
5	15	0	2	0.5	55	Pass	72%	1.4
			0			Pass		0.0
			0			Pass		0.0
			0			Pass		0.0
			0			Pass		0.0
9	10	0	5	7.8	11.2	Pass	36%	1.8
	300		1		12	Pass	97%	1.0
			0			Pass		0.0
1		10000	5	30000		Pass		0.0
	10		10		3.3	Pass	68%	6.8
						Pass		0.0
Radiometric Stability	K/yr	1	10		0.05	Pass	95%	9.5
Orbital Stability	hr/yr	12	0		0.001	Pass	100%	0.0
Radiometric Noise	K	10	1		0.15	Pass	99%	1.0
Spectral Resolution	cm-1	100	10		0.25	Pass	100%	10.0
Spectral Stability	cm-1/yr	2	10		0.000002	Pass	100%	10.0
SBAF Uncertainty	K	1	0		0.15	Pass	85%	0.0
Absolute Calibration Acc	K	1	10		0.05	Pass	95%	9.5
Inter-channel calibration	K					Pass		0.0
Traceability						Fail		
Documentation						Pass		
Community adoption						Pass		
Total			184			96%	71%	130.9

More Stable and accurate references being explored For Eg. AMSU/MSU FCDR.

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- *MW metadata and filenaming conventions*
  - NOAA GDWG in collaboration with MW former Chair Cheng-Zhi formulated the MW metadata and fileneming conventions for MW GSICS Products.
  - The conventions were accepted by the GDWG members and would be put up on the wiki.
  - *Proposed Document Management plan to GSICS.*

NOAA proposed to GSICS a Document Management Plan based on the DMS existing at NOAA library. Review of this plan underway



# Summary

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- **GCC actively engaged in JPSS Instrument in-orbit calibration.**
- **GSICS Coordination Center leading efforts in In-Orbit Reference (radiance) Instrument Identification, Cross Calibration Product Maturity and Data Standardizations.**
- **Developed new technique to retrieve in-orbit SRF .**