In 2006 the World Meteorological Organization (WMO) and the CGMS together initiated the Global Space Based Inter-Calibration System (GSICS, gsics.wmo.int) with the aim of monitoring the quality of measurement from satellite instruments launched by member including NASA, NOAA, EUMETSAT, ISRO, CMA, KMA, and CNES.

In recent years, GSICS, via collaboration among member agencies across nations has successfully monitored instrument records for both GEO (GOES, SEVIRI, MTSAT) and LEO (AVHRR) based instruments by comparing them to in-orbit references such as IASI, AIRS and MODIS. The cross comparison products undergo stringent quality checks and standardizations and a scientific review of the theoretical bases and are assigned a GSICS maturity level. The accepted products are distributed freely as GSICS correction products.

These products have wide applications. The goal of this poster is to introduce GSICS cross calibration products and their application in evaluating Spectral Response Function status and providing bias corrections and monitoring.

1. Background

2. Methods of In-Orbit monitoring

Step 1. Identification of Collocated Pixels that satisfy GSICS selection criterion

Geographical locations that are observed by the reference and the monitored instrument at close to the same time under similar viewing conditions are identified.

Step 2. Overlapping pixels from Step-1 need to satisfy GSICS selection criterion prior to proceeding the next step of Convolution and Comparison

GSICS collocated pixel selection criterion

- Time difference of observations \(\Delta t < 5\) Min
- Atmospheric path diff \(\Delta \text{sec} (\text{at. zenith angle}) < 0.01\)
- \(\Delta \text{Lat} < 35^\circ\)
- \(\Delta \text{Lon} < 35^\circ\)

Spatial Averaging

Average GEO pixels in each LEO FOV

Estimate Uncertainty

- Due to spatial variability
- Use in weighted regression

Step 3. Convolution and Comparison

Once collocated pixels are found, Radiances of the (reference) hyperspectral instrument are convolved with the monitored instrument Spectral Response Function to provide radiances representative of the reference instrument. These representative radiances are compared with the monitored instrument’s measurements.
5. GSICS Deliverable
Ozone Mapping Profiler Suite (OMPS)

The Ozone Mapping Profiler Suite (OMPS) onboard the JPSS is an important instrument for monitoring global
Ozone. Both on-board and external methods are used to maintain the quality of UV measurements. The key
monitoring requirements placed by the ozone community are:

1. Pre-Flight Laboratory calibration on the instrument include:
2. Performance of dual diffusers for OMPS for Solar Measurements (Diffuser and instrument degradation)
3. Comparisons to forward model results using ground targets and ground truth
4. Internal consistency checks
5. Matchup comparisons using Chasing orbits and SNOs

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


A novel method has been developed that can determine SRF by inter-comparing with a Hyperspectral
instrument such as CrIS/IASI

Above: OMPS NP Working Solar residuals after model fits for
degradation, solar activity and wavelength shifts

VIIRS I5 Channel SRF retrieved by comparisons
with CrIS radiances.

GOES-13 11 Micron Channel SRF retrieved by
comparisons with IASI radiances.

GEO COMS instrument monitoring by using SNOs with LEO hyperspectral IR instruments. Vertical axis units are Kelvin.

GEO AHI instrument monitoring by using SNOs with the LEO CrIS instrument.