GSICS Vis/NIR Calibration Activities

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Overview

- GSICS VIS/NIR calibration strategy
- Lunar Calibration status
- DCC Calibration status
- Solar spectra
- Spectral band adjustment factors
- Discussion
GSICS GEO VIS/NIR calibration strategy

• Use lunar (ROLO model) and Deep Convective Clouds (DCC) calibration to determine the stability of the sensor and to tie the calibration to an absolute reference
  – All GEOs observe the moon and DCC
• Combine lunar and DCC visible calibration gains as the final GSICS calibration
  – Consistent multiple calibration results validates all techniques
  – The combined gain will have a smaller uncertainty than any individual method gain
  – Individual method gains will be made available so that the user may determine calibration method best suited for the application
GSICS VIS/NIR reference calibration strategy

- Use Aqua-MODIS Band 1 Collection 6 radiances as the absolute reference
  - Migrate to NPP-VIIRS
  - Have an unbroken chain of traceable calibration reference records
  - The reference record chain is then tied to an SI-traceable on-orbit calibration system sensor, such as CLARREO or TRUTHS
GSICS VIS/NIR SBAF strategy

- Use SCIAMACHY based spectral band adjustment factors (SBAF) to take into account spectral differences between the reference and target instrument
  - If there were a well-calibrated hyper-spectral sensor there would be no need for SBAF
  - The SBAF need to be unique to the spectra used over the GEO and reference sensor intercalibration site
  - Lunar spectra available from ROLO model and SCIAMACHY
Lunar Calibration

- **GSICS Implementation of the ROLO model (GIRO) / GSICS Lunar Observation Dataset (GLOD)**
  - Intellectual Property Right being cleared in order to distributed to the Lunar Calibration Community members upon agreement with the usage police and the license.
  - Infrastructure for GIRO/GLOD expected in 2016 Q4.
  - Activities planned with USGS to formalise the traceability to the ROLO

- **Inter-calibration using the Moon**
  - Scheme proposed by EUMETSAT at the last GSICS Annual Meeting in Tsukuba – Japan.
  - On-going study on the validation of SBAF using hyperspectral measurements from SCIAMACHY ➔ Final Presentation in November 2016
  - Interactions between JMA and EUMETSAT on AHI lunar data

- **Organisation of a second Lunar Calibration Workshop (still to be confirmed)**
  - Co-organised and hosted by the Chinese Meteorological Administration
  - Probably second half 2017
  - Main topics still to be defined
  - GSICS web meeting on 30 August 2016 to initiate the preparation
GSICS VNIR product for Meteosat SEVIRI VIS0.6 channel

- GSICS VNIR product in demonstration phase (reference = Aqua MODIS)
- Currently based on Deep Convective Clouds only.
- Applies to VIS0.6 channel on Meteosat-10.
- Near-Real Time and Re-Analysis products generated on a daily basis stored on EUMETSAT GSICS data server.
- Dataset available on request for Meteosat-9 VIS0.6 (till December 2012).

Future work:
- Change the reference from Aqua MODIS to Suomi NPP VIIRS in order to process more bands (VIS0.8 for instance).
- Complement the DCC method with other methods such as lunar inter-calibration (some questions still to be resolved to blend the product).
Where to get the data?

- NetCDF format

- Follows GSICS standards (based on WMO standards + CF conventions)

- Updated once per day (Near Real Time + Re-Analysis)

- A product user’s manual soon available

— For NRT + RA  ➔ see http://gsics.eumetsat.int

Courtesy of EUMETSAT
VIIRS I1 (0.65µm) DCC mode radiances

- The VIIRS I1 band NASA LandPeate calibrated radiances seem stable over time
Comparison of Met-10 VIS/NIR calibration methods

• Validate that the AquaMODIS DCC mode radiance equals the Meteosat-10 DCC mode radiance over the Met-10 domain
  – thereby validating that the DCC mode algorithm properly transfer the calibration reference

• Also all calibration methods are within 0.4%

ATO: All-Sky Ocean Ray Matching
DCC (RM): DCC ray-matching
Libya-4: Based on Met-9 Libya-4 model
DCC (Mode): DCC mode radiance method (GSI CS)
GSICS Solar Spectra Recommended Reference

• Many available solar spectra available
  – SORCE, daily varying
  – Thuillier, MCST, IDPS
  – Radiative transfer enhanced datasets

• Work with CEOS IVOS to recommend the best available solar spectra for the wavelength range needed
  – Spectral resolution
  – Absolute calibration
  – Work with Nigel Fox, Greg Kopp

• Have GSICS/CEOS IVOS web meeting, beginning this year
Solar Constant Comparison

- Absolute calibration within 1.7%
- * When using the same solar spectra dataset, the band ratios are very consistent
Spectral Band Adjustment Factor (SBAF)

- Web site available for SBAF over many SCIAMACHY based Earth reflected spectra
  - [http://www-pm.larc.nasa.gov/cgi-bin/site/showdoc?mnemonic=SBAF](http://www-pm.larc.nasa.gov/cgi-bin/site/showdoc?mnemonic=SBAF)

- Future Plans
  - Incorporate Hyperion, and GOME-2 observations
Libya-4 SCIAMACHY spectra
Comparison of SBAF over Libya-4

SCIAMACHY Pseudo Radiance (Wm\(^{-2}\mu\text{m}^{-1}\text{sr}^{-1}\))

- **Scene:** Libya 4
- **Date Range:** 2002–9–5 to 2010–5–19
- **Lat. Range** South–North: 28 to 29.5
- **Lon. Range** West–East: 22.51 to 23.99
- **Seasonal Subset:** No
- **Fit:** Linear

**GOES-15, 0.65–Micron (Ch. 1)**

- **SLOPE:** 0.951
- **OFF:** 1.596
- **R^2:** 0.9992
- **NUM:** 873
- **StdErrReg%:** 0.4062
- **StdErrSlp%:** 9.2667e–02

HYPERION Pseudo Radiance (Wm\(^{-2}\mu\text{m}^{-1}\text{sr}^{-1}\))

- **Pointing:** ALL
- **Date Range:** 2001–4–14 to 2015–3–9
- **Lat. Range** South–North: 28 to 29.5
- **Lon. Range** West–East: 22.51 to 23.99
- **Seasonal Subset:** No
- **Fit:** Linear

**GOES-15, 0.65–Micron (Ch. 1)**

- **SLOPE:** 0.946
- **OFF:** 1.977
- **R^2:** 0.999
- **NUM:** 354
- **StdErrReg%:** 0.5267
- **StdErrSlp%:** 0.1699
Thank You

Any thoughts for Discussion