Report for BO09: Satellite Instrument Pre- and Post-Launch Calibration

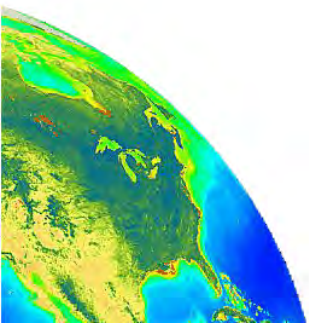
Chair: Gerhard Meister, NASA Code 616

OBPG (Ocean Biology Processing Group)

6/18/2015

IOCS Plenary Session

San Francisco, CA

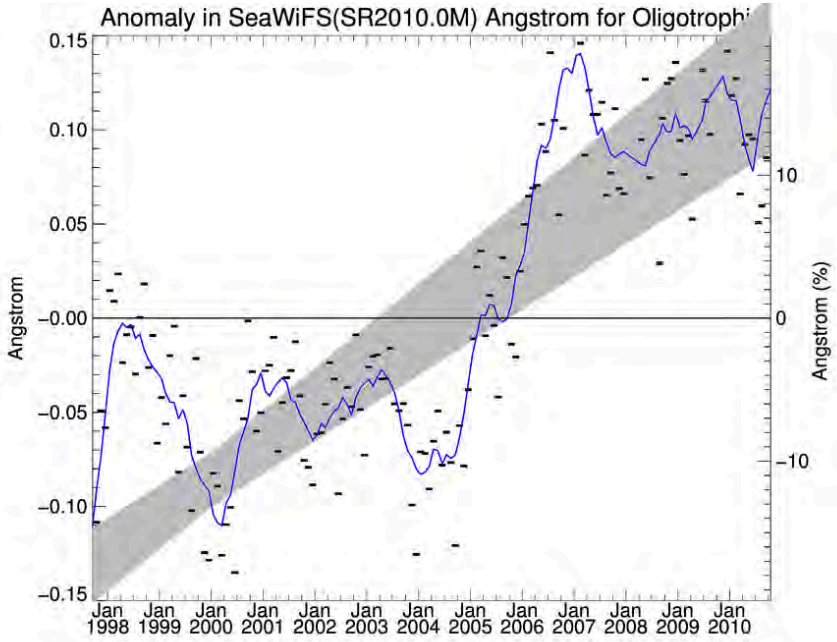


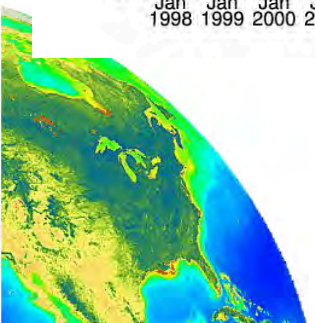
Overall Summary:

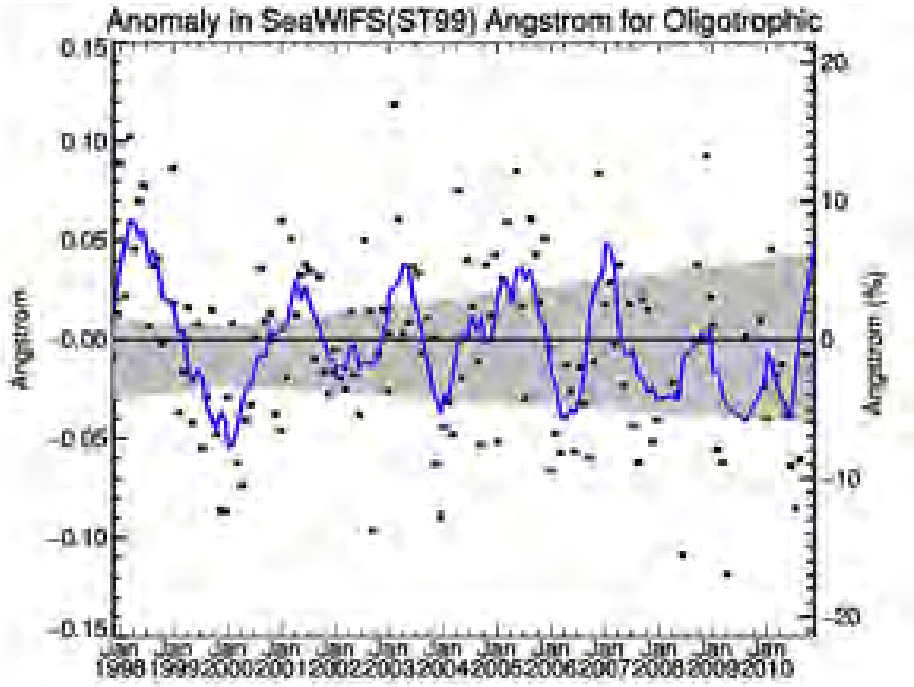
- Broad representation from space agencies: ESA, EUMETSAT, ISRO, KIOST, NASA, NOAA, SOA
- Excellent overview of the calibration activities for all current OC sensors (COCTS, GOCI, MODISA, OCM-2, VIIRS) plus ‘historical’ sensors (MERIS, SeaWiFS)
- No status reports from OLCI and SGLI (presented at previous IOCS)
- Session went well into lunch break
- This summary not complete (summary of summaries)

SeaWiFS (Fred Patt):

- Improved method to deal with SeaWiFS 10-bit limitation yielded significant improvements in temporal consistency of OC products:

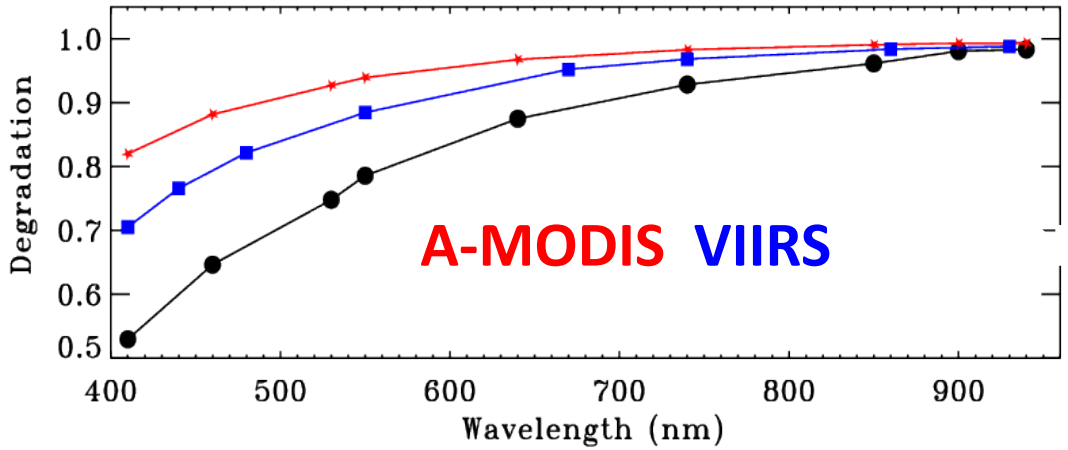




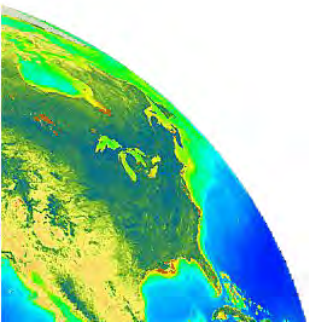


MODIS Aqua (Jack Xiong):

- Large degradation of solar diffuser reflectance presents challenges for calibration accuracy:

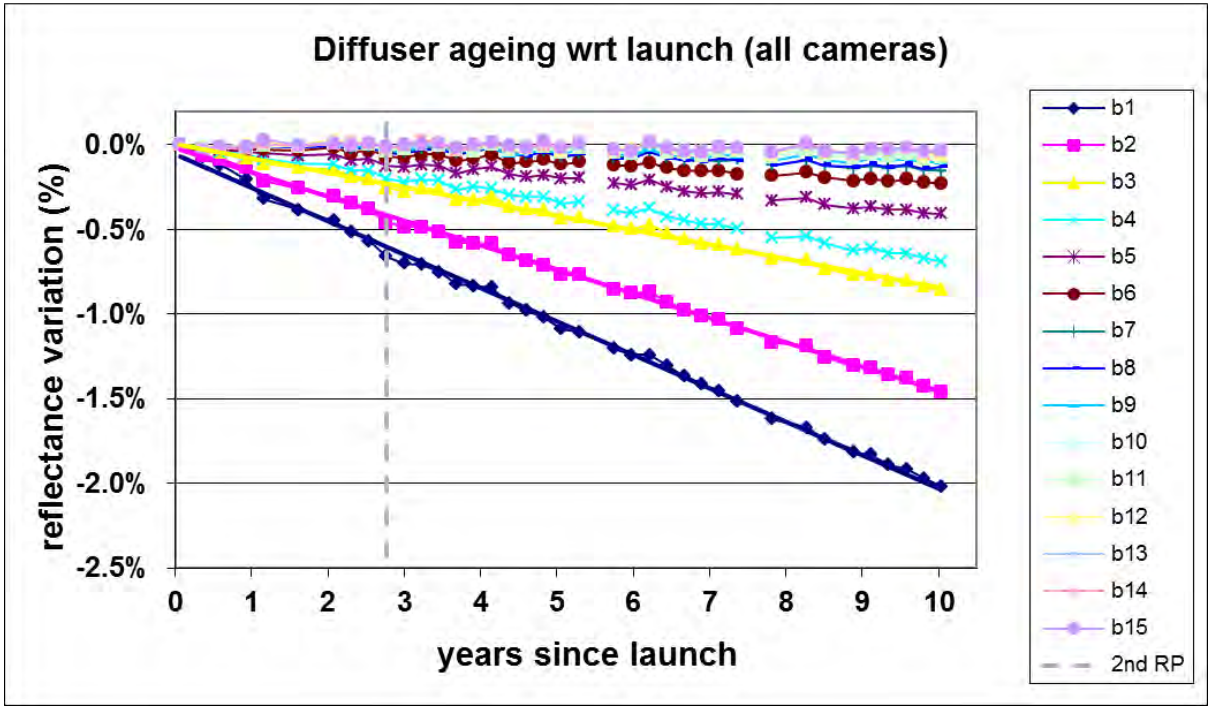


- Angle dependent degradation of MODIS primary mirror requires combination of solar diffuser, lunar, and desert trending



MERIS (Ludovic Bourg):

- MERIS 4th reprocessing will include modeling of 'pristine' solar diffuser :



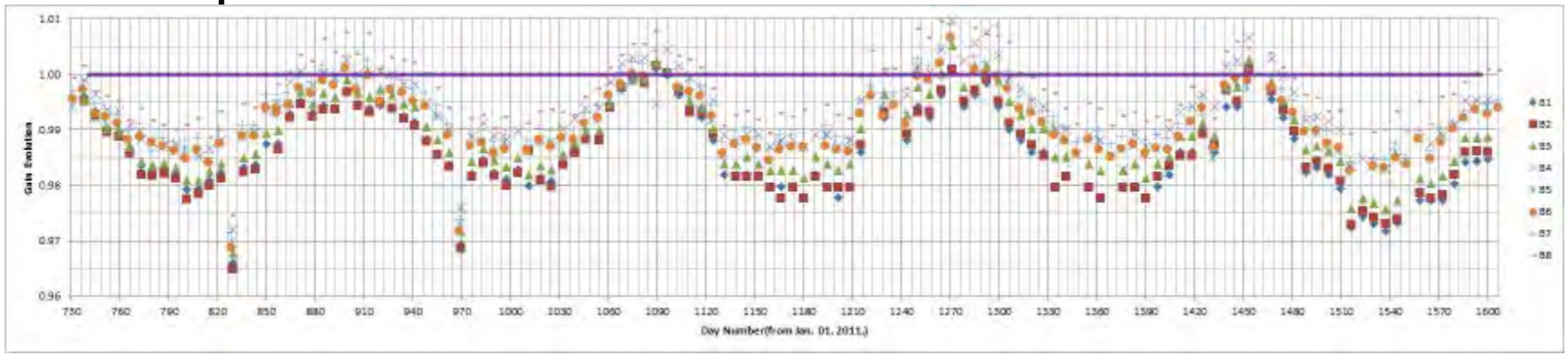
- Assumption: : ageing proportional to cumulated exposure (pristine diffuser exposed ~10 times less)

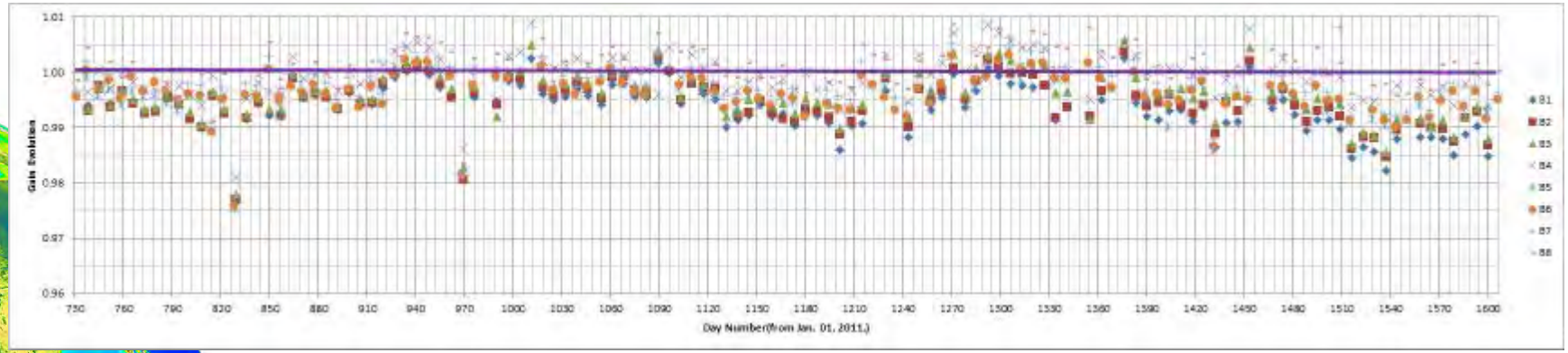
OCM-2 (Prakash Chauhan):

- Post launch Lunar and Vicarious calibration techniques have been used to asses the radiometric calibration of OCM-2 data
- Lunar calibration using ROLO model has improved the geophysical retrieval.
- Vicarious Calibration has helped in tracing the radiometric stability
- Relative radiometric calibration techniques have reduced striping
- Rayleigh calibration has helped further in overall improvement of global geophysical products

GOCI (Seongick Cho):

Insufficient characterization of solar diffuser (variation of diffuser transmittance w.r.t. solar incident angle) in pre-launch test, empirical correction method is in the development:





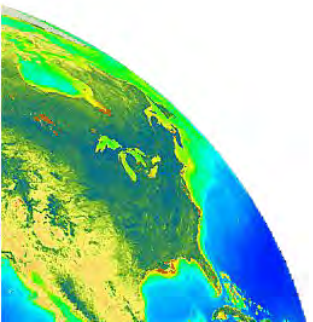
GOCI-II (Seongick Cho):

Several calibration improvements are planned for GOCI-II:

- Full SD characterization w.r.t. solar incidence angle
- New SD material: Spectralon
- New capability: lunar calibration

COCTS (Xianqiang He):

- COCTS has no on-board calibration devices.
- Vicarious calibration with in-situ measurements
- Trending using crosscalibration to SeaWiFS (to MODIS Aqua after 2011)
- COTCS prelaunch polarization characterization incomplete (only part of optical path)
- Preliminary estimates indicate polarization sensitivity of 5-30%



VIIRS (Gene Eplee):

- Use of modulated RSRs in ROLO model for lunar geometry corrections.
- Application of empirical sub-spacecraft and sub-solar point libration corrections to VIIRS measurement / ROLO prediction ratios.
- Lunar-derived adjustments applied to the solar calibration time series.
- VIIRS calibration stability comparable to that achieved for heritage instruments (SeaWiFS, Aqua MODIS).

VIIRS (Junqiang Sun):

- The “degradation uniformity condition”, a key assumption in SD/SDSM calibration methodology, has recently proved to be untrue, which may result in a long-term bias into the calibration coefficients.
- A hybrid approach properly combining the SD and lunar calibration coefficients restores the accuracy of the calibration coefficients from the non-uniformity issue and other various effects.
- The hybrid calibration coefficients have significantly reduced the long-term drift in the ocean color EDR products.

OLCI (Ewa Kwiatkowska):

- Lunar: GSICS has implemented GIRO, providing free access to the ROLO model (goal: 1% absolute uncertainty)
- Solar Diffuser:
  - Imperfect prelaunch characterization of the solar diffuser BRDF can lead to less accuracy for gains derived on-orbit, especially early in the mission
  - Spacecraft yaw maneuvers to characterize the solar diffuser BRDF on-orbit should be considered early in the Sentinel-3 mission
  - Investigations on-going, results will be presented to ESA and EUMETSAT teams and management

System Vicarious Calibration (Constant Mazeran):

- Standard NASA atmospheric correction algorithms use vicarious calibration approach with unique vicarious gain factors
- For spectral matching atmospheric correction algorithms (e.g. POLYMER), the vicarious gains are not always unique
- However, the derived ocean color products can be equally robust