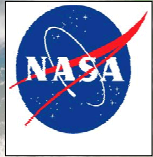
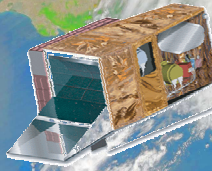


Radiometric Quality of VIIRS: Impact on Ocean Color Products



Gerhard Meister, Sean Bailey, Robert Barnes, Gene Eplee, Gene Feldman, Charles McClain, Fred Patt, Wayne Robinson, Kevin Turpie, Jeremy Werdell (Contact: Gerhard.Meister@nasa.gov)
 NASA VIIRS Ocean Science Team (VOST), Goddard Space Flight Center



1. Instrument Performance

Crosstalk:

- several types of crosstalk are present and of significant magnitude in VIIRS (optical, electronic, static, dynamic, gain-transition related)
- the effects are difficult to characterize, it is unlikely that a correction algorithm sufficient for reliable ocean color retrievals can be developed

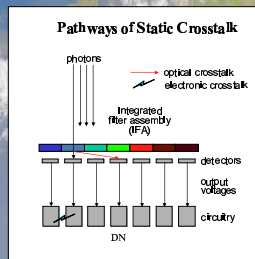


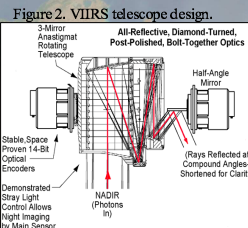
Figure 1. - the illustration shows where in the measurement process two basic categories of crosstalk occur. To correct optical crosstalk, the integrated filter assembly needs to be replaced.

Reduced spectral coverage:

- VIIRS will neither have a 510nm/530nm band (important for coastal chlorophyll) or a 678nm band for fluorescence line height

Stray light, polarization, spectral response:

- similar uncertainties expected as in MODIS, possibly polarization is improved in VIIRS



Spatial resolution and noise:

- NIR bands may require aggregation to bring signal-to-noise ratio to heritage levels; this may reduce benefit of higher spatial resolution of VIIRS (750m x 750m at nadir)

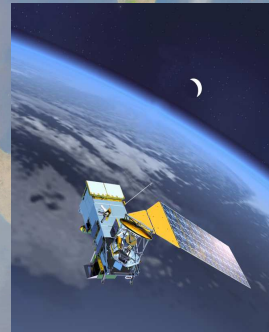
Dual gains:

- nonlinearity at transition from High to Low gain will affect bright ocean pixels (e.g. coccolithophores, high scan angles)

2. Instrument Calibration

Solar diffuser (SD) calibrations:

- permanently exposed SD will lead to on-orbit BRDF changes that could invalidate SD stability monitor measurements
- no prelaunch system level test of SD calibration; SD screen vignetting function not measurable on-orbit
- telescope views SD at angle outside of earth view range; on-orbit response-versus-scan change could break calibration chain

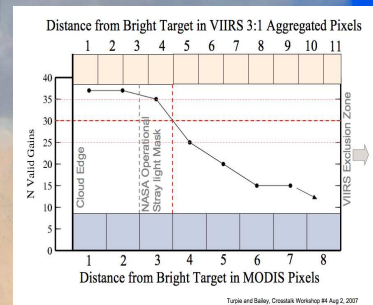


Lunar calibrations:

- no lunar calibrations for 3 continuous month every year even if roll maneuver is approved (NPP only, no maneuvers on NPOESS)

Vicarious calibration:

- unclear whether sufficient vicarious calibration stations will be available after VIIRS launch
- if data 4km off a cloud is not available for vic. cal. purposes, not enough data points will be acquired even after 5 years (about 30 gains necessary for SeaWiFS convergence, single site)



3. Algorithm and Data Production

No re-analysis and reprocessing:

- no opportunity to reprocess the standard VIIRS ocean color products
- neither NASA nor any other agency is planning to produce an alternative data set.

Non-heritage algorithms:

- VIIRS atmospheric correction '9 years old'
- VIIRS will use the Carder chlorophyll a algorithm, which performs differently from the standard chlorophyll algorithm used for SeaWiFS and MODIS.

Instrument corrections:

- Corrections (e.g. for polarization) need to be detector specific, not implemented in current code, efficiency unproven (crosstalk)

4. Conclusions

- Crosstalk is largest problem for NPP VIIRS instrument performance; NPOESS (new IFA) less affected
- Calibration issues presented here pose serious risk to long term trending; VIIRS ocean color CalVal plan largely undefined and unfunded
- Purely operational approach without reprocessings does not make optimal use of all available information, heritage sensors have not been able to produce climate data records without reprocessings

Acknowledgements: We would like to thank the NPP Instrument Characterization Support Team (NICST) for their support.
 Back ground image: MODIS Aqua, 8/25/2007, provided by Norman Kuring, NASA.