

Continuity of VIIRS/MODIS Radiometric Measurements: Simultaneous Nadir Overpass Comparisons for Reflective Solar Bands

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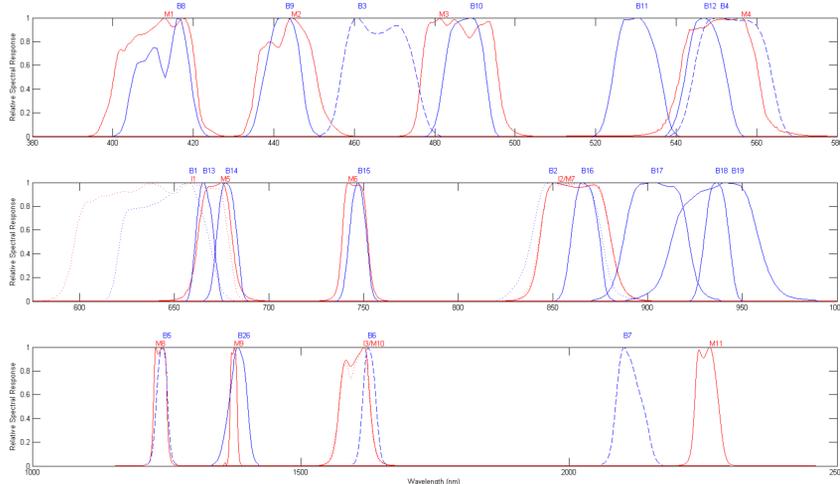
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Apr-Aug Suomi NPP / Aqua SNO
Jan-Nov Suomi NPP / Terra SNO

Comparison of VIIRS and MODIS spectral response functions



Experience gained with the NPP satellite will be used during calibration and validation of the VIIRS instruments deployed on the future JPSS (Joint Polar Satellite System) satellites

• VIIRS (Visible Infrared Imager Radiometer Suite) is one of five instruments onboard the Suomi NPP (National Polar-orbiting Partnership) satellite which was launched in October 2011

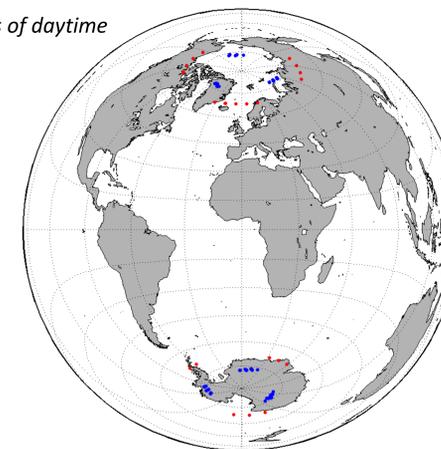
To achieve the required quality of the radiometrically and geometrically corrected Sensor Data Records, VIIRS performance and accuracy of its data products are continuously evaluated

Since the finding of an accelerated degradation of VIIRS sensitivity in selected spectral bands, frequent monitoring of VIIRS radiometric performance became even more essential

SNO (Simultaneous Nadir Overpass) measurements have provided many opportunities for comparisons between VIIRS and the MODIS instruments from the Aqua and Terra satellites

• TOA (Top-of-Atmosphere) reflectance values measured by VIIRS during the SNO events were found to be highly correlated with the MODIS data for the corresponding spectral bands

Locations of daytime SNOs



Dec Suomi NPP / Terra SNO
Sep-Mar Suomi NPP / Aqua SNO

Based on predictions from the NOAA STAR NCC website, <http://ncc.nesdis.noaa.gov>, analyzed all SNO datasets acquired by Suomi NPP VIIRS and by MODIS from both Aqua and Terra since mid-February 2012

• Observed discrepancies of a few percent can be attributed to differences between spectral responses of VIIRS and MODIS, as shown by estimates from 6S radiative transfer modeling

MODIS Collection 5

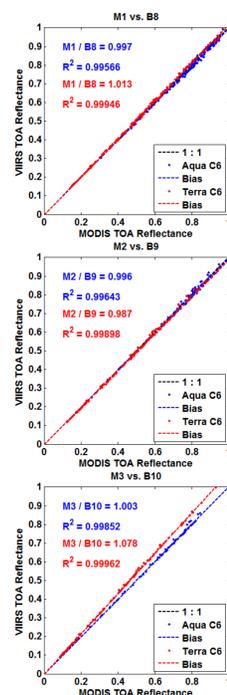
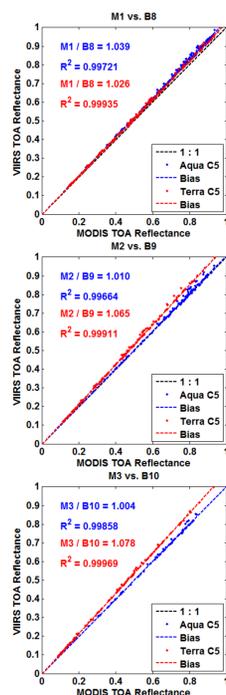
MODIS Collection 6

MODIS Collection 5

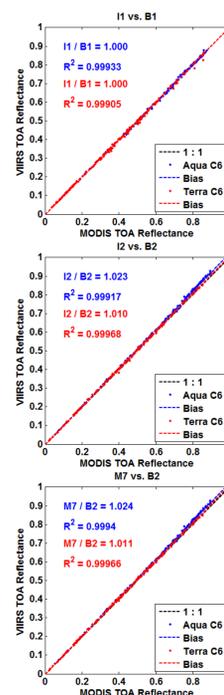
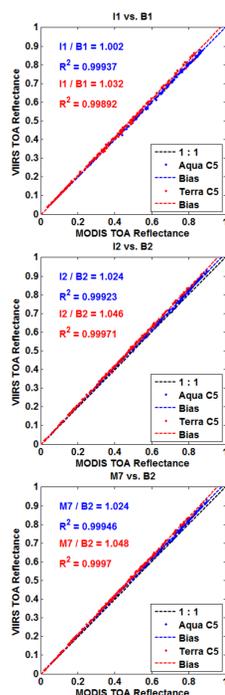
MODIS Collection 6

MODIS Collection 5

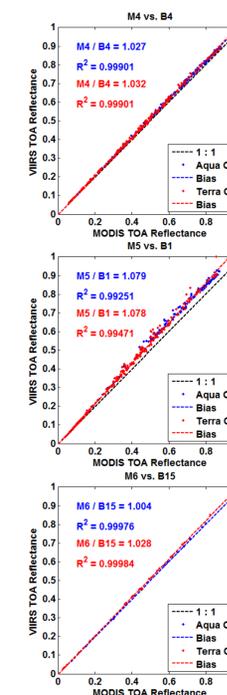
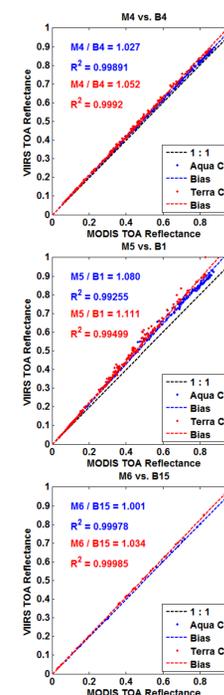
MODIS Collection 6



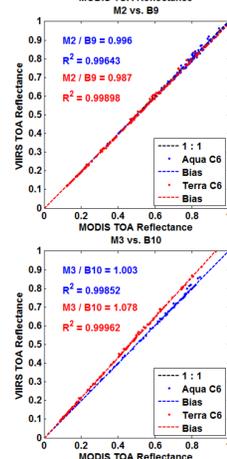
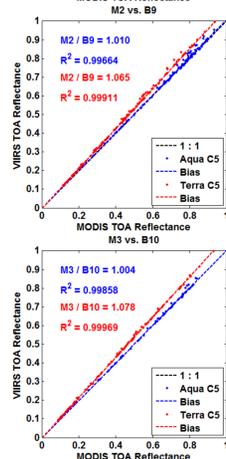
412 nm



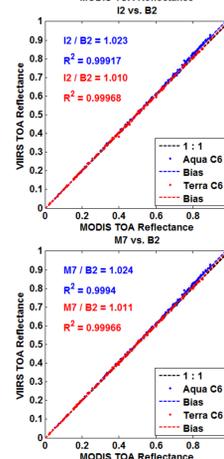
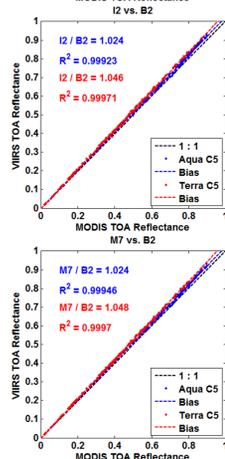
640 nm



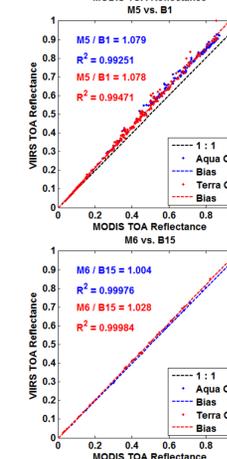
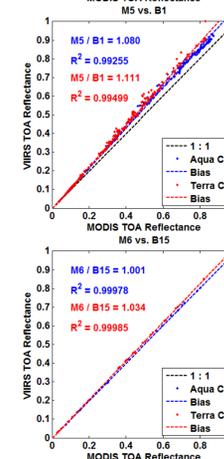
555 nm



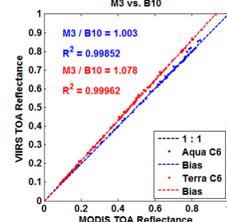
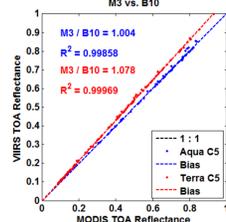
445 nm



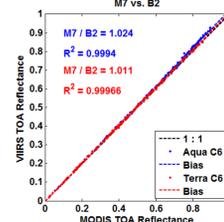
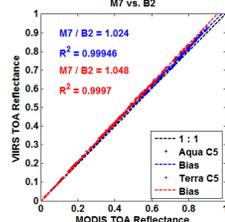
865 nm



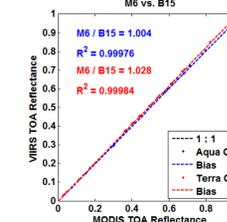
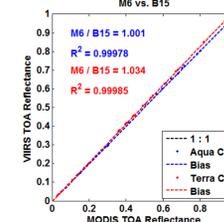
672 nm



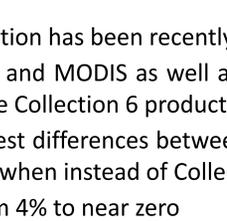
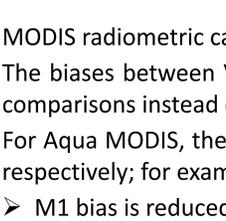
488 nm



865 nm



746 nm



1240 nm

- MODIS radiometric calibration has been recently improved in production of Collection 6 datasets
- The biases between VIIRS and MODIS as well as between Aqua and Terra MODIS data are larger when Collection 5 MODIS Level 1B data are used in the comparisons instead of the Collection 6 products
- For Aqua MODIS, the largest differences between Collection 6 and Collection 5 data are for bands 8 and 9 that are comparable to VIIRS bands M1 and M2, respectively; for example, when instead of Collection 5 data Collection 6 data are used in the SNO comparisons with VIIRS :
 - M1 bias is reduced from 4% to near zero
 - M2 bias is reduced from 1% to near zero
- While the changes for bands 1 and 2 from Aqua MODIS are small, the improvements for Terra MODIS are larger
- SNO comparisons with both MODIS instruments (on Aqua and Terra) have reduced uncertainty of the SNO measurements for VIIRS and helped determined when a bias is more likely due to radiometric calibration of one of the MODIS instruments (e.g., for M3 and M8)