



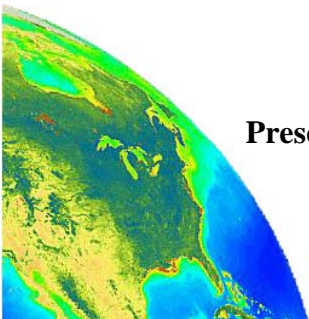
MODIS calibration and characterization

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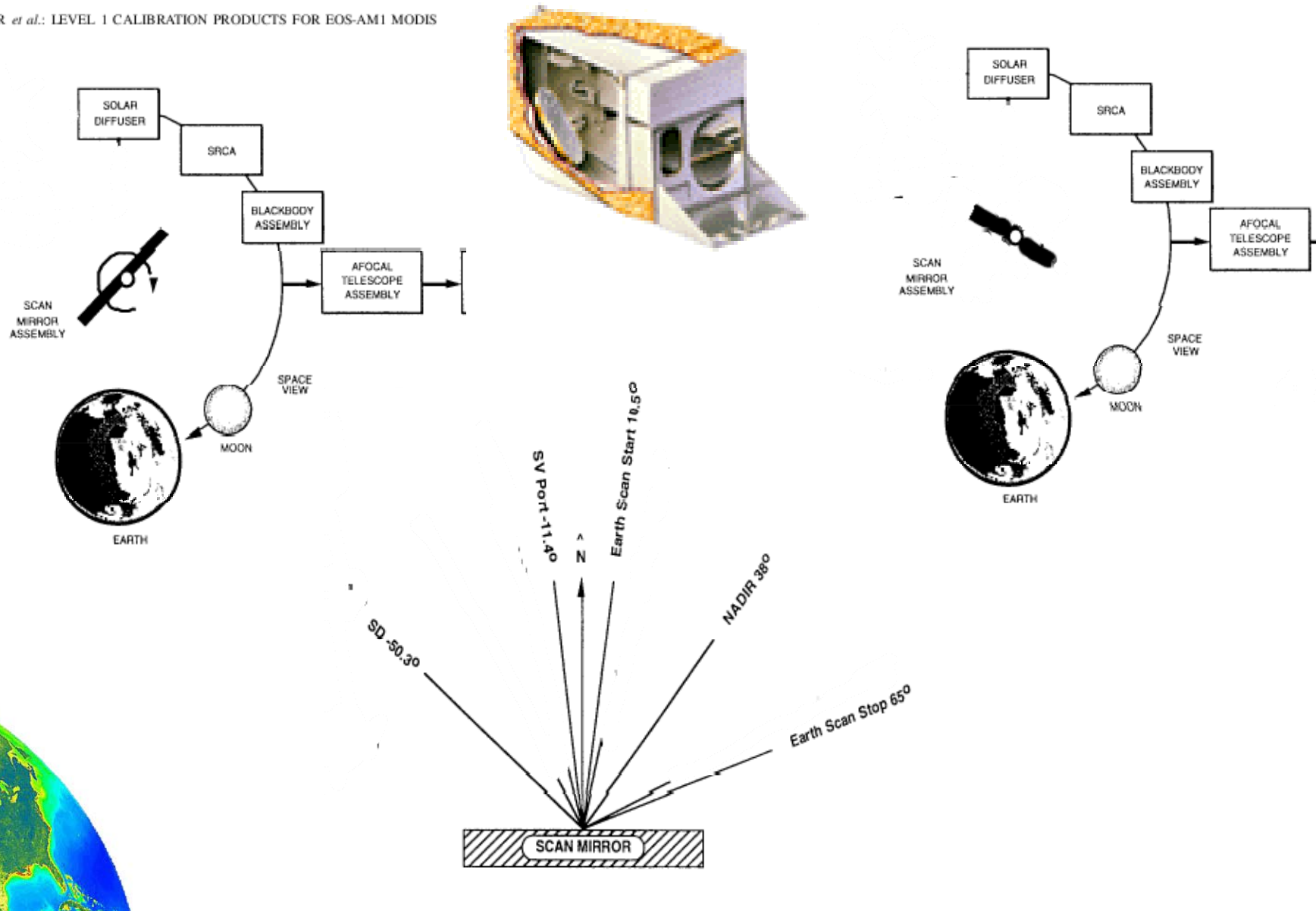
May 7th, 2013

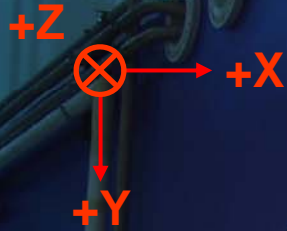
Presentation at IOCS, Splinter 12: 'Satellite instrument pre- and post-launch calibration', Darmstadt, Germany



MODIS Optical System

GUENTHER *et al.*: LEVEL 1 CALIBRATION PRODUCTS FOR EOS-AM1 MODIS





Orientation of the transmitted electric field vector when polarizing sheet is at 0deg:

BVO777: \longleftrightarrow

BVONIR: \updownarrow

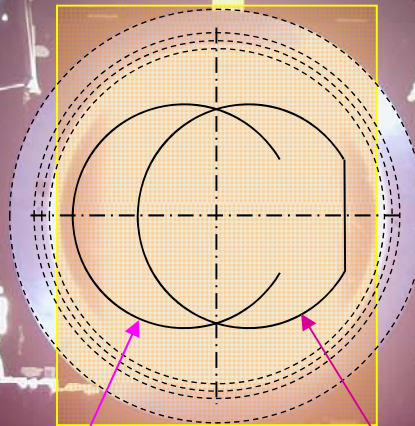
VIIRS flight direction: \longrightarrow

VIIRS scan direction: \uparrow

(VIIRS scans from -55deg to +55deg view angle)

SIS port 10.5 x 13.8 inches
Polarizer I.D. 11.0 inches
(all scaled to photo incl. FOVs)

Polarizing sheet rotation angles:



FOV of VIIRS detector 16 (instrument engineering order)

FOV of VIIRS detector 1 (instrument engineering order)

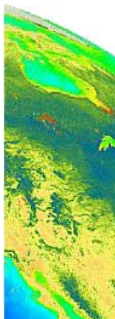
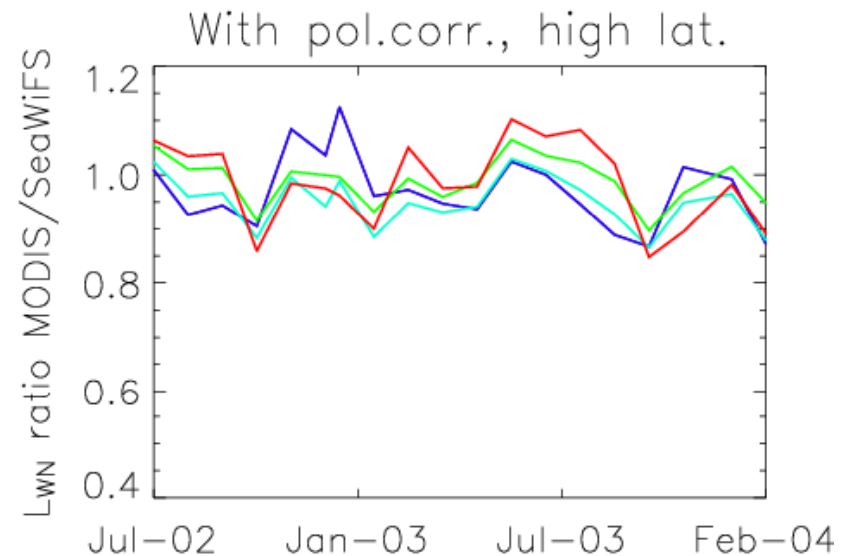
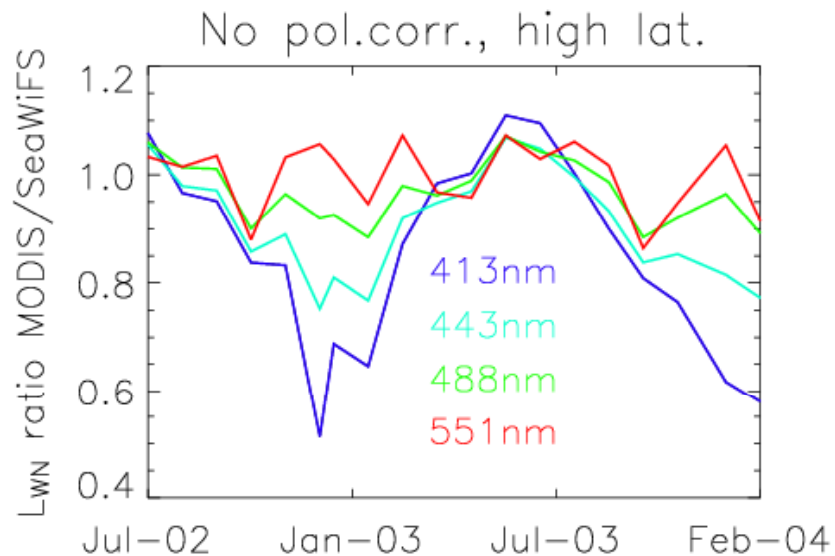
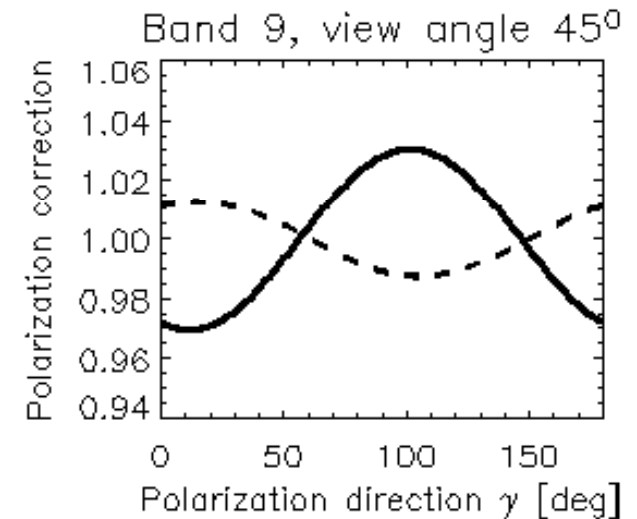
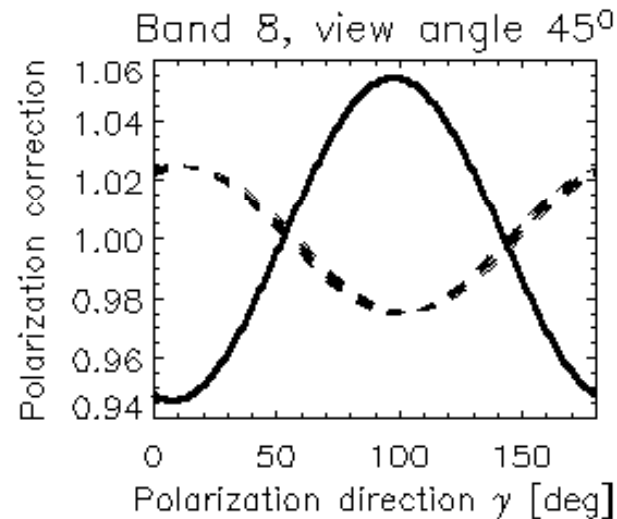
FOVs are 7.39 x 6.82 inches



MODIS Polarization Characterization: Impact

Solid line:
Correct
polarization
Correction

Dashed line:
Previous
polarization
correction



Crosscalibration approach needed for MODIS Terra:

Assumption: NIR bands are well calibrated

Required: global water-leaving radiances (truth field) for every month of the mission

$$\text{Optimization equation: } L_m/M_{11} = L_t + m_{12} * Q + m_{13} * U$$

L_m : measured TOA radiance (MODIS)

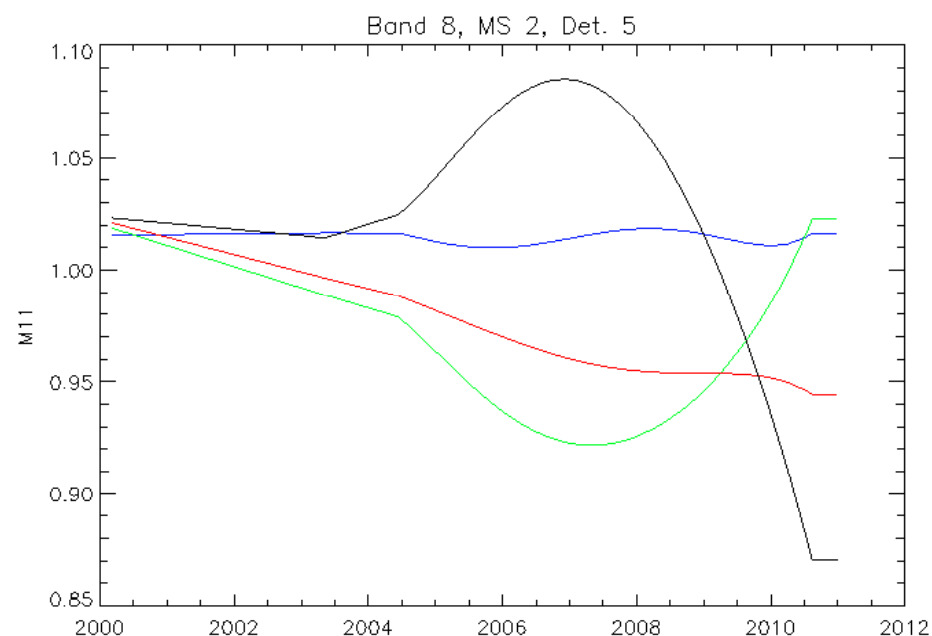
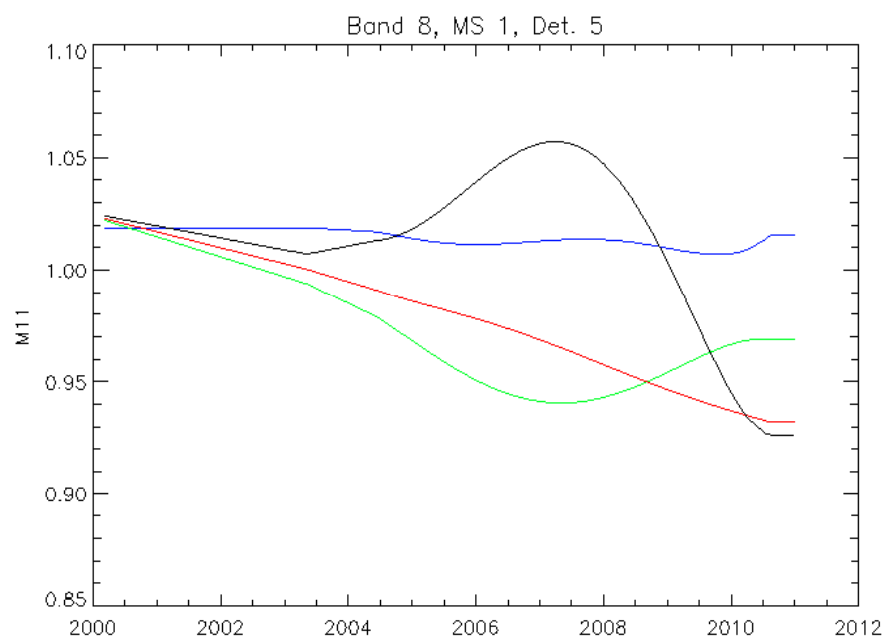
L_t : true TOA radiance (from SeaWiFS nLw)

Q, U : linear Stokes vector components, modeled from Rayleigh and glint

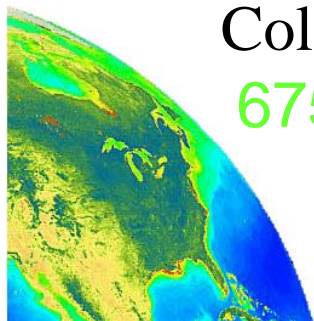
M_{11}, m_{12}, m_{13} : fitted instrument characterization parameters (depend on band, MS, detector, scan angle)



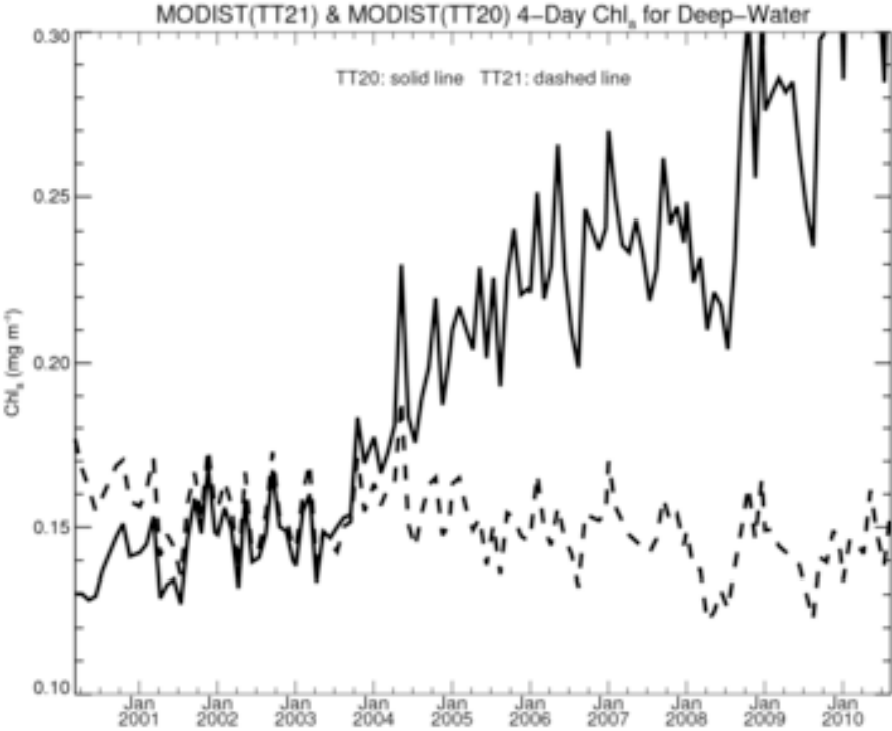
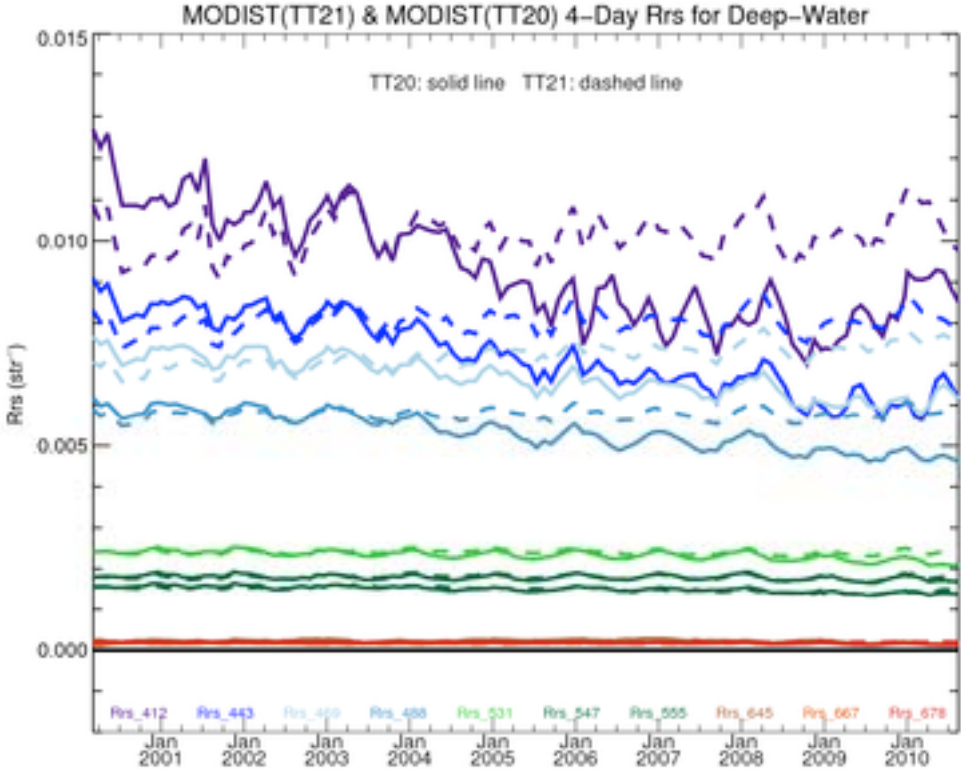
MODIS Terra gain corrections (coll. 5) as a function of time at different view angles at 412nm:



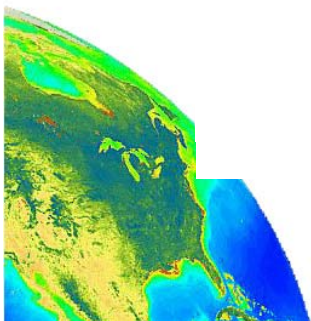
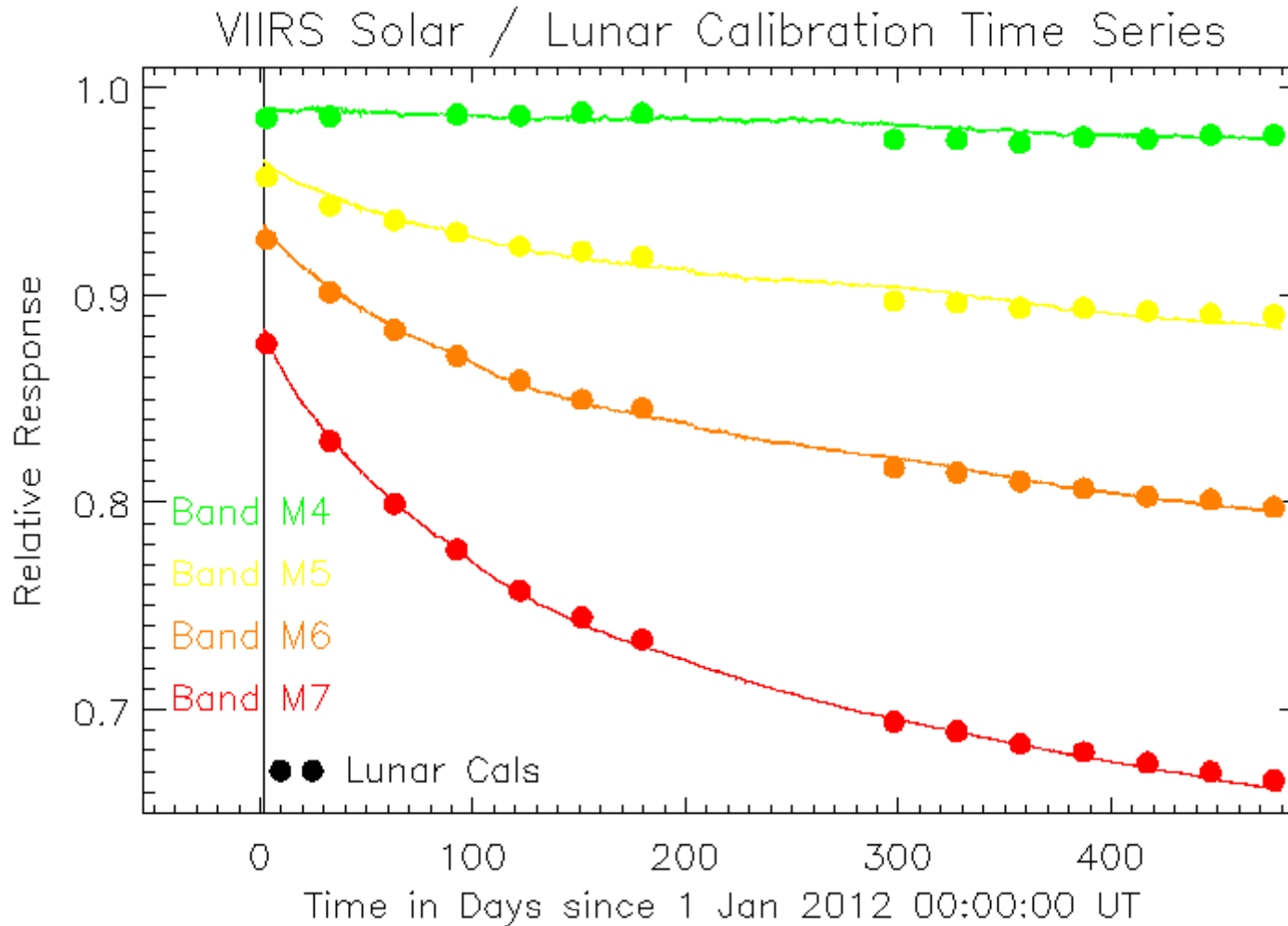
Color coding: Frame/pixel 22 (beginning of scan, lunar),
675 (nadir), 989 (solar diffuser), 1250 (end of scan)



MODIS Terra Rrs (left) and chlorophyll-a (right) with (dashed line) and without (solid line) crosscalibration:



VIIRS Lunar / Solar Comparison (provided by G. Eplee)



Lessons learned:

- Define prelaunch characterization requirements and their purpose
- MODIS design (rotating primary mirror) lead to angle-dependent degradation (SeaWiFS/VIIRS design did/does not)
- Solar diffuser needs to be protected
- Monitor calibration performance with trending of ocean color products

