

A satellite is shown in orbit above the Earth's surface. The satellite has a long boom extending upwards to a smaller instrument. The Earth's atmosphere and clouds are visible below, and the blackness of space is above.

“Surface Reflectance over Land in Collection 6”

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Overview of collection 6 changes/ activities

- Evaluation of Calibration /Level 1B
- Continuous Assessment over the AERONET sites
- BRDF coupling correction (including BRDF database creation)
 - Internal cloud/snow etc.. Improvements
 - Improving the aerosol retrieval/correction
 - Polarization correction

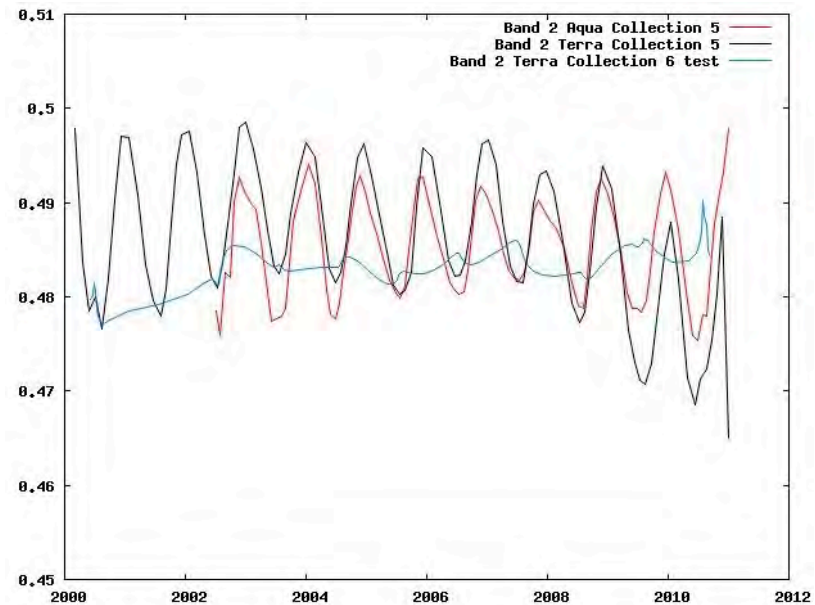
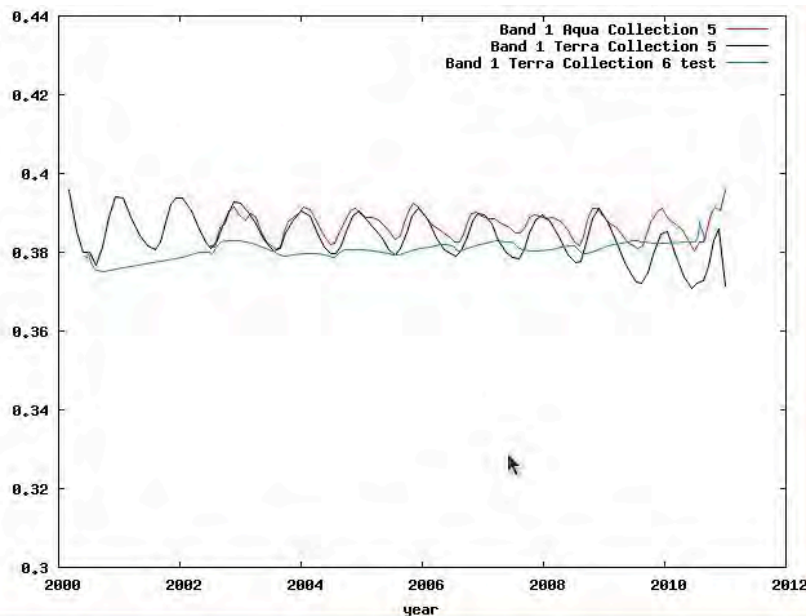
Calibration evaluation monitoring (1/2)

Terra calibration issues

Solar diffuser degradation in NIR $\sim 1.5\%$ (previously assumed non existent) – impact on NDVI (Wang et al.,2012)

Degradation of the mirror function of view of Angle of Incidence (AOI \sim view angle) and mirror side

Polarization sensitivity (AOI and mirror side dependent)



Dongdong Wang, Douglas Morton, Jeffrey Masek, Aisheng Wu, Jyoteshwar Nagol, Xiaoxiong Xiong, Robert Levy, [Eric Vermote](#), Robert Wolfe, Impact of sensor degradation on the MODIS NDVI time series, **Remote Sensing of Environment**, Volume 119, 16 April 2012, Pages 55-61, ISSN 0034-4257, 10.1016/j.rse.2011.12.001.

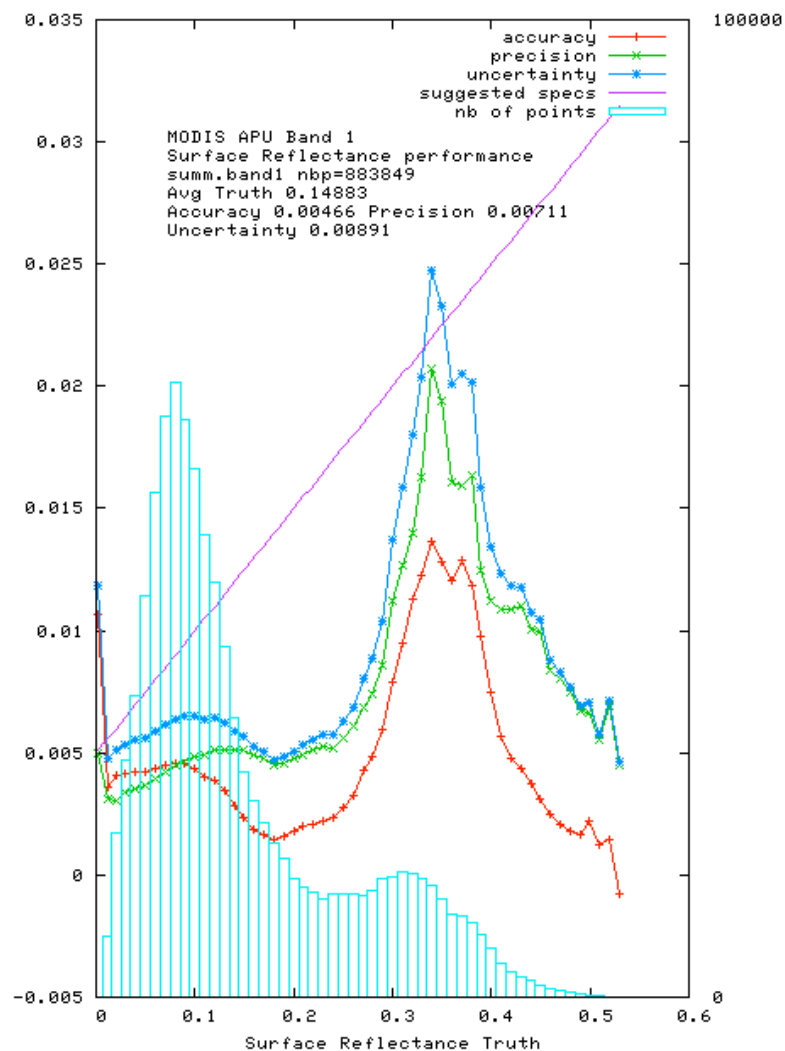
Calibration evaluation monitoring (2/2)

Terra “bad detector” issues

Striping in Terra data apparent over Europe associated with no data flag (GIMMS product) – Issue was fixed in collection 5 by L1B LUT delivery and is fixed in collection 6



Continuous assesment over Aeronet sites (November 2012 update)



Red = Accuracy (mean bias)
Green = Precision (repeatability)
Blue = Uncertainty (quadratic sum of
A and P)

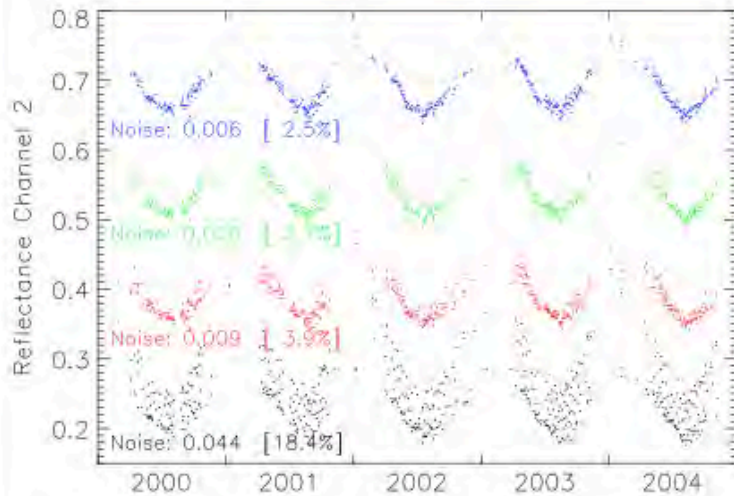
On average well below magenta
theoretical error bar

BRDF/Atmosphere coupling correction

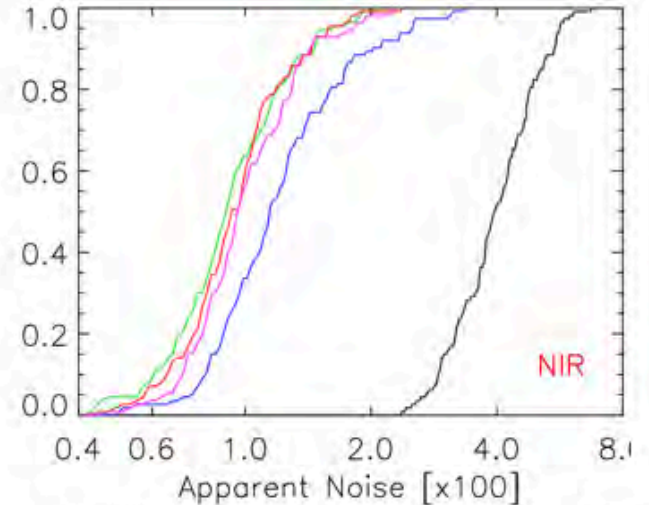
Franch B., Vermote E., Sobrino J.A. and Fedèle E. (2013). Analysis of directional effects on atmospheric correction, Remote Sensing of Environment, 128, 276-288.

Breon, F.M., & Vermote, E. (2012). Correction of MODIS surface reflectance time series for BRDF effects. Remote Sensing of Environment, 125, 1-9.

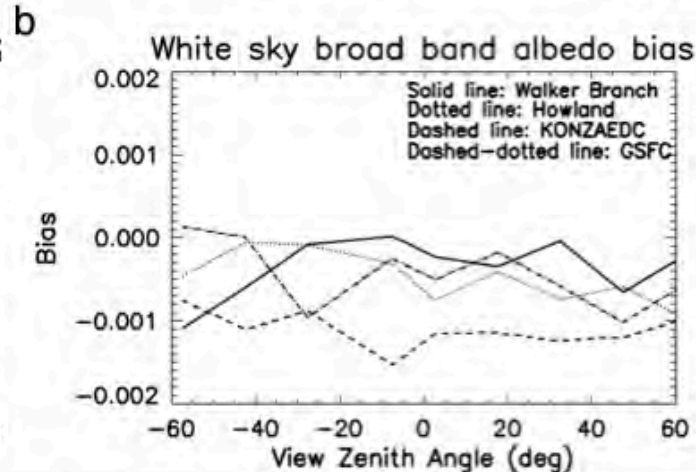
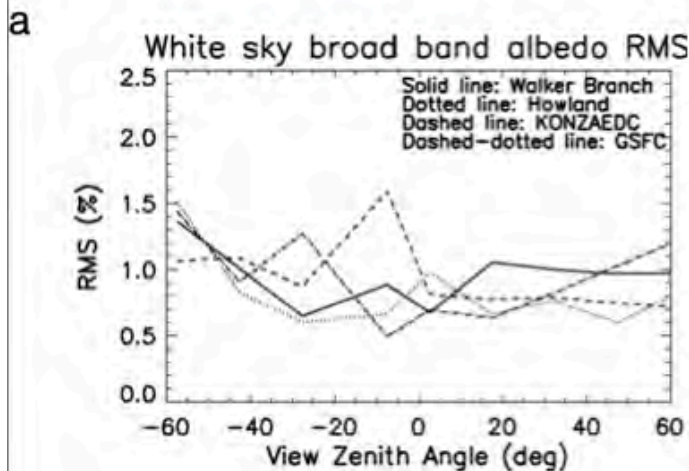
Vermote, E., Justice, C.O., & Breon, F.M. (2009). Towards a Generalized Approach for Correction of the BRDF Effect in MODIS Directional Reflectances. IEEE Transactions on Geoscience and Remote Sensing, 47, 898-908



Time series of surface reflectance derived from Terra/MODIS reflectances at Kaoma (Zambia) for different level of processing.



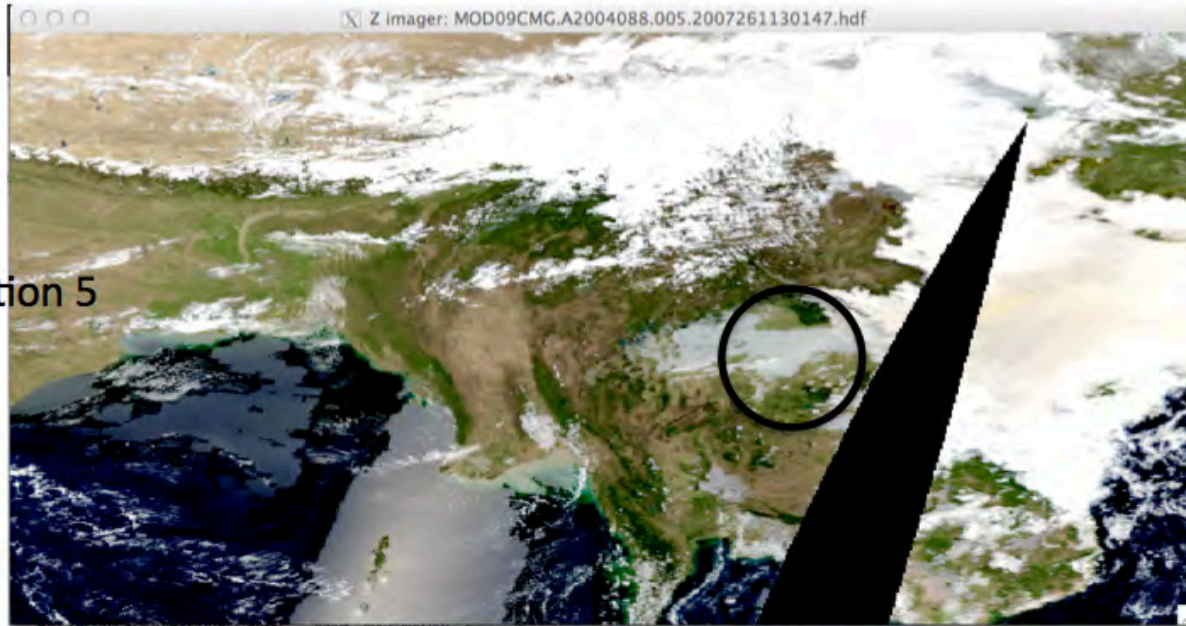
Cumulative histogram of the apparent noise of the reflectance (Black) and corrected reflectance (blue average model, green red and magenta classical and 2009 approach) time series in MODIS Channel 2 (from 2012 paper). Derived from 100 sites over one year.



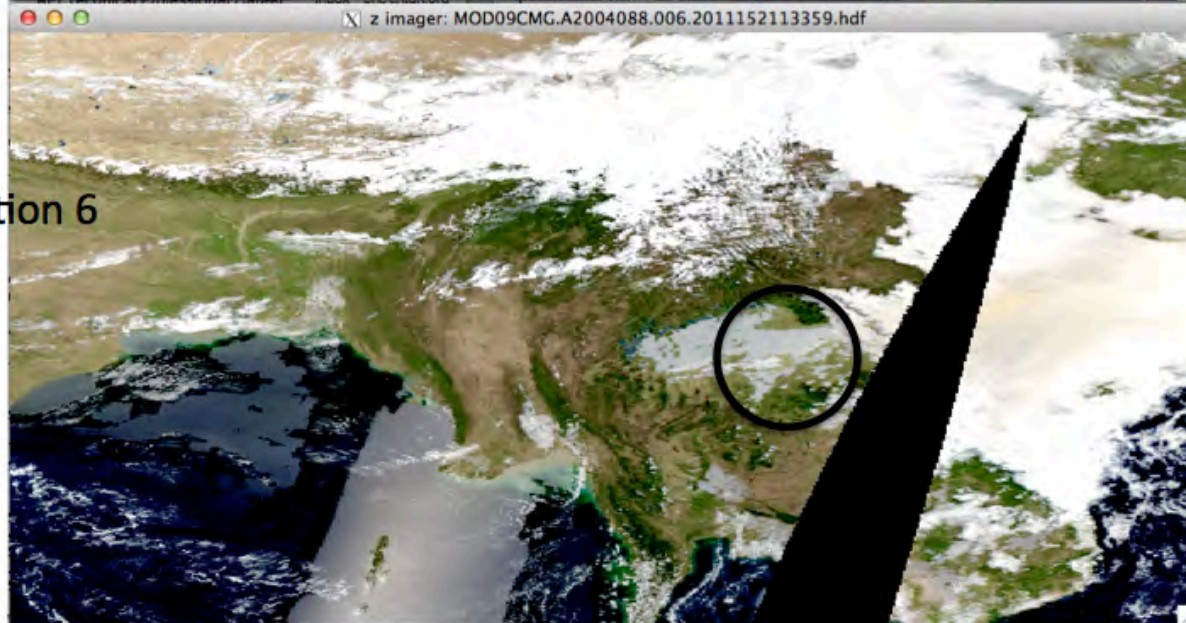
Impact of the coupling atmosphere BRDF on the retrieval of the broad band albedo (a) RMS (b) bias.

Internal cloud mask improvement

Collection 5

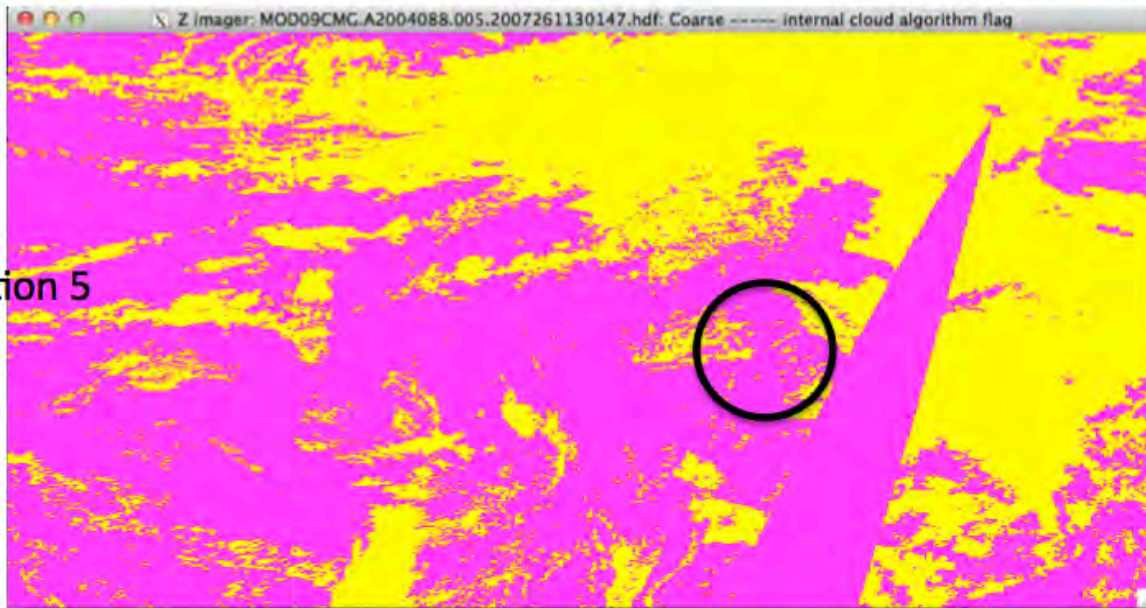


Collection 6



Internal cloud mask improvement

Collection 5

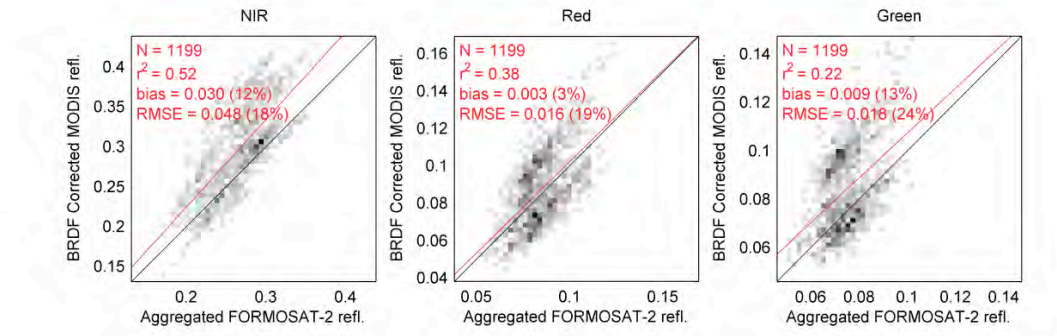


Collection 5 internal Cloud mask flag (yellow) let a substantial amount of cloud go through (leakage)

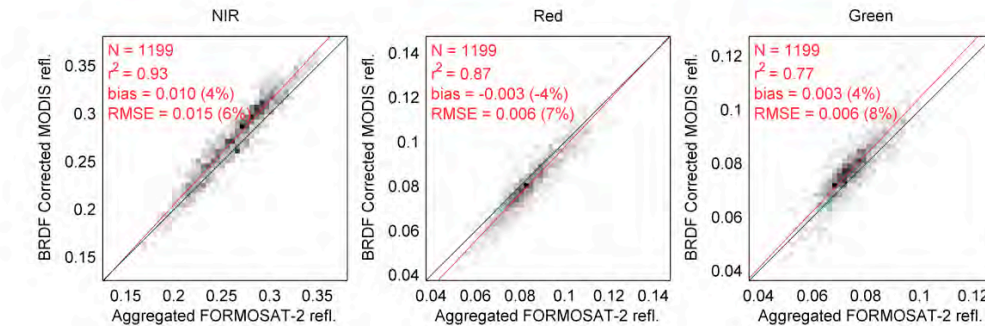
Collection 6



Cross-comparison of MODIS SR with product derived using independent approach 1/2

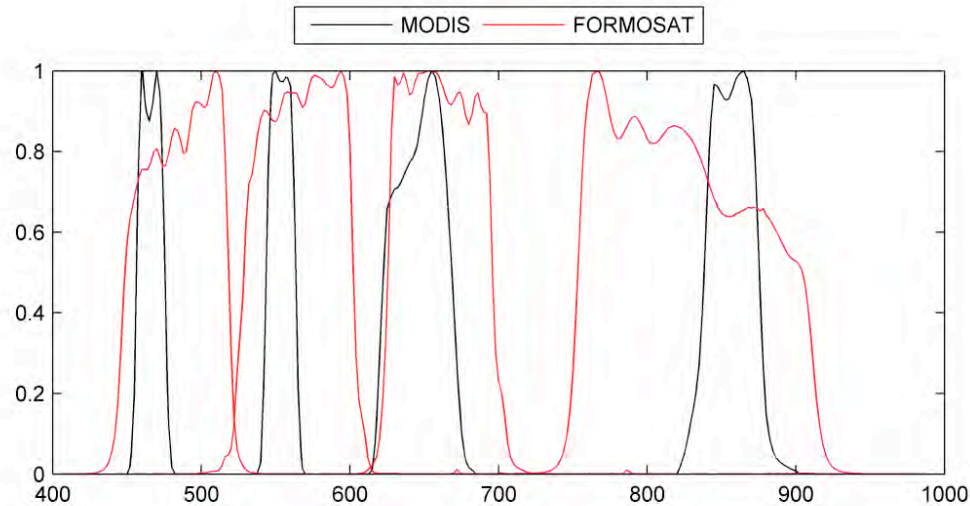


Comparison of aggregated FORMOSAT-2 reflectance and MODIS reflectance. No BRDF correction. Density function from light grey (minimum) to black (maximum); white = no data.

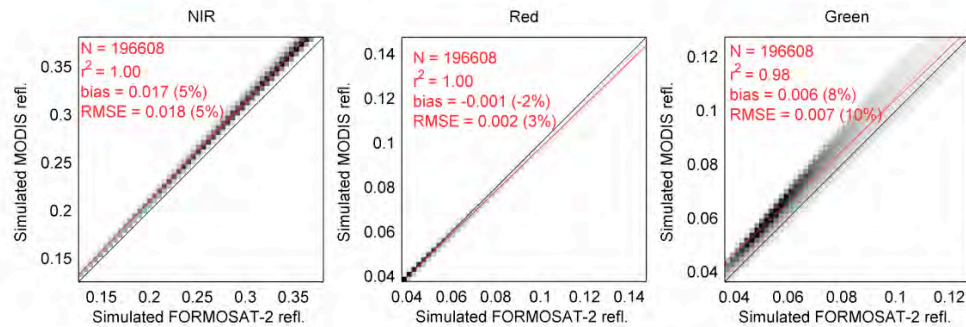


Comparison of aggregated FORMOSAT-2 reflectance and BRDF corrected MODIS reflectance. Corrections were performed with Vermote al. (2009) method using for each day of acquisition, the angular configuration of FORMOSAT-2 data.

Cross-comparison of MODIS SR with product derived using independent approach 2/2



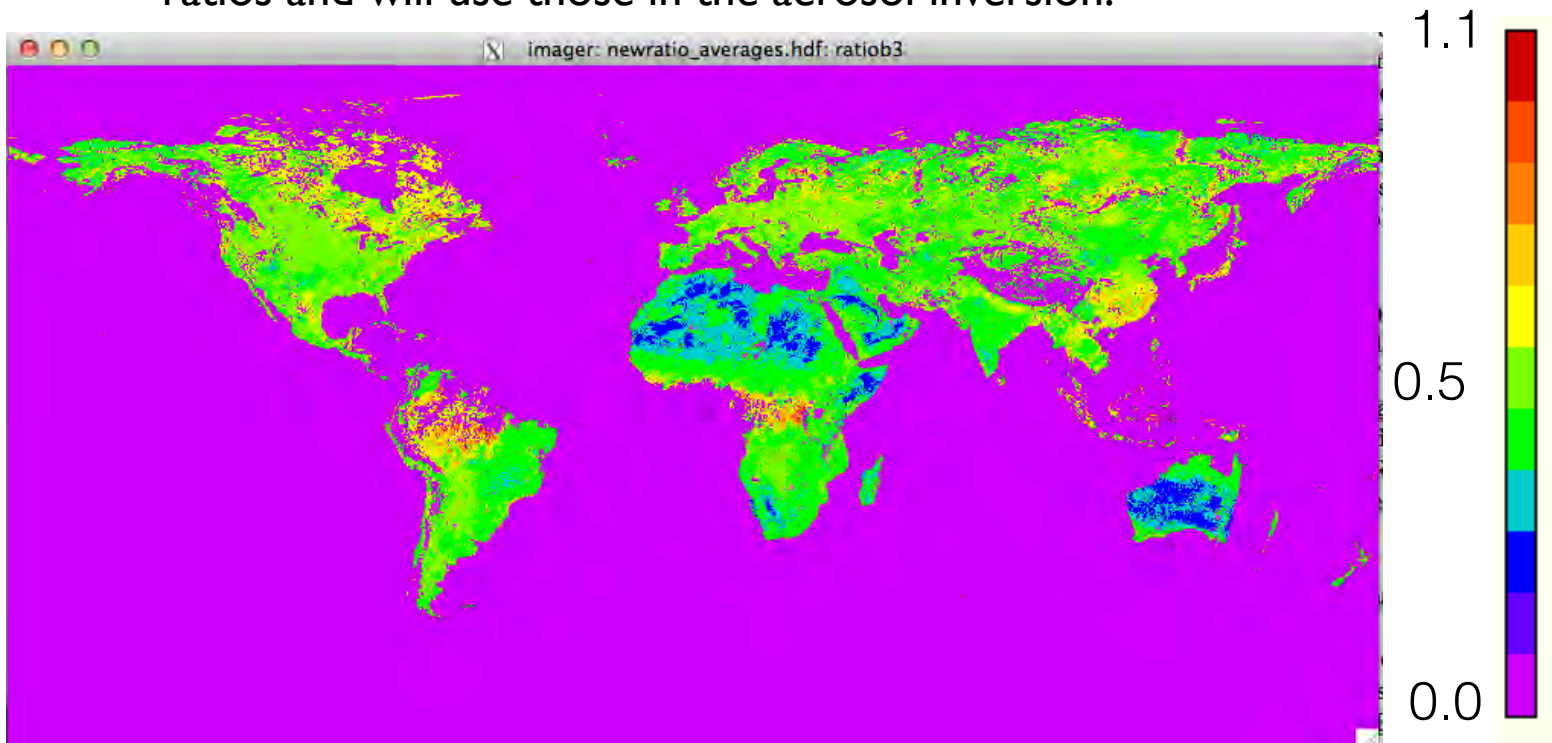
Spectral Bands of MODIS and FORMOSAT-2



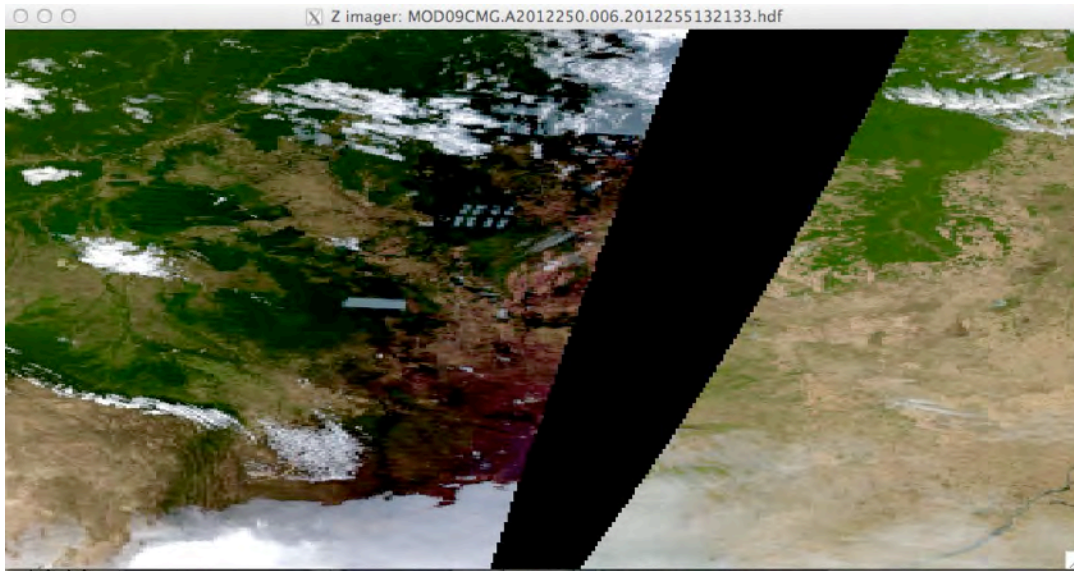
Comparison of simulated FORMOSAT-2 and MODIS reflectance performed with PROSAIL model. The simulated dataset is the same as the one described in Baret et al. (2007).

Improving the aerosol retrieval

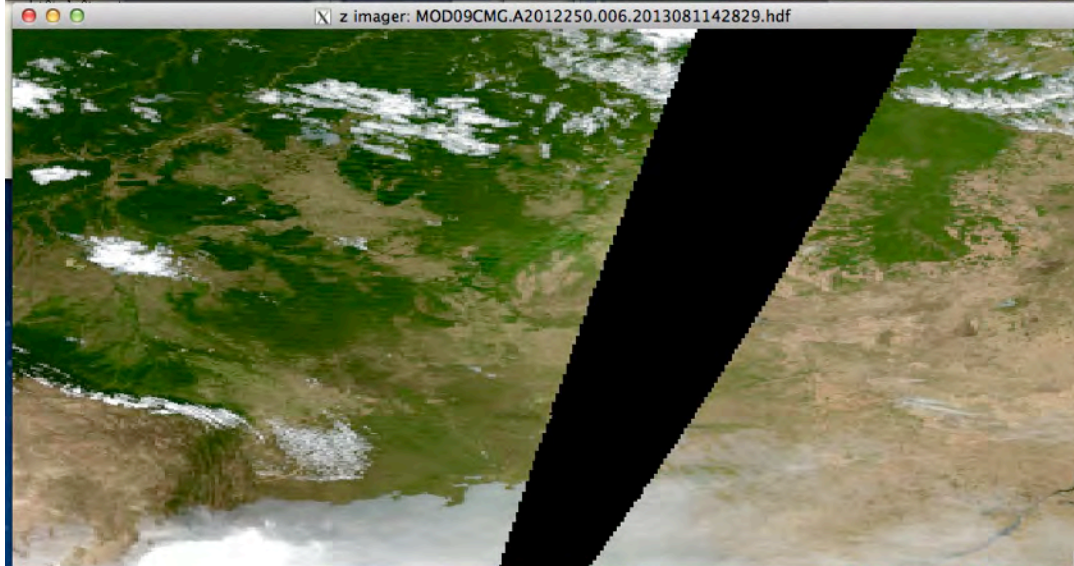
- (a) Revised the aerosol model using the latest result of the AERONET database, in particular the accounting for particles non-sphericity and the version 2, level 2 particles properties inversions. A new model for dust is under development.
- (b) Started Improving the ratio used in the visible and swir used in the inversion. Currently a default value is used globally, that value is adequate for vegetated area but not on sparsely vegetated or desert area, We used the MISR data and the CMG product to produce a spatially explicit CMG climatology of these ratios and will use those in the aerosol inversion.



Polarization effect not as bad as previously thought



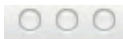
Collection 5 Level 1B
input



Collection 6 Level 1B
input

Conclusions

- Collection 6 development is well on track (BRDF database included, new aerosol by the end of the month)
- New reprocessing of the CMG using C6 Level1B will be critical to address additional correction needed (e.g. Polarization on Terra).
- Cloud mask will be evaluated using CALIPSO and CMG reflectance time series



z imager: MOD09CMG.A2010274.006.2013088203149.hdf



Z imager: MOD09CMG.A2010274.005.2010278052558.hdf

