Vicarious calibration of Aqua and Terra MODIS

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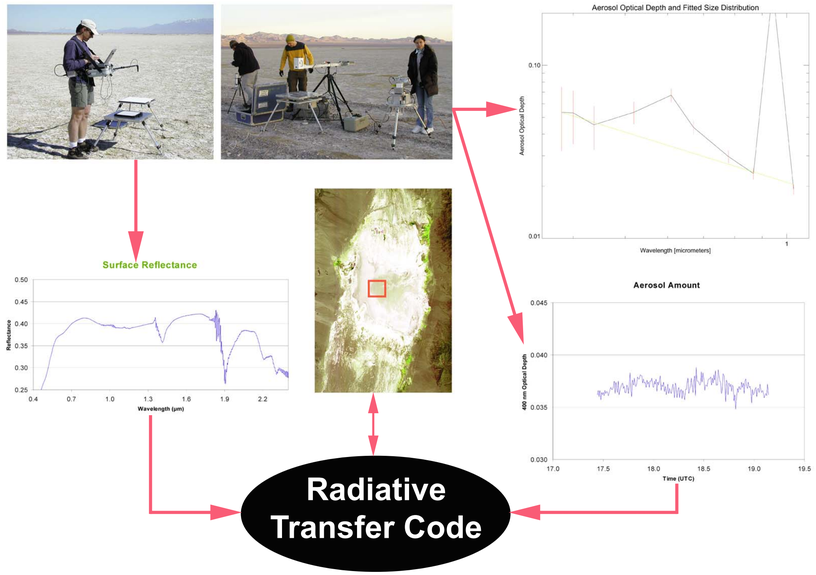
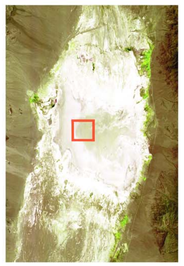
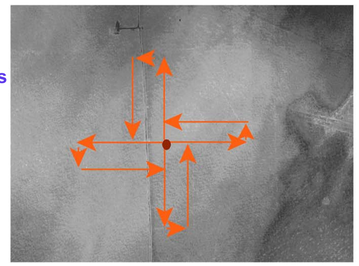
Reflectance-based Approach



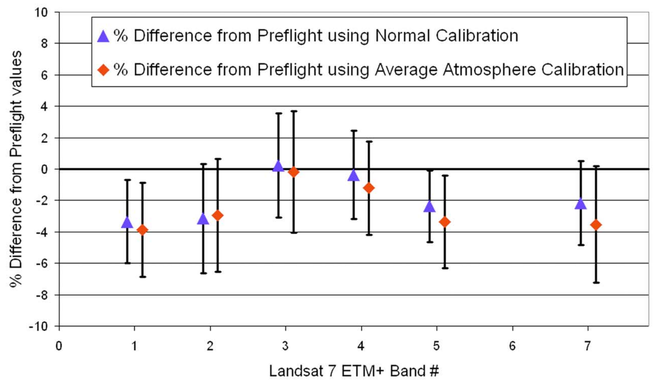


Reflectance-based method applied to large footprint sensors such as MODIS uses a 1-km by 1-km area that is sampled with ground-based spectrometer data as shown in the figure at right. The measurements take approximately 1 hour to complete.



Insensitivity to Atmospheric Characterization

Recent studies have examined the impact that uncertainties in atmospheric characterizations have on the accuracy and precision of the results. The study calculated calibration results using daily measurements of atmospheric conditions as well as with average atmospheric conditions for each of the sites used by the Remote Sensing Group for Landsat-7 ETM+. The results summarized below indicate that the same calibration coefficient is retrieved for both cases indicating that average conditions adequately represent the typical calibration and the results are relatively insensitive to atmospheric uncertainties. Note also that the standard deviations are nearly identical.

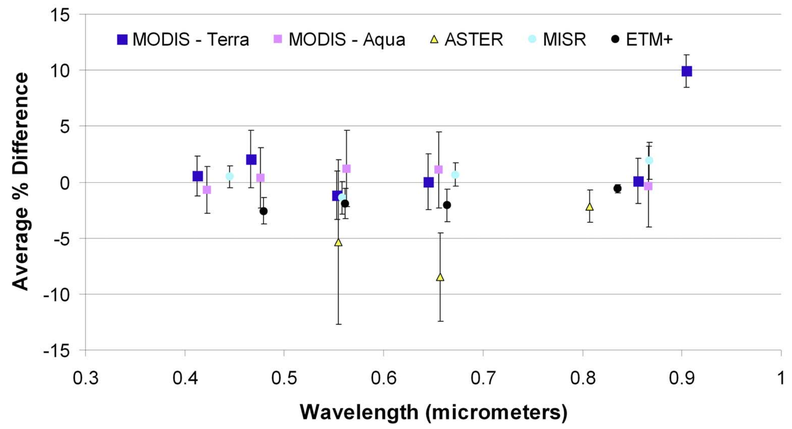


U of A has been using the reflectance-based approach for both Terra and Aqua MODIS relying primarily on the Railroad Valley test site in Nevada.

Method has also been used for numerous other sensors allowing an intercomparison between MODIS and these other sensors.

Approach indicates that the precision is on the order of 3% with a similar level of accuracy.

MODIS versus other sensors

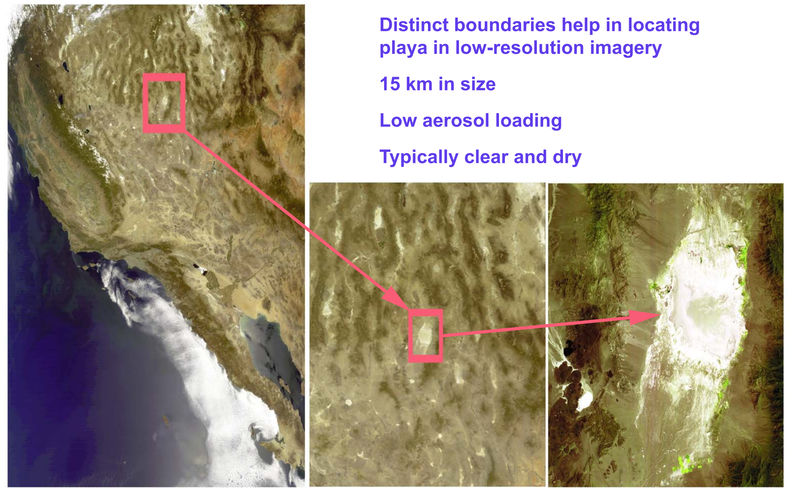


Conclusions

The precision of the reflectance-based results for large-footprint sensors is dominated by registration of the image data to the ground data and by the precision of the surface reflectance measurements. Atmospheric uncertainties play a small role in the overall precision of the method due to the high reflectance and low aerosol loading at the test sites. The precision of the approach is still sufficient enough to allow differences between sensors of as small as 1% to be statistically significant. The results give confidence that the reflectance-based method is an excellent method to ensure consistency of sensors over time and across platforms.

Railroad Valley Test Site

North-central Nevada at elevation of 1.5 km



Distinct boundaries help in locating playa in low-resolution imagery

15 km in size

Low aerosol loading

Typically clear and dry

Automated LED-based reflectance retrieval

Ground-looking automated radiometers have been tested at Railroad Valley Playa to increase the frequency of calibration opportunities. Results below show that values obtained from only three radiometers give results for Aqua MODIS that are similar to those obtained from on-site measurements. Also shown are results from three high-spatial-resolution sensors. These results allow correlation of the ground-instrument measurements to the known area on the ground that is visible in the imagery (see image). The overall conclusion is that issues with noise and other effects in the ground-based radiometers dominates spatial sampling effects.