

A generic aerosol retrieval-atmospheric correction algorithm for MODIS

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Theme: Advanced preprocessing and processing of remotely sensed data

If given a consecutive set of images of the same region of the Earth obtained from space, an untrained human will easily solve many of the remote sensing problems, such as selecting clear-skies areas, identifying clouds, distinguishing between clear and hazy conditions, and so on. What, in contrast to our brain's work, is missing in our algorithms, armed with the modern science, that solving these problems becomes difficult and fraught with uncertainties?

One answer is that the contemporary concepts of aerosol and land surface remote sensing from whiskbroom (MODIS-like) sensors are pixel-based and disregard history of previous measurements. In this case, some important invariants of the atmosphere-surface system are overlooked. One example is a spatial structure (or texture) of the land surface at the landscape level, which generally changes at a very slow rate as compared to the frequency of spaceborne observations.

A new MODIS land algorithm was developed, which uses multi-temporal observations and an image-based rather than pixel-based processing. The new algorithm retrieves aerosol optical thickness simultaneously with surface bidirectional reflectance and albedo. It is generic and works over the dark vegetated and bright non-vegetated world regions with the current exception of snow-covered areas. The algorithm has internal water vapor retrievals and a new cloud mask algorithm. An initial validation shows an excellent agreement of retrievals with AERONET water vapor and aerosol measurements.