A Study of Surface Directional Reflectance Shapes Using MISR

John V. Martonchik, Michael Bull and Van Thai Dang
Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California 91109 USA

e-mail: John.V.Martonchik@jpl.nasa.gov

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MISR (Multiangle Imaging SpectroRadiometer) is an instrument on the EOS Terra platform, which takes data at nine view angles ranging from 70 deg forward to 70 deg aftward in spectral bands centered at 446, 558, 672, and 866 nm. The resulting nearly-simultaneous multiangle, multispectra, radiometrically calibrated imagery has a nominal spatial resolution of 1.1 km and covers the globe in about 9 days. Once the imagery is co-located and co-registered, an aerosol retrieval is performed, followed by an atmospheric correction process which transforms the MISR top-of atmosphere (TOA) multi-angle imagery into spectral land surface hemispherical-directional reflectance factors (HDRFs)and bidirectional reflectance factors (BRFs) as part of MISR's archived surface product.

To facilitate the aerosol retrieval process, it is assumed that the individual multispectral surface HDRF (and BRF) at any given location have the same (or very similar) angular shape. There is some theoretical basis for the justification of this assumption, especially when the multispectral HDRF (or BRF) have similar spectral albedos, but an empirical verification in the context of multiangle remote sensing data needs to be done. This poster presents some results of a study currently in progress to test the HDRF/BRF similarity assumption. It focuses on MISR data, taken at AERONET sites with different surface conditions at the MISR scale of 1.1 km. In contrast to MISR data the AERONET data provide an independent and better constrained determination of the aerosol properties, which then are used to correct the associated MISR TOA imagery for atmospheric effects to produce best estimates (i.e., ground truth) of the AERONET site spectral HDRF and BRF. To understand how the angular shape similarity of the spectral directional reflectance depends on spatial scale, the HDRF and BRF are retrieved at a variety of spatial resolutions, starting at 1.1 km centered at the AERONET site and systematically increasing by pixel averaging around the site to 17.6 km resolution, the spatial scale of the aerosol retrieval. A wide variety of AERONET sites are being analyzed to provide information on how the degree of spectral HDRF/BRF similarity may relate to surface type. Because MISR data has been available since early 2000 to the present, seasonal and secular trends in HDRF/BRF variability also will be investigated.

TO BE PRESENTED AS A POSTER