Quantitative Constraints on Aerosol Optical Properties Over Dark Water from MISR Multi-angle Imaging

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Prior to the NASA Earth Observing System (EOS) satellite launchs, a broad picture of global aerosol distributions was already emerging, from the combination of earlier *in situ* and satellite measurements with transport modeling. One goal of the instruments aboard the EOS satellites is to quantitatively improve our knowledge of the aerosol radiative impacts and transport budgets developed from the pre-launch picture, by better constraining aerosol amounts and types, globally. To address this goal, details of low-light-level instrument calibration, as well as assumed aerosol properties and other attributes of the satellite aerosol retrieval algorithms, must be understood, within a few percent accuracy.

We identified 14 occasions when the Multi-angle Imaging SpectroRadiometer (MISR) instrument aboard the EOS Terra satellite took high-quality data over islands hosting operational AERONET sun photometers, under relatively cloud-free conditions, at times when aerosol optical thickness (AOT), AOT variability, wind speed, and ocean surface reflectance were low. We simulated top-of-atmosphere equivalent reflectances in all 36 MISR channels using AERONET-derived AOT and particle properties, and compared with MISR radiance products. The details of these comparisons raise interesting questions that bear upon the quality of satellite instrument calibration, the nature of data sets required to validate satellite aerosol retrieval algorithms, and about the combinations of measurements needed routinely to achieve quantitative improvements in the aerosol picture over global oceans.

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