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A Decade of MODIS Albedo and Reflectance Anisotropy Products

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The MODIS albedo and reflectance anisotropy products have utilized both Terra and Aqua acquisitions for the last decade. The operational MODIS Albedo and Reflectance Anisotropy algorithm uses all high quality, cloud-cleared, atmospherically-corrected surface reflectances available over a 16 day period at a location to determine the most appropriate Bidirectional Reflectance Distribution Function model at a 500m spatial resolution. Once an appropriate anisotropy model has been retrieved, integration over all view angles results in a directional-hemispherical reflectance (DHR) or a black-sky albedo, at any desired solar angle and a further integration over all illumination angles results in a bihemispherical reflectance (BHR) under isotropic illumination, or a white-sky albedo. These albedo quantities are intrinsic to a specific location and can be combined with appropriate optical depth information to produce an actual (blue-sky) albedo for a specific time, such as would be measured at the surface by field sensors under ambient illumination. The anisotropy models can also be used to compute surface reflectances at any other view or solar zenith angle desired (e.g. they are frequently used to correct multiple swaths for view angle effects and provide nadir BRDF-adjusted reflectances (NBAR) for land cover classification, land use change detection and phenological studies). These spectral quantities can be combined via narrow to broadband conversion coefficients to provide broadband anisotropy information and thus accurate broadband albedos equivalent to those routinely collected in the field with and commonly used in large-scale models. Gapfilled, snow-free versions of the products have been prepared specifically for climate modeling applications by fitting annual curves to all high quality retrievals and using these curves to estimate periods missing due to cloud-contamination and ephemeral snow-cover. More recently the algorithm has been applied to rolling periods of data with emphasis on the most recent observations to more accurately capture the rapid effects of phenology, disturbance, and ephemeral snowfall.