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Surface Downward Short-Wave Fluxes Estimated from MODIS Level-2 Swath Products

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Many attempts have been made to use satellite data to estimate surface shortwave fluxes at both regional and global scales using geostationary satellites to capture the diurnal variability in cloud distributions. Due to their instrument configurations, many of these satellites are limited in their capability to accurately detect cloud or aerosol optical properties that are important elements of the radiation budget. Polar orbiting satellites tend to have higher spatial resolution than the geostationary satellites, as well as more spectrally resolving bands. The MODIS instrument onboard the Terra and Aqua satellites, a state-of-the-art sensor with 36 spectral bands and onboard calibration of both solar and infrared bands has the capability for measuring atmospheric and surface properties with higher accuracy and consistency than previous Earth observation imagers. Therefore, it is important to utilize such observations to evaluate the performance of algorithms applied to satellites that do not provide direct information on cloud and aerosol optical characteristics. The input parameters needed to drive most inference schemes are the column water vapor, column ozone amount, cloud fraction, cloud optical depth, aerosol optical depth and spectral surface albedo. In this study used are Level-2 MODIS Swath Products of cloud (MOD06_L2), aerosol (MOD04_L2), atmosphere profile (MOD07_L2) from Terra with cloud fraction at 5 km resolution, cloud optical depth at 1 km, aerosol optical depth at 10 km, water vapor and ozone at 5 km respectively, spectral surface albedos from the MODIS Bidirectional Reflectance Distribution Function (BRDF) and Albedo Product (MOD43C1) at a 0.05 degrees resolution. Precipitable Water for cloudy pixels are taken from NECP/Reanalysis data and missing aerosol optical depth is filled with information from chemical transport models. The resulting information is used to evaluate the limitations of models that lack such detailed information.