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Intercomparison of surface albedo retrievals from MISR, MODIS, CGLS using tower and upscaled tower measurements using Landsat BRFs

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Surface albedo is of crucial interest in land-climate interaction studies since it is a key parameter that affects the Earth's radiation budget. The temporal and spatial variation of surface albedo can be retrieved from conventional satellite observations after a series of processes, including atmospheric correction to surface spectral BRF, Bidirectional Reflectance Distribution Function (BRDF) modelling using these BRFs, and, where required, narrow-to-broadband albedo conversions. This processing chain introduces errors that can be accumulated and then affect the accuracy of the retrieved albedo products. In this study, the albedo products derived from the Multi-angle Imaging SpectroRadiometer (MISR), Moderate Resolution Imaging Spectroradiometer (MODIS) and Copernicus Global Land Service (CGLS) based on the VEGETATION and now the Proba-V sensors are compared with in situ and upscaled in situ measurements from 19 tower sites from the FLUXNET, SURFRAD and BSRN networks. The MISR sensor onboard the Terra satellite has nine cameras at different view angles, which allows a near-simultaneous retrieval of surface albedo. Using a 16-day retrieval algorithm, the MODIS generates the daily albedo products (MCD43A) at a 500-m resolution. The CGLS albedo products are derived from the SPOT/VEGETATION and PROBA-V, and updated every 10 days using a 30-day window. We describe the newly developed method to derive Directional Hemispherical Reflectance (DHR) and Bi-Hemispherical Reflectance (BHR) directly from tower measured downwelling, upwelling and diffuse shortwave radiation. In the validation process, the MISR, MODIS and CGLS derived DHR/ BHR are first compared with tower measured DHR/BHR using pixel-to-point analysis between 2012 to 2016. The tower measured point DHR/BHR are then upscaled to coarse-resolution DHR/BHR based on atmospherically corrected bidirectional reflectance factors (BRFs) from high-resolution EO data alongside BRFs predicted from a larger area derived from a downscaled MODIS BRDF climatology. Then a pixel-to-pixel comparison is performed between DHR/BHR retrieved from satellite observations and DHR/BHR upscaled from accurate tower measurements. We will present results of experimentation on exploring the parameter space associated with land cover type, heterogeneous vs homogeneous and instantaneous vs time composite retrievals of surface albedo. A parallel paper will discuss the detailed methods for tower and upscaling of albedometer measurements (see Song, Kharbouche, Muller this congress).

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