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Evapotranspiration estimation with MODIS land surface temperature after correction of the angle effect with two MODIS BRDF related products

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Land surface temperature (LST) from remote sensing has been widely used to estimate regional and local scale evapotranspiration (ET). However, remotely sensed LST viewed by the same sensor from different angles would lead to different LST retrievals and this would lead to the deviation in ET estimations with LST as input. The terrestrial surface bidirectional reflectance distribution function (BRDF) are commonly inverted against multiple cloud-free, atmospherically-corrected directional reflectance values that sufficiently sample the anisotropy caused by different view angles. The MODerate-resolution Imaging Spectroradiometer (MODIS) product MCD43A1 contains three-dimensional (3D) data sets and can provide weighting parameters for the models used to derive the Albedo. The MODIS MCD43A4 is reflectance product providing reflectance data adjusted using a bidirectional reflectance distribution function (BRDF) to model the values as if they were taken from nadir view and solar zenith. Here we intend to operate the correction of the angle effect in LST with these two MODIS BRDF related products in ET estimation. The two products are used to provide reflectance with consistent view angle and with solar zenith of satellite sensor and 0° solar zenith, respectively, and then corresponding fractional vegetation cover (FVC) are calculated with two kinds of corrected reflectance, respectively. Combining the soil temperature (T_s) and vegetation temperature (T_v) components which are separated from MODIS LST and have no directional effects with the corrected FVC, the nadir LST (with solar zenith of satellite sensor and 0°solar zenith, respectively) were obtained. Finally, ET were estimated with the surface energy balance system (SEBS) model using the remote sensed LST and the two kinds of corrected LST as input, respectively. The results showed that compared to ET measurements, the ET estimations with two kinds of corrected LST as input performed much better than that with uncorrected LST as input, and ET estimation with corrected LST in which FVC are calculated from MCD43A1 had highest accuracy.