A Modified Trapezoidal Framework Model for Partitioning Regional Evapotranspiration

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April 28, 2020

Abstract

While evapotranspiration (ET) is normally measured as one hydrologic component, evaporation (E) and transpiration (T) result from different physical-biological processes. In the two-source model, a trapezoidal framework has been widely applied in recent years. The key to applying the trapezoidal framework is the determination of the dry/wet boundaries of the land surface temperature-vegetation coverage trapezoid (LST-fc). Although algorithms have been developed to characterize the two boundaries, , there still, however, exists a significant uncertainty near the wet boundary which scatters in a discrete and uneven manner. It thus is difficult to precisely locate the wet boundary. To tackle the problem, a Wet Boundary Algorithm (WBA) was developed in this study and the algorithm was applied in the region of Huang-Huai-Hai plain of China by using Pixel Component Arranging and Comparing Algorithm (PCACA) to retrieve ET from MODIS Data. The latent heat flux (LE) observed by eddy covariance (EC) measurements from China FLUXNET was used to verify the modified model where the coefficient of determination (R2) was found to 0.81 and the root-mean-square-error (RMSE) was 22.8 W/m2. The ratio of transpiration to evapotranspiration (T/ET) varied between 0.5-0.75 over the region of Huang-Huai-Hai plain. The spatial and temporal distribution of ET revealed that agriculture practices had a great influence on the hydrological cycle.

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