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Estimating daily evaporation and transpiration at field scale (100 m) based on TSEB and data fusion using MODIS and Landsat data in irrigated agriculture area

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In semiarid and arid regions, irrigated agriculture consumes most of water resources via evapotranspiration (ET) that mainly consists of evaporation (E) from bare soil and transpiration (T) from plant tissue. Generally, T is regarded as beneficial water use that contribute to plant production but E is considered as water waste. Therefore, daily ET and ET components E and T at filed scale are often required for improving water resource management strategy in semiarid and arid regions. Recently, time-continuous daily ET at filed scale have been achieved based on remote sensing-based ET model and multi-satellite data fusion, but few study focus on estimating of daily field-scale ET component of E and T. In this study, a daily filed-scale ET partitioning method based on the two source energy balance (TSEB) model and the spatial and temporal adaptive reflectance fusion model (STARFM) was applied and verified in a typical arid area dominated by irrigated cropland and natural desert. The comparisons of instantaneous land surface fluxes and daily ET modeled from proposed method and that derived from eddy covariance (EC) systems and automated weather stations (AWS) set up in irrigated cropland and desert indicate that reasonable surface fluxes partitioning and daily ET can be estimated by using this method. The root mean square error (RMSE) for cropland and desert are 0.87 mm and 0.84 mm, respectively. Evaluations of E and T partitioning capabilities of this proposed method based on E/ET and T/ET derived from isotopic technology at the irrigated cropland site show that the modeled E/ET and T/ET agree well with observations in terms of both magnitude and dynamics. Finally, the multi-year spatiotemporal patterns of modeled ET, E and T at filed scale with reasonable seasonal variation and spatial diversity were produced using the ET partitioning method to provide reasonable information for monitoring water use in study area.