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Partitioning of evapotranspiration in four grassland ecosystems with a two source model

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Introduction The Shuttleworth-Wallace model (S-W model) (Shuttleworth and Wallace, 1985) is a two source model well known for its good performance on partitioning ecosystem evapotranspiration (ET) into soil evaporation (E) and vegetation transpiration (T). However, its applications on China's grasslands and for long periods are rarely documented. In this study, we use this model to estimate ET and the two components E and T over 2~3 continuous years on four grassland ecosystems in China.

Results and discussion Based on outputs of the model, the spatiotemporal dynamics of E/ET were described as well. Results indicated that modeled ET for the four ecosystems agreed well with the eddy covariance measurements at the half-hourly, daily and annual timescales, suggesting a good performance of the S-W model over a long-term period on China grasslands. Diurnally, E/ET was high in the morning and afternoon, and low in the late morning. Seasonally, E/ET decreased with the progress of growing season and declined after the active periods. Processes controlling the dynamics of E/ET at different timescales were different. Half-hourly, E/ET was mainly controlled by canopy conductance, and seasonally and interannually, the leaf area index (LAI) was the main controller. In general, E accounts for a great proportion of ET on typical grasslands in China. E/ET ranged from 0.1 to 0.57 during the peak growing seasons and totally 0.52~0.74 for the whole year.

Reference

Shuttleworth WJ, Wallace JS. (1985). Evaporation from sparse crops-an energy combination theory. Q. J. R. Meteorol. Soc., 111, 839-855.