Estimates of evapotranspiration using Two-Source Energy Balance (TSEB) and a distributed hydrological model

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The combined use of remote sensing and a distributed hydrological model have demonstrated the improved understanding of the entire water balance in an area where data are scarcely available. This is especially meaningful in semi-humid and semi-arid areas where evaporation dominates the water balance. In this paper , Penman–Monteith approaches was firstly employed and then, TSEB, a two-source (soil + vegetation) energy balance model, which explicitly evaluates soil and vegetation contributions to the radiative temperature and to the net turbulent exchange/surface energy balance was used with Landsat-TM data to estimate the daily actual evapotranspiration of a selected sub-basin of Taoer river basin with heterogeneous landscape in Northeast China.

The accuracy of ET estimates from remote sensing-based models of the selected watershed was evaluated in terms of SWAT-based ET. The ET estimates from the two methodologies are shown to be comparable. Then a detailed sensitivity analysis of the TSEB approach to typical uncertainties in the required inputs was conducted indicating greatest model sensitivity to soil and canopy temperature uncertainties with high relative errors in latent heat flux estimates. And the secondary important were fractional vegetation cover for TSEB. This was because the TSEB model had to be resolved under some assumptions when the temperatures of the soil and vegetation components can not be acquired directly and therefore suffered greater uncertainty in the determination of resistances and also in the input parameters derived from remote sensing data, e.g. fraction coverage. A rigorous analysis of the estimation of spatial variation in evapotranspiration with these different methods was also conducted.

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