

Parameters Estimation of Coupled Water and Energy Balance Model Based on Stationary Constraints of Surface States

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The approach used here is built on conditional averaging of the water and energy balance equations. After doing conditional averaging to the fluxes at the land surface with respect to the moisture and temperature, we can express an objective function about temperature and moisture dependent errors in the energy and water fluxes in terms of atmospheric forcing (precipitation, radiation and wind speed), surface states (moisture and temperature) and some unknown parameters. Due to the equilibrium of the moisture and temperature state in long time series, we can estimate the parameters of the coupled water and energy balance model by minimizing this objective function. The parameter estimation strategy is proposed and proved working well by previous research in only water balance situation (Salvucci, 2001). Now we extend the idea to the coupled model of water and energy balance. Here we take the data from Ameriflux sites as a test case. Considering the imperfection of the measured data, we use outlier detection method based on Mahalanobis distance to calibrate the data used in the model. Also, we introduce MODIS/Terra leaf area index (LAI) data to describe the canopy related term in our model since there is no LAI data measured in Ameriflux. The results demonstrate that the flux models are simulated correctly through the method. Moreover since this method is considered only from stationary constraints of both temperature and moisture, it is scale free. That is, the model parameters can be estimated at the scale where the data are used.

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