

Estimation of sensible and latent heat flux by assimilating MODIS LST products

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To estimate the sensible and latent heat flux of a region is very important to global changes research. To clarify the land-atmosphere interactions over the global, many projects were initiated to observe fluxes globally. However, the monitoring network over the global is sparse and there is a need to upscale the sensible and latent heat flux from the observational plot-scale to a region. Land surface model has the ability to estimate continuous regional fluxes, but its output is contaminated by uncertainties of the model's parameters, model structure and forcing data. Remote sensing approaches can estimate flux accurately over a region, but remote sensing data is instantaneous. Assimilate the remote sensing data to a land surface model can produce continuous regional and accurately fluxes.

In this paper, we develop a land data assimilation scheme based on ensemble Kalman filter and Common Land Model. This scheme is used to improve the estimation of soil temperature profile and surface fluxes. The leaf area index (LAI) is also updated dynamically by MODIS LAI production and the MODIS land surface temperature (LST) products are assimilated into CLM. In this study, we relate the MODIS LST and the CLM surface temperature and take it as the observation operator of the assimilation scheme. We compare the ground temperature in situ observations with the MODIS LST, and take the RMSE (Root Mean Square Error) as the observation error. The scheme was tested and validated based on measurements from these observation stations: Ameriflux net (Blackhill, Bondville, Audubon), CEOP (Lindenberg, Tongyu, Tibet), GEF (Guantao). Results indicate that data assimilation method improves the estimation of surface temperature and sensible heat fluxes. In addition, assimilation of MODIS land surface temperature into land surface model is a practical way to improve the estimation of sensible and latent heat flux.

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