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Estimation of evapotranspiration over heterogeneous surfaces based on HJ1B satellite data in China

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The HJ1B satellite of China is equipped with two CCD cameras with 30m resolution and one infrared multispectral camera with 300m resolution. And the revisit period of HJ1B satellite is 4 days. Compared to MODIS or TM, HJ1B data has the advantage of high spatial-temporal resolution. Methodology based on the one-source energy balance model was developed for net radiation (Rn), soil heat flux (G), sensible heat flux (H) and latent heat flux (LE) estimation from HI1B data. The core procedure is a scheme that was designed for correcting the spatial scale error over heterogeneous surfaces by taking advantage of the HJ1B data characteristics, i.e. high resolution CCD data (30m) along with thermal data (300m). First of all, a regression relationship between Ts and NDVI was built up at 300m resolution based on the data of Ts and NDVI of the selected "pure" pixels. And then the relationship function was applied at 30m resolution to derive Ts at high resolution, i.e. at the subpixel level. Furthermore, the 30m land class data was also used in the parameterization of surface energy balance and surface aerodynamic transfer, which is important since significant error may be resulted by using one land class type to represent the whole mixed pixel. By using high resolution NDVI and land class data, we are able to mitigate the spatial scale error of the mixed pixels at 300m resolution. At last, the 300m surface energy fluxes were obtained by aggregation of the 30m estimation.
HJ1B data at Hai river basin in north China in 2010 were used to verify this method. The eddy-correlation system data were used as validation. The results of the method were compared with the results of a simple method that estimates the fluxes at 300m by aggregating all of the input parameters to 300m. It is shown that the method proposed in this study shows higher agreement with in-suit measurement, and the fluxes maps also show much more details of the spatial variation. By using this method, it can be sure that each end member (30m pixel) was not ignored or exaggerated in the estimation of the pixel fluxes. The HJ1B method has the ability to capture the land surface heterogeneities, and mitigate the uncertainty produced by spatial scale problem. So it can be used to estimate surface heat fluxes with higher accuracy.