

Time scale and influencing factor variations of Water and Heat fluxes in Sandy Land

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Abstract

The transfer process and variation characteristics of water and heat fluxes play an important role in both ecosystems function and climatic patterns of arid and semi-arid areas. However, both water (latent heat flux, Fe) and heat (sensible heat flux, Fh) fluxes and the impact factors have different time scales. Therefore, the wavelet transformation was used to reconstruct water and heat flux data measured by an eddy covariance system installed in Horqin sandy land, China. Then the distribution and response regularity of water and heat flux to the control factors were analyzed under different time scales. The results indicated that the responses of Fe and Fh to controlling factors were similar on 30min and daily scales, in which the energy terms (net radiation, Fn and available energy, Fa) showed extremely significant positive contribution. The part of water condition (vapor pressure deficit, VPD and relative humidity, RH) were the main influencing factors at monthly scale. At the seasonal scale, Fe was positively correlated with Fa and Fn, but negatively correlated with soil heat flux (Fg), RH and wind speed (WS). On the contrary, Fh was positively correlated with RH, but negatively correlated with Fn. At the annual scale, Fe and Fh showed a significant positive correlation with all factors. Generally, at the daily and annual scales, there is a high correlation between Fe, Fh and the control factors, and exhibits pronounced periodicity. These results suggest that the time scales of flux and impact factors should be both considered when doing water and heat fluxes analysis of sandy land or others ecosystem.

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