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Evapotranspiration Measurements over Different Surfaces in the Heihe River Basin

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Based on observations of eddy covariance systems (EC) and large aperture scintillometer (LAS) conducted over the Heihe River Basin in 2008, China, diurnal /seasonal variations of energy and water fluxes, especially characteristics of evapotranspiration (ET) over different surfaces are analyzed, namely, oasis cropland (Yingke site, for short YK site), alpine meadow (A'Rou site, for short AR site), and spruce forest (Guantan site, for short GT site). Besides, the source areas of EC and LAS are calculated for different sites and reasons of the difference between sensible heat fluxes measured by EC and LAS are discussed. The results show that the source areas of EC are different among the sites, while the main contributing areas concentrate on a scope of 500m around the EC point. The main contributing area for LAS distributes perpendicular to the path length and about 250m apart from it. The underlying surfaces in the source area change obviously in the plant growing season and non-growing season at all sites. There are clear diurnal and seasonal variations of energy and water fluxes at all sites. Sensible heat flux is the main energy consumption during plant non-growing seasons. During plant growing seasons, latent heat flux dominates the energy budget at YK and AR sites, and obvious "oasis effect" is observed at YK site. In the GT site, sensible heat flux is the dominant component of energy budget all the time. ET at YK site is larger than those at the other two sites (the maximum daily ET is larger than 6mm), while ET at GT site is relatively small (daily ET is less than 4mm). The monthly ET reaches the peak value in July, August and June for YK, AR, and GT site, respectively. Sensible heat flux measured by LAS at AR site is generally larger than that of EC measurement at the same site. The reason, besides the differences of the overlapped source areas of EC and LAS systems and heterogeneity of the underlying surfaces, is the contribution of larger eddies to the energy transport, which can't be measured by EC system.

KEY WORDS: evapotranspiration; eddy covariance system; large aperture scintillometer; different scales