Characteristics of the Nocturnal Surface Fluxes in Semi-arid Area, Mongolia

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At night, the ground surface temperature is usually lower than the air temperature because there is no radiation heating by the sun, and thus atmosphere becomes stable. As a result, the vertical mixing of evaporated water vapor, heat transfer and pollutant emission tend to be suppressed at night. If pollutant substances exhaust into the air near the ground through day and night, these are deposited on the ground surface at night. However, we do not have perfect understanding about the nocturnal boundary layer which is in stable condition. It is an object of this research to make clear the characteristics of the nocturnal surface fluxes. The data were measured by the automatic observation station in Mongolian steppe area. The wind velocity components, virtual temperature, water vapor content were measured at high frequency. These data were used for calculating surface fluxes by applying eddy correlation methods and their quality was first tested by a stationary test. Friction velocity and virtual sensible heat fluxes which were estimated from profile equation with the new stability functions (Cheng and Brutsaert, 2005) were compared with those by eddy correlation method. It was found that only high quality data that satisfy the stationarity requirement showed a good agreement. The high quality data were only 32 % of the tested night data. The virtual sensible heat fluxes and latent heat fluxes were estimated by time series variation with the high quality data. The fluctuation of estimated surface fluxes was found to correspond well to the variation of the fluxes which were calculated by eddy correlation method. Although the input data for estimation by time series variation included low quality data, there was a good agreement for estimated data and observed data if the initial data for estimation is stationary.