



Energy and matter exchange in an atmosphere-ecosystem over a complex terrain in Korea

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Increasing anthropogenic impacts on natural and managed ecosystems have been modifying ecosystem functions and having an apparent influence on ecosystem services. A joint education and research activity between Germany and South Korea, called Complex TERRain and ECOlogical Heterogeneity (TERRECO), is running to evaluate ecosystem services in production versus water yield and water quality in mountainous landscapes.

As a sub-program of TERRECO, this study is focused on a better understanding of the energy and matter exchange above farmlands (both flooded and dry) during the whole growing period including the monsoon season in such a complex terrain as Haean Basin in Korea. Field work and preliminary data processing were carried out in 2010.

An eddy covariance complex (USA-1, LI-7500) was installed in Haean Basin to collect the fluctuation of the 3D wind vector, water vapor and carbon dioxide concentration at a sampling frequency of 20 Hz. It was running continuously and moved between a typical rice field and a typical potato field every other half a month from June to October in 2010, to obtain the turbulent atmospheric flux data of both wet and dry surfaces. Biomass was sampled manually at both fields. Two automatic weather stations and a net radiometer were measuring the basic meteorological parameter and the net radiation simultaneously. A post-processing software packages called TK2, developed by University of Bayreuth, is used to obtain reliable sensible and latent heat and carbon dioxide fluxes with a high standard in data quality. In addition, the footprint analysis gives an opportunity to track the spatial contribution of the surrounding land use to the observed heat and CO₂ fluxes helping to interpret the data.

Preliminary results are obtained. Useful data will be picked out to determine the variability of the stratification of the near surface boundary atmospheric layer to better understand the process of evaporation and the NEE (Net ecosystem exchange) above farmlands in a monsoon driven climate. This information could be used to compare different approaches of surface exchange studies (e.g. chamber measurements), and will be integrated into the relating models.

Preliminary results show that more than 80% of the data have a high quality (quality class 1 to 6), and low-quality data mostly occur during night time when the atmosphere is stable. The NEE generally increases with the growing of crops, but decreases during rain events. Compared to the rice field, there are larger CO₂ and sensible heat fluxes and similar latent heat fluxes over the potato field. The footprint model shows that the fluxes over the potato field are influenced slightly by the adjacent cabbage field. Further analysis for the data is expected.