Spatial assessment of atmosphere-ecosystem exchanges via micrometeorological measurements and footprint modelling over complex terrain

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Anthropogenic impacts on natural and managed ecosystems have increased seriously during recent years. Ecosystem functions are modified as a result, which have an apparent influence on ecosystem services. TERRECO, a joint activity of the University of Bayreuth, Kangwon National University in Korea, and Korean Forest Research Institute, focuses the goal on building a bridge between ecosystem performance in mountainous terrain and derived ecosystem services that are critical for human well being.

As a sub-program of TERRECO, our study is concentrated in Haean-Myun Catchment, an intensively used landscape within the Soyang Lake watershed including Soyang Lake Reservoir, and a sub-catchment of the Han River system which drains 26% of the land surface of South Korea. The aim of our study is to better understand the energy and matter exchange above farmlands (rice fields and/or dry crops) during the whole growing period including monsoon seasons in such a complex terrain as Haean Basin in Korea. To determine reliable evaporation and net ecosystem exchange (NEE), and to determine reliable information about near surface atmospheric stratification conditions, including convective events in Haean Basin, an eddy covariance complex (USA-1, LI-7500) will be installed above a typical farmland in Haean Basin to collect the 3D wind vector, water vapor and carbon dioxide concentration. It will be running at a sampling frequency of 20 Hz continuously, from late April to October in 2010. A post-processing software packages called TK2 will be used to obtain reliable sensible and latent heat and carbon dioxide fluxes with a high standard in data quality. Ongoing Footprint analysis will give an opportunity to track the spatial contribution of the surrounding land uses to the observed heat and CO2 fluxes helping to interpret the data. 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 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.