



University of Bayreuth

# Complex Terrain and Ecological Heterogeneity (TERRECO): Evaluating Ecosystem Services in Mountainous Landscapes

## Spatial assessment of atmosphere-ecosystem exchanges via micrometeorological measurements and footprint modelling



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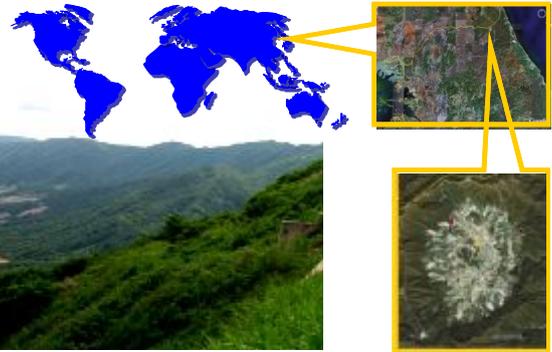
### Introduction:

Anthropogenic impacts on natural and managed ecosystems have increased to alarming levels during recent years. Ecosystem functions are modified as a result, which has an apparent influence on ecosystem services, i.e., agricultural and forest products, water discharge into rivers and streams, water quality, biodiversity, etc.. TERRECO, a joint activity of the University of Bayreuth in Germany, 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 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 .

### Objectives:

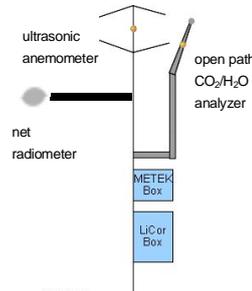
- To better understand the energy exchange above dominant farmlands (rice fields and dry crops) during the whole growing period including monsoon seasons in Korea
- To understand the sensible and latent heat fluxes in such a complex terrain as Haean Basin
- To determine reliable evaporation and net ecosystem exchange (NEE) above farmlands
- To determine reliable information about near surface atmospheric stratification conditions, including convective events in Haean Basin



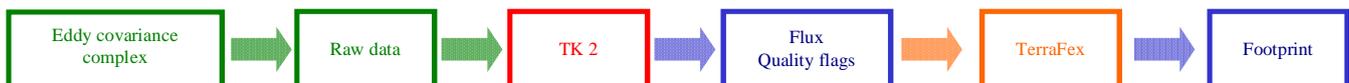
### Methods:

A mobile eddy covariance complex (USA-1, LI-7500) will be installed in Haean Basin to collect 3D wind vector, water vapor and CO<sub>2</sub> concentration at a sampling frequency of 20 Hz continuously to obtain the sensible and latent heat and CO<sub>2</sub> fluxes. It will be moved between a typical rice field (24% of the fields in Haean) and a typical potato (12%) or cabbage (14%) field from May to October in 2010 to obtain information of both important agricultural areas. Biomass of rice and potatoes or cabbage respectively will be sampled several times and a net radiometer will measure the net radiation simultaneously. A post-processing software package called TK2 will be used to obtain reliable fluxes with a high standard in data quality.

An ongoing footprint analysis package called TerraFex using forward Lagrangian stochastic (LS) trajectory model will give an opportunity to track the spatial contribution of the surrounding land uses to the observed heat and CO<sub>2</sub> 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 evapotranspiration and 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.



Matrix Landuse  
Matrix Roughness Length



### References:

TERRECO homepage: <http://www.bayceer.uni-bayreuth.de/terreco>  
 Göckede, M., Markkanen, T., Hasager, C.B. and Foken, T. (2006). Update of a footprint-based approach for the characterisation of complex measurement sites. *Boundary-Layer Meteorol.*, 118:635-655.  
 Mauder, M., Foken, T. (2004): Documentation an instructional manual of the Eddy Covariance Software Package, *Arbeitsergebnisse* 26. ISSN 1614-8916, 44 pp.