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

Atmospheric turbulent energy flux measurements in South Korea 2010

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Objectives

- To understand the sensible and latent heat fluxes in such a complex terrain as Haean Basin, South Korea

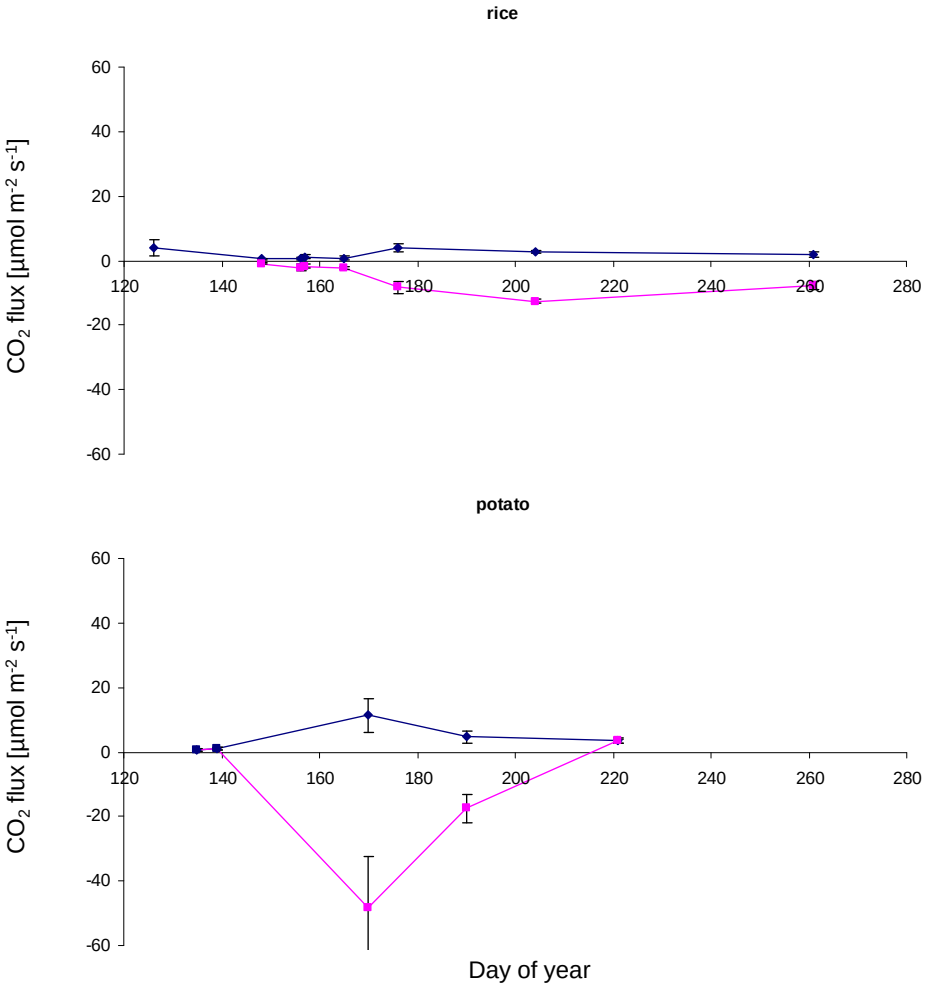
- To better understand the energy exchange above farmlands (rice fields and dry crops) during the whole growing period including monsoon seasons in Korea

- To determine reliable evapotranspiration and net ecosystem exchange (NEE) of carbon above farmlands

- To determine reliable information about near surface atmospheric stratification conditions, including convective events in Haean Basin

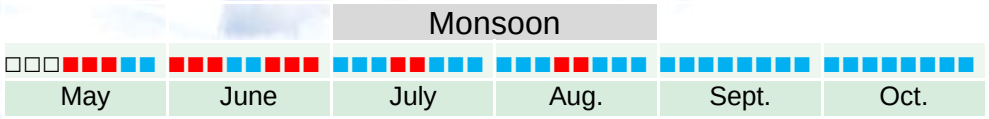
Plant production studies in Haean in 2009

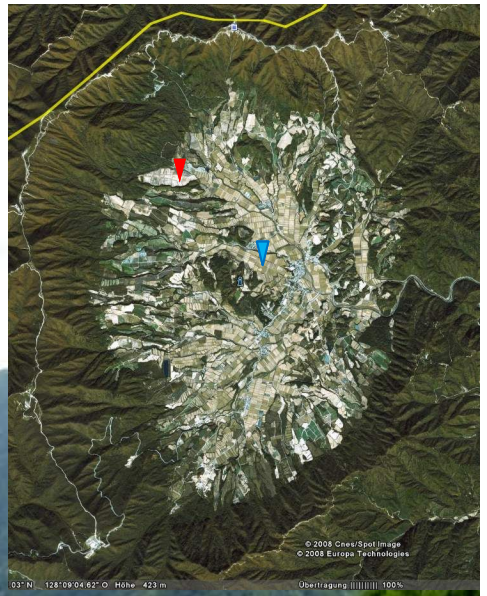
Steve Lindner



SITE SELECTION

Schedule 2010:



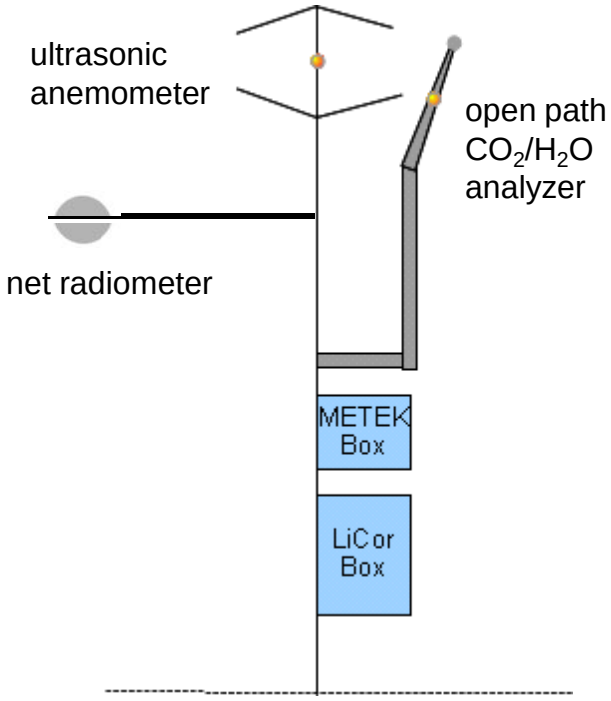


rice field

dry field

panorama of rice field

Eddy covariance complex



Parametera	Instrument	Sampling frequency
Wind vector	Ultrasonic anemometer (USA-1)	20 Hz
Sonic temperature		
Humidity (H_2O concentration)	open path CO_2/H_2O analyzer (LiCOR 7500)	
CO_2 concentration		
Net radiation	Net radiometer (NR lite)	

Data processing and QA/QC

Flux corrections

- **Coordinate rotation: Planar fit, double rotation**
- **Buoyuancy correction (Schotanus/Liu)**

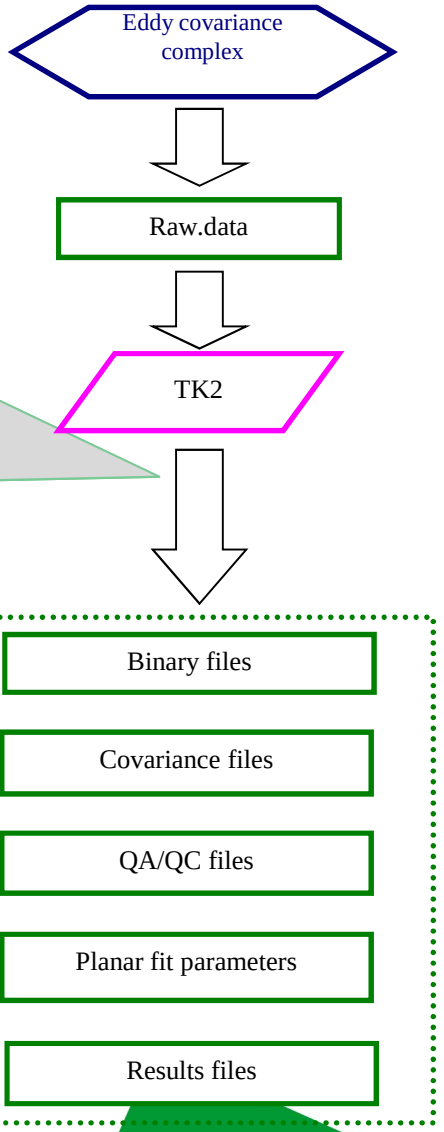
$$\overline{w'T'} = \overline{w'T_s'} - 0.51T\overline{w'q'}$$

- **WPL correction**

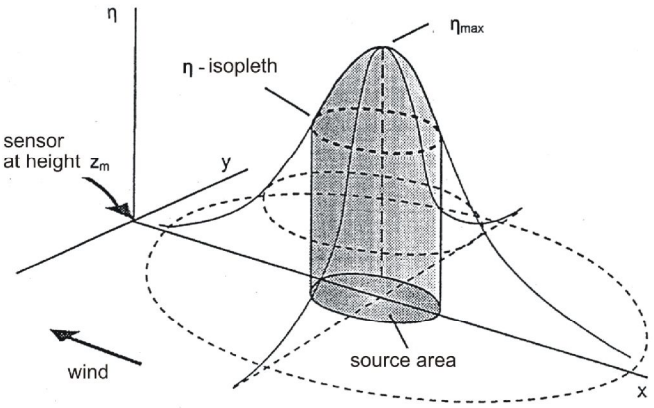
$$F_c = \overline{w'\rho_c'} + \overline{q_c} \cdot \frac{H}{c_p \cdot \overline{T}} \cdot \left[1 + 1.61 \cdot \frac{c_p \cdot \overline{T}}{\lambda} \cdot \left(1 - 0.61 \cdot \overline{q}\right) \cdot \frac{1}{Bo_{turb}} \right]$$

- **Spectral correction (Moore)**

$$\frac{\Delta F}{F} = 1 - \frac{\int_0^\infty T_{w,x}(f) \cdot S_{w,x}(f)\,df}{\int_0^\infty S_{w,x}(f)\,df}$$



Footprints with TerraFex

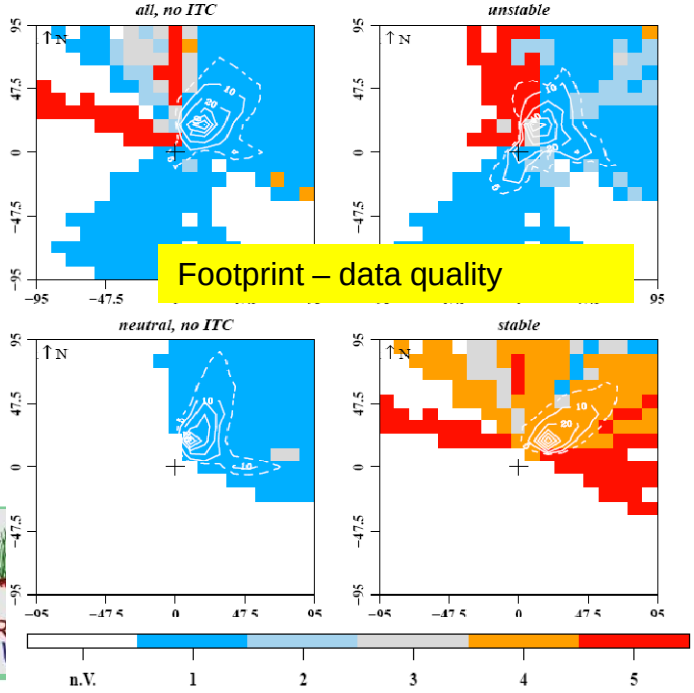


TK2 output → TerraFex → FOOTPRINT

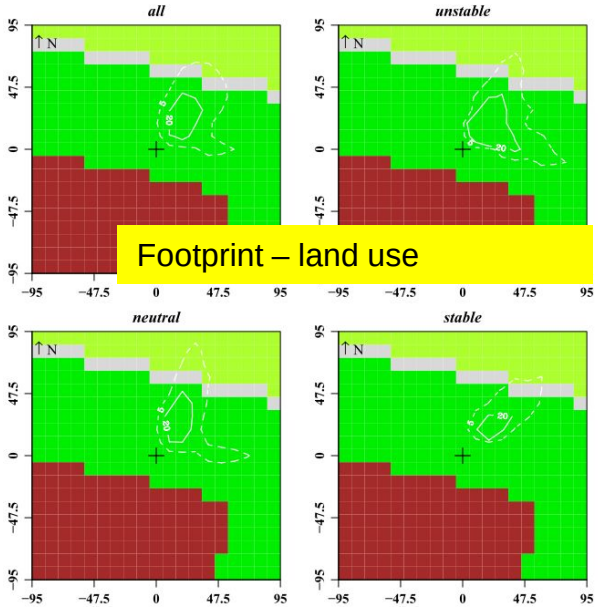
- Raw Covariances
- QA/QC (flags 1-5)
- Resultfile (flags 1-5)

Matrix Landuse

Matrix Roughness Length

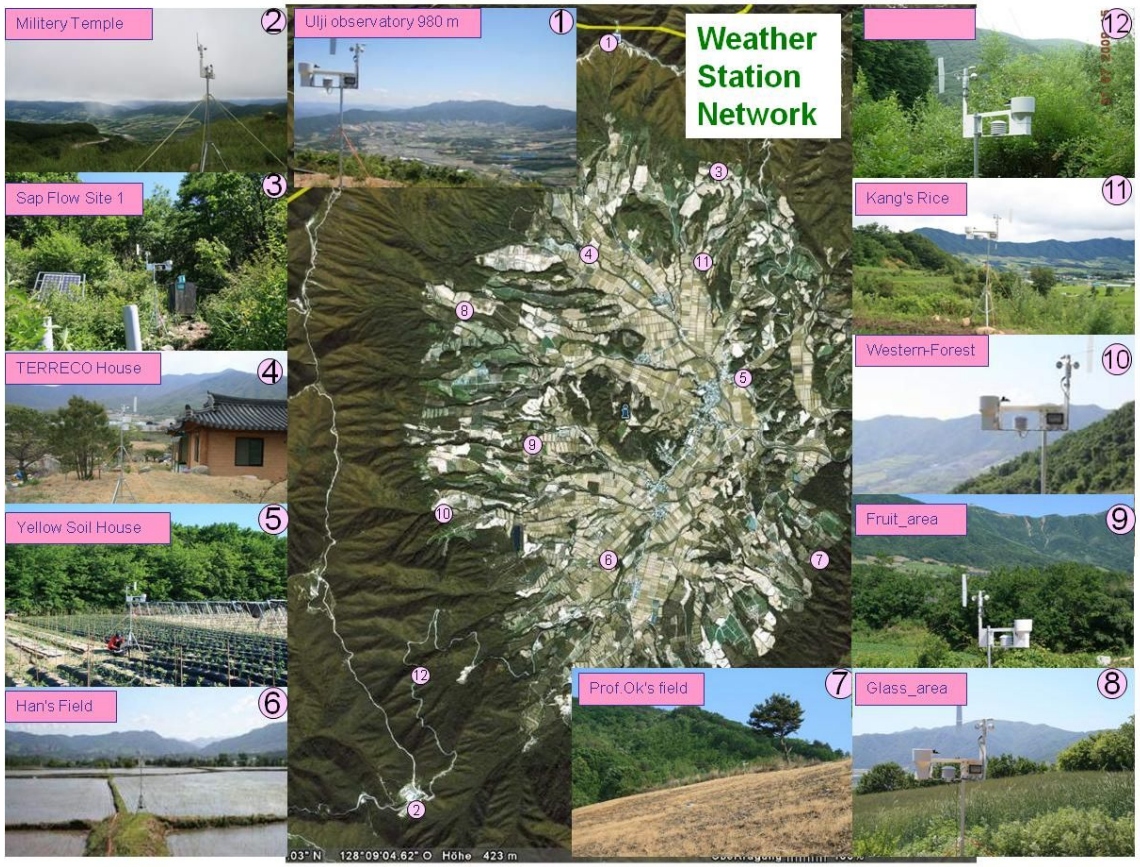


Footprint – data quality

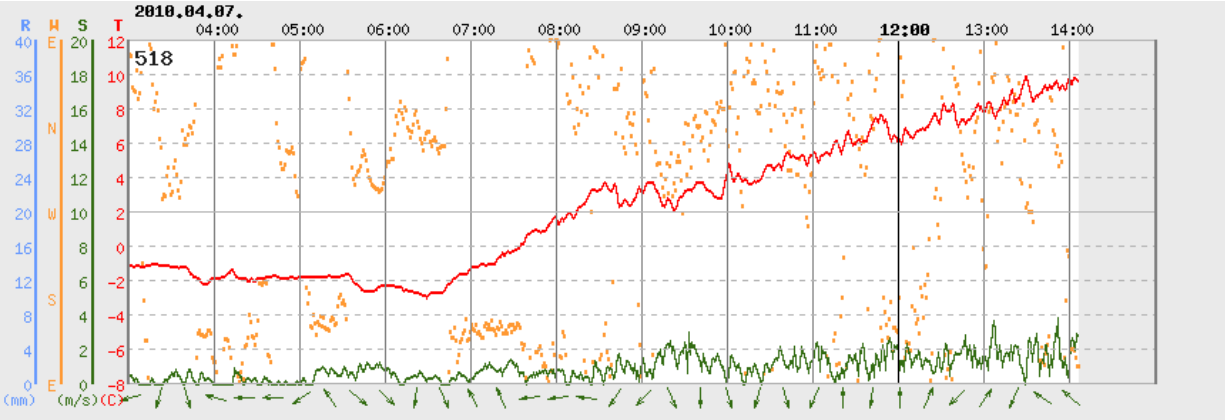


Footprint – land use

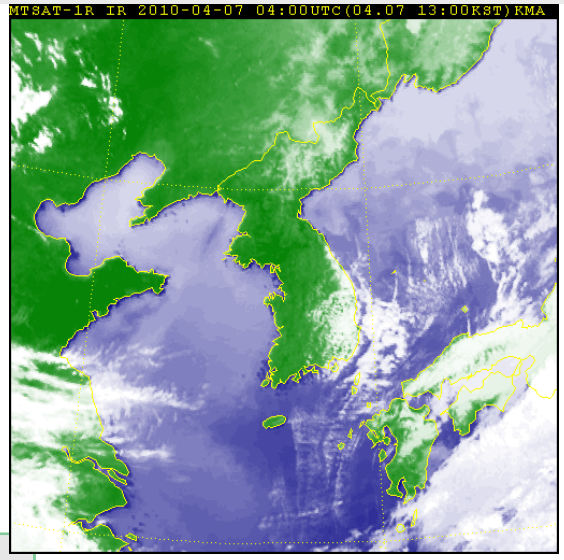
Automatic Weather Stations



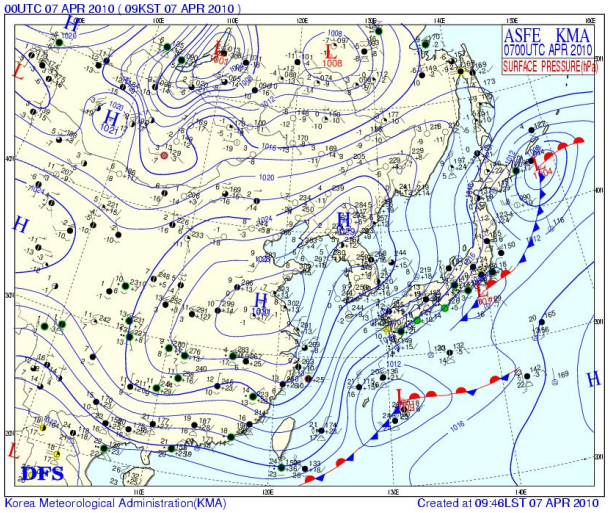
KMA Weather information as supporting data



AWS of KMA



Satellite image



Synoptic weather chart

Thank You