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

CO$_2$ flux [µmol m$^{-2}$ s$^{-1}$]

Day of year
## SITE SELECTION

### Schedule 2010:

<table>
<thead>
<tr>
<th>Monsoon</th>
<th>Weather Conditions</th>
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<tbody>
<tr>
<td>May</td>
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<td>June</td>
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<td>July</td>
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<td>Sept.</td>
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<td>Oct.</td>
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![Rice Field Panorama](panorama_of_rice_field)

![Dry Field Location](dry_field)

![Monsoon Map](monsoon_map)
**Eddy covariance complex**

- Ultrasonic anemometer
- Open path CO₂/H₂O analyzer
- Net radiometer

**Parameter** | **Instrument** | **Sampling frequency**
--- | --- | ---
Wind vector | Ultrasonic anemometer (USA-1) | 20 Hz
Sonic temperature |  |  
Humidity (H₂O concentration) | Open path CO₂/H₂O analyzer (LiCOR 7500) |  
CO₂ concentration |  |  
Net radiation | Net radiometer (NR lite) |  

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**TERRECO**
Data processing and QA/QC

Flux corrections
- Coordinate rotation: Planar fit, double rotation
- Buoyancy correction (Schotanus/Liu)
  \[ \overline{w'T'} = \overline{w'T_s} - 0.51T\overline{w'q'} \]
- WPL correction
  \[ F_c = \overline{w' \rho_e + q_e \cdot H \cdot \frac{1}{c_p \cdot T} \left[ 1 + 1.61 \cdot \frac{c_p \cdot T}{\lambda} \cdot (1 - 0.61 \cdot \bar{q}) \cdot \frac{1}{Bo_{turb}} \right] } \]
- Spectral correction (Moore)
  \[ \frac{\Delta F}{F} = 1 - \frac{\int_0^{\infty} T_{\text{max}}(f) \cdot S_{\text{max}}(f) \, df}{\int_0^{\infty} S_{\text{max}}(f) \, df} \]
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

www.bayceer.de
Automatic Weather Stations
KMA Weather information as supporting data

AWS of KMA

Satellite image

Synoptic weather chart
Thank You