Geophysical Research Abstracts
Vol. 16, EGU2014-6768, 2014
EGU General Assembly 2014

The Dynamics of Energy and CO_2 Transport above a Subtropical Rice Paddy

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An eddy-covariance system was established to understand the dynamics of turbulent transport of sensible heat, water vapor, and CO_2 above a subtropical rice paddy in north Taiwan (24°48'07.958"N, 121°47'58.665"E). The results showed that, during crop season, about 25% of net radiation was used for latent heat flux, 10% for sensible heat flux, and the rest (65%) was absorbed by the water and soil in the rice paddy. However, during fallow period, where there was no rice in the paddy, both water vapor and sensible heat fluxes occupied about 18% of the net radiation. Also, Penman-Monteith equation was found to reproduce the water vapor flux well with surface resistance close to 190 s m-1.

We also found that, under small Bowen ratio (< 0.2) conditions, water vapor and CO_2 were transported more efficiently than heat. However, when Bowen ration was large (> 0.5), sensible heat was transported about 10% more efficiently than water vapor and CO_2. During crop season the maximum CO_2 uptake was about 22 micro mol m-2 s-1. In fallow period, the maximum CO_2 emission rate from the soil-water surface was around 5 micro mol m-2 s-1, which was about the same as the growing season.