Geophysical Research Abstracts
Vol. 14, EGU2012-5413, 2012
EGU General Assembly 2012

Aggregation of energy and water surface fluxes at the agricultural landscape scale by combining scintillometer measurements, remote sensing data and SVAT modelling.

A. Brut (1), V. Rivalland (1), B. Coudert (1), P.A. Solignac (2), J. Cote (1), P. Keravec (1), O. Merlin (1), and E. Ceschia (1)

(1) Universite Paul Sabatier, CESBIO, 18 av. E. Belin, 31401 Toulouse Cedex 9, France, (2) Hydroscience, Montpellier UMR 5569, Université de Montpellier 2 – CC MSE Place Eugène Bataillon 34095 Montpellier Cedex 5

The Earth's surface shows variability at the landscape scale (1-10 km) and this has consequences on the water and energy surface fluxes intensity and spatial distribution. In this context, the question of the measurement representativeness is posed. Similarly, the simulation of these surface fluxes is depending on the models parameters distribution whether they are considered at the crop scale or the landscape scale.

The purpose of this work is to present a study combining 1) measurements from an eXtra Large Aperture Scintillometer (XLAS), 2) simulations with a calibrated Soil-Vegetation-Atmosphere-Transfer (SVAT) model and 3) fluxes estimates based on a simple Equation Balance model and high resolution remote sensing data, in order to better understand the aggregation processes of surface energy fluxes over agricultural landscapes.

In the framework of the SudOuest project managed by CESBIO and the CarboEurope Regional Experiment (CERES 2007), a comprehensive instrumental set-up has been installed over an agricultural area in Southwestern France, near Toulouse. It included an optical scintillometer integrating sensible heat flux over a 10 km transect, between June and September 2007; and two instrumented sites which are part of the GHGEurope network. On these sites, micrometeorological (mass and energy fluxes), vegetation and other biophysical parameters are continuously collected since the year 2005.

In this study, we first present the flux computation and data validation from the XLAS measurements, and we perform a quick analysis of the surface heat fluxes related to both the landscape and the local flux datasets from local instrumented fields.

Then, a two energy sources SVAT model (SEtHyS french acronym for sol moisture monitoring) has been calibrated over the 2 agricultural experimental sites for the main classes of vegetation and soil types of the studied area. Different aggregation configurations have been tested with the simulated fluxes, either using a footprint model or a fixed area under the XLAS transect. The footprint of the XLAS instrument mainly depends on the wind (speed and direction), the surface roughness and the vegetation height. Sensitivity tests have been performed to evaluate the influence of these latter variables on the footprint. The model aggregation fluxes are based on the projection of the XLAS contribution (footprint or fixed area) on the land use map obtained from 20m optical SPOT images. The results show good agreements between aggregated simulations and XLAS measurements mainly because the agricultural area is not so heterogeneous (the main crops are wheat, rapeseed and sunflower in similar proportions) and the meteorological conditions are not highly contrasted.

At last, we compared the XLAS fluxes to heat flux estimation using a simple energy balance model (S-SEBI) derived from Landsat (5 & 7) remote sensing surface temperature and short wave broadband albedo data. Local and aggregation on XLAS footprint fluxes comparison are proposed.