Geophysical Research Abstracts
Vol. 12, EGU2010-14765, 2010
EGU General Assembly 2010

Water and energy budget monitoring over an agricultural landscape from optical scintillometer and TIR remote sensing data using a SVAT model

Benoit Coudert (1,2), P.-A. Solignac (1,2), A. Brut (1,2), V. Rivalland (1), P. Keravec (1), O. Hagolle (1), V. Demarez (1,2)

(1) CESBIO UMR 5126, 18 av. Edouard Belin, 31401 Toulouse cedex 9, France (benoit.coudert@cesbio.cnes.fr), (2) Université Paul Sabatier - Toulouse III, France

The purpose of this paper is to present an application combining remote sensing and modeling approaches for water and energy surface exchanges monitoring at high resolution over an agricultural landscape. This study takes advantage of using high spatial resolution data in the visible and thermal infrared (TIR) domains and at-ground eXtra Large Aperture Scintillometer (XLAS) sensible heat flux measurements. Actually, numerous studies have shown the interest of using TIR data to monitor evapotranspiration or water availability for vertical exchanges at the soil vegetation atmosphere interface. Moreover, scintillometers have demonstrated interesting capabilities to estimate sensible heat fluxes or Bowen ratio over transects varying from hundred meters to several kilometers length over various types of canopies. The measured fluxes are associated to a footprint of the instrument depending on surface and atmospheric conditions. In this work we use the measurements from an optical scintillometer integrating sensible heat flux over a 10 km transect (Solignac et al, submitted) implemented over an agricultural area.

A two sources and two layers SVAT (Soil Vegetation Atmosphere Transfers) model has been firstly calibrated over 2 agricultural experimental sites for various classes of vegetation and soil types. The instrumented sites located in south west of France near Toulouse are managed by the CESBIO team. Micrometeorological, vegetation, mass and energy fluxes are continuously collected since the year 2005. The SVAT model has then been spatialised over the footprint of the XLAS instrument depending mainly on the wind direction, its velocity and the surface roughness. We have selected several wind conditions and the associated footprints during summer 2007 when continuous measurements of sensible heat flux series were available. The model spatialisation is based on the projection of the XLAS footprint on the surface land use classification map obtained from SPOT images and in situ validation. Afterwards, the outputs of the model are aggregated according to this projection and also to their weighted contribution to the total flux measured by the XLAS over the footprint. Regarding TIR data, high resolution surface temperature from ASTER sensor has been used for model calibration as well as for validation purposes. Actually two methods has been tested. Firstly, the thermal contrasts from ASTER between vegetation classes inside the footprint were assimilated in the spatialised model and the validation was done on the integrated sensible heat flux over the scintillometer transect. Secondly, the model parameters were adjusted by a minimisation of the differences between aggregated simulated sensible flux time series and the measured one from the scintillometer.

Therefore, the paper presents the advantages and the limits of using high resolution TIR data and integrated sensible heat flux measurements from a scintillometer for water and energy budget monitoring at field scale over agricultural landscapes. Perspectives of using these two types of data in synergy are finally proposed.