Geophysical Research Abstracts
Vol. 14, EGU2012-6530, 2012
EGU General Assembly 2012

Multi-year assessment of soil-vegetation-atmosphere transfer (SVAT) modeling uncertainties over a Mediterranean agricultural site

S. Garrigues (1), A. Olioso (1), J-C. Calvet (2), S. Lafont (2), E. Martin (2), A. Chanzy (1), O. Marloie (1), N. Bertrand (1), V. Desfonds (1), and D. Renard (1)

(1) INRA, EMMAH, France (sebastien.garrigues@avignon.inra.fr), (2) CNRM-GAME (Météo-France, CNRS), Toulouse, France

Vegetation productivity and water balance of Mediterranean regions will be particularly affected by climate and land-use changes. In order to analyze and predict these changes through land surface models, a critical step is to quantify the uncertainties associated with these models (processes, parameters) and their implementation over a long period of time. Besides, uncertainties attached to the data used to force these models (atmospheric forcing, vegetation and soil characteristics, crop management practices...) which are generally available at coarse spatial resolution (>1-10 km) and for a limited number of plant functional types, need to be evaluated. This paper aims at assessing the uncertainties in water (evapotranspiration) and energy fluxes estimated from a Soil Vegetation Atmosphere Transfer (SVAT) model over a Mediterranean agricultural site. While similar past studies focused on particular crop types and limited period of time, the originality of this paper consists in implementing the SVAT model and assessing its uncertainties over a long period of time (10 years), encompassing several cycles of distinct crops (wheat, sorghum, sunflower, peas).

The impacts on the SVAT simulations of the following sources of uncertainties are characterized:
- Uncertainties in atmospheric forcing are assessed comparing simulations forced with local meteorological measurements and simulations forced with re-analysis atmospheric dataset (SAFRAN database).
- Uncertainties in key surface characteristics (soil, vegetation, crop management practises) are tested comparing simulations feeded with standard values from global database (e.g. ECOCLIMAP) and simulations based on in situ or site-calibrated values.
- Uncertainties dues to the implementation of the SVAT model over a long period of time are analyzed with regards to crop rotation.

The SVAT model being analyzed in this paper is ISBA in its a-gs version which simulates the photosynthesis and its coupling with the stomata conductance, as well as the time course of the plant biomass and the Leaf Area Index (LAI). The experiment was conducted at the INRA-Avignon (France) crop site (ICOS associated site), for which 10 years of energy and water eddy fluxes, soil moisture profiles, vegetation measurements, agricultural practises are available for distinct crop types.

The uncertainties in evapotranspiration and energy flux estimates are quantified from both 10-year trend analysis and selected daily cycles spanning a range of atmospheric conditions and phenological stages. While the net radiation flux is correctly simulated, the cumulated latent heat flux is under-estimated. Daily plots indicate i) an overestimation of evapotranspiration over bare soil probably due to an overestimation of the soil water reservoir available for evaporation and ii) an under-estimation of transpiration for developed canopy. Uncertainties attached to the re-analysis atmospheric data show little influence on the cumulated values of evapotranspiration. Better performances are reached using in situ soil depths and site-calibrated photosynthesis parameters compared to the simulations based on the ECOCLIMAP standard values. Finally, this paper highlights the impact of the temporal succession of vegetation cover and bare soil on the simulation of soil moisture and evapotranspiration over a long period of time. Thus, solutions to account for crop rotation in the implementation of SVAT models are discussed.