



Simulations over South-Western France with the ISBA-A-gs model : insights into several European projects.

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The water and the carbon are key parameters of the Earth system and their complex interactions play an important role in the context of climate change, mainly through the vegetation evolution. The soil-vegetation-atmosphere transfer model ISBA-A-gs (Interactions between Soil, Biosphere and Atmosphere, CO₂-reactive) developed at CNRM (Noilhan and Mahfouf, 1996; Calvet et al. 1998) is able to simulate the energy and water exchanges at the surface as well as the plant growth related to CO₂ assimilation, in different climate and nutrient-supply conditions. Therefore, it represents a useful tool to investigate the interactions and feedbacks between the water and CO₂ cycles for various ecosystems.

In order to describe and understand the inter-annual variability of vegetation and its impact on water resources and carbon budget, simulations at regional scale using the ISBA-A-gs scheme are performed over the Adour-Garonne basin (located in the South-West of France) between 2002 and 2005 and provide surface variables (soil temperature, water content and Leaf Area Index) and energy and water budgets. This study area also takes advantage of a strong interest from several European research programs like CERES (CarboEurope Regional Experiment), Geoland/ONC (Observatory of Natural Carbon fluxes) and SMOS, this latter being supported by ESA (European Spatial Agency).

Thus, the CERES experiment which took place in the same region during the spring 2005 yielded interesting flux estimates from ground-surface stations and vegetation

measurements. This dataset allowed in-situ validation of the ISBA-A-gs model for various types of ecosystems. In addition, satellite-derived products provided in the framework of the geoland/ONC program could be evaluated by comparison with the simulated LAI and soil water content.

Eventually, in the context of the SMOS/Synergy program which is dedicated to the “Synergy of passive microwave observations and spatial dis-aggregation techniques for soil moisture estimates”, these simulations are also used to test the validity of the microwave emission model L-MEB (Pellarin et al., 2003) over a large number of surface types present in South-Western France. Indeed, the synthetic SMOS brightness temperatures can be produced by using the surface variables (LAI, soil moisture, surface temperature, etc . . .) simulated by ISBA-A-gs and the L-MEB emission model. Both the low resolution and disaggregated retrieval schemes will be used to analyse the synthetic SMOS data.

The objectives and strategy of these projects will be briefly presented and the results of the simulations over the Adour-Garonne basin will be discussed in the framework of these projects.

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- Noilhan J. and Mahfouf J.-F., 1996 : The ISBA land surface parameterization scheme. *Global Planetary Change*, 13 : 145:159.
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