Geophysical Research Abstracts,
Vol. 10, EGU2008-A-10380, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-10380
EGU General Assembly 2008

The role of land-surface interactions in simulating the climate of the Iberian Peninsula

S. Jerez (1,2), **J. P. Montávez** (1), J. J. Gómez-Navarro (1), S. B. Navarro (1), J. A. García-Valero (3), F. González-Rouco (4), F. Valero (4)

(1) Dpto. de Física, Universidad de Murcia, Spain, (2) Instituto Euromediterráneo del Agua, Murcia, Spain, (3) Instituto Nacional de Meteorología, Spain, (4) Dpto. de Astrofísica y C.C. de la Atmósfera, Universidad Complutense de Madrid, Spain

The aim of this work is to test the influence of the interactions between atmosphere and land-surface in regional climate simulations over the Iberian Peninsula (IP). The simulations have been performed using a climate version of the regional atmospheric model MM5, over two two-way nested domains with a resolution of 30 km over the region of interest. Boundary conditions have been obtained from ERA40 reanalysis for the period 1958-2001, completed till 2006 with analysis data. Two integrations over the same domains and period (1958-2006), and using identical physical configuration except for the soil parametrization, have been performed.

In the first experiment (NOR) a simple five-layer soil model (Dudhia, 1996), where soil temperature is predicted but soil moisture is prescribed by the climatology, is used. In the second experiment (LSM) the Noah Land Surface Model (Chen and Dudhia, 2001) was employed. This land-surface model is capable of predicting soil moisture and temperature in four layers, as well as canopy moisture and water-equivalent snow depth. It also outputs surface and underground run-off accumulations, makes use of vegetation and soil type in handling evapotranspiration, and has effects such as soil conductivity and gravitational flux of moisture. From this configuration it can be expected a more realistic reproduction of sensible and latent heat, moisture and momentum fluxes between land-surface and atmosphere, affecting positively the regional climate simulations.

To confirm this hypothesis and characterize the attained improvement, we have at our dispoal a real data base of temperature to compare, provided by the National Institute of Meteorology of Spain (INM).

Firstly, we found that the annual temperature cycle is much better reproduced by the LSM experiment, not only because of the bias error is smaller, but also because its variance is reduced, i.e. changes between consecutive months are better captured. Moreover, a better performance of the annual cycle of maximum and minimun temperature is arised. The main reason of these improvements is related to the large variability simulated by the LSM experiment, mainly induced by the variability of soil moisture which allows the development of land-atmosphere feedback process, in contrast to what happen in the NOR experiment.

Regarding the interannual variability, we have tested the correlation between seasonal temperature series, founding again a better agreement between LSM experiment and real data for Summer. This improvement is explained by the fact that in such dry season a good estimation of soil moisture became more important and that regional circulation govern the climate of IP during Summer.

Additionally, we have investigated the main factors causing the differences in temperature estimation. It has been found that the differences between simulated monthly temperature anomalies series (LSM minus NOR) are highly correlated to soil moisture series from LSM experiment. During Summer, the correlation pattern is negative in most of the IP, reaching the highest values in the the center, which is in agreement with reasons exposed above (which respond to theoretical reasonings). But in winter, the correlation pattern show a bipolar behavior, with positive values in NorthWest and negative in the rest. Such a phenomena is still under study.