Land-surface Interactions with the Atmosphere over the Iberian Semi-arid Environment (LIAISE)

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Land surface-atmosphere interactions determine the atmospheric boundary layer (ABL) features, and in the case of semi-arid regions the water availability in the upper ground strongly conditions the surface energy balance and in general the observed dominant processes. LIAISE (Land surface Interactions with the Atmosphere over the Iberian Semi-arid Environment, eastern Ebro sub-basin, Boone et al. 2021) is an observational campaign planned between spring and fall 2021 designed to study the land/atmosphere interactions and the effect of the surface heterogeneities on the ABL in a semi-arid environment enclosing a large irrigated area in summer.

The combined analysis of the ground-based observations and ABL atmospheric measurements, including aircraft and remote-sensing data, is expected to improve the understanding of processes affecting exchange fluxes between the surface and the atmosphere, especially evapotranspiration, and to allow exploring the local and mesoscale circulations induced by the surface heterogeneities. In this sense, mesoscale simulations will be performed over the eastern Ebro sub-basin to contribute to this understanding while

evaluating the representation of the surface features in the numerical models and its impact in the organisation of the flow at lower levels.

A first mesoscale modelling inter-comparison for a 2016 summer event in the LIAISE area, is under progress, intended to evaluate the performance of the participating models compared to the observations and explore the differences between them, trying to understand the reasons behind them. In this initial phase the models are run at their standard configurations and the comparison is expected to allow improvements in the definitions of the setup of each model for a later phase.

Four models participate in the inter-comparison: MesoNH, WRF, UKMO Unified Model and MOLOCH. They are run with similar horizontal (2km x 2km and 400m x 400m for the outer and inner domains) and vertical (2m resolution at lower levels and stretched above) grid meshes. In this first phase, initial conditions taken from the ECMWF analysis are taken for all the models but runs are made using their default parameterizations. A 48-h integration is made between 16 and 18 July 2016 for a case under a high-pressure system centred over NW France, with well-developed thermally-driven circulations in the Ebro Basin. Sea breezes are found at the coast and seem to reach the basin after surmounting the mountain coastal range (see horizontal cross-sections in Figure 1).

Preliminary results show that each model has a different representation of the surface heterogeneities affecting the grid values of the surface fluxes. Nevertheless, the mesoscale circulations generated by them do not differ significantly between models, the differences lying mostly at smaller scales, namely the ABL characteristics, the values of the exchange fluxes at the surface or the state of the surface and the soil (Figure 1). The challenge at this point is to relate the observed differences to the particularities of the parameterisations and of the physiographic data bases used by each model.

References

Boone, A., J. Bellvert, M. Best, J. Brooke, G. Canut-Rocafort, J. Cuxart, O. Hartogensis, P. Le Moigne, J. R. Miró, J. Polcher, J. Price, P. Quintana Seguí, M. Wooster, 2021: Updates on the international Land Surface Interactions with the Atmosphere over the

Iberian Semi-Arid Environment (LIAISE) Field Campaign. *GEWEX News*, Q4, (in press).

Jiménez, M. A., J. Cuxrt, A. Grau, A. Boone, S. Donier, P. Le Moigne, J. R. Miró, J. More, A. Tiesi, P. Malguzzi, J. Brooke and M. Best, 2021: Land surface Interactions with the Atmosphere over the IberianSemi-arid Environment (LIAISE): 1st modelling intercomparison. 8th International Conference on METeorology and climatology of the MEDiterranean (MetMed). May 25-27, 2021

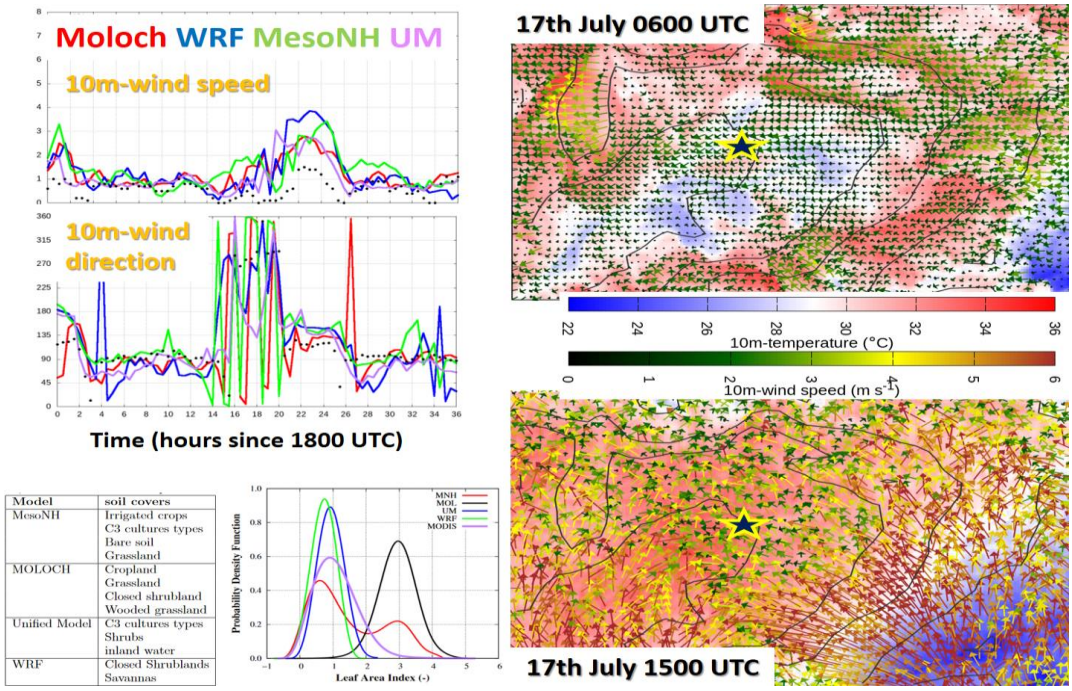

Figure 1. Model results (only considering the inner domain): horizontal cross-sections (a zoom over the region of interest for the 10m-wind speed and direction), modelled and observed the temporal evolution of the wind in El Poal (placed the center of the basin, indicated with a start) and surface features (most common soil covers in the basin and modelled LAI compared to the estimation from MODIS).