

SPECIAL PROJECT PROGRESS REPORT

All the following mandatory information needs to be provided. The length should *reflect the complexity and duration* of the project.

Reporting year 2021

Project Title: THE ROLE OF BASIN TOPOGRAPHY AND SURFACE HETEROGENEITIES IN THE ORGANIZATION OF THE FLOW AT LOW LEVELS

Computer Project Account: spesturb

Principal Investigator(s): Maria A. Jiménez & Joan Cuxart

Affiliation: Universitat de les Illes Balears

Name of ECMWF scientist(s) collaborating to the project
(if applicable)

Start date of the project: 01/01/2021

Expected end date: 31/12/2023

Computer resources allocated/used for the current year and the previous one (if applicable)

Please answer for all project resources

		Previous year		Current year	
		Allocated	Used	Allocated	Used
High Performance Computing Facility	(units)	NA	NA	900,000	0
Data storage capacity	(Gbytes)	NA	NA	250	

Summary of project objectives (10 lines max)

The aim of the special project is to increase the current knowledge of the processes in the surface-atmosphere interface through a combined inspection of simulations and observations from the campaigns in which we participate. Firstly, the interactions between heterogeneous surfaces and the atmosphere will be explored through simulations based on observational campaigns held in the Eastern Ebro valley in zones with extensive irrigated areas, linked to the LIAISE effort from HyMeX. Secondly, we will continue exploring the organization of the wind at low levels in the island of Mallorca under Sea-and Land-Breeze conditions. A combined inspection of mesoscale simulations and observations from an experimental field campaign (January 2021 – summer 2022) will be used to understand the interaction between the sea and land breezes and local winds (slope winds) and other winds from larger scales.

Summary of problems encountered (10 lines max)

Due to the COVID-19 pandemic, the LIAISE experimental field campaign has been delayed for 1 year (it is now taking place until the end of July). As a result, numerical works have been delayed. We expect to start numerical studies once the campaign will end, during the end of the year.

Summary of plans for the continuation of the project (10 lines max)

During the second semester of 2021 we plan to start the numerical works related to the LIAISE campaign and finalizing the analysis of the simulations of two sea-breeze events in Mallorca initiated during the previous special project.

List of publications/reports from the project with complete references

M.A. Jiménez, J. Cuxart, A. Grau, A. Boone, S. Donier, Patrick Le Moigne, J.R. Miro, J. More, A. Tiesi, P. Malguzzi, J. K. Brooke, M. J. Best (2021) Land surface Interactions with the Atmosphere over the Iberian Semi-arid Environment (LIAISE): 1st modelling intercomparison, *EGU General Assembly 2021* (virtual).

A. Grau and M.A. Jiménez (2021) Statistical analysis of the sea-breeze features in the island of Mallorca, *8th International Conference on Meteorology and Climatology of the Mediterranean (MetMed)* 25 – 27 May 2021 (virtual).

A. Torres, A. Grau, M.A. Jiménez and J. Cuxart (2021) Surface thermal heterogeneities in the eastern Ebro basin and their impact on regional circulations, *8th International Conference on Meteorology and Climatology of the Mediterranean (MetMed)* 25 – 27 May 2021 (virtual).

Summary of results

If submitted **during the first project year**, please summarise the results achieved during the period from the project start to June of the current year. A few paragraphs might be sufficient. If submitted **during the second project year**, this summary should be more detailed and cover the period from the project start. The length, at most 8 pages, should reflect the complexity of the project. Alternatively, it could be replaced by a short summary plus an existing scientific report on the project attached to this document. If submitted **during the third project year**, please summarise the results achieved during the period from July of the previous year to June of the current year. A few paragraphs might be sufficient.

The period 16 – 18 July 2016 is taken to perform the 1st intercomparison exercise (launched during the preparation of the LIAISE campaign) because it is close to the period when the LIAISE

campaign will take place (July 2021). Besides, the western Ebro river subbasin was under the influence of a high-pressure system centered in the NW France and thermally-driven circulations were developed in the region of interest (close to Mollerussa, a dot in Figure 1) and also in coastal areas where sea/land breezes were present. There are a total of 4 participant models: MesoNH, WRF, Moloch and Unified Model. All models are run with the same horizontal (see Figure 1) and vertical (2m close to the surface at stretched above) resolutions.

The validation of the model outputs is made through the comparison with the observations from the AWS network of Servei Meteorològic de Catalunya (SMC) and satellite-derived fields (such as LST from MSG or MODIS). Preliminary results are shown in Figure 2 and we are now trying to understand the differences between models.

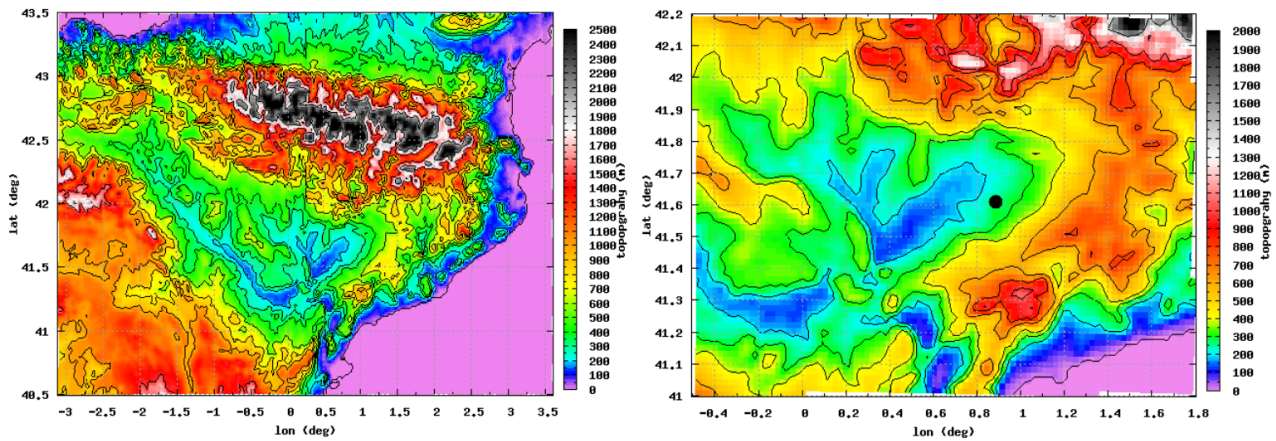


Figure 1. Outer (2km x 2km) and inner (400m x 400m) domains selected to perform simulations of the LLAISE IOPs (July 2021). These domains are also used for the 1st mesoscale models intercomparison (16-18 July 2016).

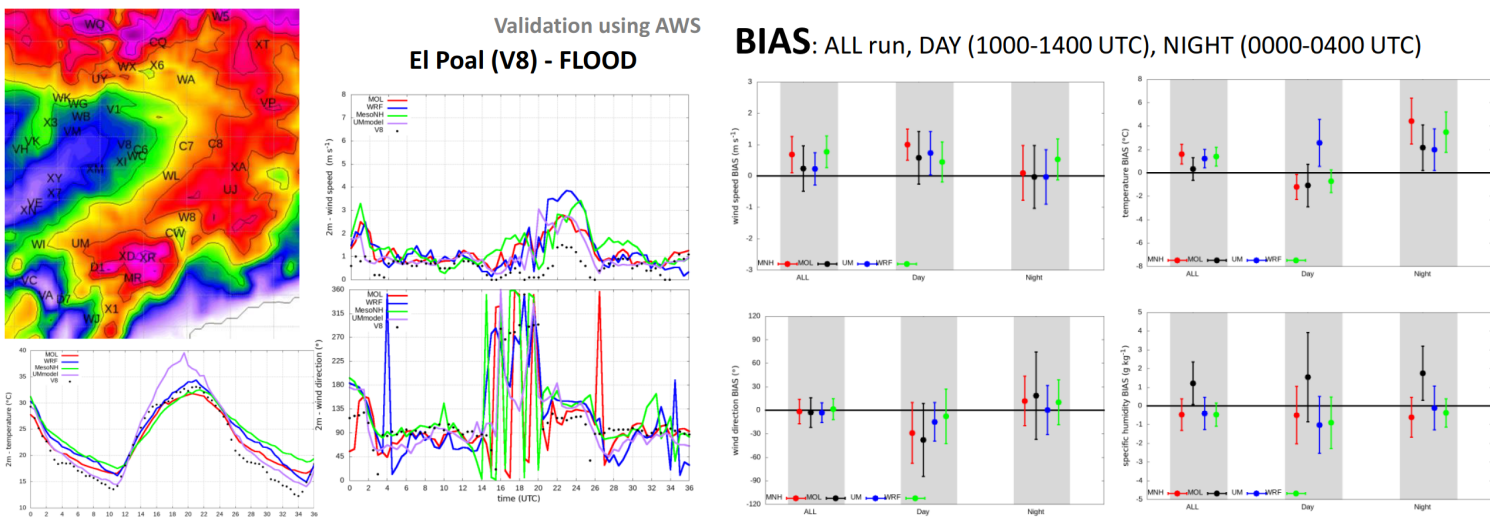


Figure 2. (LEFT) Model validation using AWS from SMC network and (RIGHT) averaged bias computed for each AWS in the map.