

REQUEST FOR A SPECIAL PROJECT 2015–2017

MEMBER STATE: SPAIN

Principal Investigators¹: JOAN CUXART (1) and MARIA A. JIMÉNEZ (2)

Affiliation: (1) Universitat de les Illes Balears (UIB)
(2) Institut Mediterrani d'Estudis Avançats (IMEDEA, UIB-CSIC)

Address:
DEPARTAMENT DE FISICA, EDIFICI MATEU ORFILA
CARRET. VALLDEMOSSA, KM 7.5
07122 – PALMA DE MALLORCA (ILLES BALEARS) SPAIN

E-mail: joan.cuxart@uib.cat (corresponding)
mantonia.jimenez@uib.cat

Other researchers:

Project Title:
EFFECT OF THE SURFACE HETEROGENEITIES IN THE
ATMOSPHERIC BOUNDARY-LAYER

If this is a continuation of an existing project, please state the computer project account assigned previously.	SP ESTURB	
Starting year: (Each project will have a well defined duration, up to a maximum of 3 years, agreed at the beginning of the project.)	2015	
Would you accept support for 1 year only, if necessary?	X YES <input checked="" type="checkbox"/>	NO <input type="checkbox"/>

Computer resources required for 2015-2017: (The maximum project duration is 3 years, therefore a continuation project cannot request resources for 2017.)	2015	2016	2017
High Performance Computing Facility (units)	150000	150000	150000
Data storage capacity (total archive volume) (gigabytes)	200	200	200

An electronic copy of this form **must be sent** via e-mail to: special_projects@ecmwf.int

Electronic copy of the form sent on (please specify date):
30th June 2014

Continue overleaf

Principal Investigators: Joan Cuxart & Maria A. Jiménez

Project Title: EFFECT OF THE SURFACE HETEROGENEITIES IN THE ATMOSPHERIC BOUNDARY-LAYER

Extended abstract

It is expected that Special Projects requesting large amounts of computing resources (500,000 SBU or more) should provide a more detailed abstract/project description (3-5 pages) including a scientific plan, a justification of the computer resources requested and the technical characteristics of the code to be used. The Scientific Advisory Committee and the Technical Advisory Committee review the scientific and technical aspects of each Special Project application. The review process takes into account the resources available, the quality of the scientific and technical proposals, the use of ECMWF software and data infrastructure, and their relevance to ECMWF's objectives. - Descriptions of all accepted projects will be published on the ECMWF website.

The analysis of atmospheric motions in complex terrain, in our case from the mesoalpha (large basins) to the microscale (tens of meters), is made by our group through the combined use of experimental data (very often from campaigns that we organize or where we participate with our own instrumentation) and numerical modelling. The principal source of computing time for the very high-resolution simulations has been so far the SPESTURB project at ECMWF. We have been using the resources of the ECMWF since 2002 with full satisfaction and with the support of the Spanish Meteorological Agency (AEMET), that has provided extra resources if needed and available.

During the last decade we mostly concentrated on flows in the stable boundary layer over land, introducing progressively complex terrain to understand the reasons of the observed evolution of wind, temperature and humidity in the nocturnal surface layer and the morning and evening transitions. Recently the attention is more focused in complex terrain regions and small-scale heterogeneities. The previous subjects of interest have been the within-basin circulations and surface temperature heterogeneities in the Duero river basin, the daily cycle of permanent fog and its interaction with the surrounding slopes, as well as the study of strong surface inversions in the Ebro river valley, and the organization of the nocturnal flows in the island of Mallorca.

Simulations completed that still need inspection -and therefore access to the ECMWF systems- are i) the study of the upvalley and downvalley flows in the Swiss Reusstal, where we inspect the interaction of the slopes and the valley flows and evaluate the effect of the associated advection in a point at the center of the valley; ii) the 80m-horizontal resolution simulations of BLLAST'11 Site 1, embedded in two larger domains that allow the inspection of the role of the mountain-plain interaction and the valley flows. In both cases, experimental data of good quality are available.

Simulations planned for the period of appliance are intended to be of very high resolution to account for small-scale heterogeneities in selected sites for which ad-hoc experimental campaigns have been held or are ready to be performed. Firstly we may extend the duration of the inner domain for BLLAST to three days (now we only have one day) and be very much attentive to the description of the soil and vegetation representation in the model compared to the detailed observations, and with very special interest to nocturnal stable ABL dynamics and the morning and evening transitions, which take place under a well organized daily cycle of mountain-plain winds between the Garonne plain and the Pyrenees.

Secondly, we want to model selected days of our home-based campaigns. The recent Sea breeze campaigns in Mallorca (MSB13 & MSB14) have documented morning and evening transitions near the sea shore and selected cases will be modeled at the hectometer scale. The "Sub-pixel" campaign is scheduled for the whole 2015 in the University Campus in Mallorca, which is essentially a flat area. A 1km x 1km area with a low-level of heterogeneity will be densely instrumented in each of its landscape units, with a central site where soundings and extensive measurements will exist for selected situations. Heterogeneity recorded will be compared to information from available satellite passes from Aqua, Terra, NOAA (resolution 1 km, daily) and Landsat (60 m resolution, monthly). The nearby mountains and the sea organize a land-sea breeze system under which our measurements will be often taken and this regime will be prioritized in our investigations (MSB15 is planned within this effort). Good cases will be modelled at ECMWF at 60 m-resolution, taking advantage of all the data gathered in the area, which will have a significant amount of information at high resolution of the soil-vegetation state (temperature and moisture).

*****EoF*****