REQUEST FOR A SPECIAL PROJECT 2012–2014

MEMBER STATE: Italy

Principal Investigator[1]: Chiara Marsigli

Affiliation: ARPA-SIMC

Address: V.le Silvani 6
40133 Bologna
Italy

E-mail: cmarsigli@arpa.emr.it

Other researchers: Lucio Torrisi, Francesca Marcucci (CNMCA, Italy)
Andrea Montani, Tiziana Paccagnella (ARPA-SIMC)

Project Title: Testing the impact of model perturbations applied to the COSMO model at a convection-permitting scale over Italy

If this is a continuation of an existing project, please state the computer project account assigned previously.	**SPITCONV**	
Starting year: (Each project will have a well defined duration, up to a maximum of 3 years, agreed at the beginning of the project.)	2010 (as late SP)	
Would you accept support for 1 year only, if necessary?	YES x	NO ☐

Computer resources required for 2012-2014: (The maximum project duration is 3 years, therefore a continuation project cannot request resources for 2014.)	**2012**	**2013**	**2014**
High Performance Computing Facility (units)	450000		
Data storage capacity (total archive volume) (gigabytes)	100		

*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): 26/04/2011

Continue overleaf

[1] The Principal Investigator will act as contact person for this Special Project and, in particular, will be asked to register the project, provide an annual progress report of the project's activities, etc.

Principal Investigator: Chiara Marsigli

Project Title: Testing the impact of model perturbations applied to the COSMO model at a convection-permitting scale over Italy

Extended abstract

The purpose of this project is to develop and test a methodology to perturb the limited-area model COSMO when running at a convection-permitting resolution (namely 2.8 km), over Italy. The development of these perturbations is part of a more extensive work aimed at building up an ensemble forecasting system running at this resolution over Italy in some years.

The passage from ensemble forecasts issued at O(10km) scale to a convection-permitting scale is not at all straightforward and should be addressed in a comprehensive scientific framework. How to build such an ensemble is still almost unknown, and it presently matter of investigation in some institutions, in Europe and outside Europe.

The purpose of this project is simply to test if the COSMO model perturbation approach, based on parameter perturbations, works reasonably also at the 2.8 km scale over Italy, and which range of parameter variability should be considered. In addition to this approach, the applicability of the stochastic physics perturbation methodology will be evaluated, starting from the second year of the project. The stochastic physics perturbation methodology (Buizza et al., 1999) will be implemented in the COSMO model, for several ensemble forecasting and data assimilation purposes. In the context of this particular project, this scheme will be tested as source of model perturbations at the 2.8 km runs, to evaluate if, and under which conditions or after which tuning, it could be used in 2.8 km ensemble runs.

At the beginning, the tests will be performed in a simple downscaling approach, in order to assess if the increase of the spatial resolution and the better ability to forecast convection by the 2.8 km COSMO model permit to add information to the coarser resolution ensemble runs, together with the small scale variability of the physics perturbations. After some tests with deterministic initial and boundary conditions, using the ECMWF IFS mode, a downscaling of the COSMO-SREPS and COSMO-LEPS systems will be performed, going from 10 (soon 7) to 2.8 km, with 10 to 16 members. The ensemble members will be differentiated, a part from initial and boundary conditions, taken from the correspondent coarser ensemble runs, by using different setting of some selected parameters of the COSMO physics schemes. Turbulence as well as microphysics schemes will be considered. This work will be carried on following also the experience gained by DWD in running a convection-permitting ensemble over Germany, namely the COSMO-DE-EPS.

The tests will be performed on a case-study basis. The aim is to understand if such model perturbation approaches could bring some benefit for the forecasts of some selected convection events occurred over Italy, considering both precipitation and the distribution of the microphysical species in the vertical.