LATE REQUEST FOR A SPECIAL PROJECT 2014–2016

MEMBER STATE: Italy

Principal Investigator[1]: Nicola Loglisci

Affiliation: ARPA Piemonte

Address: Via Pio VII, 9
10136 TORINO
ITALY

E-mail: n.loglisci@arpa.piemonte.it

Other researchers: Riccardo Bonanno (ARPA Piemonte)
Chiara Marsigli, Andrea Montani (ARPA-ER SIMC)
Lucio Torrisi (CNMCA)
Francesca Marcucci (CNMCA)

Project Title: Testing soil condition perturbations for a convection-permitting ensemble over Italy.

Would you accept support for 1 year only, if necessary?	YES x	NO ☐

Computer resources required for 2014-2016: (The project duration is limited to a maximum of 3 years, agreed at the beginning of the project. For late requests the project will start in the current year.)	**2014**	**2015**	**2016**
High Performance Computing Facility (units)	450000	500000	500000
Data storage capacity (total archive volume) (gigabytes)	100	100	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):

………………………………………

Continue overleaf

Principal Investigator: Nicola Loglisci

Project Title: Testing soil condition perturbations for a convection-permitting ensemble over Italy,

Extended abstract

---

[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.

A well-known problem with ensemble forecasts is their lack of variability between members, typically worse near the surface rather than higher in the troposphere.

Surface condition uncertainties are seldom taken into account in ensemble systems, and ensemble forecasts typically use the same surface conditions for all members.
However, the sensitivity of moist atmospheric processes to soil conditions has been demonstrated in numerous studies.

Integrating surface perturbations into an ensemble system would be very important to account for uncertainties in surface conditions and to increase the ensemble spread near the surface.

At ARPA Piemonte, the sensitivity of the high resolution (2.8 km), convection permitting version of COSMO model, hereafter COSMO-I2, to different initial conditions of the soil has already been verified (COSMO Newsletter no. 14). This sensitivity test, based on different soil initial conditions coming from different kind of surface analysis, highlighted the potential benefits of perturbing the soil in an ensemble forecast increasing the spread of prognostic variables from the surface layer up to the middle troposphere.

The goal of this study is to develop and test a perturbing techniques of the soil initial state in order to include soil perturbation in the convection-permitting ensemble COSMO-IT-EPS, currently under development in Italy in collaboration between ARPA-SIMC, ARPA-Piemonte and CNMCA., also thanks to the computing resources allocated in the SPITCONV Special Project.

Tests will be initially performed on a case-study basis. Each case study will be selected in order to represent different synoptic forcing. The ensemble members will differ from each other only in the initial soil conditions (namely soil water content). Boundary conditions, as well as initial atmospheric conditions, will be the same for all the ensemble members in order to understand the contribution to the spread given only by different soil initial state.

Once the perturbation technique is defined, more extensive tests will be performed, running the soil perturbation scheme in an ensemble forecasting framework, where soil perturbations will be integrated with lateral boundary condition perturbations and, at a later stage (second year), also with initial condition perturbations and model perturbation. The role of the different perturbations will also be addressed.

Working plan for the first year (second half of 2014) will be structured in the following way:
1. Chose an appropriate perturbation technique acting both on the soil initial state (i.e. soil water content) and the soil/land-use property setting (i.e. LAI, roughness length);
2. Simulate several case studies with different synoptic forcing;
3. Result analysis.