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 2019

Project Title: Improvement of a convection-permitting Ensemble Prediction System over Italy

Computer Project Account: SPITEPS

Principal Investigator(s): Lucio Torrisi

Affiliation: COMET (Operational Center for Meteorology) - Italian Air Force Met. Service

Name of ECMWF scientist(s) collaborating to the project (if applicable)
Francesca Marcucci (COMET)
Marco Alemanno (COMET)
Riccardo Scatamacchia (COMET)

Start date of the project: 01 jan 2019

Expected end date: 31 dec 2021

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)	-	-	9500000	0
Data storage capacity	(Gbytes)	-	-	5000	0

Summary of project objectives (10 lines max)

The goal of this study is to improve the convection permitting ensemble prediction system COSMO-IT EPS, over the Italian domain, based on the Ensemble Kalman Filter (EnKF) approach for the data assimilation component (estimation of the initial conditions) and the COSMO local model (www.cosmo-model.org) for the prognostic one. The output of this system could then be used to generate new probabilistic products for aeronautical support, taking advantage also of the developed tools for fog and thunderstorm prediction developed in the framework of the EUMETNET SRNWP EPS-II Project

Summary of problems encountered (10 lines max)

No real problem was encountered, neither technical nor conceptual.

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

Plans for the continuation of the project envisage the sensitivity test of the system using different parameterizations of the shallow convection in COSMO model (Tiedtke versus Becthold scheme). Implementation of convective permitting ensemble with BCs from most recent ECMWF-EPS run and evaluation of performances with respect to the configuration with BCs from COSMO-ME EPS is also planned.

List of publications/reports from the project with complete references

None

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 first part of the current year has been spent to implement an experimental suite to test the data assimilation algorithm based on the LETKF approach (KENDA system, Schraff C. et al., 2016) to initialize the COSMO model over the Italian domain in deterministic (COSMO-IT) and probabilistic mode (COSMO-IT EPS).

A modified version of KENDA- LETKF analysis algorithm and of COSMO model (also in single precision) have been compiled on cray-hpc, under the same environment. The test suite for the data assimilation cycle has been realized with a 40 members ensemble plus a deterministic member, having a 0.02° grid spacing (~2.2 km) and 65 vertical levels, 3hour data assimilation cycle and BCs from operational COSMO-ME EPS.

It is our intention to start in this second part of the year the statistical comparison of the LETKF performance with respect to the nudging assimilation over of a past dataset (BC and observations have been archived from 04 Nov 2017 to 22 Jan 2018)

For this experiment we planned to ingest a similar set of observations used in the operational data stream for the nudging analysis of the COSMO-IT model. The observational dataset comprises radiosonde ascents (RAOB), surface pressure observations from land and sea stations (SYNOP, SHIP, BUOY), manual and automatic aircraft observations and wind profilers.
An a-posteriori perspective will be assumed as regards the treatment of random model error. We will use a combination of additive and adaptively-varying multiplicative covariance inflation techniques. Stochastic sea surface temperature and soil moisture perturbations will be applied. Model uncertainty representation through a stochastic physics scheme (Buizza et al, 1999; Palmer et al, 2009) will be also switched on in the prognostic model for the EPS runs.