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:	Investigating the impact of 3-hourly cycling 3D-VAR with GNSS measurements in Weather Research and Forecasting (WRF) model
Computer Project Account:	spitmazz
Principal Investigator(s):	Vincenzo Mazzarella
Affiliation:	CIMA Research Foundation – Savona, Italy
Name of ECMWF scientist(s) collaborating to the project (if applicable)	…………………………………………………….…… …………………………………………………….……
Start date of the project:	March 3, 2021
Expected end date:	December 31, 2022

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)			950000	9365.17
Data storage capacity	(Gbytes)			1000	300

Summary of project objectives (10 lines max)

This special project aims to investigate the impact of the different types of GNSS data in the simulation of several convective events within the framework of the SINOPTICA project. To this purpose the GNSS Radio Occultation (RO), GNSS Zenith Total Delay (ZTD) and GNSS Precipitable Water Vapor (PWV) in combination with the weather radar reflectivity are assimilated in Weather Research and Forecasting (WRF) model using a 3-hourly cycling 3D-Var.

The performance of the different experiments will be evaluated in terms of Quantitative Precipitation Forecasts (QPF) adopting a spatial verification technique. This method identifies the spatial patterns (or objects) in observed/predicted precipitation fields and compare them through a few attributes, e.g., distance between centroid, area of intersection, orientation, that are calculated based on fuzzy logic.

Summary of problems encountered (10 lines max)

Despite WRF versions available on CCA/B, we have compiled the WRF and WRFDA version used operationally at CIMA foundation. This was our first time working with a Cray HPC and we had some small issues in compiling WRF and WRFDA. However, the problems have been resolved following the guide on the ECMWF Confluence Wiki page.

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

We will proceed to the first experiments with GNSS data, namely ZTD, PWV and RO in combination with the reflectivity acquired from the Italian weather radar network. We plan to perform 3 simulations for each selected event and in addition a control run (CTL) without assimilation. The comparisons will be made in terms of 1-hourly and 3-hourly cumulated precipitation using the Method for Object-Based Diagnostic Evaluation (MODE) tool.

List of publications/reports from the project with complete references

There are not yet publications but a PICO presentation at EGU General Assembly 2021:

Parodi, A., Temme, M., Gluchshenko, O., Kerschbaum, M., Surian, N., Biondi, R., Realini, E., Gatti, A., Tagliaferro, G., Llasat, M. C., Rigo, T., Esbri, L., Milelli, M., Mazzarella, V., Lagasio, M., and Parodi, A.: H2020 SINOPTICA (Satellite-borne and IN-situ Observations to Predict The Initiation of Convection for ATM) project: initial results, EGU General Assembly 2021, online, 19–30 Apr 2021, EGU21-891, https://doi.org/10.5194/egusphere-egu21-891, 2021.

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.

This special project is part of the SINOPTICA, a project funded under the European Horizon 2020 programme and dedicated to the assimilation of data for the improvement of mathematical models used in the prediction of extreme events, in order to support air traffic management. In this context, the first 3 months of this late project were devoted to the selection of the severe convective events in some of the busiest airports in Italy and their synoptic description. Finally, WRF model and WRFDA are successfully compiled on ECMWF's Cray HPC and the first experiment with no assimilation is carried out.

For more details about SINOPTICA project you can visit the following website:

http://sinoptica-project.eu/