REQUEST FOR ADDITIONAL RESOURCES IN THE CURRENT YEAR FOR AN EXISTING SPECIAL PROJECT

Please email the completed form to special_projects@ecmwf.int.

MEMBER STATE: ………ITALY…………….…………………...…

Principal Investigator[1]: ………Stefano Federico…(user cm4)……… ……….……

Affiliation: ………ISAC-CNR (Institute of Atmospheric Sciences and Climate)………………….……

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Other researchers: Claudio Transerici (account cmn)………… …

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Project title: Study of different configurations of the RAMS model for precipitation and lightning forecast over Italy at high horizontal resolution.

Project account: **SPITFEDE _**

Additional computer resources requested for	2020
High Performance Computing Facility (units)	4,000,000
Data storage capacity (total) (Gbytes)	3000

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[1] The Principal Investigator is the contact person for this Special Project

Technical reasons and scientific justifications why additional resources are needed

The PI of this project is writing of a book chapter where two aspects of lightning data assimilation are considered: first the sensitivity of the prediction of the rainfall to the choice of the vertical layers were the pseudo profile of water vapour is assimilated (the charging zone (0C, -25C) or the layer between the Lifting Condensation Level and the -25°C isotherm); second the impact of forecast length (3h, 6h, 9h and 12 h) on the precipitation forecast.

To examine the above two points, ten days of November 2019, characterized by widespread and heavy rainfall over Italy are selected (3,5,11,12,15,16,17,19,23,24).

To tackle the two scientific questions, 30 days must be simulated: CTRL, 10 days without lightning data assimilation; LCL: 10 days with lightning data assimilation through saturated pseudo-profiles of water vapour between the LCL and the -25°C isotherm; charging zone: 10 days with lightning data assimilation through saturated pseudo-profiles of water vapour between 0°C and the -25°C isotherm. Each simulation lasts 18h and the first 6h are used to assimilate lightning, leaving 12 h of forecast available to evaluate the impact of lightning data assimilation on different forecast ranges (3h, 6h, 9h and12 h). Also, the forecast approach used is that of VSF (Very Short-term Forecast) in which a forecast is run every 3h updating, for each cycle, the lightning assimilated. In this approach, 8 simulations are necessary to complete the forecast of 1 day.

So, 30 *8 simulations of 18h are needed for this experiment to consider the 10 days, the three model configurations and the 8 VSF for each day.

The RAMS@ISAC model will be used in this research. The horizontal resolution of the model is 3 km, which is necessary to account for the complex orography of Italy. The domain will extend over the whole Italy and part of neighbourhood countries. The number of grid points is 635 in both horizontal directions while the vertical levels are 42, spanning the troposphere and the lower stratosphere. No nesting is applied and only one grid will be used.

Each simulation (1 complete day, i.e. 8 VSF, for a specific configuration) will take 100,000 SBU on cca. This is a quite precise estimate obtained from experience with cca. So, the whole experiment will take 3,000,000 SBU. However, a request of 4,000,000 SBU seems more appropriate to account for post-elaboration of simulations as well as errors that may occur.

The simulations will be stored on ECFS and the model output will be saved every 1h to consider in more detail the most intense phases of the storm, if necessary. This justify the request for additional 3 TB on ECFS.