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]:   Andrea Storto

Affiliation: CMRE, CNR

……………………………………………………………….……

……………………………………………………………….……

Address: Via del Fosso del Cavaliere 100, 00133 Roma, Italy

……………………………………………………………………….

Other researchers: Silvia Falchetti, Paolo Oddo

……………………………………………………………….……

Project title: Enhancing regional ocean data assimilation in high and mid latitude European seas

……………………………………………………………….……

Project account: **SPITSTOR**

Additional computer resources requested for	2021
High Performance Computing Facility (units)	1 000 000 SBU
Data storage capacity (total) (Gbytes)	NO ADDITIONAL RESOURCES NEEDED

Continue overleaf

---

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

Technical reasons and scientific justifications
why additional resources are needed

With respect to the initial proposal (https://www.ecmwf.int/sites/default/files/special_projects/2019/spitstor-2019-request.pdf), we have increased the resolution of the NEMO ocean model configuration covering the North Atlantic and Arctic oceans (using both eddy-permitting, 1/4°, and eddy-resolving, 1/12° resolutions). The additional resources would then be used to perform multi-annual simulations with those model configurations, in order to:

1) recalculate background-error statistics for use in variational data assimilation and perform short assimilation experiments at such resolutions, with the specific goal to test the assimilation of altimetry data at high latitudes (evaluating the new Sentinel-6 dataset) and test the assimilation of synthetic data from the forthcoming CIMR microwave imager. We will indeed focus on assessing data from the Copernicus constellation, which is among the priorities of CNR-ISMAR.

2) assess the eddy activity at 1/4° with or without the newly developed stochastic ocean physics package (https://doi.org/10.1002/qj.3990), and compare it with the 1/12° resolution configuration. This will shed light on the increase of the signal resolution through the use of stochastic ocean physics schemes, which is important for a very broad range of climate applications.

3) create a dataset of sea-ice anomalies and sea-ice ocean state, in order to test the use of machine learning algorithm (a deep artificial neural network, DNN) for use in multi-variate multi-category sea-ice data assimilation. The way sea-ice analysis increments from "mono-category" observations are divided into "multi-category" increments is indeed non-trivial, and we plan to test a DNN approach to such problem.

Additionally, we have completely updated our tangent-linear/adjoint code of the ocean model for use in 4DVAR experiments. The additional resources will be used to perform short tests comparing the new 4DVAR system with the old one and the standard 3DVAR. These tests are generally short (3-month period) and performed with a regional configuration (Ligurian Sea) of the NEMO ocean model. Nevertheless, they still require more resources than initially planned, due to the costly nature of the 4DVAR algorithm.