

# 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:** REsolved orography impact on the mid-latitude FLOW with ECEarth (REFOrgE)

**Computer Project Account:** spitdav2

**Principal Investigator(s):** Paolo Davini

**Affiliation:** Istituto di Scienza dell' Atmosfera e del Clima, Consiglio Nazionale delle Ricerche (CNR-ISAC)

**Name of ECMWF scientist(s) collaborating to the project**  
(if applicable) Dr. Irina Sandu (ECMWF)

**Start date of the project:** 01/01/2019

**Expected end date:** 31/12/2021

## 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
<b>High Performance Computing Facility</b>	(units)	0	0	29.5 millions	0.24 millions
<b>Data storage capacity</b>	(Gbytes)	0	0	40,000	0

### **Summary of project objectives** (10 lines max)

Within REFORGE we aim at exploring the impact that resolved and sub-grid orography has on the flow using the EC-Earth global climate model. Making use of a set of atmosphere-only integrations at three different horizontal resolutions (~80 km, ~40 km and ~25 km) we will 1) explore the effect of resolved orography on the mid-latitude climate – with a special regard to recurrent weather pattern as atmospheric blocking –2) assess to what extent the current parametrizations of sub-grid orographic effects (which are unresolved at a standard climate model resolution, i.e. ~80 km) are able to reproduce the effects of the resolved orography, 3) explore ways of improving the simulation of circulation patterns in climate simulations improving the representation of the unresolved orography.

### **Summary of problems encountered** (10 lines max)

During 2018 and 2019 massive updates have been performed on the EC-Earth Global Climate Model code following the need of fulfilling the CMIP6 requirements. Therefore the previous version of model – EC-Earth v3.2.2., the one that we planned to use in the current project – has become deprecated and it is no longer maintained. This pushed the PI to wait for a stable CMIP6-compliant release to pursue the REFORGE present special project. Indeed, several changes (not only in the code but also in the postprocessing suite) has been introduced.

EC-Earth 3.3.1.1, which is the official release used for all the DECK integrations, has been released in mid-June and it will be therefore used for the entire REFORGE project. This original planning has been slightly postponed so that the first integrations will start in the next weeks.

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

We will start as planned with the CORE runs, i.e. the ones at TL255, TL511 and TL799 with default orography that will be used as a benchmark. By the end of the year we will proceed with TL799 and TL511 with the coarser orography. They will be ready during winter 2019-2020.

### **List of publications/reports from the project with complete references**

None – The experiments will be starting shortly.

### **Summary of results**

In the first 6 months of the project (from January 2019 up to June 2019) the most of the work has been technical, porting the EC-Earth global climate model code on the CCA platform and setting up the diagnostic and postprocessing tool. A major improvement is that REFORGE will benefit of the ece2cmor3 tool (which has been developed for the CMIP6 EC-Earth campaign, [https://zenodo.org/record/1051094#.XQibi\\_kzb1I](https://zenodo.org/record/1051094#.XQibi_kzb1I)) that will provide output in cmor format allowing a simpler data analysis and sharing.

The model has been tested at the 3 different resolutions (TL255, TL511, TL799) and it is currently installed with a revision (r6970) which represents the official EC-Earth 3.3.1.1. A new scaling has been carried out for the TL255 and TL511 resolutions confirming the figures provided at the times of the proposal.

Furthermore, the current version of EC-Earth is now based on the so called “amip-reader”, a tool that interpolates the SST and SIC field to the required resolution radically simplifying the treatment of the boundary conditions. It will be therefore easy to provide a climatological field SST/SIC based on the CMIP6 boundary conditions. Similarly, the EC-Earth 3.3.1.1 is now reading CMIP6 GHG forcing.