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: Ireland

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Project title: HARMONIE Climate (HCLIM) Regional Downscaling Simulations for Ireland

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Project account: **spiemcgo**

Additional computer resources requested for		**2021**
High Performance Computing Facility	(units)	4.5 million
Data storage capacity (total)	(Gbytes)	

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

Technical reasons and scientific justifications why additional resources are needed

We would like to apply for an additional 4.5 million SBUs for 2021.

This project aims to obtain downscaled projections of the Irish climate using the HARMONIE climate (HCLIM) model, with CMIP6 global EC-Earth data as input. A two-stage approach is adopted whereby EC-Earth data is downscaled first to 12 km with Aladin physics, and subsequently to 4 km with Arome physics. The domains of the 12 km and 4 km resolution runs are shown respectively in Fig.1.

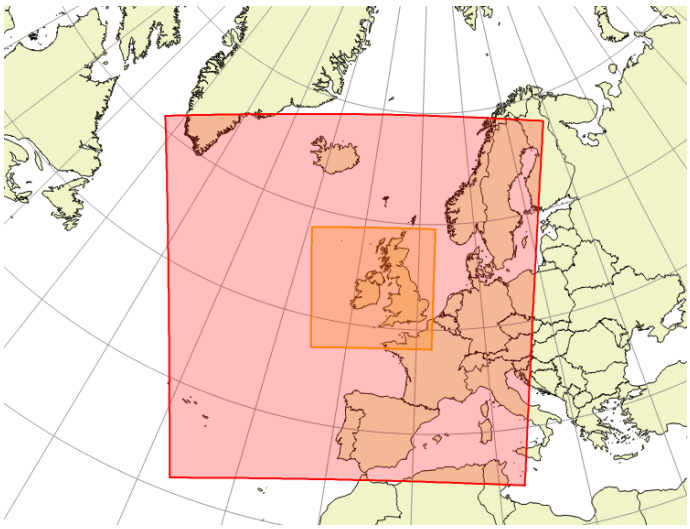

Fig. 1 *Domains of the 12 km resolution (red) and 4 km resolution runs (yellow)*

The 4 km and 12 km resolution 21-year 1980-2001 ERA5 runs, and the 4 km and 12 km historical 35-year 1980-2015 EC-Earth runs have so far been completed. The future RCP4.5 EC-Earth 4 km and 12 km runs beginning at 2014 are in progress. As of end of March 2021, the 12 km future EC-Earth run has completed 36 years to 2050, and the 4 km EC-Earth run has completed 26 years to 2040.

Due to computational constraints, the decision was taken in 2020 to focus on completing the first half of the future EC-Earth 4 km and 12 km nested runs, namely from 2014-2050. Although shorter than originally planned, these reduced runs will nevertheless allow for a 2015-2050 35-year future climatology to be constructed (after removal of the 2014 spin-up year). Such a climatology meets the generally recommended minimum time period of 30-35 years, providing a valuable climatological record for further analysis.

We have completed the 12 km future EC-Earth run to 2050, thereby reaching our goal of constructing a 35-year climatology at this particular resolution. Unfortunately, our SBU allocation for 2021 only permitted our 4 km future EC-Earth run to complete to 2040. We are therefore currently 10 years short from completing the 4 km 35-year climatology.

Based on the completed simulations to date, the average cost of running 1 month at 4 km is approximately 35 kSBU, or 4.2 MSBU for 10 years. The HCLIM model has a tendency to crash and to require a restart every 5-10 years of model simulation. For a 10-year run at 4 km resolution, such restarts can be expected to cost in the range of 0.2-0.3 MSBU. Therefore, the total cost for running 10 years at 4 km resolution is estimated to be approximately 4.5 MSBU.

The project allocation for 2021 was 18 MSBUs, which has now been fully utilised. This 18 MSBU, along with the project allocation for 2020, has allowed us to complete the planned historical ERA5, EC-Earth runs, and the future 12 km future EC-Earth run. We require an additional 4.5 MSBU to complete the final 10 years of the 4 km future EC-Earth run. These additional units would enable a 35-year 2015-2050 climatology to be constructed at the desired higher resolution. This climatology will serve as a valuable dataset for further analysis for a wide range of researchers and users in Ireland.