SPECIAL PROJECT PROGRESS REPORT

Progress Reports should be 2 to 10 pages in length, depending on importance of the project. All the following mandatory information needs to be provided.

Reporting year
……………2017…………………………….……

Project Title:
…Modeling MIS3: a mild glacial climate state.……

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Computer Project Account:
……spdklang…………………………….……

Principal Investigator(s):
………Peter Langen………….……

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Affiliation:
……Danish Meteorological Institute.……

Name of ECMWF scientist(s)
………………………………………………….………
collaborating to the project
(if applicable)
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Start date of the project:
……1 Jan 2017…………………………….……

Expected end date:
……31 Dec 2018…………………………….……

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)	-	-	2250000	0
Data storage capacity	(Gbytes)	-	-	3000	~0

Summary of project objectives

(10 lines max)

As part of the efforts under the ERC Synergy Grant project "ice2ice", we aim to perform an EC-Earth simulation of climate conditions during Marine Isotope Stage 3 (MIS3), a time prior to the Last Glacial Maximum marking the period with the most pronounced climate shifts recorded in the Greenland ice core records. In light of the ongoing rapid decline of Arctic sea ice and its likely influence on the Greenland Ice Sheet, understanding of previous abrupt reorganizations in the North Atlantic/Arctic climate system is important for a clear mapping of the potential consequences of the current warming. We have devised a protocol for a coordinated set of experiments between the NorESM (run by ice2ice colleagues in Bergen), HadCM3 (by William Roberts, U Bristol) and EC-Earth models. The main experiment will consist of an equilibrium snap-shot at 38,000 years before present (38 ka). The protocol addresses the changed land-sea mask and ocean bathymetry (due to 70 m lowered sea level), ice sheet geometries for the Northern Hemisphere and settings for atmospheric composition, orbital parameters and changed/extended river routing.

Summary of problems encountered (if any)

(20 lines max)

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The EC-Earth version 3 (currently at 3.2.2) which is to be used for the EC-Earth consortium's CMIP6 contributions is fully tuned. Since we wish to use the same model (albeit in the lower T159-1 deg ocean resolution) we have not been able to commence the production runs. This tuning is planned to be completed over the summer and production runs can commence in the fall.

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Summary of results of the current year (from July of previous year to June of current year)

This section should comprise 1 to 8 pages and can be replaced by a short summary plus an existing scientific report on the project

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As described above, we have been unable to commence the production runs. But we have set up the T159 version of the model (standard EC-Earth resolution is T255) and post-processing of the output.

We have also set up forking so that executables can share nodes. This is nice when running at relatively low resolution and two of the model component executables only need one processor. With the 36 pu wide nodes, this would without forking lead to 70 idle pus giving a huge relative overhead.

We did some tests and found that the best trade-off between waiting for results and minimizing billing unit use per model year was:
3 nodes (108 pus) spread across
ifs 42
nemo 64
xios 1
runoffmapper 1

This setup gave us approximately 6-7 sim years pr wall clock day (or roughly 16 wall clock days for 100 sim years). And each sim years costs just over 7000 SBUs.

This is about 50% more than we estimated in the application based on the previous version of the model. This is primarily due to higher vertical resolution in the ocean in the new version. This may mean that once production runs start, we may apply for additional resources. But we will wait with this until we have the production going and we can gauge the cost of model spin-up.

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List of publications/reports from the project with complete references
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None
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Summary of plans for the continuation of the project
(10 lines max)

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During summer, the model will be tuned and ready for production. In the meantime, we have included Qiang Li from Bolin Centre for Climate Research, Department of Physical Geography, Stockholm University who has previously set up the EC-Earth for Last Glacial Maximum conditions. He will be involved in preparing the boundary conditions and in setting up the MIS3-specific experiment.

Once the final version of the model is ready and we have the boundary conditions in place after summer, we will start the spinup of the MIS3 climate.

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