

## SPECIAL PROJECT FINAL REPORT

All the following mandatory information needs to be provided.

|  |  |
|--|--|
| <b>Project Title:</b>                            | Permafrost in the global climate system:<br>EC-Earth and GIPL                              |
| <b>Computer Project Account:</b>                 | Spdkrode   |
| <b>Start Year - End Year :</b>                   | 2017 - 2018  |
| <b>Principal Investigator(s)</b>                 | Christian Rodehacke (nhc)  |
| <b>Affiliation/Address:</b>                      | Danish Meteorological Institute (DMI),<br>Lyngbyvej 100<br>DK-2100 Copenhagen Ø<br>Denmark |
| <b>Other Researchers<br/>(Name/Affiliation):</b> |  |

The following should cover the entire project duration.

## **Summary of project objectives**

(10 lines max)

### **Permafrost in the global climate system**

As part of our commitment to the EC-Earth community, we aim to perform simulations between the two-way coupled global climate model EC-Earth and the dedicated permafrost model GIPL.

Permafrost is commonly considered as passive parts of the global climate system due to their long memory of past climate conditions. However they may be subject to sporadic changes and/or trigger changes in the remaining climate system. Permafrost as a large cryonic body, with a vertical extent up to more than 100 meter, requires a substantial amount of energy to change its state from frozen to thaw. Could this mitigate the “Polar Amplification” over centuries? Since permafrost holds vast quantities of various potent greenhouse gases, their release could potentially amplify warming trends. The amplified release of methane may already occur from subsea permafrost located on the continental shelf of Siberia

## **Summary of problems encountered**

(If you encountered any problems of a more technical nature, please describe them here.)

We have tested the permafrost model GIPL extensively on the DMI's HPC computer (Cray), where the code runs hassle-free. However a difficult financial situation at DMI, which came to a head in spring 2017, has led to less comfortable staffing levels at my institute. We're still recovering from these cuts. Since we at our institute have not been able to restore the project, I could not implement what we have planned.

## **Experience with the Special Project framework**

(Please let us know about your experience with administrative aspects like the application procedure, progress reporting etc.)

Everything worked smoothly and we got immediate responses if we had any questions.

## **Summary of results**

(This section should comprise up to 10 pages, reflecting the complexity and duration of the project, and can be replaced by a short summary plus an existing scientific report on the project.)

As part of our intensive testing of the permafrost model, we have performed subsea permafrost simulations with a focus on the Siberian continental shelf. Currently we're analysing this ensemble of subsea permafrost simulations to understand its future prospects. The publication in progress will address also the results dependence from weakly constrained parameterizations and from various poorly known boundary conditions, such as the layering of the ground properties or salinity profiles with depth

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

None

## **Future plans**

(Please let us know of any imminent plans regarding a continuation of this research activity, in particular if they are linked to another/new Special Project.)

The needed boundary conditions to drive our model are now available from the EC-Earth community. Since our staffing level is recovering much slower than we have anticipated, we have to reduce our ambitions for the immediate following period. We will first focus only on the technical part of the work. However, tight personal resources may not allow reviving the project.