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Impact of research software engineering by natESM in climate and weather domain

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Earth System Modeling (ESM) involves a high variety and complexity of processes to be simulated which resulted in the development of numerous models, each aiming on the simulation of different aspects of the system. These components are written in various languages, using different High-Performance Computing (HPC) techniques, tools, and overlap or lack functionalities.

To use the national HPC resources and the scientific expertise more efficiently, the national Earth System Modeling strategy (natESM) project aims to establish a coupled seamless ESM system by providing so-called technical-support sprints. A sprint consists of a goal-oriented package of work executed by a dedicated RSE on a selected ESM model during a defined amount of time. Here we present the results achieved during the project so far in terms of technical improvements to the community code and the community perception on the project.

Since April 2022, 15 sprints have been conducted by the project team, working on different subjects like GPU porting, coupling, parallelization and general software engineering tasks. By far, the largest interest of the community has been in GPU porting, which was the focus of 8 of the 15 sprints, followed by coupling and model integration with 5 sprints. This is in line with the natESM vision, and reinforces both the power of such a project in shaping the community codes and the importance of a clear strategy and communication.

These sprints focused on 13 models from the community, including ocean modelling, atmospheric chemistry, land and urban surface, frameworks and more. Out of these 13 models, 10 are written mostly in Fortran – indicating still a preference from the community for this language –2 are written in C/C++ and 1 in Python.

naESM's positive perceived impact on the ESM community resulted in the preparation of a second phase for the project. An objective survey is planned before February 2025, to get the feedback from the scientists who have engaged in natESM sprints. The survey results will be included in the poster for the entire RSE community to witness. The community workshop, which is planned for February 2025, will further serve as a platform to get the pulse of the community regarding the services provided by natESM.

We aim to show the impact that a project such as natESM can have on the scientific community it pertains to. It is an effective way to help scientists overcome technical challenges, ultimately enabling the models to support more and better science. Due to its governance structure, it can also act as the executive entity responsible for bringing to reality a vision shared by the community. We believe this is a model that can be replicated by other institutions and for different fields to provide technical support for a broad group of scientists.

I want to participate in the youngRSE prize

Primary authors: MITIC, Aleksandar (DKRZ); DEVULAPALLI, Aparna (DKRZ); BENKE, Joerg; LOCH, Wilton Jaciel (Deutsches Klimarechenzentrum)

Co-author: Dr SUKOV, Sergey (FZ Jülich (JSC))

Presenters: MITIC, Aleksandar (DKRZ); DEVULAPALLI, Aparna (DKRZ)

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