REQUEST FOR ADDITIONAL RESOURCES IN THE CURRENT YEAR FOR AN EXISTING SPECIAL PROJECT

MEMBER STATE: Germany

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Project title: Potential sea-ice predictability with a high resolution Arctic sea ice-ocean model

Project account: **SPDELOSC**

Additional computer resources requested for	3/2/17
High Performance Computing Facility (units)	7000000 SBU
Data storage capacity (total) (Gbytes)	

Continue overleaf

Technical reasons and scientific justifications why additional resources are needed

We are requesting extra computational resource because we need more simulations to answer the key questions of the project with convincing results.

One of the aims of the project is to measure the potential predictability of sea ice deformation in high resolution sea ice models. As we explained in our latest progress report, we used deterministic metrics to measure the predictability of the Linear Kinematic Features (LKF) that appeared in our high resolution Arctic model. The new metrics made visible unrealistic, stationary, artificial LKFs related to the domain decomposition. The smooth discontinuities in the solutions of the sea ice velocity field could be traced back to insufficient iterations in the restricted additive Schwartz (RAS) method for solving the non-linear implicit discretized equations. For analysis of sea ice fields such as thickness, concentration and drift speed, the solutions are sufficiently accurate, but for analyzing derivative fields of velocities (deformation and hence leads), more iterations are required. More iterations make the simulations 25 % more expensive, and we had to repeat a few experiments that we had already carried out to test the new metrics of lead detection and comparison.

Part of the project is analyzing the effects of uncertainties in the forcing and of internal errors of the sea ice model on sea ice deformation predictability. Our currently available ensemble prediction system, which we used for testing and first predictability estimates, covers only a few months in the year 2005. Now, we need to provide more ensemble cases to investigate the seasonality effects. Furthermore, during our investigation is became clear that the resolution of the atmospheric forcing may play a pivotal role in the predictability of the LKFs. Our deterministic analyses have shown the dominant effects of the atmosphere in the predictability, but to our mind our analysis can only be complete after we have investigated the mechanisms of transferring predictability from larger scale, which current low resolution atmospheric forcing are resolved, to the smaller scales. Thus, we need additional ensemble simulations with high resolution atmospheric forcing products. We plan to compare simulations with HRES forcing (http://www.ecmwf.int/en/forecasts/datasets/set-i#l-i-a) to our ensemble simulations with lower resolution forcing.

In summary, we still need 4 ensemble experiments x 24 cases of 10 days each x 20 ensemble members = 1920 simulation. Each simulations requires approximately 5000 SBU, so that we need 9.2 10^{-6} SBU to complete this work plan. There are approximately 2 10^{-6} SBU left so that we are asking for 7 10^{-6} SBU.