

Project information

Keywords

Marine Ecology, Biogeochemistry, Physical Oceanography, Mathematical modeling

Project title

Ecosystem modeling of the Arctic Ocean around Svalbard

Year

2016

Project leader

Pedro Duarte

Geographical localization of the research project in decimal degrees (max 5 per project, ex. 70,662°N and 23,707°E)

78° N 13° W, 72° N 11° E, 83° N 36° E and 88° N 15° E.

Participants

Haakon Hop / NPI / Haakon.hop@npolar.no

Harald Steen / NPI/ Harald.Steen@npolar.no

Philipp Assmy / NPI/ Philipp.Assmy@npolar.no

Tore Hatterman* / Akvaplan-niva (AKV) / tore.hattermann@akvaplan.niva.no

Ole Anders Nøst / AKV / ole.anders.nost@akvaplan.niva.no

Evgeniy Yakushev* / Norsk Institutt for vannforskning (NIVA) / evgeniy.yakushev@niva.no

Andre Staalstrøm / NIVA / andre.staalstrom@niva.no

Radovan Bast* / Tromsø Arctic University (UiT) / radovan.bast@gmail.com

Flagship

Arctic Ocean

Funding Source

Fram Center

Summary of Results

A summary of the results was included in the previous report submitted in September. Therefore, here we merely update what was then detailed.

As mentioned in the previous reports we have been updating our work and coupling Ecodynamo biogeochemistry with the ROMS3.6-CICE coupled model. This task was finished and we are now testing the coupled system.

Meanwhile, the new domain with 800 m resolution was defined and its corner coordinates are: 78° N 13° W, 72° N 11° E, 83° N 36° E and 88° N 15° E. We are now in the process of defining the biogeochemical boundary conditions for the boundaries of the new domain from available databases.

Between the last report and the present one we implemented more biogeochemical processes in the coupled model to allow for the computation of dissolved inorganic carbon processes, with emphasis on carbon dioxide and pH.

Master and PhD-students involved in the project

A retreating sea ice cover will produce potentially important changes in associated ecosystems and corresponding services. Therefore, a deep understanding of ecosystem processes is crucial for the implementation of models allowing accurate prediction of future trends so that appropriate measures may be taken. This work will add to the

tools already available at the involved institutions, improving their understanding of the Marginal Ice Zone and the Arctic Ocean. Considering that the project end was postponed from December 2016 to June 2017 it is likely that most of its goals will be achieved. Efforts are being done to conciliate the modeling work developed here with that developed in other Fram Center projects to make sure that the model physical background and setup is exactly the same avoiding any compatibility issues in the future. These efforts delay the final model implementation but we believe they are worthy.

Published Results/Planned Publications

A paper was submitted to the Journal of Geophysical Research in September that was partly done with funds from this project. We got feedback from the editor las December and were asked to carry on some modifications in the submitted paper. We plan to send the revised version within next week.

“Sea ice thermo-, halodynamics and biogeochemistry during the Norwegian Young Sea Ice cruise (N-ICE2015) in the Arctic Ocean: empirical and modeling results”

Another paper about the coupling methodology ROMS-EcoDynamo is in prep.

Communicated Results

Results were communicated to the following conferences/workshops this year:

- 9th Portuguese Polar Conference in Lisbon, 27-28th October (oral presentation)
- 5th Forum for Arctic Modeling and Observing Synthesis (FAMOS) Meeting, Woods Hole Oceanographic Institution, 2-4th November (poster)
- A communication to Arctic Frontiers “Model forecasting of sea-ice physics and biogeochemistry in the Arctic Ocean”

Interdisciplinary Cooperation

This project benefits from inter-disciplinary cooperation. In fact, the modeling work done so far includes ice physicists and marine biologists. Therefore, the main disciplines involved in the project are Ice and Ocean Physics and Marine Biology and Ecology. Furthermore, contacts were established with colleagues at the University of Alaska Fairbanks regarding biogeochemical modeling that, hopefully, may boost some important collaboration in the near future. Also, contacts were established with the CICE modeling team at the Los Alamos National Laboratory (USA) and the Finnish Environmental Institute.

Budget in accordance to results

Funding from the Fram Centre is fundamental to pay for the project expenses, with emphasis on labor and technical assistance. The project was not completed yet. Fram Centre funding for 2016 and first half of 2017 is a necessary condition to complete the project. The Norwegian Polar Institute and its Centre for Ice Climate and Ecosystem have substantially contributed with in-house funding for this project, namely in what concerns the development of the ice algal model. Following recommendations from the Fram Centre flagship financing this project, other sources of financing were and will be attempted.

Could results from the project be subject for any commercial utilization

No

Conclusions

Project tasks have evolved as planned in spite of some delays due to unforeseen problems. It is likely that project goals will be achieved by June 2017, even though model calibration/validation may not be at the desired level by then. In any case, a sound modeling system will be available that may be further developed and improved over time as more data and knowledge becomes available within the scope of projects carried out in the Arctic Ocean.