Project information

Keywords
Marine Ecology, Biogeochemistry, Physical Oceanography, Mathematical modeling

Project title
Ecosystem modeling of the Arctic Ocean around Svalbard

Year
2017

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

As mentioned in the previous reports in 2016 we have been updating our work and coupling Ecodynamo biogeohemistry 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 gathered the biogeochemical boundary conditions for the boundaries of the new domain from available databases and we are now testing the model with the "final" domain. We are struggling with several technicalities that we hope to solve in due time.

Master and PhD-students involved in the project

None

For the Management

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 December 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 published recently that was partly done with funds from this project.

Duarte, P., Meyer, A., Olsen, L.M., Kauko, H.M., Assmy, P., Rösel, A., Itkin, P., Hudson, S.R., Granskog, M.A., Gerland, S., Sundfjord, A., Steen, H., Hop, H., Cohen, L., Peterson, A.K., Jeffery, N., Elliot, S.M., Hunke, E.C., Turner, A.K., 2017. Sea ice thermodynamics and biogeochemistry in the Arctic Ocean: Empirical and model results. Journal of Geophysical Research Biogeosciences, 122. doi:10.1002/2016JG003660.

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

Communicated Results

Results were communicated in previous years as described in previous reports but not yet in 2017.

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. In spite of the great help of the funding from the Fram Centre, we are struggling with a shortage of man-power due to unexpected technical problems in using ROMS+CICE. However, we expect to deliver the planned work.

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 the end of 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.