

## Project information

### Keywords

Fjord circulation, glacier fronts, Atlantic water

### Project title

Effects of oceanic inflow and glacial runoff on fjord circulation in Kongsfjorden, Svalbard; establishment of a high resolution ocean circulation model system (KongHiro)

### Year

2016

### Project leader

Arild Sundfjord

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

79 N, 12 E

### Participants

Norwegian Polar Institute

Institute of Marine Research

University Centre in Svalbard

### Flagship

Fjord and Coast

### Funding Source

Fram Centre and IMR internal funding

## Summary of Results

In phase I (2014) a high resolution (160 m) hydrodynamic numerical model setup of ROMS for Kongsfjorden, was established and initial simulations performed for the period 2005-2010 - a period where good observational data sets are available for evaluation of the model performance. In phase II (2015) the model's representation of fjord exchanges - AW inflow in particular - was compared with statistics based on available data from available mooring time series. Model hydrography was compared with data from moored instruments and from annual cruises; fresh water height, potential energy anomaly and mixed layer depth. Sea ice area and thickness was evaluated against data from the NPI sea ice monitoring series. In 2016 the analysis of results continued and a manuscript has been submitted to Elsevier's Estuarine, Coastal and Shelf Science (currently under review). Main results are that wind-driven exchanges are more important than circulation driven by runoff of glacier melt water. This means that the local wind field is capable of bringing significant volumes of water into the interior fjord also in winter, contributing to reduced sea ice cover and accelerated glacier front melting in periods when warm water is available in the outer fjord basins. In addition to completing the work from the first years of the project we have started implementation of a finer-resolution two-way coupled non-hydrostatic model for improved modeling of the glacier front near-field. This work will continue in 2017, with a goal of publishing initial results then. Furthermore we have initiated discussion and collaboration with the OAdrivers project, aiming to use modelled volume fluxes and measured OA state parameters to set up OA budgets for Kongsfjorden.

## For the Management

A new fjord circulation model for Kongsfjorden has been established and tested. The model can be used to study fjord dynamics in the present and future climate states, and coupled with ecosystem and biogeochemical models to investigate e.g. local responses to regional changes.

## Published Results/Planned Publications

Effects of glacier runoff and wind on surface layer dynamics and Atlantic Water exchange in Kongsfjorden, Svalbard; a model study. Manuscript under review for Elsevier's Estuarine, Coastal and Shelf Science.

## Communicated Results

Project results were presented (oral) at EGU in Vienna, Austria, April 2016.

## Interdisciplinary Cooperation

Meeting with scientists from Ocean Acidification flagship has been held as planned, and we have developed a new joint proposal building on results from the kongHiro project and field data on carbon system parameters from Kongsfjorden.

## Budget in accordance to results

Project work has progressed in accordance with the revised budget, which was reduced and distributed differently between partners than what was applied for.

## Could results from the project be subject for any commercial utilization

No

## Conclusions

The KongHiro project has been quite successful; a new model system has been established and compared with existing observations, showing that model performance is good. The funding from Fjord and Coast flagship was smaller than applied for and distributed differently among the partners than what we applied for based on science plans. It was thus not possible to carry out all the work in an optimal way.