SINTEF. The freshwater dynamics and its pathways, and its influence on the thermohaline circulation are evaluated. The models. including MPI-ESM-LR show a reasonable overall freshwater distribution in the Arctic Ocean for the periods when observations are available. Two sets of experiments with MPI-ESM-LR were compared testing the effect of a newly implemented sub grid scale parameterization of ice thickness distribution ITD (see Task 2.5) on freshwater in the model experiments. The spatial pattern of the freshwater in the Arctic Ocean is similar between the experiments CTRL and ITD, an overall lower level in ITD and in particular a lower freshwater content in the Eurasian Basin, is closer to observations and forced model results than in CTRL. The ensemble std deviation of the freshwater distribution shows an overall reduction in experiment ITD when compared to experiment CTRL, translating into a small reduction of the model uncertainty. On the Arctic Ocean scale, the freshwater content showed a long term increase in both experiments for all ensemble members of about 40-50% compared to the beginning of the century. The fact that in all experiments shown (forced and coupled models), the bulk of the freshwater is located in the Amerasian Basin, shows that this distribution is very stable under a large range if different conditions in terms of forcing and time periods. This is important to understand, since this location has direct access to the exit gateways of the Canadian Archipelago and the Fram Strait. Differences found are in terms of total amount and details of the interior distribution. We will discuss the impact of surface stress curl for freshwater content changes in the Amerasian Basin and show the consequences of total freshwater export changes on the intensity of the Atlantic Meridional Overturning Circulation AMOC. We will identify a number of open questions that need to be evaluated further.

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Work Package: 3
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Title: Understanding and assessing current and future shifts and transformations in Arctic sea ice and the broader environment in Northwest Greenland

Abstract: Work Package (WP) 3 of ICE-ARC has an interdisciplinary focus on communities, ice and living resources in Northwest Greenland. Our concern throughout the ICE-ARC project has been with understanding and assessing current and future shifts and transformations in Arctic sea ice and the broader environment in Northwest Greenland-from both changing atmospheric and oceanic conditions-and the social and economic consequences of these changes. Our research is collaborative across the social and physical and natural sciences, which makes it unique within the overall ICE-ARC programme of work in terms of integration and interdisciplinary efforts. Importantly, it is also participatory and community-based, with emphasis on community-relevant research and applied approaches to understanding and responding to change (but also anticipating the possible effects of climate change), as well as building capacity for community-based monitoring. This has broader applications for policy and practice.

Author: Joo-Hong Kim
Work Package: 1

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Title: Four-year solid partnership of KOPRI and ICE-ARC on Arctic sea ice field research, and future

Abstract: The ICE-ARC programme, started in 2014, has been an important international cooperation partner of the KOPRI, by which the KOPRI's Arctic sea ice research capacity has been raised for many years. Owing to a solid partnership with ICE-ARC, the KOPRI was able to begin the research using the unmanned sea ice observation equipment during the IBRV ARAON's Arctic Ocean expedition. Since 2014, ICE-ARC has deployed 25 ice buoys through ARAON. Because eleven of them are the IMB and the KOPRI wants to promote IMB-based researches, ICE-ARC is the best partner for the KOPRI as well. Particularly, it is regarded as a remarkable step to start observing the thermal evolution of melt ponds through the IMB. This observation- theory-model convergent study will make us one step closer to understand the mechanism of ice-albedo feedback. In addition, the joint research on developing the boundary detection algorithm that takes advantage of the characteristics of ICE-ARC IMB, in which the heated temperature data is calculated, is also under way, which is expected to contribute to the increase of IMB utilization. The ICM-CSIC SATICE has been also steadily deployed by the IBRV ARAON. Especially in this year the deployment of six SATICEs were attempted, four of which successfully transmitted data so far. It is expected that some interesting events will be observed by the small-scale buoy network this year. The installation of the UPMC IAOOS has been also carried out since 2015. The consistent contribution of the KOPRI to the IAOOS network should be recognized. Over the past few years, the ICE-ARC's high-resolution satellite imagery support has been a great help in the planning and implementation of sea ice camps. Though the ICE-ARC programme is completed, subsequent programs will continue to conduct the Arctic sea ice studies. The KOPRI will also continue to strengthen the Arctic sea ice research, by building a second icebreaker for the Arctic use and planning to expand the on-ice research period during the Arctic expedition. Thus it is certain that solid partnership will persist in the future.

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Title: Atlantic water properties and circulation North of Svalbard in a changing Arctic

Abstract: The Atlantic Water (AW) inflow is crucial for the heat and salt budget of the Arctic. This PhD brings new insights to the entrance of the AW inflow in the area north of Svalbard, using several tools: hydrography from autonomous drifting buoys, current from a mooring and 1/12° spatial resolution operational model outputs. The IAOOS (Ice Atmosphere Ocean Observing System) deployed during the N-ICE2015 expedition gathered the first winter hydrographic data in the area. They documented shallow warm water over the Svalbard continental slope that generate ocean to ice heat fluxes reaching values up to 400W/m2 that melts the ice although the air surface temperature is -30°C. Warm water is brought from the AW layer up to the surface through near-inertial waves generated by winter storms, large barotropic tides over steep topography and/or geostrophic adjustments. The 1/12° Mercator Ocean operational model is used after validation against the IAOOS platform data from N-ICE2015 expedition. Sea ice extent between winters 2015 and 2016 differs largely. Model outputs suggest that convection-induced upward heat fluxes explain the northern sea ice edge over the continental slope north of