Abstract:

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Session: SS43 - Bridging the land–ocean divide: limnological and oceanographic perspectives on the ecological effects of a changing Arctic hydrological cycle 1

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IMPORTANCE OF GREENLAND ICE SHEET FRESH WATER DISCHARGE AND SEA ICE COVER FOR THE PRODUCTIVITY OF A COASTAL ARCTIC ECOSYSTEM

The Greenland ice sheet is melting and current rates of ice loss are double those of the end of the last century. At the same time, the Arctic sea ice is decreasing. These changes will affect the marine primary production.  In this study, we evaluate the relative importance of these processes to the primary productivity of an Arctic coastal ecosystem, Disko Bay, western Greenland using a coupled hydrodynamic-biogeochemical model for 2004 to 2018 validated against in situ measurement of nutrients, phytoplankton and zooplankton biomass. The model is forced by meltwater run-off from the Programme for Monitoring the Greenland Ice Sheet (PROMICE), and a coupled ocean- and sea-ice model (HYCOM-CICE). Disko Bay is one of the most important areas for biodiversity and fisheries around Greenland. During the last 50 years, the bay has experienced both a large decrease in sea ice cover and an increase in freshwater from the Greenland ice sheet, e.g. the large marine terminating glacier Jakobshavn isbræ. During 2004 -2018, the primary production varied between 100- 150 gC/m/year and was correlated to both sea ice cover and freshwater discharge, although at different scales. Glacier runoff had a strong local effect near the glacier, but when considering the primary productivity at bay scale, sea ice cover was the most important factor. Considering the seasonal impact, variations in the sea ice cover had the strongest impact on spring production, whereas the changes in freshwater discharge had the largest effect on the later summer production.