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The relative importance of GIS freshwater discharge and sea ice cover for the productivity of Disko Bay (presented by Marie Maar, AU)

Current climate changes are affecting global ecosystems. The Arctic is one of the environments experiencing the most dramatic changes due to climate change. Disko Bay is located at the west coast of Greenland at the southern border of the Arctic sea ice and is influenced by both sub-Arctic waters from southwestern Greenland and Arctic waters from Baffin Bay. The area is one of the most important areas for biodiversity and fisheries around Greenland. The large marine terminating glacier Jakobshavn isbræ is found in the bottom of the bay near Ilulissat. Since the 1980'ies the freshwater discharge has almost doubled. During the same period, Disko Bay has experienced a large decrease in sea ice cover, and also the year-to-year variations have increased in the last decade. In this study, we investigate the effect of changes in sea ice cover and Greenland ice sheet freshwater discharge on the primary productivity in Disko Bay. We use the 3D coupled hydrodynamic-biogeochemical model FlexSem-ERGOM (Larsen et al 2020) validated against in situ measurement of nutrients, phytoplankton and zooplankton biomass from 2004 to 2018. The model results showed that annual primary productivity on bay scale was correlated to sea ice cover during spring, because an earlier break-up of the ice (less ice cover) resulted in a longer productive period and higher production (Fig. 3.2b). Locally, close to the freshwater sources, there was a significant negative correlation between salinity and primary production indicating that higher freshwater inflow (less salinity) leads to higher primary production (Fig. 3.2a). In the future, less sea ice and more discharge are expected to increase primary productivity with implications for fish stocks and fisheries and, hence, the local population in Disko Bay (Møller et al. in prep). Next steps are to investigate the secondary production patterns, *Calanus* spp. migration and the connection with Baffin Bay.

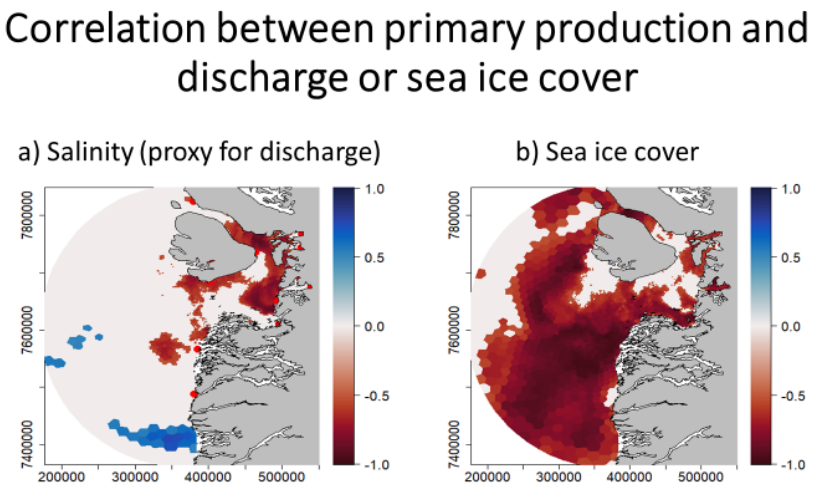

Figure 3.2. Correlation coefficients between annual primary production and a) salinity, and b) sea ice cover. Freshwater sources are indicated as red points. Non-significant correlations are shown as white background.

Larsen J, Mohn, C, Pastor AR, Maar, M (2020). A versatile marine modelling tool applied to arctic, temperate and tropical waters. PLoS One 15(4): e0231193

Møller, E.F., Larsen, J., Sejr, M., Ken Mankoff, Mads Hvid Ribergaard, Philip Wallhead, Maar, M. (in prep.) The relative importance of GIS freshwater discharge and sea ice cover for the productivity of Disko Bay. Biogeochemistry.