On the ocean's role for high latitude climate change in the Arctic-Atlantic sector

Camille Li, *Geophysical Institute, University of Bergen, Norway*
(camille.li@uib.no)
Aleksi Nummelin, University of Bergen, Norway; Lars Henrik Smedsrud, University of Bergen, Norway; Mehmet Ilicak, Uni Research Climate, Norway

Our view of Atlantic variability leans heavily on the Atlantic Meridional Overturning Circulation (AMOC), which provides a simple integrated measure for describing climate change. Looking further north, the Atlantic and Arctic Oceans are linked by a continuous exchange of heat and salt as warm, saline Atlantic water moves north and fresher, colder water masses and sea ice move south. Changes in the AMOC should thus be reflected in the Arctic Ocean and vice versa. The details of this link are poorly characterized, yet the link itself could be important for understanding phenomena such as the climate impacts of deglacial fresh water pulses, the high latitude warmth of Cretaceous and Eocene hothouse climates, and even the Arctic amplification of ongoing global warming. Here, we investigate processes that link the midlatitudes and the Arctic using a hierarchy of dynamical models (e.g., single column, ocean only, coupled climate models). The results indicate that, under strong forcing, changes in the Arctic may be somewhat decoupled from changes in the midlatitudes, with implications for transient adjustments on decadal to multi-decadal time scales in response to a range of freshwater and greenhouse forcings. Ultimately, these simulations suggest that we must consider the meridional structure of ocean heat transport to appreciate the ocean's role in high latitude climate change.