

Pathways and sources of the warm Atlantic Intermediate Water in the trough system leading to the 79-North Glacier in a high resolution model

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More than 25% of mean global sea level rise is caused by mass loss of Greenland Ice Sheet (GrIS). A significant part of this melt is attributed to the interaction between marine terminating glaciers of the GrIS and the surrounding warm ocean waters. However, the sources and pathways of the warm waters on the shelf, their variability and mechanisms of the heat transfer involved are variable regionally and yet largely unknown.

In this work, we focus on the 79-North Glacier (79-NG), a major glacier in North-East Greenland that was subject to an increased melt in the last years. Recent observations show that Atlantic Intermediate Water (AIW) warmer than 1°C reaches the 79NG via the trough system on the East Greenland continental shelf. In particular, these observations indicate that AIW reaches the glacier rather through the southern Norske Trough than through the northern Westwind Trough. Here we employ Lagrangian modelling and analysis using a high resolution FESOM (Finite Element Sea Ice-Ocean Model) simulation. Particle trajectories representing warm AIW mass are calculated to determine the pathways of this water mass on the adjacent shelf in the Norske Trough, and we analyze the water property changes along the trajectories. Moreover, to identify the sources of the AIW in the vicinity of the 79-NG, we compute backward particle trajectories.