

EGU21-1362

<https://doi.org/10.5194/egusphere-egu21-1362>

EGU General Assembly 2021

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Basal melting at the floating tongue of the 79° North Glacier – on the impacts of ice-shelf basal channels

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The floating ice tongue of the 79° North Glacier (Nioghalvfjerdsfjorden Glacier) in Northeast Greenland has been found to thin over the past two decades. Recent studies suggest the warming of the ocean as one of the main drivers of destabilizing outlet glaciers of the Greenland ice sheet by enhanced subglacial melting. Using a horizontal two-dimensional numerical plume model, we study the hydrodynamic processes determining basal melt rates beneath the glacial tongue of the 79° North Glacier. We specifically investigate the spatial distribution of submarine melting and assess the importance of ice base morphology in controlling basal melting. For our study, we design a suite of simulations by implementing a synthetic network of basal channels. Additionally, we determine the role of subglacial discharge in driving melting along the glacier base. Our model results lead us to the conclusion that channelised basal topographies at the glacier base are the dominant control on the basal melt rates and its spatial distribution.