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Twenty-first century projections of ice-shelf melt in the Amundsen Sea, Antarctica

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Approximately 10% of the global mean sea level rise over 2005–2010 was attributed to the glaciers flowing into the Amundsen Sea. This was mostly driven by changes in intrusions of Circumpolar Deep Water and subsequent ice shelf melt. Yet, projecting future ice shelf melt remains challenging because of large biases of CMIP models near Antarctica and because resolving the ocean circulation below the relatively small ice shelves in this sector requires a relatively high model resolution. Previously, we built atmospheric projections of the Amundsen sector at 10km resolution constrained by the rcp85 CMIP5 multi-model mean (Donat-Magnin et al. 2021). Here we use this atmospheric forcing to drive an ensemble of three 1/12° NEMO projections of the Amundsen Sea circulation and ice shelf melting. We find that melt rates are typically increased by 50% to 100% at the end of the 21st century compared to present day. Approximately half of this increase is explained by remote ocean changes transmitted through the model boundaries, while increased iceberg discharge does not have a significant effect. We describe the mechanisms at play through the terms of the ocean heat budget equations. We then use these projections to re-discuss some of the ISMIP6 projections (Seroussi et al. 2020, Edwards et al. 2021).