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Remote atmospheric drivers of melt rates in the Filchner Ice Shelf System on inter-annual timescales

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The Filchner Ice Shelf System (FISS) located at the southern boundary of the Weddell sea buttresses the outflow of ice flows upstream. Work by Hellmer et al. (2012; 2017) suggests that the intrusion of warm circumpolar deep water in the future could lead to dramatic, irreversible changes for the ice shelf system, making the FISS system a major component of Antarctica's contribution to projected sea level rise. First-order questions remain however, as to the present day factors influencing FISS' melt rates on inter-annual timescales. Recent in-situ moorings and a seismic survey (e.g. (Rosier et al., 2018)) by the British Antarctic Survey offer an unprecedented opportunity to improve and evaluate numerical simulations of the region. Here, using eddy-permitting NEMO regional ocean model simulations with static ice-shelves, we focus on understanding the large-scale ocean and atmospheric circulation patterns that influence melt rates over the re-analysis period. In particular, we show that the remote atmospheric forcing plays a strong role in controlling Ronne's bottom water properties and modulates inter-annual melt rates. The eddy-permitting results presented shed light on the historical context of the BAS S03/S05 mooring observations and the AWI POLARSTERN FISS transects of 1980 and 1995.