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Variability of warm water intrusions onto the Bellingshausen Sea continental shelf

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The continental shelf of the Bellingshausen Sea, located between the West Antarctic Peninsula and the Amundsen Sea, Antarctica, is poorly investigated, compared with its neighbours. Here, the southernmost frontal jet of the Antarctic Circumpolar Current is adjacent to the continental slope which impacts the transport of warm Circumpolar Deep Water onto the shelf. This in turn can influence the transport of heat southward across the shelf and therefore the melting of vulnerable ice shelves.

We present model-based investigations using the GLORYS12V1 1/12° reanalysis monthly output (GLOBAL_REANALYSIS_PHY_001_030) over 19 years from 2000 to 2018. By connecting the location of the frontal jet to SSH contours we identify seasonal and interannual variability in this current system and demonstrate that the closer the frontal jet is to the continental slope, the greater the flow of warm deep water onto the shelf. This onshore flow is limited to specific areas closest to the frontal jet, predominantly in the eastern Bellingshausen Sea. In contrast, other areas, specifically those troughs where water flows towards the West Antarctic Peninsula and close to the coastline of Antarctica show opposite behaviour with respect to onshelf heat content. Further analyses of flow patterns also indicate the involvement of a coastal jet close to the shore that is weaker when more warm water is on the shelf. Understanding the variability in the current structures throughout the continental shelf of the Bellingshausen Sea in response to a changing frontal jet is essential to gain knowledge about the distribution of heat and therefore the melting of ice shelves.