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Wåhlin, Anna

Circulation of warm deep water on the Amundsen Shelf: Variability and forcing mechanisms

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Two moorings have been placed on either side of a deep trough leading in to the deep shelf basin in the Western and Central Amundsen Shelf. The moorings measure current speed, temperature, salinity and oxygen content from about 300 m depth to the bottom (at ≈550 m depth), and the results are used to characterize the inflows of warm deep water, its variability, and connect the observed variability to meteorological forcing. An average flow of warm deep water towards the ice shelves was observed on the eastern side of the channel. The bottom water on the western side of the channel was colder and fresher than on the eastern side, but still warmer than the cold and fresh surface layer. The average flow direction in the deep water was away from the iceshelves on the western side. This indicates a net circulation of warm deep water where warm and salty CDW flows southward on the eastern side of the channel, and after interaction with the iceshelves flows northward steered by the topography on the western side of the channel. The flow in the trough is dominated by barotropic fluctuations that do not contribute to the on-shelf heat transport. Along-shelf wind at the shelf break is correlated to the barotropic fluctuations in the eastern part of the channel. This result agrees with previous model studies from the West Antarctic Peninsula and the Amundsen Sea. The flow also consists of a baroclinic part, where warm modified Lower Circumpolar Deep Water flows toward the coast in the lower layer. This part of the flow, as well as the net heat flux and the temperature field, is not correlated to the wind fields which contradicts the model results. The eastward winds at the shelf break were unusually weak at the time of the measurements, which may the reason for the discrepancy between the models and the observations.