



On the Modified Warm Deep Water Flow toward the Filchner Ronne Ice Shelf: Observations and Model Results

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The Filchner Ronne Ice Shelf (FRIS), located in the southern Weddell Sea, plays a key role in the Weddell Sea Deep Water (WSDW) formation, which is a precursor of AABW in the world ocean. Today, the ice shelf is protected by a large continental shelf covered with cold and dense water. Model studies, however, have suggested the potential for an increased flow of Modified Warm Deep Water (MWDW) toward and under FRIS via the Filchner Trough, causing a substantial increase in basal melt rates by the end of this century. Historic data in the region suffer from a strong summer bias. New two-year long mooring time series from 2014 to 2016 reveal a distinct seasonal cycle in hydrography along the eastern flank of the Filchner Trough, with a southward flow of MWDW only in summer, connected to a seasonal shoaling of the Antarctic Slope Front (ASF). With the goal of analysing the seasonal and interannual variability of this warm inflow, we set up a new global configuration for the Finite Element Sea-ice Ocean Model (FESOM) with increased resolution over the Weddell Sea and over the continental shelves. The general Weddell Gyre circulation and ASF properties upstream of the Filchner Trough are improved significantly. In order to test the influence of a correct representation of the water masses encountering the Filchner Trough on the on-shelf flow of MWDW, we perform an experiment where the upstream temperature and salinity field over the continental slope is restored. For this, a monthly climatology section at 17°W, compiled from available CTD and seal data, was merged into the World Ocean Data Atlas over a defined patch. We achieve a realistic representation of the Filchner Trough hydrography and a seasonal cycle that compares well with our mooring observations.