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Influence of the Southern Annular Mode on the sea ice-ocean system

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The global sea ice-ocean model FESOM, driven by a derived daily data, is used to investigate the impact of the Southern Annular Mode (SAM) on the Antarctic sea ice-ocean system. The derived data consists of a multi-year monthly mean anomaly over the years with a positive SAM index (Marshall, G. J., 2003) during 1989-2008, plus the NCEP/NCAR reanalysis daily data.

The results of 20 years (1989-2008) show that a shift of the surface forcing towards the SAM positive phase leads to a reduction of the mean sea ice concentration and thickness in the southern ocean, but an increase in the ice covering area. In the Weddell Sea, the ice coverage is smaller, and the response of the sea ice-ocean system to the SAM is stronger than in other regions. These further reduce the salinity of the surface and the intermediate water, while the deep water is more saline. The nonlinearity of the system is studied by comparing these results with those driven by negatively shifted surface forcing.