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Local and remote impact of Antarctic ice shelf melting

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Ice shelves are the floating extension of the Antarctic ice sheet and form the southern boundary between ocean and ice. Fueled by relatively warm Circucumpolar Deep Water, melting of ice shelf takes heat from and inputs freshwater into the adjacent ocean. The complex thermodynamic interaction between ocean and ice shelf, however, is usually neglected in the global coupled ice-ocean models. Following the parameterization proposed by Beckmann and Goosse (2003), this interaction is considered in ORCA2-LIM which is a model with a mean resolution of 2 degree. Using two contrasting experiments without and with ice shelf melting, we found local and global differences in the modelled ocean. As expected for the case with ice shelf melting, the Antarctic shelf waters become colder and fresher and sea ice thickens. These changes show regional and temporal variations during the 43 year integration from 1958 to 2000.

In addition, the impact of ice shelf melting is not only local, but can be seen in the North Atlantic, where the mixed layer is affected (deepened by more than 40m in the annual mean) along the Greeland-Iceland-Scotland Ridge, an important region for the thermohaline circulation. Finally, possible interhemispheric teleconnection mechanisms are investigated.