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Interhemispheric teleconnections through Southern Ocean eddies

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A cessation of the deep Atlantic meridional overturning circulation is accompanied by a reorganization of the density distribution within the basin. We discuss the effect on the southward eddy-induced heat transport in the Southern Ocean across the Antarctic Circumpolar Current (ACC). On a time scale of decades the South Atlantic north of the ACC warms in the upper layer due to the lack of heat transport to the north. This leads to a steepening of the isopycnals in the Southern Ocean and therefore an enhanced southward heat transport by eddies. On centennial time scales a similar effect occurs due to a freshening of the upper layers in the South Atlantic, leading to an additional heat transport towards Antarctica. The second effect is enhanced by strong freshwater injection into the North Atlantic as occuring e.g. during Heinrich events. This constitutes an interhemispheric teleconnection between northern cooling and southern warming. These ideas are tested in the global coupled climate model, CLIMBER-3 α , which includes an oceanic general circulation model.