



Stable AMOC off state in an eddy-permitting coupled climate model

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Shifts between on and off states of the Atlantic Meridional Overturning Circulation (AMOC) have been associated with past abrupt climate change, supported by the bistability of the AMOC found in many older, coarser resolution, ocean and climate models. However, as coupled climate models evolved in complexity a stable AMOC off state no longer seemed supported. Here we show that a current-generation, eddy-permitting climate model has an AMOC off state that remains stable for the 450-year duration of the model integration. Ocean eddies modify the overall freshwater balance, allowing for stronger northward salt transport by the AMOC compared with previous, non eddy-permitting models. As a result, the salinification of the subtropical North Atlantic, due to a southward shift of the intertropical rain belt, is counteracted by the reduced salt transport of the collapsed AMOC. The reduced salinification of the subtropical North Atlantic allows for an anomalous northward freshwater transport into the subpolar North Atlantic dominated by the gyre component. Combining the anomalous northward freshwater transport with the freshening due to reduced evaporation in this region helps stabilise the AMOC off state.