



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

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A collapse of the Atlantic Meridional Overturning Circulation (AMOC) despite being unlikely could have devastating impacts on the current climate. Shifts between on- and off-states of the AMOC have been associated with past abrupt climate change, supported by the bistability of the AMOC found in many ocean and climate models. However, as coupled climate models evolved in complexity a stable AMOC off-state no longer seemed supported. In this study a next-generation, eddy-resolving, climate model, HadGEM3 has an AMOC off-state that remains stable for the 260 year duration of the model integration. Ocean eddies modify the overall freshwater balance, allowing for stronger northward salt transport by the AMOC compared to non-eddy resolving models. As a result, the salinification of the subtropical North Atlantic, due to a southward shift of the intertropical rain belt, is balanced by reduced salt transport of the collapsed AMOC, stabilizing the off-state. Without ocean eddies, salinity biases in the Atlantic preclude the balance that stabilizes the off-state, unless flux-correction is applied.