

AMOC hysteresis in a state-of-the-art GCM

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We conduct idealised experiments with HadGEM3-GC2, which is a post-CMIP5 eddy-permitting GCM, to test for the presence of thresholds in the AMOC. We add fresh water to the North Atlantic for different rates and lengths of time, and then examine the AMOC recovery. In some cases the AMOC recovers to its original strength, however in others the AMOC does not recover, and even continues decreasing. There appears to be a threshold of ~ 8 Sv: the AMOC mostly recovers if the hosing stops before the AMOC reaches 8 Sv, and mostly does not recover if the AMOC weakens more than this.

We examine the mechanisms controlling the presence of the recovery in order to understand what sets the threshold, and why this GCM exhibits hysteresis behaviour. We also discuss the implications for monitoring and introduce the concept of temporary resilience.