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The Tropical Climate Response to Fresh Water Induced Reductions is Atlantic Meridional Overturning Circulation

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A number of previous modelling studies of the impact of freshwater forcing (FWF) applied to high latitude ocean basins have investigated possible triggering mechanisms for the Younger-Dryas cold reversal. Using the NCAR CSM v1.4 (AOGCM), a range of different FWF anomalies have been applied to the North Atlantic that vary in magnitude from 0.1Sv to 1.0Sv, for varying durations of time, usually 100 years in length. Here we present evidence of the atmospheric and oceanic pathways along which the Northern Hemisphere cooling signal propagates from the North Atlantic as the thermohaline circulation either slows substantially, or recovers from a period of reduced activity, and the changes the signal induces in various aspects of the climate system along the way. In particular, we will demonstrate how the response in tropical climate variability to a FWF event manifests itself most prominently in changes that occur in the behaviour of the ENSO phenomenon. The most prominent climate dynamical mechanisms involve the well known repositioning of the atmospheric Hadley Cell and the Intertropical Convergence Zone. These Atlantic meridional overturning signals are teleconnected to the Tropical Pacific within 2 decades suggesting a mixed coupled atmosphere-ocean bridge rather than an atmosphere-only bridge or ocean-only bridge. Various mechanisms that comprise this North Atlantic-Tropical Pacific atmospheric-ocean bridge will be discussed.