"On the dynamics of historical AMOC variability"

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The dynamics which underpin the mean overturning and gyre circulations in a non-eddy-resolving ocean model hindcast simulation of the late 20th century, and which explain the model response to interannual surface momentum and buoyancy forcing perturbations, are investigated in terms of mean and time-varying vorticity balances. The significant effect of bottom vortex stretching, noted in previous studies, is shown here to play a key role in a variety of time-dependent phenomena, such as the covariation of overturning and gyre circulations, the variation of the barotropic streamfunction in the intergyre-gyre region, and changes in AMOC associated with momentum forcing perturbations. Latitudinal changes in the model AMOC vorticity balance explains the attenuation of buoyancy-forced signals south of Cape Hatteras, and the dominant frictional balance near the Equator greatly inhibits the propagation of AMOC variability signals from one hemisphere to the other. Finally, we examine model AMOC dynamics at 26N in an attempt to shed light on recently observed interannual variability.