Coupling between AMOC variability and wind-driven gyres

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The mid-depth Atlantic Meridional Overturning Circulation (AMOC) connects regions of high latitude buoyancy forcing through meridional flows that are largely isolated from direct atmospheric forcing. Low-frequency variability in source regions is propagated through the system via Kelvin and Rossby waves, resulting in regions of exchange between the deep western boundary current and the interior that are shown to depend on two non-dimensional numbers. Furthermore, wind-driven subtropical and subpolar gyres can modify the mid-depth potential vorticity structure and thus are shown to alter the pathways and time scales of AMOC variability. As a result, the time-dependent AMOC amplitude and Lagrangian pathways can be modified by steady winds and time-dependent mid-latitude winds can introduce variability into the AMOC even with steady buoyancy forcing.