

## Topographic Effects on AMOC Variability and its Propagation Pathways

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The Atlantic Meridional Overturning Circulation (AMOC) is a large-scale circulation system that acts on complex bathymetry. Potential vorticity (PV) contours, which constrain geostrophic flows and guide the propagation of Rossby waves, are strongly influenced by topography especially along the continental margins and mid-ocean ridges and trenches. Topographic effects on PV gradient also directly affect the oceanic responses to external forcing through the topographic Sverdrup balance. A process-oriented 3-layer model is constructed to interpret observed AMOC variability at RAPID and OSNAP arrays, and an ocean state estimate (ECCO4), and explain mechanisms and processes that give rise to observed ocean bottom pressure (OBP) anomalies. The 3-layer, which uses realistic bathymetry and wind-stress forcing, is able to reproduce remarkably well the observed AMOC variability at RAPID and OSNAP arrays. It is found that the bottom-layer intensified AMOC variability in the RAPID observations was mainly due to enhanced topographic effects on abyssal oceans through interplays between the barotropic and baroclinic processes. Topographic Rossby waves along the continental slope and mid-ocean ridge play a central role in cross-latitudinal remote forcing of AMOC variability. The simplicity of the model and the transparency of its dynamics allow process-level understanding of key mechanisms that influence observed AMOC variations and how topography affect such mechanisms and processes.