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The contribution of density variations at the eastern boundary of the North Atlantic to the meridional overturning circulation at 26.5°N

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The RAPID-MOC array makes use of moored time series measurements of vertical density profiles at the western and eastern boundaries at 26.5°N of the Atlantic to estimate the transatlantic, absolute zonally integrated meridional geostrophic transport. Here we study the contribution of eastern boundary density to sub-seasonal and seasonal variations of the strength and vertical structure of the Meridional Overturning Circulation (MOC) at 26.5°N by means of RAPID mooring data between April 2004 and October 2007. Among the mechanisms that may change densities at the eastern boundary (and thus the strength of the MOC) are Kelvin waves propagating poleward and wind-driven processes near the coast.

The contribution from the eastern boundary density field to MOC variability is $\pm$ 2.1 Sv. Surprisingly, the eastern-boundary contribution to the upper mid ocean geostrophic transport is almost as large as the western-boundary contribution. There is a very pronounced seasonality in density right at the eastern boundary, which dominates the upper mid-ocean transport seasonality of the MOC. The seasonal cycle in density at the eastern boundary is coherent between 100 m and 1000 m with maxima in Spring and minima in Autumn. The amplitude of the seasonal cycle of overturning arising from the eastern boundary is 5.3 Sv (peak to peak). Results suggest that the seasonal cycle in eastern boundary densities may be linked to seasonal variations of the eastern boundary wind stress curl.