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Understanding boundary density variability at 26N and its relation to the geostrophic transports in the North Atlantic

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Zonal density variations over the Atlantic basin drive the geostrophic component of the Atlantic Meridional Overturning Circulation (AMOC). Impacts of the AMOC are vast and include extreme weather over the North Atlantic. Understanding the density variability, their related processes and the time-scales are very useful to be able to assimilate the oceanic data into models and make future projections of the AMOC. We have investigated the density variability using observations from RAPID-array at 26N and ocean NEMO experiments where only one of either the wind stress or the buoyancy forcing is allowed to vary in time, whereas the other remains at its seasonally varying climatology. In order to extract the signal forcing-related which is imprinted in the density vertical profiles at the eastern and western boundaries, modes of density variability are analysed. We here present the results of the variability modes from this set of experiments and the relationship between boundaries. Results suggest that buoyancy-forced density variability has a vertical structure substantially different from the wind-forced one and also the time-scales differ: buoyancy forcing dominates decadal variability while wind forcing drives intra-seasonal to inter-annual variability. From the observational period (2004-2012), the inter-annual varibility exhibits different vertical profiles mostly related to wind forcing at both boundaries.