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Overturning Variations in the South Atlantic in an Ocean Reanalyses Ensemble

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The ocean's Atlantic Meridional Overturning Circulation (AMOC) has a significant influence on global climate through its meridional transport of heat and carbon. The Southern Ocean is the conduit connecting the South Atlantic Ocean to the Pacific and Indian Oceans. Thus, overturning in the South Atlantic plays a crucial role in determining the pathways of the global overturning circulation and the transports into and out of the Atlantic Ocean. Understanding the nature and causes of its multiannual to multidecadal variation in this region is critical to improve our understanding of the MOC and more accurately predict its future changes and impacts. We analyse the South Atlantic overturning at 34.5°S in an ensemble of eddy permitting ¼ degree global ocean reanalyses, constrained by observations and historical forcings, over the period 1993-2021. This overturning transport and the meridional heat transport are validated against the continuous measurements obtained along the South Atlantic Meridional Overturning Circulation – Basin-wide Array (SAMBA). The ability of each reanalysis to capture the observed changes in the overturning will be determined, providing confidence in their ability to simulate changes prior to the availability of SAMBA, and exposing their limitations. We analyse the vertical variation of the transports and their temporal variability on various timescales. This research complements previous studies investigating changes in the subtropical and subpolar North Atlantic overturning using the same reanalyses ensemble, which was shown to provide a good representation of observations.