

Causes for model-data differences in seasonal variations of the South Atlantic Meridional Overturning Circulation

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The objective of the study is to examine the model-data differences in the seasonal variations of the meridional overturning circulation (MOC) and meridional heat transport (MHT) in the South Atlantic, and to investigate the causes for those differences. Temperature and salinity climatology from Argo profiling floats and from GFDL models are used to estimate the MOC/MHT at 34S. The MOC from model T/S fields show strong transport in the ocean interior region compared to the MOC estimated from Argo T/S fields. The geostrophic component of the MOC estimated from Argo data shows a seasonal variation with the maximum value in January and minimum value in August. However, the seasonal variations of the geostrophic contributions to the MOC from model T/S fields is very weak. Differences are seen in all three regions: western boundary, interior region, and eastern boundary, with the largest difference in the eastern boundary. Examination of the density field suggests that the difference in the eastern boundary is related to the vertical coherent density variations in the Argo measurements, which is not shown in the model field. Possible causes for those differences are discussed. Wind stress curl from models and observations show strong differences in the eastern boundary, which could explain why the models are unable to reproduce the seasonal variations in geostrophic component of the MOC.