

North Atlantic sea level, heat content and MOC variability over the last 60 years estimated from hydrographic data

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There have been marked gyre-scale property changes over the North Atlantic from 1950 to 2000: the subtropics warmed and became more saline, whereas the subpolar ocean cooled and freshened. However, increasing upper ocean temperatures and salinities across the whole basin dominate the recent period from 1995 to 2010, leading to a gradual decrease of the density and corresponding increase of the steric height. The analysis is based on the reconstructed hydrographic data set compiled by the UK Meteorological Office on an annual basis from 1950 to 2010. The effect of the property changes on the overturning and sea level is assessed by the MIT general circulation model used for dynamical adjustment of the hydrographic data. The results reveal gradual increase of the subtropical sea surface height (SSH) since 1970, but decreasing subpolar SSH from 1965 to 1995, followed by an increase from 1995 onwards. Similar patterns appear for the heat content which can be broadly explained by changes in heat transport convergence. The MOC variability has more complicated structure with periods of coherent anomalies across the basin, followed by a gyre-scale opposing changes. There is a weakening of the overturning in the high latitudes and strengthening in the subtropics since 1995, followed by a sharp decrease in 2009.