



## **The effect of gyre-scale property changes on the North Atlantic overturning over the last 50 years**

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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. The effect of these property changes on the overturning is assessed by initialising the MIT General Circulation model with the hydrographic data and allowing a dynamical adjustment for few years; the uncertainties of the model estimates are assessed by performing Bayesian-type perturbation experiments using the standard errors for the historical data. This procedure reveals a slight strengthening of the overturning at high latitudes by  $+0.8 \pm 0.5$  Sv and weakening in the subtropics by  $-1.5 \pm 1$  Sv from 1950-1970 to 1980-2000. This analysis is repeated using a reconstructed hydrographic data set of annual means compiled by the UK Meteorological Office that allows for an extension of this investigation until the present day. Using this dataset, a switch in the overturning trends is evident during the last 10 years: strengthening in the subtropics and weakening in the high latitudes. Hence, these gyre-specific changes probably reflect interannual and decadal trends rather than any long-term climate trend. We conclude that gyre dynamics strongly affect temperature and salinity changes that translate into changes in the meridional overturning circulation.