



Ocean margin densities and paleoestimates of the Atlantic meridional overturning circulation

J. Hirschi (1) and J. Lynch-Stieglitz (2)

(1) School of Ocean and Earth Science, National Oceanography Centre, Southampton, United Kingdom (jjmh@noc.soton.ac.uk), (2) School of Earth and Atmospheric Sciences, Georgia Institute of Technology, Atlanta, Georgia, U.S.A.

The variability of the Atlantic meridional overturning circulation (MOC) is a key element in understanding the past, present and future climate. Using an eddy-permitting numerical ocean model we test the potential and limitations of sea water densities at the ocean margins for reconstructing the MOC in the North Atlantic. Gradually reducing the number of locations where the densities are assumed to be known and adding systematic and random noise allows to estimate to what extent a reliable MOC picture can still be obtained based on sparse density data that is subject to errors similar to those expected for paleodensities. Our results suggest that even with a small fraction of the boundary densities the mean state of the MOC can be reproduced. For both random and systematic noise the sensitivity of the MOC reconstruction is larger the closer a location is from the equator and especially south of 40°N the noise largely prevents to reproduce the relatively modest temporal MOC variability observed in the model run. For a measuring campaign that aims to infer past states of the Atlantic MOC on the basis of boundary densities the present study suggests that the best strategy is to collect data that allow to estimate the basin-wide vertical density structure between 40°N and 50°N.