



Decadal covariability of the Deep Western Boundary Current and the Atlantic meridional overturning circulation

Charlotte Mielke (1), Stefan Gary (2), and Johanna Baehr (1)

(1) University of Hamburg, Institute of Oceanography, Germany, (2) Scottish Association for Marine Science, Scottish Marine Institute, Oban, UK

We investigate the decadal variability of the North Atlantic Deep Western Boundary Current (DWBC), its meridional coherence and relation to the Atlantic meridional overturning circulation (AMOC) in a high-resolution ocean model. The modeled DWBC is defined after a comparison of model results of both scalar quantities and integrated transports to observations, and its mean and the structure of its temporal variability correspond well to observations.

We find that the DWBC exhibits multidecadal variability, which is mostly coherent between 26°N and 53°N, and is closely related to the negative integrated wind stress curl at the western boundary, particularly in the subtropical gyre. This implies that the DWBC and the AMOC show opposing behavior if the western boundary and basin interior wind stress curl anomalies are of opposite sign. The relation is thus non-stationary.

Our results suggest that – on decadal timescales – both the AMOC and the DWBC at one latitude are representative of the variability of the same quantity over a wide range of adjacent latitudes. However, observations of the DWBC can only be used as a proxy for the AMOC variability if the boundary and basin-wide wind stress curl are in phase. This indicates that observations of the DWBC cannot easily be used as a shortcut to obtain an estimate of the decadal AMOC variability.