Contribution of the DWBC to the AMOC variability at 26°N and line W in a high resolution model

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Abstract

We investigate the relation between the Deep Western Boundary Current (DWBC) and the Atlantic meridional overturning circulation (AMOC) in a high-resolution run with the Max-Planck Institute Ocean Model. The DWBC and its layers (Labrador Sea Water, LSW, and Nordic Seas Overflow Water, NSOW) are defined dynamically in the model based on a comparison of temperature-versus-salinity data in model and observations and the time-dependent velocity field. In order to support the model results, we compare the calculated model time series to observational data. Observations of the AMOC are available at 26°N (RAPID/MOCHA array, Cunningham et al., *2007*) and 41°N (Willis, *2010*). Observations of the DWBC are also available at 26°N (Meinen et al., *2012*), but not at 41N. For the comparison with the AMOC at 41N, we therefore use DWBC observations at line W (Toole et al., *2011*), assuming coherence in the DWBC over less than three degrees of latitude. The model is able to reproduce the variability of the DWBC and its individual layers, with a shift of about three months between model and observations at line W, which is also apparent in the AMOC at 41°N. Our preliminary model results suggest a clear relation between the NSOW and the non-Ekman component of the AMOC at timescales longer than interannual, with a different phasing for 26°N and line W/41°N. For the LSW, on the other hand, there appears to be no correlation with the AMOC, although lead-lag relationships on longer timescales cannot be excluded.