3rd International Conference on Earth System Modelling
Vol. , 3ICESM-196, 2012
3rd International Conference on Earth System Modelling

North Atlantic heat transport and AMOC: Latitude dependence of the potential predictability

B. Tiedje, A. Köhl, and J. Baehr
Institute of Oceanography, University of Hamburg, Germany (bente.tiedje@zmaw.de)

We investigate the potential predictability of the North Atlantic meridional heat transport (MHT) and the meridional overturning circulation (AMOC) on interannual time scales using hindcast ensembles based on an oceanic data assimilation product. We analyze the prognostic potential predictability (PPP), using the GECCO synthesis as the initial conditions and the boundary conditions.

The PPP of both the MHT and the AMOC varies with latitude, but the PPP structure of the MHT cannot be directly related to the PPP structure of the AMOC. The PPP of the AMOC is only similar to the PPP of the MHT where the overturning component controls the PPP of the MHT (subtropical gyre), while the PPP of the AMOC is not similar to the PPP of the MHT where the gyre component controls the PPP of the MHT (subpolar gyre). The gyre-dependence of the PPP structures of the MHT and the AMOC indicate that caution should be exercised when interpreting the potential predictability of the MHT or the AMOC at a single latitude.

We calculate the thermal wind velocity field (TWv) from the basin wide zonal density gradients. The resulting PPP structures of the MHT and the AMOC calculated with the TWv are similar to the PPP structures of the MHT and the AMOC calculated with the full meridional velocity field minus the respective Ekman contribution.

We perform experiments holding the eastern or western upper (<1750m) or lower (>1750m) boundary densities temporally constant in the TWv calculation. We find that potential predictability in the MHT and the AMOC in and between both gyres result from the western boundary variability in the density field, rather than eastern boundary variability. We also perform an analysis to assess the role of the MHT's gyre and overturning component calculated with the TWv.