Session: C37 Poster: TH64B

Atlantic Meridional Overturning Circulation: a new index to investigate the interannual variability in the Atlantic Meridional Overturning Circulation comparing RAPID observations and numerical simulations

Aurelie Duchez[†]; Joel Hirschi; Stuart Cunningham; Christopher Atkinson; Harry Bryden
[†] NOC, United Kingdom
Leading author: A.Duchez@noc.soton.ac.uk

The Atlantic Meridional Overturning Circulation (AMOC), which provides one quarter of the global meridional heat transport, is composed of a number of different flow components. Here we define a new AMOC index at 26.5°N that combines the northward Gulf Stream flow through the Straits of Florida, the northward wind-driven Ekman transport in the surface layer and the southward Sverdrup transport in the thermocline. This index can potentially be used to estimate the interannual variability of the net northward transport of warm upper waters in the Atlantic. This estimate of the surface branch of the AMOC can be constructed back in time for the period when reliable measurements are available for the Gulf Stream and for the wind stress. Our observation-based AMOC index suggests a trend toward decreasing AMOC strength since 1980 due to increased southward thermocline recirculation associated with an increasingly negative curl of the wind stress that leads to a strengthening of the southward Sverdrup transport. To assess the reliability of our index for interannual AMOC variability, the 2004-2009 period, where observational RAPID AMOC data is available, is too short. During this period the observed AMOC variability at 26.5°N is mainly dominated by subannual variability that cannot be captured by our AMOC index. In order to test the potential of the index on interannual and longer timescales we use a numerical model. We use a 1958 to 2007 simulation obtained with the NEMO ocean model in an eddy-permitting configuration. The simulation provides us with an estimate of the interannual variability of the AMOC and of the heat transport over a period of fifty years. Preliminary results based on the model simulation suggest that the new AMOC index can capture a substantial fraction of the AMOC variability occurring on interannual to decadal timescales. These results indicate that it might be possible to extend an observation-based AMOC index at 26.5°N back to the 1980s.