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Low-frequency variability of the Atlantic MOC in the eddying regime : the intrinsic component.

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A 327-year 1/4° global ocean/sea-ice simulation has been produced by the DRAKKAR ocean modeling consortium. This simulation is forced by a repeated seasonal atmospheric forcing but nevertheless exhibits a substantial low-frequency variability (at interannual and longer timescales), which is therefore of intrinsic origin. This nonlinearly-generated intrinsic variability is almost absent from the coarse-resolution (2°) version of this simulation. Comparing the 1/4° simulation with its fully-forced counterpart, Penduff et al. (2011) have shown that the low-frequency variability of local sea-level is largely generated by the ocean itself in eddying areas, rather than directly forced by the atmosphere.

Using the same simulations, the present study quantifies the imprint of the intrinsic low-frequency variability on the Meridional Overturning Circulation (MOC) at interannual-to-decadal timescales in the Atlantic. We first compare the intrinsic and atmospherically-forced interannual variances of the Atlantic MOC calculated in geopotential coordinates. This analysis reveals substantial sources of intrinsic MOC variability in the South Atlantic (driven by the Agulhas mesoscale activity according to Biastoch et al. (2008)), but also in the North Atlantic. We extend our investigation to the MOC calculated in isopycnal coordinates, and identify regions in the basin where the water mass transformation exhibits low-frequency intrinsic variability. In this eddy-permitting regime, intrinsic processes are shown to generate about half the total (geopotential and isopycnal) MOC interannual variance in certain key regions of the Atlantic. This intrinsic variability is absent from 2° simulations.

Penduff, T., Juza, M., Barnier, B., Zika, J., Dewar, W.K., Treguier, A.-M., Molines, J.-M., Audiffren, N., 2011: Sea-level expression of intrinsic and forced ocean variabilities at interannual time scales. J. Climate, 24, 5652–5670. doi: 10.1175/JCLI-D-11-00077.1.

Biastoch, A., Böning, C. W., Lutjeharms, J. R. E., 2008: Agulhas leakage dynamics affects decadal variability in Atlantic overturning circulation. Nature, 456, 489-492, doi: 10.1038/nature07426.