Can the atmospheric variability damp the low-frequency intrinsic variability? Example of the AMOC in the North Atlantic subtropics.

Stéphanie Leroux*[1] and Thierry Penduff[1]

[1]IGE MEOM – CNRS : UMR5001 – France

Abstract

This on-going study is part of a wider investigation of the features of the low-frequency AMOC variability from several OGCM simulations, including the large (50-member) OCCIPUT ensemble of global, eddy-permitting (1/4∘) ocean/sea-ice hindcasts. After an initial stochastic perturbation, each member is driven by the same realistic atmospheric forcing over 1960-2015. The magnitude, spatio-temporal scales and patterns of the atmospherically-forced and intrinsic/chaotic interannual AMOC variability are then characterised from the ensemble mean and ensemble spread, respectively.
We compare the intrinsic interannual AMOC variability in the ensemble simulation to the "pure" intrinsic interannual AMOC variability that emerges in climatological simulations under repeated seasonal-cycle forcing. The 10-20∘N latitude range is the only location where a significant difference is found between the two: the climatological simulations show a peak of intrinsic interannual AMOC variance which does not exist in the ensemble simulation under realistic forcing.

This on-going study thus investigates the hypothesis that this behaviour could be an example of a free intrinsic mode of AMOC variability (detected in the climatological simulation) that is not detected in the ensemble simulation because the realistic atmospheric forcing might pace the free mode at this latitude (i.e. identical phase of the mode in each of the 50 members). Consistent with this hypothesis, we find a peak in the atmospherically-forced component of the AMOC variance at this latitude in the ensemble simulation. The spectral analysis of the variance peak in the climatological simulation highlights periods of about 4-15 years. This is also consistent with the range of timescales of the atmopsherically-forced variance at this latitude in the ensemble simulation.
This poster is intended to display these preliminary results, and discuss about this hypothesis and the possible mechanisms by which the atmosphere may pace such "free" intrinsic modes in the ocean.

*Speaker