



Kawase & McDermott revisited with a proper ocean model.

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A suite of experiments with global ocean models is used to test the hypothesis that Southern Ocean (SO) winds can modify the strength of the Atlantic Meridional Overturning Circulation (AMOC). It is found that for 3 and 1 degree resolution models the results are consistent with Toggweiler & Samuels (1995): stronger SO winds lead to a slight increase of the AMOC. In the simulations with 1/10 degree resolution, however, stronger SO winds weaken the AMOC.

We show that these different outcomes are determined by the models' representation of topographic Rossby and Kelvin waves. Consistent with previous literature based on theory and idealized models, first baroclinic waves are slower in the coarse resolution models, but still manage to establish a pattern of global response that is similar to the one in the eddy-permitting model. Because of its different stratification, however, the Atlantic signal is transmitted by higher baroclinic modes. In the coarse resolution model these higher modes are dissipated before they reach 30N, whereas in the eddy-permitting model they reach the subpolar gyre undiminished. This inability of non-eddy-permitting ocean models to represent planetary waves with higher baroclinic modes casts doubt on the ability of climate models to represent non-local effects of climate change. Ideas on how to overcome these difficulties will be discussed.