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Thickness diffusivity in an eddy resolving model of the North Atlantic

C. Eden (1), R.J. Greatbatch (2) and J. Willebrand (1)
(1) IFM-GEOMAR, Kiel, Germany, (2) Dalhousie University, Halifax, Canada

We use output from a $1/12^o$ eddy-resolving model of the North Atlantic Ocean to estimate values for the thickness diffusivity, κ, appropriate to the Gent and McWilliams parameterization. Three different procedures are used to remove a rotational flux prior to the estimation of the thickness diffusivity. In all cases however,large negatives values (exceeding $-5000\,m^2/s$) of κ are diagnosed particularly in the Gulf Stream region and in the equatorial Atlantic and large positive values (exceeding $5000\,m^2/s$) in the subtropical gyre.

We also discuss a previously neglected component (ν) of the bolus velocity associated with the horizontal flux of buoyancy along, rather than across the mean buoyancy contours. All the estimates show a similar pattern for ν and indicate that the effect of this flux is to "advect" the mean buoyancy field westward, reminiscent of the westward propagation of long baroclinic Rossby waves. We speculate that this component might be important for fluxing tracers whose mean fields vary on isopycnal surfaces and for large–scale flow beyond the quasi–geostrophic limit.