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Evaluation of the z-tilde vertical coordinate in a 1/4° global NEMO

Alex Megann[1], Jerome Chanut[2], and Dave Storkey[3]
[1]National Oceanography Centre, Marine Systems Modelling, Southampton,UK
[2]Mercator Océan, Ramonville Saint Agne, France
[3]Met Office, FitzRoy Road, Exeter EX1 3LX, UK

The eddy-permitting 1/4° resolution in NEMO has been known to suffer from significant numerical diapycnal mixing. This arises from truncations in the advection scheme, which causes spurious mixing of tracers where there are transient vertical motions from internal tides and near-inertial waves, as well as from computational modes associated with partly-resolved mesoscale features. Suppressing the near-gridscale noise by increasing the viscosity has been shown to offer a useful reduction in that contribution to numerical mixing, but does not have a significant effect on tides and inertial waves.

The z~ scheme replaces eulerian vertical tracer advection across the vertical coordinate surfaces, on time scales less than a few days, with displacements of the coordinate surfaces themselves, in a manner more consistent with the nearly adiabatic nature of near-inertial gravity waves and tides. This has been shown to give substantial reduction in numerical mixing in an idealised configuration, but has yet to be fully evaluated in a global ocean domain. It is shown, using a new prototype eORCA025 global NEMO configuration, that **z~** with the default filter timescales reduces the effective diapycnal diffusivity and temperature drifts by only about 10%. Preliminary results will be presented for the sensitivity of the numerical mixing to the z~ timescale and other parameters. The application of z~ to a tidally-forced simulation will also be discussed.