

WHAT'S WRONG WITH THE DISCRETE ISOPYCNAL MIXING SCHEME?: ORIGIN OF THE PROBLEM AND SUGGESTIONS FOR REMEDIES

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Isopycnal diffusion is used in coarse-grid OGCM to parameterize the mixing of tracers by meso-scale eddies. Although the rotated isopycnal mixing tensor is physically-based and therefore highly beneficial for the ocean simulations, it suffers from a lack of numerical integrity. Namely, classic linear discretisations of the rotated tensor (like the Cox scheme) generate spurious over-undershooting in the tracer field and require thereby an unphysical background horizontal diffusion to damp the numerical noise.

In this talk, we discuss the problems and solutions related to the non-monotonic behaviour of the isopycnal mixing scheme by (i) identifying the origin of the ripples, (ii) exploring their impact in an OGCM, (iii) establishing the mathematical conditions to obtain a monotonic scheme and (iv) proposing and analysing briefly the performances of a set of new isopycnal mixing schemes (linear/non-linear) respecting the min-max-principle.