Geophysical Research Abstracts
Vol. 19, EGU2017-16556, 2017
EGU General Assembly 2017

A new method to quantify spatial distribution of spurious mixing in ocean models

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Numerical mixing is inevitable for ocean models due to tracer advection schemes. Until now, there is no robust way to identify the regions of spurious mixing in ocean models. We propose a new method to compute the spatial distribution of the spurious diapycnic mixing in an ocean model. This new method is an extension of available potential energy density method proposed by Winters and Barkan (2013). We test the new method in lock-exchange and baroclinic eddies test cases. We can quantify the amount and the location of numerical mixing. We find high-shear areas are the main regions which are susceptible to numerical truncation errors. We also test the new method to quantify the numerical mixing in different horizontal momentum closures. We conclude that Smagorinsky viscosity has less numerical mixing than the Leith viscosity using the same non-dimensional constant.