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A new data-driven subgrid 2d turbulence parameterization and comparison with conventional kinetic energy backscatter parameterizations in NEMO ocean model

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Kinetic energy backscatter (KEB) parameterizations of subgrid 2d turbulence have shown their efficiency in ocean models as they restore activity of mesoscale eddies. Modern KEBs utilize only two properties of badly resolved inverse energy cascade: KEB tendency should be larger than turbulent viscosity in spatial scale and amount of returning energy should compensate energy loss due to eddy viscosity. Typical operators for KEB tendency are Laplace operator with negative viscosity coefficient and stochastic process. Application of artificial neural networks (ANN) to approximate subgrid forces may give rise to new KEB models. The main challenge in this direction is to preprocess subgrid forces in such a way to reveal a part corresponding to returning of energy from subgrid scales. In this work, we propose to define subgrid forces as a term nudging a coarse-resolution model toward high-resolution model. This force is energy-generating and may be approximated with ANN. Conventional KEBs and ANN model are compared in Double-Gyre configuration of NEMO ocean model.

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