Abstract Submitted
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Anisotropic mesoscale eddy transport in ocean general circulation models SCOTT RECKINGER, BAYLOR FOX-KEMPER, Brown University, SCOTT BACHMAN, University of Cambridge, FRANK BRYAN, JOHN DENNIS, GOKHAN DANABASOGLU, National Center for Atmospheric Research — In modern climate models, the effects of oceanic mesoscale eddies are introduced by relating subgrid eddy fluxes to the resolved gradients of buoyancy or other tracers, where the proportionality is, in general, governed by an eddy transport tensor. The symmetric part of the tensor, which represents the diffusive effects of mesoscale eddies, is universally treated isotropically. However, the diffusive processes that the parameterization approximates, such as shear dispersion and potential vorticity barriers, typically have strongly anisotropic characteristics. Generalizing the eddy diffusivity tensor for anisotropy extends the number of parameters from one to three: major diffusivity, minor diffusivity, and alignment. The Community Earth System Model (CESM) with the anisotropic eddy parameterization is used to test various choices for the parameters, which are motivated by observations and the eddy transport tensor diagnosed from high resolution simulations. Simply setting the ratio of major to minor diffusivities to a value of five globally, while aligning the major axis along the flow direction, improves biogeochemical tracer ventilation and reduces temperature and salinity biases. These effects can be improved by parameterizing the oceanic anisotropic transport mechanisms.

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