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Representing the horizontal diffusion of tracers within the boundary layers of general vertical coordinate ocean models

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The stirring and mixing of tracers by mesoscale eddies, parameterized in many models as a type of diffusion, contribute to the distribution of tracers in the ocean. In the stratified ocean interior, such processes occur mostly along the direction parallel to the local neutral density surface. However, near boundaries, small-scale turbulence tends to break this constraint so that the mesoscale eddy transport occurs mostly along a plane parallel to the boundary. We propose and implement two methods for representing diffusive mesoscale eddy fluxes within the surface boundary layer in a general vertical coordinate ocean model (MOM6). In the first method, a bulk diffusive flux is calculated by depth-averaging tracers from the surface to the surface boundary layer depth and then decomposing this flux into individual cells. In the second method, diffusive fluxes are calculated individually, layer-by-layer for all cells within the boundary layer. Both methods are tested in forced ocean/sea-ice simulations using the Community Earth System Model framework. We broadly find that the 'bulk'approach leads to stronger meridional heat transport in the surface ocean. Additional results showing how these schemes affect climate-relevant oceanic metrics, when compared to a control simulation, will be presented and discussed.

Do you need an official invitation letter?

No

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