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The thickness diffusion coefficient in the Southern Ocean inferred from a high-resolution ocean model

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The distribution of the eddy buoyancy flux convergence (EBFC) in the Southern Ocean is obtained by using a high-resolution (longitude:$1/8^\circ \times$latitude:$1/12^\circ$, 85 levels) ocean model. The model is the Center for Climate System Research (CCSR) Ocean Component model (COCO). The simulation area is the Southern Ocean from 20° S to 75° S. The model is forced by the monthly-mean climatology of the sea surface wind stress (OMIP-Forcing), the sea surface temperature and salinity (WOA98). For northern and southern boundaries, the temperature and salinity are restored to the annual-mean climatology. The model is integrated for 53 years and the results for the last 3 years are used to evaluate the EBFC.

At 2000m depth the strong EBFC region is located in the east of Kerguelen Plateau, Drake Passage, Argentine and Cape Basin. The EBFC is positive (negative) in the right (left) hand side of the current flow and tend to decrease the slope of the density. The Gent and McWilliams (GM) thickness diffusion coefficient is evaluated by comparing the obtained EBFC and the EBFC calculated from the GM parameterization. The values of the coefficient are more than 1000m^2/sec in the strong current flow regions and less than 500m^2/sec in the weak ones. The obtained coefficient is consistent with the spatially variable coefficient advocated by Held and Larichev (1996) and Visbeck et al. (1997).