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Implementing a nonlocal eddy parameterization into a global ocean model

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The Gent-McWilliams parameterization for the bolus eddy streamfunction defines it proportional to the local isopycnal slope. This form does not vanish at boundaries, and fails with weak or unstable stratification. Various ad hoc fixes are hence required.

We propose a new form for the streamfunction, obtained by equating the horizontal density gradient to a second-order vertical differential operator acting on the streamfunction. This streamfunction naturally vanishes at the surface and floor, and behaves physically plausibly in regions of weak stratification. It gives a measure of vertical nonlocality. Various versions of the formulation are tested against GM in 50-year runs of a 1° global model.