Abstract Submitted
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An efficient coarse grid projection method for quasigeostrophic models of large-scale ocean circulation[1] ANNE STAPLES, OMER SAN, Virginia Tech — We present a coarse grid projection (CGP) multiscale method to accelerate computations of quasigeostrophic (QG) models for large scale ocean circulation. These models require solving an elliptic sub-problem at each time step, which takes the bulk of the computational time. The method we propose here is a modular approach that facilitates data transfer with simple interpolations and uses black-box solvers for solving the elliptic sub-problem and potential vorticity equations in the QG flow solvers. After solving the elliptic sub-problem on a coarsened grid, an interpolation scheme is used to obtain the fine data for subsequent time stepping on the full grid. The potential vorticity field is then updated on the fine grid with savings in computational time due to the reduced number of grid points for the elliptic solver. The method is applied to both single layer barotropic and two-layer stratified QG ocean models for mid-latitude oceanic basins in the beta plane. The method is found to accelerate these computations (at a linear rate) while retaining the same level of accuracy in the fine-resolution field. In addition, numerical oscillations due to lower grid resolutions are effectively eliminated with CGP method.

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