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A dynamic framework for subgrid-scale parametrization of mesoscale eddies in geophysical flows OMER SAN, ROMIT MAULIK, Oklahoma State University - Stillwater — This study puts forth a modular dynamic subgrid-scale modeling framework for large eddy simulation of quasigeostrophic turbulence based upon minimizing the errors between structural and functional subgrid-scale models. The approximate deconvolution procedure (AD) is used to estimate the free modeling parameters for the eddy viscosity coefficient parameterized in space and time using the Smagorinsky and Leith models. The novel idea here is to estimate the modeling parameters using the AD method rather than a test filter. The proposed model is applied to a wind-driven quasigeostrophic four-gyre ocean circulation problem, which is a standard prototype of more realistic ocean dynamics. Results show that the proposed model captures the quasi-stationary ocean dynamics and provides the time averaged four-gyre circulation patterns. Taking into account for local resolved flow characteristics, the model dynamically provides higher eddy viscosity values for lower resolutions. Furthermore, our first step in the numerical assessment for solving the quasigeostrophic turbulence problem addresses the intimate relationship between the eddy viscosity coefficients and the numerical resolution employed by the quasigeostrophic models.

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