EGU21-12418, updated on 27 Jul 2021
https://doi.org/10.5194/egusphere-egu21-12418
EGU General Assembly 2021

Advancing the simulation of mesoscale eddies: Backscatter schemes in eddy-permitting ocean simulations

Stephan Juricke[1,2], Sergey Danilov[1,2], Marcel Oliver[1,2], Nikolay Koldunov[2], Dmitry Sidorenko[2], and Dmitry Sein[2]

[1]Jacobs University Bremen gGmbH, Bremen, Germany (s.juricke@jacobs-university.de)
[2]Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany

Capturing mesoscale eddy dynamics is crucial for accurate simulations of the large-scale ocean currents as well as oceanic and climate variability. Eddy-mean flow interactions affect the position, strength and variations of mean currents and eddies are important drivers of oceanic heat transport and atmosphere-ocean-coupling. However, simulations at eddy-permitting resolutions are substantially underestimating eddy variability and eddy kinetic energy many times over. Such eddy-permitting simulations will be in use for years to come, both in coupled and uncoupled climate simulations. We present a set of kinetic energy backscatter schemes with different complexity as alternative momentum closures that can alleviate some eddy related biases such as biases in the mean currents, in sea surface height variability and in temperature and salinity. The complexity of the schemes reflects in their computational costs, the related simulation improvements and their adaptability to different resolutions. However, all schemes outperform classical viscous closures and are computationally less expensive than a related necessary resolution increase to achieve similar results. While the backscatter schemes are implemented in the ocean model FESOM2, the concepts can be adjusted to any ocean model including NEMO.