EGU2020-18490
https://doi.org/10.5194/egusphere-egu2020-18490
EGU General Assembly 2020

Dissecting the Barotropic Transport in a High-resolution ocean model

Martin Claus[1,2], Yuan Wang[3], Richard Greatbatch[1,2], and Jinyu Sheng[3]
[1]GEOMAR Helmholtz Centre for Ocean Research Kiel, Kiel, Germany
[2]Faculty of Mathematics and Natural Sciences, University of Kiel, Kiel, Germany
[3]Department of Oceanography, Dalhousie University, Halifax, Nova Scotia, Canada

We present a method to decompose the time mean vertically averaged transport, as simulated by an high-resolution ocean model, into its four dominant components. These components are driven by the gradient of potential energy per unit area (PE), the divergence of the flux of time mean momentum (MMF) and eddy momentum (EMF), and the wind stress. Since the local vorticity budget and the bathymetry are noisy and dominated by small spatial scales, a barotropic shallow water model is used as a filter to diagnose the respective transports instead of integrating along lines of constant f/H.
Applying this method to the output of a high-resolution model of the North Atlantic we find that PE is the most important driver, including the northwest corner. MMF is an important driver of transport around the Labrador Sea continental slope and, together with the EMF, it drives significant transport along the path of the Gulf Stream and North Atlantic current. Additionally, the circulation patterns driven by the EMF compares well with an estimate based on a satellite product. Hence, the presented method provides insights into the relative importance of the different dynamical processes that may drive barotropic transport in an ocean model. But it may also be used to isolate potential issues if a model misrepresents the barotropic transport.