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## Global view of oceanic cascades from the Global Circulation Model

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In his seminal work "Weather Prediction by Numerical Process" in 1922, Lewis Fry Richardson proposed the famous cascade picture qualitatively for a turbulent flow that energy transferring from large to small scale structures, until the viscosity one where the kinetic energy is converted into heat. This picture has been recognized further as the forward energy cascade. But, it cannot be applied directly to the real atmospheric or oceanic motions. Whatever, the global circulation model is indeed established within this framework by considering more complex situations, e.g., earth rotation, stratification, tide, mesoscale eddies, to list a few. In this work, an improved Filter-Space-Technique (FST) is applied to a reanalysis product provided by the CMEMS global ocean eddy-resolving ( $1/12^\circ$  degree horizontal resolution). The FST provides a global view of the energy flux  $\Pi_E$  that associated with the oceanic cascades for all resolved scales, e.g., from mesoscale eddies to global circulations. For instance, at scale  $r=160$  km (i.e., radius of the Gaussian filter kernel), a rich dynamic pattern is observed for an instantaneous flow field. Both forward ( $\Pi_E>0$ , energy transferring from large scale to small scale structures) and inverse ( $\Pi_E<0$ , energy transferring from small scale to large scale structures) cascades are evident in the equator, western boundary current regions, Antarctic Circumpolar Current region, to name a few. While, the long-term averaged flux field show mainly a negative  $\Pi_E$  (inverse energy cascade) except for the equatorial region. Moreover, a high intensity negative flux is found for both the Loop Current and Kuroshio Current, indicating that the mesoscale eddies might be absorbed by the main flow.

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