

1131-76-34

Eleftherios Gkioulekas* (eleftherios.gkioulekas@utrgv.edu), University of Texas Rio Grande Valley, School of Mathematical and Statistical Science, 1201 West University Drive, Edinburg, TX 78539-2999. *Energy and potential enstrophy flux constraints in quasi-geostrophic models.*

We investigate an inequality constraining the energy and potential enstrophy flux spectra in two-layer and multi-layer quasi-geostrophic models. Its physical significance is that it can diagnose whether any given multi-layer model that allows co-existing downscale cascades of energy and potential enstrophy can allow the downscale energy flux to become large enough to yield a mixed energy spectrum where the dominant k^{-3} scaling is overtaken by a subdominant $k^{-5/3}$ contribution beyond a transition wavenumber k_t situated in the inertial range. The validity of the flux inequality implies that this scaling transition cannot occur within the inertial range, whereas a violation of the flux inequality beyond some wavenumber k_t implies the existence of a scaling transition near that wavenumber. This flux inequality holds unconditionally in two-dimensional Navier-Stokes turbulence, however, it is far from obvious that it continues to hold in multi-layer quasi-geostrophic models, because the dissipation rate spectra for energy and potential enstrophy no longer relate in a trivial way, as in two-dimensional Navier-Stokes. (Received June 09, 2017)