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Backscatter in Large-Scale Flows BALU NADIGA, LANL — Downgradient mixing of potential-voriticity and its variants are commonly employed to model the effects of unresolved geostrophic turbulence on resolved scales. This is motivated by the (inviscid and unforced) particle-wise conservation of potential-vorticity and the mean forward or down-scale cascade of potential enstrophy in geostrophic turubulence. By examining the statistical distribution of the transfer of potential enstrophy from mean or filtered motions to eddy or sub-filter motions, we find that the mean forward cascade results from the forward-scatter being only slightly greater than the backscatter. Downgradient mixing ideas, do not recognize such equitable mean-eddy or large scale-small scale interactions and consequently model only the mean effect of forward cascade; the importance of capturing the effects of backscatter—the forcing of resolved scales by unresolved scales—are only beginning to be recognized. While recent attempts to model the effects of backscatter on resolved scales have taken a stochastic approach, our analysis suggests that these effects are amenable to being modeled deterministically.

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