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Macroturbulence Response to Vertical Stratification Change Using Linear Response Function of an Idealized Dry Atmosphere

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Rossby radius and Rhines scale are two popular scaling arguments for eddy length scale. They have not been tested in a well-controlled experiment with increased vertical stratification and unchanged jet. This is done using the linear response function of an idealized dry atmosphere calculated by Hassanzadeh and Kuang (2016). The resulting change in zonal wind is mostly less than 0.2m/s when temperature near surface is cooled by more than 2K. In such experiment, energy-containing zonal scale decreases, which is against the prediction of Rossby radius but consistent with the prediction of Rhines scale. Eddy kinetic energy decreases for all wavenumbers and latitudes, but eddy momentum flux strengthens locally around zonal wavenumber 8 and 40°S. This local strengthening is associated with a stronger Pearson correlation between u and v .

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