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Effects of Dispersion on Vortical and Wave Modes in 3D Rotating Stratified Flows[1] LESLIE SMITH, JAI SUKHATME, University of Wisconsin, Madison — We study the growth and spectra of energy in the vortical and wave modes of a forced, 3D rotating stratified fluid as a function of $\epsilon = f/N$, where f, N are the Coriolis parameter and Brunt-Vaisala frequency. The Froude and Rossby numbers are comparable and much less than one. The inquiry is motivated by analytical work suggesting asymmetry about $\epsilon = 1$. For $\epsilon \leq 1$ the wave mode energy saturates and the ensuing forward cascade is an efficient means of dissipating ageostrophic energy. As ϵ decreases, the wave spectra steepen from k^{-1} to $k^{-5/3}$. When $\epsilon > 1$ the wave mode energy never saturates and eventually dominates the total energy. With regard to the vortical modes, for $\epsilon \leq 1$, the signatures of 3D quasi-geostrophy are clearly evident. In contrast, for $\epsilon > 1$ and increasing, the vortical modes contain a progressively smaller fraction of the total energy and the 3D quasi-geostrophic subsystem disappears.

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