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Dissipation of synoptic-scale flow by small-scale turbulence

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Although it is now accepted that imbalance in the atmosphere and ocean is generic, the feedback of the unbalanced motion on the balanced flow has not been extensively studied. In this work we examine the parameterisation problem in the context of rotating stratified turbulence, i.e., with a non-hydrostatic Boussinesq model. Using the linear normal modes as a first approximation to the balanced and unbalanced flow, the growth of ageostrophic perturbations to the quasi-geostrophic flow is studied, as well as their associated feedback. For weak stratification, there are analogies with the three-dimensionalization of decaying 2-D turbulence. For strong stratification, the transfer spectra and eddy viscosities are analogous if there is synoptic-scale motion and the buoyancy scale is adequately resolved.