

Wave and balanced motions in rotating, stratified, non-hydrostatic fluids

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Oceanic flows are dominated by rotation and non-constant stratification, which leads to motions with balanced (low frequency) and unbalanced (high frequency) components. The balanced components are associated with slow quasi-geostrophic large-scale flows while the unbalanced components correspond to fast small-scale inertia-gravity waves. In this talk, we will analyze properties of both components in the context of rotating fluids with non-constant stratification. Exact analytical expressions for available potential energy density (APE) and available potential vorticity (APV) will be derived from first principles. In addition to their intuitive appeal and simplicity, the new APE and APV expressions are easily implemented in numerical computations of Boussinesq dynamics with non-constant stratification. This is joint work with Jeffrey J. Early, Leslie M. Smith and M.-Pascale Lelong.

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