LONG INTERNAL GRAVITY WAVES: DYNAMICS AND WAVE-INDUCED TRANSPORT

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Traditional numerical modeling efforts focus on quasi-geostrophic (QG) oceanic motions as the main factor of long-term oceanic variability. In particular, horizontal diffusion of scalars, such as heat and bio-geochemical quantities, is modeled based on parameterizations of 2D eddy turbulence effects dominated by baroclinic QG motions, and the mean advection is attributed to ocean currents. However, the shallow-water equations also contain high-frequency solutions known as inertia-gravity (IG) waves. The role of the baroclinic (BIG) component of these motions, including internal tides, is the subject of this talk. Our theoretical and experimental studies indicate that these, essentially nonlinear, motions - which we treat as "wave turbulence" - may play an important role in the horizontal transport of tracers, in the spatial variations of tracer concentration, and in the overall energy and momentum balance in some ocean regions. High-latituded regions are affected by this mechanism to a greater extent, for the level of BIG wave turbulence there is comparable to that of QG turbulence. A review of our theoretical and experimental results is presented with an emphasis on accounting for latitudinal variations of BIG wave field properties.