THE CHINESE UNIVERSITY OF HONG KONG
Department of Physics
SEMINAR

Resonant Generation of Oceanic Internal Gravity Waves

by

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ALL INTERESTED ARE WELCOME
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Abstract

Away from shallow, well-mixed surface regions, the density of sea water increases with depth due to variation in salinity and temperature. This continuous density stratification supports internal gravity waves, which are the counterpart within the fluid interior of surface gravity waves. Internal gravity waves are important for many oceanic processes, such as sediment transportation and ocean mixing.

Oceanic internal waves are mainly generated by interactions between oscillatory tides and topography at the ocean bottom. Our experimental and numerical studies have shown that the most efficient generation regions are near-critical, where the slope of the bottom topography matches that of internal waves. The wave strength depends crucially on the length of the near-critical region. In experiments with a long near-critical region, fluid motion with a velocity an order of magnitude larger than that of the forcing occurs within a thin boundary layer above the bottom surface. This resonant wave is unstable because of strong shear; Kelvin-Helmholtz billows precede wave breaking. We construct a model to extrapolate our results to oceanic conditions. Our work provides a new explanation for the intense boundary flows frequently observed on continental slopes; our results suggest that resonant internal waves may play a role in shaping global continental shelf.

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