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Intrusion-generated internal waves in a constantly stratified fluid[1]

BENJAMIN MAURER, Scripps Institution of Oceanography, PAUL LINDEN, University of California, San Diego — Intrusive Gravity Currents (IGCs) occur when horizontal density gradients result in the intrusion of one fluid into another fluid at an intermediate depth. The vertical density stratification of the receiving fluid necessary for an IGC is also capable of supporting internal wave motion. Though many IGCs in the ocean and atmosphere propagate into a stratified fluid, traditional assessments of GC and IGC dynamics neglect energy losses to internal wave motion. We present an experimental study of the internal wave field propagating ahead of a well-mixed intrusion into a constantly stratified ambient fluid. Intrusions at various heights in the ambient fluid are examined, and synthetic schlieren imaging techniques are used to quantify wave motion ahead of the current. We note a strong influence of the level of IGC propagation on the forcing of particular supercritical wave modes, and estimate the associated energy fluxes. To construct a more balanced energy budget of intrusions into stratified environments, we compare these losses to the initial Available Potential Energy (APE) of the system and to estimates of the kinetic energy of the IGC.

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