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Simultaneous experimental measurements of velocity and density in solitary internal waves with trapped cores P. LUZZATTO-FEGIZ, University of Cambridge, K. HELFRICH, Woods Hole Oceanographic Institution — Long internal waves with trapped cores are relatively common in the ocean and atmosphere (e.g. Lien et al. 2012). It has been proposed that such waves may be important for transporting mass, energy, and biological matter across the continental shelf (Shroyer et al. 2010, Scotti & Pineda 2004). However, several fundamental wave properties, including mass and energy transport, as well as core circulation and density structure, remain to be quantified experimentally. A key prerequisite, for such measurements, involves simultaneously accessing the velocity and density fields with sufficient resolution. We employ a setup comprising a thin linearly stratified region overlaying a deep, uniform-density layer, and perform experiments with and without a no-slip lid at the surface. The waves are produced by a lock-release mechanism. We develop a technique for high-resolution, simultaneous measurements of velocity and density in stratified flows, using pulsed-laser, co-planar PIV and LIF. We are thereby able to extract properties including phase velocity, kinetic and potential energies, minimum Richardson number, as well as core size, circulation and density. To examine larger waves, we complement these results with numerical simulations, which are in good agreement with our experiments.

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