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Pressure and wave-flux optical analysis of 3D focusing internal waves compared between laboratory experiments and SOMAR[1] PIERRE-YVES PASSAGGIA, University of Orleans, VAMSI K. CHALAMALLA, Indian Institute of Technology Delhi, EDWARD SANTILLI, Thomas Jefferson University , ALBERTO SCOTTI, University of North Carolina at Chapel Hill — Stratified flows driven by internal waves are particularly challenging to diagnose in lab experiments. Non-intrusive measurements techniques offer a viable way to obtain pressure which is notably difficult to measure in such flows. In this talk, we present an experimental procedure coupling Particle Image Velocimetry (PIV) with Synthetic Schlieren (SS) to reconstruct simultaneously velocity and density. Using these two time-resolved quantities, pressure can be estimated to establish energy budgets. We compare combined time-resolved PIV-SS measurements with direct numerical simulations (DNS) in the case of three-dimensional internal waves focusing on top of a Gaussian ring. The ring is forced by a barotropic-like tidal motion which drives a mode-1 type beam-like structure focusing at the center of the domain and the results from PIV and SS for velocity, density and pressure are compared with DNS using a newly implemented low-dissipation-type scheme of the numerical code SOMAR. In addition, we show that approaches based on PIV alone or SS alone can be flawed in the focusing region and that combined PIV and SS measurements provide an accurate comparison with the DNS.

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