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Experimental and Numerical Studies of Oceanic Overflow[1]

THOMAS GIBSON, Baylor University, FRED HOHMAN, University of Georgia, THERESA MORRISON, San Diego State University, SHANON RECKINGER, Fairfield University, SCOTT RECKINGER, Brown University — Oceanic overflows occur when dense water flows down a continental slope into less dense ambient water. The resulting density driven plumes occur naturally in various regions of the global ocean and affect the large-scale circulation. General circulation models currently rely on parameterizations for representing dense overflows due to resolution restrictions. The work presented here involves a direct qualitative and quantitative comparison between physical laboratory experiments and lab-scale numerical simulations. Laboratory experiments are conducted using a rotating square tank customized for idealized overflow and a high-resolution camera mounted on the table in the rotating reference frame for data collection. Corresponding numerical simulations are performed using the MIT general circulation model (MITgcm) run in the non-hydrostatic configuration. Resolution and numerical parameter studies are presented to ensure accuracy of the simulation. Laboratory and computational experiments are compared across a wide range of physical parameters, including Coriolis parameter, inflow density anomaly, and dense inflow volumetric flow rate. The results are analyzed using various calculated metrics, such as the plume velocity.

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