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Boluses leading the run up of shoaling internal waves of elevation MICHELLE E. PEDE, DANIEL T. VALENTINE, Clarkson University — Numerical solutions of the two-dimensional Navier-Stokes and convective-diffusion equations, to within the Boussinesq approximation, are presented. These solutions illustrate the mechanism of production, ejection and propagation of boluses, i.e., vortex projectiles, induced by shoaling internal solitary waves of elevation. They are the type of boluses observed in laboratory and field experiments reported in the geophysical fluid dynamics literature. The boluses predicted in this study are *not* a consequence of a breaking event. They are the shedding of a packet of fluid with concentrated vorticity that forms a vortex. This vortex is formed as the leading portion of the shoaling internal solitary wave of elevation steepens. The wave of elevation contains a significant concentration of vorticity. This vorticity is accumulated near the front of the wave by a combination of convection and production by enhancement of horizontal gradients of density as it shoals. The concentration of vorticity forms a vortex projectile. It interacts with its image on the other side of the shoal in the same way two vortices of opposite strength interact. The image vortex system propels the vortex projectile up the shoal a relatively large distance, even as part of the incident wave reflects and recedes offshore. The bolus leading the run-up process contains fluid that is heavier than the surrounding fluid and, hence, transports bottom layer fluid quite effectively to locations far up the sloped topography.

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