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Three-dimensional structure of vortex shedding beneath internal solitary waves of depression in a two-layered system PAYAM AGHSAEE, LEON BOEGMAN, Queen's University, Kingston, Canada — Field observations show bed sediment re-suspension occurs in the wake of internal solitary waves (ISWs) of depression traveling over flat and sloping ocean topography. Previous studies suggest that near-bed vortex shedding elevates the near-bed shear and Reynolds stress fields leading to re-suspension. However this work has been limited to investigating the two-dimensional (2D) flow structure and planar PIV results are inconsistent with 2D DNS; vortices ascend higher in the watercolumn in 2D relative to 3D. In this study we present the first three-dimensional (3D) acoustic (ADV) and optical (stereo PIV) observations of vortex shedding beneath ISWs. We show that vortex shedding occurs for smaller values of Reynolds number and pressure gradient parameters in 3D, compared to 2D DNS. The ADV profile data shows transverse velocity fluctuations to be of the same order as horizontal and vertical ones, and this contributes to faster energy dissipation of vortices in 3D relative to 2D simulations, thus limiting the height to which vortices ascend into the watercolumn and potentially transport sediment.

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