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The structure of self-sustained instability, transition and turbulence in the separating boundary layer under an internal solitary wave of depression

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The development of the separated bottom boundary layer (BBL) in the footprint of a large-amplitude ISW of depression is examined using high-accuracy/resolution implicit Large Eddy Simulation. The talk will focus on a single relatively idealized case of a large-amplitude ISW propagating against an oncoming barotropic current with its own, initially laminar, BBL under the inevitable restriction of laboratory-scale Reynolds number. Significant discussion will be dedicated to the non-trivial computational cost of setting up and conducting the above simulation, within long domains and over long-integration times, in a high-performance-computing environment. Results will focus on documenting the full downstream evolution of the structure of the separated BBL development. Particular emphasis will be placed on the existence of a three-dimensional global instability mode, at the core of the separation bubble where typically one might assume two-dimensional dynamics. The particular instability mode is spontaneously excited and is considered responsible for the self-sustained nature of the resulting near-bed turbulent wake in the lee of the ISW. Fundamental mean BBL flow metrics will then be presented along with a short discussion for potential for particulate resuspension. The talk will close with a discussion of the relevance of the existing flow configuration to both the laboratory and ocean, in light of recent measurements in the NW Australian Shelf.