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Bypass transition of the bottom boundary layer under solitary wave MAHMOUD SADEK, PETER DIAMESSIS, Cornell University, LUIS PARRAS, University of Malaga, PHILIP LIU, Cornell University — The transition to turbulence in the bottom boundary layer (BBL) flow driven by a soliton-like pressure gradient in an oscillating water tunnel (an approximation for the BBL under solitary waves) is investigated using hydrodynamic linear stability theory and DNS. As observed in the laboratory experiment by Sumer et al. (2010), two possible transition scenarios exist. The first scenario is associated with the classical transition resulting from the breakdown of the exponentially growing 2-D Tollmien-Schlichting waves. The alternative scenario; i.e., bypass transition; takes place through formation of localized turbulent spots. The investigation of the latter transition scenario is performed in two steps. The first step consists of reformulating the linear stability analysis in the non-modal framework for the purpose of finding the optimum disturbance characteristics which lead to the formation of those turbulent spots. In the second step, the computed optimum noise structure is inserted in the 3D DNS in order to induce the formation of the turbulent spots and effectively simulate the bypass transition observed experimentally.

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