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Emergence of streaks and turbulent spots in an unsteady boundary layer beneath a solitary wave ASIM ONDER, PHILIP LI-FAN LIU, National University of Singapore — Bypass route to transition is studied in a bottom boundary layer developing under solitary wave. First, the conditions for streak growth and breakdown are analyzed using a linear input-output framework and secondary stability analysis. Vortical perturbations whose intensity is about 1% of the maximum free-stream velocity are found to be sufficient to induce unstable streaks in moderate to high Reynolds numbers. In the second step, a natural bypass transition scenario is realized using direct numerical simulations, where a weak turbulent current is introduced to initiate the transition. The breakdown of streaks to turbulent spots is shown. Depending on their nucleation phase, the turbulent spots can grow to occupy the whole domain leading to a premature transition bypassing the emergence of two-dimensional modal instabilities.

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