理論科學研究中心

Center for Advanced Study in Theoretical Sciences

講者：Philip Li-Fan Liu Distinguished Professor (National University of Singapore)
劉立方院士 新加坡大學講座教授

講題：On the three-dimensional transition in the boundary layer beneath a solitary wave

摘要： The transient boundary layer developing under a solitary wave is analyzed for two essential steps of bypass transition, the streak growth and breakdown. To initiate the process, a linearly optimal cross-stream forcing is employed, which is found using an input-output framework, based on an adjoint method. Optimal forcing configurations are deployed to nonlinear equations, and streaks of various amplitude are generated via lift- up mechanism. The secondary stability of streaks is examined and the most unstable modes are found to be sinuous modes. Streamwise vortices with intensities in the range of 0.5% of maximum wave orbital velocity are sufficient to develop unstable streaks. In the final step, the nonlinear development and breakdown of unstable streaks are investigated using direct numerical simulations, and further estimates for transition to turbulence are provided.

時間：2019年10月22日(星期二) 9:10 - 11:00

地點：國立臺灣大學 工程科學與海洋工程學系 二樓視聽室

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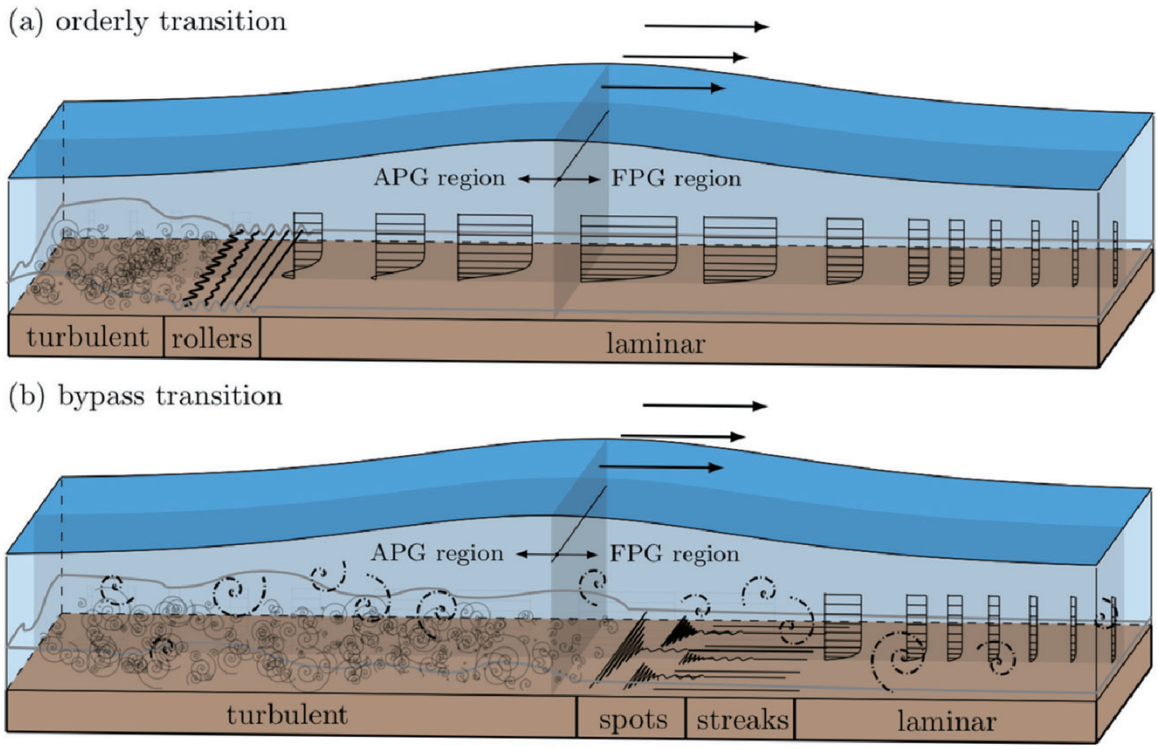

FIGURE 1. Two main paths for transition to turbulence in the unsteady boundary layer at the bottom of a solitary wave. Scales in the boundary layer are exaggerated for clarity. Laminar velocity profiles are plotted until the onset of transition. (a): Orderly route to transition via two-dimensional modal instabilities initiated by the inflectional velocity profile. (b) Bypass transition initiated by the receptivity of boundary layer to high-amplitude ambient disturbances (dashed-dotted curls). The instability is three-dimensional and of stochastic nature.