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Roles of a scatter on boundary-layer instability and acoustic radiation MING DONG, Tianjin University, XUESONG WU, Imperial College — When a boundary-layer instability mode propagates through a region of rapid distortion, the ensuing scattering causes two consequences of physical interest. First, the amplitude of the instability mode may be suppressed or energized. Second, substantial sound wave can be radiated by the boundary-layer instability mode. This paper focuses on this issue by proposing a framework which is called Local Scattering Theory. In this framework, a transmission coefficient, defined as the ratio of the T-S wave amplitude downstream of the scatter to that upstream, is introduced to characterize the effect of a local scatter on boundary-layer instability and transition. The mathematical formulation is based on triple-deck formulism, but in order to accommodate the acoustic far field, the unsteady terms in the upper deck are retained. By computation, the impacts of a steady local suction on flow instability and acoustic radiation are studied. It is found that, (1) a suction slot would suppress the oncoming T-S wave; (2) the acoustic waves radiated by the scattering effect have similar directivities; (3) the intensity of the sound increases with the mass flux when the latter is not too large, and it also increases with the frequency monotonously.

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