

Abstract Submitted
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Sensitivity of boundary-layer stability to base-state distortions at high Mach numbers¹ JUNHO PARK, TAMER ZAKI, Johns Hopkins University — The stability diagram of high-speed boundary layers has been established by evaluating the linear instability modes of the similarity profile, over wide ranges of Reynolds and Mach numbers. In real flows, however, the base state can deviate from the similarity profile. Both the base velocity and temperature can be distorted, for example due to roughness and thermal wall treatments. We review the stability problem of high-speed boundary layer, and derive a new formulation of the sensitivity to base-state distortion using forward and adjoint parabolized stability equations. The new formulation provides qualitative and quantitative interpretations on change in growth rate due to modifications of mean-flow and mean-temperature in heated high-speed boundary layers, and establishes the foundation for future control strategies.

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