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High-speed linear analysis of a blunt cone[1] TIM FLINT, PARVIZ MOIN, M. J. PHILIPP HACK, Center for Turbulence Research, Stanford University — Transition to turbulence critically affects heat transfer towards the walls in the flow over high-speed vehicles. We seek to identify the mechanisms which govern the receptivity and amplification of disturbances in the boundary layer on a blunt cone at Mach 6 by means of global linear analysis. The approach directly captures the influence of the bow shock wave as well as the geometry of the blunt nose of the cone. Two families of modes are computed, and their spatial structure is characterized. One group of modes extend beyond the boundary layer and interacts with the vortical post-shock flow near the cone tip. The other describes acoustic emissions and decays in the free-stream. The receptivity of the modes is directly captured in their corresponding adjoint eigensolutions. Receptivity is highest upstream of the bow shock near the cone axis. The computations are performed using a curvilinear framework with shock capturing and continuous, discretely consistent formulations of the linearized and adjoint linearized governing equations.

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