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Global stability analysis of supersonic shock/turbulent boundary layer interactions[1] MATTEO BERNARDINI, SERGIO PIROZZOLI, Dept. of Mech. and Aerosp. Eng., University La Sapienza, Rome, JOSEPH W. NICHOLS, JOHAN LARSSON, Center for Turbulence Research, Stanford University, BRANDON E. MORGAN, SANJIVA K. LELE, Dept. of Aero. and Astro., Stanford University — The global stability of supersonic shock/turbulent boundary layer interactions is investigated in a wide range of shock intensities. The analysis relies on linearization of the governing equations about the mean turbulent flow obtained from LES calculations. The global stability analysis relies on the Arnoldi iterative method, whose convergence requires suitable preliminary smoothing of the base flow. Results of two-dimensional stability analysis highlight the occurrence of a single exponentially growing, zero-frequency mode, also observed by previous investigators. The dominance of such mode in the linearized flow dynamics is confirmed by three-dimensional calculations with slightly disturbed initial conditions. However, the global stability analysis also shows the occurrence of a marginally stable oscillatory mode, whose characteristic frequency is close to those found in LES. Such mode becomes less stable as the incident shock strength increases, and it features a typical 'breathing' motion of the recirculation bubble, whereby fluid is periodically entrapped and released, also driving the motion of the reflected shock.

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