Abstract Submitted
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Emergence of three-dimensional flow structures in shock boundary layer interactions[1] SIDHARTH GS, ANUBHAV DWIVEDI, JOSEPH NICHOLS, MIHAILO JOVANOVIC[2], GRAHAM CANDLER, Univ of Minn - Minneapolis — Experiments and computations point to the emergence of three-dimensional (3D) flow structures in laminar shock boundary layer interactions in various configurations. We examine a Mach 5 flow over a double compression ramp and reveal the presence of a bifurcation from a steady 2D to a steady 3D flow state. This is done by varying the relative angle of the two ramps which increases the interaction strength. We employ global linear stability analysis and direct numerical simulation to characterize this bifurcation and demonstrate that global instability induces 3D flow structures. We use the direct and adjoint linear equations to further investigate the origin of this instability and examine the influence of uncertainty (including the effect of geometric irregularities in the ramp and free-stream disturbances in wind tunnel) on this bifurcation.

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