Abstract Submitted
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Input/output Analysis of Hypersonic Boundary Layers using the One-Way Navier-Stokes (OWNS) Equations[1] OMAR KAMAL, Caltech, GEORGIOS RIGAS, Imperial College London, MATTHEW LAKEBRINK, The Boeing Company, TIM COLONIUS, Caltech — Input/output (resolvent) analysis is used to examine the most amplified linear disturbances in hypersonic flat-plate boundary layers. Owing to the large computational expense of the resulting singular value decomposition for PDEs discretized in two inhomogeneous directions, we apply an approximate fast marching technique, the One-Way Navier-Stokes (OWNS) Equations, in iterative fashion to solve for the optimal disturbances. In this way, we are able to systematically investigate the full parametric space for this class of boundary layers over a range of hypersonic Mach numbers, while varying the input and output metrics that determine the corresponding receptivity problems, and highlight different transition scenarios depending on the spatial support, frequency, and physical nature of the external disturbances. We also highlight extensions of the OWNS methodology to complex three-dimensional geometries.

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