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Spatially Distributed Forcing for Boundary Layer Separation Control on a Wall Mounted Hump[1] DAVID BORGMANN, ARTH PANDE, JESSE LITTLE, University of Arizona, RENE WOSZIDLO, The Boeing Company — Numerous successful efforts on controlling flow separation have been demonstrated using spatially distributed actuators. These include both steady and unsteady forcing from discrete locations in the vicinity of separation. Despite this, there are many open questions on the actual flow control mechanism. A canonical hump model is used to investigate these physics in a subsonic wind tunnel. Reynolds number independence is achieved above 0.72x10ˆ6 and testing is performed up to 2.2x10ˆ6. The efficacy of discrete steady jets is studied as a function of spacing, momentum coefficient, velocity ratio and mass flux. Highly-resolved surface pressure data for the controlled flow are compared to an inviscid solution establishing a figure of merit. Results indicate the inviscid limit is reached for a momentum coefficient of 1% with actuator spacing of 0.5% span. A comparison of steady discrete jets with sweeping jets actuators of equivalent cross-sectional area is undertaken. Surface flow visualization and PIV are employed to extract detailed information on the baseline and controlled flow field. This importance of establishing critical baseline features is also discussed with respect to establishing proper boundary conditions for accompanying numerical simulations.

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