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Separation Control over a Surface-Mounted Hemisphere D. BRZOZOWSKI, B. VUKASINOVIC, A. GLEZER, Georgia Institute of Technology — High-frequency control of the separated flow over a hemispherical, surface-mounted shell is investigated experimentally at Re_D up to 700,000. Actuation is effected by an array of surface mounted synthetic jet actuators and the control effectiveness is characterized using high-resolution particle image velocimetry, hotwire anemometry, and surface pressure distributions. Actuation results in a substantial reduction in the extent of the recirculating flow domain through separation delay and concomitant decrease in the attachment length. Consequently, the recirculating vortex within the separated domain is displaced toward the hemisphere-surface juncture and its cross-sectional area is substantially diminished. Direct coupling to small-scale motions within the separated domain leads to a substantial reduction in the magnitude of the turbulent stresses and kinetic energy over all flow scales and the suppression is particularly effective at the large-scale motions. It is also shown that large scale coherent motions within the recirculating domain can be induced and controlled at desired frequency and phase by amplitude modulation of the actuation waveform.

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