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Effects of Spanwise-Modulated Blowing on the Cylinder Near-Wake[1] JAMES GREGORY, SAMIK BHATTACHARYA, The Ohio State University — Three-dimensional characteristics of the wake of a circular cylinder at Re=5×10^3 were controlled using spanwise-modulated forcing from dielectric barrier discharge plasma actuators. Three-dimensional blowing profiles were created by varying the shape of the buried electrode in the spanwise direction. A sinusoidal voltage of 10 kVpp at 5 kHz was applied between the electrodes to create the plasma. Wake surveys conducted with a rake of x-wires were used to understand the impact of the actuation on the time-resolved wake development. Simultaneous transverse profiles at multiple spanwise positions reveal that the actuation has a substantial impact on the spanwise variation of frequency and phase of the Kármán shedding process, as well as on the mean and fluctuating properties of the wake profile. Cross-correlations indicate a loss of coherence between adjacent spanwise locations, and the amplitude of the dominant vortex shedding frequency was substantially attenuated due to forcing. Further studies were carried out by modulating the actuation with harmonics and sub harmonics of Kármán shedding and the shear layer instability, with the aim of introducing small-scale structures that enhance break-up of the wake coherence.

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