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Shear-Layer Interactions Between Surface-Mounted Obstacles at Varying Streamwise Spacings T. KIM, J.L. BEST, K.T. CHRISTENSEN, University of Illinois at Urbana-Champaign — Surface obstacles occur in a variety of flows, such as roughness elements in engineering flows and barchan dunes in natural eolian environments on both the Earth and Mars. Depending upon the arrangement and spacing between such obstacles, the flow over one obstacle can significantly alter the flow over those positioned downstream. Such flow interactions occur in fields of barchan dunes that are closely spaced and aligned in the flow direction, and where flow sheltering may play a significant role. To better understand these flow interactions, experiments were conducted for a pair of identical, upright cylinders extending into the log layer and aligned at various spacings in the streamwise direction of a turbulent channel flow at $\mathrm{Re}_\tau \sim 1200$. Particle-image velocimetry measurements of the flow around the cylinders reveal strong interactions between the shear layers generated downstream of the cylinders, and particularly a weakening of the downstream-most shear layer for small cylinder spacings ($< 4 - 6D$). Modifications of the vortex-shedding processes at the downstream cylinder are under investigation, as these interactions are thought to play a critical role in the formation and evolution of surface obstacles when the surface is cohesionless and mobile.

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