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Can vortex pinch-off explain wake modes? TAIT POTTEBAUM, University of Southern California — Experiments with heated, transversely oscillating cylinders have shown that the surface temperature can play a significant role in determining the wake mode. Temperature induced variations in the boundary layer viscosity, and the resulting changes in the velocity profile of the attached boundary layer, are believed to produce this effect. By viewing the wake mode from the perspective of vortex pinch-off, the significance of the velocity profile becomes evident. Pinch-off is generally modeled in terms of the non-dimensional kinetic energy of the forming vortex and the corresponding flux in the trailing shear layer, which is set by the velocity profile at the separation point. The evolution of the vorticity, momentum and kinetic energy fields in the shear layers and vortices throughout the shedding process was measured from DPIV data for two different wake modes at the same oscillation amplitude and period. Lagrangian coherent structures were used to determine the boundary between the shear layers and the forming vortices, allowing for integration over the vortices and calculation of fluxes. The ability of pinch-off models to explain the observed wake modes was then tested. By testing these models, the understanding of general vortex formation and pinch-off processes is advanced.

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