Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Horseshoe Vortex Dynamics in Cylinder-Wall and Cylinder-Endplate Junctions ADAM BLACKMORE, TAYFUN AYDIN, ALIS EKMEKCI, University of Toronto — Unsteady horseshoe vortex systems forming near circular cylinder-wall and circular cylinder-end plate junctures are studied experimentally using Particle Image Velocimetry (PIV). Wall mounted cylinder is exposed to a flow with boundary layer thickness of $0.24D$ at the juncture, and the endplate mounted cylinder is exposed to flow that undergoes separation at the leading edge of the endplate and reattaches before the junction. PIV measurements on the cylinder-wall junction show presence of two primary horseshoe vortices. The vortex closest to the body (the first vortex) is periodically fed by the second vortex which develops further upstream. The trajectories of the horseshoe vortices on the plane of symmetry show that the second vortex shows several oscillations in the approach flow direction before merging closer to the first vortex, which also oscillates at the same frequency. The horseshoe vortex system at the cylinder-endplate junction shows quasi-periodicity over a certain leading edge distance, but has a more complex unsteady behaviour due to the separation/reattachment of the flow prior to the juncture.

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Date submitted: 07 Aug 2010 Electronic form version 1.4