Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Low frequency instabilities in the wake of a cantilevered circular cylinder. ROBERT MARTINUZZI, MATTHEW KINDREE, MARYAM SHAHROODI, CHRIS MORTON, University of Calgary — The flow development over a cantilevered circular cylinder (AR = 4) protruding through a thin laminar boundary layer was investigated experimentally (Re = 6,800 -10,800) and numerically (Re = 300). For both the experiment and simulation, the unsteady flow development was found to be dominated by two instabilities: (i) vortex shedding, and (ii) a low frequency instability centered on approximately one-quarter of the vortex shedding frequency. The low frequency phenomenon persisted only in the case of an incoming laminar boundary layer as was demonstrated experimentally when compared to an incoming turbulent boundary layer. Coherent flow structures were analyzed using proper orthogonal decomposition (POD). The low frequency instability was found to represent a spanwise motion in the cylinder's upper wake. POD also provided insight into the nature of vortex formation and associated coupling with the detected low frequency instability. The temporal coefficients obtained from POD analysis were used to construct a low order model which described the influence of the low frequency instability on the vortex shedding amplitude.

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Date submitted: 30 Jul 2017 Electronic form version 1.4