Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

3D separation over a wall-mounted hemisphere in steady and pulsatile flow[1] IAN A. CARR, MICHAEL W. PLESNIAK, George Washington University — Flow separation over a surface-mounted hemispheriod is prevalent in countless applications, both under steady (constant freestream velocity) and unsteady flow over the protuberance. Previous studies of 3D separation have been limited to steady inflow conditions. In biological and geophysical flows, pulsatile flow conditions are much more commonly observed, yet such conditions have not been well studied. Primarily motivated by previous studies of the flow observed in various human vocal fold pathologies, such as polyps, our research aims to fill the knowledge gap in unsteady 3D flow separation. This is achieved by characterizing surface pressure fields and velocity fields, focused primarily on the vortical flow structures and dynamics that occur around a hemispheroid protuberance under pulsatile flow conditions. Surface static pressure and two-dimensional, instantaneous and phase-averaged, particle image velocimetry data in steady and pulsatile flow are presented and compared. Coherent vortical flow structures have been identified using the λ_{ci} vortex identification criterion. This analysis has revealed a novel set of flow structures dependent on the pulsatile flow forcing function.

[1]This material is based in part upon work supported by the National Science Foundation under Grant Number CBET-1236351

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Date submitted: 25 Jul 2014 Electronic form version 1.4