Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Transition in Pulsatile Pipe Flow PAVLOS VLACHOS, MELISSA BRINDISE, Purdue Univ — Transition has been observed to occur in the aorta, and stenotic vessels, where pulsatile flow exists. However, few studies have investigated the characteristics and effects of transition in oscillating or pulsatile flow and none have utilized a physiological waveform. In this work, we explore transition in pipe flow using three pulsatile waveforms which all maintain the same mean and maximum flow rates and range to zero flow, as is physiologically typical. Velocity fields were obtained using planar particle image velocimetry for each pulsatile waveform at six mean Reynolds numbers ranging between 500 and 4000. Turbulent statistics including turbulent kinetic energy (TKE) and Reynolds stresses were computed. Quadrant analysis was used to identify characteristics of the production and dissipation of turbulence. Coherent structures were identified using the λ_{ci} method. We developed a wavelet-Hilbert time-frequency analysis method to identify high frequency structures and compared these to the coherent structures. The results of this study demonstrate that the different pulsatile waveforms induce different levels of TKE and high frequency structures, suggesting that the rates of acceleration and deceleration influence the onset and development of transition.

Melissa Brindise
Purdue Univ

Date submitted: 01 Aug 2016 Electronic form version 1.4