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Transition in Pulsatile Flows with Flow Reversals[1] JOAN GOMEZ, YIANNIS ANDREOPOULOS, City College of New York, YIANNIS ANDREOPOULOS TEAM — Pulsatile flows are of interest because for certain range of Reynolds and Womersley numbers they exhibit flow reversals while at the same time they display laminar and turbulent behavior at different times of the pulsating cycle. Addressing how turbulence appears, decays and is suppressed in such environments is challenging due to the flow unsteadiness and flow-wall interactions. An experiment was setup to replicate pulsatile motion of water flowing in a clear, rigid pipe. The flow is driven by a piston-motor assembly controlled by a computer to induce cyclic motion of the mean flow. Time-Resolved Particle Image Velocimetry (TR-PIV) techniques are used to acquire velocity data on the plane of a CW laser illumination sheet. Simultaneous acquisition of time-dependent PIV data and wall pressure measurements, obtained from pressure sensors installed along the length of the pipe, allow the estimation of the instantaneous wall shear-stress which was used as a metric for the appearance of reverse and forward flow regions. It was found that the reverse flow region is formed close to the wall and it is bounded from the forward flow region by a counter-flowing shear-layer. Transition to turbulence occurs within this shear layer which prevents propagation of disturbances from the near wall region towards the center of the pipe.

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