

Fluids and Space Engineering Seminar

Date: Wednesday, April 18, 2018 at 13:00

Location: ZARM, Room 1730

Transition to turbulence in pulsatile pipe flow

Dr. Duo Xu

University of Bremen, ZARM

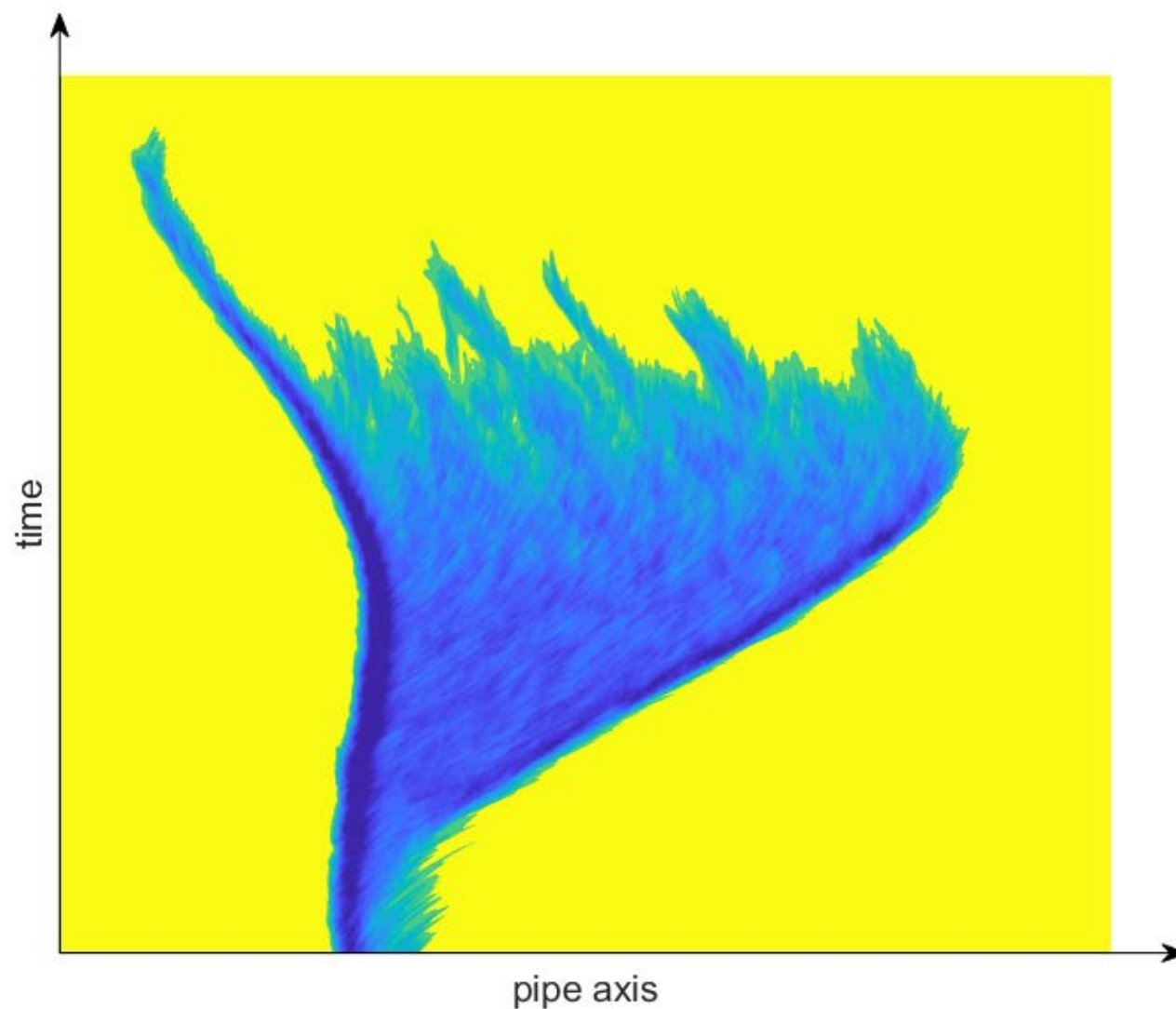


Figure: Development and decay of turbulence (blue) in pulsatile pipe flow.

Pulsatile flow is found in cardiovascular system and is commonplace in hydraulic systems. Stability and transition to turbulence in the pulsatile flow are much less understood than in flows driven at constant rates. Even in the simple case of pulsatile pipe flow, there are contradictory reports among experimental studies on the effect of pulsation on the transition. We here carry out laboratory experiments and direct numerical simulations of pulsatile pipe flow. Our experimental and numerical results show that there are three transition regimes: (I) when the pulsation frequency is large, the transition is not altered by the pulsation regarding to the transition in steady pipe flow which has a constant flow rate; (II) when the frequency is small, the pulsation delays the transition to approach to an upper limit of transition threshold; (III) there is an intermediate regime connecting the above two regimes. Based on the asymptotic behavior in the low and high frequency limits, we propose a model which adjusts well the transition thresholds in previous experiments. Our investigations resolve the discrepancies in the literature.