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Transition to turbulence in pulsatile pipe flow BJORN HOF, IST Austria, DUO XU, University of Erlangen — Pulsating flows are common in nature and applications, the most prominent example being cardiovascular flow. Often such flows are at the verge of becoming turbulent yet the influence of pulsation on the transition process is unclear. We present detailed experiments carried out in a straight pipe of circular cross-section with a sinusoidally modulated flow rate. With decreasing frequencies (Wo < 10) the transition is delayed considerably to larger mean Reynolds numbers, however the qualitative transition scenario remains unchanged. Like for steady flows puffs are the first observable turbulent structures but their lifetimes are shorter and turbulence only becomes sustained at larger Re. For fixed frequency and increasing pulsation amplitude on the other hand a different transition process is found. Here turbulence only occurs during the decelerating flow phase. Like the steady flow transition also this transition appears to require finite amplitude perturbations. The structure of the resulting turbulent flow however differs considerably for the pulsatile case. We map out the stability threshold for both instabilities in Re-frequency-amplitude parameter space. Particular attention is paid to the regime where both transition types co-exist and compete.

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