Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Transition to turbulence in particle laden flow NISHCHAL AGRAWAL, GEORGE CHOUEIRI, BJRN HOF, IST Austria — The critical Reynolds number for transition to turbulence in particle laden flows, depends not only on the particle size but also on the particle concentration. Although this dependence is known to a certain extent, the mechanism of transition is not well understood. In this study, we experimentally investigate the effect of inertial particles on transition to turbulence in pipe flows. The particles used were spherical, monodispersed and neutrally buoyant. At low particle concentrations transition occur abruptly via localized structures called puffs, similar to that for a single phase Newtonian flow i.e., a sub-critical transition, and the critical Reynolds number above which turbulence can be sustained decreases with particle concentration. At higher particle concentrations however, these localized structure cease to exist and turbulence arises continuously from laminar flow, unlike in the case of a sub-critical transition. This suggests a mechanism of transition significantly different from that for a single phase Newtonian flow. We infer that at high concentrations of particles the sub-critical transition is replaced by a super-critical transition.

Nishchal Agrawal
IST Austria

Date submitted: 31 Jul 2017 Electronic form version 1.4