Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Flow regimes of a neutrally buoyant suspension in the wake of a circular cylinder[1] RAPHAEL MAURIN, MATTHIEU MERCIER, LAURENT LACAZE, Institut de Mecanique des Fluides de Toulouse, Universite de Toulouse, CNRS, JEFFREY MORRIS, Levich Institute and Department of Chemical Engineering, City College of the City University of New York — While the rheology of suspensions has been mainly studied in the Stokes regime, fluid mechanical applications such as blood flows or sediment transport at finite particle Reynolds number require a more general understanding. From this perspective, we revisit experimentally the well-known flow around a cylinder, considering a neutrally-buoyant suspension instead of a pure fluid. Varying the particle Reynolds number, Re, and the solid volume fraction, ϕ, we investigate various wake structures, from the laminar creeping flow to the Karman vortex street. We characterize the corresponding stability map as a function of Re and ϕ. The presence of particles affects the shape of the wake of the cylinder in a non-trivial way, which cannot be accounted for by a modification of the effective fluid viscosity due to particle loading. Furthermore, the presence of the particles alters the critical values of the Reynolds number at which transitions in the flow regimes occur. These results can also be interpreted by the local behavior of the particles relative to the fluid near specific features of the flow around the cylinder.

[1]NEMESIS Chair, IDEX UNITI

Raphael Maurin
Institut de Mecanique des Fluides de Toulouse, Universite de Toulouse, CNRS

Date submitted: 31 Jul 2019 Electronic form version 1.4