Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

A cavitation bubble bursts near a particle STEPHANE POULAIN, Universite de Toulouse, ISAE-Supaero, Departement Aerodynamique, Energetique et Propulsion, Toulouse, France, GABRIEL GUENOUN, Department of Physics, ENS Cachan, Cachan, France, SEAN GART, WILLIAM CROWE, SUNGHWAN JUNG, Department of Biomedical Engineering and Mechanics, Virginia Tech, Blacksburg, Virginia, USA — Cavitation bubbles induce impulsive forces on surrounding substrates, particles, or surfaces. Even though cavitation is a traditional topic in fluid mechanics, current understanding and studies do not capture the effect of cavitation on suspended objects in fluids. In the present work, the dynamics of a spherical particle due to a cavitation bubble is experimentally characterized and compared with an analytical model. Three phases are observed: the growth of the bubble where the particle is pushed away, its collapse where the particle approaches the bubble, and a longer time scale postcollapse where the particle continues to move toward the collapsed bubble. The particle motion in the longer time scale presumably results from the asymmetric cavitation evolution at an earlier time. Our theory considering the asymmetric bubble dynamics shows that the particle velocity strongly depends on the distance from the bubble as an inverse-fourthpower law, which is in good agreement with our experimentation. This study sheds light on how small free particles respond to cavitation bubbles in fluids.

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Date submitted: 23 Jul 2015 Electronic form version 1.4