Cavitation & bubbles: investigation of the physical mechanisms by joint experimental and numerical approaches.

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Date: Friday, November 13, 2015
Time: 9:00 – 10:00 AM
Location: 358 Willard Blg.

Coffee and donuts will be provided

Abstract:
Hydrodynamic cavitation is the partial vaporization of high speed liquid flows. The turbulent, compressible and unsteady character of these flows makes their study unusually complex and challenging. Both fundamental mechanisms and effects of cavitation in rotating machinery (mainly rocket engine turbopump inducers) have been investigated in the last 10 years in the LML laboratory by joint experimental and numerical approaches. The most recent activities have focused on the use of X-ray imaging to obtain time resolved high resolution fields of void fraction and velocities in both phases. The primary objective is to characterize the two-phase flow structure, the large scale instabilities and the properties of turbulence. In parallel, a new CFD approach based on the DNS of turbulence coupled with a homogeneous cavitation modelling has been initiated. This work aims to avoid the errors due to turbulence modelling and focus on the improvement of the physical cavitation model. Validation of the results is now made possible thanks to the database provided by the experimental X-ray work. Other current projects dealing with cavitation erosion, characterization of thermal effects associated with expansion and collapse of bubbles, investigation of the interactions of controlled cloud of bubbles, and DNS of oil/water flows (initiated last year during my stay in JHU), will be also briefly evocated.

Bio:

Olivier Coutier-Delgosha is currently professor in Arts et Metiers ParisTech, one of the French Grandes Ecoles for future engineers, and the director of the LML laboratory, which groups 75 researchers from 3 universities in Lille. His research activity is in the area of hydrodynamics, and has especially focused for the last 18 years on two-phase flows. Study of cavitation, which involves the coexistence of liquid and vapor phases in high speed flows, has been his main research interest. The turbulent, compressible and unsteady character of these flows makes their study unusually complex and challenging. Both
fundamental mechanisms and effects of cavitation in rotating machinery have been investigated by joint experimental and numerical approaches. This work has resulted in significant technical contributions, in particular to a better understanding of the morphology and dynamics of cavitating flows. Olivier Coutier-Delgosha is just returning from a 1-year stay at Johns Hopkins University as a Fulbright grantee.