Title : Hydrodynamics of floating structures subject to partial or total water entry and exit in extreme environments

Abstract:

Floating structures operating in extreme environments are subject to motions of large amplitude. Critical loads such as the so-called slamming loads are induced on the structures due to the relative motion of the body and the free surface. Although different semi-analytical approaches are available for the study of the slamming loads in basic configurations (flat initial free surface, infinite Froude number), further investigations are necessary to study the slamming loads in more general configurations: water entry of a body already partially immersed, impacts on waves, entry at moderate Froude number, oscillations at the free surface, entry stage followed/preceded by an exit stage. The exit stage is a major challenge for a clear understanding of the behavior of a floating body in large amplitude waves. In fact, very few studies have been dedicated to the exit stage and both numerical and analytical models have to be validated experimentally. Furthermore, the exit problem still needs to be clearly posed in order to derive analytical models of water exit. The main objectives of the PhD thesis are:

- to carry out experiments on scale models in forced motion and in waves during which the contact surface will experience significant changes (wetting and de-wetting)

- to derive new analytical models of water entry and exit, to validate state-of-the-art numerical simulation CFD tools and to identify the domain of validity of the different models (for different Froude numbers)