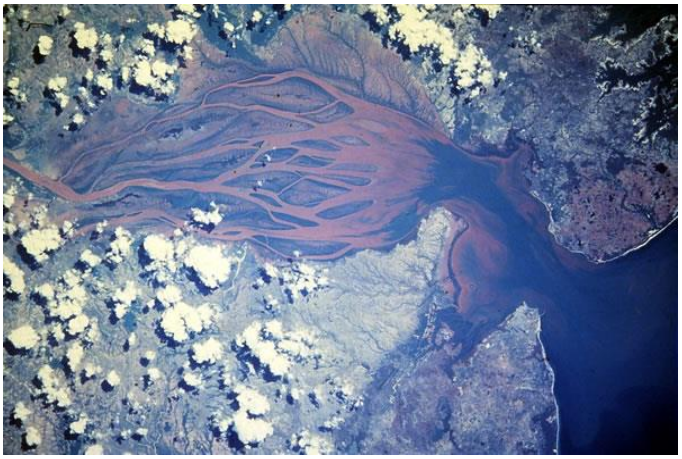
OIST SEMINAR

Date: March 25th, 2016 (Fri)
Time: 11:00 am – 12:00 pm
Venue: C015, Lab1 Level C
Speaker: Prof. Fabian Bombardelli
University of California, Davis

What you see is what you understand: explaining two-phase flows at different scales with computational and theoretical approaches



Abstract

Examples of multi-phase flows are legion: bubble plumes, dust storms, sediment transport in rivers, and many other natural and man-made applications. To study such flows, numerous empirical regressions have been provided for decades. Since three/four decades ago, more mechanistic approaches have been developed, which address the interaction of carrier and disperse phases. Still, it is not clear what to use for a given level of concentration, and for the objective of a given study. Furthermore, the action of turbulence needs to be quantified carefully depending on the problem at hand, and phenomena such as entrainment need to be accounted for. In this presentation, I describe a novel framework to analyze multi-phase flows, which clearly puts forward a pathway for the analysis of a host of problems. We present the application of this framework to solve the problem of sediment in suspension. For the case of transport of sediment as bed-load, we present a Lagrangian model which tracks each particle individually and addresses the non-Fickian behavior of the particles, and a new computational algorithm for the Basset force. For the problem of flow in stepped spillways, we discuss recent numerical simulations which give physical insight to the problem of air entrainment, allowing us to characterize the "release of vorticity" from the steps to the free surface. The presentation concludes with an analysis of future work and the challenges to overcome.

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