

2011 Special Program: Two-Phase Flow, Interface Flow and Related Phenomena

Numerical study of multi-scale sediment dynamics in estuaries and coastal oceans

2011 - 09 - 14 (Wed.)

15:00 - 17:00

308, Mathematics Research Center Building (ori. New Math. Bldg.)

In this talk I will summarize some recent developments and applications of numerical models to solve environmental flow and sediment transport problems at different scales. An example will be given on modeling cohesive sediment (mud) transport in San Francisco Bay using the Stanford coastal model SUNTANS. The focus will be on the implementation of an integrated modeling system to solve coupled interactions of wind-waves, tides and mud in a complex estuarine system. The model framework demonstrates the importance of the better understanding and proper parameterization for small-scale phenomenon. Therefore, two more examples that focus on small-scale flow features will be presented. The first example reveals detailed turbulent structures in the boundary layer and the resulting development and evolution of sand ripples. The second example shows how sediment particles response to vortex structures during the propagation of the turbidity current. Through use of multi-scale and multiphase numerical models, a better understanding of complex estuarine dynamics that spans a wide range of spatial and temporal scales is obtained. Some challenges and future directions will be addressed.



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