Friday, November 24, 2017 – 9.30-10.30
Aula 107 – Scuola di Ingegneria, via di Santa Marta 3, Firenze

"SPH MODELLING IN COASTAL ENGINEERING"

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The numerical modelling represents a useful and complementary tool to physical model tests. Sophisticated tools are now at a formative stage and here we are actively developing the novel, flexible numerical technique Smoothed Particle Hydrodynamics (SPH). As a meshless and Lagrangian technique, SPH is ideally suited to fluid and solid mechanics with highly nonlinear deformation and is opening new avenues of activity in several areas, notably fluid-structure interaction, multi-phase flows and importantly, engineering application and design. SPH describes a fluid by replacing its continuum properties with locally smoothed quantities at discrete Lagrangian locations. Thus, the domain can be multiply-connected with no special treatment of the free surface, making it ideal for examining complicated flow situations.

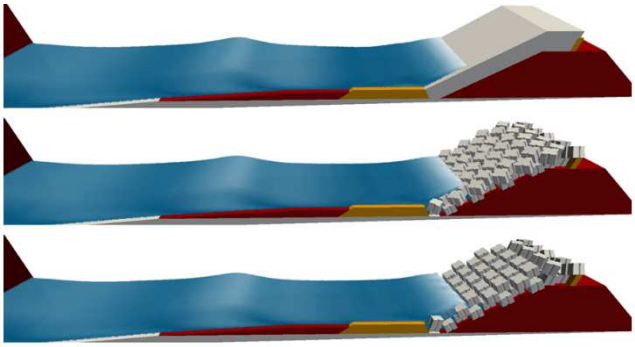

Figure 1. Run-up in rubble-mound breakwaters.

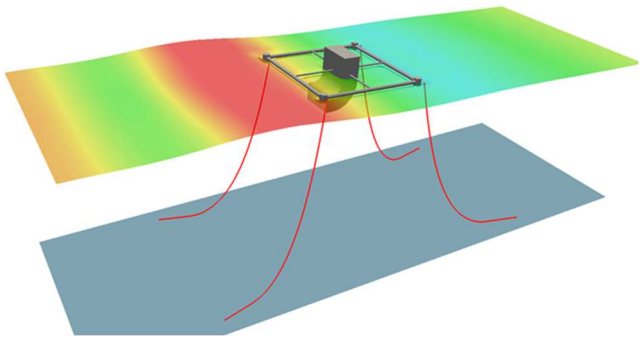

Figure 2. Floating OWC moored to the seabed.

The open source DualSPHysics code has been developed to use SPH for real engineering problems. The DualSPHysics code has already been applied to coastal applications (including validation with experiments) such as:

- to simulate wave interaction with complex geometries such as rubble mound breakwaters (Fig. 1)
- to assess accurately the forces exerted by sea waves on coastal defenses
- to simulate floating wave energy converters under the action of extreme waves, including wave breaking and overtopping, in order to study their survivability and efficiency to absorb the available wave energy in extreme conditions (Fig. 2).