Mesh-free Computing: Powerful modelling tool for violent hydro-environmental and geophysical flows

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Tsunamis, floods, landslides, violent river flows, and wave breaks are only a few examples of violent hydro-environmental and geophysical flows. These flows are characterized by the large deformations and frequent change in boundaries and interfaces and frequent topology changes in various spatial and temporal scales. They also often involve the interaction and mixing of multiple phases of matter (i.e., liquid, solid, and gas). Simulation of such complex characteristics is still beyond the capabilities of many conventional computational models. In recent years, a novel generation of computational techniques, the mesh-free particle methods, has provided a unique opportunity to deal with such complexities. This presentation overviews these computational techniques and demonstrates their capabilities for a wide range of