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NUMERICAL SIMULATION OF MULTI-PHASE FLOWS

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ABSTRACT

Multi-phase flows are pervasive in many natural and man-made conditions. They range from sediment transport in water, to particle motion in air in density currents, and to air-water flows in spillways. These flows are characterized by a carrier fluid and a disperse phase, which could be air bubbles or solid particles. Most multi-phase flows are turbulent flows in nature and have the additional shortcoming that concentrations are often non dilute.

Although multi-phase flows have been known for long time, the equations needed to describe the problem have been made available only a few decades ago. In general, those equations concern the conservations of mass, momentum and energy for all phases present in the flow. However, solving all those equations is not only time consuming but also can pose serious numerical difficulties in many flow types. One of the most commonly used is the so-called two-fluid model, which has well-known ill-posed attribute in a simple case.

In recent years, different methods in Lagrangian-Eulerian and Eulerian-Eulerian approaches have been proposed. The purpose of this Mini-symposium is to bring together works addressing numerical solutions of solid-water, solid-air, and air-water flows. Paper could discuss fundamental works such as, for instance, the integration of the Basset force in Lagrangian methods or the mathematical analysis of the two-fluid model, or present and analyze important applications in mechanical or environmental engineering. Special interest will be on papers addressing the flows which are non dilute, and in which diverse turbulent closures are discussed and applied.