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RECENT ADVANCES IN HIGH-ORDER HYDRODYNAMIC METHODS (700)

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ABSTRACT

This minisymposium will focus on both theoretical and computational aspects of high-order Lagrangian, Eulerian, and Arbitrary Lagrangian Eulerian (ALE) methods for applications ranging from single- to multi-material and multi-phase flow problems and simulations of both fluids and solid materials.

There are two common formulations of the fluid mechanics equations, depending on whether the equations are written in a fixed reference frame (Eulerian formulation) or a reference frame moving at the fluid speed (Lagrangian formulation). Each of these formulations has advantages and drawbacks. The Eulerian one is conceptually the simplest because the computations are performed on a fixed grid. This formulation is widely used in computational fluid dynamics (CFD).

The Lagrangian form is more complicated because of a moving reference frame; however it is advantageous for solving multiphysics problems involving e.g. large deformations, strong shocks and interactions of multiple materials. On the other hand, multidimensional Lagrangian meshes tend to tangle so that the mesh elements become invalid, and in general cannot represent large deformation. This difficulty can be resolved in ALE methods, which assume that the mesh moves independently on the flow and therefore offer additional flexibility and accuracy. ALE techniques can also be directly implemented in numerical schemes, for example to take into account moving objects, in fluid structure interaction, etc.

The aim of this minisymposium is to discuss the recent advances in single- and multi-material hydrodynamic simulations. We are particularly interested in high order methods, such as high order finite volume, discontinuous Galerkin, finite element, residual distribution and flux-corrected transport methods, as applied to Lagrangian, Eulerian or ALE flow description.

High order mesh generation, optimization and adaptation are among other topics that should be addressed in this minisymposium.