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MINISYMPOSIUM ON MODELLING OF ATOMIZATION, BREAKUP AND FRAGMENTATION OF FLUIDS

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ABSTRACT

The atomization and fragmentation of spray, droplet and bubbly flows poses remarkable challenges to simulation and computation. Typical flows range in scale from that of the vessel in which the flows are confined (tens of cm) to that of the smallest structures that need to be resolved, such as thin liquid or gas sheets, droplets and ligaments (microns or less). Despite its difficulty, the computation of such flows is of great importance in industry and the natural sciences. In combustion technology, the burning of liquid fuels is controlled by the droplet sizes and velocities in the combustion chambers. In the oceans, breaking waves produce sprays and bubbles that control the mass and heat exchanges with the atmosphere. Many other applications abound, in process engineering, biology, modern manufacturing etc.

The session will bring together a broad range of scientists, including those that develop methods, those that adapt them for computational efficiency and those that systematically use

them for developing our understanding of the flows. The breaking and atomizing flows have inspired the development of methods such as Volume of Fluid (VOF) methods, Lattice Boltzmann methods, Level Set (LS) methods and Front Tracking (FT) methods with topology changes. They perform best for complex multiscale flows when coupled with AMR strategies or multiscale methods that take into account local slender structures. Finally engineers and physicists have been using them extensively to analyze typical bubbly or droplet flows with sometimes very intense use of current computer resources, ranging up to the tens of millions of hours of CPU.