MMM SEMINAR SERIES

Fast Interface Models and Adaptive Meshing for Multiphase Flows (for clouds and plumes)

Steve Shkoller
University of California, Davis

Multiphase flows undergoing Rayleigh-Taylor or convective instabilities (as well as entrainment) develop complex small-scale structures that can be difficult to accurately simulate using conventional methods. In a large class of flow regimes, it is possible to decompose the fluid motion into (a) the dynamics of fluid interfaces, (b) the dynamics of shock waves, (c) dynamics of vorticity and compression, and (d) the dynamics of the remaining physical variables in the problem. In the first part of the talk, I will describe a set of fast-running interface models which can accurately reproduce the motion of multiple contacts and shocks and their interactions, using dimensional reduction and asymptotics in non-locality. Results will be presented comparing the interface models against classical experiments and traditional computational algorithms. In the second part of the talk, I will discuss a new Smooth Adaptive Meshing (SAM) algorithm for dynamic curvilinear mesh generation, which is based on a fast solution strategy of the time-dependent Monge-Ampère equation and is coupled to a simple Arbitrary Lagrangian Eulerian scheme for hydrodynamics. I will show results from challenging 2d and 3d mesh generation experiments for grids that track very complicated small-scale features that can be found in rising thermals and/or clouds.

Thursday, 11 May 2023, 2:00pm
Refreshments 1:45pm
Please also join colleagues for refreshments and informal discussion after the seminar until 3:30pm
NCAR-Foothills Laboratory, 3450 Mitchell Lane
FL2-1022, Large Auditorium

Seminar will also be live webcast
https://operations.ucar.edu/live-mmm
Participants may ask questions during the seminar via Slido.