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Abstracts of Papers to Appear

Radiation Diffusion for Multi-Fluid Eulerian Hydrodynamics with Adaptive Mesh Refinement. Louis H. Howell and Jeffrey A. Greenough. Lawrence Livermore National Laboratory, MS L-560, Livermore, CA 94550, USA.

Block-structured meshes provide the ability to concentrate grid points and computational effort in interesting regions of a flow field, without sacrificing the efficiency and low memory requirements of a regular grid. We describe an algorithm for simulating radiation diffusion on such a mesh, coupled to multi-fluid gasdynamics. Conservation laws are enforced by using locally conservative difference schemes along with explicit synchronization operations between different levels of refinement. In unsteady calculations each refinement level is advanced at its own optimal timestep. Particular attention is given to the appropriate coupling between the fluid energy and the radiation field, the behavior of the discretization at sharp interfaces, and the form of synchronization between levels required for energy conservation in the diffusion process. Two- and three-dimensional examples are presented, including parallel calculations performed on an IBM SP-2.

A Further Study of Numerical Errors in Large-Eddy Simulations. Fotini Katopodes Chow* and Parviz Moin.† *Environmental Fluid Mechanics Laboratory, Department of Civil and Environmental Engineering, Stanford, CA 94305-4020, USA; and †Department of Mechanical Engineering, Stanford, CA 94305, USA.

Numerical errors in large-eddy simulations (LES) arise from aliasing and discretization errors, and errors in the subfilter-scale (SFS) model. Using a direct numerical simulation (DNS) dataset of stably stratified shear flow to perform a priori tests, we compare the numerical error from several finite difference schemes to the magnitude of the SFS force. This is an extension of Ghosal's analysis [J. Comput. Phys. 125 (1996) 187] to realistic flow fields. By evaluating different grid resolutions as well as different filter–grid ratios, we provide guidelines for LES: for a second-order finite difference scheme, a filter–grid ratio of at least four is desired; for a sixth-order Padé scheme, a filter–grid ratio of two is sufficient.

Force-Coupling Method for Particulate Two-Phase Flow: Stokes Flow. Sune Lomholt* and Martin R. Maxey.† *Risø National Laboratory, Roskilde, Denmark; and †Division of Applied Mathematics, Brown University, 37 Manning Street, P.O. Box 1966, Providence, RI 02912, USA.

In this paper we describe a force-coupling method for particle dynamics in fluid flows. The general principles of the model are described and it is tested on three different Stokes flow problems; a single isolated sphere, a pair of otherwise isolated spheres, and a single sphere in a channel. For sphere to sphere or sphere to wall distances larger than 1/4 of the sphere radius the force-coupling results compared well with analytical and accurate numerical values. For smaller distances the results agree qualitatively, but lubrication effects are not included and this leads to a quantitative discrepancy.

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