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EXPLICIT AND IMPLICIT LARGE EDDY SIMULATION OF TURBULENT FLOWS

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ABSTRACT

Large Eddy Simulation (LES) approach has become a valued tool applied in many important engineering and physical problems involving turbulent flows. However, issues of achieving an adequate accuracy with economical or affordable computations are still being addressed. The minisyposium will examine recent developments in the general field of Large Eddy Simulation and support them with demonstrations involving challenging applications. Both, the traditional explicit LES methods and Implicit LES (ILES, a.k.a MILES) will be considered. For explicit LES, particular emphasis will be on subgrid scale (SGS) models, advantages and limitations of non-linear models and the efficient treatment of boundary and shear layers. The contributions may include hybrid approaches with, e.g., Reynolds Averaged Navier Stokes methods.

With LES responsibility to capture important turbulent structures is shifted from the turbulence model to the numerical resolution, while parameterizing the action of small, least-energetic eddies on the resolved eddies with explicit SGS models. In contrast, with ILES numerical discretizations that totally and economically replace the need for an explicit turbulence model are sought. Despite well documented computational evidence and theoretical arguments derived for specific types of flows, it is hard to accept that certain discrete solvers regulate themselves intelligently by dispensing suitable numerical dissipation and can predict turbulent flows in a simple and efficient manner without resorting to any SGS models. The symposium will contribute to examining applicability of ILES in predicting complex strain fields found in practical engineering problems, complex geometries as well as solar, geophysical and urban flows. Canonical problems will be demonstrated and discussed in the context of studies addressing various aspects of numerical accuracy and efficiency, from nonlinear computational stability to realistic representation of back scatter.