Computational & Information Systems Laboratory
P.O. Box 3000 – Boulder, CO 80307-3000 – www.cisl.ucar.edu

Joint GTP – MMM- HAO Special Seminar

Petascale Computing and the Study of Turbulent Mixing and Dispersion

P.K. Yeung

Georgia Tech

Because of the presence of a wide range of scales, turbulence is both a complex problem in science and a grand challenge problem for high-performance computing. At the same time, rapid advancements of computer capacity have made it possible to perform detailed numerical simulations, at increasingly high Reynolds number and with increasing complexity in accompanying physical processes or flow geometry. In this talk we first discuss some of the challenges involved in developing algorithms for optimal performance on current and hopefully future massively parallel computers, and in analyzing and maintaining huge volumes of data resulting from simulations of grid resolution 4096^3 and beyond. Our second major focus is the study of efficient mixing and dispersion, which are among the most important effects of turbulence in many geophysical, environmental, and engineering contexts. In particular, we consider dependence of passive scalar transport on the Schmidt number (which varies widely in applications), and the dependence of single- and multiparticle Lagrangian statistics on Reynolds number and scale size. Finally we give some thoughts to future prospects, including additional physical processes, and issues that require collective action by the turbulence research community to ensure continued benefits from the arrival of machines capable of sustained Petascale performance and beyond.

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FL2-1022 Large Auditorium
Lecture at 11:00am
(Refreshments at 10:45)

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gentile@ucar.edu