Boulder Fluid Dynamics Seminar Series

Wednesday, July 2, 2014
3:30pm-4:30pm (refreshments at 3:15pm)
Bechtel Collaboratory in the Discovery Learning Center (DLC)
University of Colorado at Boulder

Massively Parallel Adaptive Simulation of Multi-Element Aeronautical Flows with Detached Eddy Simulation

Kenneth Jansen, *University of Colorado, Boulder*

When the limits of wings and rudders are pushed to their performance limits, complicated three-dimensional separations are common. Traditional models like Reynolds Averaged Navier Stokes Simulations (RANSS) often fail to model these cases well, especially if flow control is used to extend the performance range. Recent efforts demonstrating massively parallel, adaptive finite element simulations will be presented to illustrate what Detached Eddy Simulation (DES) can provide will be shown and compared with experiments.

Phase Coherence for Simulating Nonstationary, Turbulent Wind

Jenni Rinker, *Duke University and NREL*

Many current stochastic turbulent simulation methods generate a random vector by prescribing a power spectral density, which specifies the magnitudes of the Fourier components, and then independently sampling the phases from a uniform distribution. It can be shown that this formulation will lead to a Gaussian, stationary process in the time domain, which may not accurately model the non-Gaussian, nonstationary wind of the real world. This presentation will cover the theory of “phase coherence,” a simple modification of the standard stochastic simulation method that can simulate nonstationary processes. An analysis of the prevalence of phase coherence in real data will also be presented. Lastly, a brief demonstration on the effect of phase coherence on the output of a dynamical system will be given to emphasize the importance of including phase coherence in simulations for design purposes.