Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

**Challenges in large-eddy simulation of cumulus convection** GEORGIOS MATHEOU, DANIEL CHUNG, Jet Propulsion Laboratory/California Institute of Technology, LOUISE NUIJENS, BJORN STEVENS, Max Planck Institute for Meteorology, JOAO TEIXEIRA, Jet Propulsion Laboratory/California Institute of Technology — High-resolution simulation is a vital tool for studying the physical processes in the atmospheric boundary layer. In spite of the numerous encouraging large-eddy simulation (LES) results, prediction of complex turbulent flows continues to present many challenges. The present study considers the impact of various choices pertaining to the numerical solution of the governing equations on the LES prediction and the association of these choices to flow physics. Simulations corresponding to the trade wind precipitating shallow cumulus composite case of the Rain In Cumulus over the Ocean (RICO) field experiment were carried out. Global boundary layer quantities such as cloud cover, surface precipitation rate, power spectra and the overall convection structure were used to compare the effects of different discretization implementations, grid resolution and computational-domain size. The different discretization implementations were found to exert a significant impact on the LES prediction. The observed differences can be attributed to the nonlinear nature of moist convection, especially when precipitation is present, which results in an increased sensitivity of the atmospheric boundary layer statistics to the representation of small-scale turbulence.

Georgios Matheou
Jet Propulsion Laboratory/California Institute of Technology

Date submitted: 05 Aug 2010 Electronic form version 1.4