Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Fine-scale modeling of entrainment and mixing of cloudy and clear air[1] STEVEN KRUEGER, HELENA SCHLUETER, PAMELA LEHR, University of Utah — The EMPM (Explicit Mixing Parcel Model) predicts the evolving in-cloud variability due to entrainment and finite-rate turbulent mixing using a 1D representation of a rising cloudy parcel. The 1D formulation allows the model to resolve fine-scale variability down to the smallest turbulent scales (about 1 mm). The EMPM calculates the growth of thousands of individual cloud droplets based on each droplet's local environment. Our analyses of EMPM results address two fundamental difficulties that the large-eddy simulation (LES) approach faces when attempting to represent the effects of entrainment and mixing on droplet microphysics. One is representing the subgrid-scale (SGS) variability of subsaturation and its impact on droplet size distribution (DSD) evolution. Another is accounting for the finite rate of SGS mixing and therefore of droplet evaporation. We have used EMPM results to characterize the evolution of the DSD due to a single isobaric entrainment and mixing event for a range of conditions. We have also used the EMPM to quantify the dependence of the relative humidity time scale on droplet evaporation, turbulent mixing, and droplet sedimentation time scales.

[1]This material is based upon work supported by the National Science Foundation under Grant No. ATM-0346854.

Steven Krueger
University of Utah

Date submitted: 08 Aug 2007 Electronic form version 1.4