Modeling warm-rain microphysics and dynamics-microphysics interactions with EULAG-based large-eddy simulation model.

W. W. Grabowski 1, A. A. Wyszogrodzki 1, J. Slawinska 2, D. Jarecka 3, H.
Pawlowska 3, and L.-P. Wang 4

1 NCAR, Boulder, CO, USA
2 Courant Institute for Mathematical Sciences, NYU, New York, NY, USA
3 Institute of Geophysics, Faculty of Physics, University of Warsaw, Warsaw, Poland
4 Department of Mechanical Engineering, University of Delaware, Newark, DE, USA

This paper will discuss sophisticated warm-rain microphysics schemes implemented in recent years in a Large-Eddy Simulation (LES) model based on EULAG and subsequently applied to study dynamics-microphysics interactions in shallow boundary layer clouds, such as subtropical stratocumulus and shallow cumulus. The schemes implemented include the double-moment bulk microphysics scheme (i.e., predicting mixing ratios and concentrations of cloud droplets and drizzle/rain drops) and the bin microphysics scheme that predicts the evolution of the water drop spectra. These schemes were used to study the effects of activating aerosols on micro- and macrophysical characteristics of cloud fields (i.e., contrasting clouds that develop in clean and polluted environments) and to investigate the impact of cloud turbulence on warm-rain initiation. Details of the scheme will be briefly discussed and highlights from EULAG-LES simulations of cloud fields will be presented at the meeting.