Geophysical Research Abstracts
Vol. 19, EGU2017-10429, 2017
EGU General Assembly 2017

Microphysical Parameterizations for NWP: It's All About the Sizes and Production Pathways of Hydrometeors

Sara A Michelson (1,2), Jian-Wen Bao (1), Evelyn D. Grell (1,2)

(1) NOAA/ESRL/PSD, Boulder, Colorado, United States, (2) CIRES, University of Colorado, Boulder, Colorado, United States

Bulk microphysical parameterization schemes are popularly used in numerical weather prediction (NWP) models to simulate clouds and precpitation. These schemes are based on assumed number distribution functions for individual hydrometeor species, which are integratable over size distributions of diameters from zero to infinity. Typically, hydrometeor mass and number mixing ratios are predicted in these schemes. Some schemes also predict a third parameter of hydrometeor distribution characteristics.

In this study, four commonly-used microphysics schemes of various complexity that are available in the Weather Research and Forecasting Model (WRF) are investigated and compared using numerical model simulations of an idealized 2-D squall line and microphysics budget analysis. Diagnoses of the parameterized pathways for hydrometeor production reveal that the differences related to the assumptions of hydrometeor size distributions between the schemes lead to the differences in the simulations due to the net effect of various microphysical processes on the interaction between latent heating/evaporative cooling and flow dynamics as the squall line develops. Results from this study also highlight the possibility that the advantage of double-moment formulations can be overshadowed by the uncertainties in the spectral definition of individual hydrometeor categories and spectrum-dependent microphysical processes. It is concluded that the major differences between the schemes investigated here are in the assumed hydrometeor size distributions and pathways for their production.