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Effect of microphysical parameterization on the simulation of high-latitude surface energy budget and boundary-layer structure

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Recent tests using a double-moment microphysics scheme in the NCAR Weather Research Forecast (WRF) model have show significant differences with single-moment schemes in high-resolution simulations of mixed-phase Arctic clouds during the ARM Mixed-Phase Arctic Cloud Experiment (M-PACE) on the North Slope of Alaska. In particular, the double-moment scheme shows a greater ability to retain the cloud liquid water and produce more realistic surface radiation. These changes in turn impact the surface energy budget and the boundary-layer structure. The extensive M-PACE data set, with intensive ground, remote sensing, aircraft, and radiosonde measurements, is used to verify the microphysical characteristics of the model's simulation of mixed-phase clouds and to examine the impact of the double-moment scheme on the microphysical structure, the surface radiation, and the boundary-layer structure. Results of various sensitivity tests will also be discussed, such as the role of ice nuclei concentrations, and the impact of 1-D and 3-D turbulence representation.