P7 A sensitivity study of convection parameterizations in MPAS-A utilized in conjunction with USEPA physics options.

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The Model for Prediction Across Scales – Atmosphere (MPAS-A) is the meteorological foundation for a next generation global air quality modeling system currently being developed at the U.S. Environmental Protection Agency (USEPA). In recent years, meteorological fields for retrospective air quality simulations have been produced by versions of the Weather Research and Forecasting (WRF) model employing USEPA-developed physics schemes and options. These USEPA enhancements have been implemented into MPAS-A and include the Pleim surface layer, the Pleim-Xiu (PX) land surface model with fractional land use for a 40-class National Land Cover Database (NLCD40), the Asymmetric Convective Model 2 (ACM2) planetary boundary layer scheme, a modified Kain-Fritsch (KF) convection parameterization with subgrid-scale cloud feedback to the radiation schemes and a scale-aware convective time scale, and grid analysis nudging four-dimensional data assimilation (FDDA). Accurate simulation of cloud characteristics and precipitation are essential to modeling atmospheric photochemistry and aerosol processes, so this study investigates the efficacy of various MPAS-A convection parameterization schemes (CPSs) when combined with the PX, ACM2, and FDDA physics options. Global simulations of July 2016 using KF, New Tiedtke (NT), and Grell-Freitas (GF), all with WSM6 microphysics, and GF with Thompson microphysics on variable meshes of different base resolutions are evaluated against observational data, such as those available from NCEP's Meteorological Assimilation Data Ingest System (MADIS) and the World Radiation Monitoring Center's Baseline Surface Radiation Network (BSRN).