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Modeling of the July 10 STERAO storm with the RAMS model: tracer transport and impact of microphysics scheme in the framework of the WMO cloud modeling workshop investigating chemistry transport in deep convection

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The meso-scale RAMS model has been applied to the July 10, 1996, STERAO storm observed in Colorado using an idealized horizontally homogeneous sounding with warm bubble initiation. This simulation was done in the framework of the chemistry transport in deep convection cloud modeling workshop intercomparison led by Mary Barth (http://box.mmm.ucar.edu/individual/barth/TracerTransportDeepConvection.html). The RAMS model coupled with gas and aqueous chemistry simulated CO and O_3 mixing ratios similar to observations and other models. When NO_x production from lightning was parameterized in RAMS, the NO_x mixing ratios were found to be of the same order as observed NO mixing ratios, while models that did not include the lightning parameterization underpredicted NO_x. The anvil area, mass flux, CO flux and NO_x flux simulated by the RAMS-chemistry model were found to be within 35% of the values deduced from observations. We further examine the simple parameterization of NO production from lightning used in our RAMS simulations, which leads to a good agreement between computed and observed NO_x fluxes. Moreover, because the RAMS model allows using either single or double moment microphysical schemes, the impact of the choice of the microphysical scheme is examined in terms of chemical tracer redistribution by the storm.