P43 Sensitivity of simulated convection-driven stratosphere-troposphere exchange in WRF-Chem to the choice of physical and chemical parameterization.

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Tropopause-penetrating convection is capable of rapidly transporting air from the lower troposphere to the upper troposphere and lower stratosphere (UTLS), where it can have important impacts on chemistry, the radiative budget, and climate. However, obtaining in situ measurements of convection and convective transport is difficult and such observations are historically rare. Modeling studies, on the other hand, offer the advantage of providing output related to the physical, dynamical, and chemical characteristics of storms and their environments at fine spatial and temporal scales. Since these characteristics of simulated convection depend on the chosen model design, we examine the sensitivity of simulated convective transport to the choice of physical (bulk microphysics or BMP and planetary boundary layer or PBL) and chemical parameterizations in the Weather Research and Forecasting model coupled with Chemistry (WRF-Chem). In particular, we simulate multiple cases where in situ observations are available from the recent (2012) Deep Convective Clouds and Chemistry (DC3) experiment. Model output is evaluated using ground-based radar observations of each storm and in situ trace gas observations from two aircraft operated during the DC3 experiment. Model results show measurable sensitivity of the physical characteristics of a storm and the transport of water vapor and additional trace gases into the UTLS to the choice of BMP. The physical characteristics of the storm and transport of insoluble trace gases are largely insensitive to the choice of PBL scheme and chemical mechanism, though several soluble trace gases (e.g., SO2, CH2O, and HNO3) exhibit some measurable sensitivity.