AGU FALL MEETING
San Francisco | 12–16 December 2016

A34D-03: The Interaction between Very Deep Convection and Biomass Burning Plumes during DC3 and the Impact on the UTLS Region over The North Atlantic

Wednesday, 14 December 2016
16:30 - 16:45
Moscone West - 3010

The Central United States is known to be a region where intense thunderstorms develop. During the Deep Convective Cloud and Chemistry Experiment (DC3) in summer 2012 a number of these imposing storms were investigated by airborne and ground-based measurements focusing on the chemistry, microphysics and dynamics in these unique storms. Here we report on aircraft penetrations of the anvil outflow of isolated supercells and organized mesoscale convective systems and the distribution of different trace species as e.g. CO, O_3, and NO_x. Conspicuously, the burning of several extended wildfires in New Mexico and Colorado, which emitted huge amounts of SO_2 and black carbon (BC), significantly impacted the chemical composition within and nearby the probed thunderstorms. In several cases, overshooting thunderstorms developed that injected considerable amounts of pollutants into the lower stratosphere. Both in the lofted biomass burning plumes and in the thunderstorm outflow, O_3 mixing ratios were frequently enhanced due to photochemical production and downward transport from the stratosphere; however, the latter process dominated the measured O_3 enhancements in the storms. Here we present results from the local flights over Colorado, Oklahoma and Texas along with transit flights over the North Atlantic conducted by the German DLR Falcon research aircraft. In addition, microphysical measurements from radar, and remote trace species measurements (lidar and satellites) are used to demonstrate the strong air mass exchange in the UTLS region caused by the frequent occurrence of very deep convection over the Central U.S. The more general impact of these widespread, aged, and more or less invisible anvil outflows on the UTLS region downwind of the U.S. continent (North Atlantic) is discussed regarding chemistry, new particle formation, and radiation.

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