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**TITLE:** Elevated O3 in Fresh and Aged Lightning-NOx Plumes Interacting with Biomass Burning Plumes over the Central U.S. during DC3 *(Invited)*

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**ABSTRACT BODY:** During the Deep Convective Clouds and Chemistry Experiment (DC3) in summer 2012 a variety of different thunderstorm systems were investigated over the Central U.S. by the DLR research aircraft Falcon together with the NCAR GV and NASA DC-8 aircraft. In addition, the complete DC3 field phase was characterized by a number of extended wildfires burning in the surroundings of the thunderstorms. Here we mainly focus on trace gas in situ measurements, such as NOx, CO, O3, CH4, SO2, NMHC, and a variety of aerosol measurements carried out by the Falcon in the fresh (~0-6 h) and aged (~12-24 h) anvil outflow at ~10-12 km altitude. It is well-known that thunderstorms modify the trace gas composition in the upper troposphere (UT) and may affect O3 mixing ratios, an important greenhouse gas in the UT. However, a complete picture of the different processes affecting the UT-O3 composition in vicinity of thunderstorms and its large-scale effects is still missing. From the DC3 data set we present an example of small-scale effects on the O3 composition in the anvil outflow, such as immediate O3 production by an aircraft-induced flash. But we also show how the efficient convective transport that extended over the whole updraft region may transport O3-poorer air masses from the, in general, rather unpolluted inflow region (with regard to anthropogenic emissions) over the Central U.S. directly to the UT. However, in a few cases enhanced O3 mixing ratios were observed in the anvil outflow attributed to different chemical and dynamical processes. In the two most powerful convective systems, an intense MCS over Missouri/Arkansas and a supercell over Texas, extended biomass burning (BB) plumes from New Mexico interacted with the thunderstorms. Ozone production was obvious in the BB plumes transported mainly in the lower troposphere at ~2-5 km altitude ($\Delta$O3/$\Delta$CO=0.1). However, if these air masses affected by BB emissions (containing high amounts of O3 precursors such as CH4 and NMHC) were ingested into the surrounding thunderstorms (with high HOx and NOx) and transported to the UT region, the $\Delta$O3/$\Delta$CO slope increased dramatically to values up to ~0.6-2.5. In addition to enhanced O3 production rates in thunderstorm outflows interacting with BB plumes, the pronounced downward mixing of O3-rich air mass from the stratosphere down to 8 km was observed in an aged anvil outflow from a squall line active over Colorado which was advected to Kansas the day after. Overall, from the local DC3 Falcon measurements the effect of downward mixing of O3-rich stratospheric air masses seems to cause the largest increase in O3 mixing ratios in the aged anvil outflow.
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**Additional Details**

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