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Empirical ozone production in the subtropical UTLS from South American biomass burning during SOUTHTRAC

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The biomass burning season in America was exceptionally intense during summer 2019. Particularly in the subtropics biomass burning potentially contributes significantly to the trace gas budget of the upper troposphere and can affect chemistry and composition far from the source.

During the SOUTHTRAC mission, which took place in September and November 2019, several cross sections from the equator to the southern tip of south America were flown at typical altitudes of 13-14 km. During the northbound flight on October, 7th 2019 massive enhancements of pollutants were observed at these altitudes. Notably, in-situ observations show continuously elevated CO values exceeding 200 ppbv over a flight distance of more than 1000 km. These massive enhancements were accompanied by largely elevated NO and NO_y as well as CO₂ and could be attributed to the large fires in South America during this time. Observations of C₂H₂ and PAN from GLORIA show, that pollution covered a layer extending from 8-9 km to the flight level at 13 km.

Comparing the tracer observations to previous flights in exactly the same region three weeks earlier, we could estimate the ozone production due to the biomass burning. Based on first results we estimate ozone production in the polluted air masses up to 30-40 ppbv in the UT which is almost 40% of the observed ozone mixing ratio. Given the large extent of the polluted area over 15 degrees of latitude this may have an impact on the local energy budget of the tropopause region.