

BNL-63545

A CASE STUDY OF URBAN PLUME EVOLUTION NASHVILLE, TN, JULY 3, 1995

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American Geophysical Union 1996 Fall Meeting, San Francisco, CA, Dec. 15-19, 1996.

Formation and distribution of O₃ and related species in the Nashville urban plume were characterized by flights of the DOE G-1, and the NOAA Casa 212 on July 3, 1995. Flights were made during mid-day both up- and downwind of the city; winds were from the southwest transporting the urban plume to the northeast. The boundary layer was well-defined at ~1300 m (upwind) and 1700 m (downwind) as indicated by temperature, dewpoint and O₃ profiles. Background concentrations observed during the upwind transect were relatively uniform with [CO] ~280, [O₃] ~72, and [NO_y] ~5 ppbv; isoprene concentrations were high and variable in the boundary layer and very low aloft. On the downwind transects a well defined plume was sampled at approximately 40 and 75 km northeast of the urban center. The maximum observed O₃ concentration was ~120 ppbv, and was associated with maximum concentrations for CO of 490 ppb, and for NO_y of 15 ppbv. A high degree of correlation between CO and O₃ ($r^2 = 0.87$) and between NO_y and O₃ ($r^2 = 0.92$) was observed, consistent with an urban source for this plume. Boundary layer concentrations of isoprene were depleted to negligible values. Formation of O₃ in the urban plume will be examined in the context of NO_x and hydrocarbon concentrations, and the concentrations of photochemical product species such as peroxides and formaldehyde. Measurements of the horizontal and vertical distribution of O₃ concentrations in the Nashville region by the CASA 212 will be used to provide a context for interpretation of the in-situ measurements by the G-1.