

Ozone Evolution in the Mexico City Plumes during the MIRAGE-MEX Field Campaign

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The quantification of tropospheric ozone (O_3) production in the Mexico City outflow is a major objective of the MIRAGE-Mex field campaign. We used a regional chemistry-transport model (WRF-Chem) to predict the distribution of O_3 and its precursors in Mexico City and the surrounding region during March 2006, and compared with in-situ aircraft measurement of O_3 , CO, and NO_x concentrations. Both the model and the measurements indicate that O_3 production efficiency increases as the urban plume ages, and substantial O_3 production occurs downwind of the city, adding to the O_3 already produced in the city and exported with the plume. The model is also used to analyze the causes of the ozone production in the aged plume. This analysis suggests that reactive primary hydrocarbons (such as alkenes and aromatics) are the dominant contributors to O_3 production in the young plume (in and near Mexico City), but contribute less in the aged plume. In contrast, O_3 production in the aged plume is dominated by CO and oxygenated organics (including formaldehyde, ketones, glyoxal, methyl glyoxal, unsaturated dicarbonyls, peroxyacetyl nitrate, and organic nitrates). Alkanes contribute to O_3 production in both young and old plumes, but are usually not the dominant species in either.