OZONE PHOTOCHEMISTRY AND NOX OXIDATION IN TAMPA, FLORIDA: THE IMPORTANCE OF BIOGENIC HYDROCARBONS

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In May, 2002 scientists from NOAA's Air Resources Laboratory deployed the NOAA Twin Otter in the Bay Region Atmospheric Chemistry Experiment (BRACE) in Tampa. FL. The overall objective of BRACE was to provide enhanced estimates of direct and indirect N deposition to the receiving waters of Tampa Bay and the surrounding watershed. Aircraft measurements of ozone, reactive nitrogen and non-methane hydrocarbon precursors, formaldehyde, hydrogen peroxide, CO, SO2, and aerosol species were designed to elucidate the rates and efficiencies of chemical transformations producing ozone and depositable NOx oxidation products. Results of 20 aircraft flights indicate that the transport path of the advected urban plume exerts a major influence upon the photochemical oxidation processes occuring therein. Photochemial ozone yields and efficiencies, ozone generation rates, and NOx oxidation rates are all lower when the urban plume is transported over the Gulf of Mexico, rather than over the Florida peninsula. Biogenic hydrocarbons, particularly isoprene, tend to dominate the OH reactivity within the urban plume, and the lack of emission sources over the Gulf inhibits the photochemical production of ozone. Experimental results from illustrative flights will be presented, along with results of calculations by a constrained photochemical box model. A comparison of experimentally-derived NOx emission fluxes with current inventories will also be discussed, as will the relative roles of stationary and mobile NOx emission sources. Finally, evidence of enhanced HNO3 deposition by adsorption on sea-salt aerosols will be presented.