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Water Vapor Enhancements in an Athena II Rocket Plume

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One of the major goals of the Atmospheric Chemistry of Combustion Emissions Near the Tropopause (ACCENT) mission was to quantify rocket plume emissions and chemistry. On September 24, 1999, the NASA WB-57F aircraft intercepted an Athena II rocket plume multiple times in the lower stratosphere. Within the rocket plume, water vapor was enhanced two to four times above the background mixing ratio of 4.6 ppmv due to oxidation of the hydroxyl-terminated polybutadiene rocket propellant. Particle concentrations were also enhanced in the rocket plume. In this talk, we will address the following questions: What is the emission index (EI) of water from an Athena II rocket? Can plume dilution be estimated? Does a significant fraction of water condense onto particles in the rocket plume?

Reference: M. N. Ross, et al., "In situ measurement of the aerosol size distribution in stratospheric solid rocket motor exhaust plumes," *Geophys. Res. Lett.*, 26, 819-22, 1999.