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Oxidative Aging of Gas and Aerosol Products from the Ozonolysis of alpha-Pinene; Results from the MUCHACHAS-2 Campaign

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The MUltiple CHamber Aerosol CHemical Aging Study 2 (MUCHACHAS-2) took place at the Paul Scherrer Institute 27 meter cubed chamber in January-February 2009. The campaign was designed to study the oxidation of the volatile components from the ozonolysis of alpha-pinene (AP). Experiments began with the dark ozonolysis of AP at low and high AP concentrations (10 and 40 ppb, respectively) followed by OH exposure via several methods including HONO photolysis and dark OH generation from the ozonolysis of tetramethylethene (TME). OH generation via HONO experiments were conducted at both high and low NOx levels. Gas and aerosol phase evolution was monitored with Proton Transfer Reaction Mass Spectrometry (PTRMS), Ion Chromatography Mass Spectrometry (IC-MS), High Resolution Time-of-Flight Aerosol Mass Spectrometry (AMS), and a Volatility Hygroscopicity Tandem Differential Mobility Analyzer (VHTDMA). AMS results indicate continued chemical evolution of ozonolysis generated secondary organic aerosol (SOA) without additional OH exposure and after the precursor had been consumed, showing that the AP ozonolysis system does not reach a equilibrium but continues to react. A NOx dependence on specific m/z aerosol markers was also seen in both the high and low concentration AP experiments. The ratio of m/z 44 to total organics showed a strong correlation with integrated OH exposure. Increases in signal intensity with time were observed for several high molecular weight (150-250 amu) species with significant increases after OH exposure following ozonolysis. These and other results will be presented.