

New Insights into the Atmospheric Degradation of Isoprene and Some of its Oxidation Products

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Isoprene is an important atmospheric constituent that can impact air quality through the production of both ozone and secondary organic aerosol. Despite many years of study, the exact details of isoprene oxidation still are not fully elucidated, and evidence is emerging for the direct formation of a number of minor products. Furthermore, measurements of the concentrations of free radicals (OH and HO₂) in isoprene-rich areas suggest an incomplete understanding of the free radical reaction pathways. We report laboratory measurements on the oxidation of isoprene and some of its reaction products under conditions of both high and low NO_x, over a range of temperatures. Using a combination of techniques (IR spectroscopy, UV-vis Cavity Enhanced DOAS spectroscopy, and Proton Transfer Mass Spectrometry) we have measured a suite of oxygenated compounds including glyoxal, methylglyoxal, glycolaldehyde and hydroxyacetone produced from isoprene. Small but significant yields of both glyoxal and methylglyoxal were observed, in agreement with another recent study. We have also measured rate constants and product distributions of one of the hydroxy nitrates formed in isoprene oxidation. The results will be considered in terms of the overall isoprene oxidation mechanism and the potential to form SOA from isoprene.