Geophysical Research Abstracts
Vol. 17, EGU2015-9565, 2015
EGU General Assembly 2015

Measurements of Isoprene and its Oxidation Products during the CLOUD9 Experiment

Anne-Kathrin Bernhammer (1,2), Martin Breitenlechner (1), Sean Coburn (3), Rainer Volkamer (3), Armin Hansel (1,2)

(1) Institute for Ion Physics and Applied Physics, University of Innsbruck, 6020 Innsbruck, Austria, (2) IONICON Analytik Ges.m.b.H., 6020 Innsbruck, Austria, (3) Department of Chemistry and Biochemistry, University of Colorado, Boulder, CO, USA

Isoprene (C5H8), being produced and emitted by the biosphere, is by far the dominant biogenic volatile organic compound (BVOC) in the atmosphere. Its complex reaction pathways with OH radicals, O_3 and NO_3, lead to compounds with lower volatilities and increasing water solubility. The high hydrophilicity allows for easy partitioning between the gas and liquid phase making those compounds good candidates for aqueous phase droplet chemistry that may contribute to particle growth. (Ervens et al., 2008).
The CLOUD experiment (Cosmics Leaving Outdoor Droplets) at CERN allows the studying the evolution of particles originating from precursor gases in, in our case isoprene, in an ultraclean and very well controlled environmental chamber.
Gas phase concentrations of isoprene and its first reaction products were measured in real-time with a Proton-Transfer-Reaction Time-of-Flight Mass Spectrometer (PTR-ToF-MS, Graus et al., 2010) and Cavity Enhanced Differential Optical Absorption Spectroscopy (CE-DOAS, Thalman and Volkamer, 2010). PTR-ToF-MS was calibrated using gas standards with known VOC concentrations. The PTR-ToF-MS was operated with H3O+ and NO+ as primary ions, continuously switching between both operating modes throughout the experiments. The use of different primary ions allows the discrimination of isomeric compounds like the main high NO_x oxidation products methyl vinyl ketone (MVK) and methacroleine (MACR).
The experiment was conducted at high isoprene concentrations and a constant level of O_3. The highly water soluble gas phase oxidation products from the reaction of isoprene with O_3 and OH radicals (from isoprene ozonolysis) were investigated and compared for two temperatures (+10 °C and -10 °C) and different NO_x concentrations during cloud formation experiments. Here we will present first results of isoprene oxidation products observed with PTR-ToF-MS and CE-DOAS.

References

Ervens et al. (2008), Geophys. Res. Lett., 35, L02816
Graus et al. (2010), J. Am. Soc. Mass. Spectrom., 21, 1037–1044
Thalman and Volkamer (2010), Atmos. Meas. Tech., 3(6), 2681-2721.