Geophysical Research Abstracts, Vol. 7, 08936, 2005
SRef-ID: 1607-7962/gra/EGU05-A-08936

Oligomers in ambient organic aerosols and in SOA generated in a smog chamber

M. Kalberer (1), V. Samburova (1), C. Emmenegger (1), M. Sax (1), R. Zenobi (1), U. Baltensperger (2), J. Dommen (2)

(1) Department of Chemistry and Applied Biosciences, ETH Z¸rich, Z¸rich, Switzerland, (2) Laboratory of Atmospheric Chemistry, Paul Scherrer Institut, Villigen, Switzerland,

(kalberer@org.chem.ethz.ch, Fax: +41 1 632 12 92)

In recent years it has been recognized that high molecular weight compounds, or oligomers, are major constituents in organic aerosols. This class of compounds has been found in laboratory experiments as well as in field samples, however, the chemical nature and the quantity of these compounds is largely unknown.

We investigated the formation of oligomers in secondary organic aerosols generated from different gaseous precursors in smog chamber experiments. Laser desorption/ionization mass spectrometry was used to determine the mass distribution of these oligomers. Regular mass pattern with distinct differences of m/z14 or 16 are observed for all investigated types of secondary organic aerosols up to a mass of about 900Da. Similar regular mass patterns of high molecular weight compounds although in much more complex mass spectra were found in ambient urban samples and are compared with the smog chamber results. Although laser desorption/ionization mass spectrometry shows nicely the qualitative evolution of oligomers, a quantitative estimation is not possible with this method. UV absorption (using humic acid as quantification standard) and evaporative light scattering detection (ELSD) coupled with size exclusion chromatography is used to quantify the water-soluble oligomer fraction of the aerosol. ELSD, a novel detection method for atmospheric samples, is a quantification method, which is almost independent on the chemical properties of the analyzed compounds and thus ideally suited to quantify compounds with unknown chemical properties and structure. These measurements show that oligomers with a molecular weight larger 300Da comprise up to 50% of the organic aerosol mass in ambient urban samples.