Isotopes and novel tracers in atmospheric research

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Atmospheric aerosol particles play an important role in many environmental processes, influencing climate change processes and human health.

Detailed chemical composition of organic compounds was analysed by thermal desorption method.

The isotope composition of the aerosol was used to identify the two main sources of organic aerosol in winter, i. y. aerosol particles derived from biomass combustion and from fossil fuel combustion. Organic aerosol from biomass burning is enriched with ^{13}C compared to OA combustion of fossil fuels. The $\delta^{13}C_{OC}$ values of OA samples positively correlate with the mass fraction of several individual organic compounds. Most of these organic compounds contained nitrogen indicating that organic nitrogen compounds formed during the combustion of biomass burning (BB) materials and may be indicative of BB. Compounds showing a negative correlation with $\delta^{13}C_{OC}$ were possibly indicative of FF. These compounds included heavy hydrocarbons and were on the average less oxidized than the bulk organic carbon.

The correlation of $\delta^{13}C_{OC}$ and the O/C ratio was positive at low but negative at high desorption temperatures at the forest site. We propose that this might be due to photochemical processing of OA. This processing can lead to accumulation of carbon in the more refractory organic fraction that is depleted in ^{13}C compared with the less refractory organic fraction. Detailed laboratory experiments are necessary to further investigate the aging of aerosol particles before firm conclusions can be drawn.