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Compound specific bromine isotope analysis of methyl bromide: method development and initial applications toward plant emissions and the Arctic troposphere

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Methyl bromide is one of the most important ozone depleting compounds yet there are still large uncertainties regarding its sources and sinks. The stable bromine isotope composition is potentially a powerful tool for characterizing CH3Br emissions and the ambient fate of this trace gas. A novel compound specific method to measure Br-81/Br-79 isotope ratios in methyl bromide with gas chromatography coupled to an inductively coupled plasma multi collector mass spectrometer (GC-ICP-MC-MS) has been developed. Sample amounts of > 40ng could be measured with a precision of 0.1‰ (1s, n=3). The long-term reproducibility was shown with 36 analyses acquired within 3 months and giving a standard deviation (1s) < 0.4‰.
The method has been applied to investigate Br isotope ratios of abiotically produced methyl bromide from plants at different temperatures. First results show that methyl bromide emitted at high temperatures of > 200ºC is up to 3‰ depleted in Br-81 in comparison to low temperature emissions (30ºC). Relating the results to the official standard (Standard Mean Ocean Bromide, SMOB) will give insights into the Br isotope fingerprint of plant-emitted methyl bromide, e.g. from wildfires. First d81Br results will be presented for atmospheric methyl bromide samples taken in the high Arctic (Ny Ålesund, Svalbard), representing the lower tropospheric background regime.