Geophysical Research Abstracts
Vol. 18, EGU2016-4173, 2016
EGU General Assembly 2016

Emission of Trimethylamine from Chenopodium vulvaria - first results from quantifiying plant emissions of amines

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Amines comprise a wide range of nitrogenous organic compounds such as aliphatic methylamines MA. TMA is the most common amine species emitted by various sources and the most abundant amine in the atmosphere (Ge et al., 2011a). Additionally, TMA has been found to be the dominant amine species in the gas-phase compared to MMA and DMA at agriculture sites (Schade and Crutzen, 1995). On the global scale, the knowledge about the fluxes of most amines is limited (Ge et al., 2011a). Furthermore, terrestrial vegetation is also assumed to be a potential source for amines (Schade and Crutzen, 1995). There are a few studies from the end of the 19th century until 1975, which described high amount of MA-emission from certain plant species, which was associated with their plant tissues or with blossoms during flowering (Smith, 1971). Despite the low atmospheric concentration of amines (DMA = 0.5 ppb (Okita, 1970), TMA = 0.6 -1.6 ppb (Fujii and Kitai, 1987)), previous studies have already shown that amines play an important role in the New aerosol Particle Formation (NPF) (Almeida et al., 2013, and summarized in Sintermann and Neftel, 2015). In the atmosphere, NPF occurs frequently from gas-phase precursors. High uncertainty exists in the estimation of the global secondary aerosols budget, which was cause to the uncertain contribution of the gas-phase precursors to the NPF (Spracklen et al., 2011). It becomes more clearly that instead of binary systems of sulfuric acid and water, ternary system of sulfuric acid, water and a neutralizing compound as NH3 or amines is a key system in NPF (Almeida et al., 2013, Kurten et al., 2014). Despite their low atmospheric concentrations amines may play, at least locally, a crucial role in aerosol formation.
In this study, we focus on the plant species chenopodium vulvaria, which is well known as a strong TMA-emitter (Dessaignes, 1856). But TMA emission rates from that plant species was not determined systematically up to now. In this study, we investigate on the TMA emission from chenopodium vulvaria in our dynamic cuvette system described in Sun et al. (2015). As TMA plays a key role in the atmospheric NPF, the results should give a perception of the contribution of the TMA emission from the terrestrial vegetation to the global NPF.

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