Measurements of Oxidized Organic Compounds using Nitrate Chemical Ionization Time-of-Flight Mass Spectrometry coupled to an Atmospheric Pressure interface (NO_3-CI-APi-ToF)

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We present laboratory and ambient measurements of gaseous organic compounds by means of nitrate ion (NO_3^-) based chemical ionization (CI) coupled with a atmospheric pressure interface time-of-flight mass spectrometer, APi-ToF (Junninen *et al.*, 2010). This technique, namely NO_3-CI-APi-ToF allows to selectively detect gas-phase species with greater acidity than nitric acid (HNO_3), e.g., highly oxidized organic molecules and sulfuric acid (H_2SO_4), via clustering with the NO_3^- ion and its high order clusters ($NO_3^-(HNO_3)_n$) (Kurten *et al.*, 2011; Jokinen *et al.*, 2012).

The capability of making such highly selective measurements is important because both H_2SO_4 and organic vapors have a recognized key role in new particle formation (NPF) processes (Riipinen *et al.*, 2012), and likely have an important role in particulate phase chemistry and formation of secondary organic aerosols (SOA).

The NO_3-CI-API-ToF was deployed during the Southern Oxidant and Aerosol Study (SOAS) at the forest supersite in Centreville, AL. The main goal of the SOAS campaign is to investigate the composition, sources, and pollution dependence of SOA formation in the Southeast US. This site is affected both by substantial biogenic volatile organic compounds (BVOC) emissions (dominated by isoprene) and anthropogenic emissions. Isoprene and other BVOCs are known to contribute to the organic aerosol (OA) budget in this region (Goldstein and Galbally, 2007).

During SOAS, the NO_3-CI-API-ToF will be deployed along with many other state of the art instruments to address these scientific questions. The instrument will operate in dual mode, i.e., switching between the NO_3-CI-API-ToF configuration and a simple APi-ToF (without CI). The latter configuration provides additional information on the concentration and composition of negative and positive ambient ions (e.g. Ehn *et al.*, 2010, 2012).

We also compare ambient NO_3-CI-API-ToF results with laboratory measurements, where oxidized organic vapors are produced using a Potential Aerosol Mass flow reactor (Lambe *et al.*, 2011) by the OH oxidation of biogenic and anthropogenic gas-phase precursors over multiple days of equivalent atmospheric exposure. The effect of NO_x levels on the gaseous oxidation products is also investigated.

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