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Chemical composition of organic aerosol at polluted and remote sites

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Recently a high-mass-resolution thermal-desorption proton-transfer-reaction mass-spectrometer (hr-TD-PTR-MS) has been developed and successfully deployed in the field. With this instrument ion signals can be measured with an accuracy of $\sim$2 mDa which is sufficient to identify the mass peaks by their elemental composition in most cases. We report results from the rural CESAR site in the Netherlands (April 2009), the remote Mt Sonnblick observatory (July/August 2009), Austria, and from the urban CALNEX site in Pasadena, Ca, USA (June 2010). While at the Mt Sonnblick observatory about 10% of the detected organic mass was due to nitrogen containing compounds, this fraction increased significantly (>30%) at the rural CESAR site in the Netherlands. The fraction of nitrogen containing compounds in organic aerosol is expected to be higher than the measured values because during both, thermo-evaporation and protonation, nitrogen functional groups are preferentially lost. E.g. alkyl nitrates fragment upon protonation and typically produce an alkyl ion while the nitrogen group remains neutral and thus undetected. In line with findings from other studies, our results suggest that nitrogen chemistry plays a significant role in secondary aerosol formation. At the CESAR site we detected amine-ion species exhibiting a strong local source signature. Since amines are emitted from animal husbandry, the role of livestock on aerosol formation deserves some attention at least on regional scales.