

# Single particle speciation of alkylamines in ambient aerosol at five European sites

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## Abstract

Alkylamines are associated with both natural and anthropogenic sources and have been detected in ambient aerosol in a variety of environments. However, little is known about the ubiquity or relative abundance of these species in Europe. In this work, ambient single particle mass spectra collected at five sampling sites across Europe have been analysed for their alkylamine content. The Aerosol Time-of-Flight Mass Spectrometer (ATOFMS) data used were collected in Ireland (Cork), France (Paris, Dunkirk and Corsica) and Switzerland (Zurich) between 2008 and 2013. Each dataset was queried for mass spectral marker ions associated with the following ambient alkylamines: trimethylamine (TMA), diethylamine (DEA), triethylamine (TEA), dipropylamine (DPA) and tripropylamine (TPA). The fraction of ambient particles that contained detectable alkylamines ranged from 1-16% depending on location, with the highest fractions observed in Paris and Zurich in the winter months. The lowest fractions were observed at coastal sites, where the influence of animal husbandry-related alkylamine emissions is also expected to be lowest. TMA was the most ubiquitous particle phase alkylamine detected, and was observed at all locations. Alkylamines were found to be internally mixed with both sulphate and nitrate at all sites, supporting the importance of particle phase aminium salt formation. Interestingly, in Corsica, all alkylamine particles detected were also found to be internally mixed with methanesulphonic acid (MSA), indicating that aminium methanesulphonate salts may represent a component of marine ambient aerosol in the summer months. Internal mixing of alkylamines with sea salt was not observed, however. Alkylamine-containing particle composition was found to be highly homogeneous at each location, with the exception of the Dunkirk site, where proximity to local industrial emissions resulted in five distinct mixing states.

Analytical and Bioanalytical Chemistry

DOI: 10.1007/s00216-014-8092-1

<http://link.springer.com/article/10.1007/s00216-014-8092-1>