Geophysical Research Abstracts
Vol. 12, EGU2010-14330, 2010
EGU General Assembly 2010

Synchronised Aerosol Mass Spectrometer Measurements across Europe

Eiko Nemitz and the EUCAARI/EMEP AMS Team
Centre for Ecology and Hydrology (CEH), Penicuik, United Kingdom (en@ceh.ac.uk)

Up to twelve Aerodyne Aerosol Mass Spectrometers (AMSs) were operated simultaneously at rural and background stations (EMEP and EUSAAR sites) across Europe. Measurements took place during three intensive periods, in collaboration between the European EUCAARI IP and the EMEP monitoring activities under the UNECE Convention for Long-Range Transboundary Air Pollution (CLRTAP) during three contrasting months (May 2008, Sep/Oct 2008, Feb/Mar 2009). These measurements were conducted, analysed and quality controlled carefully using a unified protocol, providing the largest spatial database of aerosol chemical composition measured with a unified online technique to date, and a unique snapshots of the European non-refractory submicron aerosol climatology. As campaign averages over all active monitoring sites, organics represent 28 to 43%, sulphate 18 to 25%, ammonium 13 to 15% and nitrate 15 to 36% of the resolved aerosol mass, with the highest relative nitrate contribution during the Feb/Mar campaign.

The measurements demonstrate that in NW Europe (e.g. Ireland, UK, The Netherlands, Germany, Switzerland) the regional submicron aerosol tends to be neutralised and here nitrates make a major contribution to the aerosol mass. By contrast, periods with low nitrate and acidic aerosol were observed at sites in S and E Europe (e.g. Greece, Finland), presumably due to a combination of larger SO2 point sources in Easter Europe, smaller local NH3 sources and, in the case of Greece, higher temperatures.

While at the more marine and remote sites (Ireland, Scotland, Finland) nitrate concentrations were dominated by episodic transport phenomena, at continental sites (Switzerland, Germany, Hungary) nitrate followed a clear diurnal cycle, reflecting the thermodynamic behaviour of ammonium nitrate. The datasets clearly shows spatially co-ordinated, large-scale pollution episodes of organics, sulphate and nitrate, the latter being most pronounced during the Feb/Mar campaign. At selected sites concentrations of inorganic precursor gases (e.g. NH3, HNO3, SO2) were measured simultaneously, mainly with a denuder based wet chemistry technique.

The database provides a powerful dataset against which to compare the performance of European scale Chemistry and Transport Models (CTMs) in reproducing transport patterns, thermodynamics (e.g. daytime vs. night-time concentrations and gas/aerosol partitioning) and organic aerosol partitioning (e.g. primary versus oxidised aerosol).

Future analysis will include a detailed analysis of the organic aerosol composition, through statistical factor analysis and based on the high mass resolution data provided by a subset of the AMS instruments.