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A seasonal time history of the size resolved composition of fine aerosol in Manchester UK

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Numerous studies have been conducted in urban centres now using sophisticated instruments that measure aerosol properties needed to determine their effects on human health, air quality and climate change) showing that a significant fraction of urban aerosols (mainly from automotive sources) are composed of organic compounds with implications for human health.

In this project we have produced the first seasonal aerosol composition and emission database for the City of Manchester in the UK

Several recent projects have been conducted by SEAES looking at fundamental properties of urban atmospheric aerosol to understand their influence on climate. This work is now expanding through collaboration with the School of Geography & Centre for Occupational & Environmental Health to investigate urban aerosol emission impacts on human health

In this paper we present a compendium of data from field campaigns in Manchester city centre over the past decade. The data are from six different campaigns, between 2001 - 2007, each campaign was between 2 weeks and 2 months long predominantly from January and June periods .
The data analysis includes air parcel trajectory examination and comparisons with external data, including PM10, CO and NOx data from AURN fixed monitoring sites
Six Manchester fine aerosol datasets from the past decade have been quality controlled and analysed regarding averages of the size distributions of Organic, NO3, NH4 and SO4 mass loadings.

It was found that:

Organic material is the largest single component of the aerosol with primary aliphatic material dominating the smallest sizes, but with oxygenated secondary organic material being important in the accumulation mode. In the accumulation mode the organic material seems to be internally mixed with sulphate and nitrate.
The accumulation mode particles were effective as cloud condensation nuclei.
Seasonal effects surrounding atmospheric stability and photochemistry were found to play an important role in the size distribution and mass loading of organic nitates and sulphates in the secondary aerosol.
Analysis of the aerosol size distribution and composition showed that long range transport was important in determining the properties of the accumulation mode aerosol in the urban environment but not the fine aerosol

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