Chapter (non-refereed)

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Eddy Correlation Measurements of Urban Aerosol Fluxes

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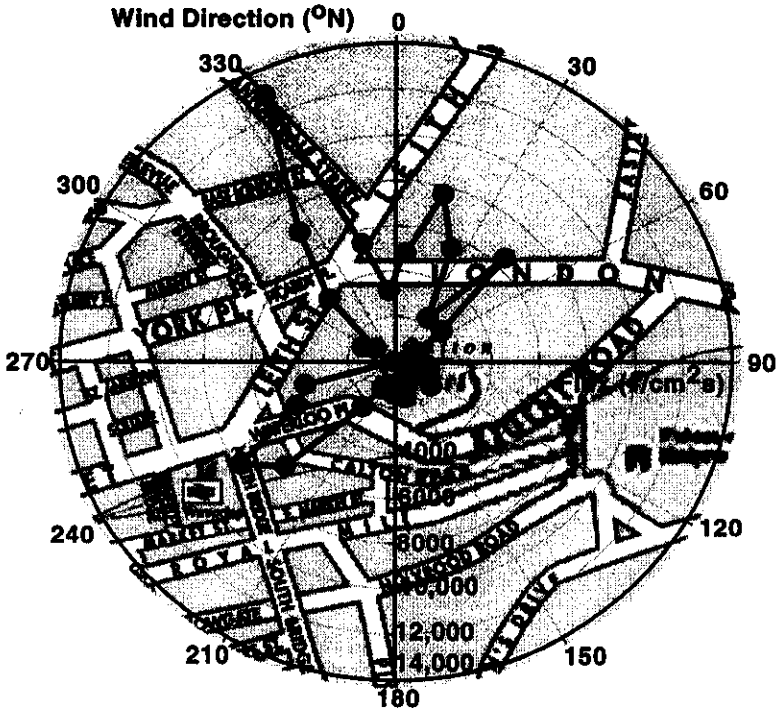
Introduction

Urban aerosols have a variety of effects, including direct impacts on human health. They can be transported large distances downwind of their city of origin, and deposited to potentially sensitive ecosystems. SASUA is an ongoing project aimed at quantifying the Sources and Sinks of Urban Aerosol.

Measurements

We have measured total and size segregated aerosol fluxes in the size range 11 nm < Dp < 25um within Edinburgh City centre, using the eddy correlation technique. The city was treated as a tall canopy, with measurements being made above it. The Nelson Monument(70 m above street level) was used to achieve the required height. Size segregated concentrations were also measured for Dp > 3 nm. Along with supporting trace gas and traffic activity measurements, this allows identification of the main pollution sources in the city.

Figure 1, (below) shows the particle flux distribution with wind direction.



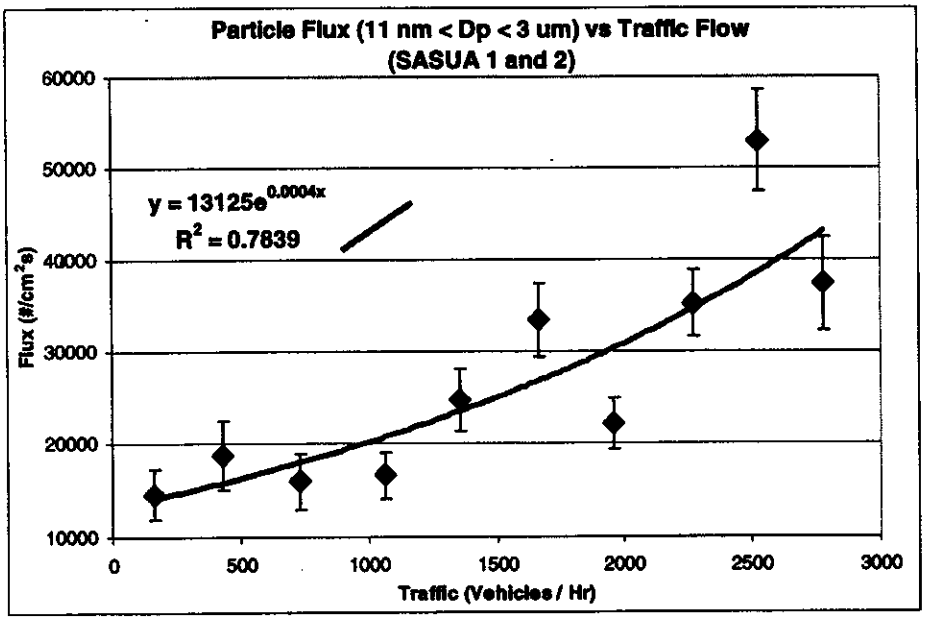


Figure 2, (above) shows the relationship between traffic activity and total particle flux

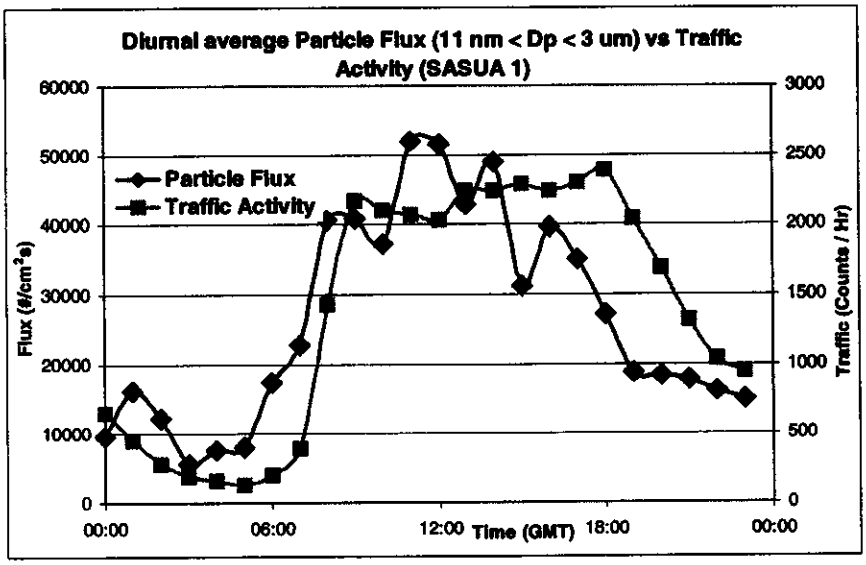


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Figure 3, (above) shows the relation between fine and accumulation mode aerosol fluxes measured in the city.

The particle flux distribution shown in Figure 1 has a number of interesting features. The large values to the NW and SW are caused by the busy northern one way system including Queen Street, and the main road through the city, Princes Street respectively.

The effect of traffic is shown in Figure 2, with a clear increase in particle flux with traffic activity in the city. Scatter is introduced by inclusion of data from different regimens and wind directions. Particulates produced by traffic are thought to peak at around 20 nm. This is borne out in Figure 3, a comparison of fine and accumulation mode fluxes.

Traffic activity appears to dominate the particle flux in the city, as shown in the preceding figures. However the imperfect correlation between traffic activity and total particle flux shown in Figure 4 may suggest there are also other mechanisms producing particles. These may include space heating, biogenic emissions and non-road transport sources, as well as unaccounted-for background.

These results will be used to develop and test parameterisations for urban aerosol concentrations and fluxes, in terms of anthropogenic activity and meteorological conditions.

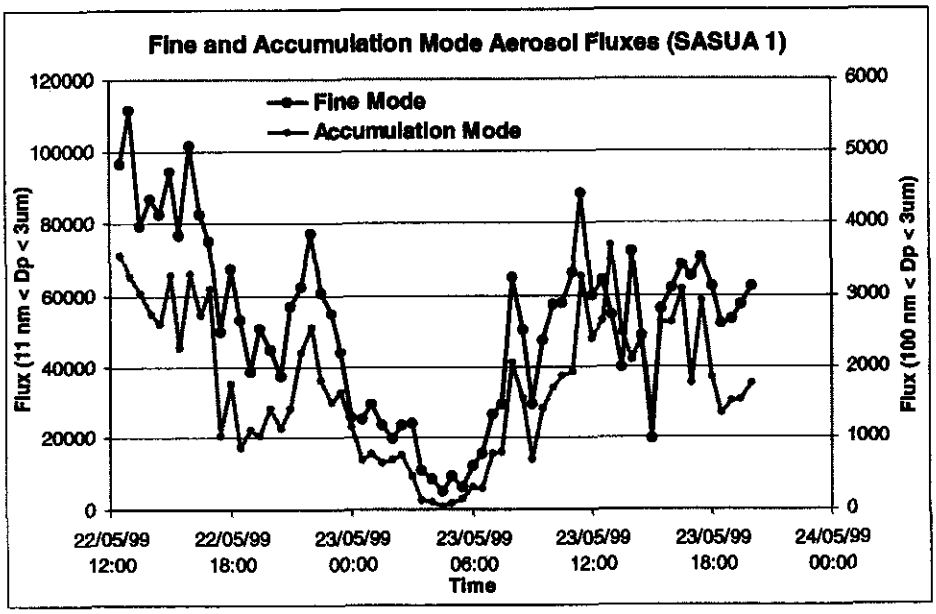

Figure 4, (above) shows the traffic activity and total particle flux, diurnally averaged over the first project (May 1999).

Acknowledgements

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