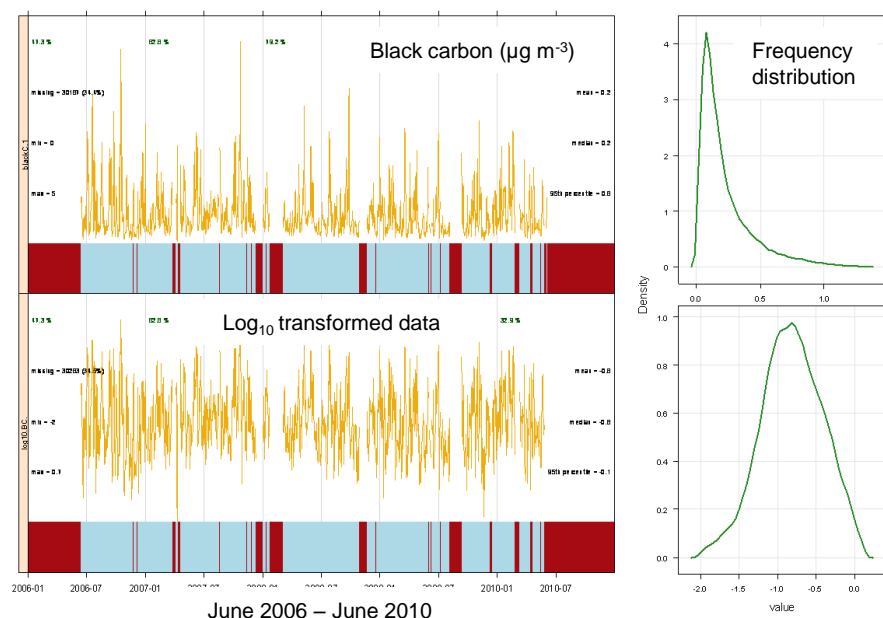


Neil Cape and Mhairi Coyle, Centre for Ecology & Hydrology, Edinburgh
contact: jnc@ceh.ac.uk

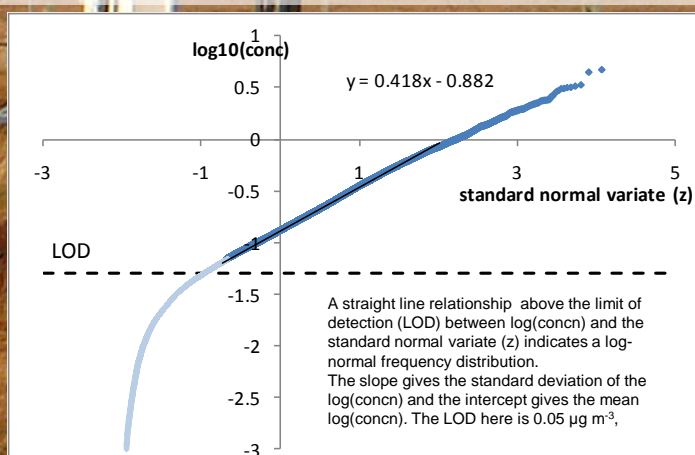
As part of its commitment to the European Monitoring and Evaluation Programme (EMEP) of the UNECE, Defra funds two 'supersites' in the UK for monitoring air composition.

The site at Auchencorth (central Scotland, 15 km south of Edinburgh and 25 km SW of Cockenzie power station) has been operating since 2006, measuring black carbon using a Magee Aethalometer with an inlet cutoff at $2.5 \mu\text{m}$ ($\text{PM}_{2.5}$). Five-minute data are aggregated to half-hour averages for reporting to EMEP.

June 2006 to May 2010 median concentrations were $0.15 \mu\text{g m}^{-3}$ with peaks up to $5 \mu\text{g m}^{-3}$ (upper figure).



Data are distributed log-normally (lower figure). Even in well-mixed conditions (wind speed $> 2 \text{ m.s}^{-1}$) concentrations are log-normal with geometric mean and standard deviation of $0.13 \mu\text{g m}^{-3}$ and 2.62, respectively (see below).



Acknowledgements

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References

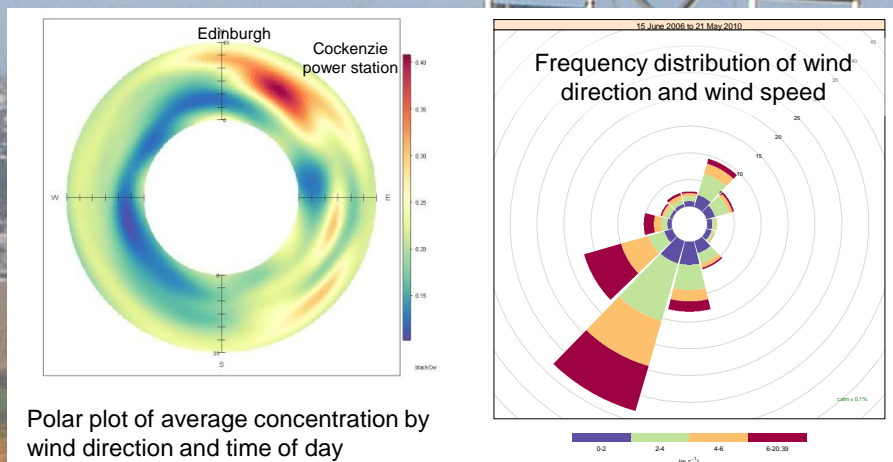
Jobson B.T., McKeen S.A., Parrish D.D., Fehsenfeld F.C., Blake D.R., Goldstein A.H., Schauffler S.M., Elkins J.C., 1999. Trace gas mixing ratio variability versus lifetime in the troposphere and stratosphere: Observations. *Journal of Geophysical Research-Atmospheres* 104, 16091-16113.
Carslaw, D., Ropkins, K. 2010. *Open-source tools for analysing air pollution data*. Environmental Research Group, King's College London, 3rd October 2010.

Atmospheric lifetime of black carbon

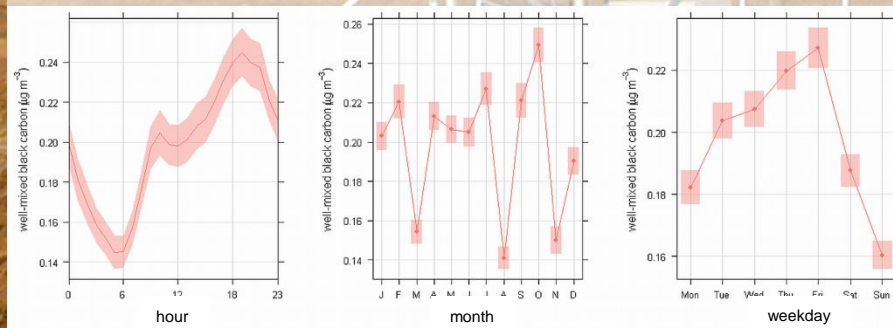
Based on analysis (Jobson et al., 1999) of the concentration distribution of volatile organic compounds measured at the site during well-mixed daytime conditions (data not shown), black carbon has a lifetime similar to that of butane, i.e. between 20 and 50 days, depending on the average OH concentration (2.5 to $1 \times 10^5 \text{ cm}^{-3}$).

Influence of local sources

Even in well-mixed conditions, the influence of the Edinburgh conurbation to the north-east can be seen in the directional dependence of the black carbon concentrations. In the figure, the inside of the annulus corresponds to midnight, and the mid-point to midday, averaged over the whole period. However, the wind usually comes from the south-west (below, right), bringing low concentrations.



On average, concentrations are highest in the evening (below, left), and lowest at weekends (below, right) with no obvious seasonal pattern (below, centre)



Peak episodes

There have been 12 periods of several hours with concentrations above $2 \mu\text{g m}^{-3}$ in the 4 years of operation. The example below on 25-26 September 2008 was in stable high-pressure weather conditions with generally low wind speeds. Local wind direction changed around 1800 GMT on 25 September, and the characteristics of the air mass also changed; before 1800, black carbon and NO_2 were not correlated, whereas they were strongly correlated afterwards.

