Dr Mathew Heal
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Research Interests: Field and laboratory measurements of atmospheric trace species concentrations and fluxes. Urban air quality and the impact on health.

Our research group uses a combination of field measurements, laboratory experiments and modelling to investigate some of the fluxes and chemical processes that occur within the lower atmosphere and the impacts of these on the terrestrial environment and on human health. Current areas of research, most in collaboration, include:

- Characterization of airborne particulate matter from different microenvironments of exposure to determine the sources and chemical evolution of atmospheric particles, and for application to epidemiological studies and biological toxicity assays
- Particulate matter and NO_2 measurement method validation and intercomparison, and the modelling of small-scale spatial and temporal variations in urban air pollution for estimating human exposure
- High resolution modelling of atmospheric chemistry, with particular focus on ozone and particulate matter
- Measurement of the magnitude and controlling factors on methyl bromide and methyl chloride emission fluxes from terrestrial systems such as salt marshes, woodland soils and decaying leaf and woody litter
- Measurement of the concentrations and emission fluxes of volatile organic compounds (natural and anthropogenic) using gas chromatography and proton transfer reaction-mass spectrometry combined with eddy covariance
- Speciation of organic nitrogen compounds in rainwater and in the gas-phase, and the relationship with dissolved and gaseous inorganic nitrogen
- Quantification of the kinetics of gas-to-liquid transfer of aromatic VOC into aqueous solution

SELECTED RECENT PUBLICATIONS

1. Gonzalez Benitez, J.M., Cape, J.N., Heal, M.R. et al. (2009) Atmospheric nitrogen deposition in south-east Scotland: quantification of the organic nitrogen fraction in wet, dry and bulk deposition, *Atmos. Environ.* **43**, 4087-4094.
2. Vieno, M., Dore, A.J., Stevenson, D.S., Doherty, R., Heal, M.R., et al. (2009) Modelling surface ozone during the 2003 heatwave in the UK, *Atmos. Chem. Phys. Discuss.* **9**, 19509-19544.
3. Heal, M.R., Elton, R.A., Hibbs, L.R., Agius, R.M. and Beverland, I.J. (2009) A time-series study of the health effects of water-soluble and total-extractable metal content of airborne particulate matter, *Occup. Environ. Med.* **66**, 636-638
4. Drewer, J., Heal, K.V., Smith, K. and Heal, M.R. (2008) Methyl bromide fluxes to the atmosphere from temperate woodland ecosystems. *Global Change Biology* **14**, 2539-2547, doi:10.1111/j.1365-2486.2008.01676.x
5. Heal, M.R. (2008) The effect of absorbent preparation method on precision and accuracy of ambient nitrogen dioxide measurement by Palmes passive diffusion tube. *J. Environ. Monitor*. **10**, , doi:10.1039/b811230d
6. Heal, M.R., Harrison, M.A.J. and Cape, J.N. (2007) Aqueous-phase nitration of phenol by N_2O_5 and $ClNO_2$. *Atmos. Environ*. **41**, 3515-3520.
7. Heal, M.R., Hibbs, L.R., Agius, R.M. and Beverland, I.J. (2005) Interpretation of variations in fine, coarse and black smoke particulate matter concentrations in a Northern European city. *Atmos. Environ*. **39**, 3711-3718.