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Flux measurements of formaldehyde and OH reactivity in the atmosphere

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The atmospheric concentration of OH largely determines the atmospheric oxidation and lifetime of volatile organic compounds (VOCs), an important group of compounds emitted from natural and manmade sources. Reaction of VOCs with OH leads to the formation of secondary pollutants such as ozone, oxygenated VOCs and secondary organic aerosols (SOA) which impact human and ecosystem health as well as the climate system. Total OH reactivity and formaldehyde (HCHO) (which forms during the oxidation of virtually every VOC) are useful target parameters against which to assess the completeness of photochemical oxidation schemes used in atmospheric models.

This studentship will develop the first system capable of measuring OH reactivity fluxes at the canopy-scale as well as a system to measure HCHO fluxes. Flux measurements provide valuable insights into production and loss mechanisms of species occurring in the atmosphere and comparison with emission inventories can reveal unidentified sources and sinks which can influence atmospheric composition.

The project will involve a three stage process of technological development, testing and validation, and field deployments and analysis:

The new flux instruments will initially be deployed at the Centre for Hydrology and Ecology Easter Bush field site in Edinburgh, for validation and to determine emissions of total VOCs and HCHO from this grassland site. Following this, the OH reactivity flux instrument will take place in an inter-comparison with a CRM OH reactivity disjunct eddy covariance flux system from Mainz, Germany to validate the reliability of this new technique further. Where opportunities arise, the instruments will be deployed at other ground sites. For example, VOC flux measurements have previously been measured at an Oak forest site in Southern England (Alice Holt, Forestry Commission) and so this site offers further opportunities to investigate missing VOC fluxes in a forest setting, an environment, where typically the largest missing OH reactivity is reported. The studentship will assess whether better closure can be achieved for the OH reactivity based on local fluxes rather than for the concentrations and look to gain unique insights into the nature of the missing reactivity fluxes based on its biophysical behaviour. Measurements from the BT tower in central London will be made allowing missing VOC fluxes to be identified and direct emissions of HCHO from various sources (e.g. traffic) to be quantified. Modelling studies will investigate the impact that these local emissions have on the formation of the secondary pollutant, ozone.

You will work in well equipped laboratories and be part of the active, thriving and well-funded *Atmospheric and Planetary Chemistry* group within the School of Chemistry that has close links with the UK and international atmospheric communities. You will receive a wide range of training, for example in communication skills, project management, and technology (lasers, vacuum systems, optics, computer controlled data acquisition) and numerical modelling. The project will involve collaboration with the Centre for Hydrology and Ecology (Edinburgh) and is available as a project in the NERC funded SPHERES Doctoral Training Partnership (DTP). A full description of the project, together with further details of the DTP and instructions for making an application, together with eligibility requirements, can be found at:

http://www.nercdtp.leeds.ac.uk/projects/index.php?id=525

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