Proposed Research Studentship

Fugitive Methane Emissions in the UK and their Impacts on the Urban Atmosphere

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Project Description:

Methane is the second most important greenhouse gas in terms of its global warming potential, but its sources offer far greater prospect for short-term reduction than those of CO_2. Sources in urban England are dominated by fugitive gas emissions and lesser amounts from vehicles, with emissions from landfills, ruminants and in some areas, coal mines, in peripheral areas.

Methane sources can be identified from their distinctive carbon isotopic ratios ($^{13}C/^{12}C$), which distinguish sources by temperature of production, from combustion at one end of the scale to cold biological processes at the other. This allows the main sources to be identified as contributions to total methane in air masses that have passed over sources forming downwind emission plumes. The Royal Holloway Greenhouse Gas Laboratory has a mobile, laser-based methane analyser that allows continuous measurement in a vehicle and continuous output to Google Earth from on-board GPS. This is used to sample within source plumes and characterise the isotopic signature of each source type.

Urban conurbations represent large areas of mostly small methane sources that contribute to a merged 'dome' of pollution that moves out from the urban centres depending on wind speed and direction. The aim is to characterise the methane source types within an urban region, then make continuous measurements and isotopic sampling upwind and downwind of the areas under suitable conditions for emission build-up. Inventories of UK sources will be used to identify regions with different source components to investigate variability in the mixed source isotopic signature and the results compared with isotopic inventories derived from information on source distribution. The student will be expected to work on development of a flux-measurement module for the mobile equipment and have responsibility for maintenance, testing and calibration of the mobile unit. The use of dispersion models will be explored to calculate fluxes from identified point sources.

The project fits well with the current NERC Greenhouse Gas Emissions and Feedbacks research theme that aims to "*To develop the capability to measure and predict sources and sinks of the major anthropogenic greenhouse gases.*"

Training

Training will be provided in field-based practical scientific research (site selection, sample collection and logistics), set-up and use of the mobile monitoring unit, laboratory analysis using cavity ring-down and mass spectrometers, and quantitative analysis and interpretation of the data generated. Results will be disseminated to national and international greenhouse gas communities, and to the general public. Communication, organisation and networking skills will be refined at symposia with

UK and EU colleagues. Additionally there will be the opportunity to contribute to ongoing research projects on greenhouse gases in the Arctic, Atlantic and tropics.

Individual research development programmes at RHUL offer a wide range of transferable skills to conduct and present research efficiently and effectively. They also provide broad knowledge of environmental geoscience, and help foster a multi-disciplinary approach to research that benefits career development.

References:

Dlugokencky E.J et al., 2011. Phil Trans Roy Soc A, 369, 1943, 2058-2072.
Fisher R.E. et al. 2011. Geophysical Research Letters, 38, L21803.
Nisbet E.G. & Weiss R. 2010 Science, 328, 1241.
Fisher R. et al. 2006. Rapid Communications in Mass Spectrometry, 20, 200-208.
Lowry D. et al. 2001. Journal of Geophysical Research, 106, 7427-7448.

*Details on how to apply can be found here **www.rhul.ac.uk/studyhere/postgraduate/applying***
*Please contact the Postgraduate Programmes Co-ordinator, if you have additional questions about the department or application procedures (email: **pgadmin@es.rhul.ac.uk** ; fax: 01784-471780; tel: 01784-443581).*
Applicants are requested to send an additional copy of their CV directly to the lead supervisor of the project in which they are interested. Please also contact the supervisor if you have any questions about the project itself