SPITFIRE

NERC SCIENCE OF THE ENVIRONMENT

SPITFIRE Doctoral Training Partnership (DTP)

Research Experience Placement 2017

Project Brief

Applications close at Noon, Friday, 2 June 2017

Lead Supervisor:	Dr Mhairi Coyle
Email:	mcoy@ceh.ac.uk
University/Research Organisation:	CEH
Department:	Edinburgh
Project Title:	A Fast Instrument for Ozone Eddy-Covariance Fluxes

Total Student Support Costs: £	£2500 (£200 for 10 weeks plus £500 research and training support grant)
Based on a minimum of £200/week full time for a minimum of 8 weeks and maximum of 10 weeks and a £500 Research and Training Support Grant.	

Proposed Start Date: **Monday, 26 June 2017**	Proposed End Date: **Friday, 1 September 2017**
Projects should run over the summer vacation and we recommend that projects will have terminated by 15 September 2017.	

Brief Summary – please provide a brief summary (maximum 300 words) of the project.

This should include:

- *Project outline;*
- *Links to staff/School/Centre activity as appropriate;*
- *Supervisory arrangement;*
- *How space/equipment/supporting resource demands will be met;*
- *Elements of the project that will incorporate elements other than computer/modelling e.g. fieldwork and data collection;*
- *How the project will enhance the skills of the appointed student;*
- *Any intellectual property rights concerns that may arise from the work.*

A Fast Instrument for Ozone Eddy-Covariance Fluxes

Ground-level ozone is a secondary air pollutant that has detrimental effects on human health and vegetation as well as being a climate forcing gas and a key oxidant in atmospheric chemistry. Quantifying ozone deposition to the surface is important for fully understanding the ozone budget and simulating its concentration in the atmosphere. Eddy-covariance is the preferred method for measuring the deposition flux as it is calculated directly from measurements of rapid fluctuations (> 10 Hz) in ozone concentration and turbulence without the need for semi-empirical corrections. However the application of eddy-covariance techniques for ozone research has so far been limited by the availability and quality of suitable instruments. This project would involve the setup and operation of a new instrument with the aim of providing a primary standard for ozone flux measurements, focussing on two aspects:

- Technical setup and operation of the analyser, including interfacing with electronics and programming logging software
- Analysis of the data to assess the analyser's performance in the laboratory

If time allows the instrument will also be setup in our nearby field site which is already instrumented for fluxes using an alternative method.

The work would take place at CEH-Edinburgh within the group focusing on Biosphere-Atmosphere Interactions of trace gases and aerosols. They have extensive experience with flux measurements and the operation of specialised instrumentation. The supervisor will work closely with the student, being available for the whole period, and specialises in ozone deposition measurement. This project would be a contribution to the development of a standard methodology for implementation at monitoring sites around the world.

The student would gain: an insight into the operation of a research organisation that utilises the skills of many people in a wide range of subjects from microbiology to global ecosystem modelling; practical experience of working with instrumentation inside and outside a laboratory; experience of integrating an instrument with a logging and data processing system.

Please give an indicative timescale for the student's work over the length of the project: (maximum 150 words).

This should include:

- *The broad tasks the student will undertake;*
- *An indicative timescale for these tasks.*

Weeks:

1 Familiarisation with the background to the methodologies being used and eddy-covariance theory; Training in safety procedures for working in the laboratory and field, including the safe handling of gases and electrical equipment; familiarisation with data acquisition and processing methods

2 – 5 Setup of the instrument in the laboratory; Testing data acquisition systems; Calibration and performance testing (stability, time response, interactions with humidity or temperature etc); running instrument alongside slow-response ozone analyser in laboratory

6 – 7 Setup at the field site or in the laboratory alongside another fast ozone sensor

Throughout weeks 2-7 the data and instrument performance would be assessed and adjustments made to the setup as needed. A decision on moving the instrument in the field would be made as soon as it appeared practical.

8 – 10 Detailed data analysis and write up of results

Proposed procedure for appointing students, including selection criteria:

Please identify specific criteria that should be considered for the selection of placement students e.g. specific quantitative skills that may be required, subject knowledge etc. If a student has been pre-selected, or the research area has been led by the student, please provide the student's contact details, and a summary of their suitability for the SPITFIRE DTP REP programme.

- Physics, engineering or other instrumentation related degree
- Programming experience, preferably in Labview, R or IGOR but guidance in the use of new software will be given