

## Methane source identification and characterisation of D/H isotopic ratios

Supervisor(s): Dr Rebecca Fisher

### Project Description:

Methane in the atmosphere is rising, and the reasons for year to year variations are not well understood. Reductions in methane are vital for the Paris Agreement to succeed. The isotopic composition of methane identifies sources emitting methane to the atmosphere because of characteristic source-specific isotopic signatures. The ability to isotopically fingerprint a methane source from samples taken at some distance from emission location is an important tool for many local and global environmental issues.

RHUL has focussed on measurement of methane  $\delta^{13}\text{C}$ , but is now developing measurement of D/H in methane for which far fewer measurements are made globally. The database of D/H signatures for methane sources has many gaps that need to be filled.

### Research Methodology

The PhD student will measure isotopic ratios of D/H in methane by isotope ratio mass spectrometry (IRMS) for improved source attribution. Mobile campaigns will be carried out to locate emissions and air samples collected for isotopic analysis from the major methane sources. Ambient air samples will be analysed to compare measured signatures with that expected from inventories.

Collaboration with the British Geological Survey will be on the use of IRMS to measure isotopic compositions of methane close to source. Collaboration with the National Physical Laboratory will be on ambient measurements of methane  $\delta^{13}\text{C}$  and  $\delta\text{D}$  using laser spectroscopy, as well as on the development of traceability and calibration of isotopic measurements.

### Training

Training in field sampling, greenhouse gas analysis, stable isotope analysis, GIS and data interpretation will be given at RHUL. The student will also gain experience in laboratories at NPL and the BGS. The student will be expected to participate in group meetings for ongoing synergistic projects of the GHG group and present findings at international conferences.

### Person specification

A good science or engineering degree, preferably with some knowledge of atmospheric science and laboratory experience.

### References:

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Warwick, NJ, Cain, ML, Fisher, R, France, JL, Lowry, D, Michel, SE, Nisbet, E, Vaughn, BH, White, JWC & Pyle, JA 2016, 'Using  $\delta^{13}\text{C}\text{-CH}_4$  and  $\delta\text{D}\text{-CH}_4$  to constrain Arctic methane emissions' Atmospheric Chemistry and Physics, vol 16, no. 23, pp. 14891-14908. DOI: 10.5194/acp-16-14891-2016

*This project has been shortlisted for funding by the ARIES NERC Doctoral Training Partnership. Undertaking a PhD with ARIES will involve attendance at training events.*

*ARIES is committed to equality & diversity, and inclusion of students of any and all backgrounds. All ARIES Universities have Athena Swan Bronze status as a minimum.*

*Applicants from quantitative disciplines who may have limited environmental science experience may be considered for an additional 3-month stipend to take appropriate advanced-level courses.*

*Usually only UK and EU nationals who have been resident in the UK for 3 years are eligible for a stipend. Shortlisted applicants will be interviewed on 26th/27th February 2019.*

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*Please contact the Postgraduate Programmes Co-ordinator, if you have additional questions about the department or application procedures (email: [pgadmin@es.rhul.ac.uk](mailto:pgadmin@es.rhul.ac.uk); 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*