

E5 NERC Summer Research Experience Placements (REPS) 2026

Please return to e5dtp.info@ed.ac.uk by 20th March 2026

A. Name, email and affiliation of supervisor(s)
<p>I. Pablo Espina Martin (pabesp@ceh.ac.uk) UKCEH Edinburgh</p> <p>II. Eric Mussell Webber (erimus@ceh.ac.uk) UKCEH Edinburgh</p> <p>III. Syd Colvin (sydcoll@ceh.ac.uk) UKCEH Edinburgh</p>
B. Name, email and affiliation of mentor (a current PhD student)
Damaris Tan (damtan@ceh.ac.uk) UKCEH Edinburgh
C. Department/School
UK Centre of Ecology and Hydrology Edinburgh – Air Impacts and Responses
D. Placement project title
Tracking Ammonia More Accurately: Improving sampling methods
E. Job purpose
The aim of this project is to conduct a methodological study with the UKCEH DELTA [®] sampler by testing different coating methods in the laboratory and testing paired samplers to assess the NH ₃ capture efficiency.
F. Host and project outline
<p>The UK Centre for Ecology & Hydrology (UKCEH) is a world-leading independent research institute that delivers high-quality environmental science with real-world impact.</p> <p>In recent years, there has been a particular focus on ammonia (NH₃), as it is a globally important atmospheric pollutant. It plays a key role in atmospheric processes, primarily by neutralising acidic gases to form secondary particulate matter such as ammonium nitrate (NH₄NO₃) and ammonium sulphate ((NH₄)₂SO₄). These compounds are largely found in the PM_{2.5} fraction, which is known to be harmful to human health, and they also contribute to the growth of existing particles (Sutton et al., 2020; Wang et al., 2020).</p> <p>The DELTA (DENuder for Long-Term Atmospheric) sampler is designed to measure inorganic reactive gases and aerosols. The system can be configured to target the NH₃/NH₄⁺ system, or extended to include additional acidic gases (HNO₃, SO₂) and aerosols (NO₃⁻, SO₄²⁻, Ca²⁺, Mg²⁺, Na⁺, Cl⁻) (Sutton et al., 2001). The effectiveness of this sampler relies on rigorous laboratory preparation, systematic procedures to minimise contamination during transport and exposure, and robust quality assurance and quality control (QA/QC) protocols to filter out invalid data (Tang et al., 2018).</p> <p>This study will research innovation in the NH₃/NH₄⁺ DELTA sampler configuration and assess the sampling efficiency of a single-denuder setup. It will address the following research questions:</p> <ul style="list-style-type: none"> • Are there any modifications to the coating process that could improve quality?

This will be investigated through laboratory trials in which key parameters are varied. The objective is to identify the main factors influencing coating quality and optimise performance. Results will be assessed primarily through qualitative analysis, and compared with theory.

• What affects performance at high concentration ranges?

This question will be addressed through field trials involving weekly side-by-side sampling of NH₃/NH₄⁺ using both the current single-denuder configuration and a multi-denuder setup (×3). The aim is to determine the saturation point and identify the NH₃ concentration levels at which additional denuders become necessary. These samples will require chemical analysis and quantitative assessment.

This project combines bibliographic research, laboratory experimentation, and field measurements. Its outcomes will improve understanding of the DELTA sampler.

References

- Sutton, M.A., Tang, Y.S., Miners, B., Fowler, D., 2001. A New Diffusion Denuder System for Long-Term, Regional Monitoring of Atmospheric Ammonia and Ammonium. *Water, Air, & Soil Pollution: Focus* 1, 145–156. <https://doi.org/10.1023/A:1013138601753>
- Sutton, M.A., van Dijk, N., Levy, P.E., Jones, M.R., Leith, I.D., Sheppard, L.J., Leeson, S., Sim Tang, Y., Stephens, A., Braban, C.F., Dragosits, U., Howard, C.M., Vieno, M., Fowler, D., Corbett, P., Naikoo, M.I., Munzi, S., Ellis, C.J., Chatterjee, S., Steadman, C.E., Möring, A., Wolseley, P.A., 2020. Alkaline air: changing perspectives on nitrogen and air pollution in an ammonia-rich world. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 378, 20190315. <https://doi.org/10.1098/rsta.2019.0315>
- Tang, Y.S., Braban, C.F., Dragosits, U., Dore, A.J., Simmons, I., van Dijk, N., Poskitt, J., Dos Santos Pereira, G., Keenan, P.O., Conolly, C., Vincent, K., Smith, R.I., Heal, M.R., Sutton, M.A., 2018. Drivers for spatial, temporal and long-term trends in atmospheric ammonia and ammonium in the UK. *Atmospheric Chemistry and Physics* 18, 705–733. <https://doi.org/10.5194/acp-18-705-2018>

G. Main responsibilities

- Conduct different tests in the laboratory to measure the impact of the methodology over the coating quality.
- Prepare, extract and analyse paired DELTA sampler parts to determine NH₃/NH₄⁺ levels.
- Do the QA/QC and analysis of the analysed data
- Prepare a synthetic report with the findings of the project

Key contacts and relationships can be included here:

- Pablo Espina Martin – Atmospheric Ammonia Measurement Scientist
- Eric Mussel Webber – Edinburgh laboratory manager
- Syd Colvin – DELTA product manager

H. Knowledge, skills and experience

Attribute	Essential	Desirable
Education, Qualifications & Training	<ul style="list-style-type: none"> • Chemistry Laboratory Experience 	
Knowledge & Experience	<ul style="list-style-type: none"> • Environmental Science background 	<ul style="list-style-type: none"> • Atmospheric pollution issues • Working outdoors

I. Planning and organising
The student must have a rigorous and methodical approach to conduct the sampling and recording tasks, as the nature of the project involves the repetition and quantification of several similar experiments so solid conclusions can be extracted.
J. Problem solving
The student will develop fine eye observation skills and establish high quality standards for their work, as the methodological nature of this project requires smart thinking and scientific problem solving. The project will give the opportunity to decide which type of analysis and model comparison may be appropriate with the dataset.
K. Decision making
The project will engage the student in decision making within a team to enable practical and scientific choices on laboratory preparation, data analysis and scientific reporting. Within the short –term project prioritisation of tasks will be a key decision-making skill which the project supervisors will help the student develop.
L. Length and timing
8 weeks. Start date to be agreed.
M. Budget
<ul style="list-style-type: none"> • 50 glass denuders 290£ • Analysis of DELTA samplers (210£)
N. Location
<p><u>Analysis and reporting – UK CEH Edinburgh</u></p> <p>-Laboratory access</p> <p>-Desk space</p>
O. Health & Safety requirements for the role
N/A

P. Key job hazard information specific to the role

The role will handle hazardous chemicals; however controls will be in place to minimise potential exposures to acceptable levels. All activities will be risk assessed to reduce the likelihood and severity of hazard occurrence These will be risk assessed by the school or department, which may require you to participate in, for example, health surveillance or follow other health and safety requirements.

Other - The student will be required to undertake UKCEH H&S inductions and on-line trainings and review all safe systems of work and risk assessments associated with the planned activities. induction process and work under the supervision of one of the laboratory technicians when analysing the samples.

Q. Alternative/adjusted placement if remote.

If the applicant was not able to do field work or be present in the laboratory, a data modelling project based on the blanks of the last years of the National Ammonia Monitoring Network could be considered instead.