**Research Experience Placement (REP) Scheme 2023**

**Supervisor Project Proforma**

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| **Project title:** | Birmingham summer ammonia pollution monitoring in urban environments |
| **Host Institution:** | University of Birmingham / UK CEH Edinburgh |
| **Project supervisor (name, department):** | Pablo Espina Martin |
| **Project enquiries (supervisor email):** | pabesp@ceh.ac.uk |
| **Co-Supervisor, if any (name, department):** | Siqi Hou (UoB, s.hou.1@bham.ac.uk) |
| **Proposed start date:** | 26/06/2023 |
| **Project description (max 700 words, 1-2 figures may be included):**Ammonia is a very important atmospheric pollutant globally due to its involvement in many atmospheric processes, mainly neutralizing acidic gas species to form secondary particles such as ammonium nitrate (NH4NO3) and ammonium sulfate ((NH4)2SO4), most of them in the PM2.5 fraction, known to be harmful for human health and enhances the growth of existing particles (Perrino et al. 2002, Wang et al. 2020). Currently there are several knowledge gaps regarding urban ammonia sources such as traffic, human agglomerations, waste, and garbage accumulation (Sutton et al. 2000), as they were considered negligible until the late 90s, when the bloom of diesel engine cars was linked to an increase in the contribution of traffic sources towards urban ammonia emissions. In recent years changes in the catalysers used to decrease NOx emissions in diesel engines are known to emit ammonia as a by-product (Ehrnspenger & Klemm, 2021). The lack of local measurements of ammonia in urban environments prevent the quantification and the apportionment contribution of ammonia urban sources towards AQ issues and ammonia total emissions. Within this framework, this project aims to map the NH3 sources at the surroundings of the Birmingham Air Quality Supersite (BAQS) for 6 weeks using passive samplers at weekly basis during the summer months of 2023. This sampling campaign will allow to understand where the hotspots and main sources of ammonia in the area are and better understand the drivers of the concentrations measured by the on-line high time resolution NH3 analyzer located at the BAQS. The summer NH3  campaign would be conducted in parallel with similar campaigns conducted in Edinburgh, Manchester and London monitoring super sites under the Integrated Research Observation System for Clean Air (OSCA) project, aiming to understand the main local sources of ammonia and their contribution to long term concentrations as monitored with high-time resolution monitors (<https://www.imperial.ac.uk/school-public-health/environmental-research-group/research/aerosol-science/osca/>). These campaigns will use the same methodology as the Edinburgh one and the results will be used to improve knowledge gaps on urban ammonia sources, improve the emission and dispersion modelling of ammonia in urban areas and the planification on mitigation policies to decrease AQ issues in the UK. |
| **Project timeline:** |
| * Review the emission sources of ammonia across the surroundings of the BAQS and do the ALPHA sampling training in Edinburgh. (Week 1)
* Deploy weekly ALPHA samplers at 10 sites located around the BAQS, collect, and store the previous week ones, and record any events or conditions in the sites that may impact NH3 concentrations (Weeks 2-7)
* Analyse the ALPHA samplers in the Edinburgh site and exploit the resulting dataset, comparing the passive samplers’ concentrations with the concentrations measured with of the on-line high time resolution LGR monitor located at the BAQS. (Week 8-9)
* Report the obtained results in a synthetic scientific report (Week 10).
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| **Candidate requirements:** |
| * The applicants must have a rigorous and methodical approach to conduct the sampling and recording tasks.
* Basic environmental science background is required; specific knowledge on atmospheric pollution issues and prior outdoor work experience will be highly valued.
* Previous experience in Chemistry laboratory
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| Background reading and references: |
| * Perrino, C., Catrambone, M., Di Menno Di Bucchianico, A., and Allegrini, I.: Gaseous ammonia in the urban area of Rome, Italy and its relationship with traffic emissions, Atmospheric Environment, 36, 5385–5394, [https://doi.org/10.1016/S1352-2310(02)00469-7](https://doi.org/10.1016/S1352-2310%2802%2900469-7), 2002.
* Wang, M., Kong, W., Marten, R., He, X.-C., Chen, D., et al. Rapid growth of new atmospheric particles by nitric acid and ammonia condensation, Nature, 581, 184–189, <https://doi.org/10.1038/s41586-020-2270-4>, 2020.
* Sutton, M. A., Dragosits, U., Tang, Y. S., and Fowler, D.: Ammonia emissions from non-agricultural sources in the UK, Atmospheric Environment, 34, 855–869, [https://doi.org/10.1016/S1352-2310(99)00362-3](https://doi.org/10.1016/S1352-2310%2899%2900362-3), 2000.
* Ehrnsperger, L. and Klemm, O.: Source Apportionment of Urban Ammonia and its Contribution to Secondary Particle Formation in a Mid-size European City, Aerosol Air Qual. Res., 21, 200404, <https://doi.org/10.4209/aaqr.2020.07.0404>, 2021.
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**To be completed by institutional CENTA PoC**

I confirm that:

* Appropriate supervisory arrangements are in place
* Any necessary ethical committee approvals, animals’ licenses & requirements of regulatory authorities will be in place before the work begins and will be maintained for the duration of the project
* We will take responsibility for identification, protection & exploitation of any intellectual property rights arising from the project
* All facilities, agreements regarding access and collaborations necessary for the work will be obtained before the work commences and can be ensured for the duration of the project
* All costs awarded by NERC for the REP will be used and accounted for appropriately
* A report of the project by the student will be submitted no later than one week after the end date of the placement or 15th September 2023, whichever falls first.

Signed:

Date:

Position: