University of Birmingham

Dr Salim Alam PhD

Research Fellow

School of Geography, Earth and Environmental Sciences (/schools/gees/index.aspx)

Contact details

Telephone +44 (0) 121 414 7297 (tel:+44 121 414 7297)

Email m.s.alam@bham.ac.uk (mailto:m.s.alam@bham.ac.uk)

School of Geography, Earth and Environmental Sciences
University of Birmingham
Edgbaston
Birmingham
B15 2TT
UK

About

Dr Alam's research focuses on understanding the chemistry of key atmospheric pollutants. His research involves interpreting laboratory and field measurements using numerical modelling, and improving the accuracy of chemistry within atmospheric models.

Qualifications

2007-2011 Ph.D Atmospheric Science. University of Birmingham

2003-2006 BSc (Hons) Chemistry with Pharmacology (Class I). University of Birmingham

Biography

Dr Alam obtained his BSc in Chemistry with Pharmacology (2006) and PhD in Atmospheric Science (2011) from the University of Birmingham. His PhD research included the study of gas phase reactions of alkenes and ozone and their implications in the Earth's atmosphere; where he completed his laboratory studies at the European Photoreactor (EUPHORE) smog simulation chamber, Valencia, Spain. He is currently working as a Research Fellow continuing his interest in the measurement of key atmospheric pollutants and their interactions in the troposphere.

Postgraduate supervision

Anna (Eun-Hwa) Jang

Research

- Atmospheric chemistry and composition
- Tropospheric oxidation reactions
- Alkene ozonolysis
- Air Pollution and Meteorology
- Numerical modeling
- Particulate Matter and Human Exposure
- GCxGC-ToF-MS Analysis

Current and Recent Research

Fundamental studies of the sources, properties and environmental behavious of exhaust nanoparticles from road vehicles (FASTER)

The aim of this project is to study, at a fundamental level, the composition and properties of semi-volatile constituents of vehicle exhaust particles, and to measure and model their behaviour in the atmosphere. This will be completed by elucidating the composition of the exhaust particles utilising GCxGC-ToF-MS and studying thier conversion to vapour. This information will then be exploited to develop models of traffic particle behavious in street canyons and the urban atmosphere.

Collaborators: Prof Roy Harrison, Prof Rob MacKenzie, Dr Xiaoming Cai, Prof Hongming Xu, Dr Irina Nikolova and Mr Christopher Stark

Sources and atmospheric processes determining airborne concentrations of polycyclic aromatic hydrocarbons (PAH) and their degradation products

Polycyclic Aromatic Hydrocarbons (PAH) are ubiquitous organic pollutants, emitted into the atmosphere through incomplete combustion of organic materials. They are present in both gaseous and associated with particulate matter and are harmful to human health. PAHs can react with other constituents in the atmosphere which can lead to the formation of products such as quinones, which may be more toxic than their parent PAH.

The aim of this project was to determine the sources and atmospheric processes of airborne concentrations of PAH and their degradation products. This was completed by sampling from various monitoring stations throughout the UK using meteorological and air pollution instrumentation collecting environmental data and PAHs / quinones, respectively. The data collected was then subjected to GC-MS analysis followed by interpretation using positive matrix factorisation.

Collaborators: Prof Roy Harrison, Dr Juana Maria Delgado-Saborit and Mr Christopher Stark

Total Radical Production and Degradation Products from Alkene Ozonolysis

Unsaturated VOCs (alkenes) are emitted to the atmosphere both anthropogenically and biogenically from natural sources. Alkenes react with ozone leading to the production of organic species such as HCHO, acetone and acetaldehyde, as well as radical species HO_2, RO_2 and OH. The formation of these radicals (HO_2, RO_2 and OH) is of significant interest, as it may influence the radical budget in the urban and rural environments; ultimately affecting the removal of pollutants and greenhouse

gases, otherwise known as the oxidative capacity of the atmosphere.

The aim of this project was to directly observe the degradation products from selected alkene ozone reactions. The experiments were performed in an outdoor smog simulation chamber (EUPHORE) equipped with a range of instrumentation, including Laser Induced Fluorescence (LIF) and Chemical-Ionisation Time-Of-Flight Mass-Spectrometry (CIR-TOF-MS) to measure OH/HO_2 and VOCs/OVOCs, respectively. The results were interpreted through detailed numerical modelling, drawing upon atmospheric models, namely the Master Chemical Mechanism. Reaction rate coefficients, humidity dependent radical yields and stable product yields were compared with those simulated, and implications for atmospheric oxidant levels were explored.

Collaborators: Dr William Bloss (PhD, Supervisor), Dr Andrew Rickard (Leeds), Dr Marie Camredon (Paris) and Prof Paul Monks (Leicester)

Interferences in commercial nitric oxide(s) analysers

Nitric oxide(s) (NO and NO_2) are important air pollutants which drive hydrocarbon oxidation in the atmosphere. NO_x abundance controls the levels of the atmospheric oxidants OH, NO_3 and ozone, and also regulates the production of ozone resulting from the degradation of VOCs. Accurate measurement of nitrogen oxides in the atmosphere is therefore of major importance in understanding the atmosphere. This project was designed to quantify the interference posed by alkenes, monoterpenes and sesquiterpenes in the nitric oxide mode of detection in commercial nitric oxide(s) analysers; and was achieved by testing a range of commercially available analysers at the EUPHORE smog simulation chamber.

Collaborators: Dr William Bloss, Dr James Lee (York), Dr Monica Varquez (Valencia)

Other activities

Royal Society of Chemistry: MRSC

Publications

2013

E. Jang, **M. S. Alam** and R. M. Harrison. *Source apportionment of polycyclic aromatic hydrocarbons in urban air using positive matrix factorization and spatial distribution analysis.* Atmospheric Environment. 79, 271-285, 2013

J.M. Delgado-Saborit, **M.S. Alam**, K.J. Godri Pollitt, C. Stark and R.M. Harrison. *Analysis of atmospheric concentrations of quinones and polycyclic aromatic hydrocarbons in vapour and particulate phases.* Atmospheric Environment. 77, 974-982, 2013

M.S. Alam, J.M. Delgado-Saborit, C. Stark and R.M. Harrison. *Using atmospheric measurements of PAH and quinone compounds at roadside and urban background sites to assess sources and reactivity.* Atmospheric Environment. 77, 24-35, 2013

M. S. Alam, A. G. Scarlett, C. E. West, S. J. Rowland and R. M. Harrison. *Application of 2D-GCMS reveals many industrial chemicals in airborne particulate matter*, Atmospheric Environment. 65, 101–111, 2013

M.S. Alam, J.M. Delgado-Saborit, C. Stark and R.M. Harrison. *Investigating PAH Relative Reactivity using congener profiles, quinone measurements and back trajectories.* Atmospheric Chemistry & Physics Discussion. 2013 (submitted)

M.S. Alam, A. R. Rickard, M. Camredon, T. Carr, K. P. Wyche, K. Hornsby, P. S. Monks and W. J. Bloss. *Radical product yields from the ozonolysis of short chain alkenes under atmospheric boundary layer conditions.* Journal of Physical Chemistry A. 2013 (submitted)

M.S. Alam, A. R. Rickard, M. Camredon, T. Carr, K. P. Wyche, K. Hornsby, P. S. Monks and W. J. Bloss. *Stable product yields from the ozonolysis of short chain alkenes under atmospheric boundary layer conditions.* Journal of Physical Chemistry A. 2013 (In preparation)

W.J. Bloss, **M.S. Alam,** J.D. Lee, M. Martinez. *Alkene interference in chemiluminscent NO_x measurements.* Atmospheric Measurements Techniques Discussion. 2013 (In preparation)

2011

M. S. Alam, M. Camredon, A. R. Rickard, T. Carr, K. Hornsby, K. P. Wyche, P. S. Monks and W. J. Bloss. *Total radical yields from tropospheric ethene ozonolysis.* Physical Chemistry Chemical Physics. 13, 11002–11015, 2011

2010

M. Camredon, J. F. Hamilton, **M. S. Alam**, K. P. Wyche, T. Carr, I. R. White, P. S. Monks, A. R. Rickard, and W. J. Bloss. *Distribution of gaseous and particulate organic composition during dark α-pinene ozonolysis.* Atmospheric Chemistry & Physics. 10, 2893–2917, 2010