Atmospheric Chemistry and Air Pollution

Our research focuses upon understanding natural and anthropogenic emissions to the atmosphere, the transport, chemical and physical transformations of atmospheric constituents, and the effects of air pollution and atmospheric chemistry upon the environment, and particularly upon human health.

Much of the research in this area is carried out in collaboration with external partners, particularly with the UK National Centre for Atmospheric Science (NCAS), other UK universities, government departments and agencies, private sector organisations and overseas collaborators.

Research areas include :

- Airborne Particulate Matter (PM), including analysis of emissions, particle transport and transformations, and PM source apportionment and mass closure. Approaches to these topics include on- and off-line field measurements of particle mass, size distribution and composition, and laboratory analyses of inorganic, organic, radiocarbon and biological components. (**Harrison (/staff/profiles/gees/harrison-roy.aspx)** , **Delgado Saborit (/staff/profiles/gees/delgado-saborit-juana-maria.aspx)** , **Pope (/staff/profiles/gees/pope-francis.aspx)** , **Shi (/staff/profiles/gees/shi-zongbo.aspx)**)
- Atmospheric oxidation processes, including the degradation of volatile organic compounds, and associated production of ozone and secondary organic aerosol, studied through laboratory and simulation chamber experiments, and field observations. (**Bloss (/staff/profiles/gees/bloss-william.aspx)** , **MacKenzie (/staff/profiles/gees/mackenzie-rob.aspx)** , **Harrison (/staff/profiles/gees/harrison-roy.aspx)**)
- The role of plants in atmospheric chemistry, ranging from the atmospheric impacts of oil palm plantations, to the contribution of trees to improving urban air quality – linking to related research in urban resilience and city planning (**MacKenzie (/staff/profiles/gees/mackenzie-rob.aspx)** , **Cai (/staff/profiles/gees/cai-xiaoming.aspx)** , **Bloss (/staff/profiles/gees/bloss-william.aspx)**)
- Atmospheric Chemistry and Climate, including the chemistry of greenhouse gases such as ozone and methane, aerosol processes, and future climate impacts upon emissions, atmospheric chemistry and air pollution (**MacKenzie (/staff/profiles/gees/mackenzie-rob.aspx)** , **Pope (/staff/profiles/gees/pope-francis.aspx)** , **Bloss (/staff/profiles/gees/bloss-william.aspx)** , **Cai (/staff/profiles/gees/cai-xiaoming.aspx)**)
- Geoengineering, focussing upon stratospheric particle injection for solar radiation management (**Pope (/staff/profiles/gees/pope-francis.aspx)**)
- Personal exposure measurement and assessment of the health impacts of airborne pollutants in indoor and outdoor environments (**Delgado Saborit (/staff/profiles/gees/delgado-saborit-juana-maria.aspx)** , **Harrison (/staff/profiles/gees/harrison-roy.aspx)** , **Harrad (/staff/profiles/gees/harrad-stuart.aspx)**)
- Numerical modelling of atmospheric composition, ranging from application of near-explicit chemical mechanisms such as the MCM in box models, through lagrangian (trajectory) models such as CittyCAT, to the coupling of chemical and dynamic processes in street canyons (**Cai (/staff/profiles/gees/cai-xiaoming.aspx)** , **Bloss (/staff/profiles/gees/bloss-william.aspx)** , **MacKenzie (/staff/profiles/gees/mackenzie-rob.aspx)** , **Harrison (/staff/profiles/gees/harrison-roy.aspx)**)
- Atmospheric halogen chemistry, ranging from laboratory studies of stratospheric ClOx chemistry to field observations of iodine species in the marine boundary layer (**Bloss (/staff/profiles/gees/bloss-william.aspx)** , **Pope (/staff/profiles/gees/pope-francis.aspx)**)
- Natural and anthropogenic emission and deposition of biogeochemically important trace elements such as iron and phosphorus and their impact on the marine ecosystems and the climate (**Shi (/staff/profiles/gees/shi-zongbo.aspx)** , **Harrison (/staff/profiles/gees/harrison-roy.aspx)**)

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