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National
Oceanography Centre

NATURAL ENVIRONMENT RESEARCH COUNCIL

Aircraft Observations of Atmospheric Aerosols

Supervisors: Hugh Coe, James Allan, Paul Williams, Martin Gallagher (UOM SEAES)

External supervisors and institution:

Contact: Hugh Coe (hugh.coe@manchester.ac.uk)



Introduction:

The Centre for Atmospheric Sciences at the University of Manchester is one of only a few groups globally that has developed a substantial capability for airborne measurement of aerosol particles in the atmosphere. It has developed and installed several instruments on the NERC large research aircraft, a BAe-146 (www.faam.ac.uk) and uses these instruments to characterize the chemical and physical properties. The suite of instruments continues to be developed and utilised in a wide range of projects around the world. Recent additions to our instrument suite include a counter flow virtual impactor, which samples cloud droplets and ice crystals, dries them and then samples the residual particles onto which the cloud formed. Our current instruments for measuring aerosol composition can be coupled to the CVI to examine the residual material in cloud droplets. We are currently installing a chemical ionization time of flight mass spectrometer (ToF-CIMS) that can be configured with an atmospheric pressure interface to enable it to measure precursors to new particle formation or an iodide ion interface to measure a wide range of halogenated, nitrated and functionalized organic molecules which will provide valuable information. The influence of pollution on clouds and their subsequent effect on the Earth's radiation budget and precipitation formation remains a very important research area and one where large uncertainties remain. The CVI inlet and the new ToF-CIMS instrument provide very useful additions to the suite of aerosol and cloud measurements on the aircraft and there will be several opportunities for using these to investigate aerosol-cloud interactions in the coming years including experiments in warm clouds above the mid-latitude Atlantic Ocean, investigating mixed phase and ice clouds in the Arctic and other studies focussed on polluted regions.

Project Summary:

You will make a substantial contribution to at least one of the major aircraft studies taking place in the period 2018-2020. Initially you will be trained in the operation of a number of instruments on the aircraft and learn how to analyse and interpret data from them. The focus of this PhD can be either to develop and characterize new and existing instrumentation such as the counterflow virtual impactor and other instruments that will be coupled to it, and the ToF-CIMS, or to lead the data analysis from one of the forthcoming studies, or a combination of the two depending on your interests. This work is highly collaborative and it is expected that you will be working with a large number of UK and international research groups during this work.

References

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