PROJECT TITLE: **Dynamics of the Antarctic Stratosphere & Mesosphere**

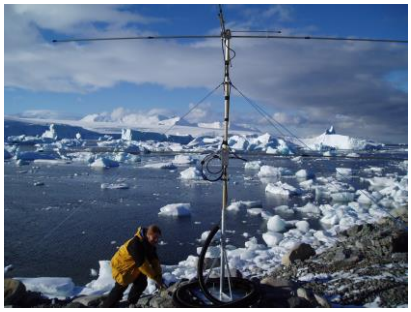
DTP Research Theme(s): **Changing Planet**

Lead Institution: **University of Bath**

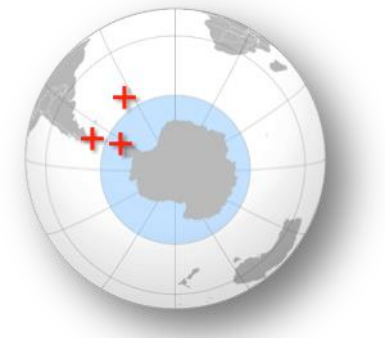
Lead Supervisor: **Professor Nick Mitchell, University of Bath, Centre for Space, Atmospheric & Oceanic Science, Department of Electronic & Electrical Engineering**

Co-Supervisor: **Dr Tracy Moffat-Griffin, Deputy Science Leader, Ice & Climate, British Antarctic Survey**

Project Enquiries: Nick Mitchell, email: N.J.Mitchell@bath.ac.uk



An antenna of the meteor radar at the British Antarctic Survey's Rothera base.



The locations of the three radars to be used in this project.

Project Background

The mesosphere/lower-thermosphere (MLT) region of the atmosphere at heights of about 80 – 100 km is critical in the coupling of the atmosphere and space environment. MLT dynamics are dominated by planetary waves, tides and gravity waves of large amplitude. Physical processes shape the ascending field of MLT waves and tides, thus controlling the coupling of the atmosphere to near-Earth space. Conversely, the MLT responds to solar variability and may mediate this signal into lower-atmosphere climate. These processes are particularly important in the Antarctic regions, where strong vertical connections take place. However, the physical mechanisms involved remain poorly understood.

Here, we will use sophisticated radars, imagers and NASA satellites to answer fundamental questions about Antarctic MLT dynamics. We will investigate whether atmospheric tides raised by the Moon act to transmit the influence of dramatic sudden stratospheric warmings into near-Earth space, we will combine complementary radar, imager and satellite data to determine the coupling between gravity waves and planetary waves/tides and we will investigate if the Antarctic MLT responds to solar variability.

Project Aims and Methods

You will join a lively team of researchers at Bath and the British Antarctic Survey. We will use exciting new data available from meteor radars located at Rothera in the Antarctic, on the isolated mountainous island of South Georgia and in Tierra del Fuego. The radars measure MLT winds by detecting the drifting of meteor trails carried by the flow at heights of 80-100 km – effectively the edge of space. We will combine these unique data with data from optical imagers and global observations from MLS on the NASA Aura satellite to investigate key problems in MLT science:

1. We will determine the climatology, variability, fluxes and coupling of the planetary waves, gravity waves and tides of the MLT over Rothera, South Georgia and Tierra del Fuego and investigate how they influence the global circulation.

2. We will determine the response of the lunar tide in the Antarctic MLT to sudden stratospheric warmings in the Arctic and investigate if and how this response propagates to the near-Earth space environment.
3. We will exploit the unique extended data set available from Rothera to determine if and how the Antarctic MLT responds to the 11-year cycle in solar variability.

There is considerable scope for the student to take the project in new and exciting directions. There will be strong international collaboration with groups in the US, Australia and Europe.

Candidate Requirements

Applicants must have or expect to receive a good degree in physics, mathematics, meteorology or engineering. No prior knowledge of atmospheric physic is necessary and suitable training will be provided. Applicants should first contact Prof Nicholas Mitchell who will be happy to discuss the project in full (email: N.J.Mitchell@bath.ac.uk).

Training

The supervisor is Prof Nick Mitchell of Bath's Centre for Space, Atmospheric & Oceanic Science. The co-supervisor is Dr Tracy Moffat-Griffin of the British Antarctic Survey. Full training in essential research skills will be provided through Bath's Graduate School and the NERC GW4+ DTP. In addition, the student will attend the month-long European Research Course on Atmospheres held in Grenoble in France and the seven UK atmospheric science courses organised by the National Centre for Atmospheric Science. The student will present their work at national and international conferences and interact with staff from the Met Office and British Antarctic Survey.

References / Background reading list

A full reading list can be made available on request to interested applicants. A description of the meteor radars can be found here: Mitchell, N. J., Radar, meteor radar, Encyclopedia of Atmospheric Sciences (Second Edition), https://doi.org/10.1016/B978-0-12-382225-3.00333-9, 2015.

Useful links

Enquiries relating to the project should be directed to the lead supervisor (see email address above for Project Enquiries). Enquiries relating to the application process should be directed to doctoraladmissions@bath.ac.uk

In order to apply, you should select the relevant University of Bath PhD online application form found here: https://www.bath.ac.uk/study/pg/applications.pl. When completing the form, please state in the 'Finance' section that you wish to be considered for GW4+ DTP funding and quote the project title and lead supervisor's name in the 'Your research interests' section.

Further information about the application process may be found here: http://www.bath.ac.uk/topics/postgraduate-research/

The application deadline is 1600 hours GMT Monday 7 January 2019 and interviews will take place between 4 and 15 February 2019. For more information about the NERC GW4+ DTP, please visit https://nercgw4plus.ac.uk.