SPITFIRE

NERC SCIENCE OF THE ENVIRONMENT

SPITFIRE Doctoral Training Partnership (DTP)

Research Experience Placement 2017

Project Brief:

Applications close at Noon on Friday, 2 June 2017

Lead Supervisor:	Mervyn Freeman
Email:	mpf@bas.ac.uk
University/Research Organisation:	British Antarctic Survey
Department:	Space Weather and Atmosphere
Project Title:	Solar variability effects on weather via the global atmospheric electric circuit

Total Student Support Costs: £	£2500 (£250 for 8 weeks plus £500 research and training support grant)
Based on a minimum of £200/week full time for a minimum of 8 weeks and maximum of 10 weeks and a £500 Research and Training Support Grant.	

Proposed Start Date: **Monday, 26 June 2017**	Proposed End Date: **Friday, 18 August 2017**
Projects should run over the summer vacation and we recommend that projects will have terminated by 15 September 2017.	

Brief Summary – please provide a brief summary (maximum 300 words) of the project.

This should include:

- *Project outline;*
- *Links to staff/School/Centre activity as appropriate;*
- *Supervisory arrangement;*
- *How space/equipment/supporting resource demands will be met;*
- *Elements of the project that will incorporate elements other than computer/modelling e.g. fieldwork and data collection;*
- *How the project will enhance the skills of the appointed student;*
- *Any intellectual property rights concerns that may arise from the work.*

Project outline. Our understanding of the effects of solar variability on weather is incomplete and inadequately represented in atmospheric models. Observations have shown a clear correlation between fluctuations in the interplanetary magnetic field (IMF) from the Sun and tropospheric pressure and temperature variations. IMF variability is known to change the electric potential in the ionosphere and an associated downward electric current through the atmosphere. It is argued that this varying current affects the microphysical properties of clouds. These properties are known to influence radiative balance and latent-heat release and thus atmospheric pressure and temperature. A clear difference in the relationship between the IMF and tropospheric pressure would therefore be expected for different proportions of cloud cover, according to this 'cloud hypothesis'. The aim of the project is to test this hypothesis.

Links to staff and Centre activity. The student will join the BAS SWA team and participate in seminars and other team activities.
Supervisory arrangement. By Dr Mervyn Freeman (SWA team deputy leader, BAS), Dr Mai Mai Lam (Southampton and BAS), and Dr Constantino Listowski (Laboratoire Atmosphères, Milieux, Observations Spatiales, Paris, France). Based on the initial task schedule below, each week the student will prepare an informal progress report that will be jointly discussed and next milestones set; a model that has worked well previously.
Space/equipment/supporting resources. The student will have a desk in an office with other students for peer group support. IT and library resources will be provided, together with IT and supervisory support.
Elements other than computer/modelling. The student will visit partner Listowski in Paris to learn about satellite remote sensing of clouds and continue this collaboration by Skype and e-mail.
Skills enhancement. Hypothesis setting and testing, data retrieval, manipulation and analysis, software development, and atmospheric science and space weather knowledge.

Please give an indicative timescale for the student's work over the length of the project: (maximum 150 words).
This should include:

- *The broad tasks the student will undertake;*
- *An indicative timescale for these tasks.*

Week 1. Understand the hypothesis being tested
2. Visit Listowski in Paris to understand cloud physics and the satellite cloud dataset.
3. Retrieve solar wind and cloud datasets for the period 1995-2016
4. Write software to develop a simple model of the hypothesis
5. Use the model and ground-based cloud data to test the hypothesis
6. Use the model and satellite cloud data to test the hypothesis
7-8. Write up results for publication and present at SWA group meeting

The student will develop the model of the hypothesis, identify intervals when the temporal variation in IMF results in a perturbation in tropospheric pressure at a given Antarctic location, and use the model to test whether such a perturbation is still observed in the presence or absence of cloud cover. Each week the student will prepare an informal progress report that will be jointly discussed and revised, with next milestones set.

Proposed procedure for appointing students, including selection criteria:
Please identify specific criteria that should be considered for the selection of placement students e.g. specific quantitative skills that may be required, subject knowledge etc. If a student has been pre-selected, or the research area has been led by the student, please provide the student's contact details, and a summary of their suitability for the SPITFIRE DTP REP programme.

We are looking for a student with a background in physical sciences, with some experience in programming.