

SPITFIRE Doctoral Training Partnership (DTP)

Research Experience Placement Project 2018

Lead Supervisor:	Dr Hua Lu
Email:	hlu@bas.ac.uk
University/Research Organisation:	British Antarctic Survey
Department:	Atmosphere, Ice and Climate
Project Title:	Antarctic extreme temperature events and related meteorological patterns

Total Student Support Costs: £	£2500 (£200 for 10 weeks plus £500 research and training support grant)
<i>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.</i>	

Proposed Start Date: 4 th of July 2018	Proposed End Date: 24 th August 2018
<i>Projects should run over the summer vacation and we recommend that projects will have terminated by 21 September 2018.</i>	

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.*

Antarctica is a region of extremes with the coldest temperature on Earth in winter and possible melting of ice shelves in summer, which frequently hamper logistical, research and maritime operations. The climatic conditions vary from the relatively warm maritime near the Antarctic Peninsula to the frigid high plateau of East Antarctica. A knowledge of extreme conditions, their frequency and the background conditions is of great research interest regarding regional climate variability as well as for ensuring the physical maintenance and safety of the Antarctic stations.

The REP student will be supervised by Dr Hua Lu, an experienced researcher within the Atmosphere, Ice and Climate (AIC) team at BAS. Dr Lu works closely with the team to study the influential factors of Antarctica extreme events, including large-scale circulation patterns such as Southern Annular Mode (SAM), Synoptic-scale weather systems and localized effects such as Föhn winds. The goal is to understand the extent to which these processes may interact with sea ice, ice shelves and ocean at different time-scales and how to better represent them in climate models.

The student will apply, test and refine statistical software to examine extreme events using observations from 18 research stations. They must interact with the data collection team to understand the reasons/effects of missing data, station relocations, outliers and their potential impacts on the extreme event identification. This REP would provide the student with hands-on experiences in applying statistics to address practical problems, developing computational programs to solve real-world problem, testing statistical software using observational data, and interpreting research outcomes based on imperfect data sets.

The REP student will be located alongside other PhD/REP students and will be encouraged to attend weekly seminars at both BAS and Cambridge University. He/she will interact with other researchers to gain insights into meteorological observations and climate modelling.

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.*

The project is structured as a sequence of tasks:

1. Familiar with statistic methods of extreme value distributions and analytical tools with guidance provided by the supervisor (1 week)
2. Modify/test/improve a computer program (in Matlab) that calculates extreme events (4 weeks)
3. Corroborate/compare with existing software developed by the supervisor (1 week)
4. Gain a perspective on statistic uncertainty. For instance, understand and appreciate the effects of noise in the data due to observational errors, missing data and outliers; detect the abnormal behaviour in histogram and interpret its effect on extreme value identification. This task involves close interaction with a field experimentalist (Steve Colwell) (1 week)
5. Organize, prepare and present the final results to the team (1 week)

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.

Skills / Experience	Numerate, computing literate and computational skills
Qualifications	Currently taking an undergraduate degree in either statistics, mathematics, computer sciences, and/or physics.
Numerical ability, Computer / IT skills	Experience in scientific computing programs (especially Matlab, Octave, or R) would be an advantage
Communication skills	Understand and follow task specification; speak and write in English language; appreciate multidisciplinary research