

SPITFIRE Doctoral Training Partnership (DTP)

Research Experience Placement Project 2019

Lead Supervisor:	Dr Maria-Vittoria Guarino , Prof John Turner (co-supervisor: Dr Louise Sime, Dr Tom Bracegirdle)
Email:	m.v.guarino@bas.ac.uk , jtu@bas.ac.uk
University/Research Organisation:	British Antarctic Survey
Department:	Atmosphere, Ice and Climate & Ice Dynamics and Paleoclimate Groups
Project Title:	Understanding a changing world: studying the decline of Antarctic sea ice

Total Student Support Costs: £	Student based at BAS will undertake an 8 week placement, working 30 hours a week. The successful candidate will be required to complete further local paperwork and internal BAS processes. The hourly rate paid, will be no less than the legal minimum wage.
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Proposed Start Date: 17 June 2019	Proposed End Date: 9 August 2019
<i>Projects should run over the summer vacation and we recommend that projects will have terminated by 25 September 2019.</i>	

Brief Summary

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.*

Changes in sea ice extent and area are important indicators of climate change. Since observational records began in the late 1970s, Antarctic sea ice increased at a statistically significant rate, reaching a surprising maximum extent in 2014. After that, Antarctic sea ice started a rapid descent and reached its minimum extent for the satellite era in 2017.

The fact that the Antarctic sea ice extent has since 2014 started decreasing, suggests that the system moved to a new state. By doing so, it reconciled with the decline simulated by IPCC-class climate models. In fact, according to the most recent IPCC report, Antarctic sea ice is expected to retreat by about 50–60% over the next two centuries.

In this project, the student will investigate possible causes for the observed decline of Antarctic sea ice. A previous study led by Prof Turner showed that the greatest loss (over a

third) of Antarctic sea ice in 2016 occurred during austral spring and in the Weddell Sea sector (Turner et al., 2017 GRL).

Additionally, preliminary analysis carried by our group on the CMIP5 (Coupled Model Intercomparison Project Phase 5) model projections revealed that the Weddell Sea is also where the greatest retreat of sea ice is expected by the end of the 21st century.

This project will investigate the variability of Antarctic sea ice in the Weddell Sea and confirm whether this is the dominant sector in terms of projected future sea-ice retreat. The student will analyse quantities such as sea ice area and extent, sea surface temperature, the Southern Annular Mode (SAM) index and winds to identify driving mechanisms of sea ice loss. Analysis will be carried out primarily on observational data and CMIP5 model output and, depending upon time and data availability, be extended to CMIP6 models.

The student's work will contribute towards the BAS research focus of studying Antarctic sea ice in past and future climates. Through the project they will gain an excellent understanding of the subject area and knowledge of climate data processing and analysis.

Please give an indicative timescale for the student's work over the length of the project:

This should include:

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

- 1st week: familiarization with the background literature
- 2nd to 4th week: familiarization with observational dataset, CMIP5 archive and data visualization tools (mainly python scripts)
- 5th to 8th week: data analysis

Management, supervision, and outreach

- Weekly review meetings with supervisors
- Further (daily) contact with supervisors as required.

Scientific output

- 1-2nd week: Short written report on background literature
- 3-8th week: Short written report on data, methods, and findings. Production of 1-2 publication quality figures, and around 500 words of publication quality text.

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.

This project would be suitable for students undertaking a degree in physics, applied maths, or statistics, who is on course for a good first. Strong computational skills are required. No background in the specific subject area is necessary.