

NERC GW4+ Research Experience Placement Project 2019

Understanding a changing world: studying the decline of Antarctic sea ice

Lead Supervisors: Dr Maria-Vittoria Guarino (m.v.guarino@bas.ac.uk), Prof John Turner (jt@bas.ac.uk). Co-supervisor: Dr Louise Sime, Dr Tom Bracegirdle.

Atmosphere, Ice and Climate & Ice Dynamics and Paleoclimate Groups

Proposed 8 week placement commencing mid-June. Dates to be confirmed.

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.

Scientific tasks

- 1st week: familiarization with the background literature
- 2nd to 5th week: familiarization with observational dataset, CMIP5 archive and data visualization tools (mainly python scripts)
- 6th 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.
- Students must meet all of the following criteria to be eligible to apply for a REP:

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- Be studying for an undergraduate degree in a quantitative discipline outside of NERC's scientific remit (eg mathematics, statistics, computing, engineering, physics).
- Be applying for a placement in a different department to their undergraduate degree.
- Be undertaking their first undergraduate degree studies (or integrated Masters).
- Be expected to obtain a first or upper second class UK honours degree.
- Be eligible for subsequent NERC PhD funding (ie UK, EU or right to remain in the UK).

Applications (no more than 2 sides A4 and CV) and enquiries should be sent directly to: Dr Maria-Vittoria Guarino m.v.guarino@bas.ac.uk no later than noon, 15th May 2019