



SDM **14b**
 Agenda Item: 4.2.2
 Person Responsible: T Bracegirdle / D Bromwich

**XXXV SCAR Delegates Meeting
 Davos, Switzerland, 25-26 June 2018**

**Proposed Scientific Research Programme
 Planning Group**

**Near-term Variability and Prediction of the
 Antarctic Climate System (AntClim^{now})**

Report Authors

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Summary

This paper outlines, in keeping with the *Guidelines for SSGs on the Establishment and Operation of SCAR Science Research Programmes*, the proposal for the establishment of a Programme Planning Group for developing a Scientific Research Programme (SRP) entitled Near-term Variability and Prediction of the Antarctic Climate System (AntClim^{now}). The SRP concerns the investigation of prediction of near-term conditions in the Antarctic climate system on timescales of years to multiple decades. These time scales are highly relevant across multiple disciplines and to a range of key stakeholders whilst aligning strongly with scientific priorities identified as part of the SCAR Horizon Scan. Initial Chief Officers are Tom Bracegirdle (UK) and David Bromwich (USA). The proposed initial core membership is shown in the Appendix and currently includes 18 members from 7 countries, representing the physical sciences and biological sciences. Their range of expertise comprises atmosphere, ocean, ice, chemistry and biology. The Appendix will be updated for the SCAR Delegates meeting in Davos.

Recommendation

Delegates to consider the proposal and decide whether to approve the Programme Planning Group Proposal.

Summary Budget 2017 to 2020

| | 2017 | 2018 | 2019 | 2020 |
|--------|-------|---------|---------|---------|
| | Spent | Request | Request | Request |
| (US\$) | N/A | 0 | 10,000 | 10,000 |



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Scientific Research Programme Title

Near-term Variability and Prediction of the Antarctic Climate System
(AntClim^{now})

Proposed Scientific Research Programme Outline

Motivation

Antarctic Climate Change in the 21st Century (AntClim²¹) is a successful SCAR Scientific Research Programme that is delivering on the key aim of producing improved projections of Antarctic climate change to 2100 and beyond. The focus on century timescales provides crucial information to researchers in many disciplines studying the impacts of longer-term climate change on Antarctica and wider impacts on the rest of the planet through, for example, sea level and ocean circulation. These are important topics that will still need to be addressed going forward as the next generation of SCAR Scientific Research Programmes are developed.

However, a focus on the century timescales does leave a major gap in terms of key questions in Antarctic climate science on near-term changes from years to multiple decades. These shorter time scales are highly relevant across multiple disciplines and to a range of key stakeholders whilst aligning strongly with scientific priorities identified as part of the SCAR Horizon Scan. New capabilities are emerging that will help to improve our understanding and our ability to quantify the envelope of possible near-term future climate states across a range of spatial scales. These advances include progress in modelling future climate change, understanding contemporary climate change and variability, and reconstructing past climate. *A more integrated* approach would also help to look beyond climate projections of the physical system, but consider the *Antarctic environment* as a whole.

Scientific priorities, questions and strategies

Different parts of Antarctica show a wide range in behaviour in terms of climate variability, which highlights the need for a regional approach to observing and modelling the Antarctic environment. The scientific priorities, key questions and suggested strategies for answering these questions are listed below. These may seem broad and ambitious in scope, but this is a reflection of the fact that a key role of a Scientific Research Programme is to promote strategic priorities and provide resources for planning future funding of research. In addition, they should be viewed as starting point for future discussions in developing AntClim^{now} and could change significantly going forward. *In particular it is anticipated that discussions across multiple disciplines will lead to the development of a broader range of questions on*



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near-term Antarctic environmental change. Current recommendations for questions and strategies for addressing them are as follows:

- **Key question:** What is the role of tropical climate variability in annual-to-multi-decadal Antarctic climate variability?
- **Suggested strategy:** The increasing availability and sophistication of climate model experiments means that we will soon be better able to identify explanations for current and near-future Antarctic climate trends. A key dataset in this context will be the new climate model dataset that is being produced in preparation for the next full IPCC report (the CMIP6 dataset) and will become available to the science community over the next two years. In order to test the realism of climate model depictions, targeted observational and modelling investigations of the linkages from the tropics to Antarctica are needed.
- **Key question:** What are the important processes that drive annual-to-multi-decadal variability of the Southern Ocean and its ice-atmosphere interactions?
- **Suggested strategy:** (i) Evaluate, and promote the development of, coupled high-resolution models of the Southern Ocean and Antarctica and (ii) utilise the increasing quantity of observational data that is now being collected by the use of newly-available observational capabilities both by in-situ measurements and proxy data sources.
- **Key question:** How predictable is the Antarctic climate system on annual-to-decadal timescales?
- **Suggested strategy:** One major priority will be to assess output from the latest decadal prediction systems from leading weather and climate modelling centres, many of which will become available in the near future as part the pre-IPCC climate model simulations mentioned above. The other will be to improve estimates of future change at high spatial resolution over key parts of Antarctica using high-resolution climate modelling, for example in collaboration with Antarctic-CORDEX (note that CORDEX is an endorsed contribution to CMIP6).
- **Key question:** How large is real-world multi-decadal variability of the Antarctic climate system and how well represented is it in the current generation of climate / earth-system models?
Suggested strategy: Utilise current advances in proxy reconstructions of Antarctic climate variability in recent centuries and develop cross-disciplinary collaborations to help make the best use of such information in the evaluation of climate models.

Timeliness – why now?

- One of the Grand Challenges of the World Climate Research Programme (WCRP) is Near-term Climate Prediction.
- The latest version of WCRP Coupled Model Inter-comparison Project (CMIP6) is starting to produce results from this year including new decadal prediction simulations.



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- New syntheses providing reconstructions of past Antarctic climate and its variability are being produced that are potentially highly valuable in evaluating climate model skill in representing natural variability and thus indicating the reliability of model-derived envelopes of possible near-term conditions over Antarctica.
- A wide range of recent observational and modelling studies (https://journals.ametsoc.org/topic/connecting_tropics_to_polar) has set the stage for rapid advances in understanding and predicting annual to multi-decadal climate variability in Antarctica.
- Improved ocean observations from initiatives such as the Southern Ocean Carbon and Climate Observations and Modeling (SOCCOM) project are currently providing a wealth of new information that is highly important for improving process understanding and for climate model evaluation.

Proposed Chief Officers

Tom Bracegirdle, David Bromwich and TBA

Proposed Core Membership

The attached Appendix shows the current proposed core membership. An updated version will be presented at the SCAR Delegates Meeting in Davos.

Budget

Planned use of funds for 2018 to 2020

| Year (YYYY) | Purpose/Activity | Amount (in USD) | Contact Name | Contact Email |
|-------------|------------------|-----------------|----------------|-----------------|
| 2019 | Planning meeting | 10,000 | T. Bracegirdle | tjbra@bas.ac.uk |
| 2020 | Planning meeting | 10,000 | T. Bracegirdle | tjbra@bas.ac.uk |

Briefly describe how funds will be used and desired results

- The 2019 meeting would be to finalise the science plan and scope
 - The 2020 meeting will be for finalising the SRP proposal.
- For both meetings the funds will be used to support venue costs and to cover travel expenses where necessary, in particular to support contributors from emerging Antarctic nations and early career representation.

Percentage of the budget to be used for support of early career researchers

2019: 10-20%
 2020: 10-20%



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Appendix 1. Proposed core membership (6/6/2018)

| | Name | Country | Science Discipline |
|-----------------|---------------|-----------|--------------------|
| Nerilie | Abram | Australia | Physical |
| Azizan | bin Abu Samah | Malaysia | Physical |
| Tom | Bracegirdle | UK | Physical |
| David | Bromwich | USA | Physical |
| Rachel | Cavanagh | UK | Biological |
| Ryan | Fogt | USA | Physical |
| John | Fyfe | Canada | Physical |
| Will | Hobbs | Australia | Physical |
| Alia | Khan | USA | Physical |
| Jan | Lenaerts | USA | Physical |
| Francois | Massonnet | Belgium | Physical |
| Andrew | Orr | UK | Physical |
| Marilyn | Raphael | USA | Physical |
| James | Renwick | NZ | Physical |
| Doug | Smith | UK | Physical |
| Aleks | Terauds | Australia | Biological |
| Liz | Thomas | UK | Physical |
| John | Turner | UK | Physical |