

Minutes - Second Meeting of the SCAR Action Group on Prediction of Changes in the Physical and Biological Environments of the Antarctic

Location – Alfred Wegener Institute (AWI), Bremerhaven, Germany

Dates – 30.9.2009 to 2.10.2009

Wednesday 30 September 2009

Attending: Co-chairs: John Turner (JT; BAS) and Julian Gutt (JG; AWI)

Tom Bracegirdle (TB; BAS), Pete Convey (PC; BAS), Guido di Prisco (GdP; Institute of Protein Biochemistry, Italy), David Thomas (DT; Bangor University – 1 Oct only).

Unable to attend: Martin Riddle, Yvon le Maho.

Start 1430.

The discussion opened with a review of the terms of reference. It was agreed that no changes should be made.

Review of actions from the first meeting (previously agreed actions in italics).

Papers.

1) *One or two on perspectives of climate science in marine and terrestrial biology. A simplified review. Interested parties in group will write a paper. Year 1 – terrestrial, Year 2 possibly marine.*

This has not been completed mainly due to the focus of effort on the ACCE report.

2) *Encourage research in direction of natural variability.*

Examples: JT and TB are currently looking at explaining temperature variability and trends in the Faraday temperature record. JT also lead work on the contribution of the ozone hole to observed total sea ice increases.

3) *Zhaomin work on future temperature and salinity in the ocean as nothing is written yet.*

The major issue of a lack of observations to validate ocean models has resulted in a greater focus on understanding model simulations of the present and recent decades.

4) *Antarctic Science paper which summarises ACCE. 3-6 months timescale.*

This has been completed and is now in press.

5) *Material for ACCE.*

ACCE has been printed and will be launched this autumn.

6) *Action Group website.*

The web site has now been created by JT.

ACCE (Antarctic Climate Change Evolution)

Worked on a 10-point summary of ACCE report.

Thursday 1 October

ACCE

Continued working on and produced a draft of the 10-point summary of the ACCE report. The final version will appear on the ACCE website at:

http://www.antarctica.ac.uk/met/SCAR_ssg_ps/ACCE.htm

Presentations

John Turner – Antarctic Peninsula decadal to century time scale variability of temperature.

Summary of temperature change over continent. Peninsula warming, insignificant elsewhere.

Ozone hole caused the wind speed to increase around the Antarctic. This change in winds projects onto the Southern Annular Mode (SAM). The SAM has changed most in the summer and Autumn.

This change in winds pushes more warm maritime air over the Peninsula to cause summer/autumn warming to the north-east and eastern Peninsula. The winter warming to the west is less well understood. A major current focus is to understand a strong winter warming in this record. The warming is intimately linked to a reduction of sea ice extent just off the coast from Faraday. The warming is mainly due to a reduction of the frequency of extreme cold events. Seems that there has been reduction of 'blocking events' that promote ice growth.

Tom Bracegirdle – Decadal temporal variability of climate on sub-continental spatial scales.

Variability in climate models on a regional scale is an important part of understanding past change.

At the moment large-scale climate models probably under-estimate natural climate variability. Work is currently focussed on understanding the extent to which global climate models correctly simulate variability over and around Antarctica.

Andrew Orr (presented by John Turner) - High resolution modelling.

JT showed results from work being conducted by Andrew Orr at BAS. High resolution models are required for the Peninsula. Need models with a horizontal grid spacing as small as 1-4 km in order to simulate accurate winds.

Tom Bracegirdle – Key field database of climate model data.

The form of data was discussed and it was decided that a graphical approach is preferable. This will take the form of spatial maps of Antarctica. More specific data requests would be better handled on an individual basis. It was suggested that we could include a link to useful data and maps that are already available.

Julian Gutt – Ecosystem modelling

At the moment climate models include simplified biological processes in association with their representation of, for example, ocean acidification and the carbon cycle. Biological (ecological) predictions are not widely done. JG is looking at funding options for a concerted Antarctic-based study. A key idea is to conduct spatially explicit predictions on the succession of Antarctic ecosystems. To achieve this needs include:

- Full databases (portals).
- Ecosystem functioning studies (interactions, life-history traits, adaptation).
- Habitat suitability modelling (bio-regionalisation).

- Combine with physical predictions.

Components of regional biological knowledge.

- Bioregionalisation (physical and biological parameters included).

- Biogeography.

- Ecoregionalisation (potential habitat modelling) – use bioregionalisation information.

Use physical models in bioregionalisation approach to feed predictions into ecoregionalisation.

Studies could take various forms/approaches: Key species; community structures, habitats and processes.

JG presented a demonstration of the SIMBAA (Simulation Model of Benthic Antarctic Assemblages) model.

David Thomas – Sea ice

David showed work on prediction future changes of different categories of ice. Recent work on the wider implications/feedbacks of these predictions was then shown. Ice acts as a physical barrier to gas exchange and impacts on the primary production of biomass. What has been found is that by removing sea ice the result is more productivity in the open water. For a 25% loss of sea ice the result is a 10% increase of productivity.

The importance of the periphery regions of ice floes for primary production was highlighted.

A crucial point is that ice thickness changes are more important than ice extent changes.

For prediction of the future sea ice biology is also an important consideration in addition to sea ice amount.

Guido di Prisco - The effect of ice changes on fish

Important aspects of sea ice extent change for fish species are those that influence vulnerable periods of life such as spawning. Different species will respond differently.

Key example species:

- *Pleuragramma antarcticum* (Antarctic silver fish) uses sea ice for spawning.
- Other species show minimal dependence on sea ice distribution.

Similar key species examples exist in the Arctic.

Funding and future research.

The Arctic is becoming a funding priority. So we should take advantage of a 'bipolar vision'.

A key research priority is the current study of the spawning area of Antarctic silver fish in Terra Nova Bay, which is the only such area investigated so far.

Strategy for next IPCC report.

Action: Look at biological section of AR4 and think about AR5 strategy.

Action: Find out when the AR5 data will become available.

Initial strategy: Possible workshop to share initial physical analysis of IPCC data with other research fields.

Friday 2 October 2009

Report for SCAR

A report of the Action Group for SCAR was discussed.

JT suggested that we could produce a cut down version of the SCAR 'standard format' – approx ½ a page in length.

It was agreed that this would be completed by Group members who work at BAS.

Website

Agreed updates for the website are as follows:

Update minutes.

Link to ACCE.

Link to lists of publications that are contained within the ACCE report.

Key fields Figures.

Next meeting

The next meeting of the Action Group is planned for the SCAR meeting in Buenos Aires. It was agreed to schedule the meeting for Saturday 31st July 2010 between 1000 and 1600. JG agreed to locate and book a room.

Recommendations to SCAR

Recommend future science programmes looking to promote interaction between different disciplines.

1. As a group, the way forward for improving prediction in the Antarctic is to integrate between biological and physical data gatherers and modellers.
2. Long-term monitoring (LTM). There is little in terms of LTM studies currently conducted in either terrestrial or marine biology, although a bit more in the latter. Such studies, equivalent in scope to the long-term physical (meteorological) records, are proposed. This is vital to understanding how ecosystems are linked to climate variability.
3. Equivalent biological computer predictive model to bring together with physical models.

Antarctic paper on the physical and biological environment by 2100.

JG explained that the biological community -with exceptions- are not yet at the level of hard data. There is a gap between the relatively advanced physical models the early development stage of biological models. However, if we write a paper now we can use this to highlight the current issues and give a road-map to future developments. JG could write a contribution to such a 'perspective' paper.

Several months time scale. Have a draft prepared by Buenos Aires.

Paper on recent regional decadal climate variability

A key aim of this paper is to compare climate variability in the physical environment with that in the biological. This is required to improve predictions of the future. However, a problem is the lack of long-term biological datasets. JG suggested one possibility is a long-term biological dataset from Signy, which is a 30yrs record of marine/terrestrial biology (Andy Clarke). JG also suggested that the interface between the physical and biological components could be biological tolerance to environmental change (Lloyd Peck, or Dave Barnes, Hans Poertner).

PC mentioned that another link between the biological and physical components could be through extreme events (Martin Riddle).

Long term variability (millennial) time-scale variability might also be a way forward (Louise Allcock – Belfast; Christoph Held – AWI; Mark Stevens). JG Martin Riddle works on extreme events.

Proposed workshop in approx 2 years

JG will check what is expected from funding organisations. He will write a summary of marine biological perspectives for workshop.

GdP suggested that we can try ESF/EPB; a second option is the Italian Antarctic Programme and/or CNR.

JG will circulate summary first (within 8 weeks). Others in the Action Group will then contribute their own parts. From there we can write a short proposal.

Logo

JG proposed a logo, which was widely approved. GdP had one comment regarding the colour scheme, but everyone else at the meeting felt that it should not be altered.

Meeting ended at lunch time.

Tom Bracegirdle, Secretary