SOUTHERN OCEAN OBSERVING SYSTEM

ANTARCTIC GATEWAY PARTNERSHIP
A Special Research Initiative of the Australian Research Council

OASIIS:

Observing and Understanding the Oceans Beneath Antarctic Sea Ice and Ice Shelves

Esmee van Wijk and Richard Coleman

Atlantic Sail City Hotel, Bremerhaven, Germany, 14 - 17 June 2017

Photo: B. Wallis (AAD)

Meeting Organisers: Esmee van Wijk, Richard Coleman, Louise Newman, Jenna Patterson, Stephanie Thielebeule, Olaf Boebel, Steve Rintoul, Pierre Dutrieux, Laura Herraiz-Borreguero, Alex Brearley

pogo

AWI ALFRED-WEGENER-INSTITUT HELMHOLTZ-ZENTRUM FÜR POLAR- UND MEERESFORSCHUNG

Meeting Logistics

14th June Day 1 8:30 am – 5:30pm

15th June Day 2 8:30am – 5:30pm

Workshop Dinner 7:00pm

(at participants expense 30-40 Euro)

Restaurant Seute Deern, http://www.seutedeern.de/de/

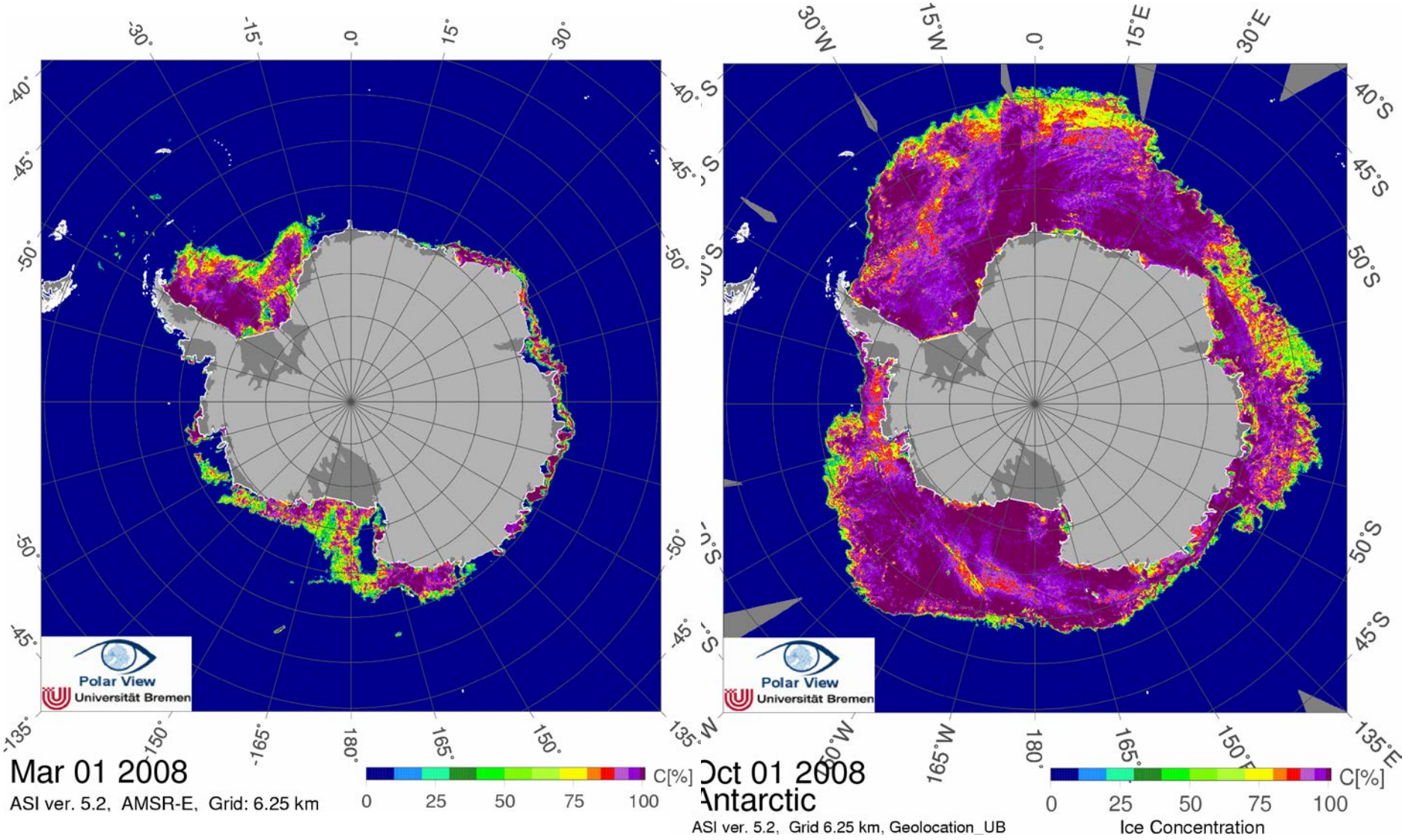
Hans-Scharoun-Platz 1, 27568

16th June Day 3 8:30am – 5:30pm

17th June Day 4 Writing Workshop 09:00am – 5:30pm

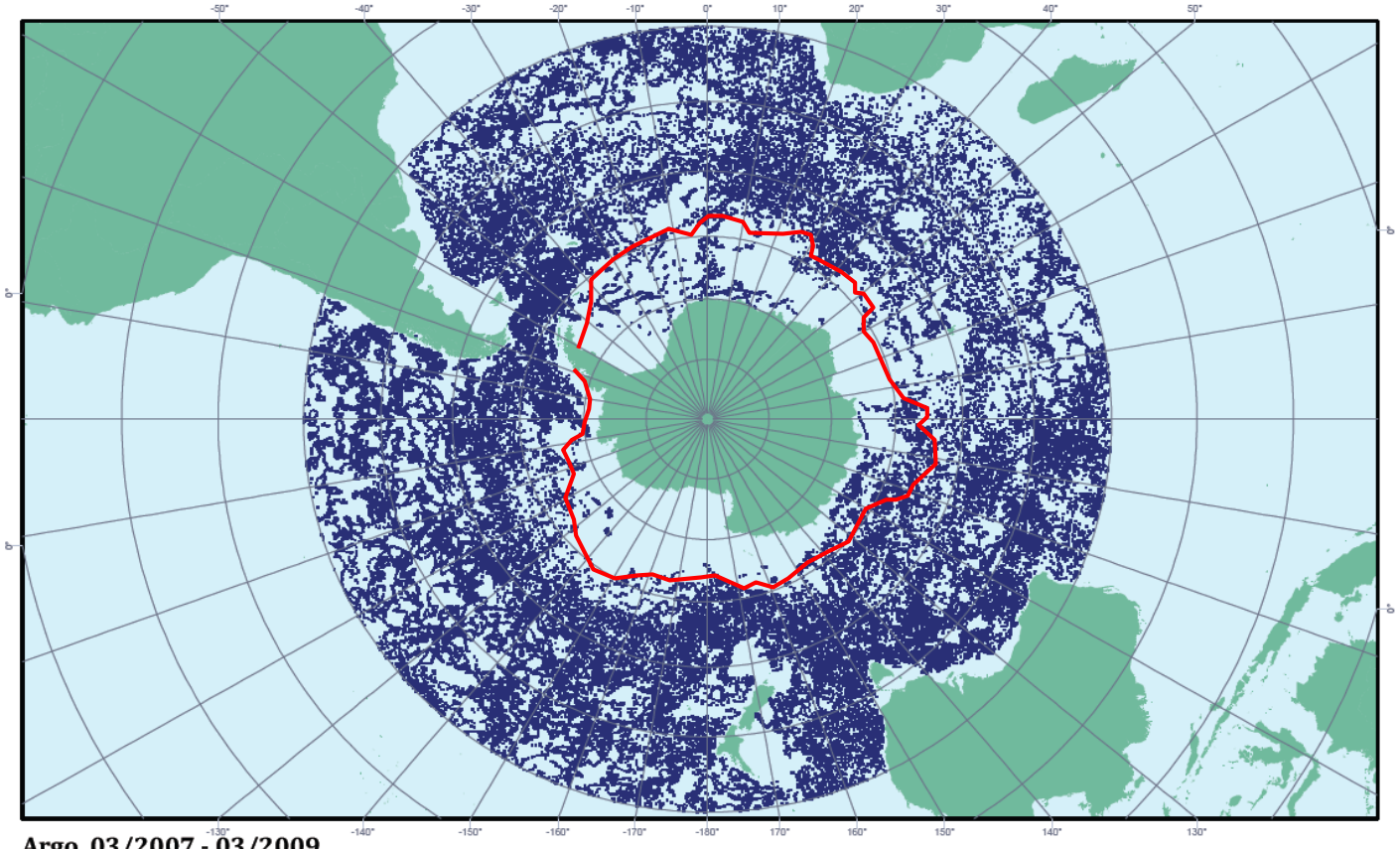
- Allocated talk times should include some time for questions
- Lunch, morning and afternoon tea provided for all 4 Days
- WiFi: Conference Center password: AWI.2017!
- Please update the attendance list at the registration desk

Antarctic sea ice: 19 million km^2 in winter



Source: AMSR-E, Bremen

Ocean beneath sea ice and ice shelves is a “blind spot” in the observing system

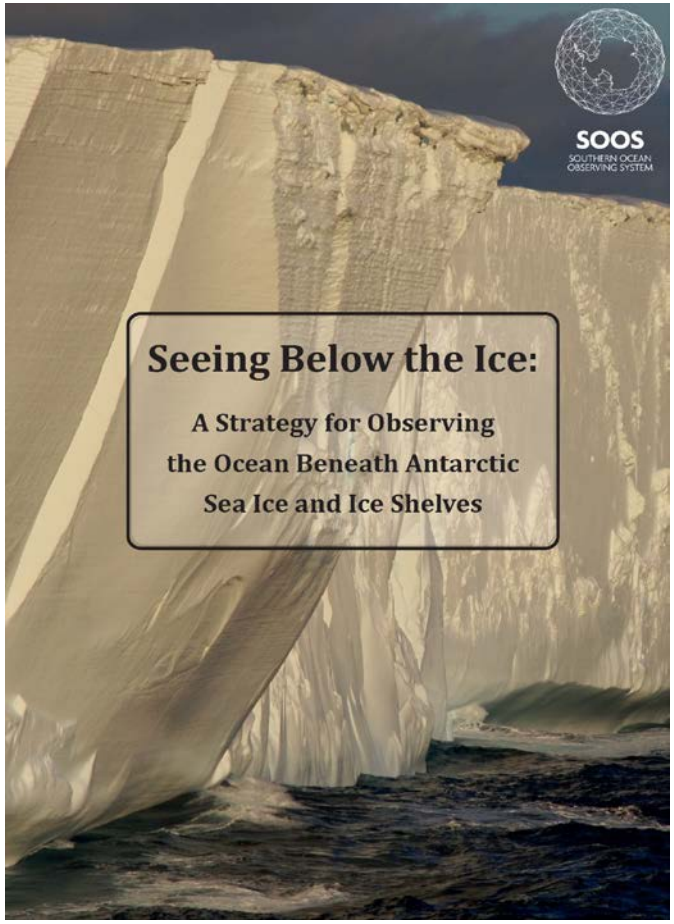


Argo 03/2007 - 03/2009
61965 profiles from 1353 distinct floats

http://argo.jcommops.org

Seeing Below the Ice v1.0

- Result of a workshop held in Hobart in 2012
- Articulated a community view of the motivation for under-ice observations
- Identified scientific objectives and key science questions in 3 themes:
    - Circulation and inventories of heat, freshwater and carbon in the sea ice zone
    - Ocean – sea ice interaction
    - Ocean – ice shelf interaction
- Outlined an integrated under–ice observing strategy but did not provide a detailed implementation plan.



Strategy was successful in raising the profile of under – ice observations, but did not fully succeed in motivating scientists and funding agencies to implement a comprehensive observing system.

Themes and Objectives

1. Circulation and inventories of heat, freshwater and carbon in the sea ice zone

  - To quantify how much heat, freshwater and carbon are stored by the ocean between the winter sea ice edge and the Antarctic continent.
  - To understand the processes responsible for ocean storage of heat, freshwater and carbon and their sensitivity to changes in forcing

Example Questions:

- What is the time-evolving inventory of ocean heat, freshwater and carbon?
- What are the key physical processes regulating exchange between the open ocean and continental shelf?
- How does glacial melt water affect the dynamics of sea ice?
- What is the contribution of tides to cross-shelf exchange,bottom water formation and export and diapycnal mixing?
- Where, how and in what quantity is AABW formed?

Themes and Objectives

2. Ocean – sea ice interaction:

- To determine the processes controlling the circumpolar and regional distribution of sea ice concentration and thickness.
- To determine how and why the concentration/thickness of sea ice varies over time-scales from days to millennia.
- To understand and quantify coupled interactions between Antarctic sea ice, the ocean, the atmosphere and ice shelves.

Example Questions:

- What is the circumpolar and regional distribution of Antarctic sea ice and how does it vary in time?
- How do waves influence the growth and disintegration of sea ice?
- How does glacial melt water affect the dynamics of sea ice?
- What is the contribution of ice shelf water and platelet ice to formation of sea ice?
- How does sea ice formation and melt influence water mass formation?

Themes and Objectives

3. Ocean – ice shelf interaction:

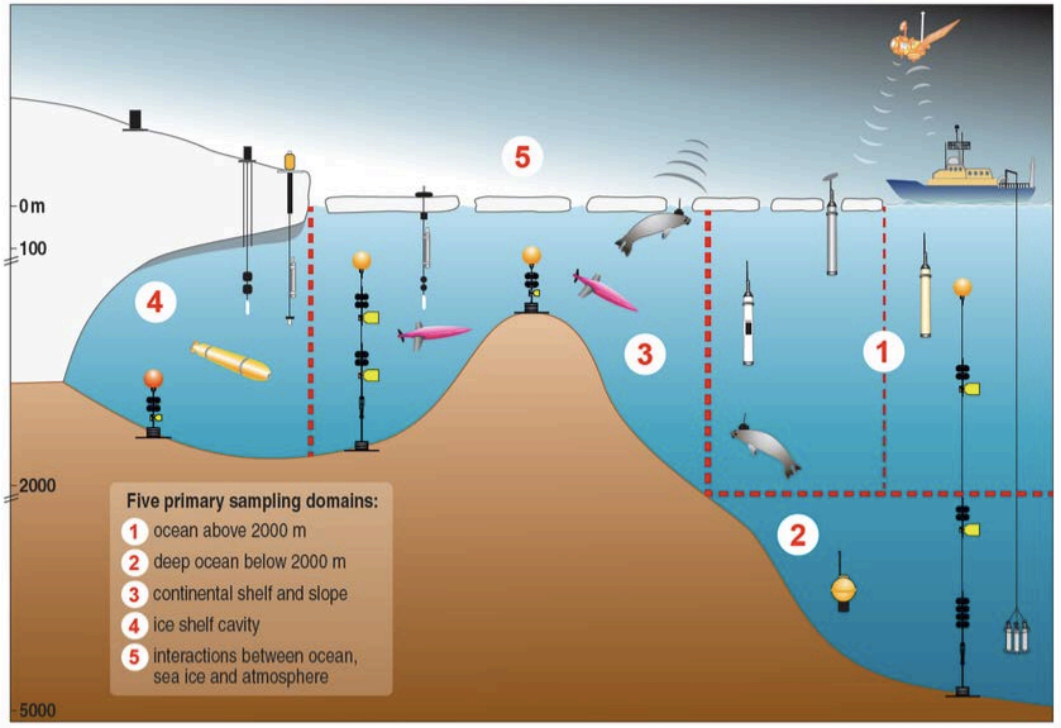
  - To determine the sensitivity of Antarctic ice shelves to changes in ocean circulation & temperature.
  - To assess the effect of basal melt of floating ice shelves on the mass balance of the Antarctic Ice Sheet and its contribution to sea level rise.
  - To determine the response of the ocean to changes in freshwater flux input from Antarctica.

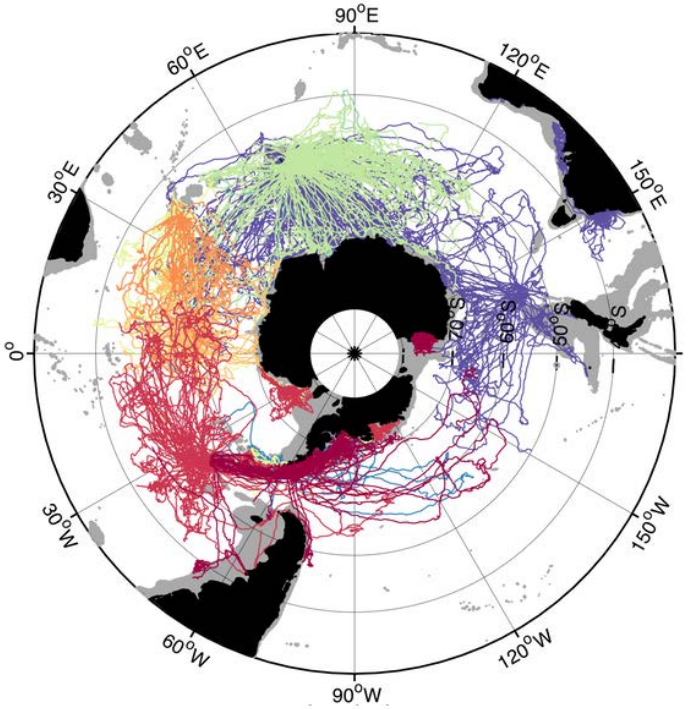
Example Questions:

- What controls the rate at which ocean heat is delivered to the ice shelf base and grounding line?
- How sensitive is basal melt to changes in large-scale climate forcing?
- What observations are needed to ground-truth satellite-based and numerical modelling estimates of ice shelf mass balance?
- How does polynya activity influence the rate of basal melt and vice versa?

Under-Ice Observing System

- Integrated system requires broadscale measurements and process studies from in-situ and remote-sensing instruments.
- Observations of the ocean, atmosphere and cryosphere from winter ice edge to grounding line, and year-round sampling from the ocean surface to sea floor.
- Divided into 5 distinct domains each with a different sampling strategy.
- Open ocean domain best addressed on a circumpolar basis.
- Implementation most effectively carried out at the regional level.





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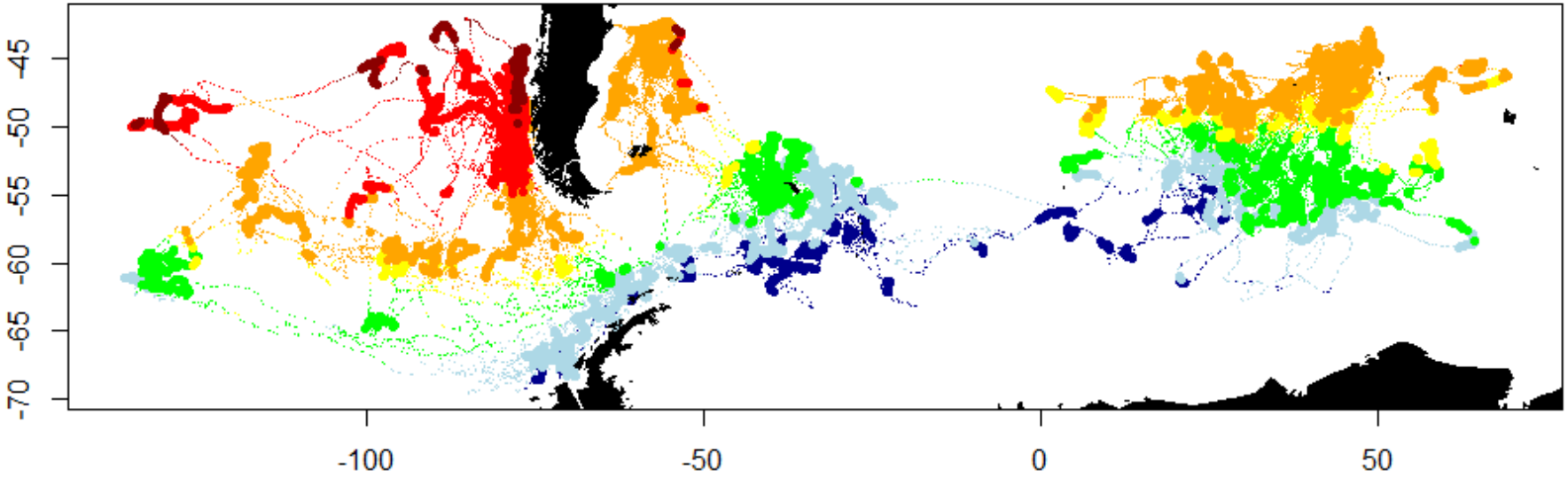
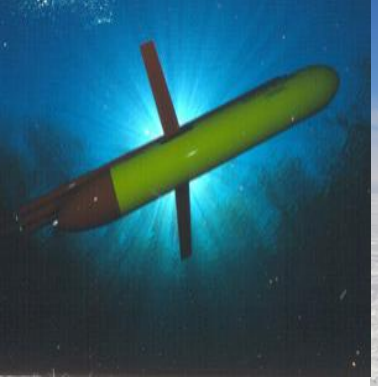
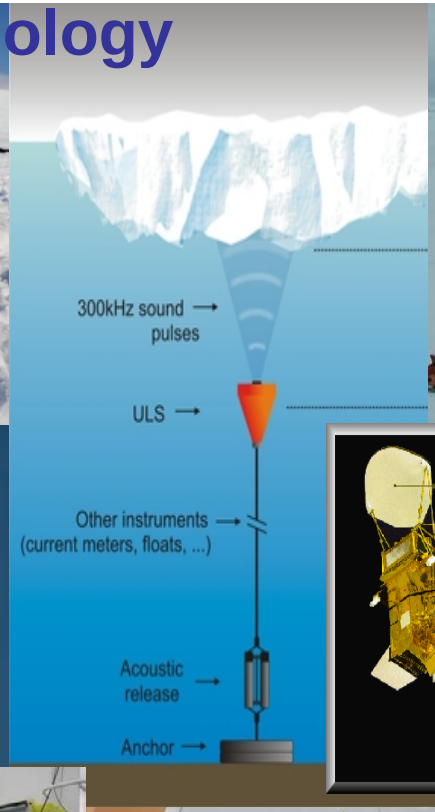
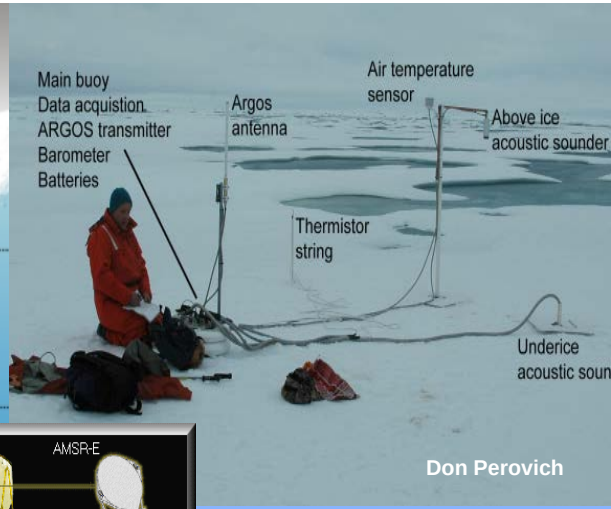
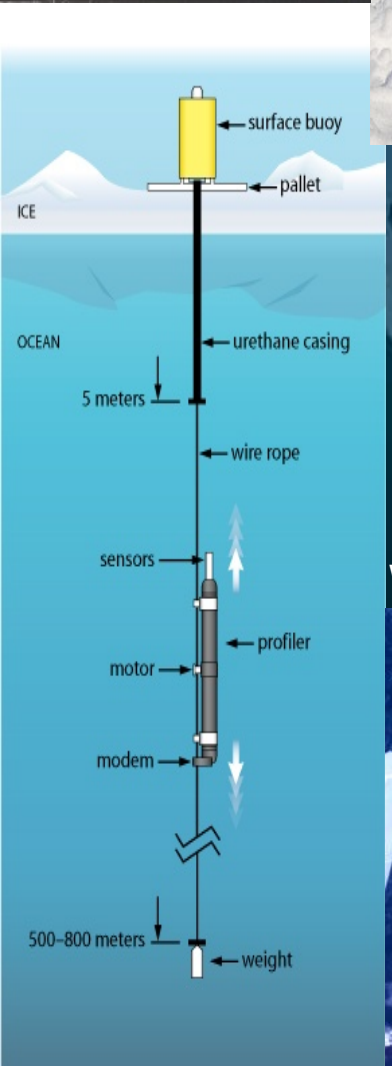


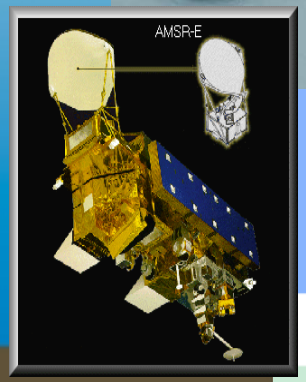
Advances in observing system technology

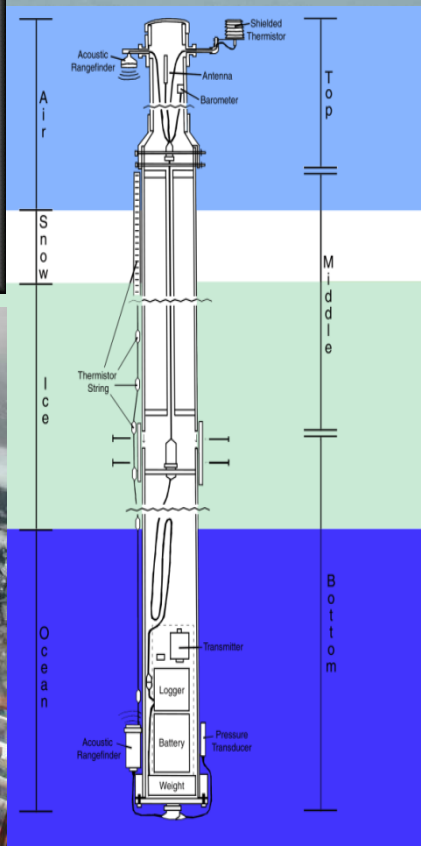












POGO OASIIS Working Group

(Observing and understanding the Ocean below the **A**ntarctic **S**ea **I**ce and **I**ce **S**helves)

- The Goal of the WG is to develop a community-led implementation plan for an integrated, circumpolar under-ice/on ice observing system for the Southern hemisphere.
- Follows on from the 2012 SOOS Workshop “Seeing Below the Ice”:http://www.soos.aq/images/soos/products/attachments/SOOS-UnderIceStrategy.pdf
- Define quantitative sampling requirements and identify leaders(teams) to take key elements of the observing system forward either as mature contributions to GOOS or as regional pilots.
- Outline what can we do now with existing platforms/technology and what areas do we need to develop?
- Produce a peer-reviewed publication that articulates the implementation strategy for core components of an under-ice observing system - Bulletin of American Meteorological Society (BAMS).
- Inform the development of a white paper on under-ice/on ice observations for Ocean Obs 2019.

OASIIS Meeting

- Science program over 4 days (14-17 June), with the last day being a writing workshop
- About 58 international scientists from 16 countries giving 50 talks
- Update of recent science advances
  - have we made progress that changes our thoughts on why we need an under-ice observing system and what it might look like?
  - is there a need to review the key science questions/priorities?
  - are new tools, sensors, techniques available?
- Draw on expertise from, and enhance synergies with the Arctic observing community.
- YOPP (Year of Polar Prediction) - mid 2017-19, defined fieldwork activity
- Look at future planned fieldwork from 2017-2022, noting resources available (ship capability, available datasets, available technologies [gliders, AUVs, ApRES, ..], multiple ice shelf campaigns, sea ice campaigns)
- Possible proposal for regional pilot project developed at the workshop?
- Workshop supported by POGO (10Ke), AWI (7Ke), AGP ($A10K), SOOS ($A10K), in-kind (AGP), SCAR/SCOR funds for SOOS SSC members to attend.