



## Seeing Below the Ice: Developing a strategy for sustained observations in the sea-ice zone of the Southern Ocean



CSIRO Wealth from Oceans Flagship is the Principle Sponsor of the Under Ice workshop

**Location:** CSIRO Marine and Atmospheric Research, Castray Esplanade, Hobart, Tasmania, Australia.

**Date:** 22-25 October 2012

### Workshop Objective

To develop a strategy to observe ocean circulation and ice-ocean interaction (both sea ice and glacial ice) in the Antarctic sea-ice zone.

### Motivation

Some of the strongest climate change signals are already underway in the high latitudes, with rapid and accelerating changes occurring where warming oceans meet ice. These changes have far-reaching effects through their impact on global sea-level rise (through changes to the major ice sheets) and warming rates (through changes to total planetary albedo). However, the polar oceans under ice are the least understood and most poorly monitored physical systems on the planet. They remain a 'blind spot' in our Global Climate Observing System.

Many of the key scientific questions concerning the role of high latitude ice-ocean-atmosphere interactions in the climate system remain unanswered because of a paucity of observations. New technologies now allow such measurements to be made. The goal of the workshop is to develop a strategy for sustained observations of the Antarctic sea-ice zone. The strategy will include observations needed for the study of interactions between the ocean and both sea ice and glacial ice, including the sub-ice-shelf cavity and deep troughs through which warm ocean waters access the shelf region. While the focus is on the Antarctic, experts from the Arctic community will be invited so we can benefit from experience gained there, where efforts to measure the ocean beneath the sea ice are more advanced.

### Scope

The focus is on the ocean between the northern boundary of the winter sea-ice edge and the Antarctic coast. Interactions between the ocean and both sea ice and glacial ice (ice shelves, glacier tongues) will be discussed. Observations of the ice itself (e.g. structure of sea ice, glaciology) are clearly relevant but not the primary focus of the workshop.





### Meeting Programme

The workshop will be held over four days. Days 1 and 2 are open to the public; Days 3 and 4 are closed sessions for development of the strategy. The program for all days is attached.

### Presentations

If you are giving a PowerPoint presentation on Day 1 or 2 please email your presentation to Fiona Taylor ([info@soos.aq](mailto:info@soos.aq)) in the SOOS International Project Office as soon as possible. Alternatively, see staff at the Registration Desk on Day 1 (8.00-8.30 am or 10.00-10.15 am), with your presentation on a USB stick so that it can be uploaded to the auditorium computer.

### Registration

The Registration Desk will open at the workshop venue (CSIRO, Castray Esplanade) at 8.00 am on Day 1 for participants to upload their presentations, collect a satchel with name badge, program, and other information. Tea and coffee will be available during Registration.

### Functions

A **Cocktail Reception** to welcome all workshop participants will be held at the historic mansion 'Lenna', near CSIRO, at 6.00 pm on Day 1. *All participants are invited to attend the Cocktail Reception.* Participants should RSVP to [info@soos.aq](mailto:info@soos.aq) by Friday 12th October to confirm attendance so that numbers can be finalized for catering.

The **Workshop Dinner**, funded by the Workshop's principle sponsor (CSIRO), will be held at 7.30 pm on Day 3 at 'Blue Skies Restaurant'. *The Dinner is only open to those participating in Days 3-4 of the Workshop.* If you would like to attend the Dinner please RSVP to [info@soos.aq](mailto:info@soos.aq) by Friday 12th October so that numbers can be finalized for catering.

### Special Dietary Requirements

If you have special dietary requirements (food allergies, gluten-free, etc.) and have not yet advised the Workshop organisers please contact [info@soos.aq](mailto:info@soos.aq) ASAP. Vegetarians will be catered for at the workshop morning/afternoon teas, lunches and functions.

### Venues

A map locating venues for the workshop, functions and main accommodation (Customs House and Macquarie Hotel) is attached for your information. All venues are within walking distance of each other and Hobart city centre.

### Climate

Tasmania's temperate maritime climate is highly variable. In October average temperatures are 17° C (maximum) to 8° C (minimum). It could be warmer or cooler, and you might experience all four seasons in one day. The best clothing solution is 'layering' so that you can add or remove layers as required. A waterproof coat will be handy if you plan to spend any time outdoors.

### Other Information

For general enquiries please contact Fiona Taylor in the SOOS International Project Office ([info@soos.aq](mailto:info@soos.aq) or telephone +61 (0) 3 6226 6011).





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### DAY 1: Monday 22 October

Registration & Welcome		
Time		Presenter
8:00 – 8:45	Registration. Tea & coffee available.	
9:00 – 9:15	Welcome and introduction to the goals of the workshop	S. Rintoul
<b>Session 1: Observing the ocean beneath the Antarctic sea ice (Convenor: A. Wåhlin)</b>		
09:15 – 10:00	Lessons from the Arctic Observing System Ice Tethered Profilers – Arctic lessons and Antarctic potential	J. Toole J. Toole
10:00 – 10:20	<i>Morning Tea</i>	
10:20 – 11:40	Scientific Perspectives <ul style="list-style-type: none"> <li>- Observing heat and freshwater budgets of the Southern Ocean sea ice zone</li> <li>- What measurements do we need to understand Antarctic sea ice?</li> <li>- A strategy for improving knowledge of air-sea fluxes</li> <li>- Under ice observing system for the Ross Sea</li> </ul>	A. Naveira Garabato S. Ackley, J. Liu S. Ackley K. Speer (presenter TBA)
11:40 – 12:40	The Weddell Sea <ul style="list-style-type: none"> <li>- A straw-man observing system</li> <li>- Measuring continental shelf waters</li> <li>- NW Weddell Sea</li> </ul>	O. Boebel S. Østerhus M. Mata
12:40 – 13:50	<i>Lunch</i>	
13:50 – 14:10	Observations of the Ross Sea	A. Orsi
14:10 – 14:30	Polynya Observations	S. Rintoul; K. Ohshima (n/a to attend)
<b>Session 2: Ocean-Ice Shelf Interaction (Convenor: TBA)</b>		
14:30 – 15:40	Scientific Perspectives <ul style="list-style-type: none"> <li>- Ocean-ice shelf interactions in the Amundsen/Bellingshausen (30 min)</li> <li>- Lessons from AMISOR (20 min)</li> <li>- Filchner-Ronne Ice Shelf processes (20 min)</li> </ul>	A. Jenkins; A. Wåhlin L. Herraiz-Borreguero K. Nicholls
15:40 – 16:00	<i>Afternoon Tea</i>	
16:00 – 16:30	- Bottom water changes in the Australian Antarctic Basin (van Wijk) and Weddell Sea (Naveira Garabato)(30 min)	E. van Wijk; A. Naveira Garabato
16:30 – 17:30	Perspectives from Modelling <ul style="list-style-type: none"> <li>- What is needed to measure ocean-ice shelf interaction? (30 min)</li> <li>- Quantifying contributions to the Southern Ocean freshwater balance (10 min)</li> <li>- Observations needed for testing high res models of ocean-ice shelf interaction (20 min)</li> </ul>	D. Holland B. Galton-Fenzi B. Galton-Fenzi
<b>Cocktail Reception</b>		
18:00 – 19:30	McGregor Room, 'Lenna' (Runnymede St, Battery Point). All workshop participants are invited to attend.	





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### DAY 2: Tuesday 23 October

Time		Presenter
8:00 – 8:30	Registration. Tea & coffee available	
8:30 – 8:40	General housekeeping, information, overview	S. Rintoul

Session 3: Platforms and Proxies – present status and potential (20 min each) (Convenor: E. van Wijk)		
8:40 – 10:00	Gliders under ice Gliders, drifters, moorings Moorings and bore holes – new technologies & synergies with ANDRILL Sea-ice drifters	C. Lee K. Heywood K. Nicholls S. Ackley
10:00 – 10:20	<i>Morning Tea</i>	
10:20 – 11:20	Profiling floats - Strategies for deployments in the sea-ice zone - Acoustic tracking of profiling floats - Argo plans	S. Riser; B. Owens O. Boebbel S. Piotrowicz
11:20 – 12:00	Potential of mammal tagging - Using tagged animals to measure the ocean under sea ice - Combining Argo and seal data	M. Hindell L. Boehme
12:00 – 12:20	Acoustic probing of the ocean wedge under an ice sheet	W. Munk
12:20 – 12:40	Acoustic tomography	M. Dzieciuch
12:40 – 13:40	<i>Lunch</i>	
13:40 – 14:00	Role of AUV's in measuring under sea ice and ice shelves	A. Jenkins
14:00 – 14:20	Tethered ROV's under ice	A. Bowen
14:20 – 14:40	Role of isotopes and tracer measurements	K. Heywood
14:40 – 15:00	<i>Afternoon Tea</i>	

Session 4: National activities and international programmes not covered in previous talks (Convenor: S. Rintoul)		
15:00 – 16:30	Reports on national activities relevant to observing the ocean in the sea ice zone (7 minute presentations, to include maps of present and planned fieldwork) - Korea - Russia - iSTAR - Australia - Observing under ice: the New Zealand experience - Canada - Other nations	S.-H. Lee A. Klepikov K. Nicholls, A. Jenkins TBA M. Williams M. Douglas (presenter TBA) TBA
16:30 – 17:30	Discussion and wrap-up. Where to from here.	S. Rintoul





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### DAY 3: Wednesday 24 October

Time	Topic
8:30 – 9:00	Tea & coffee available
9:00 – 9:20	Summary of main points from Days 1 & 2. Outline tasks for working groups
9:20 – 10:30	Break into working groups [group leaders in brackets]  WG1: High latitude heat and salt budgets / circulation of the ice-covered ocean [Alberto Naveira Garabato] WG2: Ocean – ice shelf interaction [Anna Wählin] WG3: Sea ice – ocean interaction [Steve Ackley]  Each group to consider: <ul style="list-style-type: none"> <li>• What are the key science questions?</li> <li>• What do we need to measure to answer these questions?</li> <li>• How can these measurements be made?</li> </ul>
10:30 – 10:50	<i>Morning Tea</i>
10:50 – 12:00	Working groups resume
12:00 – 12:30	Report back from working groups (10 min each, including discussion)
12:30 – 13:30	<i>Lunch</i>
13:30 – 15:00	Working groups by platform (e.g., floats, AUVs, ITPs, moorings, seals, etc.).  Each working group to develop a first cut at a strawman deployment strategy for this technology, potentially considering a mix of sustained observations and focused process studies. Aim for a map and timeline. Each group to identify synergies (i.e., this measurement is likely to benefit something else) and dependencies (i.e., this measurement really only has value if combined with something else).
15:00 – 15:30	<i>Afternoon Tea</i>
15:30 – 17:30	Plenary: Report back from platform working groups (10 minutes to present rationale, strawman strategy and timeline, and discussion/ questions). Reality check: is this starting to look like a coherent strategy? Are we missing anything? Do we have the science questions right?

Under Ice Workshop Dinner	
19:30	'Waterline', Blue Skies Restaurant, Murray St Pier. (Day 3-4 participants only)



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### DAY 4: Thursday 25 October

Time	Topic
8:30 – 9:00	Tea & coffee available
9:00 – 9:15	Plenary: Reach agreement on structure of the report. Assign writing tasks to small groups. (May also include groups tasked to make a figure, prepare maps, or do a calculation.)
9:15 – 10:40	Writing tasks
10:40 – 11:00	<i>Morning Tea</i>
11:00 – 12:00	Writing tasks completed
12:00 – 12:30	Plenary. Presentation by writing groups and group discussion.
12:30 – 13:30	<i>Lunch</i>  <i>[Organisers to compile and circulate rough draft from written material]</i>
13:30 – 15:00	Plenary discussion of strategy: what's missing? What could be improved?
15:00 – 15:30	<i>Afternoon Tea</i>
15:30 – 17:00	Plenary: Summarise and discuss strategy and next steps. Publication plans. Assign action items.
17:00	Adjourn to the Pub!

The SOOS 'Seeing Below the Ice' Workshop (Hobart, 22-25 October 2012) is sponsored by the following organisations:

### PRINCIPLE SPONSOR



Wealth from Oceans Flagship

### SPONSORS

