

ASPeCt 2018 REPORT to SCAR PSG

ASPeCt is an expert group on multi-disciplinary Antarctic sea ice zone research within the SCAR Physical Sciences program. ASPeCt has the key objective of improving our understanding of the Antarctic sea ice zone and its response to climate change. **This understanding is to be achieved through focussed field programs, systematic monitoring of the ice cover, analysis of remote sensing and numerical modelling.**

Marilyn Raphael (Chair), University of California, Los Angeles
Stephen Ackley (Immediate Past Chair), University of Texas at San Antonio
Petra Heil (Data and Communications Executive)
Stefanie Arndt (Junior Officer, ECS)
SCAR PSG, Davos, Switzerland, 18th June 2018

ASPeCt
Antarctic Sea Ice Processes & Climate



Structure of Report

1. Update/Progress report
2. Continuing ASPeCt Effort
3. ASPeCt Outreach/community building
4. Selected ASPeCt national projects
5. Selected Fieldwork Highlights
6. Future ASPeCt activities



Key Activities in 2016-2018

❖ Administrative:

→ ASPeCt updated and submitted its Terms of Reference and created a new leadership structure under which it now operates. The group is now led by Chair (Marilyn Raphael), Vice Chair (*to be nominated*) an Immediate Past Chair (Steve Ackley) a Junior Officer(ECS) (Stefanie Arndt) and a Communication and Data Executive (Petra Heil).

→ Meeting held during the IGS meeting in New Zealand in February 2017. Focused on discussions of potential new ASPeCt activities.

❖ Scientific

→ In 2017, the PIPERS cruise into the early winter Ross Sea was successfully completed and initial reports on the outcomes will be made the subject of numerous posters and oral presentations at the SCAR POLAR18 OSC. Funded by the NSF, the cruise was an international effort with ASPeCt scientists from several countries on board making measurements and carrying out experiments.

Cruise led by S. Ackley, S. Stammerjohn, T. Maksym, J. Cassano, P. Guest and R. Bell

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Project to work on IceBridge airborne lidar analyses for sea ice thickness from China funded by NSF-China. (X. Wang PI(China), S.F.Ackley Co-I(USA) and H.Xie Co-I(USA)).

This project is completed

Outcomes:

Wang, X.W., F. Guan, J. Liu, H. Xie, and S. Ackley, 2016. An improved approach of total freeboard retrieval with IceBridge Airborne Topographic Mapper (ATM) elevation and Digital Mapping System (DMS) images. *Remote Sensing of Environment* 184: 582-594, doi:10.1016/j.rse.2016.08.002

Wang, X., H. Xie, Y. Ke, SF Ackley, and L. Liu, 2013. A method to automatically determine sea level for referencing snow freeboards and computing sea ice thicknesses from NASA IceBridge airborne LIDAR. *Remote Sensing of Environment*, Vol. 131: 160-172. doi: 10.1016/j.rse.2012.12.022

Two oral presentations in POLAR2018 session OS that use the Wang et al approach developed for analysis of IceBridge data for the Ross Sea (Tian et al) and the Weddell Sea (Jing Li et al) in our continuing efforts to develop ice thickness information from IceBridge.

Data acquisition & processing software

The ASPeCt digital underway ice observation method, version 2:

- Deployment & testing of 1-version for **bridge-based observations**.

 - Deployed by AADC in summer 2016/17.

 - Finalizing the sea ice core database and coordinating user interfaces for data access through the Australian Antarctic Division data centre.

 - Continued additions to the ship observations database (ASPeCt observations).

Continued development of sea ice thickness and sea ice core properties databases.

 - Continued development of the ASPeCt ship-based observation system and database for sea ice measurements taken by remote vessels (airborne and under ice), ship-based instruments and surface-based instruments and sampling.

Meets ASPeCt's TOR:

Provide standardization of ice observing protocols, and core and ice station sampling.

Provide data archive for ship observations, ice thickness profiles, ice core properties, aerial photos

Provide metadata directory to experiment data sets, buoy data.

New data acquisition and analysis system: "IceBox"

IceBox

Australian Antarctic Division [AU] | <https://data.aad.gov.au/aspect/>

IceBox

sea ice data acquisition and analysis system

For observers

ASPeCt - Australian Antarctic Division

41st Russian Expedition 07 Jun - 22:28 UTC
VL: VL - Captain: Captain
Observer This Hour: None Rostered

May 30 1996

Position		Sea Ice Observations																									
W	Latitude	Longitude	Class	Primary Ice	Secondary Ice						Secondary Ice																
[Z]	dd°mm'SS'W	dd°mm'SS'W	[mmths]	C	ty	z	f	l	s	h2	h1	mc	ms	ml	ml2	C	ty	z	f	l	s	h2	h1	mc	ms	ml	ml2
9	61°21.000'S	18°25.620'W	9	2	69	32	400	330	2	4	6	50	29	400	330	2	3										
1	61°22.980'S	18°15.620'W	9	4	69	35	400	330	2	5	4	50	29	400	330	2	5										
2	61°25.000'S	17°59.620'W	9	3	69	32	400	330	2	5	5	50	29	400	330	2	3										
3	61°31.000'S	18°46.620'W	9	5	69	35	400	330	2	5	3	50	29	400	330	2	3										
4	61°38.000'S	18°24.620'W	9	7	69	35	400	330	2	5	1	50	29	400	330	2	3										
5	61°39.000'S	19°19.400'W	9	3	69	32	700	330	2	5	5	50	29	400	330	2	5										
6	61°39.000'S	19°27.800'W	29	6	69	32	800	330	2	5	3	50	29	400	330	2	5										
7	61°31.000'S	19°16.620'W	9	2	69	35	500	330	2	5	4	50	25	600	330	2	5										
8	61°28.980'S	14°49.980'W	9	2	69	35	900	330	2	5	4	50	25	600	330	2	5										

and researchers

IceBox

Australian Antarctic Division [AU] | <https://data.aad.gov.au/aspect/>

Download IceBox

For running ice observations and data analysis
Requires Windows, MacOS or Linux

Download Cruise

Historical ASPeCt cruise data for use within
the IceBox application or stand-alone

data.aad.gov.au/aspect

ASPeCt links with other groups: outreach, communication and capacity building activity:

Meets ASPeCt TOR:

Collaborate with other groups (e.g AntClim21, SORP) where such collaboration draws upon the expertise within ASPeCt.

SCAR: ASPeCt Chair Marilyn Raphael is a member of the AntClim21 SSG and led the sea ice component of the Great Antarctic Climate Hack Workshop sponsored by AntClim21 in October 2017. Marilyn also helped to plan the recent (16-17/06/18) Workshop that followed on from the GACH.

SCAR: Inga Smith a member of ASPeCt, is also Co-Chair of the CLIVAR/CliC/SCAR Southern Ocean Region Panel (SORP). She coordinates activities of interest to both groups for example ASPeCt interest in working more closely with SORP on Ocean Observations Panel for Climate (OOPC). Francois Massonnet, another ASPeCt member also serves on SORP.

OTHER: Continued representation on the World Climate Research Programme (WCRP) and SPARC's Polar Climate Predictability Initiative (PCPI) via membership on the leadership group. (Marilyn Raphael is co-lead of PCPI).

ASPeCt links with other groups: outreach, communication and capacity building activity:

OTHER: Southern Ocean Observing System (SOOS) – Steve Ackley, co Chair of ASPeCt also served on the SOOS SSG. He has been replaced by Burcu Ozsoy-Bicek, another ASPeCt member.

OTHER: Year of Polar Prediction Southern Hemisphere (YOPP-SH) – ASPeCt member, Francois Massonnet was supported by ASPeCt to attend the most recent joint meeting in June, 2017 in Boulder, CO. There he presented the project SIPN South. SIPN South aims at collecting and analysing seasonal sea ice forecasts in the Southern Ocean for the next two years (2017-2019). * Note that ASPeCt will be seeking to have its data acquisition strategy endorsed for inclusion in YOPP. This will be one of ASPeCt's chief contributions to YOPP.

*** Numerous ASPeCt scientists are also individually involved with (i.e leading) their national programs focused on the Antarctic and sea ice observation. For example Dr. Burcu Orszoy-Bicek leads the fledgling Turkish Antarctic project, Dr Kay Ohshima leads the Japanese ROBOTICA project.*

German Antarctic sea ice projects.

Selected ASPeCt national projects

- ❖ **Neumayer Station - Fast-ice in Akte Bay:** Monthly measurements on sea ice thickness, snow depth and platelet ice thickness are done. These data sets will be published soon.
- ❖ **Outreach - Outreach project “Adopt a buoy”,** all Snow Depth and Ice-Mass balance Buoys deployed during PS111 were decorated with pictures painted by children from all over Germany. Project page (in German):
<http://www.meereisportal.de/meereisexpedition/buntes-bojen-abenteuer/>
- ❖ **Satellite data:** A first approach to sea-ice thickness maps and time series on Antarctic sea ice from 2002 onwards. This data set is experimentally but will be soon available on data.meereisportal.de.
- ❖ **Projects:** Snow Cover impacts on Antarctic Sea ice (SCASI)“ (led by Marcel Nicolaus, AWI), and the retrieval of Sea ice type distribution in the Antarctic from microwave satellite observations (SITAnt)“, led by Gunnar Spreen (University of Bremen).

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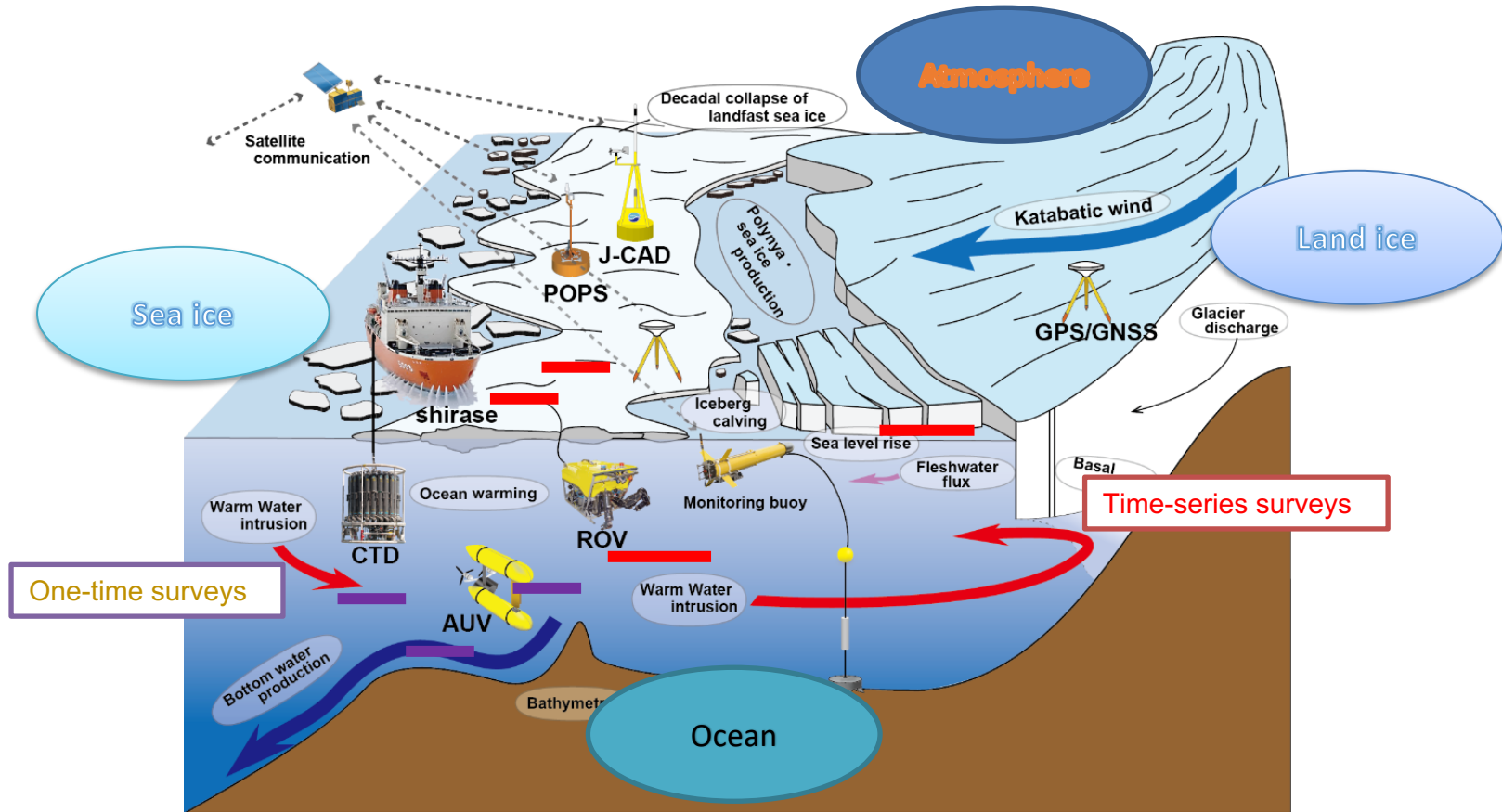
- ❖ New Zealand researchers took part in the NSF-funded PIPERS cruise and collaborated by undertaking electromagnetic induction sea ice thickness flights from McMurdo Sound up to the Adare Peninsula.
- ❖ **Sea ice field work** conducted as part of the Deep South National Science Challenge (DSNSC) - to enable New Zealanders to adapt, manage risk, and thrive in a changing climate. Antarctic sea ice is an important component of this. <http://www.deepsouthchallenge.co.nz/>
- ❖ **Outreach activities:** at least 4 magazine or newspaper articles, several radio interviews and presentations in the Otago Museum.

- ❖ Australian Antarctic Division (AAD) coordinated collection of ASPeCt underway data on several cruises, including US PIPERS (Apr - May 2017), South African Marginal Ice Zone voyage (Jun/Jul 2017), AAD's Voyages 1 -3 (2017/18) and AWI's PS111 (Jan/Mar 2018).
- ❖ Porting of historic ASPeCt data [Worby et al., 2008] to new ASPeCt data server at AADC (Australian Antarctic Data Center).
 - Uncovered and dealt with issues with bad and missing data.
 - Added missing voyages.
- ❖ AADC server issues:
 - Decided to transition wrapper to Electron App to speed up.
 - Software release planned for end June 2018.
 - Testing of new software is promising.

Japanese Sea ice project

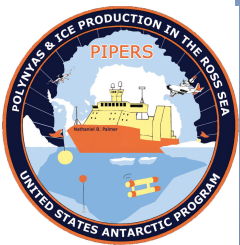
Research of Ocean-ice BOundary InTeraction and Change around Antarctica (ROBOTICA) ,led by Drs. Aoki & Tamura

Based on mobility of *Shirase*, revealing Interactions and decadal-longer variabilities of Climate subsystems in East Antarctica with Interdisciplinary observations using autonomous techniques during 2016-2022



A few field work highlights of ASPeCt work. These are from slides provided by different ASPeCt group members. Not all activities lend themselves to slides. Other members' contributions are represented in our list of publications from 2016 – 2018.

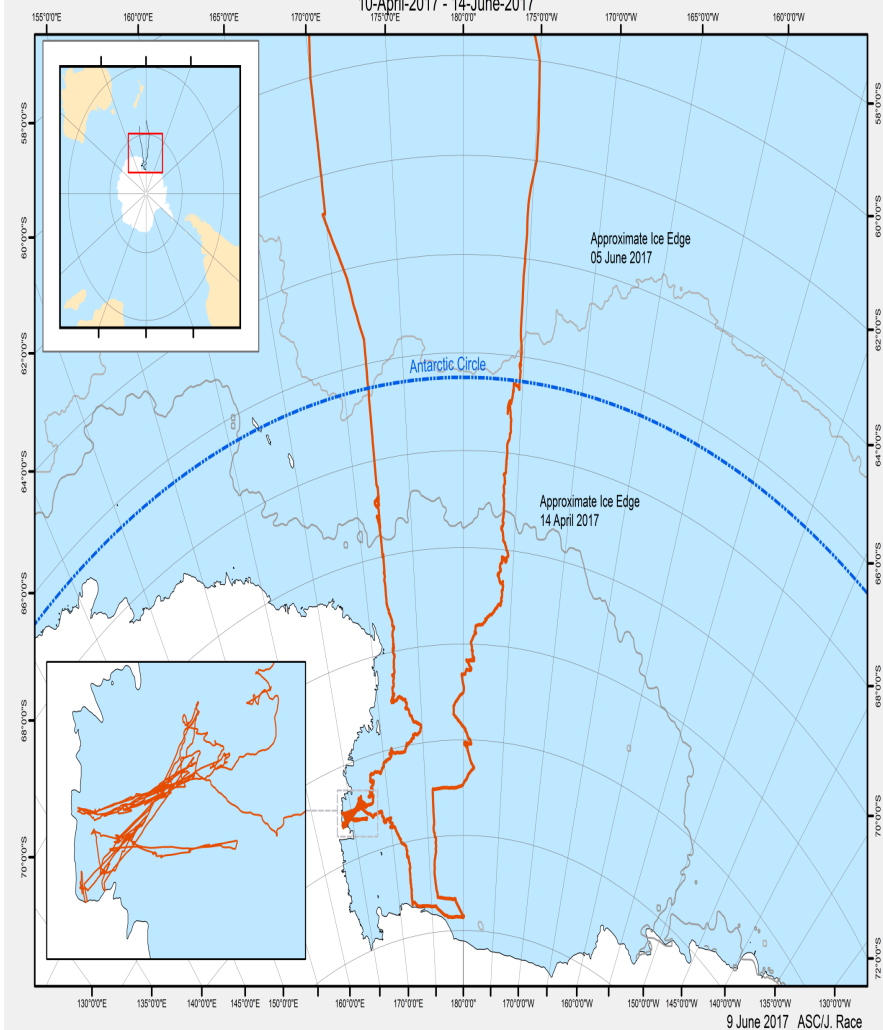




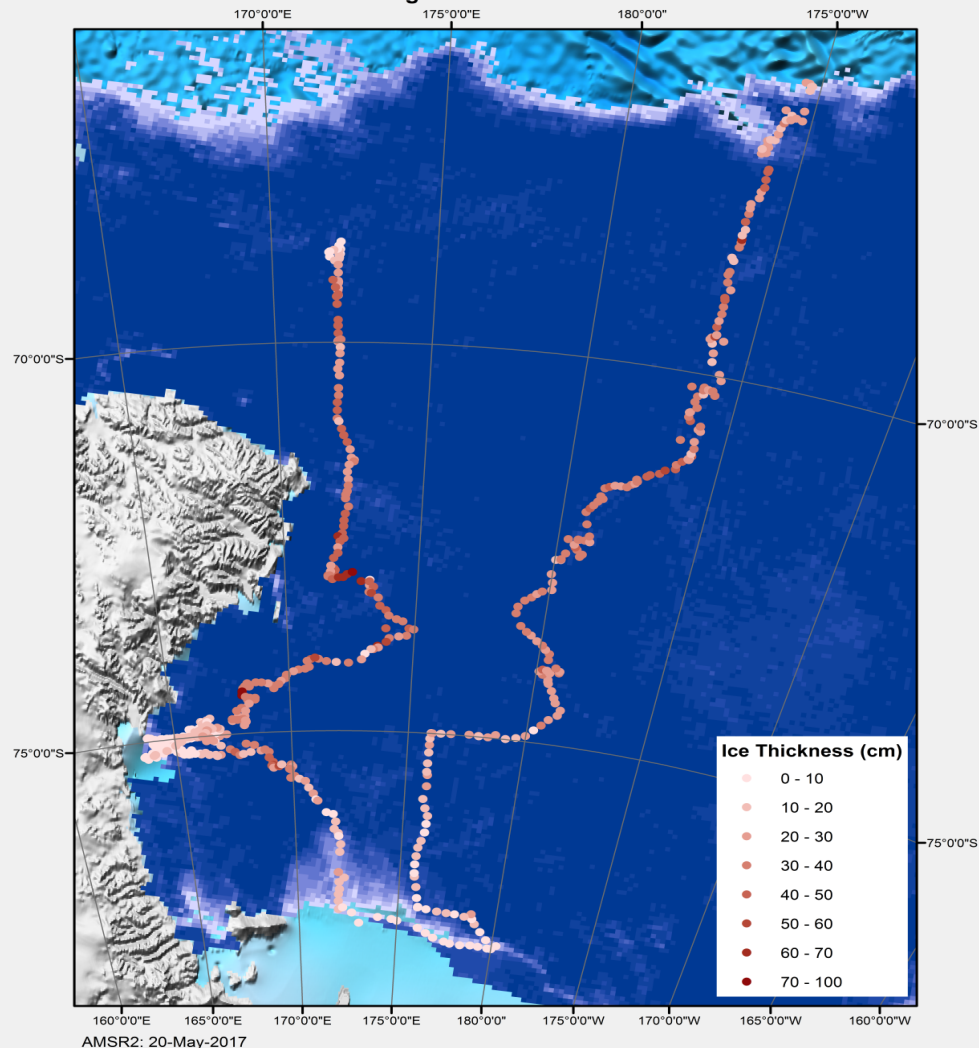
PIPERS: Polynyas, Ice Production, and seasonal Evolution in the Ross Sea April - June 2017



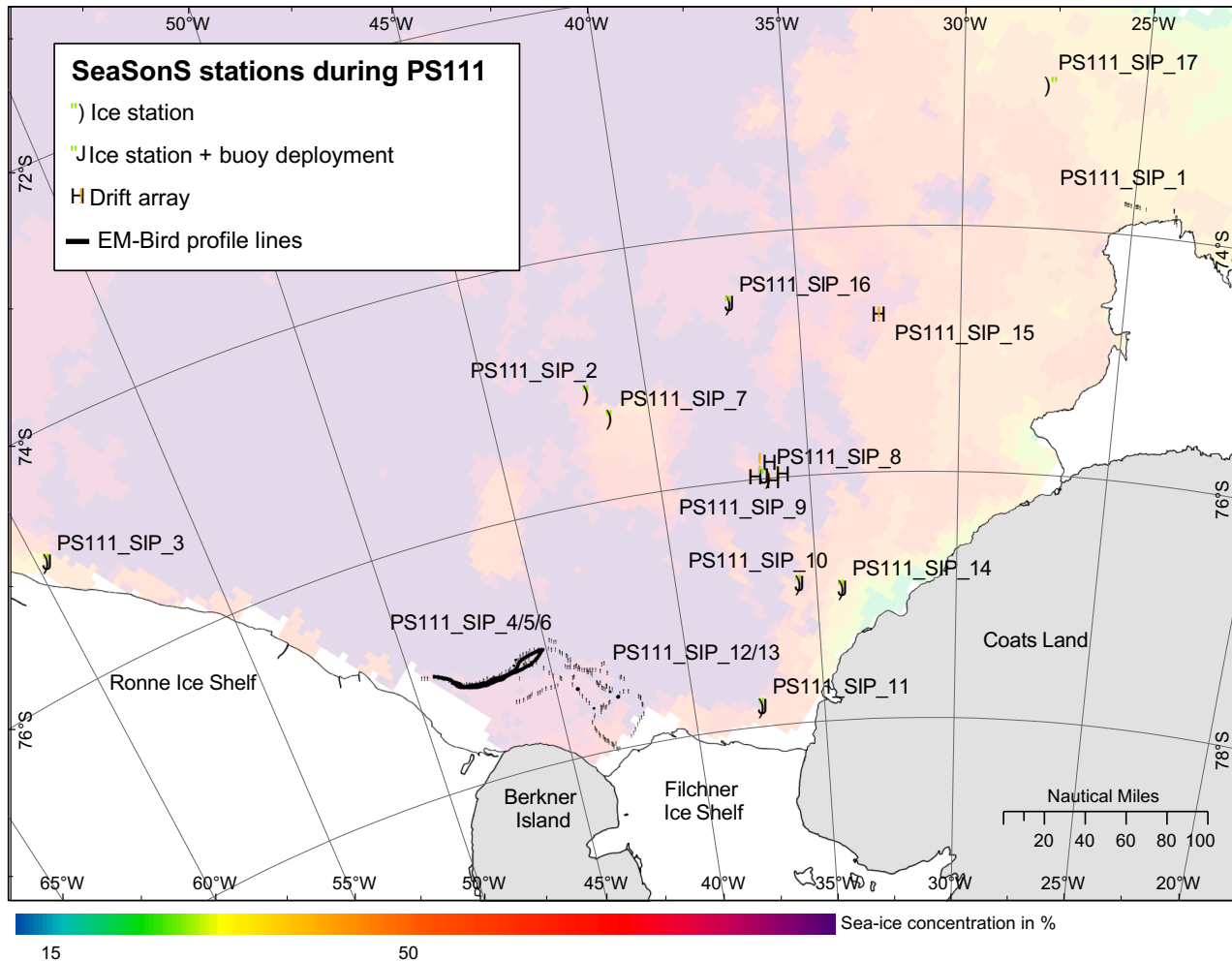
NBP17-04 PIPERS Cruise Track Map
10-April-2017 - 14-June-2017



Ice Observations
Weighted Ice Thickness



Investigating the seasonal variability of sea ice and snow properties in the Weddell Sea



16 sea ice floes

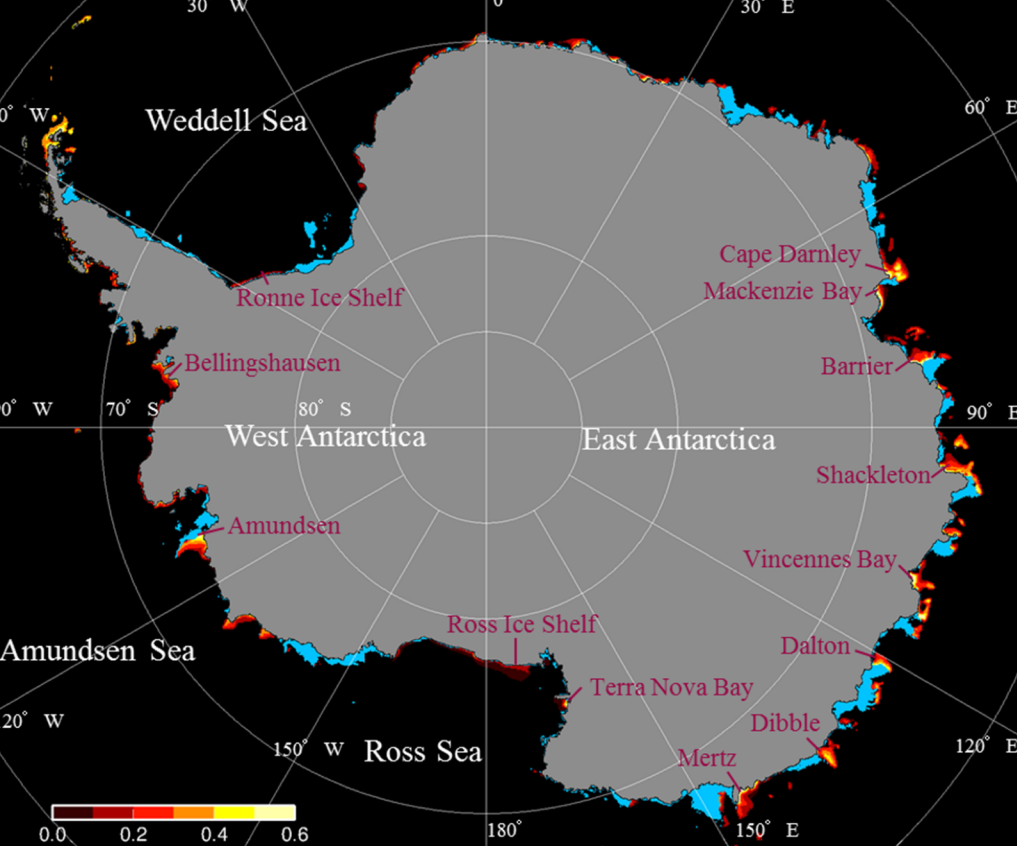
24 buoy deployments

7 snow/ice stations

-1000 km sea ice thickness transects

Polarstern Expedition in to the Weddell Sea - 19 Jan - 14 Mar 2018)

This cruise also contributed to additional ASPeCt observations, which are published in Pangaea: <https://doi.pangaea.de/10.1594/PANGAEA.880046>



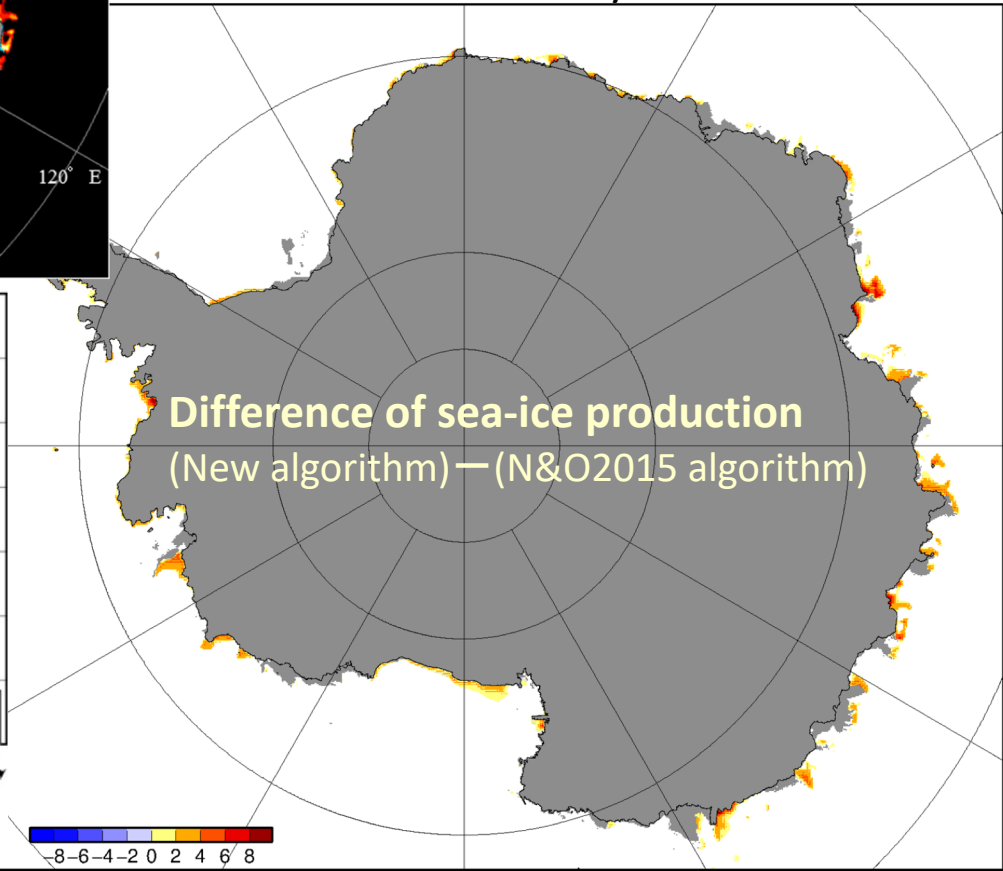
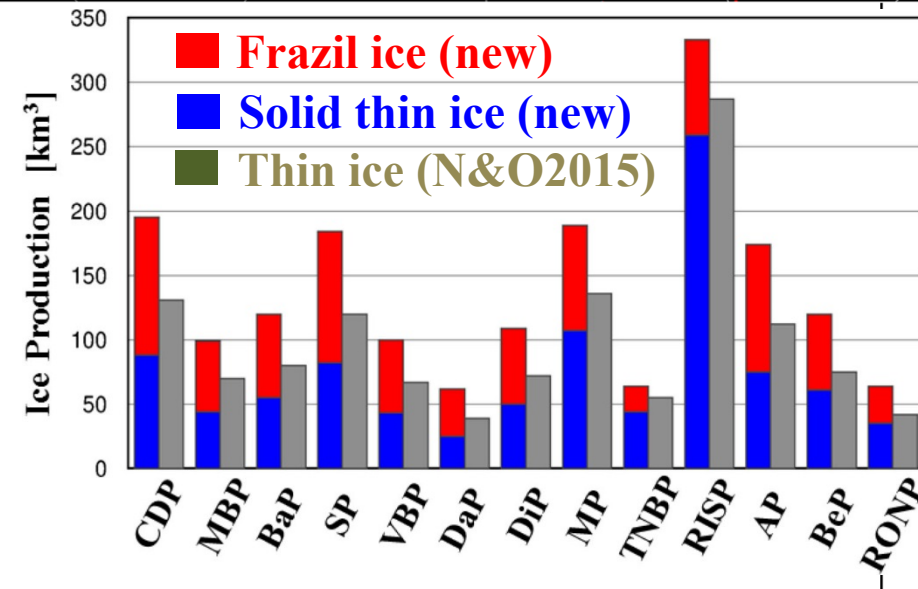
Improvement of thin-ice thickness algorithm



Frequency of occurrence of active frazil.

Active frazil is predominant in the East Antarctica, where prevailing offshore wind is strong

by Kazuki Nakata



Future ASPeCt Activities

- ❖ **Development of ASPeCt ship-based automated instrumentation of sea ice observation.** ASPeCt's sea ice observation platform is now established, the software is working and observations are being contributed consistently by research cruises in the region. A natural next step in the evolution of sea ice observation is automation of observation and recording of such information in a way that matches the present ASPeCt protocol. This was the subject of discussion at ASPeCt's side-meeting 06/17/18
- ❖ **ASPeCt will convene a session (4 separate sections) on Antarctic sea ice processes and ice shelves status** at the SCAR OSC in Davos, Switzerland (June 2018) *and will also hold a side-meeting on June 17th, before the OSC begins.* Scientists from the PIPERS cruise will also hold a meeting during the week of the SCAR POLAR18 OSC.
- ❖ **ASPeCt will hold a workshop at the SCAR 2020 OSC** in Hobart, Tasmania. This will be the first full-scale workshop that ASPeCt has had in six years and will highlight the group's achievements as well as establish plans for future group efforts. *Discussions on the foci of the workshop began at our side-meeting and will continue.*



THANK YOU!



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