



SCAR Sub-Group

ASPeCt

SG / SC

PS

Person Responsible: Marilyn Raphael

## XXXVII SCAR Delegates Meeting

India, September 2022

# Antarctic Sea-ice Processes and Climate (ASPeCt)

## 2020-22 Report

### Summary

#### Report Author(s)

Marilyn Raphael (Chair, USA)

#### Summary of activities from 2020-22

The key challenge that ASPeCt faced over the past two years was (and remains) the COVID-19 pandemic which limited our activities and led to revision of planned activities.

2020- ASPeCt held a Workshop online on July 31<sup>st</sup>, 2020. This workshop was previously scheduled to be held in Hobart at the SCAR 2020 OSC. We were updated on the progress of our national programs, we updated the community on ASPeCt-led initiatives, identified critical Antarctic sea-ice areas for targeted observations in next 5 – 8 years and identified key ASPeCt objectives for the next 5 – 10 years. SOOS and SORP joined our meeting to discuss common goals. Parallel sessions convened by ASPeCt scientists, were held online during the SCAR 2020 OSC.

**2020-2022-** ASPeCt Immediate Past Chair, Steve Ackley, led a weekly online seminar series on Antarctic Sea Ice and Southern Ocean including numerous ASPeCt scientists. This series was instrumental in keeping ASPeCt scientists engaged despite the restrictions imposed during the pandemic.

**2021-** We revised our use of requested funds using them instead to hire someone to update our database. This update included quality control and entering new data, making the database accessible to the larger public and formatting the data to make it easier for incorporating into climate models, and finally, analysing the data and writing up the results. [An outcome of this is our newly updated sea ice cards for training of sea-ice observers on our icebreakers.](#)

**2022-** ASPeCt scientists participated in publication of BAMS article, **A New Structure for the Sea Ice Essential Climate Variables of the Global Climate Observing System**, Lavergne and Kern et al. (2022). DOI: <https://doi.org/10.1175/BAMS-D-21-0227.1>

**2022- Just initiated:** An information gathering exercise aimed at developing a community-owned pipeline from observational methods → protocols → meta data (→ data). This includes standardization of observation protocols and development of best practices. The outcomes of these are scheduled to be discussed at a proposed ASPeCt workshop at the IGS sea ice meeting in Bremerhaven, in June 2023.

#### Summary Budget 2021 to 2024

	2021	2022	2023	2024
	Spent	Allocated	Request	Request
(US\$)	\$5000	\$3000	\$5000	\$5000

## Progress to date

### Sub-group Outcomes Summary

Sub-group	Activity/Outcome/Benefit/Achievement
ASPeCt	- ASPeCt held a Workshop online on July 31 <sup>st</sup> 2020. This workshop was previously scheduled to be held in Hobart at the SCAR 2020 OSC. We were updated on the progress of our national programs, we updated the community on ASPeCt-led initiatives, identified critical Antarctic sea-ice areas for targeted observations in next 5 – 8 years and identified key ASPeCt objectives for the next 5 – 10 years. Representatives from SOOS and SORP participated in the workshop
ASPeCt	-ASPeCt Immediate Past Chair, Steve Ackley, led a weekly online seminar series on Antarctic Sea Ice and Southern Ocean including numerous ASPeCt scientists. This series was instrumental in keeping ASPeCt scientists engaged despite the restrictions imposed during the pandemic, with a consistent attendance of 20 – 40 participants.
ASPeCt	ASPeCt updated its database in 2021-2022. This update included quality control, entering new data, making the database accessible to the larger public and formatting the data to make it easier for incorporating into climate models, and analysing the data and writing up the results. An outcome of this is our newly updated sea ice cards for training of sea-ice observers on our icebreakers.
ASPeCt	Numerous ASPeCt scientists participated in publication of BAMS article, <b>A New Structure for the Sea Ice Essential Climate Variables of the Global Climate Observing System</b> , Lavergne and Kern et al. (2022). DOI: <a href="https://doi.org/10.1175/BAMS-D-21-0227.1">https://doi.org/10.1175/BAMS-D-21-0227.1</a> The article argues that the Global Climate Observing System should from now on consider a set of seven ECVs (sea ice concentration, thickness, snow depth, surface temperature, surface albedo, age, and drift).
ASPeCt	ASPeCt has just initiated an information gathering exercise aimed at developing a community-owned pipeline from observational methods → protocols → meta data (→ data). This includes standardization of observation protocols and development of best practices. The outcomes of these are scheduled to be discussed at a proposed ASPeCt workshop at the IGS sea ice meeting in Bremerhaven, in June 2023.

### Sub-group Cash Flow

(Since previous report to Delegates in 2020)

Sub-group	Allocation	Amount spent		
		2020	2021	2022
ASPeCt	\$5000		\$5000	
ASPeCt	\$3000	-----	-----	Not yet spent

## Future plans

### Planned activities in 2022 to 2024

Sub-group	Planned activity
ASPeCt	Group side-meeting in August 2022 paired with SCAR 2022 OSC
ASPeCt	Participation in IGS sea ice symposium in Bremerhaven in 2023 and In-person ASPeCt workshop at the same meeting.
ASPeCt	Fund development of a community-owned pipeline from observational methods → protocols → meta data (→ data). This includes standardization of observation protocols and development of best practices.
ASPeCt	Renewed enlistment of cruises going into the sea ice zone using DUE SOUTH as a tool to access information on upcoming cruises
ASPeCt	Continuing 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.

### Planned use of funds for 2022 to 2024

Year (YYYY)	Purpose/Activity	Amount (in USD)	Contact Name	Contact Email
2022	Fund travel and participation in ASPeCt-related meetings; fund development of community-owned pipeline from observation → data and database management needs	\$3000	Marilyn Raphael	raphael@geog.ucla.edu
2023	Fund travel and participation in ASPeCt-related meetings	\$5000	Marilyn Raphael	raphael@geog.ucla.edu
2024	Fund travel and participation in ASPeCt-related meetings	\$4000	Marilyn Raphael	raphael@geog.ucla.edu
<b>Total</b>		<b>\$12000</b>		

### Any additional detail on funds usage and desired results/outcomes

ASPeCt members convene sessions at regular science conferences and ASPeCt leverages members' attendance to hold sub-group meetings to ensure that progress is made on ASPeCt goals. ASPeCt members also attend meetings of groups with which it would like to form closer ties. To that end ASPeCt requests support in each of years 2022 to 2024 to support ASPeCt-related travel to science conferences and

to coordinate with other groups. The requested funds will be targeted primarily to support the travel of early career scientists.

Anticipating an in-person meeting in 2023, ASPeCt plans to hold a side meeting at the IGS sea ice meeting in Bremerhaven in June 2023. This is a meeting where we hope draw many ASPeCt members and which will allow us to regroup and recover from the effects of the pandemic and to discuss progress on continuing work. The requested funds will be targeted primarily to support the travel of early career scientists to attend and participate in the side-meeting.

*An overall benefit of these meetings is the fostering of community and alignment of common ASPeCt-related goals which together ensure scientific progress.*

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

2022: Here we expect at least 50% of the budget to go towards funding ECSs.

2023: Here we expect at least 50% of the budget to go towards funding ECSs.

2024: Here we expect at least 50% of the budget to go towards funding ECSs.

### **Percentage of the budget to be used for support of scientists from countries with developing Antarctic programmes**

2022: This is not known but we expect to prioritize ECSs from such countries.

2023: This is not known but we expect to prioritize ECSs from such countries.

2024: This is not known but we expect to prioritize ECSs from such countries.

## Membership

### Leadership

Role	First Name	Last Name	Affiliation	Country	Primary Language	Email	Date Started
<b>Chair</b>	Marilyn	Raphael	UCLA Department of Geography	USA	English	raphael@geog.ucla.edu	2017
<b>Data and Communications Officer</b>	Petra	Heil	Australian Antarctic Division/AAPP	Australia	English	petra.heil@utas.edu.au	2017
<b>* Junior Officer</b>	Stefanie	Arndt	Alfred Wegener Institute	Germany	German	stefanie.arndt@awi.de	2017
<b>Immediate Past Chair</b>	Stephen	Ackley	University of Texas at San Antonio	USA	English	Stephen.Ackley@utsa.edu	2017

*(Please identify early-career researchers with \* in first column)*

### Other members

First Name	Last Name	Affiliation	Country	Primary Language	Email
Kay	Ohshima		Japan	Japanese	
Rob	Massom	AAD/AAPP	Australia	English	
Ted	Maksym	WHOI	USA	English	
Pat	Langhorne	University of Otago	New Zealand	English	
Elizabeth	Hunke	LANL	USA	English	
Klaus	Meiners	AAPP	Australia	English/German	
Sharon	Stammerjohn	INSTAAR	USA	English	
Jean Louis	Tison		Belgium	French	
Gunther	Heinemann	University of Trier	Germany	German	
Ron	Kwok	JPL	USA	English	

*(Please identify early-career researchers with \* in first column)*

\*ASPeCt has more than 60 members, many of whom are early career researchers. Here we include only the members on our Advisory Group. We can send a full list of the membership by email if necessary.

## Additional information (optional)

### Notable Papers

1. Ackley, S; Stammerjohn, S; Maksym, T; Smith, M; Cassano, J; Guest, P; Tison, J-L; Delille, B; Loose, B; Sedwick, P; DePace, L; Roach, L; Parno, J (2020). Sea ice production and air-ocean-ice-biogeochemistry interactions in the Ross Sea during the PIPERS, 2017 autumn field campaign, *Annals of Glaciology*, 1-15. [doi:10.1017/aog.2020.31](https://doi.org/10.1017/aog.2020.31)

This paper is the outcome of the PIPERS project - a comprehensive campaign in the seasonal sea-ice zone and coastal polynyas of the Ross Sea, to examine the coupled air-ice-ocean processes driving the autumn sea-ice advance and their impacts on biogeochemical processes.

2. Stammerjohn, S. E., and Scambos, T. A. **2020**. Warming reaches the South Pole. *Nat. Clim. Chang.* (2020). <https://doi.org/10.1038/s41558-020-0827-8>.

This paper discusses the switch in temperature trend over the South Pole which contrary to the last half of the 20<sup>th</sup> century is now shown to be warming over the past 30 years at three times the global rate.

3. Thompson, L., M. Smith, J. Thomson, S. Stammerjohn, S. Ackley, B. Loose, **2020**. Frazil ice growth and production during katabatic wind events in the Ross Sea, Antarctica, *The Cryosphere*, 14, 3329-3347, <https://doi.org/10.5194/tc-14-3329-2020>.

This paper describes oceanic observations during multiple katabatic wind events during May 2017 in the Terra Nova Bay and Ross Sea polynyas. Indications are that unconsolidated crystals may be an important part of the total freezing that happens around Antarctica.

4. Reiser, F., Willmes, S., Heinemann, G., 2020: A new algorithm for daily sea ice lead identification in the Arctic and Antarctic winter from thermal-infrared satellite imagery. *Remote Sens.* 2020, 12, 1957; doi:10.3390/rs12121957.

This paper presents a new algorithm with which leads are automatically identified in satellite thermal infrared images. The algorithm uses a variety of lead metrics to distinguish between true leads and detection artefacts with the aid of fuzzy logic.

5. Rack, W., Price, D., Haas, C., Langhorne, P.J., Leonard, G.H. (2021) Sea ice thickness in the western Ross Sea. *Geophys. Res. Lett.* <https://doi.org/10.1029/2020GL090866>

This paper gives a first direct glimpse of the sea ice thickness distribution in the western Ross Sea. Overall, about 80% of the ice is heavily deformed, concentrated in ridges with thicknesses of 3.0–11.8 m. This is evidence that sea ice is much thicker than in the central Ross Sea.

6. Isaacs, F. E., Renwick, J. A., Mackintosh, A. N., & Dadic, R. (2021). ENSO modulates summer and autumn sea ice variability around Dronning Maud Land,

Antarctica. *Journal of Geophysical Research: Atmospheres*, 126(5), e2020JD033140. <https://doi.org/https://doi.org/10.1029/2020JD033140>

This paper investigated the links between ENSO and sea ice concentration around East Antarctica. Its findings highlight the importance of tropical variability in driving changes in Antarctic sea ice.

7. Wang, Y., X. Yuan and M. Cane, 2022: Coupled mode of cloud, atmospheric circulation, and sea ice controlled by wave-3 pattern in Antarctic winter. *Environmental Research Letters*, 17, 044053.

This paper shows that the radiative effect of clouds related to zonal wave-3 pattern can generate significant anomalies in sea ice thickness in the Amundsen Sea. It contributes to our understanding of the interaction between Antarctic sea ice processes and the atmosphere.

8. Arndt, S., Haas, C., Meyer, H., Peeken, I., and Krumpen, T.: Recent observations of superimposed ice and snow ice on sea ice in the northwestern Weddell Sea, *The Cryosphere*, 15, 4165-4178, 10.5194/tc-15-4165-2021, 2021.

This paper examined snow depth and ice thickness measurements and sea ice core analyses in the northwestern Weddell Sea in 2019. The results suggest that the low sea ice coverage in the northwestern Weddell Sea in February 2019 was due to dynamic or oceanic processes rather than thermodynamic atmospheric effects.

9. Nakata, K., K. I. Ohshima and S. Nihashi, 2021: Mapping of active frazil for Antarctic coastal polynyas, with an estimation of sea-ice production. *Geophysical Research Letters*, 48, e2020GL091353, doi:10.1029/2020GL091353.

This paper presents the first mapping of active-frazil area for Antarctic coastal polynyas, based on the thin ice algorithm of AMSR-E that discriminates active-frazil area. Results suggest that in all the major polynyas active-frazil extent depends on offshore wind and air temperature, while ice production is determined by offshore wind only.

10. Tian, T. R., Fraser, A. D., Kimura, N., Zhao, C., and Heil, P.: Rectification and validation of a daily satellite-derived Antarctic sea ice velocity product, *The Cryosphere*, 16, 1299–1314, <https://doi.org/10.5194/tc-16-1299-2022>, 2022.

This paper compares the widely used passive-microwave-derived Antarctic sea ice motion product by Kimura et al. (2013) with buoy-derived velocities and interprets the effects of satellite observational configuration on the representation of Antarctic sea ice kinematics.

### **Direct support from outside organisations received for your activities**

CliC provided technical support for the ASPeCt online Workshop in July 2020. This includes providing and supporting the video conferencing platform and recording the meeting.

## **Major collaborations your group has with other SCAR groups and with organisations/groups beyond SCAR**

### **Within SCAR**

1. ASPeCt Chair Marilyn Raphael was a member of the AntClim21 SSG. AntClim21. *Note that this project closed in 2021.*
2. ASPeCt Chair Marilyn Raphael is a member of AntClimNow and worked on the Science and Implementation Plan that was presented to SCAR in 2020.
3. 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). *Note that Inga is no longer Co-Chair of SORP beginning 2022.*

### **Outside SCAR**

1. Continued representation on the World Climate Research Programme (WCRP) and SPARC's Polar Climate Predictability Initiative (PCPI) as co-Lead of the Initiative (Marilyn Raphael).
2. Participation in the Year of Polar Prediction, an international research effort sponsored by World Meteorological Organization's (WMO) World Weather Research Programme (WWRP).
3. Southern Ocean Observing System (SOOS) – ASPeCt member Burcu Ozsoy (Turkey), is a Scientific Member on the SOOS Scientific Steering Committee.
4. Continuing contribution to the annual BAMS/NOAA State of the Climate assessment reports, re Antarctic sea ice extent and seasonality <http://www.ncdc.noaa.gov/bams-state-of-the-climate/>.
5. The British Antarctic Survey project "*Drivers and Effects of Fluctuations in sea Ice in the ANTArctic (DEFIANT)*". In her role as ASPeCt Chair, Marilyn Raphael serves on the Advisory Board of DEFIANT.

\*\*\*\* 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 leads the Turkish Antarctic project, Dr. Petra Heil and Dr. Rob Massom lead AAD/AAPP efforts.

### **Outreach, communication and capacity-building activities**

No new highlights to share since the last report. However, ASPeCt has a mailing list of more than 60 members. This mailing list is housed at the Los Alamos Lab and administered by Elizabeth Hunke as well as the ASPeCt leadership. The mailing list is used frequently to inform the group, to foster discussion about ASPeCt activities and to collect information about the results of ASPeCt-related activities. The mailing list is quite diverse in terms of gender and nationality and continues to grow.

Since 2018 ASPeCt has established a Twitter presence, actively informing about ASPeCt efforts at meetings, conferences and in the field. This effort (and the improvement of the website) is led by Stefanie Arndt, our Junior Officer. The pandemic has affected our use of this medium but as conditions return to the "new normal" we will be using this platform.



**Contributions to equality, diversity, and inclusion (EDI)**

No new contributions to report. ASPeCt continues to maintain EDI principles within the group.

**SCAR fellowship reviewers**

First Name	Last Name	Email	Principal Expertise
Marilyn	Raphael	raphael@geog.ucla.edu	Sea-ice atmosphere interactions
Sharon	Stammerjohn	sharon.stammerjohn@colorado.edu	Sea ice
Rob	Massom	Rob.Massom@aad.gov.au	Sea ice
Will	Hobbs	whobbs@utas.edu	Southern Ocean