AAPP Symposium 2021

Progress and Priorities in the Antarctic and Southern Ocean

26 - 27 October 2021

Summary Report

Dear Colleagues,

Thank you for being a part of the AAPP's recent Symposium 2021. The Symposium was a wonderful opportunity for staff and stakeholders to come together to showcase research achievements from our first two years of operation, and to help set future priorities. Around 100 people attended.

With COVID-19 lockdowns in place around most of the country, Tasmanian-based staff were privileged to come together at the Old Woolstore in Hobart, where some of us met in person for the first time! I wish to extend a very special acknowledgement to those colleagues interstate who were unable to attend in person and joined us online. We look forward seeing you in Hobart very soon!

We were also pleased to welcome representatives from our partner research agencies, including the University of Tasmania, the Australian Antarctic Division, CSIRO, the Bureau of Meteorology, the Integrated Marine Observing System, Geoscience Australia, and the Tasmanian Government – as well as from our funding agency, the Department of Industry, Science, Energy and Resources. The AAPP's work builds on a long history of collaboration and partnership established by these organisations over four decades.

Opening speeches by Senator the Hon. Jonathon Duniam and AAPP Management Committee Chair, Greg Johannes, highlighted the strong and positive reputation that this research community enjoys. The quality of our research, and its value to policy makers, are thanks to your ongoing efforts.

Of course, the first two years of the centre have not been without their challenges. Lockdowns and travel restrictions have clearly placed limits on to our ability to conduct fieldwork and to recruit staff and students. However, we finish our first two years in a better place than we might have expected even a year ago, with strong support from our partners and from government.

Sessions over the two days were broken up by theme, with presentations demonstrating what a productive first two years we have had, despite external factors. Three major field programs were completed last summer, with more planned for this coming summer, alongside some excellent research published in high impact journals, and strong international and stakeholder engagement across our program. Reports from breakout groups indicated a strong desire for closer collaboration, and for a coordinated approach to setting priorities for future observing capability. Going forward, this feedback will be immeasurably valuable to the AAPP's Themes and Projects, as well as the Management Committee.

Over the following pages are reports from each of our breakout groups. Please take the time to look over these reports, which I hope will give you a deeper understanding of the challenges and research goals of your colleagues in other parts of our organisation.

Thank you to everyone who submitted entries to our poster competition and participated in the lightning lectures. The posters were of outstanding quality and the judges, Sophie Bestley and Andrew Klekociuk, had a difficult task decide on the winners. Congratulations again to our three poster prize winners: Stephy Libera (Best poster 'student'), Alex Fraser (Best poster 'research associate'), and the Zooplankton Team led by Kerrie Swadling (Best poster 'in-kind contributor')

A copy of the Symposium program will remain on the AAPP website as a reference in perpetuity. We would welcome your feedback on any aspect of the Symposium, you can do so by submitting this through our suggestion box.

Best ,
Nathan Bindoff

Breakout report: "Integrating atmospheric modelling into the wider AAPP projects"

Matt Woodhouse, Sonya Fiddes, Marc Mallet

Session description

An opportunity for the atmospheric ACCESS modelling team to see how we can better connect to other aspects of the AAPP, including (but not limited to): BGC (dust, black carbon, DMS, radiation), ice cores (composition modelling eg. sea salt, dust, black carbon, MSA, precipitation fluxes), ocean/sea-ice (is there interest in a fully coupled ACCESS run?). Come along if you think you could use some of our outputs, or if you think we could use some of yours (eg. observations!)

Notes

Session started with an overview of Project 1 Atmosphere's objectives as they relate to the ACCESS model, motivated by the Southern Ocean radiation bias and exploring links with marine biology (DMS, organic aerosol, etc). Very brief overview of ACCESS-CM2/-AM2 also given.

Current plans

- Improve chemistry: MSA
    - Resolve influence of MSA on aerosol
- Constrain trends with ice core data?
- Configure a regional atmosphere version
- Upgrade to more sophisticated cloud scheme (CASIM)
- Resolve sources of ice nuclei
    - (and the influence of IN) ◦ Marine biology
    - Terrestrial sources?

Future ambitions (~now to few years)

- Recruit a UTas PhD student to study simulated multi-decadal trends in atmospheric composition. Goal is to constrain model using recent ice core measurements of CO, (OH), MSA, dust, BC, etc. Project has been formulated (lead by Sonya) and is advertised.
- Develop a regional (Southern Ocean) atmosphere configuration, including updated cloud microphysics scheme. Will allow closer look at aerosol, CCN, IN processes
- Coupling of atmosphere and marine BGC (DMS, marine organic aerosol, nutrient sources) and associated process quantification / study. Prototype for future ESM?

Possible talking points

- Influence next generation ESM?
    - Resolve BGC connections in two-directions
    - sea-ice – biology-atmosphere connections
- What datasets do you have that we can use?
    - CO / OH
    - MSA/sulfate
    - Mineral dust / black carbon

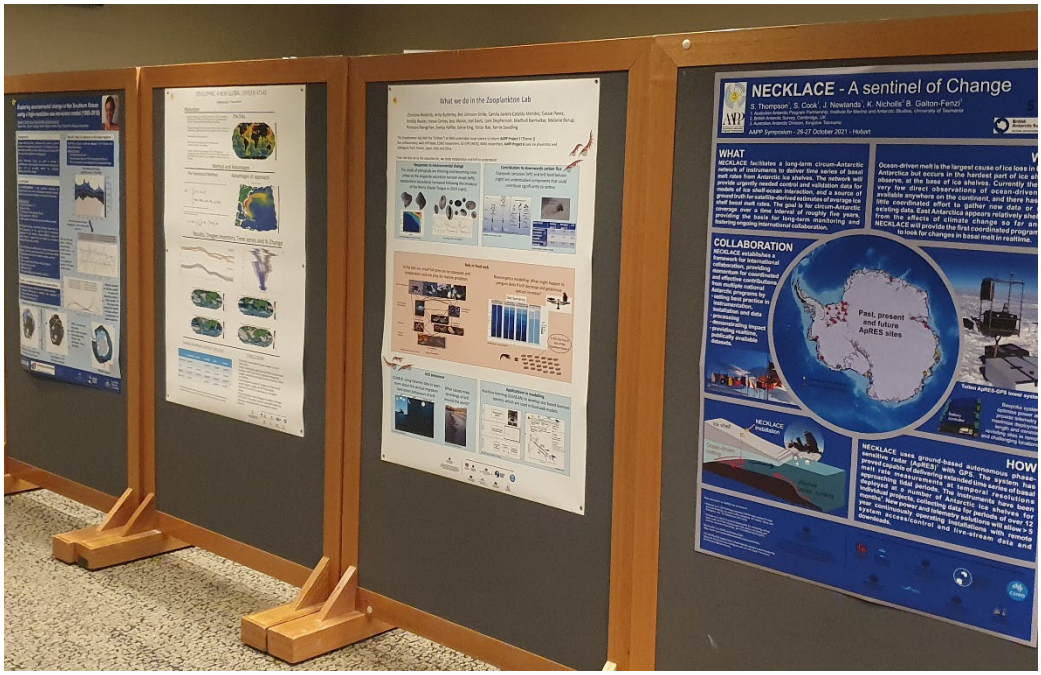
- IN from biology?
- IN from terrestrial sources?
- Terrestrial sources as nutrient source (via aerosol)
- What are we missing?
    - Stratospheric ozone
        - capability exists, include in next ESM? Computationally expensive
    - Stratospheric aerosol
        - capability exists in code, would take some tinkering and testing to make work

Discussion

- Regional modelling
    - Alex Fraser: resolving katabatics, sensitivity to resolution?
    - Katabatics represent formation pathway for aerosol?
- Ice cores
    - Lenneke Jong about to submit a paper of 2000 year record from Law Dome ◦ Other ice cores via Mark C et al, e.g. BC, MSA (~150 years)
    - OH, CO, CH4
    - Dust deposition
- New work from SOTS. Soon to be available:
    - New instrument cascade impactor, size-resolved composition ◦ IMAS dust project: Chris(?) PhD student

Actions

- Matt to develop and submit CSIRO post-doc proposal for coupled atmosphere-ocean-BGC modelling (due at next funding round)
- Recruit UTas PhD student (Sonya, ongoing)
- Scope regional model configuration (Matt / Sonya)



Breakout report: "Antarctic and Southern Ocean modelling"

Ben Galton-Fenzi, Will Hobbs, Sonya Fiddes

Session Description

Modelling activities are key to the successful completion of AAPP milestones across all Themes and Projects. Current AAPP modelling activities cut across all Antarctic geophysical domains (atmosphere, ocean, cryosphere and biogeochemistry), but to date there has been limited discussion on how best to integrate these modelling activities to best support AAPP strategic goals, especially in the medium- to long-term. This session will ensure that a) all Projects are aware of the current modelling activities and platforms are in current use in AAPP; b) ensure that all Projects are aware of what model output is immediately available for analysis; c) will discuss and list any potential science cases/experiments that may have value across multiple AAPP Projects.

Notes

Discuss ACCESS-NRI implementation

- Summarise current platforms
- Summarise experiments currently available for analysis
- Plan future science cases
- Getting science cases configured/set up for opportunistic
- Report from breakout session

Ben G-F opened the session with an overview of current modelling activities in AAPP, an overview of the 'jk72' NCI allocation, and an outline of the aims of the session. The subsequent discussion was facilitated by Will Hobbs. The session had approximately 20 in-house attendees, and 30 online attendees.

Will opened the discussion by checking whether Ben's presentation included all current model platforms in AAPP use. Eric Shultz (BoM) highlighted some planned forecast model activities (inc. sea ice), including station-based domains of the 1.5km 'city' model.

Will next posed the question of whether current activities fulfilled the needs of AAPP and its researchers, which formed the majority of the discussion:

Phil Boyd expressed concern that in some ways 'biology' is seen in the (primarily physical) modelling community as a terminus/end user, rather than an active component of the Earth system. Andy Hogg disagreed with this interpretation (BGC is integral to COSIMA activities). But there was universal agreement (including from Andy Hogg and Andrew Klekociuk) that biology/BGC interactions across different Earth system components (ocean-atmos-sea ice) is a critical activity

Roland Warner expressed concerned that grounded ice/ice sheet activities are still a bit siloed from the rest of AAPP, and we could perhaps bring that into future discussions more

Rob Massom raised the comment that snow has some particular (and highly relevant) complications across different projects, which would be a good target for future AAPP aims – improved precip, and wind-driven redistribution of snow on land/sea ice)

Neal Young raised the point that combined modelling work needs to consider the spatial/temporal resolution needed for each component (e.g. katabatic winds, ocean eddies etc)

Andy Hogg highlighted the importance, for any future cross-discipline modelling, of a solid and enforceable workflow for version control, code management etc. The value of bringing professional software engineers into sustained modelling activities must not be overlooked

Phil Boyd expressed great admiration for the way that SOCCOM has integrated obs and modelling activities, especially BSOSE. Will agreed but questioned whether AAPP has the skillset to embark on a data assimilation project.

For the final part of the discussion, Ben G-F spoke a little about ACCESS-NRI and how it could be relevant to AAPP. However, on questioning it became clear that the majority of people in the meeting (in house or virtual) aren't aware of ACCESS-NRI or what it is – this is clearly a gap that we can easily address.

Action items (immediate)

Compile list of modelling platforms currently in use within AAPP, across all projects, including an AAPP staff member who can act as 'first contact'. Distribute list (Teams?) and encourage researchers to update as appropriate

- Compile similar/complementary list/database of model output/simulations currently available to AAPP researchers.
- Communicate existing training/support available (including e.g. CLEX CMS) to AAPP staff/affiliates, including students. Ensure students are aware that they can contact AAPP compute committee with training needs/ideas
- Arrange future short workshop/discussion seminar outlining ACCESS-NRI, and discuss how/if AAPP can benefit from and contribute to ACCESS-NRI

Action Items (mid-term)

Develop a standard workflow for collaboration, version control, bug fixes etc; likely to be invaluable as different projects begin to merge modelling efforts

- Consider implementing cross-discipline modelling efforts into AAPP strategic/science plans
    - Representation of snow (including wind-drift redistribution on land/sea ice)
    - Integration of BGC processes across different coupled components (ocean, atmosphere/cloud, sea ice)

Breakout report: “Digital Antarctica – user story session”

Rob Jennings and Johnathan Kool

Session description

Digital Antarctica is providing a new way for Antarctic data centres to share their data. This breakout session will serve as an opportunity to discuss the practical benefits of easier and better data sharing, and to receive input from the broader community. From this session we will generate “user stories” based on your experiences and your expectations in finding and re-using data, which will be used in the future development of Digital Antarctica.

Notes

From this session we created 3 fictional “personas” with a story in the form of a quote, which will help guide decisions made during the development of Digital Antarctica. Hopefully we will get an opportunity to hear from more researchers to bolster these personas and create new ones.

Persona 1

A researcher searching for specific data to use.

“After a fair bit of searching, I have found a dataset that I think contains data that will bolster my research. It’s a huge dataset, though, and I’m not 100% sure it contains what I need, and even if it does, I will only need a subset. So, I start writing scripts to extract what I think I need so that I can look at it and, if it IS what I’m looking for, get it into a state that I can use for my research. The whole time I’m thinking – I must be the 10th person to be running basically the same script to do this on this data. It would be great if there was an easy way to leverage off the work that others might have done in looking at this data.”

Persona 2

A researcher who has a well-established process, and who gets all of their data from outside the AAPP:

“I get my data from worldwide data sources, such as Copernicus. While there is likely to be additional useful data that is only available through the AAPP data sources, the effort required to find, extract, and adapt that data to my purposes isn’t commensurate to the benefit it will bring my research. If the data I needed was easy to find, verify and incorporate into my research, then I would be more likely to use it. It would be even better if those external data sources were available through Digital Antarctica.”

Persona 3

Someone new to data management

“So much data! While uni taught me the skills I need to collect, manipulate, and analyse my data, it didn’t teach me much about data management. Specifically, about concepts like the importance and practicalities of data management or best practices. It would be great if there were established processes, and resources to help with this side of data, so I can spend less time and brain power thinking about it.”

Breakout Report: "Guidance on long-term monitoring in the Southern Ocean and Antarctica"

Petra Heil and Tony Press

Session Description

While not perceived cutting edge, long-term monitoring is essential to providing a sound basis of knowledge upon to build good management decisions and policy. Effective long-term environmental monitoring, especially in remote or harsh locations, is challenging and can only sustained if building on proven design, endearing commitment and resourcing. Derived data and information need to be placed in context to other relevant records to provide more complete evidence of variability, change and any drivers. Here we wish to explore not only scientific requirements for funding and undertaking long-term monitoring of Earth System variables but also those of non-scientific end users, including decision- and policy-makers.

Notes

Action items:

- Form a working group to advise on the need of and requirements for sustained long-term observations across disciplines with an focus on Southern Ocean and Antarctic research.
- Compile a position paper on science requirements (incl data timelines, data specifications) to turn RSV Nuyina into a long-term (near-)autonomous underway observatory from data acquisition to basic (i.e., Level 2) products. This paper will be addressed to the key groups at the face of data collection (AAD's Technology and Innovation) as well as data holders & distributors (i.e., Australian Antarctic Data Centre, IMOS).
- Prepare a Community White Paper on the need (and specs) for long-term observations across and the establishment of long-term observing networks across the Southern Ocean and Antarctic, incl reflection of past and existing observing systems and current & future requirements (including priorities).

Breakout report: “Frontiers for Young Minds (FYM) – Antarctica Collection”

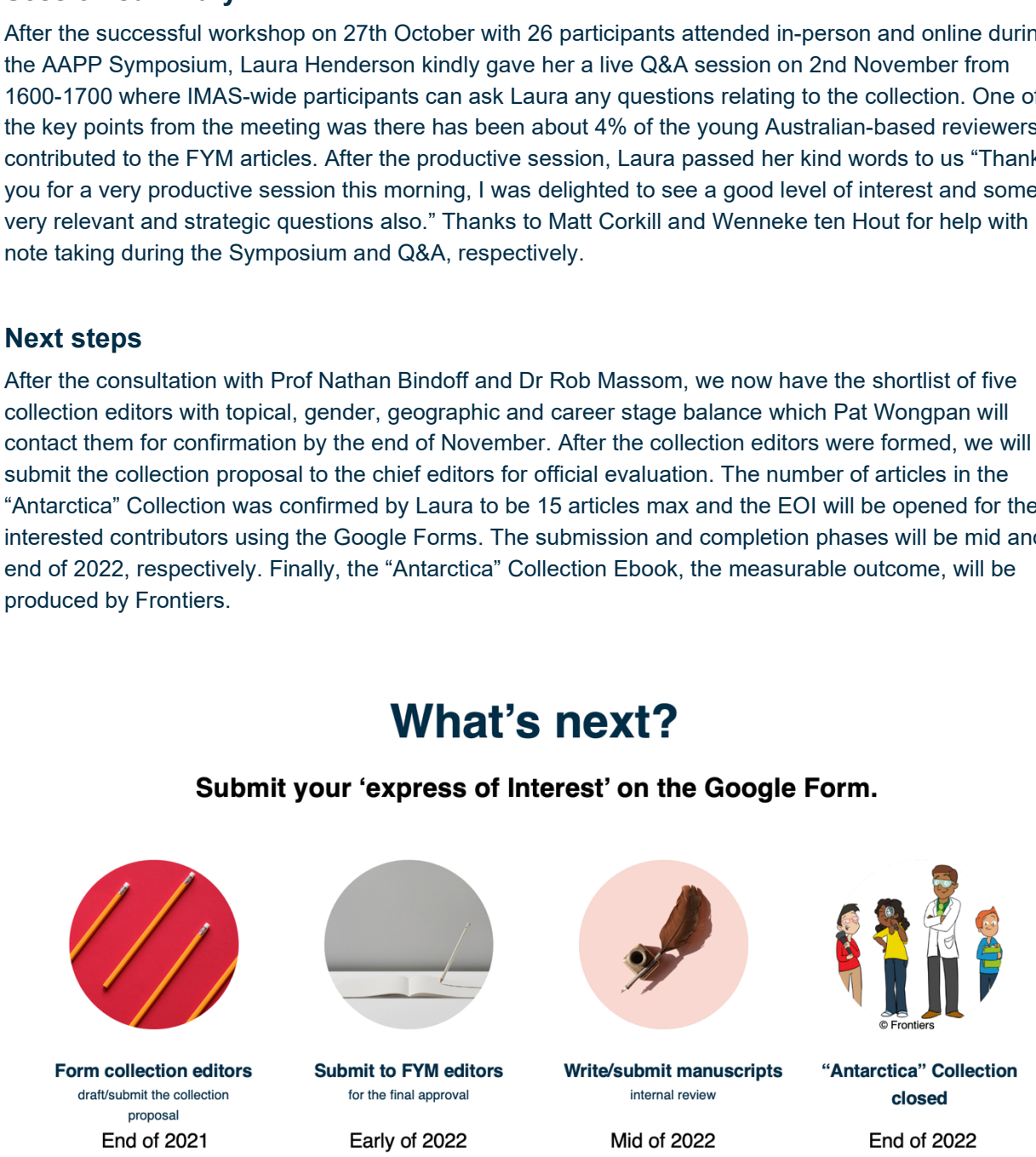
Pat Wongpan

Session summary

After the successful workshop on 27th October with 26 participants attended in-person and online during the AAPP Symposium, Laura Henderson kindly gave her a live Q&A session on 2nd November from 1600-1700 where IMAS-wide participants can ask Laura any questions relating to the collection. One of the key points from the meeting was there has been about 4% of the young Australian-based reviewers contributed to the FYM articles. After the productive session, Laura passed her kind words to us “Thank you for a very productive session this morning, I was delighted to see a good level of interest and some very relevant and strategic questions also.” Thanks to Matt Corkill and Wenneke ten Hout for help with note taking during the Symposium and Q&A, respectively.

Next steps

After the consultation with Prof Nathan Bindoff and Dr Rob Massom, we now have the shortlist of five collection editors with topical, gender, geographic and career stage balance which Pat Wongpan will contact them for confirmation by the end of November. After the collection editors were formed, we will submit the collection proposal to the chief editors for official evaluation. The number of articles in the “Antarctica” Collection was confirmed by Laura to be 15 articles max and the EOI will be opened for the interested contributors using the Google Forms. The submission and completion phases will be mid and end of 2022, respectively. Finally, the “Antarctica” Collection Ebook, the measurable outcome, will be produced by Frontiers.



Breakout report: "New remote sensing opportunities"

Alex Fraser and Benoit Legresy

Notes

- Three levels of remote sensing activity at AAPP
    - "Cal/val" – calibration and validation
    - Delivery of near-real-time products to research vessels
    - Scientific outputs from remote sensing data
- Surface Water and Ocean Topography (SWOT)
    - Next-gen radar altimeter
    - Can resolve sub-mesoscale eddies
    - "A revolution for oceanography"
    - Can map marginal ice zone extent too
    - AAPP deliverable in its cal/val
- Similar generational leaps occurring in other domains:
    - Sea ice concentration from CIMR (2025); many new synthetic aperture radars (SARs)

Discussion

- What is our role with the Aus. Space Agency?
- Cal/val? This is valuable and justifies our free access to data
- CSIRO owns 10% of Novasar
- AAPP position statement on contributions in this regard?
- AAPP has little influence directly on space agencies; but working groups (e.g., International Ice Charting Working Group) can exert influence

Breakout session "Whole Antarctic view of research voyages and opportunities"

Dr Andrew Klekociuk, Dr Ruhi Humphries, Dr Marc Mallet

Notes

This breakout session had two main components. The first, led by Andrew Klekociuk, outlined some of the current and upcoming capabilities to undertake Science in the Antarctic and Southern Ocean region. The upcoming science capabilities of the RSV Nuyina were discussed as well as the tentative timeline of the RSV Nuyina activities between 2020 – 2023, highlighting some of the uncertainties in the late 2021 to early 2022 period. A list of scientific instruments and facilities on the RSV Nuyina was provided and split into three categories based on estimate priority level.

The second component of the breakout session, led by Ruhi Humphries and Marc Mallet, gave an overview of a newly developed initiative to promote collaboration between international groups with common scientific objectives in the Antarctic and Southern Ocean region, with the focus on linking sea-ice and ocean biology to the lower atmosphere. This initiative has tentatively been named PICCAASO (Partnerships for Investigating Clouds and the biogeoChemistry of the Atmosphere in Antarctica and the Southern Ocean). There are currently 12 known ship-based field campaigns and a similar number of land-based campaigns that share many common objectives. Five of these will involve ship-based projects at the same time in early 2023 in different parts of the Southern Ocean, including the MISO project on the RV Investigator.

In recent virtual meetings with many of these project PIs, there has been strong interest in developing closer collaborations between projects, prior to, during and after field campaigns take place. The goals of PICCAASO at the moment are:

- Overarching goal is to magnify and accelerate the science by facilitating collaboration
- Improve spatial coverage of measurements
- Coordinate common instrumentation
- Share resources (labour and instrumentation)
- White paper and website by end of year
- Quarterly logistic meetings throughout 2021 and 2022.
- Annual science meetings 2024 and 2025
- Publication of data within 12 months of capture, enabling rapid reuse of data by collaborators and modellers

Within the Australian led projects (i.e. MISO, MIZ and Denman voyage), as well as many of the international projects, it has been strongly recognised that there needs to be a much stronger collaboration between different disciplines (especially to bridge gaps between phytoplankton/zooplankton/krill scientists and atmospheric scientists). Many of these collaborations will come about as the MISO project is more strongly planned, but it was pointed out that a working group should be planned for early 2022. The launch of the PICCAASO website and publication of the white paper should serve as a starting point for discussion.