

# SIPN South



Coordinating Seasonal  
Predictions of Sea Ice in the  
Southern Ocean for 2017-2019

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## Antarctic Sea Ice Research at a Crossroads

Like many regions of our planet, the Antarctic is currently undergoing profound environmental changes. Not all of these changes are well understood, partly due to a lack of comprehensive observational datasets describing this region. The Antarctic is one of the most under-sampled places on Earth, well behind the already sparsely monitored Arctic.

Floating at the interface between a hostile atmosphere and a highly dynamic and weakly stratified ocean, sea ice is a major element of the Antarctic climate. Characterising and understanding past Antarctic sea-ice variability has proven challenging, because of the numerous thermodynamic and dynamic processes by which sea ice is potentially affected and the wide range of timescales on which these processes operate. In particular, compared to the Arctic, there is a key scientific gap in understanding to what extent the seasonal development of austral sea-ice cover is predictable, what the sources of this predictability are and whether it is possible at all to extract any useful information for stakeholders from predictions.

## A Brief History of SIPN and why SIPN South is needed

After the dramatic retreat of Arctic sea ice in summer 2007, a team of U.S. researchers initiated the Sea Ice Outlook (SIO), a community-wide effort to assess seasonal forecasts of Arctic summer sea ice. The initiative rapidly gained momentum: up to now, the SIO –managed since 2014 by Sea Ice Prediction Network (SIPN)– has received more than 500 unique forecasts, the team has grown substantially (it is now comprised of 13 members) and SIPN has become a must-visit portal to learn about the seasonal evolution of Arctic sea ice and the way it is forecasted. More information on SIPN can be found in Hamilton and Stroeve (2016) or on the website at: <https://www.arcus.org/SIPN>.

The numerous post-season reports, regular webinars and scientific publications coordinated by SIPN have been key in building a community around the emerging theme of sea-ice prediction through engagement with actors beyond the world of natural sciences, for example social scientists and stakeholders. More generally, SIPN has brought together

experts in various domains that would likely not have been in contact otherwise.

Currently, a similar initiative does not exist for the Southern Ocean. Being much thinner and almost entirely seasonal, Antarctic sea ice is thought to be inherently less predictable than its Arctic counterpart – although the large thermal inertial of the Southern Ocean and the numerous atmospheric teleconnections from outside this region might in fact represent a key source of sea-ice predictability, as recent research suggests. Besides, the need for Antarctic sea-ice predictions has often been viewed as less pressing, due to the lower strategic and socio-economic relevance of this region compared to the Arctic. But tourism in the southern polar regions is booming, and intense observing campaigns are planned within the next few years, in the framework of the ongoing Year Of Polar Prediction ([www.polarprediction.net/yopp](http://www.polarprediction.net/yopp)). For operational purposes, sea-ice conditions are one of the many challenges that face vessels operating in the Antarctic coastal region. Some parts of the Antarctic are experiencing expanding sea-ice extent while other areas are seeing multi-year sea ice persisting in areas where, previously, that was not the norm. These changing conditions impact on science, science support and logistic operations in those regions (COMNAP 2015). Advance notice of seasonal sea-ice conditions would help reduce costs associated with providing alternative operational logistics.

## SIPN South goals

SIPN South is driven by the following scientific question:

*How well do current prediction systems forecast the seasonal evolution of circumpolar and regional Antarctic sea-ice conditions?*

The project has three strategic objectives:

1. Provide a **focal point for seasonal outlooks** of Antarctic sea ice (winter and summer), where the results are exchanged, compared, discussed and put in perspective with those from the Arctic thanks to interactions within SIPN;
2. Provide **news and information on the state of Antarctic sea ice**, highlight recent published research, report ongoing observational

- campaigns and disseminate upcoming events (conferences, workshops, webinars, *et cetera*);
3. Coordinate a **realistic prediction exercise** targeting austral summer 2019, in conjunction with the Year Of Polar Prediction (YOPP)'s Special Observing Period that will take place in January-February 2019.

## Implementation plan

SIPN South runs on a non-funded and voluntary basis. It is coordinated by a team of passionate people whose individual research themes are – for all of them- much broader than Antarctic sea-ice prediction itself. Since SIPN South will be maintained entirely thanks to in-kind contributions, the aim is to make it as “light” as possible and make maximal use of existing resources, notably from SIPN. It is appropriate to highlight that SIPN South has received a full and much welcome endorsement from the SIPN steering group.

SIPN South is initially designed to last for two years (2017-2019) for the reasons mentioned above. Extension of the project will depend on its success, on the interest raised and on the ability to raise funding to continue the initiative.

SIPN South is implemented in seven phases:

1. **Identification of potential contributors (mid-2017).** A request to provide September Antarctic total sea-ice extent will be added to the regular calls for contributions released by SIPN in June, July and August 2017. Groups running global dynamical models should be able to provide this additional figure almost automatically<sup>1</sup>. The winter circumpolar austral sea-ice extent is arguably not the most interesting (nor the most predictable) feature to be forecasted. The goal of this initial exercise is thus to identify a network of potential contributors for subsequent forecast experiments. A brief overview discussing the ability to forecast the observed extent will be provided in SIPN's usual post-season report to be released in December 2017.

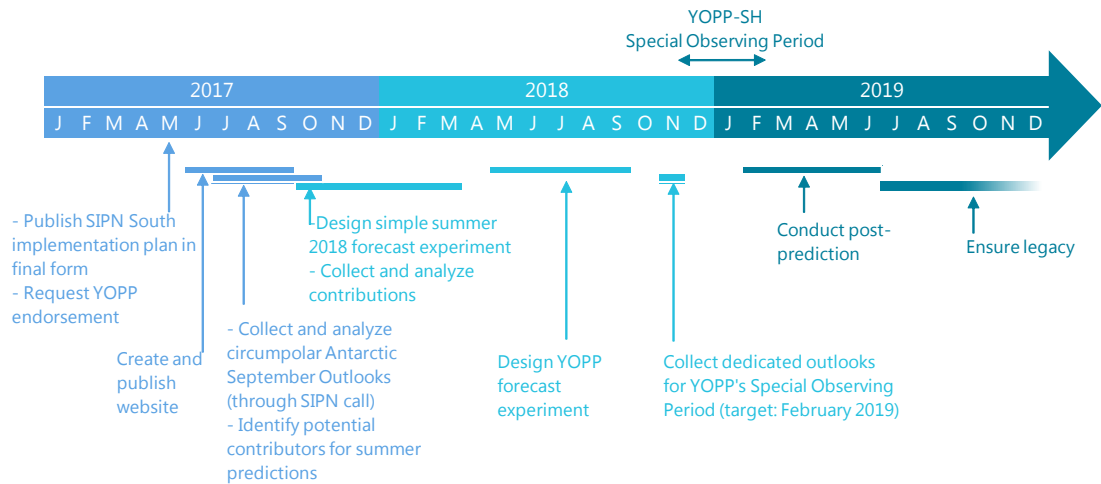
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<sup>1</sup> A show-of-hands survey conducted during the Polar Prediction Workshop (Bremerhaven, March 2017) indicated that at least 10 groups are willing to submit an Antarctic sea-ice prediction this year.

2. **Website (mid-2017 to end-2017).** A website will be created and hosted by the Australian Bureau of Meteorology. Results of the various outlooks collected during the lifetime of SIPN South will be documented and commented there. In addition, Antarctic sea-ice news and ongoing work related to the Year of Polar Prediction (YOPP) will be reported there.
3. **Simple summer forecast (end 2017-early 2018)**

A call to contributions will be sent out to the polar community to contribute a first set of coordinated summer austral sea-ice predictions (targeting February 2018). Simple metrics, such as the monthly-average sea-ice extent and date of ice retreat in key regions of the Southern Ocean (Ross Sea, Weddell Sea, possibly others) will be used to establish the baseline skill of the forecast systems.
4. **Design of the YOPP prediction experiment (mid-2018).** Based on the lessons learnt from the first set of forecasts (previous point) and depending on the specific location of YOPP field campaigns that will take place during the Special Observing Period of January-February 2019, a tailored forecast experiment will be designed for austral summer 2019. The goal of this experiment will be to test the ability of prediction systems to support the deployment of field campaigns.
5. **Prediction for Special Observing Period (mid 2018 - Feb 2019).** Following phase 4, an invitation to submit austral sea-ice forecasts will be sent out to the community. Specific questions directly related to the YOPP activities will be formulated such as "What is the probability that site X is ice-free for at least 20 days of January". Each contributing group will have the possibility to answer these question based on the method(s) of its choice. In addition, regular diagnostics such as average sea-ice extent in February or maps of dates of retreat will be requested.
6. **Post-prediction analysis (early-2019).** A critical review of the three prediction exercises (September 2017, February 2018 and February 2019) will be conducted with special emphasis on the last prediction. Results of the analyses will be advertised through joint presentations at workshops and international conferences and through a joint peer-reviewed paper highlighting the major outcomes of SIPN South (article in EOS or a similar journal with multidisciplinary contents).
7. **Legacy (2019-).** The possibility to sustain SIPN South will be investigated. This will depend on several factors: (1) the success of the project, measured by the interest raised within the polar community,

public impacts, unresolved scientific questions; (2) the availability for funding; and (3) the existence of a strong consortium to push this endeavor to a more comprehensive and systematic level.



*Timeline for SIPN South*

## Conclusion

SIPN South will coordinate the expanding interest of the ever-growing community of polar prediction to the Southern Ocean. Given the limited existing resources, SIPN South will make maximal use of the leverage effect of SIPN. A two-year plan is proposed in this document in order to better evaluate sea-ice prediction capabilities around Antarctica and bring together many groups that may not even know each other today.

SIPN South is designed as an academic *and* a practical exercise. Results obtained will be certainly insightful for SIPN – they will definitely put into perspective the results of Arctic predictions. SIPN South is also tightly linked to the ongoing Year Of Polar Prediction. By coordinating for the first time a Southern Ocean sea-ice forecast in realistic conditions, SIPN South will assist to evaluate whether current seasonal sea-ice prediction systems are apt tools for decision-making in Antarctica.

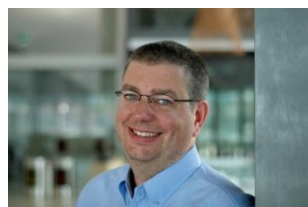
## About the SIPN South leadership team



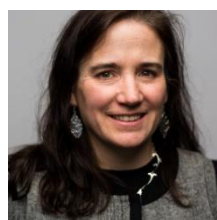
**Dr François Massonnet** is a F.R.S.-FNRS post-doctoral researcher at Université catholique de Louvain (Belgium) and is also affiliated to the Barcelona Supercomputing Center where he spent two years as a post-doctoral researcher. His main interests are the large-scale variability of Arctic and Antarctic sea ice, seasonal-to-decadal climate prediction and data assimilation. He is a member of the Southern Ocean Region Panel (WCRP/CLiC/CLIVAR SORP) and a CLiC fellow for the Year of Polar Prediction.



**Dr Phil Reid** is an Antarctic researcher for the Australian Bureau of Meteorology based in Hobart, Tasmania. He is also affiliated with the Antarctic Climate and Ecosystems Cooperative Research Centre, Antarctic Gateway Partnership and the University of Tasmania. He is passionate about understanding our broader climate system, particularly as it relates to the southern cryosphere, through analysis of multi-variable climate elements and dynamic modelling over a wide range of time-scales.



**Dr Jan Lieser** is a meteorologist and sea-ice scientist. His research focus is airborne imaging techniques using digital aerial photography and scanning LiDAR to estimate sea-ice thickness. He has researched on-site polar meteorological observations and sea-ice geophysical properties, as well as numerical modelling of Arctic sea ice and Antarctic sub-glacial Lake Vostok, and the interpretation of remote sensing data. He has participated in several field research programs in both Antarctica and the Arctic Ocean.



**Prof Cecilia M. Bitz** is an atmospheric scientist who studies the role that sea ice plays in shaping the climate in high latitudes. She is interested not only in our present and future climates, but also climates of the past. She is actively engaged in research on improving prediction of Arctic sea ice (she is part of the SIPN leadership team) and sea ice data assimilation, investigating wave-ice and coupled air-sea-ice interactions that control large-scale climate.





**Dr John Fyfe** is an internationally regarded climate scientist who has been recognized for his contributions in polar science, and to the awarding of the 2007 Nobel Peace Prize to the Intergovernmental Panel on Climate Change. John has authored or coauthored many influential peer-reviewed papers in climate, meteorology and oceanography and is currently a senior research scientist with the Canadian Centre for Climate Modelling and Analysis, an Environment Canada Laboratory located on the campus of the University of Victoria.



**Dr Will Hobbs's** main research interest is in understanding the physics behind observed changes in the Southern Ocean and Antarctic climate system, and whether they can be explained by natural processes or are due to human influence. Among many other themes of research, he has studied the role of the atmosphere in driving large-scale variability of Southern Ocean sea ice. Will came to Hobart in 2012 to take up a position in Ocean Detection and Attribution with the Institute for Marine and Antarctic Studies (IMAS).



**Dr Kazuya Kushara** is a researcher with the ACE CRC's Sea Ice Processes and Change project. His research interests are numerical modelling of interactions between the Southern Ocean and the Antarctic cryosphere, such as high sea-ice production at coastal polynyas and basal melting of ice shelves.

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