

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 place on Earth, well behind the already sparsely monitored Arctic.

Floating at the interface between the highly dynamic and weakly stratified Southern Ocean and a hostile atmosphere, Antarctic sea ice is a major element of that system. Characterizing 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 has rapidly gained momentum: nine years later, the SIO –managed since 2014 by SIPN– has received more than 400 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 forecast. More information on SIPN can be found at this address: <https://www.arcus.org/SIPN>.

The numerous post-season reports, the regular webinars and the scientific publications coordinated by SIPN have been key in building a community around the emerging theme of sea ice prediction, in engaging with actors outside the world of natural sciences (social scientists, stakeholders) and, more generally, in bringing together experts in various domains that would likely not have been in contact otherwise.

Unfortunately, a similar initiative does not currently 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 less strategic and socio-economic relevance of this region compared to the Arctic. However, 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) among others.

SIPN South goals

SIPN South is driven by the following scientific question:

What is the ability of current prediction systems to forecast the seasonal evolution of circumpolar and regional Antarctic sea ice conditions?

The project has three concrete 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 with SIPN.
2. Provide news and information on the state of Antarctic sea ice, point towards recent literature on Antarctic sea ice.
3. Coordinate a realistic prediction exercise targeting austral summer 2019, in support for the Year Of Polar Prediction (YOPP)'s Special Observing Period that will take place in January-February 2019.

Implementation plan

Given the limited resources available, the strategy is to make SIPN South as "light" as possible and make maximal use of existing resources, notably

from SIPN. It is important to stress that SIPN South has received full support from the SIPN steering group.

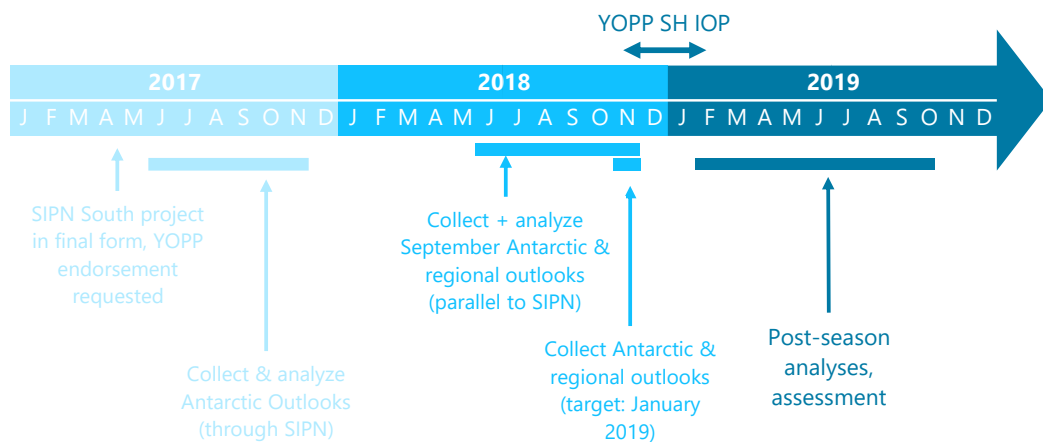
SIPN South is designed to last for two years (2017-2019). Extension of the project will depend on its success, on the interest raised and on the ability to find funding to continue the initiative. For 2017-2019, the project coordinators F. Massonnet and P. Reid will manage SIPN South on a voluntarily basis as part as they own research or their involvement in SIPN.

SIPN South is implemented in five phases:

1. **Initial assessment (mid-2017).** A request to provide September Antarctic total sea ice extent will be added in the calls for contributions released by SIPN in May, June and July 2017. Note that groups running global dynamical models should not have too much trouble in providing this additional number. A brief overview discussing the ability to forecast the observed extent will be provided in the SIPN's post-season report.
2. **Website (end 2017).** A website, hosted by the Bureau of Meteorology, will be created. The results of the first outlook will be displayed and briefly discussed. Antarctic sea ice news and ongoing work related to the Year of Polar Prediction (YOPP) will be reported.
3. **Refinement of requirements (mid-2018).** A specific call to contribution will be sent out through the SIPN mailing list to request September 2018 sea ice outlooks with a much more advanced level of information than for 2017:
 - Daily and Monthly sea ice extent in specific regions (Weddell, Ross, Amundsen-Bellingshausen Seas at least)
 - Probabilistic information (expected value, uncertainties, probability density functions)
 - Spatial information such as date of ice advance
4. **Prediction for Intensive Observing Period (mid 2018 - Jan 2019).** The ability of prediction systems to support the deployment of field campaigns will be tested. Based on the location of field campaigns organized in the framework of the YOPP Intensive Observing Period, specific questions will be formulated in November 2018 and sent out to potential contributors, such as "What is the probability that the site X is ice-free at least 20 days of January". Each contributing group will have the possibility to answer this question based on the method(s) of its choice. In addition, regular diagnostics such as average sea ice extent

in January will be requested to compare the skill of summer predictions with that from winter predictions.

5. **Post-prediction analysis.** A review of the three prediction exercises (September 2017-2018 and January 2019) will be conducted. Results of the analyses will be advertised through joint presentations in workshops and international conferences and through a joint paper reviewing the major outcomes of SIPN South



Timeline for SIPN South

Conclusion

SIPN South will hopefully expand the 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 in 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 help to evaluate whether current seasonal sea ice prediction systems are adapted tools for decision-making in Antarctica.

About the Coordinators

François Massonnet is a Doctor in Sciences from the Université catholique de Louvain (UCL). He is now a F.R.S.-FNRS post-doctoral researcher at UCL. He 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.