24 November 2022

CALL FOR CONTRIBUTIONS

Summer 2022-2023 sea ice prediction experiment

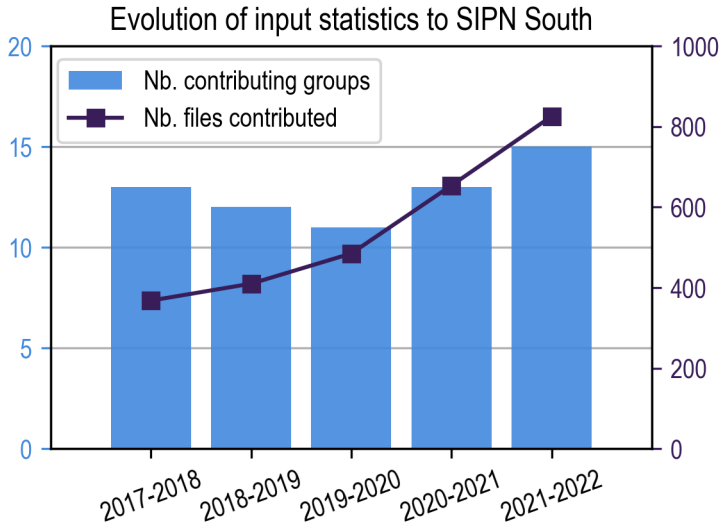
Submission deadline: Friday December 9th, 2022

Note to previous contributors: please see below an important remark about the possibility to submit extended forecasts

Overview and objectives

The Sea Ice Prediction Network South (SIPN South) is pleased to invite contributors to participate in the **sixth coordinated sea-ice prediction experiment in the Southern Ocean**. SIPN South is an international project endorsed by the Year of Polar Prediction (YOPP). Its goal is to make an initial assessment of the ability of forecasting systems to predict circumpolar average, regional average, and local Antarctic sea-ice conditions, with a focus on the summer season. More information can be found under the section "To go further" at the end of this document.

Over the past five years, we have received more than 2000 forecasts from 22 unique contributors (institutions or individuals) across the five continents. **We warmly thank all contributors for their interests, efforts and feedbacks**. An evaluation of the forecasts collected since 2017 is available in technical reports (see references below) and in a paper to be submitted in December 2022. All SIPN South contributors are automatically invited as co-authors on the paper.



This document outlines the protocol for contributing to the summer 2022-2023 experiment. The protocol is the same as the one of last year with the added option of submitting a longer (annual+) forecast (see next paragraph). All groups are invited to participate regardless of the approach they follow.

For this season, we invite contributors to submit longer forecasts of Antarctic sea ice conditions (see below). Antarctic sea ice extent reached a record-low in February 2022, and sea ice cover since has remained at record or near-record low levels. The build-up of the anomaly over the austral summer of 2021-2022 and the low conditions since, are similar to those in 2016-2017, which led to the lowest 3 years of Antarctic annual sea ice extent (2017-2019). It is likely that during times of large anomalies in sea ice/upper ocean heat content, Antarctic sea ice cover may exhibit predictability at annual timescales, and that we are currently in a 'forecast of opportunity' for 2022-2024.

If the above schedule is too tight but a delayed contribution would still be possible, please do not hesitate to let us know and we will find a flexible solution that accommodates everyone.

Diagnostics requested

Participants are invited to issue from one to five of the following diagnostics, ordered by descending priority. The submission process is described at the end of this document. The diagnostics are:

1. High priority

Diagnostic: Antarctic (circumpolar) daily mean sea-ice area[1] from December 1st 2022 to February 28th 2023 included (90 days).

Format: One text file with one row and 90 comma-separated values, each expressing daily sea-ice area for the 31 + 31 + 28 days of the December-February period. Units must be 10^6 km^2. Numbers must be rounded to four decimal digits and trailing zeroes must be included.

File name: `<group-name>_<forecast-id>_total-area.txt`

- `<group-name>` is the name of the participating group (university, research center, institution)
- `<forecast-id>` is a 3-digit identifier for the forecast (`001`, `002`, …)

Remarks: Ensemble forecasts are welcome. Please keep one file per forecast and increment each time the `<forecast-id>` by one unit: `001` for the first forecast, `002` for the second, etc. If only one forecast is submitted, set `<forecast-id>` to `001`.

Example: An example is given here for a group named "ucl" contributing three forecasts: https://goo.gl/LLfQaD.

2. Medium priority

Diagnostic: February Antarctic daily mean sea-ice area per 10° longitude bin, from December 1st 2022 to February 28th 2023 included (90 days).

Format: A text file with 36 rows each displaying 90 comma-separated values following the same requirements as diagnostic 1. Each row corresponds to a 10° longitude bin. First row: 0° ≤ longitude < 10°; second row: 10° ≤ longitude < 20°; …, 36th row: 350° ≤ longitude < 360°.

File name: `<group-name>_<forecast-id>_regional-area.txt`

Remarks: Ensemble forecasts are welcome. Please keep one file per forecast and increment each time the `<forecast-id>` by one unit: `001` for the first forecast, `002` for the second, etc. If only one forecast is submitted, set `<forecast-id>` to `001`.

Example: An example is given here for a group named "ucl" contributing three forecasts: https://goo.gl/LLfQaD

[1] Sea ice area is defined as the oceanic surface covered by sea ice. It is obtained as the surface integral of sea ice concentration. It is *not* equal to sea ice extent.

3. Low priority

Diagnostic: February Antarctic daily mean sea-ice concentration

Format: A NetCDF file with 90 timesteps (one per day from December 1st 2022 to February 28th 2023). Each time step displays the spatial field of sea-ice concentration. The file format must follow the CMIP6 conventions:

- Sea-ice concentration is defined as the fraction of the grid cell covered by sea ice, is named `siconc`, and is expressed in %.
- Longitude and latitude are reported under variables `longitude` and `latitude`.
- A land-sea mask is provided through a variable named `sftof` that expresses the percentage of the grid cell covered by ocean (units %).
- Areas of grid cells are provided through a variable named `areacello` that expresses the area of the grid cell in m^2.

File name: `<group-name>_<forecast-id>_concentration.nc`

Remarks: Ensemble forecasts are welcome. Please keep one file per forecast and increment each time the `<forecast-id>` by one unit: `001` for the first forecast, `002` for the second, etc. If only one forecast is submitted, set `<forecast-id>` to `001`.

Example: An example is given here for a group named "ucl" contributing three forecasts: https://goo.gl/LLfQaD

4. Low priority

Diagnostic: February Antarctic daily mean grid cell thickness (or, equivalently, mean sea-ice volume per unit grid cell area; or, equivalently, actual sea-ice thickness multiplied by sea-ice concentration)

Format: A NetCDF file with 90 timesteps (one per day from December 1st 2022 to February 28th 2023 period). Each time step displays the spatial field of mean grid cell thickness. The file format must follow the CMIP6 conventions:

- Mean grid cell sea ice thickness is calculated by dividing the volume of sea ice in a grid cell by the grid cell's total area, or by multiplying the actual sea ice thickness by sea ice concentration. Following CMIP6 conventions, this variable is named `sivol` and has units of meters.
- Longitude and latitude are reported under variables `longitude` and `latitude`.
- A land-sea mask is provided through a variable named `sftof` that expresses the percentage of the grid cell covered by ocean (units %).
- Areas of grid cells are provided through a variable named `areacello` that expresses the area of the grid cell in m^2.

Remarks: Ensemble forecasts are welcome. Please keep one file per forecast and increment each time the `<forecast-id>` by one unit: `001` for the first forecast, `002` for the second, etc. If only one forecast is submitted, set `<forecast-id>` to `001`.

File name: `<group-name>_<forecast-id>_volume.nc`

5. Low priority (long forecasts)

Diagnostic: Antarctic (circumpolar) monthly mean sea-ice area from forecasts initialized in 2022 (any date) extended at least 6 months up to 2024.

Format: One text file with one row and comma-separated values, each expressing monthly mean sea-ice area. Units must be 10^6 km^2. Numbers must be rounded to four decimal digits and trailing zeroes must be included.

File name: `<group-name>_<forecast-id>_total-area-long-forecast.txt`

- `<group-name>` is the name of the participating group (university, research center, institution)
- `<forecast-id>` is a 3-digit identifier for the forecast (`001`, `002`, …)

Remarks: Ensemble forecasts are welcome. Please keep one file per forecast and increment each time the `<forecast-id>` by one unit: `001` for the first forecast, `002` for the second, etc. If only one forecast is submitted, set `<forecast-id>` to `001`.

Verification products

The forecasts will be assessed against two observational references:

- The Near-Real-Time DMSP SSMIS Daily Polar Gridded Sea-Ice Concentrations, Version 1 (Data Set ID: NSIDC-0081; http://nsidc.org/data/nsidc-0081).
- The OSI SAF SSMIS Sea-Ice Concentration Maps on 10 km Polar Stereographic Grid (Data Set ID: OSI-401-b; http://osisaf.met.no/p/ice/index.html#conc-ssmis).

Both data sets are publicly available. Sea ice areas will be computed directly from the sea ice concentration fields.

Submission process

The submission of a forecast by a group is done in two steps.

1. First, the contributing group gathers the diagnostics (see "Diagnostics Requested" above) in an online archive of its choice. The archive must be accessible with a simple URL, so that the SIPN South team can easily retrieve the information. A Google Drive, a Dropbox archive, WeTransfer or a public FTP are all fine.
2. Then, the groups fill in an online form (https://forms.gle/RoDxK6TG6ufmJU5Z6) where they provide meta-data such as forecasting method, contact information but also the

link where their data can be retrieved from. **In case this information has not changed compared your submission last year, do not hesitate to indicate "see last year" in the fields.**

Groups are invited to send an e-mail to francois.massonnet@uclouvain.be upon completion of the submission process to ensure that the data and meta-data have been well received.

The deadline for submitting the online form (containing the link pointing towards the data) is the **Friday 9th of December 2022.**

Outcomes and timeline

The SIPN Leadership Team will process the forecasts and publish a summary note by the 15th of December. This note will describe how sea ice is predicted to evolve over the summer period around Antarctica, according to the contributions that will have been received. Once the summer period is over, a full report will be published and made publicly available, in which forecasts will be inter-compared and assessed against observational references.

Note that all forecast and verification data will be made publicly available, as for the previous exercises.

Contact and questions

Any question, comment or feedback should be addressed to François Massonnet (francois.massonnet@uclouvain.be).

Good luck, and enjoy!

The SIPN South Leadership team
F. Massonnet, P. Reid, J. L. Lieser, C. M. Bitz, J. Fyfe, W. Hobbs

To go further

SIPN South website:
https://fmassonn.github.io/sipn-south.github.io/

Access to forecast data and analyses:
https://github.com/fmassonn/sipn-south-public

EGU Cryosphere blog article on SIPN South:
https://blogs.egu.eu/divisions/cr/tag/sipn/

Overview papers:

Lieser, J L, F Massonnet, W Hobbs, J Fyfe, C M Bitz, and P Reid. 2020. "Sea Ice Prediction Network-South: Coordinating Seasonal Predictions of Sea Ice for the Southern Ocean." *Bulletin of the American Meteorological Society* 101 (8): S313–S315. https://dx.doi.org/10.1175/BAMS-D-20-0090.1

Bromwich, D. H., Werner, K., Casati, B., Powers, J. G., Gorodetskaya, I. V., Massonnet, F., Vitale, V., Heinrich, V. J., Liggett, D., Arndt, S., Barja, B., Bazile, E., Carpentier, S., Carrasco, J. F., Choi, T., Choi, Y., Colwell, S. R., Cordero, R. R., Gervasi, M., … Zou, X. (2020). The Year of Polar Prediction in the Southern Hemisphere (YOPP-SH). *Bulletin of the American Meteorological Society*. https://doi.org/10.1175/BAMS-D-19-0255.1

Video summarizing SIPN South's first experiment:
https://www.youtube.com/watch?v=MUeWapsdSwQ

Post-season reports of the first experiments:

Massonnet, F., P. Reid, J. L. Lieser, C. M. Bitz, J. Fyfe, W. Hobbs (2018). "Assessment of February 2018 sea-ice forecasts for the Southern Ocean". https://eprints.utas.edu.au/27184/

— (2019). "Assessment of Summer 2018-2019 Sea-Ice Forecasts for the Southern Ocean". https://eprints.utas.edu.au/29984/

— (2020). "Assessment of Summer 2019-2020 Sea-Ice Forecasts for the Southern Ocean". https://fmassonn.github.io/sipn-south.github.io/doc/2019-2020/SIPN-South_2019-2020_postseason.pdf