7 April 2022

CALL FOR CONTRIBUTIONS

Targeted Observing Period 2022 sea ice prediction experiment

Submission deadline: Tuesday May 10th, 2021

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. Since the beginning of SIPN South in 2017, SIPN South has gathered an increasing number of forecasts from 11-15 unique groups (Fig. 1), with 5 new contributors over the past two seasons.

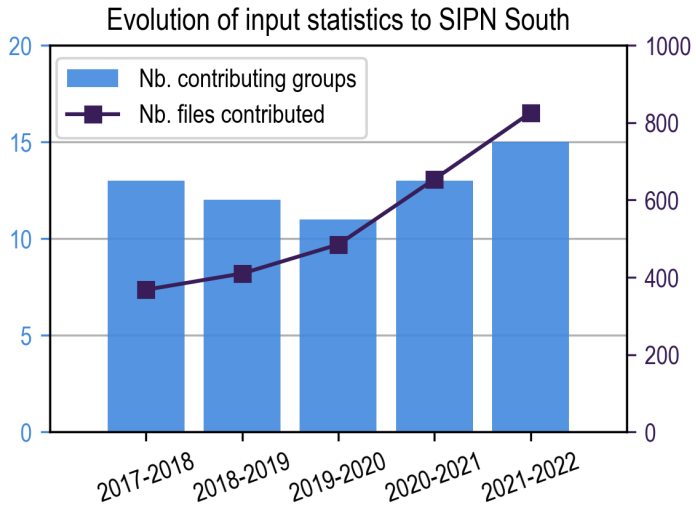

Fig. 1. Number of contributing groups and contributed files since the start of SIPN South, per forecasting season

An assessment of prediction skill for the austral summer 2021-2022, which saw the lowest observed circumpolar sea ice on record, is available here. With five forecasting seasons available, several recurring characteristics emerge, including in 2021-2022. First, while the SIPN South forecast ensemble generally reproduces the circumpolar sea-ice area at the minimum (February), contributions struggle to reproduce observed data during months of maximal melt rates (mid-November to mid-January). Second, statistical forecasts perform generally better than dynamical forecasts, even though no bias-correction is usually applied on those dynamical forecasts. Finally, the Ross Sea is the sector where the forecast performance is generally the lowest.

The Year Of Polar Prediction Southern Hemisphere (YOPP-SH) holds a "Targeted Observing Period" (TOP) for the period May 1st 2022 to August 31st 2022. While this TOP is largely centered around the atmosphere and have been initially designed to study the impact of enhanced observational coverage on numerical weather prediction skill, they represent an opportunity to study the skill of sea ice forecast in the autumn season.

This document outlines the protocol for contributing to the TOP 2022 experiment. The protocol is in many points very similar to the one followed for previous summer experiments. All groups are invited to participate regardless of the approach they follow.

Finally, 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 one, two, three or four 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 May 1st 2022 to August 31st 2022 included (123 days).

Format: One text file with one row and 123 comma-separated values, each expressing daily sea-ice area for the 31 + 30 + 31 + 31 days of the May-August 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`.

2. Medium priority

Diagnostic: Daily mean sea-ice area per 10° longitude bin, from May 1st 2022 to August 31st 2022 included (123 days).

Format: A text file with 36 rows each displaying 123 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`.

3. Low priority

Diagnostic: February Antarctic daily mean sea-ice concentration

Format: A NetCDF file with 123 timesteps (one per day in the May 1st 2022 to August 31st 2022 period). Each time step displays the spatial field of sea-ice concentration. The file format must follow the CMIP6 conventions:

[1] Sea ice area is defined as the oceanic surface covered by sea ice.

- 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`.

4. Low priority

Diagnostic: 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 in the December 1st 2021 to February 28th 2022 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`

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 leadership 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/taApi1VcyKTJm8UV9) 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 **Tuesday 10th of May 2022.**

Outcomes and timeline

The SIPN Leadership Team will process the forecasts and publish a summary note by mid-May 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