Sea Ice Outlook

2021 August Report

Individual Outlook

Name of contributor or name of contributing organization:

ECCC-CanSIPSv2

Is this contribution from a person or group not affiliated with a research organization?

Name and organization for all contributors. Indicate primary contact and total number of people who may have contributed to your Outlook, even if not included on the author list.

ECCC-CanSIPSv2

Do you want your June contribution to automatically be included in subsequent reports? (If yes, you may still update your contribution via the submission form.)

Include this submission in this month's report ONLY

What is the type of your Outlook projection?

Dynamic Model

Starting in 2017 we are accepting both pan-Arctic and pan-Antarctic sea ice extent (either one or both) of the September monthly mean. As in 2016, we are also collecting Alaskan regional sea ice extent. To be consistent with the validating sea ice extent index from NSIDC, if possible, please first compute the average sea ice concentration for the month and then compute the extent as the sum of cell areas > 15%.

a) Pan-Arctic September extent prediction in million square kilometers.

4.77

b) same as in (a) but for pan-Antarctic. If your method differs substantially from that for the Arctic, please enter it as a separate submission.

c) same as in (b) but for the Alaskan region. Please also tell us maximum possible extent if every ocean cell in your region were ice covered.

"Executive summary" of your Outlook contribution (using 300 words or less) describe how and why your contribution was formulated. To the extent possible, use non-technical language.

Our outlook includes an estimate of pan-Arctic sea ice extent (SIE) and anomaly extent, as well as spatial forecast fields of sea ice probability (SIP), ice-free dates (IFDs), and ice-advance dates (IADs). The outlook was produced using the Canadian Seasonal to Interannual Prediction System (CanSIPv2; Lin et al., 2020: https://doi.org/10.1175/WAF-D-19-0259.1), which combines ensemble forecasts from two models, CanCM4i and GEM-NEMO, with a total of 20 ensemble members (10 from each model).

Brief explanation of Outlook method (using 300 words or less).

Our pan-Arctic SIE estimate was formulated by calculating (for each ensemble member) the SIE anomaly relative to a piecewise linear trend fitted to the respective model's ensemble-mean SIE time series over 1980-2020. These anomalies were then added to the piecewise linear trend fit to the NSIDC sea ice index SIE time series, and then averaged over all 20 ensemble members. The piecewise linear fit, including the breakpoint year, was found using non-linear least squares.

Our SIE anomaly forecast was formulated by subtracting a linear-trend fit to hindcast SIE, as per the instructions from SIPN. A 2000-2020 baseline period was used for fitting a linear trend, as this resulted in a better agreement with the SIE anomaly found using a piecewise linear fit to the full 1980-2020 period.

Sea ice probability maps were produced by first calibrating the ensemble SIC forecasts for eachrespective model using trend-adjusted quantile mapping (TAQM; Dirkson et al., 2019: https://doi.org/10.1175/JCLI-D-18-0224.1), computing the probability for SIC>15%, and then averaging those probabilities across both models.

Our IFD (IAD) forecast has been bias-corrected based on the 2012-2020 mean IFD (IAD), where we have defined the IFD (IAD) as the first date that SIC falls below (above) 15% and 80%, as per

the SIPN request
(Sigmond et al., 2016: https://doi.org/10.1002/2016GL071396).

Tell us the dataset used for your initial Sea Ice Concentration (SIC).

CanCM4i: CCMEP GDPS analysis (assimilates SSM/I and SSMIS satellite & CIS ice charts) (https://doi.org/10.1175/MWR-D-14-00354.1) GEM-NEMO: CCMEP GIOPS analysis (assimilates SSM/I and SSMIS satellite & CIS ice charts) (https://doi.org/10.1002/qj.2555)

Tell us the dataset used for your initial Sea Ice Thickness (SIT) used. Include name and date.

CanCM4i: SMv3 statistical model (SIT trends from PIOMAS + anomalies proportional to observed SIC anomalies; https://doi.org/10.1175/JCLI-D-16-0437.1) GEM-NEMO: CCMEP GIOPS analysis (~constrained by SIC projection onto each thickness category; https://doi.org/10.1002/qj.2555)

If you use a dynamic model, please specify the name of the model as a whole and each component including version numbers and how the component is initialized:

CanSIPSv2 (CanCM4i+GEM-NEMO)
CanCM4i: Atmosphere: CanAM4 initialized with CCMEP GDPS; Ocean: CanOM4 initialized with CCMEP GIOPS; Sea Ice: Cavitating Fluid initialized with CCMEP GDPS (SIC) and SMv3 statistical model (SIT).
GEM-NEMO: Atmosphere: GEM v4.8-LTS.16 initialized with CCMEP GEPS; Ocean: NEMO v3.1 initialized with CCMEP GIOPS; Sea Ice: CICE4.0 initialized with GIOPS SIC & SIT.

If available from your method.
a) Uncertainty/probability estimates:

Median

4.77

Lower error bound

4.34

Lower error bound

5.2

Standard Deviation

0.22

b) Brief explanation/assessment of basis for the uncertainty estimate (1-2 sentences).

The 95% confidence interval was calculated by approximating the 20-member bias-corrected SIE values using a Gaussian distribution.

c) Brief description of any post-processing you have done (1-2 sentences).

Besides bias correcting the ensemble mean SIE, no adjustment of the ensemble spread was made.