Sea Ice Outlook
2020 June 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.

Primary Contact: Bill Merryfield (bill.merryfield@canada.ca), ECCC/CCCma
Co-contributors:
Arlan Dirkson, UQAM
Cathy Reader, ECCC/CCCma
Hai Lin, ECCC/CCMEP
Marko Markovic, ECCC/CCMEP
Michael Sigmond, ECCC/CCCma
Woosung Lee, ECCC/CCCma

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 the June 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.

4.48

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 for bias-corrected Arctic sea ice extent (SIE), bias-corrected sea ice concentration (SIC), calibrated sea ice probability (SIP), and bias-corrected ice free dates (IFD) was produced using the Canadian Seasonal to Interannual Prediction System version 2 (CanSIPSv2). CanSIPSv2 is now the operational seasonal forecasting system for Environment and Climate Change Canada.

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

CanSIPv2 combines ensemble forecasts from two models, CanCM4i and GEM-NEMO, with a total of 20 ensemble members (10 from each model). 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 1980-2019. These anomalies were then added to the fitted piecewise linear trend for the NSIDC sea ice index SIE time series, and then averaged over all 20 ensemble members to yield a total SIE of 4.48 million square kilometers. The piecewise linear fit, including the breakpoint year, was found using non-linear least squares. Sea ice probability maps were produced by first calibrating the ensemble SIC forecasts for each respective model using trend-adjusted quantile mapping (TAQM), computing the probability for SIC>15%, and then averaging those probabilities across

both models. Our outlook for the 80% SIC contour was prepared by first bias correcting the full ensemble SIC fields for each model separately using a 2011-2019 baseline, and then averaging the ensemble mean SIC across both models. The resultant SIC field was then converted to 0's and 1's corresponding to which grid cells have SIC<80% and which have SIC>=80%, respectively. Similarly, our IFD forecast has been bias corrected based on the 2011-2019 mean IFD, where we have defined the IFD as the first date that SIC falls below 50% and remains below that value for 10 consecutive days.

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); no actual sea ice thickness observations used
GEM-NEMO: CCMEP GIOPS analysis (~constrained by SIC projection onto each thickness category; https://doi.org/10.1002/qj.2555); no actual sea ice thickness observations used

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:

[DynamicModelType]

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

Median

4.41

Ranges

95% C.I.: (3.75,5.21)

Standard Deviations

0.37

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

The uncertainty values were calculated from the bias-corrected SIE across the 20 ensemble members (see section 6).

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

This is described in section 6