Sea Ice Outlook
2018 August Report
Individual Outlook

Name of contributor or name of contributing organization:

Modified CanSIPS

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

false

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: William J. Merryfield, ECCC/CCCma
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ECCC* Environment and Climate Change Canada
CCCma* Canadian Centre for Climate Modelling and Analysis
UQAM* University of Quebec and Montreal

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.)

true

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.

5.22

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 of forecast total Arctic sea ice extent (SIE), post-processed Ice-Free-Date (IFD) and Freeze-up-Date (FUD), and post-processed sea ice probability (SIP) was produced using the Canadian Seasonal to Interannual Prediction System (CanSIPS), but (as in 2017) in a modified experimental mode intended to test several potential updates to the sea ice forecast methodology including changes to the data used to initialize both sea ice concentration (SIC) and sea ice thickness (SIT).

Relative to our July 2018 contribution, our results indicate similarly high ice coverage and a shorter open water season. Specifically, our mean SIE forecast value has increased very slightly from 5.17 to 5.22 million square kilometers, and our SIP and IFD/FUD forecasts respectively show expansive probabilities for ice coverage and a shorter open-water season in the western Arctic.

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

CanSIPS combines forecasts from two models, CanCM3 and CanCM4, with a total of 20 ensemble members (10 from CanCM3, 10 from CanCM4). The Arctic SIE anomaly was calculated for each individual ensemble member relative to the 1981-2010 climatology for the

respective model. These anomalies were then added to the NSIDC climatological value of 6.5 million square kilometers, and then averaged over all 20 ensemble members to yield a total SIE of 5.22 million square kilometers.

The IFD/FUD is defined as the first date in the retreat season (April 1 to September 30) or advance season (October 1 to March 31) at which the grid box sea-ice concentration drops below/exceeds 50% and stays below/above that threshold for at least 10 days (more details in Sigmond et al GRL, 2016). The dates are bias corrected based on 1981-2010 hindcasts.

For the SIP field, we first interpolated the raw SIC fields from the model grid onto a 1deg by 1deg regular grid, fit each grid point and each model SIC ensemble to the parametric zero- and one- inflated beta distribution. We then calibrated each distribution using `trend-adjusted quantile mapping' (Dirkson et al., submitted to JClim), and calculated the probability that local SIC will exceed 15% (or equivalently SIP) directly from the calibrated parametric distribution. Lastly, the average was taken between CanCM3 and CanCM4 SIP estimates to produce the final SIP field.

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

SIC is initialized by nudging model SIC to the Meteorological Services of Canada (MSC) analysis with a 3 day time constant. Initial conditions for the August submission are from July 31 nudged SIC.

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

SIT was estimated using the statistical model 'SMv3' described in Dirkson et al., 2017 (doi:10.1175/JCLI-D-16-0437.1). The parameters in SMv3 were fit using PIOMAS SIC and SIT data over the period 2002-2017. The daily MSC SIC described above for July 31 then used as the real-time predictor field in SMv3 to estimate real-time SIT.

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:

Coupled

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

Median

5.21

Ranges

min=4.72, max=5.61

Standard Deviations

1 standard deviation = 0.29, uncertainty = ±0.57 (ie. 1.96*0.29)

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

The uncertainty values were calculated from the ensemble of 20 fcst SIE anomalies after adding the NSIDC climo of 6.5 m sq km

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

Please refer to section 6 describing our outlook method.