Sea Ice Outlook
2018 July Report
Individual Outlook

Name of contributor or name of contributing organization:

Qing Bao (LASG, IAP)

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.

Total number of people：4
Qing Bao (LASG, IAP) (Primary contact)
Jinxiao Li (LASG, IAP)
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Xiaofei Wu (PAEKL,CUIT)

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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?

Mixed

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.

4.87

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.

18.01

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.

0.36

"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.

The Sea Ice outlook prediction becomes an area of active scientific research with profound socioeconomic implications. A mixed method has been carried out for the sea ice outlook projection on China's Tianhe-2 supercomputer, which combines a dynamic model prediction system and a statistical approach of machine learning. The dynamic model prediction system, named FGOALS-f2 (ice-ocean-atmosphere-land model), provides a real-time predictions in the subseasonal-to-seasonal (S2S) timescales. FGOALS-f2 S2S system has been established in 2017 by R&D team of FGOALS-f2 from both LASG Institute of Atmospheric Physics Chinese Academy of Sciences and PAEKL Chengdu University of Information Technology. The FGOALS-f2 S2S prediction results are used in two major national climate operational prediction centers in China. A machine deep learning (MDL) method using convolutional neural network (CNN) is proposed in the work as a statistical technique for the correction of the dynamic model predictions. Basing on the 4-month lead dynamic model prediction from May 20, 2018 and MDL using CNN, the outlook predictions of Sea Ice Extent are 4.87, 18.01, and 0.36 million square kilometers for pan-Arctic, pan-Antarctic and Alaska Regions in September 2018 respectively. As for the 4-month-lead prediction skills of this mixed method in , the correlation coefficients between the reforecast results and observations are 0.73, 0.86, 0.86, and the Root mean squared error (RMSE) is 0.48, 2.14, 0.02, for the Pan-Arctic , pan-Antarctic and Alaska

regions respectively in the past 7 years (2011-2017).

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

A mixed method has been carried out for the sea ice outlook projection, which combines a dynamic model prediction system and a statistical approach of machine learning. A “reforecast” (retrospective forecast) dataset of 37 years from 1981-2016 has been developed. This dataset is comprised of a 24-member ensemble run for reforecast and 35-member ensemble run for realtime prediction out to a 6-month lead. Machine Deep Learning (MDL) methods using Convolutional Neural Network (CNN) have been proposed in the work as a statistical technique for correction of the dynamic model prediction. 37-year reforecast results of atmospheric variables are taken as the training (input) datasets. The last 7 years of 2011-2017 have been taken as a testing period for the calculation of the relevant prediction skills. Both the realtime S2S prediction system and MDL using CNN are fully operated on China’s Tianhe-2 supercomputer.

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

None

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

None

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:

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

Median

Ranges

Standard Deviations

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

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