Sea Ice Outlook

2023 July Report

Individual Outlook

Name of contributor or name of contributing organization:

SYSU/SML-KNN

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.

SYSU/SML-KNN

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.)

[Do you want your contribution for this month to automatically be included in subsequent reports?]

What is the type of your Outlook projection?

Statistical/ML

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.

4.86

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.

A machine learning kNN model is used to predict the daily sea ice concentration and the sea ice extent of September 2023 in pan-Arctic. Daily averaged sea ice concentration fields between 1979 and 2022 were used to predict. The model predicts a pan-Arctic sea ice extent of 4.86(±0.31) million square kilometers and has a positive anomaly of 0.68.

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

Machine learning algorithm kNN (k-Nearest Neighbors) is used in this prediction. The principle is to find the k nearest neighbors of the input variables from the training data set and the prediction is the mean of the kNN. We considered the sea ice concentration and net surface radiation flux as the training data. At the same time the library comprises additional available training labeled samples selected in the same and adjacent date as the target date. We first compute the distance and pattern correlation between the unlabeled samples and labeled samples in the library. Then we sort the library in descending order based on the pattern correlation between fields to get the prediction the extent where sea ice concentration>0. Last the sea ice concentration is obtained by point-by-point calculation and weighting according to the distance.

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

NSIDC NASA Team, https://nsidc.org/data/nsidc-0081/versions/2, https://doi.org/10.5067/YTTHO2FJQ97K, data in the May 31, 2023.

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

NA

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

4.86

Lower error bound

4.55

Lower error bound

5.17

Standard Deviation

0.31

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

We estimate our uncertainty with root-mean-square-error(RMSE) of sea ice extent calculated from 2015-2020 hindcast.

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

NA