

Sea Ice Outlook
2023 June Report
Individual Outlook

Name of contributor or name of contributing organization:

SICNet_IOCAS

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.

SICNet_IOCAS

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.

5.1309

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.

We propose a deep learning model, named SICNet, to predict the sea ice concentration (SIC) of Sep. in a seasonal scale. The input data includes three parts: the historical SIC of last three months (Mar. to May), the historical sea ice thickness (SIT) of last three months (Mar. to May), and the climatology of SIC. The output is the SIC of Sep. The SIC data is from NSIDC and the SIT data is from PIOMAS. The spring SIT data is a key factor to predict the SIC in Sep. Our predictions show that the sea ice extent (SIE) in Sep. will be a little bit larger than that of last year, about 5.13 mil km².

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

The SICNet model is purely data-driven deep learning model. We developed this model to predict daily SIC from weekly to seasonal scales. The SICNet is derived based on CNN modules. We fused the spatial-temporal dependency of SIC sequence at different scales in the model. We designed temporal spatial attention module and spatially-constrained loss function to improve the model's performance. The details of the model can be found in references [1-2].

[1] Ren Y, Li X. Predicting the Daily Sea Ice Concentration on a Sub-Seasonal Scale of the Pan-Arctic During the Melting Season by a Deep Learning Model[J]. IEEE Transactions on Geoscience and Remote Sensing, 2023.

[2] Ren Y, Li X, Zhang W. A data-driven deep learning model for weekly sea ice concentration prediction of the Pan-Arctic during the melting season[J]. IEEE Transactions on Geoscience and Remote Sensing, 2022, 60: 1-19.

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

NA

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

Lower error bound

Lower error bound

Standard Deviation

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).