Sea Ice Outlook

2022 June Report

Individual Outlook

Name of contributor or name of contributing organization:

GFDL/NOAA (Bushuk et al.)

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.

GFDL/NOAA, Bushuk et al.

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?

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.

4.56

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.

0.53

"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 June 1 prediction for the September-averaged Arctic sea-ice extent is 4.56 million square kilometers, with an uncertainty range of 4.01-4.94 million square kilometers. Our prediction is based on the GFDL-SPEAR_MED ensemble forecast system, which is a fully-coupled atmosphere-land-ocean-sea ice model initialized using a coupled data assimilation system. Our prediction is the bias-corrected ensemble mean, and the uncertainty range reflects the lowest and highest sea ice extents in the 30-member ensemble.

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

Our forecast is based on the GFDL Seamless system for Prediction and EArth system Research (SPEAR_MED) model (Delworth et al., 2020), which is a coupled atmosphere-land-ocean-sea ice model. The ocean model is initialized from an Ensemble Kalman Filter coupled data assimilation system (SPEAR ECDA; Lu et al., 2020), which assimilates observational surface and subsurface ocean data. The sea ice, land, and atmosphere components are initialized from a nudged ensemble run of the coupled SPEAR_MED model, which is nudged towards 3-D temperature, wind, and humidity data from CFSR and SST data from OISST. The SST values under sea ice are adjusted to the freezing point of sea water using OISST sea ice concentration data. The performance of this model in seasonal prediction of Arctic sea ice extent has been documented in Bushuk et al. (2022). For an evaluation of the model's September sea ice extent prediction skill from a June 1 initialization, see attached report.

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

OISST SIC data is used to correct assimilated SST values under sea ice.

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

No SIT data is explicitly used in our initialization procedure.

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:

Component	Name	Initialization (e.g., describe Data Assimilation)
Atmosphere	AM4	Nudged atmosphere and SST run
Land	LM4	Nudged atmosphere and SST run
Ocean	MOM6	EnKF coupled data assimilation
Sea Ice	SIS2	Nudged atmosphere and SST run

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

Median

4.58

Lower error bound

4.01

Lower error bound

4.94

Standard Deviation

0.21

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

These statistics are computed using our 30 member prediction ensemble.

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

These forecasts are bias corrected based on a linear-regression adjustment using a suite of retrospective forecasts spanning 1992-2021.