Sea Ice Outlook

2023 June Report

Individual Outlook

Name of contributor or name of contributing organization:

NASA GMAO

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.

GMAO

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.

4.46

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.

0.76

"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.

An experiment of the GMAO seasonal forecasting system version 3 predicts a September average Arctic sea ice extent of 4.46 ± 0.33 million km2, or slighly less than last year's value of 4.87 million km2. The experiment is a test of the version 3 ODAS and forecast ensemble sub-setting method in a near-real time setting. Comparison with NSIDC values suggest the system has more initial ice extent, which may be due to discrepancies between OSI SAF and the NSIDC near-real-time values.

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

The forecast uses a prototype the GEOS_S2S version 3 coupled system that was modified for this forecast. The model has an approximate grid spacing of ½° in the atmosphere and ¼° in the ocean. An offline version of the ocean data assimilation system (ODAS) was integrated through May 2022. The ODAS is driven by GMAO forward-processing atmospheric analysis. The ODAS assimilates available oceanographic observations and along-track ocean altimetry. The version 3 ensemble uses a staggered initialization of five atmosphere-perturbed ensemble members starting on every fifth day beginning 01-May. Five atmosphere-perturbed and ten ocean-perturbed ensemble members are started on the last day of the month. A total of 50 ensemble members were run through July, at which point the ensemble is sub-sampled based on an error growth assessment, with 10 ensemble members continuing the forecast integration through September.

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

OSTIA (https://doi.org/10.3390/rs12040720). The OSTIA sea ice concentration originates with OSI SAF (https://osi-saf.eumetsat.int/products/osi-401-b).

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

Model-derived.

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:

GEOS S2S_v3 model. Atmosphere: Goddard Earth Observing System model (GEOS), version Icarus3.3p2 (modified for coupled model); GMAO forward-processing (atmospheric analysis). Ocean: GFDL Modular Ocean Model version 5 (MOM5); initialized with a modified version of GMAO MERRA2-Ocean ODAS. Sea Ice: modified version of the Los Alamos Community Ice CodE version 4.1 (CICE4.1). The model is initialized with MERRA-2 atmospheric fields and an ocean data assimilation system that incorporates available observations, OSTIA sst and sea ice concentrations.

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

Median

Lower error bound

0.32

Lower error bound

0.7

Standard Deviation

0.33

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

The standard deviation is the standard deviation of the 10 ensemble members. The low bound is the difference of the average minus the lowest ensemble member estimate, while the high bound is the highest ensemble member estimate minus the average.

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

Fields have been regridded to the SSM/I 25-km grid.