

Sea Ice Outlook  
2019 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.**

Richard Cullather [primary contact; 1,2], Lauren Andrews [1], Anna Borovikov [1,3], Eric Hackert [1], Young-Kwon Lim [1,4], Zhao Li [3], Robin Kovach [1,3], Jelena Marshak [1], Andrea Molod [1], Kazumi Nakada [1,3], Steven Pawson [1], Siegfried Schubert [1,3], Yury Vikhliayev [1,4], and Bin Zhao [1,5]

[1] Global Modeling and Assimilation Office, NASA Goddard Space Flight Center, Greenbelt, MD.

[2] Earth System Science Interdisciplinary Center, University of Maryland at College Park.

[3] Science Systems and Applications, Inc., Greenbelt, MD.

[4] GESTAR, Universities Space Research Association, Columbia, MD.

[5] Science Applications International Corporation, Greenbelt, MD.

**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.)**

This is a new submission.

**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.**

4.27

**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.**

0.41

**"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 using CryoSat-2 derived ice thickness predicts a September average Arctic ice extent of  $4.27 \pm 0.38$  million km<sup>2</sup>. The experiment tests the application of ice thickness data in a near-real time setting for the seasonal forecast system. The forecast suggests a reduced ice cover for 2019 as compared to the previous year.

**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  $\frac{1}{2}^\circ$  in both the atmosphere and the ocean. The ocean data assimilation system is driven by a near real-time atmospheric analysis that is similar to MERRA-2, and uses the Local Ensemble Transform Kalman Filter (LETKF) for assimilation of available observations and along-track ocean altimetry.

A branch of the ODAS system was integrated from 1-December 2018 to 26-Apr 2019 that included nudging to CryoSat-2 sea ice thickness fields over the available time period until 12-Apr. The ensemble used a staggered initialization of 11-Apr, 16-Apr, 21-Apr, and seven additional ensemble members on 26-Apr based on initial condition perturbations of the atmosphere and ocean states.

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

The sea ice concentration was taken from MERRA-2 (doi:10.5067/Y67YQ1L3ZZ4R), which may be retrieved from the Goddard Earth Sciences Data and Information Services Center (GES DISC). The MERRA-2 sea ice concentration is derived from the Operational Sea Surface Temperature and Sea Ice Analysis system (OSTIA; Donlon et al. doi:10.1016/j.rse.2010.10.017), which in turn obtains sea ice from the EUMETSAT Satellite Application Facility on Ocean and Sea Ice (OSI SAF).

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

CryoSat-2 Level-4 Sea Ice Elevation, Freeboard, and Thickness, Version 1, <https://nsidc.org/data/RDEFT4/>, doi:10.5067/96J00KIFDAS8. The data were incorporated into the ODAS over a four month period. The ODAS integrated for an additional 14 days after the end of the CryoSat-2 data period.

**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:**

Coupled

**If available from your method.**

**a) Uncertainty/probability estimates:**

**Median**

Pan-Arctic: 4.28 ; Alaska region: 0.42 ; Hudson Bay: 0.00299

**Ranges**

Pan-Arctic: 3.64 to 4.99 ; Alaska region: 0.07 to 0.81 ; Hudson Bay: 0.00000 to 0.00599

**Standard Deviations**

Pan-Arctic: 0.38 ; Alaska region: 0.23 ; Hudson Bay: 0.00225

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

The given uncertainty is the standard deviation of the 10 member ensemble.

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

The model output was re-gridded to the standard Northern Hemisphere passive microwave grid.