Sea Ice Outlook
2019 June Report
Individual Outlook

Name of contributor or name of contributing organization:

University of East Anglia (Cawley)

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.

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?

Statistical

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.

4.1452

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.

This is a purely statistical method (related to Krigging) to extrapolate the long term trend fromprevious observations of September Arctic sea ice extent. As this uses only Septemberobservations, the prediction is not altered by observations made during the Summer of 2019.

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

A Gaussian Process model, with a squared exponential covariance function, is used to model thehistorical NSIDC September Arctic sea ice extent data. The hyper-parameters are optimised bymaximising the marginal likelihood for the model (marginalising them would probably be betterto include the additional predictive uncertainty due to uncertainty in estimating thehyper-parameters). The model was implemented in MATLAB using the GPML toolbox(http://www.gaussianprocess.org/gpml/code/matlab/doc/). An images has hopefully beenuploaded showing how the predictive uncertainty increases as the model extrapolates into thefuture. For an animation showing how the model changes as the amount of calibration dataincreases, see https://twitter.com/Gavin_Cawley/status/1004987808367464448 .

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

Include source (e.g., which data center), name (algorithm), DOI and/or data set website, and date (e.g., “NSIDC NASA Team, https://nsidc.org/data/nsidc-0081, https://doi.org/10.5067/U8C09DWVX9LM.”)

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

NSIDC September average Arctic sea ice extent data.

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:

Not Specified

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

Median

4.1452

Ranges

3.0324 - 5.2580 (Bayesian credible region)

Standard Deviations

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

Gaussian Process models provide the posterior predictive distribution. Doesn't includehyper-parameter uncertainty.

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