Name of contributor or name of contributing organization:

Goulet Coulombe and Gobel

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.

Philippe Goulet Coulombe (gouletc@sas.upenn.edu) Maximilian Gobel. From University of Pennsylvania Economics Department and University of Lisbon, respectively.

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.)

Include this submission in the July report only.

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.

4.37

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.

When it comes to forecasting sea ice, there is tension between opting for statistical methods vs forecasts based on climate models. While the former are explicitly designed for the prediction task, they usually lack interpretative potential. That is, we may get a good forecast, but it is hard to know why. Institutions in charge of macroeconomic policy have been facing such dilemmas for years. One model, Vector Autoregressions, have been an increasingly popular tool to forecast economic aggregates as they are a compromise between theory-based methods and statistical ones. As a result, it is possible to obtain an explainable forecast which are the results of dynamic interactions between key Arctic variables. Hence, our forecast implicitly uses physical transmission mechanisms in the data, without specifying them explicitly.

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

The VARCTIC, which is a Vector Autoregression (VAR) designed to capture and extrapolate Arctic feedback loops. VARs are dynamic simultaneous systems of equations, routinely estimated to predict and understand the interactions of multiple macroeconomic time series. Hence, the VARCTIC is a parsimonious compromise between full-blown climate models and purely statistical approaches that usually offer little explanation of the underlying mechanism.

Precisely, we use an 8-variable Bayesian Vector Autoregression (VAR) with 12 lags and a constant which we refer to as the VARCTIC. We estimate the model over the period from January 1980 until December 2019. The variables and their data-source can be found in our original paper. Due to the observable time-series data for Thickness ending in December 2019, we could not feed our model with any further observations from 2020, which would have allowed us to further enhance our forecast. That is, we forecast September 2020 starting from

December 2019 using a 9-months ahead recursive forecast.

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

-

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

-

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:

[DynamicModelType]

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

Median

4.37

Ranges

percentile 5: 3.76, percentile 95: 5.00

Standard Deviations

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

Done via the posterior distribution obtained by standard Bayesian Methods for linear Vector Autoregressions.

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