Sea Ice Outlook
2017 July Report
Individual Outlook

Name of contributor or name of contributing organization:

Met Office

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.

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Do you want your June contribution to automatically be included in subsequent reports? (If yes, you may still update your contribution via the Google form.)

Yes automatically include my contributions in August 2017

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.

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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.

17.6

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.

Using the Met Office GloSea5 seasonal forecast systems we are issuing a model based mean Northern Hemisphere September sea ice extent outlook of (4.0 +/- 0.8) million sq. km. This has been assembled using startdates between 30 May
and 19 June to generate an ensemble of 42 members. The Southern Hemisphere September sea ice extent outlook using the same start dates is (17.6 +/- 0.7) million sq. km.

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

Ensemble coupled model seasonal forecast from the GloSea5 seasonal prediction system [MacLachlan et al., 2015], using the Global Coupled 2 (GC2) version [Williams et al., 2015] of the HadGEM3 coupled model [Hewitt et al., 2011]. Forecast compiled together from forecasts initialized between 30 May and 19 June (2 per day) from an ocean and sea ice analysis (FOAM/NEMOVAR) [Blockley et al., 2014, Peterson et al., 2015] and an atmospheric analysis (MO-NWP/4DVar) [Rawlins et al., 2007] using observations from the previous day. Special Sensor Microwave Imager Sensor (SSMIS) ice concentration observations from EUMETSAF OSI-SAF [OSI-SAF] were assimilated in the ocean and sea ice analysis, along with satellite and in-situ SST, sub-surface temperature and salinity profiles, and sea level anomalies from altimeter data. No assimilation of ice thickness was performed.

Tell us the dataset used for your initial Sea Ice Concentration (SIC). Include name and date (e.g., "NASA Team, May 2017"). We also encourage you to submit initial fields to the dropbox, see https://www.arcus.org/sipn/sea-ice-outlook/2017/june/call in the section on

"Submitting Figures and Gridded Data of Full Spatial Fields (Optional) of Forecasts and Initial Conditions" for detailed instructions. Required if sea Ice concentration is used.

Met Office Forecast Ocean As-similation Model (FOAM) ocean and sea ice analysis [Blockley et al., 2014] using the SSMIS brightness temperature observations of sea ice concentration product of the EU- METSAT Ocean and Sea Ice Satellite Application Facility (OSI-SAF, www.osi-saf.org) [OSI-SAF].

Dataset of initial Sea Ice Thickness (SIT) used (include name and date):

Met Office FOAM ocean and sea ice analysis [Blockley et al., 2014] as evolved by model dynamics and thermodynamics. No assimilation of thickness observations is performed.

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:

HadGEM3 -- GC2 in use within the GloSea5 seasonal prediction system

Component : Name : Initialization
Sea Ice: CICE -- GSI6.0 : FOAM ocean and sea ice analysis
Ocean: NEMO -- Global Ocean 5.0 : FOAM ocean and sea ice analysis
Atmosphere: Met Office Unified Model, UM -- GA7.0 : NWP 4DVar
Land: JULES -- GL6.0 : Soil temperature and snow - NWP 4DVar, Soil Moisture - climatology

If available from your method for pan-Arctic extent prediction, please provide

a) Uncertainty/probability estimate such as median, ranges, and/or standard deviations (specify what you are providing).

0.8 million sq km for Arctic. 0.7 million sq km for Antarctic. This represents two standard deviations of the (42 member) ensemble spread around the
ensemble mean.

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

Validation of the forecast was done using our 1993-2015 historical re-forecast (hindcast) using startdates of 01, 09 and 17 June (7 members each). Root mean square error of the hindcast with observations was 0.4 million sq. km for both the Arctic and Antarctic, with a insignificant bias of

400 square km above observed climatology (the Antarctic basis was somewhat larger, but still trivial, at 0.02 million sq. km). This is consistent with the error measurement based on the ensemble spread given above. Over the hindcast period, the correlation between the GloSea5 forecast and NSIDC sea ice extent observations was 0.89 (Arctic, Antarctic 0.54) which reduces to a correlation of 0.65 (Arctic, Antarctic: 0.64) if the trend is removed from the time series.

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

None, as over the 1993-2015 hindcast, there is a insignificant forecast bias of 400 sq km above the observed sea ice extent climatology. The Antarctic basis was some what larger, but still trivial, at 0.02 million sq. km below observed climatology.