The outlook is based on two statistical methods: climate trends regression and previous sea ice extent. The latter is derived from the 30-member ensemble of the Arctic Climate Impact Assessment (ACIA) Project (2001-2002). Sea ice extent for 2022 is estimated as 4.56 million square kilometers. This prediction was based on the GFDL Seamless system for Arctic sea ice extent initialized from a nudged ensemble run of the coupled model (Delworth et al., 2020), which is a coupled atmosphere-land-ocean-sea ice model. The model is initialized June 1 using a nudged data assimilation system (CSIS). The outlook is produced from the Climate Prediction Center of the National Oceanic and Atmospheric Administration (NOAA). The forecast is initialized from the Climate Forecast System version 2 (CFSv2) for the forecast period. The outlook is produced from the Climate Prediction Center of the National Oceanic and Atmospheric Administration (NOAA). The forecast is initialized from the Climate Forecast System version 2 (CFSv2) for the forecast period.
<table>
<thead>
<tr>
<th>Institute/Model</th>
<th>Model</th>
<th>Dataset</th>
<th>Uncertainty</th>
<th>lead_time</th>
<th>uncertainty_width</th>
<th>SIE</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Washington/APL</td>
<td>Dynamic Model</td>
<td>NCEP CFSv2</td>
<td>Statistical/ML</td>
<td>3.81</td>
<td>16.37</td>
<td>0.81</td>
<td>The model uses the NCEP CFSv2 model guess (May 1-31, 2022) as input and the output of the dynamic model as an updated adaptive length to construct the AR model.</td>
</tr>
<tr>
<td>NESP (Wu et al.)</td>
<td>Dynamic Model</td>
<td>NCEP CFSv2</td>
<td>Statistical/ML</td>
<td>4.04</td>
<td>18.37</td>
<td>4.9</td>
<td>We selected ten most standard deviation of stochastic ensemble error to filter unnecessary noise. The first four types are used for training the model.</td>
</tr>
<tr>
<td>KOPRI (Chi et al.)</td>
<td>Dynamic Model</td>
<td>ANSO IAP-LASG</td>
<td>Statistical/ML</td>
<td>NA</td>
<td>NA</td>
<td>0.49</td>
<td>The model uses the most accurate models in this hierarchy and is initialized from latest SIE conditions by ensemble of global models.</td>
</tr>
<tr>
<td>KOPRI (Ou et al.)</td>
<td>Statistically</td>
<td>NA</td>
<td>Statistical/ML</td>
<td>5</td>
<td>5.5</td>
<td>4.68</td>
<td>We selected ten most standard deviation of stochastic ensemble error to filter unnecessary noise. The first four types are used for training the model.</td>
</tr>
<tr>
<td>KUROKAWA (JGLA)</td>
<td>Statistically</td>
<td>NA</td>
<td>Statistical/ML</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>The model uses the NCEP CFSv2 model guess (May 1-31, 2022) as input and the output of the dynamic model as an updated adaptive length to construct the AR model.</td>
</tr>
<tr>
<td>PHUBAS</td>
<td>Deep Learning</td>
<td>FGOALS-f2 S2S V1.3</td>
<td>NA</td>
<td>4.3</td>
<td>0.55</td>
<td>0.015</td>
<td>This model is based on FGOALS-f2 S2S V1.3, trained and tested on SIE dataset from 1982-2021. The dynamic model uses the past 12-month SIE and 12-month Sea Ice Extent (SIE) up to 12 months ahead at Sea Ice Forecasting Center, Department of Oceanography-Earth System Model (DOESM) using a lag method.</td>
</tr>
<tr>
<td>FIO-ESM (Shu et al.)</td>
<td>Dynamic Model</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>The model uses the NCEP CFSv2 model guess (May 1-31, 2022) as input and the output of the dynamic model as an updated adaptive length to construct the AR model.</td>
</tr>
</tbody>
</table>

NA: Not available or applicable.
A new model has been used to predict the September ice extent in 2023. The model is based on ice persistence and utilizes a new mean field. The uncertainty is calculated using a standard deviation of 0.31 square kilometers. Special formulae are used to reduce the error of ice predictions based on past forecasts. The new model has been tested against real-world data and has shown promising results.

### September Ice Extent Prediction

The new model incorporates a physically based melt-pond model and uses incoming solar radiation and sea ice albedo to simulate ice drift and estimate the melt-pond area. The model is driven by multiple ocean and climate models, including the NCEP Unified Forecast System (UFS) and the NASA Team Analysis from ODAS. Special sensor microwave imager sensor (SSMIS) ice thickness is assimilated using the operational FOAM ocean--atmosphere-perturbed and ten ocean-perturbed ensemble initialization of five atmosphere-perturbed ensemble members starting on every fifth day beginning 01-May. Five members are used to create a 42-member lagged ensemble or forecasts of the September ice extent. The ODAS is driven by GMAO forward--integration initialized at 00Z May 3 to May 9 with C192 and uses assimilation from 1993-2016. Arctic: +1.4 million square kilometers; Antarctic: -0.1 million square kilometers. This is a statistical prediction based on the correlation of sea ice thickness and landfast ice extent in September over the previous years. A special formula calculates a best estimate of the ice extent, taking into account the correlation of sea ice concentration and the 5th percentile of the distribution obtained based on forecasts. The lower bound is calculated using a different formula based on the correlation of sea ice concentration and ice extent in September over the previous years.

### Ice Drift and Melt-Pond Area

The forecast model is based on ice persistence. The effect of ice drift and melt-pond area is simulated using a physically based melt-pond model. The model simulates ice drift or cold freezing air blowing from the high latitudes, which is a significant factor in the melting and re-freezing of sea ice. The model uses a 42-member lagged ensemble or forecasts of the September ice extent. The uncertainty is calculated using a standard deviation of 0.31 square kilometers. The model is driven by multiple ocean and climate models, including the NCEP Unified Forecast System (UFS) and the NASA Team Analysis from ODAS. Special sensor microwave imager sensor (SSMIS) ice thickness is assimilated using the operational FOAM ocean--atmosphere-perturbed and ten ocean-perturbed ensemble initialization of five atmosphere-perturbed ensemble members starting on every fifth day beginning 01-May. Five members are used to create a 42-member lagged ensemble or forecasts of the September ice extent. The ODAS is driven by GMAO forward--integration initialized at 00Z May 3 to May 9 with C192 and uses assimilation from 1993-2016. Arctic: +1.4 million square kilometers; Antarctic: -0.1 million square kilometers. This is a statistical prediction based on the correlation of sea ice thickness and landfast ice extent in September over the previous years. A special formula calculates a best estimate of the ice extent, taking into account the correlation of sea ice concentration and the 5th percentile of the distribution obtained based on forecasts. The lower bound is calculated using a different formula based on the correlation of sea ice concentration and ice extent in September over the previous years.

### High Correlation in Arctic

The forecast model is based on ice persistence. The effect of ice drift and melt-pond area is simulated using a physically based melt-pond model. The model simulates ice drift or cold freezing air blowing from the high latitudes, which is a significant factor in the melting and re-freezing of sea ice. The model uses a 42-member lagged ensemble or forecasts of the September ice extent. The uncertainty is calculated using a standard deviation of 0.31 square kilometers. The model is driven by multiple ocean and climate models, including the NCEP Unified Forecast System (UFS) and the NASA Team Analysis from ODAS. Special sensor microwave imager sensor (SSMIS) ice thickness is assimilated using the operational FOAM ocean--atmosphere-perturbed and ten ocean-perturbed ensemble initialization of five atmosphere-perturbed ensemble members starting on every fifth day beginning 01-May. Five members are used to create a 42-member lagged ensemble or forecasts of the September ice extent. The ODAS is driven by GMAO forward--integration initialized at 00Z May 3 to May 9 with C192 and uses assimilation from 1993-2016. Arctic: +1.4 million square kilometers; Antarctic: -0.1 million square kilometers. This is a statistical prediction based on the correlation of sea ice thickness and landfast ice extent in September over the previous years. A special formula calculates a best estimate of the ice extent, taking into account the correlation of sea ice concentration and the 5th percentile of the distribution obtained based on forecasts. The lower bound is calculated using a different formula based on the correlation of sea ice concentration and ice extent in September over the previous years.

### Ocean Data Assimilation System

The forecast model is based on ice persistence. The effect of ice drift and melt-pond area is simulated using a physically based melt-pond model. The model simulates ice drift or cold freezing air blowing from the high latitudes, which is a significant factor in the melting and re-freezing of sea ice. The model uses a 42-member lagged ensemble or forecasts of the September ice extent. The uncertainty is calculated using a standard deviation of 0.31 square kilometers. The model is driven by multiple ocean and climate models, including the NCEP Unified Forecast System (UFS) and the NASA Team Analysis from ODAS. Special sensor microwave imager sensor (SSMIS) ice thickness is assimilated using the operational FOAM ocean--atmosphere-perturbed and ten ocean-perturbed ensemble initialization of five atmosphere-perturbed ensemble members starting on every fifth day beginning 01-May. Five members are used to create a 42-member lagged ensemble or forecasts of the September ice extent. The ODAS is driven by GMAO forward--integration initialized at 00Z May 3 to May 9 with C192 and uses assimilation from 1993-2016. Arctic: +1.4 million square kilometers; Antarctic: -0.1 million square kilometers. This is a statistical prediction based on the correlation of sea ice thickness and landfast ice extent in September over the previous years. A special formula calculates a best estimate of the ice extent, taking into account the correlation of sea ice concentration and the 5th percentile of the distribution obtained based on forecasts. The lower bound is calculated using a different formula based on the correlation of sea ice concentration and ice extent in September over the previous years.

### Future Ice Extent Prediction

The forecast model is based on ice persistence. The effect of ice drift and melt-pond area is simulated using a physically based melt-pond model. The model simulates ice drift or cold freezing air blowing from the high latitudes, which is a significant factor in the melting and re-freezing of sea ice. The model uses a 42-member lagged ensemble or forecasts of the September ice extent. The uncertainty is calculated using a standard deviation of 0.31 square kilometers. The model is driven by multiple ocean and climate models, including the NCEP Unified Forecast System (UFS) and the NASA Team Analysis from ODAS. Special sensor microwave imager sensor (SSMIS) ice thickness is assimilated using the operational FOAM ocean--atmosphere-perturbed and ten ocean-perturbed ensemble initialization of five atmosphere-perturbed ensemble members starting on every fifth day beginning 01-May. Five members are used to create a 42-member lagged ensemble or forecasts of the September ice extent. The ODAS is driven by GMAO forward--integration initialized at 00Z May 3 to May 9 with C192 and uses assimilation from 1993-2016. Arctic: +1.4 million square kilometers; Antarctic: -0.1 million square kilometers. This is a statistical prediction based on the correlation of sea ice thickness and landfast ice extent in September over the previous years. A special formula calculates a best estimate of the ice extent, taking into account the correlation of sea ice concentration and the 5th percentile of the distribution obtained based on forecasts. The lower bound is calculated using a different formula based on the correlation of sea ice concentration and ice extent in September over the previous years.

### Estimation and Validation

The forecast model is based on ice persistence. The effect of ice drift and melt-pond area is simulated using a physically based melt-pond model. The model simulates ice drift or cold freezing air blowing from the high latitudes, which is a significant factor in the melting and re-freezing of sea ice. The model uses a 42-member lagged ensemble or forecasts of the September ice extent. The uncertainty is calculated using a standard deviation of 0.31 square kilometers. The model is driven by multiple ocean and climate models, including the NCEP Unified Forecast System (UFS) and the NASA Team Analysis from ODAS. Special sensor microwave imager sensor (SSMIS) ice thickness is assimilated using the operational FOAM ocean--atmosphere-perturbed and ten ocean-perturbed ensemble initialization of five atmosphere-perturbed ensemble members starting on every fifth day beginning 01-May. Five members are used to create a 42-member lagged ensemble or forecasts of the September ice extent. The ODAS is driven by GMAO forward--integration initialized at 00Z May 3 to May 9 with C192 and uses assimilation from 1993-2016. Arctic: +1.4 million square kilometers; Antarctic: -0.1 million square kilometers. This is a statistical prediction based on the correlation of sea ice thickness and landfast ice extent in September over the previous years. A special formula calculates a best estimate of the ice extent, taking into account the correlation of sea ice concentration and the 5th percentile of the distribution obtained based on forecasts. The lower bound is calculated using a different formula based on the correlation of sea ice concentration and ice extent in September over the previous years.
The uncertainty in Arctic SIE is 0.40, measured by a recursive pseudo-out-of-sample forecast on the September ice extent. It turns out that previous pseudo-out-of-sample forecasts can appropriately capture the large variability in the September ice extent. As is well known, the September ice extent is of particular interest to us. As is well known, the Arctic is warming about twice as fast as the global average, and the Arctic amplification in sea ice loss over the last 17 years is statistically significant. The Arctic is warming about twice as fast as the global average, and the Arctic amplification in sea ice loss over the last 17 years is statistically significant. The Arctic is warming about twice as fast as the global average, and the Arctic amplification in sea ice loss over the last 17 years is statistically significant. The Arctic is warming about twice as fast as the global average, and the Arctic amplification in sea ice loss over the last 17 years is statistically significant.

Since 2007, sea ice extent anomalies throughout the pan-Arctic region can be exposed through the use of AVHRR, when high quality AVHRR in a particular region is available. AVHRR daily records of sea ice extent corrected for the effect of level and aspect the area of sea ice extent. This statistical model computes the probability that sea ice extent will be between 50% and 90% of the average daily rates are used to estimate the official daily ice extent. This method applies daily ice loss rates to extrapolate from the start date (June 1) through the final Arctic SIE prediction.

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The Sea Ice Index (NSIDC) is a project that provides detailed information on Arctic and Antarctic sea ice extent. The index is based on daily sea ice concentration data from the National Snow and Ice Data Center (NSIDC), which is operated by the University of Iowa and funded by NASA. The Sea Ice Index provides a comprehensive assessment of sea ice conditions, including the extent, concentration, age, and thickness of sea ice. The index is updated daily and is available for download in various formats, including CSV and Excel. The Sea Ice Index can be accessed at the following URL: https://www.nsidc.org/data/nsidc-0051.0. Without further information, it is not possible to determine the source of any potential bias or error in the Sea Ice Index.