

**Sea Ice Outlook**  
2021 September Report  
Individual Outlook

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**Name of contributor or name of contributing organization:**

IceNet1

**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.**

IceNet1

**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.)**

**What is the type of your Outlook projection?**

ML/Other

**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.**

5.17

**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.**

IceNet is a sea ice forecasting AI system which predicts monthly-averaged sea ice probability (SIP; probability of sea ice concentration > 15%) up to 6 months ahead at 25 km resolution on an EASE2 grid. IceNet is based on a deep learning U-Net architecture, and has been trained on climate simulations (CMIP6) covering 1850-2100 and observational data (OSI-SAF SIC and ERA5) from 1979-2011. IceNet's monthly-averaged inputs comprise SIC, 11 climate variables, statistical SIC forecasts, and metadata. IceNet is introduced in the following pre-print, with the study soon to be published in Nature Communications: <https://doi.org/10.31223/X5430P>. IceNet was also presented at the Oxford ML and Physics Seminar Series: <https://youtu.be/JAKWhEU09Xo>.

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

At each 25x25 km ocean grid cell in the Arctic and at each forecast lead time from 1 to 6 months ahead, IceNet produces a probability that the SIC will be less than 15% (no ice), between 15% and 80% (marginal ice), or above 80% (full ice). To compute the SIP map for this SIO submission, we sum the probability of the two ice classes to obtain  $P(\text{SIC} > 15\%)$ . IceNet comprises 25 different U-Net models, whose output SIPs are averaged to produce the final SIP forecast. To compute the SIE, we sum the area of grid cells whose  $\text{SIP} > 0.5$ . Note that IceNet's SIE prediction corresponds to the SIE of monthly-averaged sea ice, not the monthly-averaged SIE of daily sea ice.

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

EUMETSAT OSI-SAF, OSI-450/OSI-430-b  
([http://osisaf.met.no/p/ice/ice\\_conc\\_reprocessed.html](http://osisaf.met.no/p/ice/ice_conc_reprocessed.html),  
[https://doi.org/10.15770/EUM\\_SAF\\_OSI\\_0008](https://doi.org/10.15770/EUM_SAF_OSI_0008))

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

NA

**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:**

**If available from your method.**

**a) Uncertainty/probability estimates:**

**Median**

**Lower error bound**

**Lower error bound**

**Standard Deviation**

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

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