SIPN2

Sea Ice Prediction Network Phase 2

https://www.arcus.org/sipn

Principal investigator

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Areas of contribution

Polar atmospheric processes
Oceanic processes
Modelling and forecasting
Observations
Sea ice processes
Data assimilation
Data archiving
Outreach
Economic aspects
Societal and/or behavioural aspects

Summary

TA key finding that emerged from the Sea Ice Prediction Network (SIPN) is that predictions tend to have reduced skill in extreme years, away from the trend line. The objective of the proposed research under Phase 2
of SIPN (SIPN2) is to reduce these biases through a multi-disciplinary approach that includes models, new products, data analysis, scientific networks, and stakeholder engagement. More specifically, the team will: (1) Investigate the sensitivity of subseasonal-to-seasonal sea ice predictability in the Alaska Sector to variations in oceanic heat and large-scale atmospheric forcing using a dynamical model (NCAR CESM) and statistical forecasting tools, focusing on spatial fields in addition to total extent summaries; (2) Sea Ice Outlook (SIO) submissions will be assessed for accuracy based on methodology and initialization; (3) Develop new observation-based products crucial for improving sea ice predictions, including sea ice thickness, surface roughness, melt ponds, and snow depth; (4) Stakeholder Research and Engagement: evaluate socio-economic value of sea ice forecasts to stakeholders who manage ship traffic and coastal village resupply in the Alaska Sector, and engage the public in Arctic climate and sea ice prediction through blog exchanges, accessible SIO reports, bi-monthly webinars, and by making public data sources useful to non-scientists and scientists alike; and (5) Evolve network generated Sea Ice Outlook forecasts and reporting for September minima will continue as in SIPN. SIPN2 forecasts will be expanded to include full spatial resolution and emerging ice-anomaly-relevant months (October/November).

Description

While the science of sea ice forecasting lags weather forecasting by several decades, several key advancements and lessons emerged under SIPN. Through evaluations of nearly 500 SIO predictions of SIE, an improved understanding of the processes driving sea ice predictability was achieved (Hamilton and Stroeve, 2016). Predictions tend to be most biased in extreme years. Studies have highlighted the importance of accurate sea ice initial conditions, such as ice thickness (e.g. Day et al. 2014; Blanchard-Wrigglesworth et al., 2015, 2016), melt pond fraction (Schroeder et al., 2014), the timing of melt onset and ice retreat (Stroeve et al., 2016; Petty et al., 2016), as well as ocean conditions, such as the heat inflow through Bering Strait (Serreze et al., 2016a). Predictability is inherently limited by the sea ice sensitivity to weather (e.g., Blanchard-Wrigglesworth et al., 2011; Serreze et al., 2016b).

Keys to the continued success of the SIO and the growing SIPN community are the networking activities, which include the open SIO reports, across-network research experiments (e.g., done through SIPN Action Teams), webinars, AGU meetings, workshops, and web and email communication – all of which are critical for advancing the complex science of Arctic sea ice prediction. High-priority recommendations for future work from the network have been incorporated into planned activities for SIPN2.

Specifically, we plan to expand the network’s research goals to address current needs for sea ice prediction. We seek funding for the SIPN leadership team to achieve the following key outcomes over the next 4 years: (1) Lead and manage the network, including running the SIO; (2) Greatly expand our network’s scientific reach by providing automated analysis and visualization of full fields of year-round predictions (including retrospective predictions) at the subseasonal-to-annual range (known as the expanded SIO or “eSIO”); (3) Coordinate across-network collaborative research activities; and (4) Participate in network research activities ourselves using network resources and collaboration.

Timeline

2017-10-01 - 2021-01-31
User relevant aspects

All network activities under this award were geared towards including a broad community interested in Arctic sea ice. Specific accomplishments included: the open Sea Ice Outlook process that invited anyone to participate; community review of Outlook post-season reports; broad dissemination of Sea Ice Outlook reports; convening Action Teams with an open nomination process; development and maintenance of a public website, mailing list, and LinkedIn Group; development of newsletters and posters; open workshops/Town Halls; and an formative analysis of participation in network activities that documented broad representation that crosses academia, government agencies, industry, non-profit, the public, and the press.

Provider relevant aspects

A better quantification of the role of oceanic heat and climate variations in the Pacific sector, new observational-based sea ice products, and network activities will advance understanding of the limits of seasonal predictability of Arctic sea ice. The network will examine origins and impacts of extreme ocean surface warming in terms of preconditioning the ice cover in the Pacific Arctic for continued major reductions in sea ice extent and duration. Broader impacts: This work will directly engage stakeholders that create and use sea ice forecasts in Alaska and lead to improved safety around sea ice. Work under SIPN2 will also track public understanding around the issue of sea ice, working to raise this understanding through accessible SIO reports and public data sources useful to non-scientists and scientists alike. The stakeholder engagement during the research process will potentially facilitate rapid research-to-operations implementation of the products of this work. Ongoing efforts by the SEARCH sea ice action team and Sea Ice for Walrus Outlook (SIWO) will be leveraged to provide additional understanding of stakeholder needs.

Regional emphasis

Northern hemisphere: Yes

Southern hemisphere: No

Further specification

Targeted evaluation of sea ice forecasts in the Alaska region, but pan-Arctic will be continued to be evaluated.

Key project deliverables

1. SIO: Collect and synthesize submissions of September extent on large-scale domains: pan-Arctic, Pacific-Arctic, Atlantic-Arctic.
2. eSIO: Automate analysis and presentation of full-field, year-round predictions that will be archived on the
Data management

nsidc.org/sipn and arcus.org/sipn

Is data provided to WMO Global Telecommunication System

No

Real-time provision

many sea ice fields are provided in near-real-time (SIC, ice motion, thickness), snow depth may additionally be produced in NRT.