

Update #3 for the Ross Sea and McMurdo Sound Seasonal Outlook 2021–2022

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INTRODUCTION

The U.S. National Ice Center (USNIC) provides planning and real time operational support for the efforts of the United States Antarctic Program (USAP) through collaboration with National Science Foundation (NSF) and the U.S. Coast Guard (USCG). Specifically, this outlook is provided as environmental awareness to safely plan icebreaker operations in the McMurdo/Ross Sea channel and escort ice-strengthened tanker and ice-strengthened cargo ships to the pier at McMurdo Station, located at 77°51'S, 166°40'E.

In this specific outlook, the term “ice edge” is used to delineate the boundary between areas with greater than or equal to 4 tenths sea ice concentration and areas with less than 4 tenths sea ice concentration.

METHODOLOGY

Climatology: The rates of recession for the Ross Sea ice edge are predominantly derived using an analog forecasting technique that relates historical observations of pre-season ice extent and thickness to the predicted severity of austral summer ice conditions. This analog data from climatological conditions is adjusted to reflect the expected impact of current meteorological and oceanographic conditions in the Ross Sea.

In the updates we show how the recession lines validate against the weekly analyses for the same time period, and using the the Navy Earth System Prediction Capability (ESPC) model's 45-day forecast [1] look ahead at how the model compares to the recession lines from the Outlook. This employs two different forecasting techniques to provide the most accurate open date for the Ross Sea.

UPDATE

Current Conditions: As of January 13, the fast ice in McMurdo Sound extends 16.5 nautical miles from the edge to the turning basin (Figure 1). The pack ice in the area has slowly drifted north as the USCGC POLAR STAR has cut the channel from the edge to the basin.

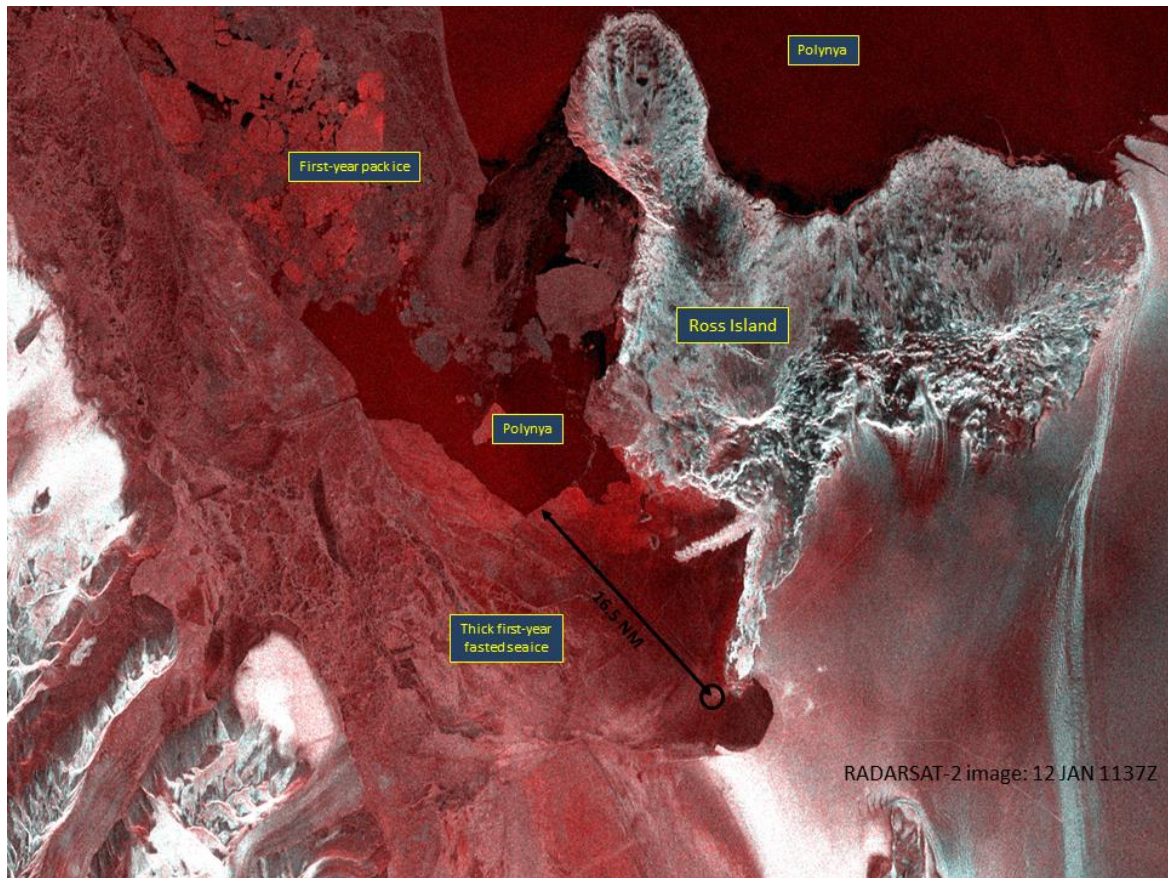


Figure 1. Fast ice situation in McMurdo Sound as of 13 Jan 2022. Radarsat-2 Image 13 Jan 1137Z.

Comparing the most recent USNIC weekly sea ice analysis from 13 January 2022 to the 15 January 2022 recession lines in the 2021–2022 Outlook (Figure 2) shows that the Ross Sea is now open to navigation between 180°–170°W longitude. The opening occurred approximately two weeks earlier than forecast around the 3rd of January as a tremendous amount of pack ice melted in the two weeks since the late December update. The distribution of ice to the west of 180° was forecasted well, and the thinning near 180° was anticipated but we were not ambitious enough with the melt. East of 180° the Outlook failed to anticipate the northward drift of the pack ice, as it is approximately 300 NM to the north-northeast of where we had forecasted it to be. This push was seen in the model runs during the initial research phase in November but those runs also showed about three times more sea ice than exists now. Despite missing the northward drift, the areal extent of the ice remaining was fairly accurate. Iceberg B-50 meandered only a few miles in the past 2 weeks and remains well east of the Ross Sea opening.



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ROSS SEA CURRENT CONDITIONS
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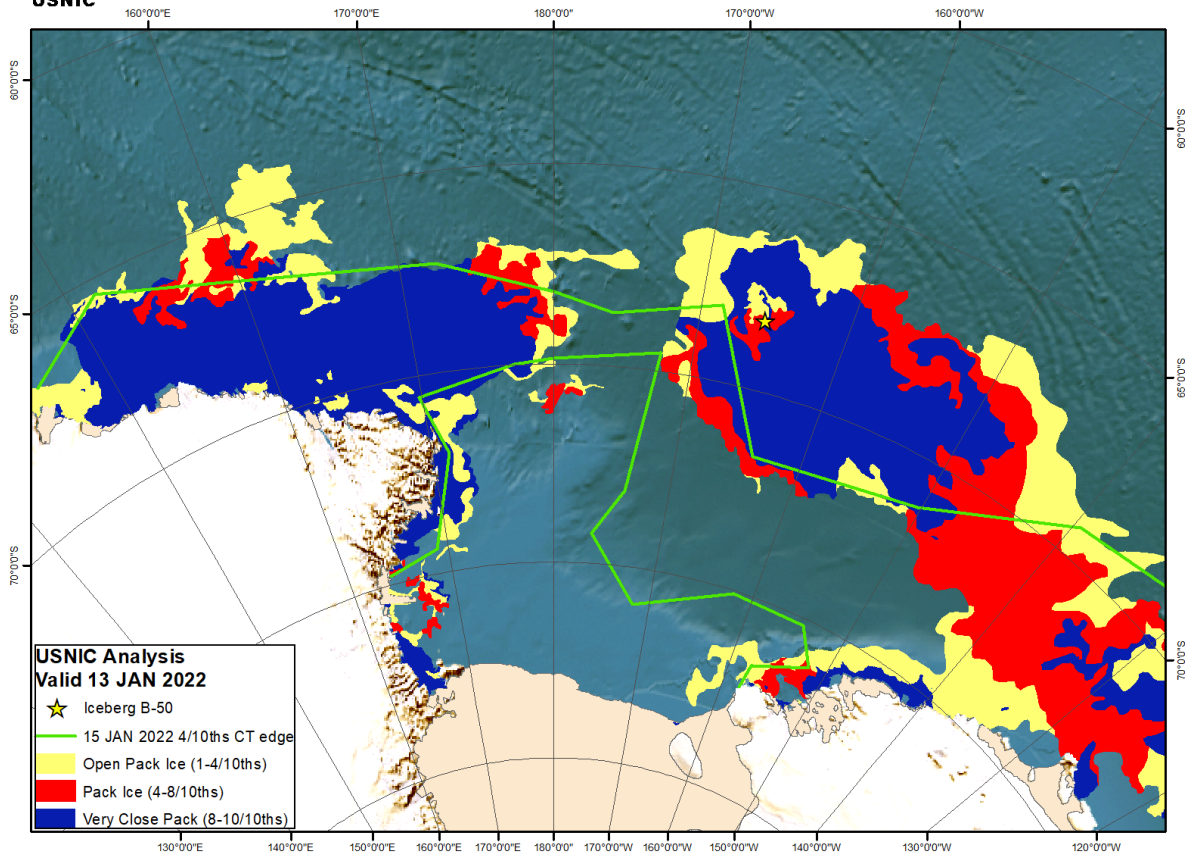


Figure 2. Ross Sea recession Outlook valid 15 Jan 2022 (green lines) compared to USNIC hemispheric analysis valid 13 Jan 2022.

Figure 3 (below) looks ahead at how the melt is expected to look by February 1 comparing the ESPC model and the USNIC Outlook. To the north and west of Cape Adare, heavy ice concentrations are expected to remain. Most of the rest of the Ross Sea is modeled to be sea ice free with small areas of sea ice lingering east of 170°W and more coastal sea ice expected in the western Amundsen Sea. The sea ice that the Outlook expected in the eastern Ross Sea (green line) drifted north into warmer waters and melted. If the model forecast verifies and the vast majority of the ice melts, that will influence how much second-year sea ice will be in the Ross Sea next season. Now that the Ross Sea is open to navigation, this will be the last update for the 2021–2022 Ross Outlook.



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ESPC MODEL VS OUTLOOK 01 FEB
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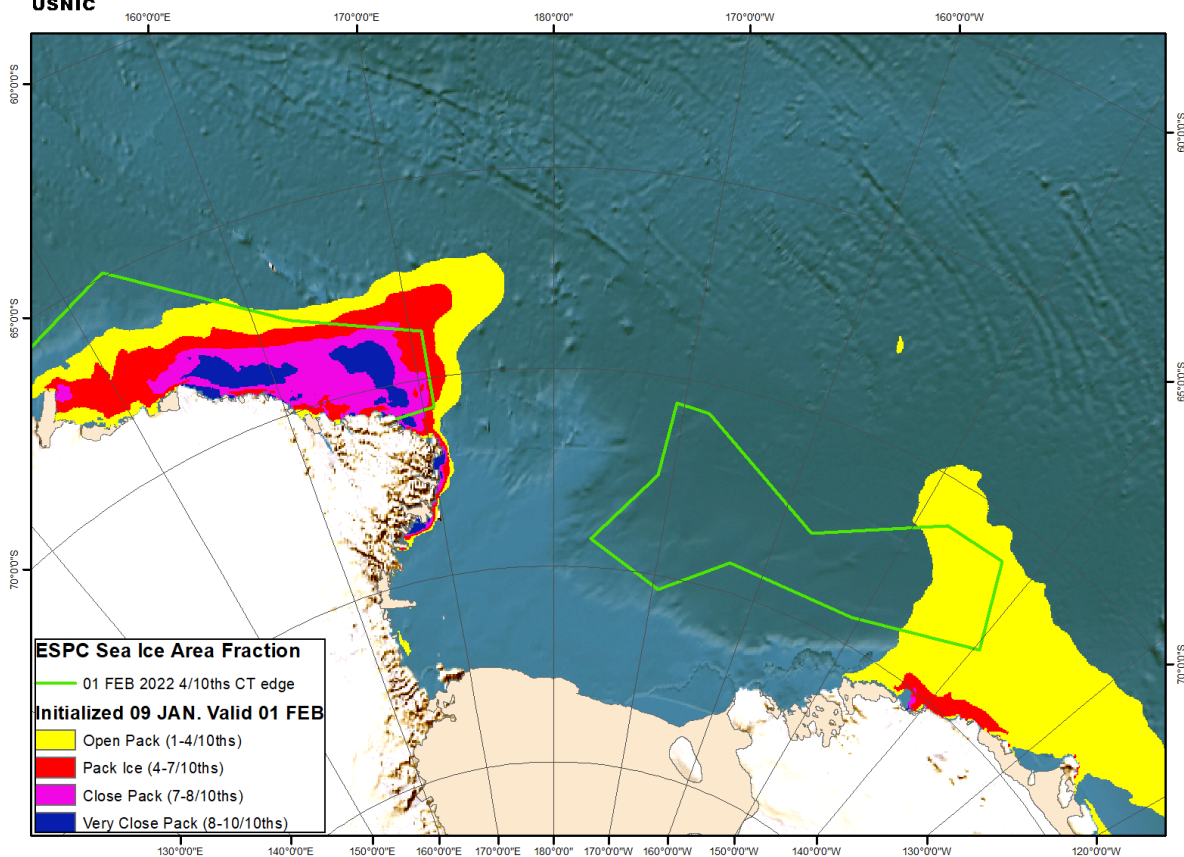


Figure 3. 01 Feb 2022 ESPC 23-day sea ice fraction forecast compared to 01 Feb 2022 USNIC Outlook (green lines).

REFERENCES

- [1] Barton, N., Metzger, E. J., Reynolds, C. A., Ruston, B., Rowley, C., Smedstad, O. M., et al. (2021). The Navy's Earth System Prediction Capability: A new global coupled atmosphere-ocean-sea ice prediction system designed for daily to subseasonal forecasting. *Earth and Space Science*, 8, e2020EA001199. <https://doi.org/10.1029/2020EA001199>