

Update #2 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 4/10ths sea ice concentration and areas with less than 4/10ths sea ice concentration.

METHODOLOGY

Climatology: The rates of recession for the Ross Sea ice edge are predominately 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 December 30, the fast ice in McMurdo Sound extends 17 nautical miles from the edge to the turning basin (Figure 1). A chunk of fast ice approximately 6 nautical miles in width broke away earlier this week and drifted off to the northwest. The remaining fast ice continues to weaken with some melt ponds developing especially in the thinner fast ice north and east of the Manhattan berg. The collapse of the fast ice is anticipated to accelerate over the coming weeks owing to the combined influence of mild temperatures, 24-hour solar insolation, and the icebreaking efforts of USCGC POLAR STAR.

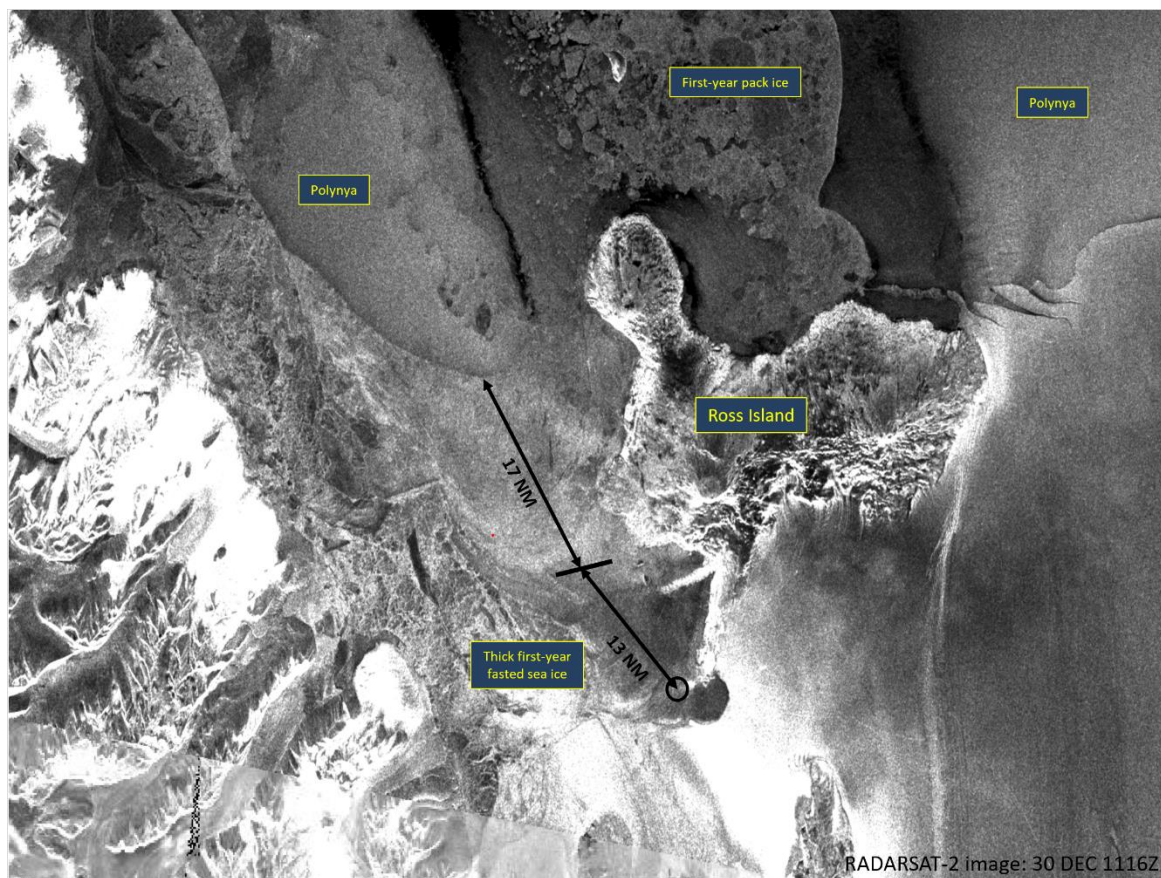


Figure 1. Fast ice situation in McMurdo Sound as of 30 Dec 2021. Radarsat-2 Image 30 Dec 1116Z.

Comparing the most recent USNIC weekly sea ice analysis from 30 December 2021 to the 01 January 2022 recession lines in the 2021–2022 Outlook (Figure 2) shows that while the overall north-south width of the pack ice bridge is roughly as forecast, it is considerably further north than expected as the Ross Sea polynya has expanded considerably further than predicted. As a result, the 4/10ths concentration edge remains at roughly the same latitude as in the first update two weeks ago. This agrees very well with the ESPC model forecast for 01 January included in that update. As we expected two weeks ago, the close pack ice did not melt very quickly over the past two weeks, but the ice bridge is finally beginning to decrease in concentration in the vicinity of 180° longitude. A path through the bridge of lower than 8/10ths concentrations will open imminently, if one has not already done so, but a path below 4/10ths concentration remains a few weeks off. Iceberg B-50 remains well east of the expected operating area and weakening in the ice bridge near 68°S, 166°W.

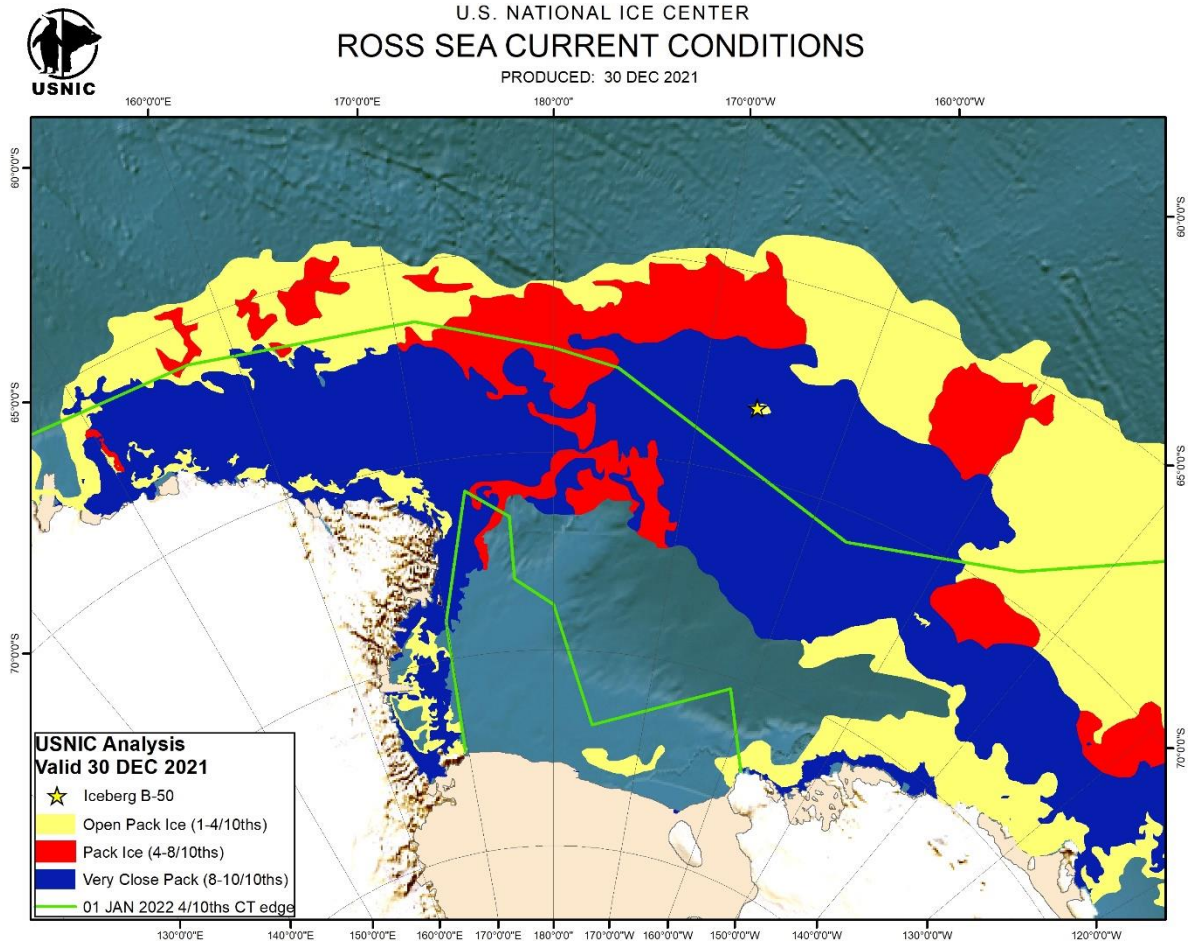


Figure 2. Ross Sea recession Outlook valid 01 Jan 2022 (green lines) compared to USNIC hemispheric analysis valid 30 Dec 2021.

Figures 3 through 5 look ahead at how the melt is expected to continue, comparing the ESPC model and the USNIC Outlook.

Figure 3 (below) shows the USNIC Outlook and the ESPC model forecast valid 15 January. The ESPC model is forecasting slightly higher ice concentrations for 15 January than it was a few weeks ago, but it still opens a path below 4/10ths concentrations through the ice bridge just before that date. Considering our initial Outlook forecast over a month ago predicted an opening date of 17 January, we are very pleased with the continued agreement between the modeling and our forecast. If anything, the model output has come slightly towards our forecast over the past few weeks. Because the ESPC model has been consistently forecasting the Ross Sea to open to unescorted navigation close to our initial Outlook, we remain comfortable that the Ross Sea should open on or within a few days of 17 January. We will pay close attention over the next few weeks to determine when the ice bridge finally breaks sufficiently for navigational purposes.

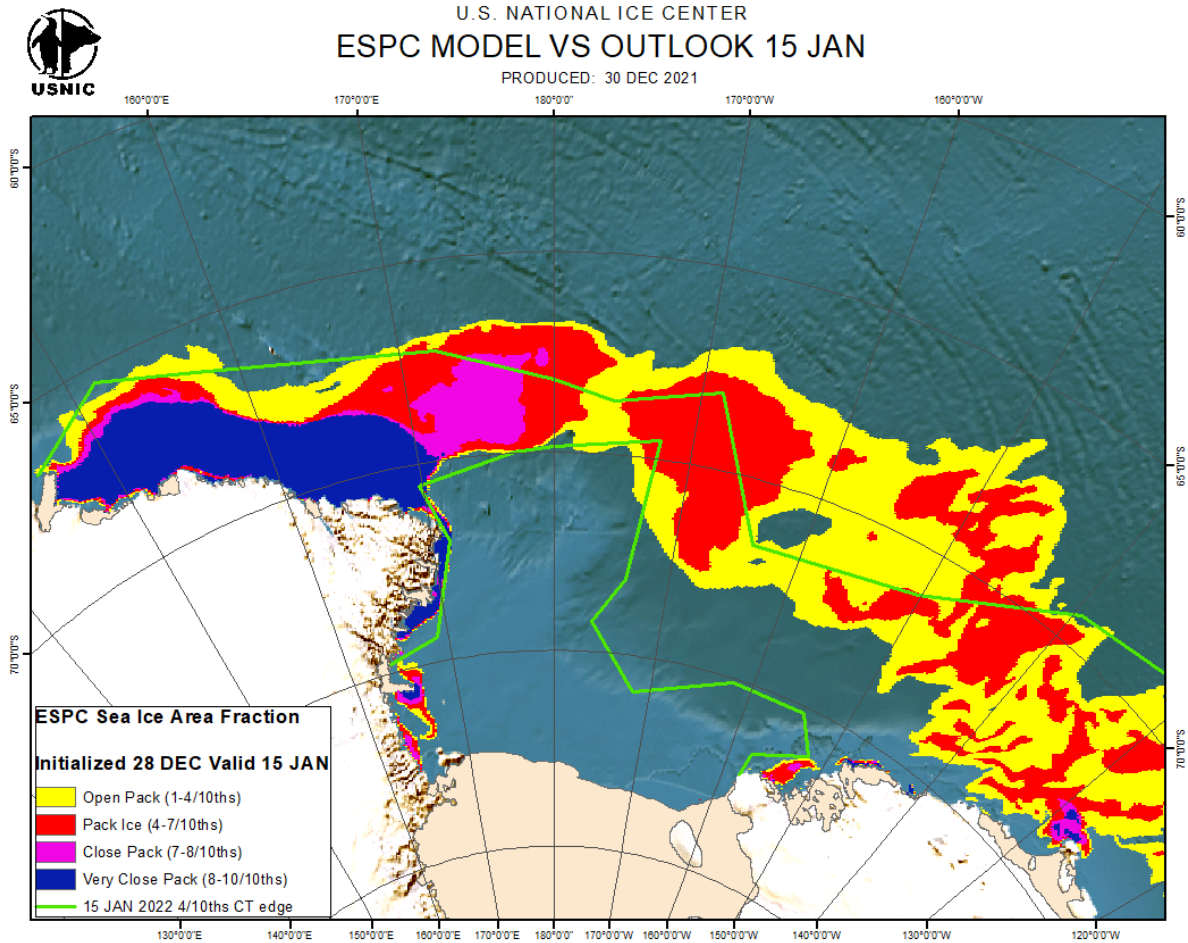


Figure 3. 15 Jan 2022 ESPC 18-day sea ice fraction forecast compared to 15 Jan 2022 USNIC Outlook (green lines).

Figure 4 (below) shows the USNIC Outlook and the ESPC model forecast valid 01 February. Both the model and the Outlook agree with a large area of sea ice remaining northwest of Cape Adare, while the model keeps the other large area of pack ice much further east of our forecast line. Whatever the location of the eastern batch of sea ice, a fairly large area of open water should be present for shipping interests in the Ross Sea by early February.

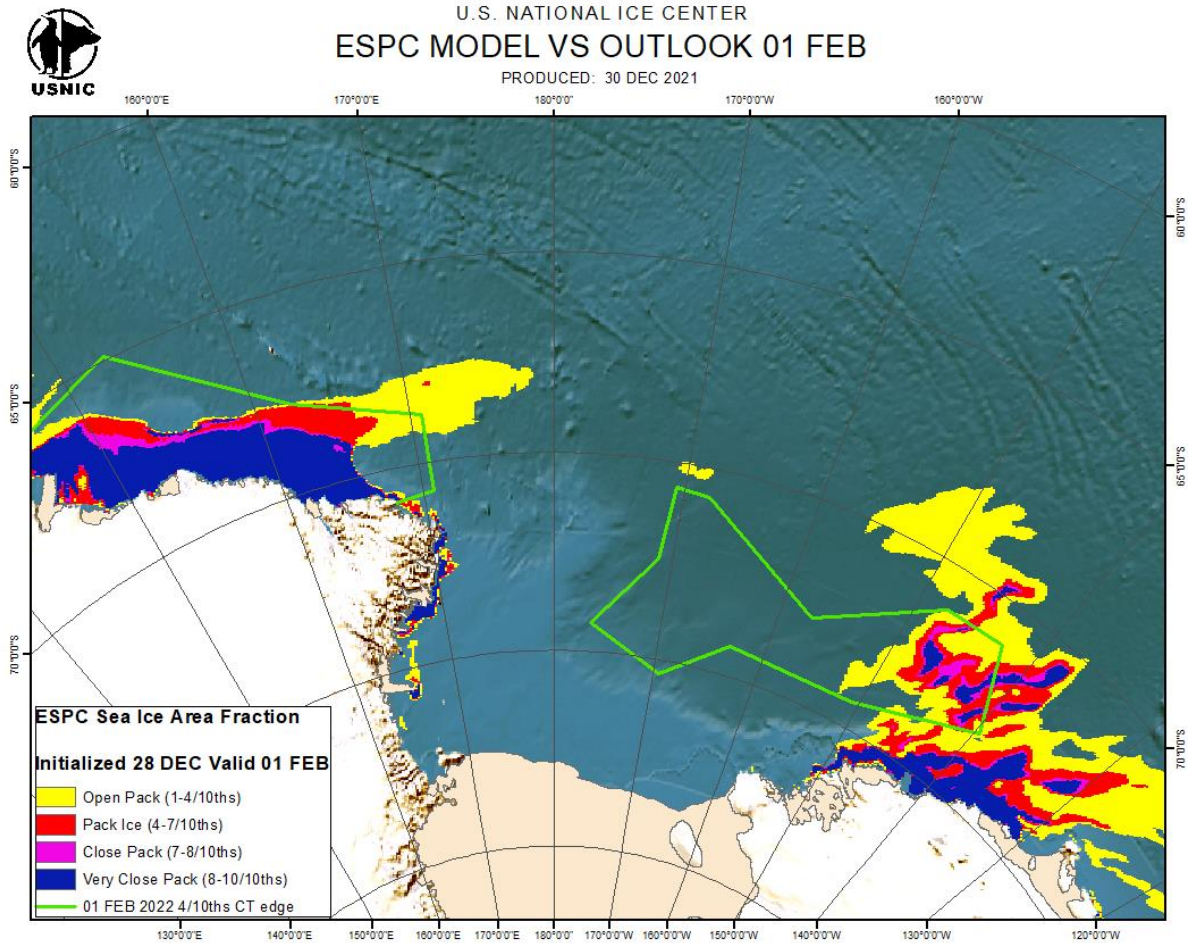


Figure 4. 01 Feb 2022 ESPC 34-day sea ice fraction forecast compared to 01 Feb 2022 USNIC Outlook (green lines).

Figure 5 (below) shows the USNIC Outlook for 15 February and the ESPC model forecast for 11 February. The ESPC model only forecasts out 45 days, but the Ross Sea should be mostly sea ice free by mid-February regardless. Though the model and our Outlook continue to differ about the location of the eastern area of pack ice, there will be little impact to shipping as the Ross Sea should be wide open to navigation at this time. The only practical impact of the location of the sea ice is that any ice that remains at the end of the 2021–2022 melt season will help determine the location of the bridge of old ice that will influence the melt out for the 2022–2023 season.



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ESPC MODEL VS OUTLOOK 11 FEB
PRODUCED: 30 DEC 2021

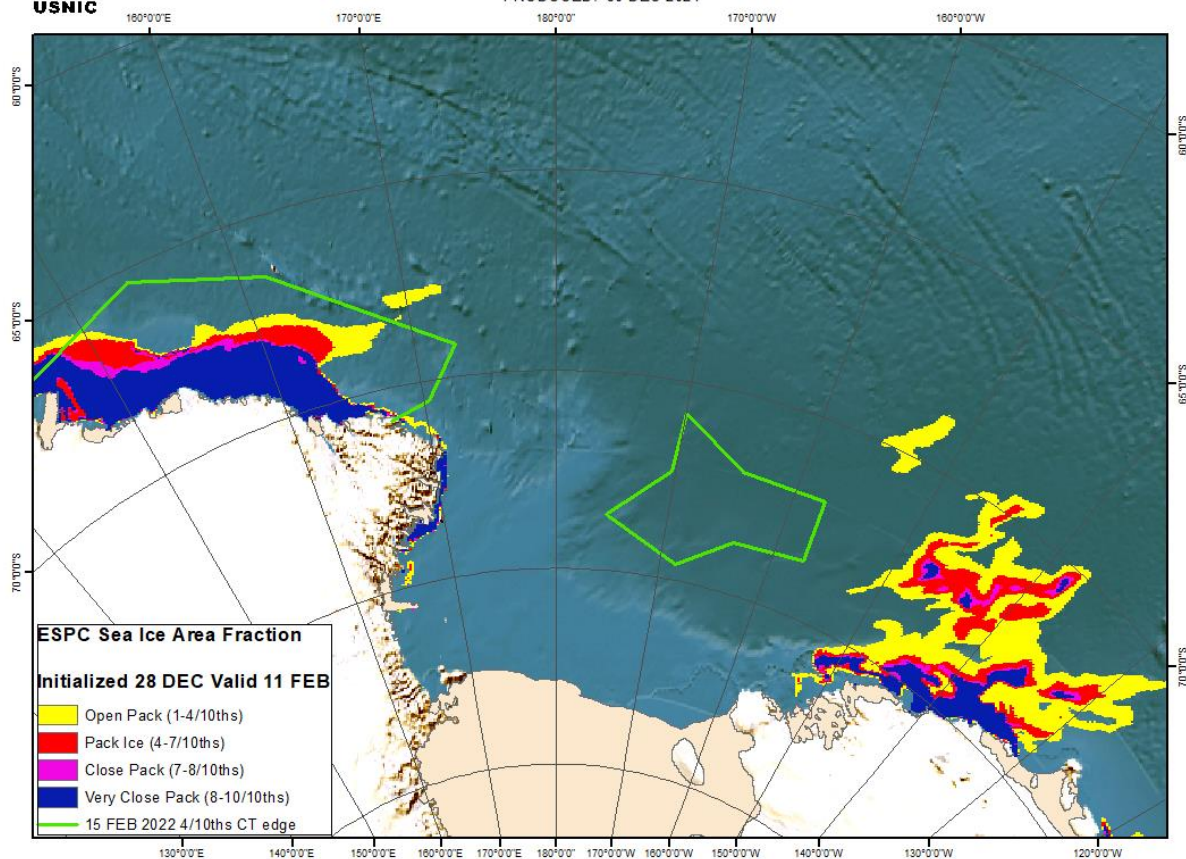


Figure 5. 11 Feb 2022 ESPC 45-day sea ice fraction forecast compared to 15 Feb 2022 USNIC Outlook (green lines).

REFERENCES

[1] Metzger, E. J. et al., (2014), Operational Implementation Design for the Earth System Prediction Capability (ESPC): A First Look, Naval Research Laboratory, NRL/MR/7320—14-9498.