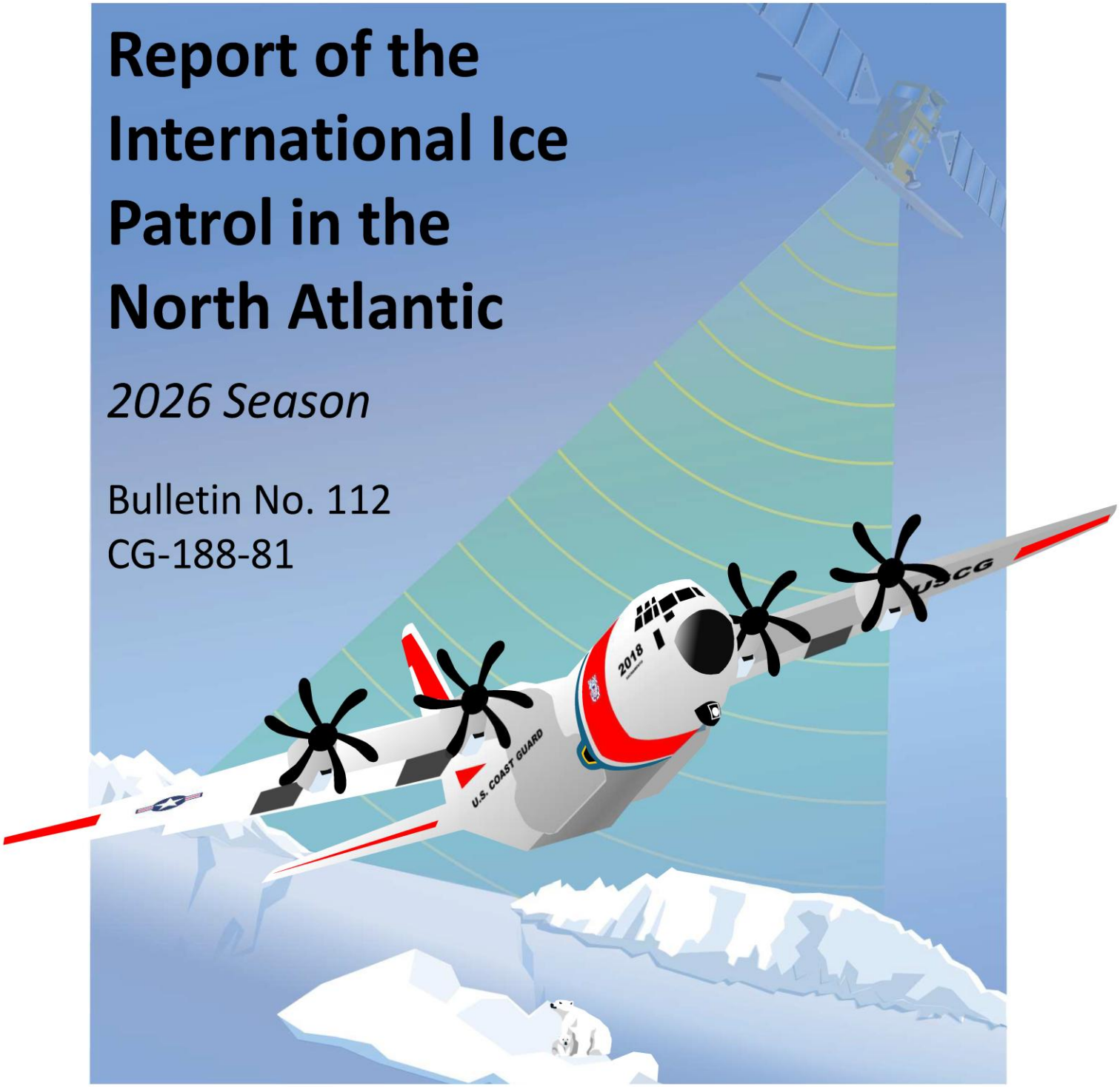
U.S. Department of Homeland Security

United States Coast Guard

Report of the International Ice Patrol in the North Atlantic

2026 Season

Bulletin No. 112
CG-188-81




INTERNATIONAL
ICE PATROL

Bulletin No. 112

Report of the International Ice Patrol in the North Atlantic

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CG-188-81

Forwarded with this report is Bulletin No. 112 of the International Ice Patrol (IIP) describing ice conditions and IIP operations during the 2026 Ice Year (1 October 2025 – 30 September 2026). In Ice Year 2026, 377 icebergs drifted into transatlantic shipping lanes, making 2026 a "moderate" Ice Year.

This year, IIP conducted its mission and successfully prevented iceberg collisions in the North Atlantic through a combination of aerial and satellite reconnaissance. IIP utilized the North Atlantic Treaty Organization's (NATO) airbase located at Happy Valley-Goose Bay in Newfoundland and Labrador. We found excellent flying conditions and received a wonderful reception from the Royal Canadian Air Force's 5 Wing staff.

Satellite reconnaissance continues to serve as the primary means for iceberg detection along the coast of Newfoundland and Labrador and over the Grand Banks of Newfoundland. For the 2026 Ice Year, 77% of recorded icebergs were sighted by IIP, the Canadian Ice Service (CIS), or commercial satellite analysts using largely public imagery. Satellite imagery was successful in identifying large icebergs, especially in the northern area of our operations. However, due to the inverse relationship between imagery resolution and spatial coverage, the quantity of available high-resolution imagery was insufficient to confirm the melt of a single iceberg and to target small icebergs. To balance this, IIP relied on aerial reconnaissance to confirm the melt of single icebergs and to detect small icebergs with confidence. During gaps in aerial reconnaissance coverage, IIP extended the buffer zone on known icebergs and kept icebergs on the plot for longer periods of time to reduce the risk of the maritime community encountering an untracked iceberg.

IIP strives to continually improve and innovate and is coordinating with international and domestic partners to find new ways of conducting this critical mission to enhance commerce and safety of life at sea. IIP is extremely grateful to our partners for their continued support.

Each year, IIP honors the sinking of the Royal Mail Ship (RMS) TITANIC, the event that founded our institution, by holding a memorial and wreath dedication honoring the lives lost. The 2026 ceremony was held in Canada at the Local Council of Women Halifax-George Wright House. The CCGS Cape Roger commemorated the sinking of the RMS TITANIC through a wreath laying ceremony off the southeast coast of Newfoundland. IIP is proud of our contributions to safe navigation in a highly dynamic and dangerous area of the world and will continue to honor the lives of those lost 114 years ago by continuing our mission to the best of our ability.

This 2026 Ice Year report was prepared by all members of the IIP team. On behalf of all of us, I hope that you enjoy reading it.



H. R. Adams
Commander, U. S. Coast Guard
Commander, International Ice Patrol


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Acronyms and Abbreviations

AIS	Automatic Identification System
AOR	Area of Responsibility
APN-241	Tactical Transport Weather Radar
ASEC	Air Station Elizabeth City
BAPS	IceBerg Analysis and Prediction System
CCGS	Canadian Coast Guard Ship
CBC	Canadian Broadcasting Corporation
CG-5PW	United Stated Coast Guard Office of Marine Transportation Systems
CIIP	Commander, International Ice Patrol
CIS	Canadian Ice Service
CSA	Canadian Space Agency
CPC	Climate Prediction Center
CYHZ	Airport in Halifax, Nova Scotia
CYYR	Royal Canadian Air Force Base in Goose Bay - Happy Valley
CYYT	St. John's International Airport
DHS S&T	Department of Homeland Security Science and Technology
DMI	Danish Metrological Institute
DSA	Duty Satellite Analyst
DWO	Duty Watch Officer
ECMWF	European Centre for Medium-Range Weather Forecasts
ELTA	ELTA-2022 360° X-Band Surface-Search Radar
ERA5	Fifth Generation ECMWF Reanalysis
EO	Electro-Optical
EOIR	Electro-Optical Infrared
ERMA	Environmental Response Management Application
ESA	European Space Agency
ESRI	Environmental Systems Research Institute
FBO	Fixed Base Operator

FLIR	Forward-Looking Infrared Camera
GIS	Geographic Information System
HDMS	His/Her Danish Majesty's Ship
HMCS	His Majesty's Canadian Ship
IBX48°N	Icebergs that Crossed South of 48°N
ICC-GEOINT	Intelligence Coordination Center Geospatial Intelligence Branch
IDS	Iceberg Detection System
IFM	Isolated/Few/Many
IICWG	International Ice Charting Working Group
IIP	International Ice Patrol
IQR	Interquartile Range
IRD	Ice Reconnaissance Detachment
ISAR	Inverse Synthetic Aperture Radar
KADW	Joint Base Andrews Airport
KFMH	Cape Cod Airport
KML	Keyhole Markup Language
MCTS	Maritime Communication and Traffic Service
MSLP	Mean Sea Level Pressure
NAIS	North American Ice Service
NAO	North Atlantic Oscillation
NAOI	North Atlantic Oscillation Index
NATO	North Atlantic Treaty Organization
NAVAREA	Navigational Area
NAVCEN	United States Coast Guard Navigation Center
NAVTEX	Navigational Telex
NAVWARN	Navigational Warning
NCEP	National Centers for Environmental Prediction
NGA	National Geospatial-Intelligence Agency
NL	Newfoundland
NM	Nautical Mile

NOAA	National Oceanic and Atmospheric Administration
NRL	Naval Research Laboratory
NSIDC	National Snow and Ice Data Center
NSOF	NOAA Satellite Operations Facility
NWS	National Weather Service
OLI	Operational Land Imager
OPC	Ocean Prediction Center
OPCEN	Operations Center
POD	Probability of Detection
R&D	Research and Development
Radiofax	Radio Facsimile
RCM	RADARSAT Constellation Mission
RMS	Royal Mail Ship
RS2	RADARSAT-2
SAR	Synthetic Aperture Radar
SAT	Surface Air Temperature
SIM	Standard Iceberg Message
SITOR	Simplex Teletype Over Radio
SN1(A/C/D)	Sentinel-1 (A/C/D)
SN2(A/B/C)	Sentinel-2 (A/B/C)
SOLAS	Safety of Life at Sea
SST	Sea Surface Temperature
SWH	Significant Wave Height
TC	Tactical Commander
UK	United Kingdom
US	United States
USCG	United States Coast Guard
USCGC	United States Coast Guard Cutter
USGS	United States Geological Survey
USNIC	United States National Ice Center

WMO	World Meteorological Organization
WWNWS	World-Wide Navigational Warning Service

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INTERNATIONAL
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1 Introduction

This is the 112th IIP annual report describing the 2026 Ice Year. It depicts IIP operations, along with environmental and iceberg conditions, in the North Atlantic from October 2025 to September 2026.

After a year of satellite-only reconnaissance in 2025, IIP resumed their aerial reconnaissance mission in Ice Year 2026, partnering with U.S. Coast Guard Air Station Elizabeth City (ASEC) and NATO Base Happy Valley-Goose Bay for five Ice Reconnaissance Detachments (IRDs). The IRDs detected icebergs in the North Atlantic Ocean and Labrador Sea with HC-130J aircraft from ASEC. IIP also received reports from commercial aircraft and mariners in the North Atlantic region. Further, IIP worked closely with partners to create new and effective satellite collection strategies.

IIP personnel analyzed iceberg and environmental data using iceberg drift and deterioration models within the IceBerg Analysis and Prediction System (BAPS) at the IIP Operations Center (OPCEN) located in the National Oceanic and Atmospheric Administration (NOAA) Satellite Operations Facility (NSOF) at Suitland, MD. In accordance with the North American Ice Service (NAIS) Collaborative Arrangement, IIP used BAPS to produce daily iceberg charts and text bulletins from the model output. These iceberg warning products were then distributed daily to the maritime community. In addition to these routine broadcasts, IIP also responded to individual requests for iceberg information.

IIP remains unequivocally committed to maintaining mariner safety as it explores adding new technology and tools to its iceberg reconnaissance mission.

IIP was formed after the RMS TITANIC sank on 15 April 1912. Since 1913, except for periods of World War, IIP has monitored the iceberg danger in the North Atlantic and broadcast iceberg warnings to the maritime community. The activities and responsibilities of IIP are delineated in U.S. Code, Title 46, Section 80302, and the International Convention for the Safety of Life at Sea (SOLAS), 1974.

For the 2026 Ice Year, IIP was under the operational control of the Director of Marine Transportation (CG-5PW), Mr. Michael D. Emerson. CDR Hillary R. Adams relieved CDR Erin M. Caldwell as Commander, IIP (CIIP).

For more information about IIP, including historical and current iceberg bulletins and charts, visit our website at:

https://www.navcen.uscg.gov/international-ice-patrol.


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2 Ice and Environmental Conditions

2.1 International Ice Patrol Oceanographic Area of Responsibility

This section describes the ice and environmental conditions in the IIP oceanographic area of responsibility (AOR) during the 2026 northern hemisphere Ice Year (1 October 2025 to 30 September 2026). IIP has the statutory mission, encoded in international (International Maritime Organization 1974) and United States (US) law (Title 46, United States Code § 80301 2021), to monitor and warn of iceberg danger in the North Atlantic Ocean. Under this mission, IIP's AOR encompasses the area of ocean around the Grand Banks of Newfoundland, Canada, where icebergs pose a threat to vessels traversing North Atlantic shipping lanes (**Figure 2.1**).

As a part of its mission, IIP collects and reports daily iceberg data (numbers, distribution, and extent, or "limit") in its AOR (International Maritime Organization 1974). IIP reports these data as estimates because IIP uses a combination of direct, imperfect measurement (human visual sighting and remote sensing detection) of icebergs or their absence, and computer modeled drift and deterioration of previously detected icebergs to estimate the daily iceberg population.

IIP's iceberg dataset is unique: due to the long history and singular mission of IIP since its formation in response to the sinking of the RMS TITANIC in 1912, it is likely the largest and most continuous, comprehensive, and accurate North Atlantic iceberg record. It is the authoritative dataset, and the only of its kind, for icebergs in IIP's AOR. For more information on the methods IIP employs to monitor icebergs in its AOR, see **Sections 3** and **4**.

2.1.1 Ice Year and Iceberg Season

The northern hemisphere Ice Year begins and ends roughly when sea ice (frozen saltwater ocean surface) reaches its minimum extent in the Arctic Ocean (September, see **Figure 2.1a**). Thus, midway through the Ice Year (March, in the northern hemisphere, see **Figure 2.1b**) corresponds to maximum sea ice extent (F. Fetterer, et al. 2017).

Within an Ice Year, IIP considers the Iceberg Season in the North Atlantic to span the months (typically January/February through August/September, **Figure 2.2**) during which icebergs (freshwater ice, of land origin, in the ocean) pose the greatest threat to the transatlantic shipping lanes by drifting south of 48°N latitude, which is nearly on parallel with St. John's, Newfoundland (**Figure 2.1c** through **e**). Previously, IIP reported that the Iceberg Season typically spanned January through September based on the mean monthly number of icebergs from 1983 to present which drift south of 48°N (IBX48°N) being greater than zero. However, **Figure 2.2** has been updated to include the monthly IBX48°N median and interquartile range (IQR) for this period rather than the mean alone. Based on the statistical analysis of the monthly median IBX48°N and IQR, icebergs typically threaten transatlantic shipping lanes from February to August (see **Figure 2.2**, months in which the median IBX48°N is greater than zero). We offer the definition of the Iceberg Season to now encompass both the mean and median analysis.

Icebergs in IIP's AOR originate from Arctic glaciers along the coast of western Greenland (see **Figure 2.1f**, *white diamonds*). At these glacial termini, ice calves (breaks off) into the ocean to become icebergs (individual pieces of floating glacial ice), which, amid sea ice and in open ocean, drift generally south in major currents in Baffin Bay and the Labrador Sea until, after several years, they reach the Grand Banks and intersect with major transatlantic shipping lanes (Larsen, et al. 2015, Newell 1993, Marko, et al. 1994, Wilton, Bigg and Hanna 2015).

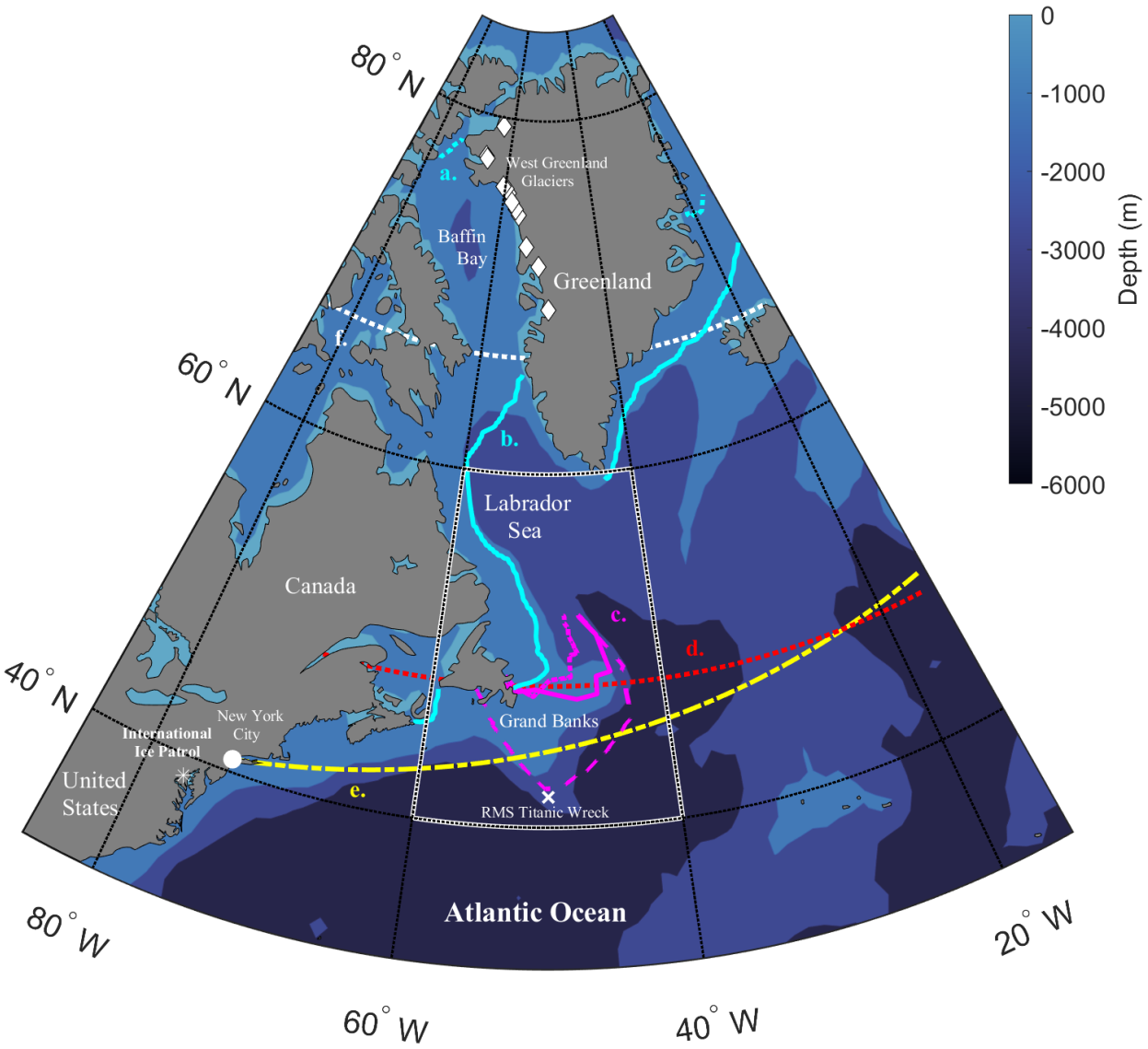


Figure 2.1. International Ice Patrol (IIP) approximate area of responsibility (AOR, *white outlined area*) around the Grand Banks of Newfoundland, Canada, in the North Atlantic Ocean, where icebergs threaten shipping lanes during the Iceberg Season. **a.** The median sea ice extent in September (at its yearly minimum, *cyan dotted line*) and **b.** March (at its yearly maximum, *cyan solid line*) for 1981 to 2010. **c.** The median mid-January (*dotted magenta line*), mid-May (*dashed magenta line*), and early-September (*solid magenta line*) iceberg limits for 1991 to 2020; prior to about 2010, IIP did not systematically monitor icebergs north of 52°N. **d.** 48°N (*red dotted line*); IIP considers this latitude as that south of which icebergs pose a significant threat to the shipping lanes, and records the daily, monthly, and yearly estimated number of icebergs which drift south of it. **e.** An example transatlantic shipping route *(yellow dashed line*) along a rhumb line between Southampton, United Kingdom (UK) and New York City, US. **f.** The Arctic Circle at roughly 66.5°N (*white dotted line*). Icebergs in IIP's AOR calve (break off) into the ocean primarily where Greenland glaciers terminate on the island's west coast (*white diamonds*) (Rignot and Kanagaratnam 2006). They drift south over years in major Arctic and North Atlantic currents and within sea ice, to IIP's AOR. The depiction of west Greenland glacial termini is not comprehensive but includes those which contribute most icebergs to IIP's AOR. Sea ice extents are from the National Snow and Ice Data Center (NSIDC) Sea Ice Index, Version 3 (F. Fetterer, et al. 2017). Iceberg limits are from IIP. See discussion in **Section 2.1**.

Outside of the Iceberg Season, typically October through December (see **Figure 2.2**), IIP transfers primary responsibility for monitoring and warning of icebergs in the North Atlantic and marginal Arctic seas to its close NAIS partner, CIS, as primarily Canadian vessels and coastline will be threatened during this time. During these months, IIP focuses on oceanographic research and scientific development of iceberg reconnaissance methods to advance the state of its

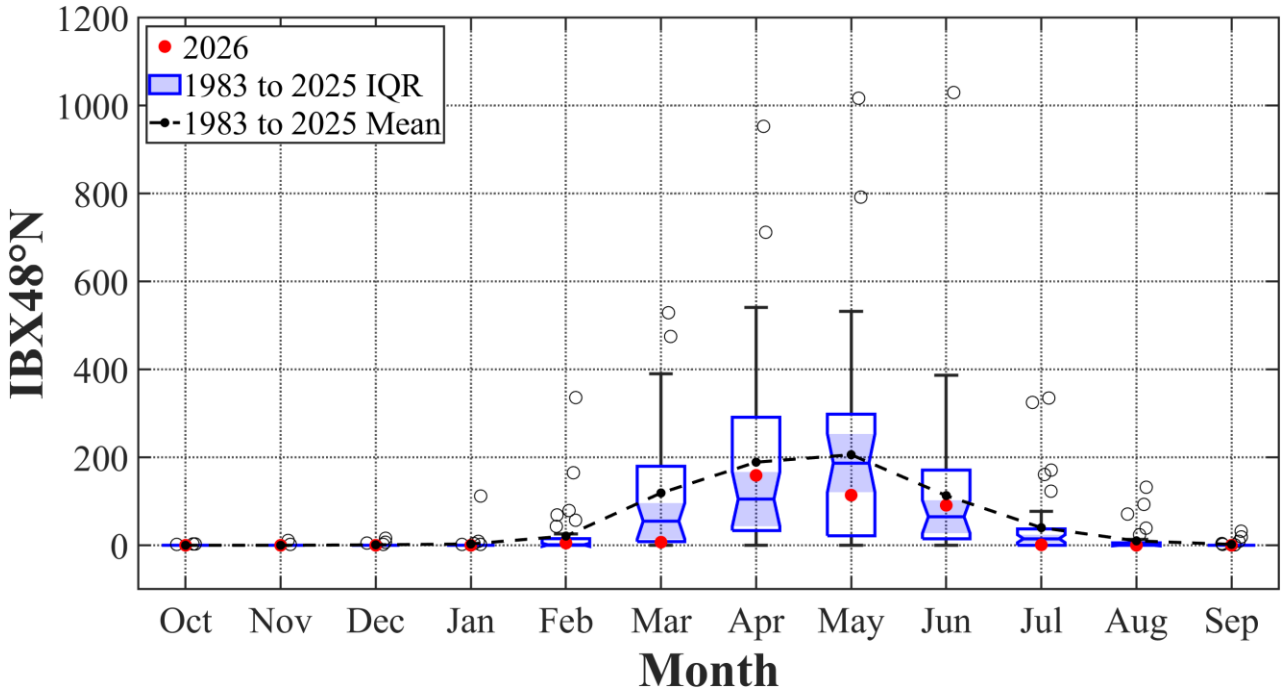


Figure 2.2. Estimated number of icebergs which crossed south of 48°N (IBX48°N) each month for Ice Years 1983 to 2025 (*blue box and black whisker plots, and black dot-dashed line*) and 2026 (*red dots*). The notched blue boxes indicate the interquartile range (IQR) of the monthly IBX48°N for 1983 to 2025, in which the bottom border corresponds to the first quartile (25th percentile), the middle line to the median (second quartile, 50th percentile), and the top border to the third quartile (75th percentile). The shaded light blue regions ("notches") indicate the range of monthly IBX48°N occupying the median $\pm\frac{1.57\times IQR}{\sqrt{n}}$ in which n is the number of Ice Years from 1983 to 2025 (43). A monthly median is not significantly different at the 5% significance level from another if their respective notches overlap (have overlapping ranges of IBX48°N). Nonoutlier minimum and maximum monthly IBX48°N for 1983 to 2025 are indicated by black error bars, and outliers (calculated as $\mathbf{1.5}\times\boldsymbol{IQR}$ less or greater than the first or third quartile respectively) are indicated by black outlined circles. The black dot-dashed line indicates the mean estimated monthly IBX48N for 1983 to 2025, which, prior to Ice Year 2025, IIP reported along with monthly standard deviation and standard error to characterize average or normal conditions for this period. The IQR gives a more complete and accurate depiction of average conditions than the mean alone for distributions which are heavily skewed; the monthly IBX48N distributions for 1983 to 2025 are heavily right-skewed (note how the mean is markedly higher than the median and that the median is closer to the minimum than the maximum IBX48N in each month during the Iceberg Season for this period). Therefore, in this report, reference to normal monthly conditions will be in relation to monthly median IBX48N and IQR for 1983 to 2025, rather than mean. 1983 marked the beginning of what IIP defines as the modern reconnaissance era, in which IIP began using modern airborne radar to detect icebergs and computer modeled iceberg drift and deterioration to estimate the daily iceberg population. Iceberg data is from IIP.

iceberg warning and monitoring; however, IIP continues to accept reports of icebergs and actively communicates them to CIS.

2.1.2 Iceberg Season Severity and the Environment

IIP considers one of the metrics of the severity of a given Iceberg Season to be the total number of icebergs that drift south of 48°N latitude in an Ice Year (**Figure 2.3**, IBX48°N) (Smith 1926, Trivers 1994). IIP classifies Iceberg Season severity for this metric as light for an iceberg number of 230 or less, moderate for 231 to 1036, severe for 1037 to 1398, and extreme for greater than 1398 (International Ice Patrol 2018). In 2018, IIP reestablished these classes and their thresholds to account for differing iceberg detection and monitoring methods through its history and into what IIP considers as its modern reconnaissance era (1983 to present), during which it has employed sophisticated airborne radar, computerized iceberg drift and deterioration models, and more recently, spaceborne sensors, to monitor icebergs. For a detailed discussion on this classification, see International Ice Patrol, 2018.

Another metric historically used by IIP to

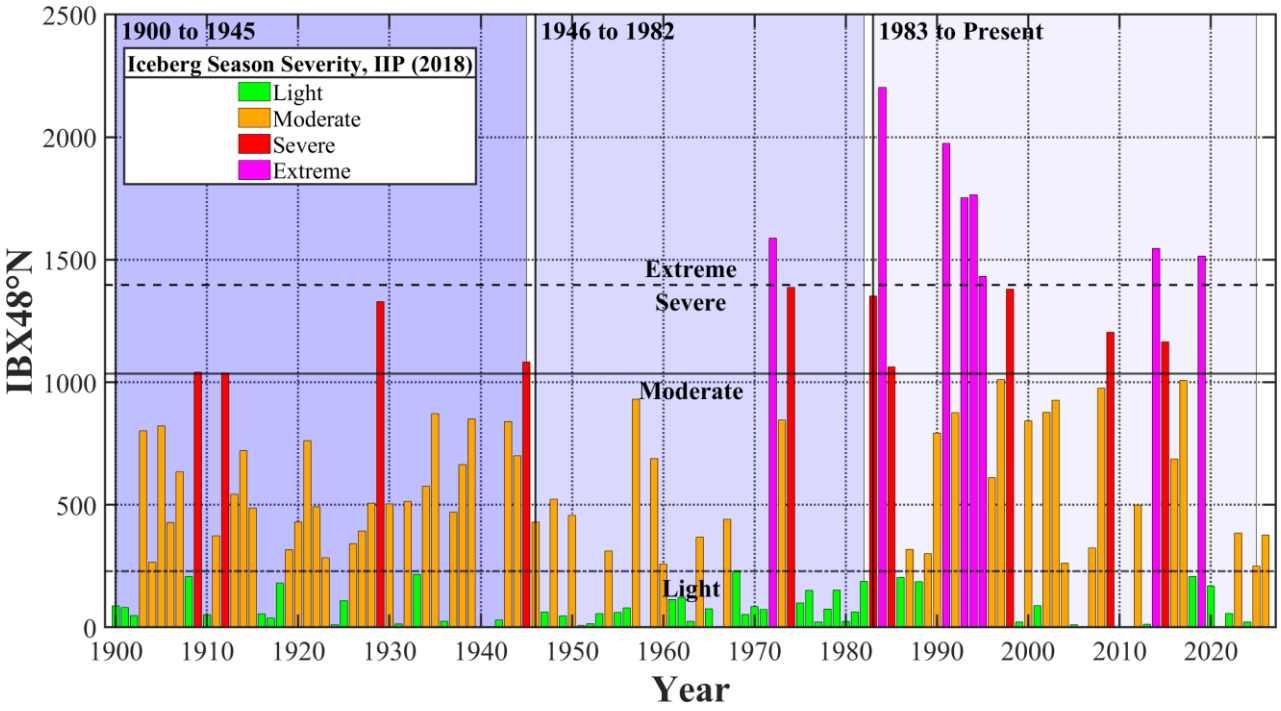


Figure 2.3. Estimated number of icebergs which crossed south of 48°N each Ice Year from 1900 to 2026. Since 2018, IIP has classified Iceberg Season severity in a given Ice Year for this metric as light (*green bars*) for an iceberg number of 230 or less (*black dot-dashed line*), moderate (*orange bars*) for 231 to 1036 (*black solid line*), severe (*red bars*) for 1037 to 1398 (*black dashed line*), and extreme (*magenta bars*) for greater than 1398 (International Ice Patrol 2018). Iceberg data is from IIP; prior to 1914, iceberg data is from the United States Hydrologic Office (Trivers 1994). IIP considers 1983 to present as its modern reconnaissance era (*rightmost lightest blue-shaded region).*

characterize Iceberg Season severity is season length, in which a longer season would correspond to greater severity, as the iceberg threat to vessels traversing shipping lanes would be prolonged (Trivers 1994). Additionally, IIP has used the total areal extent of the known iceberg population over an Ice Year as a metric of Iceberg Season severity, given that a greater extent would correspond to icebergs threatening a greater portion of the ocean near the shipping lanes (Trivers 1994, International Ice Patrol 2018).

The absolute number of icebergs that drift into IIP's AOR and south of 48°N latitude, their corresponding spatiotemporal distributions, and the duration of the Iceberg Season vary each year. However, patterns in these parameters emerge due to large-scale and long-term environmental forcings (Bigg, et al. 2014). Notably, large scale atmospheric and regional sea ice conditions have been shown to relate to North Atlantic iceberg conditions. Specifically, higher sea ice concentrations and greater sea ice extent are correlated with greater iceberg numbers and extent, because sea ice protects icebergs from destructive open ocean forces (waves and melting), and conversely from grounding in shallow coastal waters to melt quickly, as they drift south (Marko, et al. 1994, Trivers 1994).

In addition, it has been shown that the mode of the North Atlantic Oscillation (NAO)—a temporal pattern of modification of the strengths of a large-scale, predominately low surface pressure over Greenland and the Labrador Sea and a large-scale, predominately high pressure over the mid North Atlantic—may correlate to iceberg conditions (Hanna, et al. 2011). The normal mode, indicated by a positive NAO index (NAOI) corresponds to a stronger Greenlandic low, offshore winds along the Labrador and northern Newfoundland coasts, increased storms through IIP's AOR, and increased precipitation. These conditions favor offshore transport of icebergs and a potential expansion of the iceberg limit, but also expose icebergs to open ocean where they

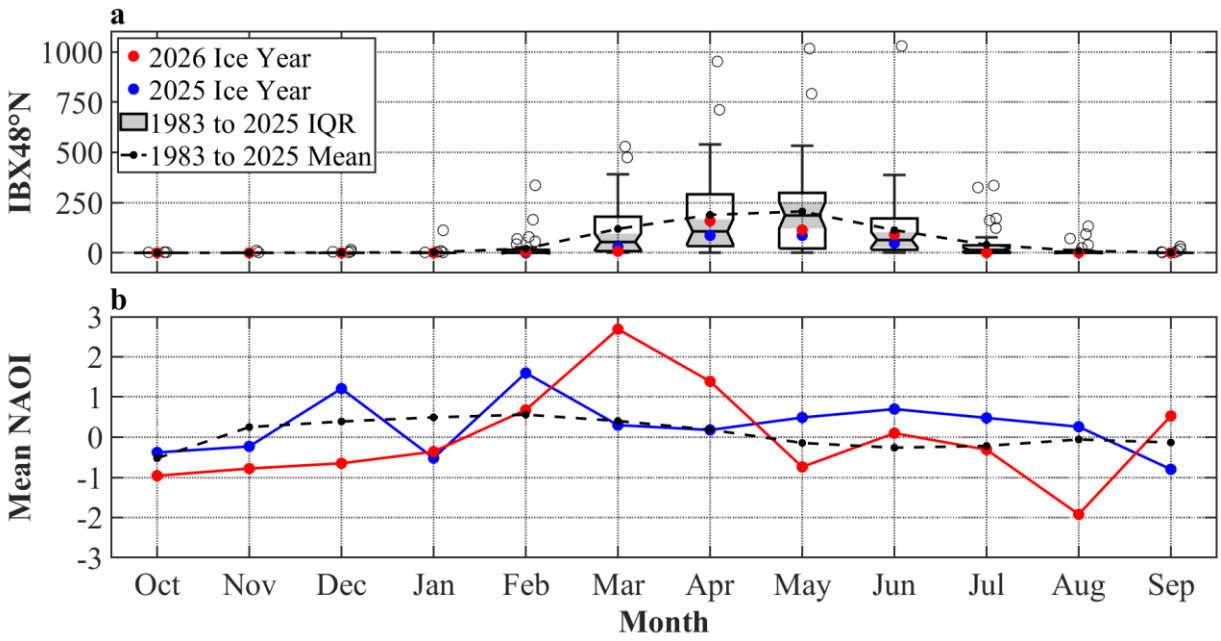


Figure 2.4. Iceberg and atmospheric conditions throughout the 2026 Ice Year as compared to 2025 and 1983 to 2025. **a.** Monthly IBX48°N for Ice Years 2026 (*red dots*), 2025 (*blue dots*), and 1983 to 2025 (*black box and whisker plots and black dotted dashed line*). The notched black boxes indicate the interquartile range (IQR) of the monthly IBX48°N for 1983 to 2025, where the shaded region ("notch") indicates overlap between monthly medians which will not be significantly different from each other at the 5% significance level. The black error bars indicate non-outlier monthly minima and maxima IBX48°N and the black outlined circles indicate monthly outlier IBX48°N values for this period. See **Figure 2.2** for a detailed explanation. **b.** Mean monthly North Atlantic Oscillation Index (NAOI) for Ice Years 2026 (*red dotted solid line*), 2025 (*blue dotted solid line*), and 1983 to 2025 (*black dotted dashed line*). Iceberg counts are from IIP. Mean monthly NAOI values are from the National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Prediction (NCEP) Climate Prediction Center (CPC) (NOAA/NWS NCEP Climate Prediction Center 2024).

deteriorate faster. Conversely, a negative NAOI corresponds to a weaker gradient between the Greenlandic low and North Atlantic high, onshore and alongshore-winds along the Labrador and northern Newfoundland coasts, decreased storms through the AOR, and decreased precipitation (Fettweis, et al. 2013, Noël, et al. 2014). These conditions instead favor onshore transport of icebergs and a contracted iceberg limit, but also harbor icebergs inshore within calmer ocean conditions and coastal sea ice.

While these relationships are known between sea ice, the atmosphere, and icebergs, they remain a topic of ongoing study.

2.2 Ice and Environmental Conditions in Ice Year 2026

Ice Year 2026 was characterized by near-normal environmental conditions during the Iceberg Season, similar to Ice Year 2025. In Ice Year 2026, 377 icebergs drifted south of 48°N (see **Figure 2.3**, *rightmost orange bar*), classifying the 2026 Iceberg Season as having moderate severity for this metric using the approach adopted by IIP in 2018 (International Ice Patrol 2018). This number remained within normal range (within IQR, **Figure 2.4a**, and see **Figure 2.2**, *red dots and box plots*) in every month except March (in which it was slightly below normal) in Ice Year 2026. The 2026 Iceberg Season was slightly below normal length: icebergs first drifted south of 48°N in February 2026, on par with the 1983 to 2025 median, and stopped drifting south of this latitude after July 2026, one month earlier than the 1983 to 2025 median (see **Figures 2.2** and **2.4a**, February to August). Finally, iceberg extent overlapped or slightly exceeded at least a part of the 1991 to 2020 mid-monthly median in each month of the peak (see **Figures 2.2** and **2.4a**, March through July, months with a median IBX48°N significantly

above zero) of the 2026 Iceberg Season (**Figure 2.5**), and additionally in the first quarter of the Ice Year (October through December 2025).

All sea ice extents reported here are from the National Snow and Ice Data Center (NSIDC) Sea Ice Index, Version 4 (F. Fetterer, et al. 2025).

All NAOI values reported here are from the NOAA National Centers for Environmental Prediction (NCEP) Climate Prediction Center (CPC) (NOAA/NWS NCEP Climate Prediction Center 2024).

Sections 2.2.1 through **2.2.4** describe in detail the ice and environmental conditions in each quarter of the 2026 Ice Year.

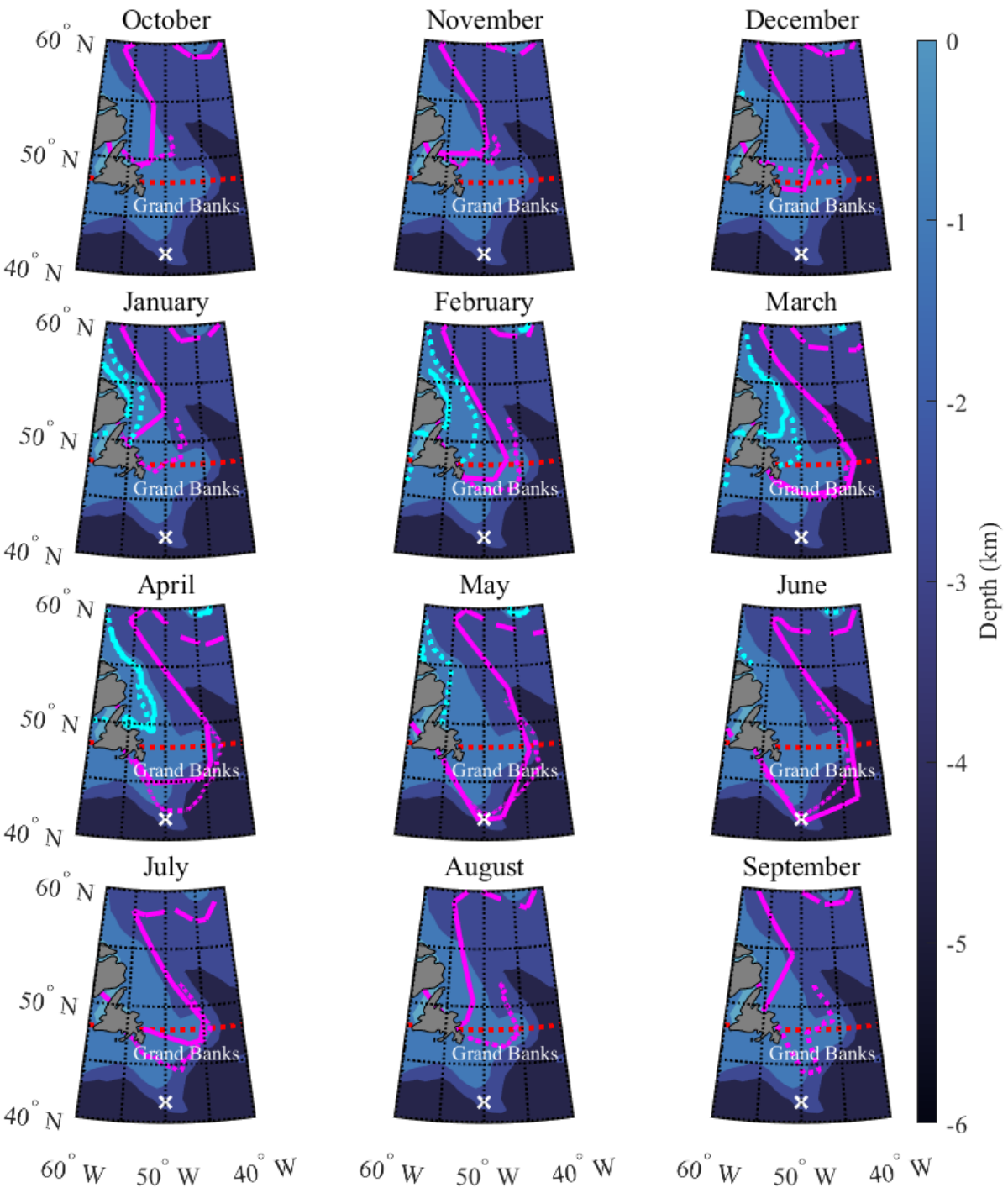


Figure 2.5. Median monthly sea ice extents *(cyan solid lines*) and mid-month iceberg extents (*magenta solid lines*) in IIP's AOR throughout the 2026 Ice Year in comparison to median monthly sea ice extents for 1981 to 2010 (*cyan dotted lines*) and mid-month iceberg limits for 1991 to 2020 (*magenta dotted lines*). The location of the RMS Titanic wreck is indicated by an "x". Sea ice extents are from the National Snow and Ice Data Center (NSIDC) Sea Ice Index, Version 4 (F. Fetterer, et al. 2025). Iceberg limits are from IIP.

2.2.1 October to December 2025

Surface air temperatures (SATs, 2-m) lowered through the first quarter of Ice Year 2026 over the entire AOR, reaching freezing in December over the Labrador Sea and Grand Banks (**Figure 2.8**). SATs were several degrees above normal through the quarter, except for below-normal temperature pockets over the Grand Banks and southern AOR in October and December **(Figure 2.9**). Sea surface temperatures (SSTs) also lowered through the quarter but remained above freezing (**Figure 2.10**). Throughout most of the AOR, SSTs were near to slightly above normal through the quarter, with the exception of pockets of up to ~6 C° above and ~4 C° below normal in the Gulf Stream (**Figure 2.11**). All SATs and SSTs reported here are from the Fifth Generation European Centre for Medium-Range Weather Forecasting (ECMWF) Reanalysis (ERA5) monthly averaged data on single levels from 1940 to present (Hersbach, et al. 2023, Copernicus Climate Change Service 2023).

Arctic sea ice reached minimum extent in mid-September 2025 (National Snow and Ice Data Center 2025). Sea ice did not expand into the AOR during the first quarter of Ice Year 2026 (see **Figures 2.5** and **2.8**).

The mean monthly NAOI increased steadily from −1 in October to roughly −0.5 in December but remained below normal through all three months (see **Figure 2.4b**). Mean sea level pressures (MSLPs) reflected the rising below-normal, negative NAOI through the quarter, with the gradient between the Greenlandic low and Azores high pressures steepening steadily through December from shallow in October (**Figure 2.12**). Higher pressures over the Grand Banks and Labrador Sea in October gave way to low pressures over the same region by December. MSLPs shifted from slightly above normal over the Labrador Sea and northern Grand Banks in October to well-below to below normal (roughly −10 to −4 hPa) over the AOR through December (**Figure 2.13**). Winds strengthened offshore through the quarter (see **Figure 2.6**), but, perhaps consistent with the persistent negative NAOI, remained weaker offshore than normal (see **Figure 2.7**). Total precipitation increased to well above-normal values (up to +6 mm) over most of the AOR through the quarter (**Figures 2.14** and **2.15**). All MSLPs, wind data, and precipitation rates are from the ECMWF ERA5 monthly averaged data on single levels from 1940 to present (Hersbach, et al. 2023, Copernicus Climate Change Service 2023).

Wave activity increased markedly through the quarter, culminating in well above-normal significant wave heights (SWHs) over the entire AOR in December, with SWHs reaching roughly 1 to 1.5 m above normal in the Labrador Sea and western North Atlantic (**Figures 2.16** and **2.17**). All SWHs are from the ECMWF ERA5 monthly averaged data on single levels from 1940 to present (Hersbach, et al. 2023, Copernicus Climate Change Service 2023).

The iceberg limit expanded through the first quarter of Ice Year 2026, matching median southern extent (for 1991 to 2020) through November and exceeding it in December, and matching median eastern extent by December (see **Figure 2.5**). IIP estimated that no icebergs crossed south of 48°N during the first quarter of Ice Year 2026 (see **Figure 2.4a**).

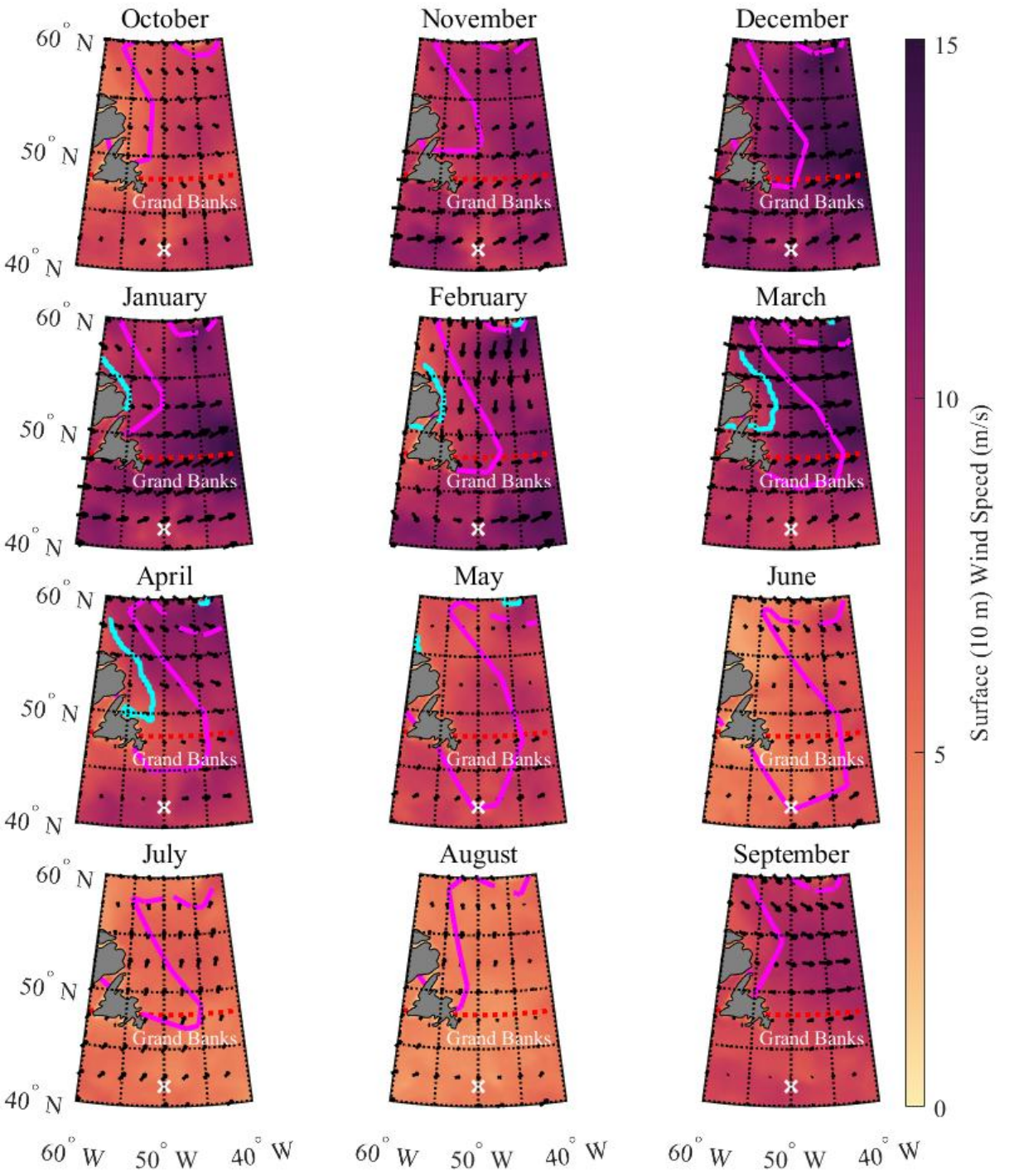


Figure 2.6. Mean monthly wind velocities (10 m) in IIP's AOR throughout the 2026 Ice Year. Median monthly sea ice extents (*cyan solid lines*) and mid-month iceberg limits (*magenta solid lines*) are shown. The location of the RMS Titanic wreck is indicated by an "x". Wind data are from the ERA5 monthly averaged data on single levels from 1940 to present (Hersbach, et al. 2023). Sea ice extents are from the NSIDC Sea Ice Index, Version 4 (F. Fetterer, et al. 2025). Iceberg limits are from IIP.

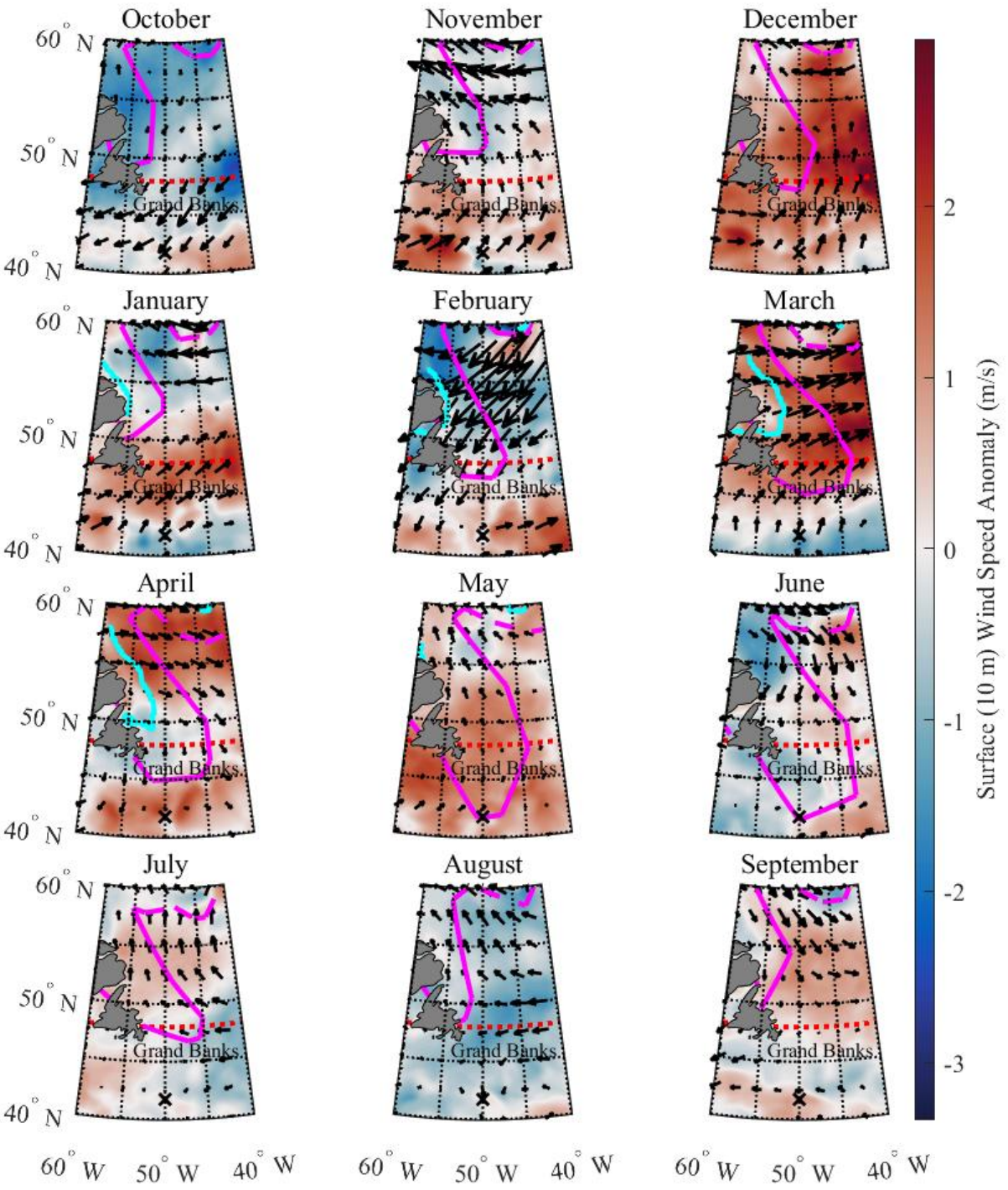


Figure 2.7. Mean monthly wind velocity (10 m) anomalies in IIP's AOR throughout the 2026 Ice Year. Wind velocity anomalies are calculated by subtracting 1983 to 2026 mean monthly wind velocities from the corresponding 2026 monthly wind velocities. Anomalies indicate how different observed values are from normal, and IIP takes environmental normals to be the mean monthly value for the relevant environmental parameter averaged over the modern reconnaissance era (1983 to present). The location of the RMS Titanic wreck is indicated by an "x". Median monthly sea ice extents (*cyan solid lines*) and mid-month iceberg limits (*magenta solid lines*) are shown. SSTs are from the ERA5 monthly averaged data on single levels from 1940 to present (Hersbach, et al. 2023). Sea ice extents are from the NSIDC Sea Ice Index, Version 4 (F. Fetterer, et al. 2025). Iceberg limits are from IIP.

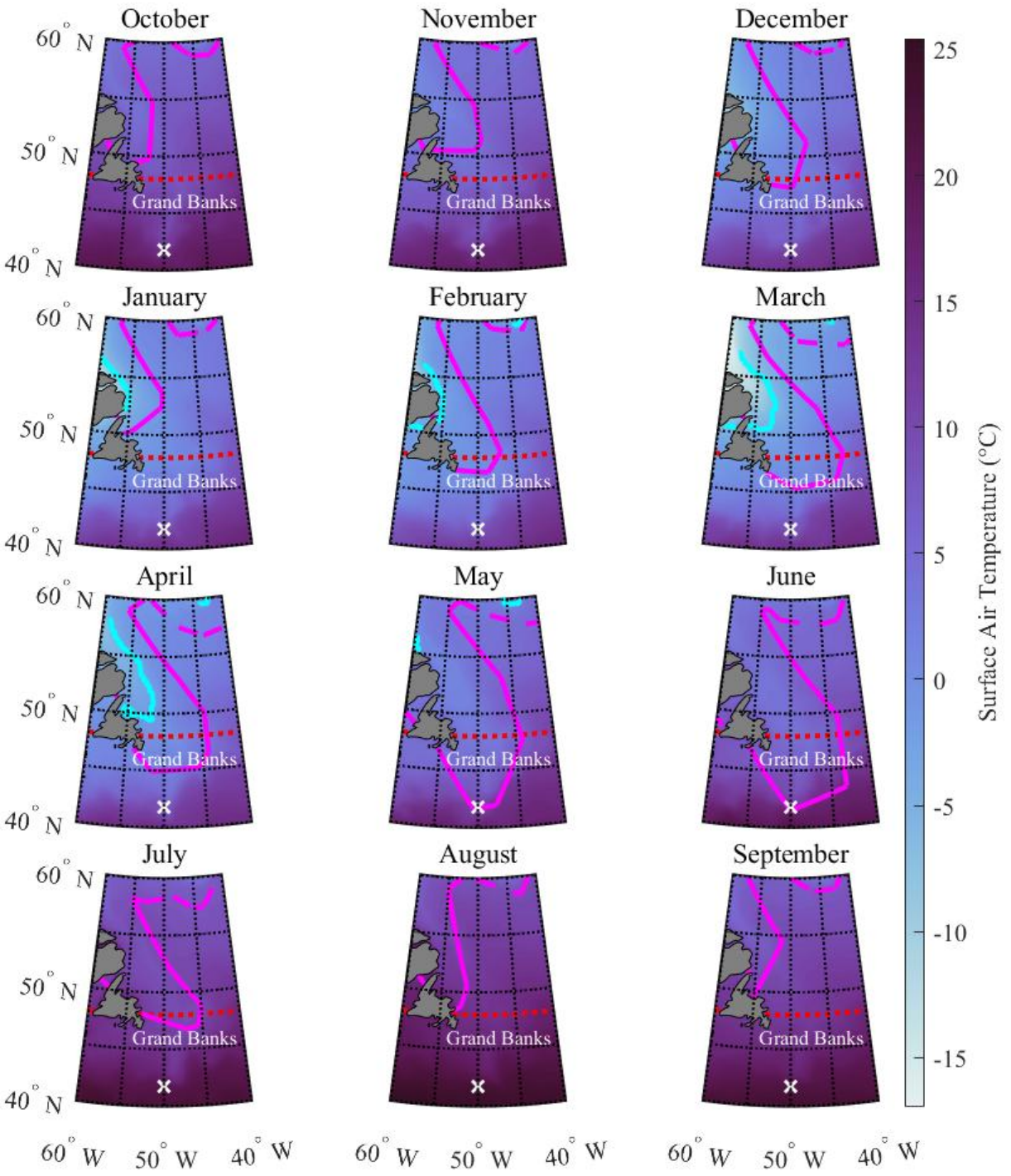


Figure 2.8. Mean monthly surface air temperatures (SATs, 2-m) in IIP's AOR throughout the 2026 Ice Year. Median monthly sea ice extents (*cyan solid lines*) and mid-month iceberg limits (*magenta solid lines*) are shown. SATs are from the ERA5 monthly averaged data on single levels from 1940 to present (Hersbach, et al. 2023). The location of the RMS Titanic wreck is indicated by an "x". Sea ice extents are from the NSIDC Sea Ice Index, Version 4 (F. Fetterer, et al. 2025). Iceberg limits are from IIP.

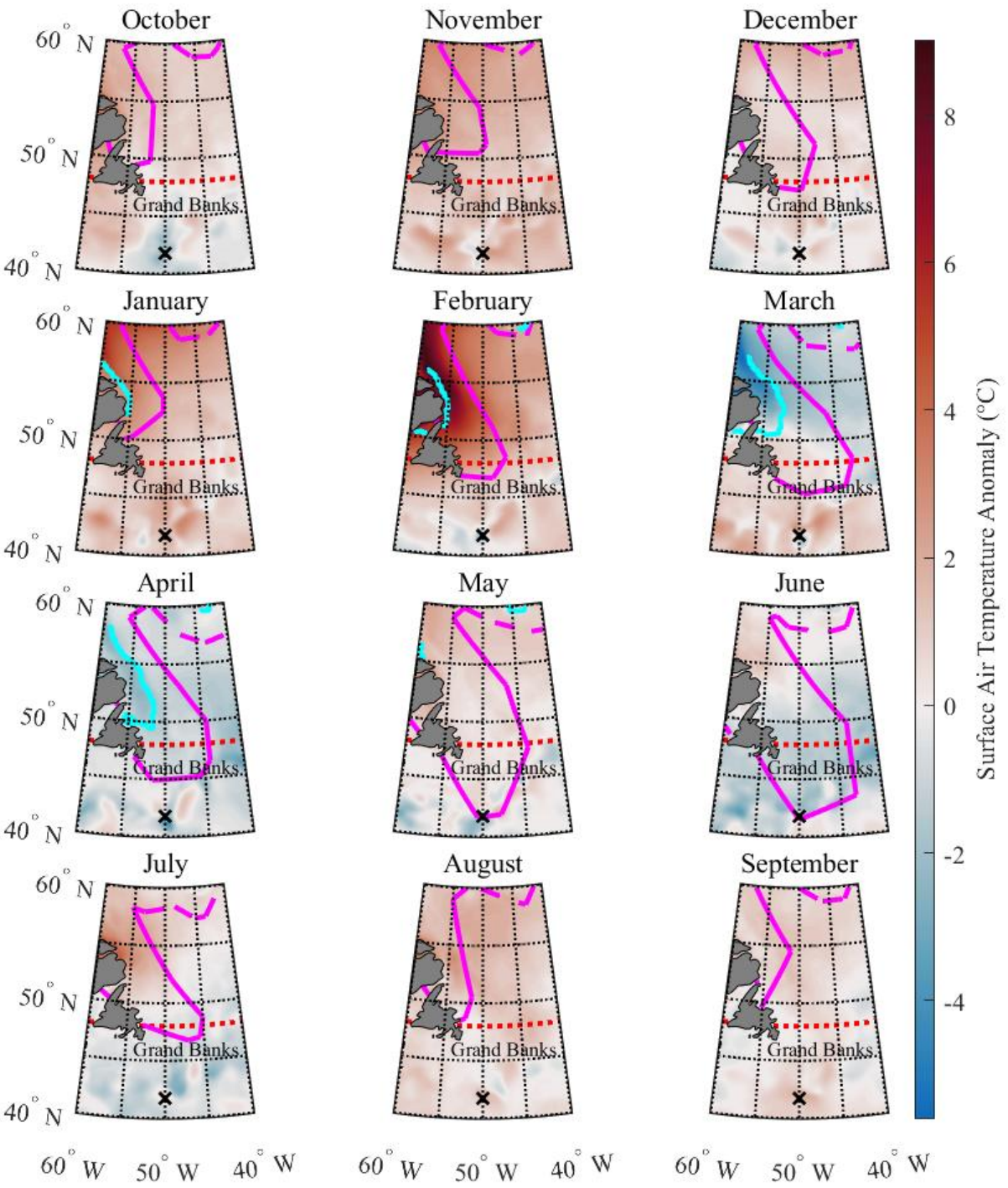


Figure 2.9. Mean monthly surface air temperature (SAT, 2-m) anomalies in IIP's AOR throughout the 2026 Ice Year. SAT anomalies are calculated by subtracting 1983 to 2026 mean monthly SATs from the corresponding 2026 monthly SATs. The location of the RMS Titanic wreck is indicated by an "x". Median monthly sea ice extents (*cyan solid lines*) and mid-month iceberg limits (*magenta solid lines*) are shown. SATs are from the ERA5 monthly averaged data on single levels from 1940 to present (Hersbach, et al. 2023). Sea ice extents are from the NSIDC Sea Ice Index, Version 4 (F. Fetterer, et al. 2025). Iceberg limits are from IIP.

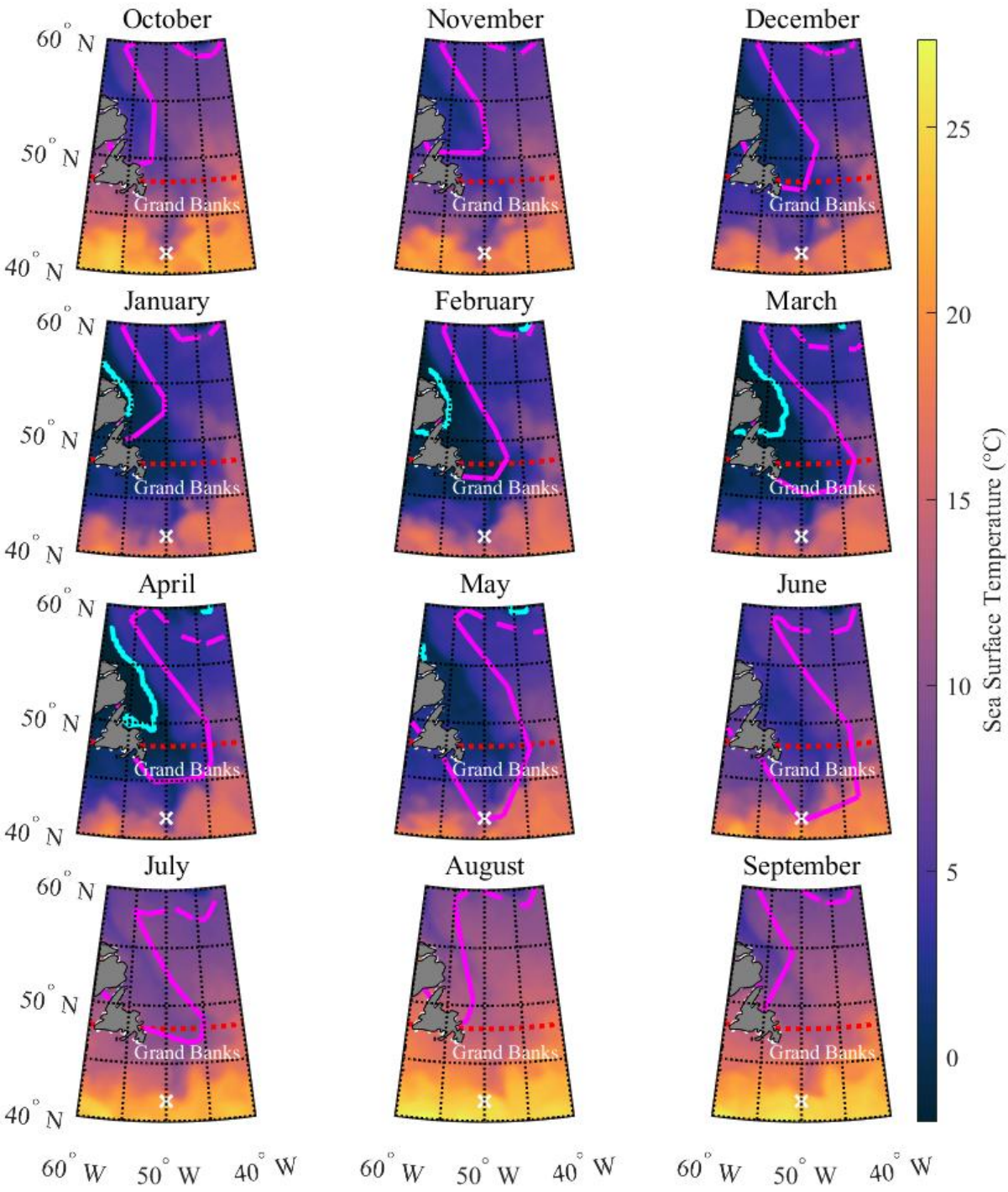


Figure 2.10. Mean monthly sea surface temperatures (SSTs) in IIP's AOR throughout the 2026 Ice Year. Median monthly sea ice extents (*cyan solid lines*) and mid-month iceberg limits (*magenta solid lines*) are shown. The location of the RMS Titanic wreck is indicated by an "x". SSTs are from the ERA5 monthly averaged data on single levels from 1940 to present (Hersbach, et al. 2023). Sea ice extents are from the NSIDC Sea Ice Index, Version 4 (F. Fetterer, et al. 2025). Iceberg limits are from IIP.

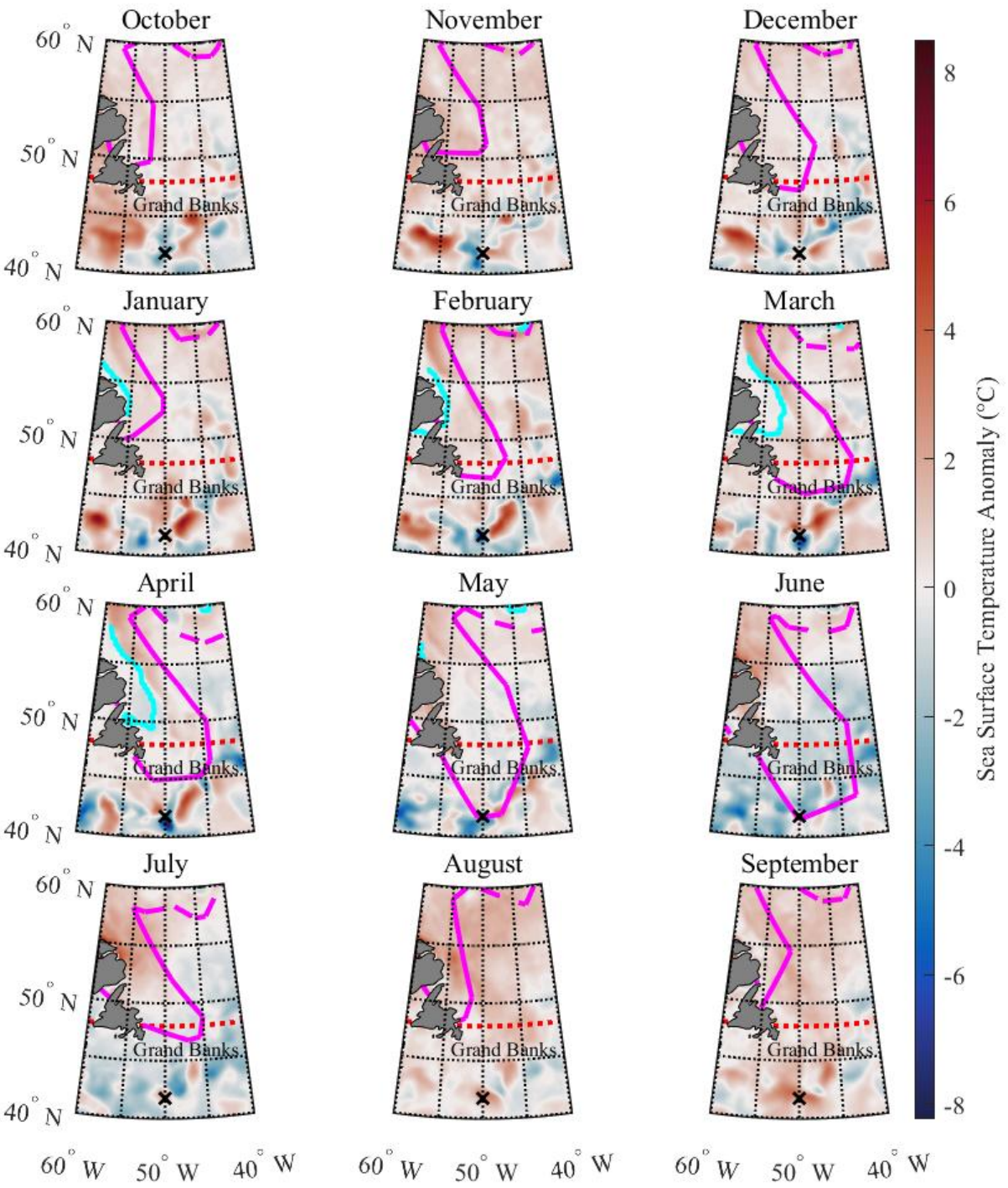


Figure 2.11. Mean monthly sea surface temperature (SST) anomalies in IIP's AOR throughout the 2026 Ice Year. SST anomalies are calculated by subtracting 1983 to 2026 mean monthly SSTs from the corresponding 2026 monthly SSTs. Median monthly sea ice extents (*cyan solid lines*) and mid-month iceberg limits (*magenta solid lines*) are shown. The location of the RMS Titanic wreck is indicated by an "x". SSTs are from the ERA5 monthly averaged data on single levels from 1940 to present (Hersbach, et al. 2023). Sea ice extents are from the NSIDC Sea Ice Index, Version 4 (F. Fetterer, et al. 2025). Iceberg limits are from IIP.

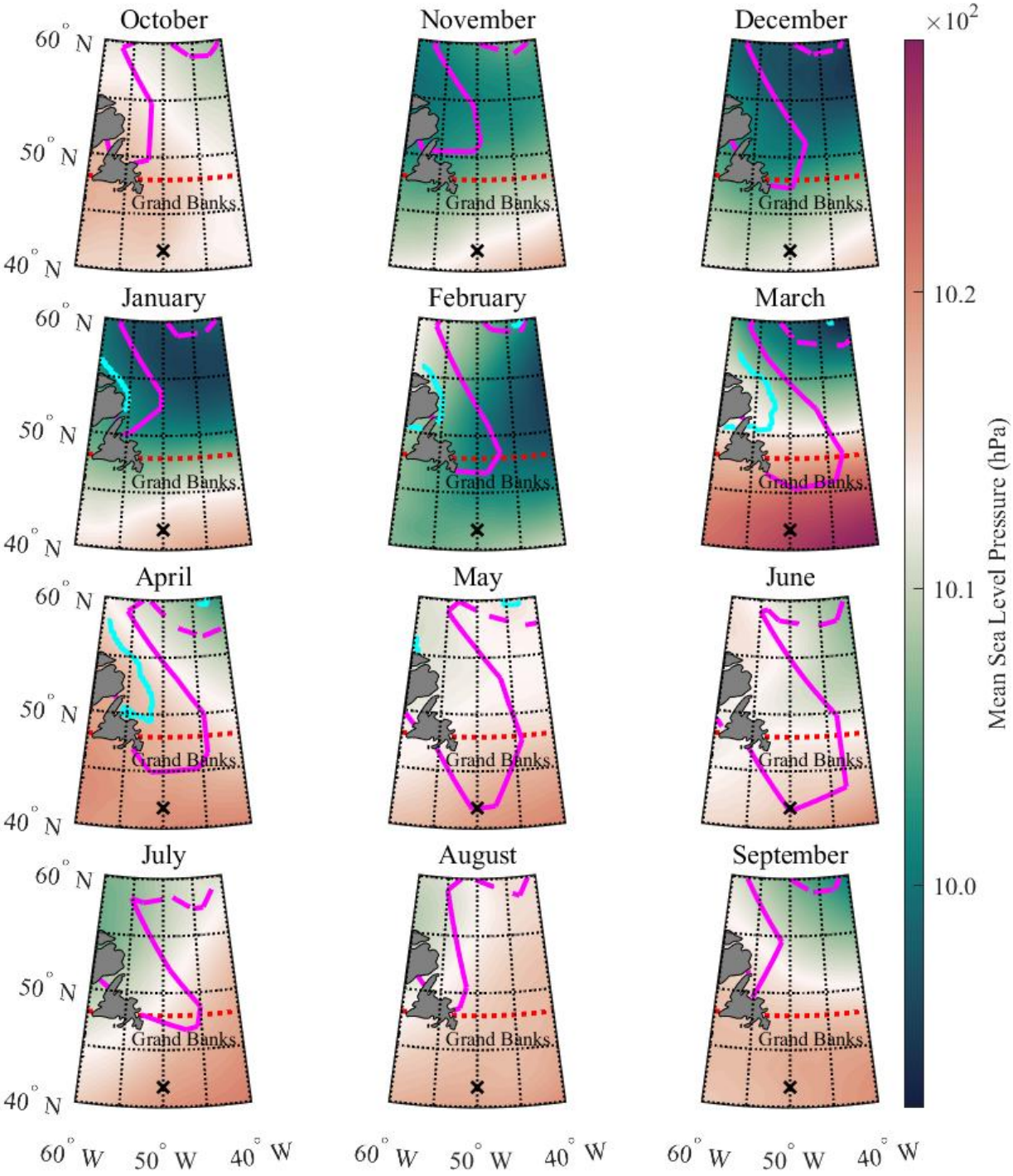


Figure 2.12. Mean monthly mean sea level pressures (MSLPs) in IIP's AOR throughout the 2026 Ice Year. Median monthly sea ice extents (*cyan solid lines*) and mid-month iceberg limits (*magenta solid lines*) are shown. The location of the RMS Titanic wreck is indicated by an "x". MSLPs are from the ERA5 monthly averaged data on single levels from 1940 to present (Hersbach, et al. 2023). Sea ice extents are from the NSIDC Sea Ice Index, Version 4 (F. Fetterer, et al. 2025). Iceberg limits are from IIP.

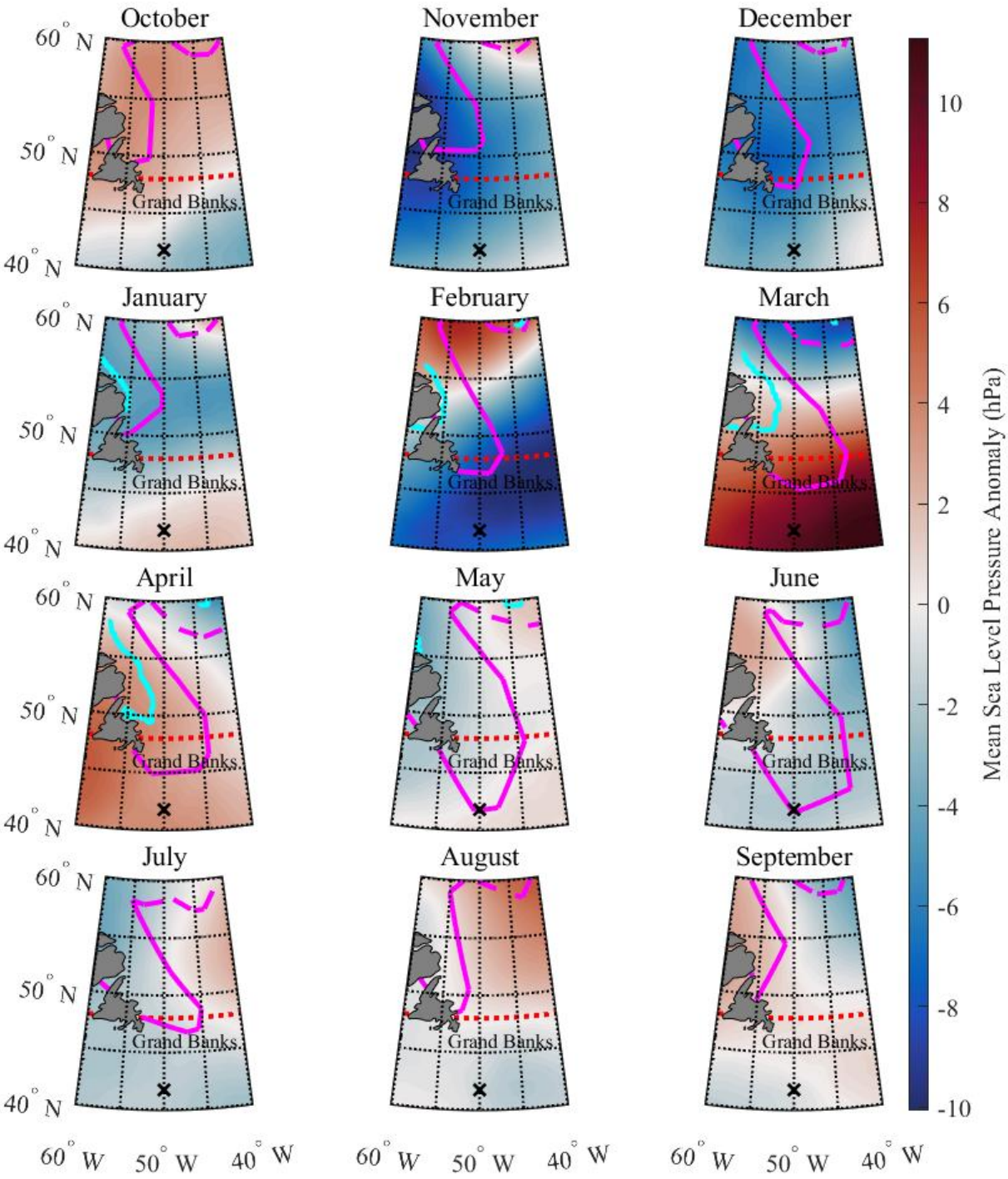


Figure 2.13. Mean monthly sea level pressure (MSLP) anomalies in IIP's AOR throughout the 2026 Ice Year. MSLP anomalies are calculated by subtracting 1983 to 2026 mean monthly MSLPs from the corresponding 2026 monthly MSLPs. Median monthly sea ice extents (*cyan solid lines*) and mid-month iceberg limits (*magenta solid lines*) are shown. The location of the RMS Titanic wreck is indicated by an "x". MSLPs are from the ERA5 monthly averaged data on single levels from 1940 to present (Hersbach, et al. 2023). Sea ice extents are from the NSIDC Sea Ice Index, Version 4 (F. Fetterer, et al. 2025). Iceberg limits are from IIP.

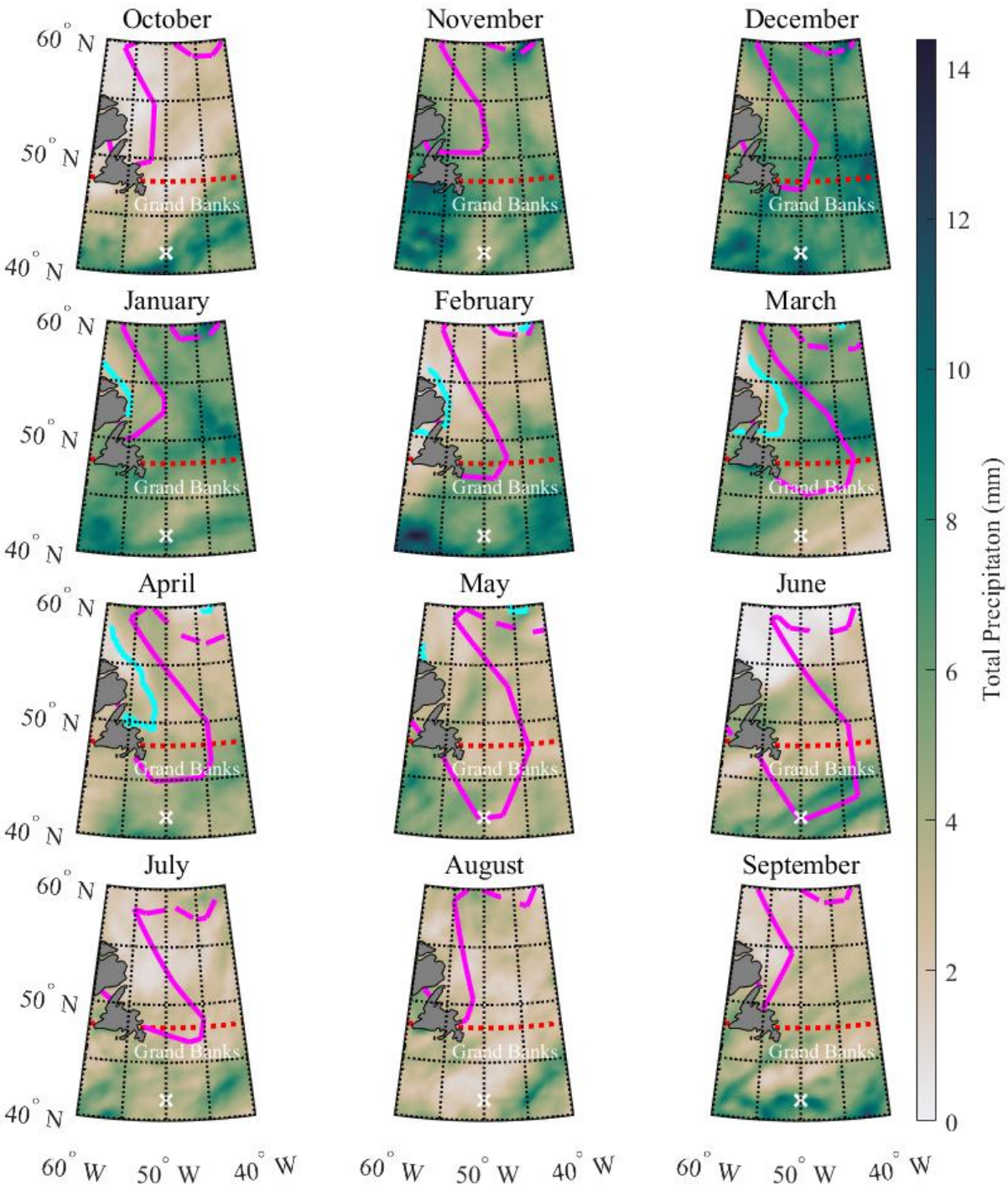


Figure 2.14. Mean monthly total precipitation in IIP's AOR throughout the 2026 Ice Year. Median monthly sea ice extents (*cyan solid lines*) and mid-month iceberg limits (*magenta solid lines*) are shown. The location of the RMS Titanic wreck is indicated by an "x". Precipitation data are from the ERA5 monthly averaged data on single levels from 1940 to present (Hersbach, et al. 2023). Sea ice extents are from the NSIDC Sea Ice Index, Version 4 (F. Fetterer, et al. 2025). Iceberg limits are from IIP.

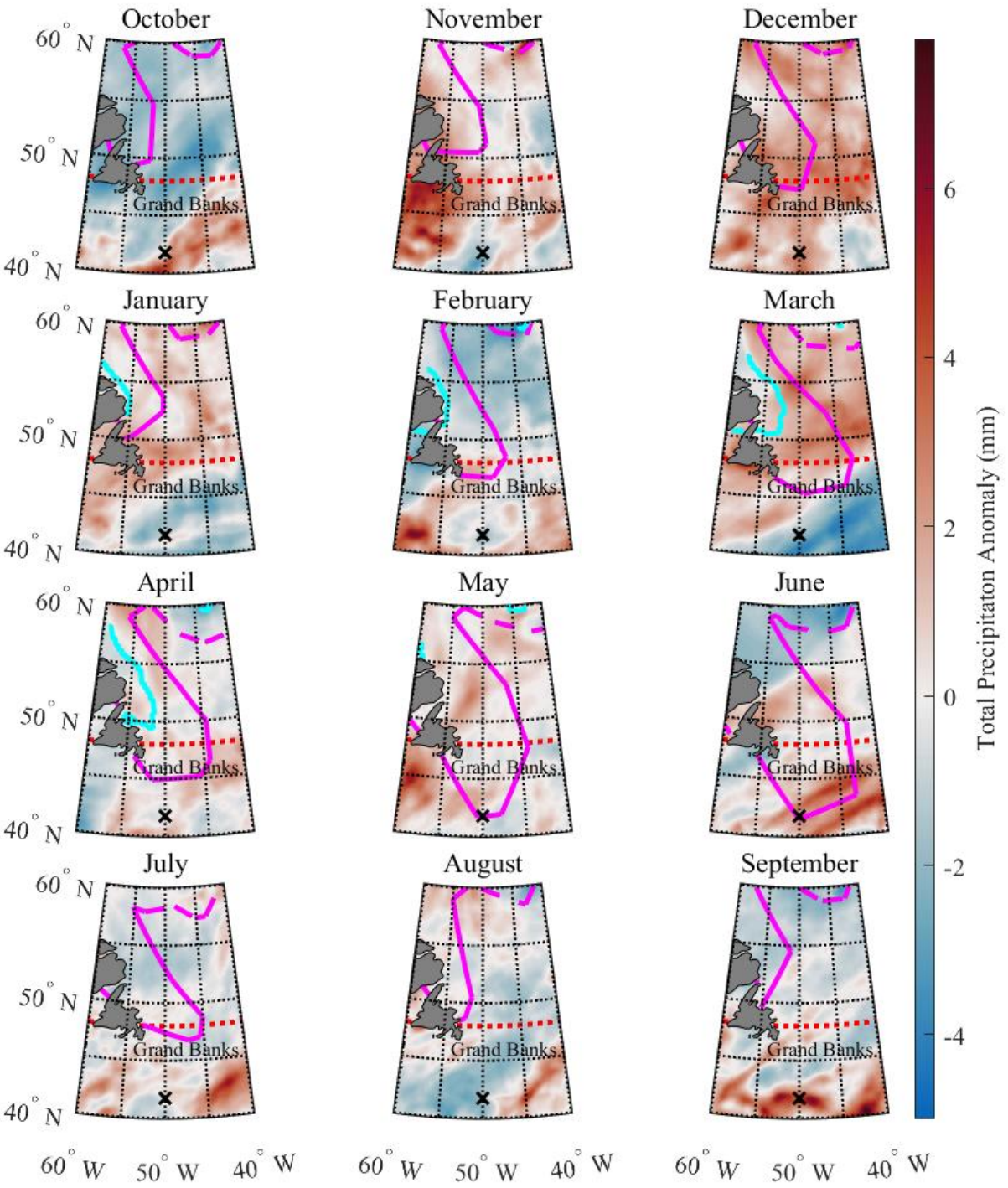


Figure 2.15. Mean monthly total precipitation anomalies in IIP's AOR throughout the 2026 Ice Year. Total precipitation anomalies are calculated by subtracting 1983 to 2026 mean monthly total precipitation from the corresponding 2026 monthly total precipitation. Median monthly sea ice extents (*cyan solid lines*) and mid-month iceberg limits (*magenta solid lines*) are shown. The location of the RMS Titanic wreck is indicated by an "x". SSTs are from the ERA5 monthly averaged data on single levels from 1940 to present (Hersbach, et al. 2023). Sea ice extents are from the NSIDC Sea Ice Index, Version 4 (F. Fetterer, et al. 2025). Iceberg limits are from IIP.

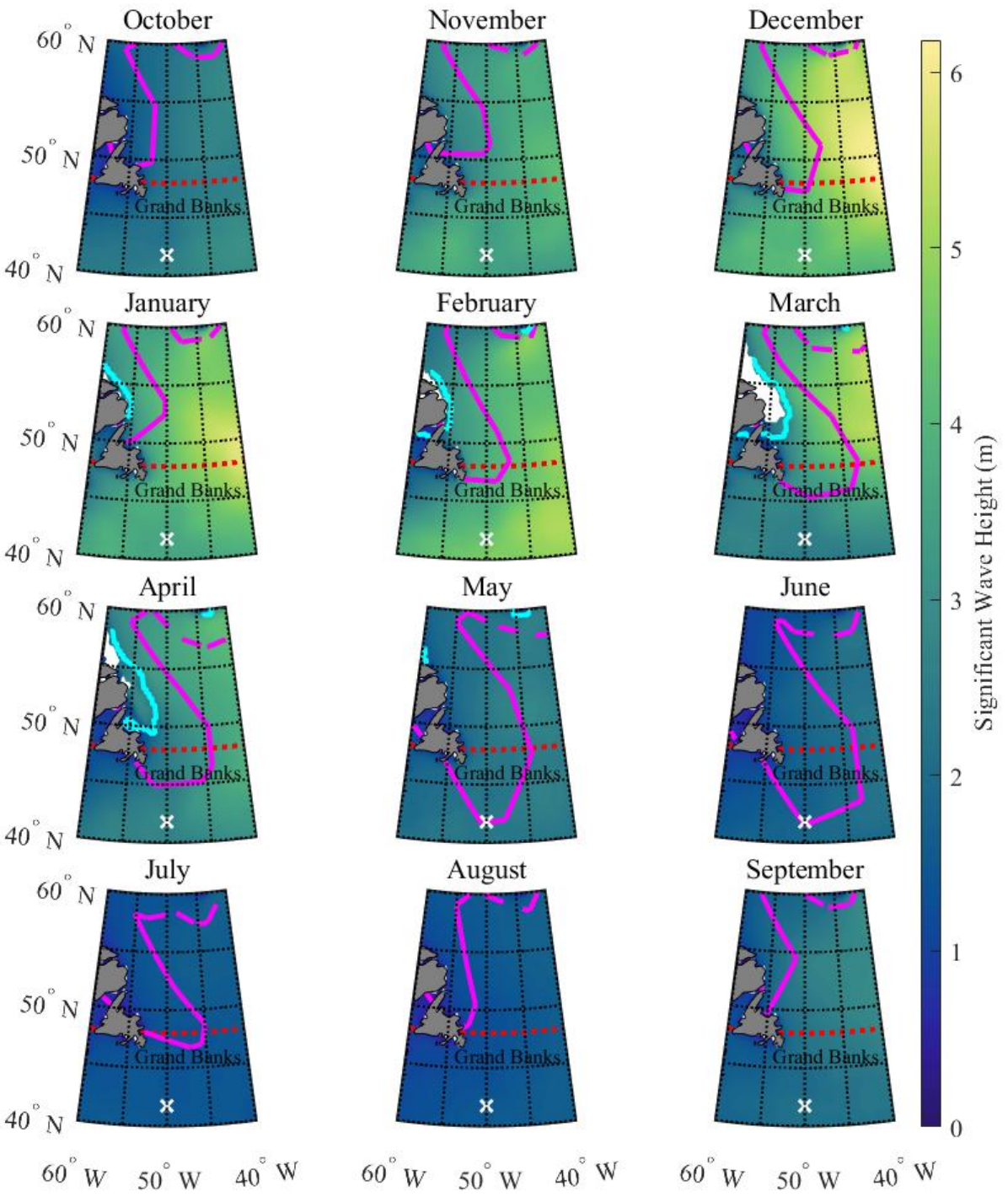


Figure 2.16. Mean monthly significant wave heights (SWH) in IIP's AOR throughout the 2026 Ice Year. Median monthly sea ice extents (*cyan solid lines*) and mid-month iceberg limits (*magenta solid lines*) are shown. SWHs are from the ERA5 monthly averaged data on single levels from 1940 to present (Hersbach, et al. 2023). Areas in white indicate no data. The location of the RMS Titanic wreck is indicated by an "x". Sea ice extents are from the NSIDC Sea Ice Index, Version 4 (F. Fetterer, et al. 2025). Iceberg limits are from IIP.

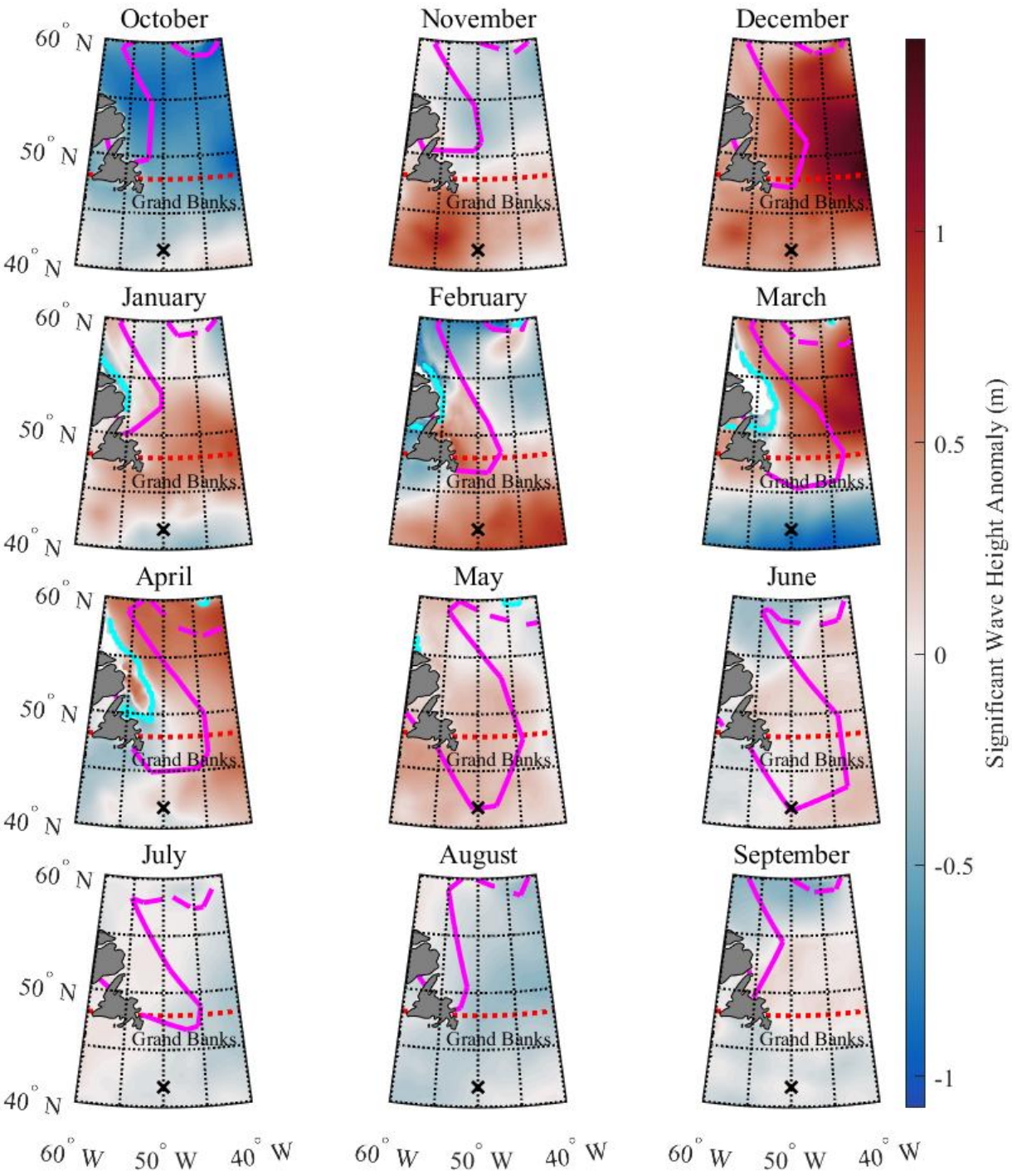


Figure 2.17. Mean monthly significant wave height (SWH) anomalies in IIP's AOR throughout the 2026 Ice Year. SWH anomalies are calculated by subtracting 1983 to 2026 mean monthly SWHs from the corresponding 2026 monthly SWHs. Median monthly sea ice extents (*cyan solid lines*) and mid-month iceberg limits (*magenta solid lines*) are shown. The location of the RMS Titanic wreck is indicated by an "x". SSTs are from the ERA5 monthly averaged data on single levels from 1940 to present (Hersbach, et al. 2023). Areas in white indicate no data. Sea ice extents are from the NSIDC Sea Ice Index, Versions 4 (F. Fetterer, et al. 2025). Iceberg limits are from IIP.

2.2.2 January to March 2026

SATs cooled to below freezing in the AOR by January and continued cooling through the second quarter of Ice Year 2026, reaching minimum values for the year over the Labrador Sea and Grand Banks in March (see **Figure 2.8**). Despite cooling, SATs were above to well (up to ~8°C) above normal, especially in the Labrador Sea, through February (see **Figure 2.9**). SATs dropped to below normal in this region in March, especially over the sea ice, but remained slightly above normal over the Grand Banks through the quarter's end. SSTs lowered to freezing along the northern Labrador Coast by January, and continued to lower especially in the Labrador Current and over the Grand Banks through March (see **Figure 2.10**). SSTs remained normal to slightly above normal throughout the AOR, with those pockets above- and below-normal temperature ocean water remaining in the Gulf Stream and North Atlantic Current through the quarter (see **Figure 2.11**).

Sea ice expanded into the region along the northern coast of Labrador beginning in January as SATs dropped below freezing and eventually surrounded the eastern coast of Labrador and extended into the Strait of Belle Isle by March (see **Figures 2.5** and **2.8**). Sea ice extent was below normal through the quarter, except for the sea ice edge along the continental shelf east of Labrador in March which reached median eastern sea ice extent.

The mean monthly NAOI continued to rise rapidly, remaining negative and below normal in January, passing a normal value near zero in February, and finally reaching a peak, well-above normal positive value of 2.69 in March (see **Figure 2.4b**). MSLPs were correspondingly low and normal to below normal through February, strengthening to high above-normal values over the Grand Banks in March (see **Figures 2.12** and **2.13**). Winds remained strong through the second quarter and increased to above-normal maximum offshore speeds by March, after turning briefly alongshore in February corresponding to the neutral NAOI of that month (see **Figures 2.6** and **2.7**). Total precipitation remained high and above normal over most of the AOR in January and March and the Grand Banks in February (see **Figures 2.14** and **Figure 2.15**).

Ocean wave activity remained high and above normal over most of the AOR through the quarter, but SWHs decreased slightly from maximum values in December (see **Figures 2.16** and **2.17**).

In the second quarter of Ice Year 2026, the iceberg limit rapidly expanded south and east outside of the sea ice edge, reaching into the major transatlantic shipping lanes south of 48°N by February (see **Figure 2.5**). The iceberg limit remained within the mid-month median for 1991 to 2020 through February and reached the median by March. Twelve icebergs drifted south of 48°N in this quarter – zero in January, five in February, and seven in March: fewer than the 1983 to 2025 mean number for these months, but on par with slightly below median and within the IQR for those years (see **Figure 2.2**).

2.2.3 April to June 2026

SATs warmed through the third quarter of Ice Year 2026, rising above freezing by May over the Grand Banks (see **Figure 2.8**). SATs were near to slightly below normal over the entire AOR through the quarter excepting May when then were near to above normal (see **Figure 2.9**). SSTs warmed rapidly through June, reaching above freezing over the Grand Banks and in the southern Labrador Current by May (see **Figure 2.10**). SSTs were near normal over most of the AOR throughout the quarter, with slightly above-normal temperatures in the north Labrador Sea and slightly below-normal temperatures within the Gulf Stream, excepting pockets of above-normal temperatures within the major current (see **Figure 2.11**).

In response to warming temperatures, sea ice rapidly retreated northwest through the quarter, vanishing by June for the Ice Year (see **Figure 2.5**). Sea ice extent only reached near- to above-

normal extent in April and was below normal thereafter through June.

The mean monthly NAOI dropped from an above-normal peak in the second quarter to an above normal value near unity in April, before falling to a below-normal near-negative unity in May and rising just above normal near-zero in June (see **Figure 2.4b**). MSLPs correspondingly weakened and gradients shoaled through the quarter (see **Figure 2.12)**, shifting from above-normal values in April to near- to below-normal values over most of the AOR by June (see **Figure 2.13**). Winds correspondingly weakened offshore through June (see **Figure 2.6**) but speeds remained above normal AOR through May, only dropping below normal along the Canadian Coast in June (see **Figure 2.7**). Total precipitation dropped through the quarter especially in the northern AOR (see **Figure 2.14**), but remained near to above normal, excepting the northern AOR in June (see **Figure 2.15**).

Ocean wave activity decreased steadily in the AOR but remained near to above normal, especially in April (see **Figures 2.16** and **2.17**).

The iceberg limit continued to expand southward into June, while maintaining eastern extent from March (see **Figure 2.5**). The limit reached par with the 1991 to 2020 median by May and exceeded it along the southeastern side by June. Three hundred and sixty-four icebergs drifted south of 48°N in the third quarter of Ice Year 2026 (159 in April, 114 in May, and 91 in June; see **Figures 2.2** and **2.4a**). The IBX48N approached mean and exceeded median in each month of the quarter except for May and was within the 1983 to 2025 IQR in all three months (see **Figure 2.2**).

2.2.4 July to September 2026

SATs warmed to their maxima over the AOR into August (see **Figure 2.8**) in the final quarter of Ice Year 2026. They rose to near to above normal values through the quarter, excepting the Grand Banks in July, over which they remained near to below normal (see **Figure 2.9**). SSTs also warmed to their maxima over the AOR through August (see **Figure 2.10**) and similarly rose above normal over most of the AOR, excepting the Grand Banks in July, where they remained below normal following the third quarter.

The mean monthly NAOI decreased through August when it reached a minumum well-below normal value near negative two (see **Figure 2.4b**) before turning sharply positive and above normal in September. MSLPs remained in a near-normal NAO pattern (see **Figure 2.12**), with a shoaling of higher pressure between the northern and southern AOR in August corresponding to the low NAOI. MSLPs were below normal in the northern AOR through August but turned above normal in September. Winds remained weakly alongshore and turned northward through August (see **Figure 2.6**) before gaining strength offshore in September. They remained near-normal speeds through the quarter, excepting in August when they were below normal over the entire AOR (see **Figure 2.7**). Precipitation remained low and near normal for the season (see **Figure 2.14**), excepting above normal values over the Grand Banks through the quarter (see **Figure 2.15**).

The ocean continued to calm through August (see **Figure 2.16**) before SWHs rose slightly in September; still, SWHs were near normal through the quarter (see **Figure 2.17**).

The iceberg limit retreated rapidly northwest from its maximum extent in June through the final Ice Year quarter (see **Figure 2.5**), exiting the shipping lanes in August. After July, the iceberg limit was well within southeastern median for 1991 to 2020. One final iceberg drifted south of 48°N in July, which is normal (see **Figure 2.3**, July to September IQR).

2.3 Summary of Ice and Environmental Conditions in Ice Year 2026

The 2026 Iceberg Season severity was moderate based on the total IBX48N (377), the near-normal season length (6 months), and the near-normal

monthly iceberg extents during the peak of the Iceberg Season and the first quarter of the Ice Year. Iceberg extent threatened shipping lanes into July—a reminder that regardless of Iceberg Season severity, the presence of icebergs at all poses a danger to the mariner navigating nearby.


INTERNATIONAL
ICE PATROL

3 Operations Center Summary

The OPCEN is the hub of IIP's iceberg information processing and dissemination. OPCEN personnel stand watch to receive and process iceberg reports, analyze ice and environmental conditions, and create and distribute daily iceberg warning products. Iceberg reports are generated and received primarily through aerial and satellite reconnaissance from IIP, CIS, and commercial sources. Iceberg reports can also be generated and received from vessels and people onshore. IIP processes iceberg reports to update sighted iceberg locations and characteristics within IIP's iceberg database. Positions of icebergs within the database are then predicted via iceberg drift and deterioration computer models within BAPS for 0000 UTC and 1200 UTC each day. Finally, iceberg limits are generated around the extent of the modeled iceberg positions for 0000 UTC the next day and are distributed to mariners and the public in the NAIS daily iceberg warning products.

3.1 Iceberg Warning Products

IIP and CIS partner to create and distribute the NAIS daily iceberg warning products. IIP takes responsibility for product generation and dissemination, including deploying personnel to Newfoundland and Labrador for aerial iceberg reconnaissance, during the active Iceberg Season. In Ice Year 2026, IIP took this responsibility from 2 February to 9 September 2026. The operational statistics contained in this section are from this period. CIS publishes the NAIS daily iceberg warning products outside of the Iceberg Season (usually September to January) when the iceberg population threatens primarily the Canadian coastline.

The NAIS daily iceberg warning products are generated and distributed in text (NAIS-10 bulletin) and graphic (NAIS-65 chart) form. The NAIS-10 bulletin lists the latitude and longitude points along the daily Iceberg Limit and sea ice limit (from CIS), and the NAIS-65 chart shows the Iceberg Limit and sea ice limit as lines and indicates the estimated iceberg number per square degree. Semi-monthly NAIS-65 iceberg charts are shown in **Section 5**. Both products include the date, coverage area, and type of the most recent relevant iceberg reconnaissance (e.g. eastern limit satellite pass). The products are released daily between 1830 UTC and 2130 UTC and are valid for 0000 UTC the following day. During the 2026 Ice Year, all iceberg warning products were released on time.

IIP publicly disseminates the NAIS iceberg warning products through various means. The NAIS-10 bulletin is broadcast over SafetyNET, Navigational Telex (NAVTEX), and Simplex Teletype Over Radio (SITOR). The NAIS-65 chart is broadcast over radio facsimile (Radiofax) and posted to the National Weather Service (NWS) Marine Forecast (https://www.weather.gov/marine/marsh) and NOAA Ocean Prediction Center (OPC) (https://ocean.weather.gov/Atl_tab.php) websites. Both products are posted daily on IIP's product webpage (https://www.navcen.uscg.gov/north-american-ice-service-products).

The daily iceberg and sea ice limits are also posted to the IIP product website as GIS compatible files (Keyhole Markup Language, KML, and Environmental Systems Research Institute, ESRI, shapefiles). Additionally, the daily Iceberg Limit is available as a displayable layer within several online mapping applications: NOAA's Environmental Response Management Application (ERMA) mapping tool for the Arctic (https://erma.noaa.gov/arctic) and Atlantic (https://erma.noaa.gov/atlantic), and the USCG Navigation Center (NAVCEN) website (https://www.navcen.uscg.gov/international-ice-patrol-map).

3.1.1 Iceberg Warning Product Changes for 2026

Each year, IIP and its NAIS partners, CIS and DMI, review NAIS iceberg products, procedures, and distribution processes to improve product content, delivery, and value for the mariner. For 2026, no changes were made to the NAIS-65 chart or NAIS-10 bulletin.

3.2 Iceberg Reports

During the 2026 Iceberg Season, the OPCEN received reports of icebergs from IIP satellite and aerial reconnaissance, CIS, commercial flights, and ship reports. The variety of reporting sources helps IIP create a more comprehensive picture of the iceberg population. This is particularly important for analysts verifying targets in satellite imagery against those sighted by aircraft to increase confidence in semi-automated satellite analysis routines. Mariners transiting the AOR remain a vital source of iceberg reporting for IIP to maintain its positive safety record. **Table 3.1** lists ships that made voluntary iceberg reports while IIP was responsible for the iceberg products. IIP thanks the crews of these vessels for helping us maintain safety in the North Atlantic.

Once received, iceberg reports (**Figure 3.1**) are converted into standard iceberg messages (SIMs) which include specific iceberg characteristics such as time of sighting, position, size, shape, and other relevant information. Additionally, iceberg messages with no reported icebergs can be useful for confirmation of their absence, especially when generated with a high-confidence source (e.g., aerial reconnaissance, cloud-free optical imagery, or ship). Due to model limitations, it can be prudent to keep icebergs longer than 30 days of drift, these SIMs are called "CIIP SIMs".

In the 2026 Ice Year, IIP received, analyzed, and processed 1,631 SIMs: 1,504 from satellite reconnaissance, 98 from aerial reconnaissance, and 29 from other sources. Of the satellite SIMs, the majority (~80%) originated from IIP satellite imagery analysis, followed by commercial partner satellite reconnaissance (6%). **Table 3.2** provides further detail on the number and source of SIMs received while IIP held product responsibility.

Table 3.1. Ice Year 2026 Iceberg Reports by ship and their Nation of Origin. IIP awards the vessel that submits the most iceberg reports each year with the CARPATHIA Award, named after the vessel credited with rescuing 705 survivors from the RMS TITANIC disaster.

Canada 	
HMCS Frederick Rolette	1
Henry Larsen	1
Oceanex Sanderling	1
CCGS Amundsen	4
HMCS Margaret Brooke	5
CCGS Des Groseilliers	1
HMCS Robert Hampton Gray	1
Netherlands 	
Fraserborg	1
France 	
Thalassa	1
Cayman Islands 	
V6	1
United Kingdom 	
Vectis Pride	1

Icebergs which govern the shape of the Iceberg Limit due to their proximity to it are termed "limit-setting" icebergs. While the spatial distribution of icebergs further toward the interior of the iceberg population affects the overall shape of the iceberg limit, the exact placement of the limit and its vertices is based on the location of limit-setting icebergs. The number of limit-setting icebergs reported by each iceberg sighting source in Ice Year 2026 is shown in **Figure 3.1** and **Table 3.2**.

In Ice Year 2026, 5,663 icebergs, growlers, and radar targets were incorporated (added or resighted) into the iceberg database from iceberg reports – a 25% decrease from Ice Year 2025 (in which 7,563 icebergs, growlers, and radar targets were incorporated into the iceberg database). This decrease corresponded to a smaller

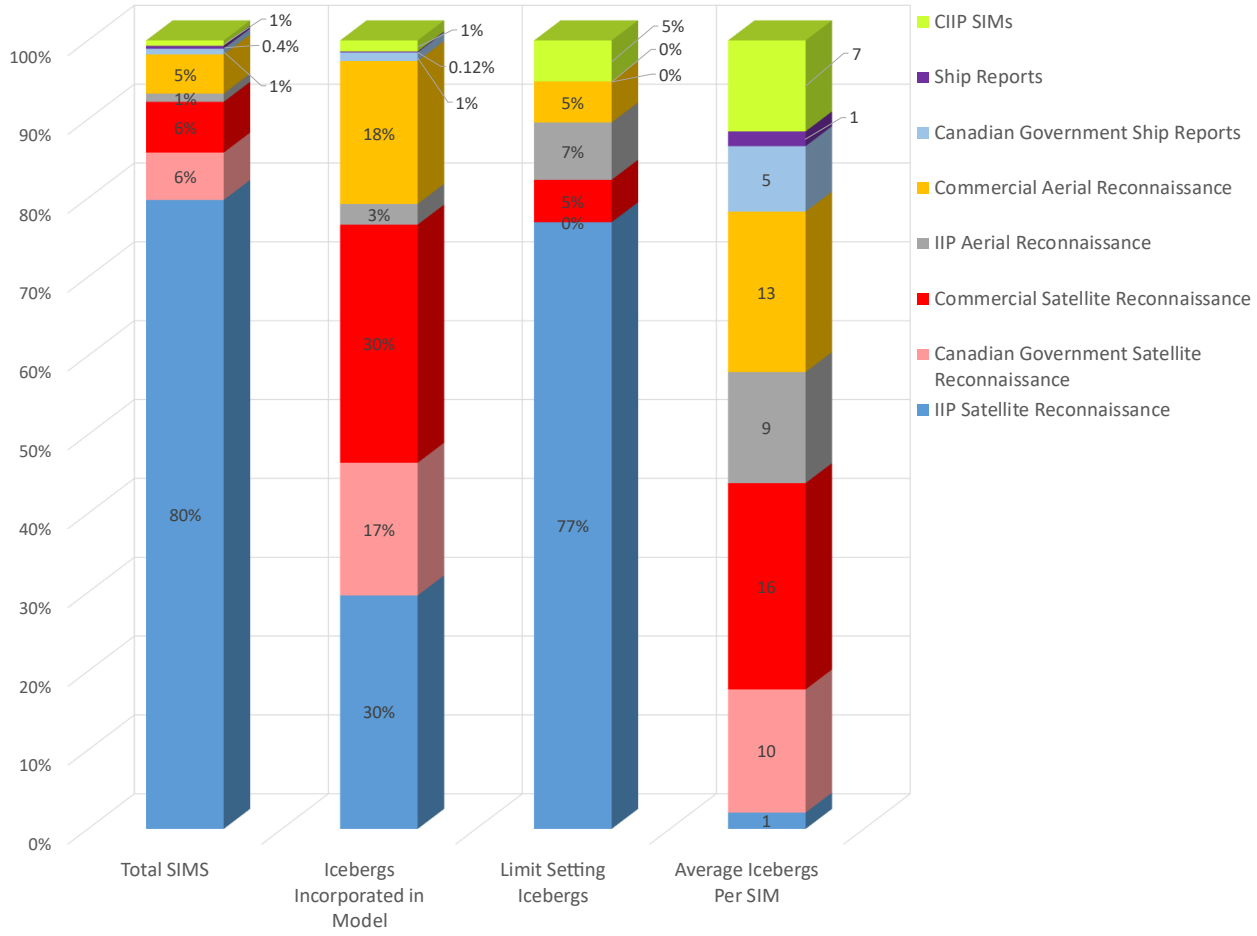


Figure 3.1. Proportion of total number of SIMs, number of icebergs incorporated into the iceberg database, average number of icebergs per SIM, and number of limit-setting icebergs by reporting source for Ice Year 2026. CIIP SIMs represent iceberg messages for icebergs for which it is prudent to maintain as active within the database for longer than 30 days of drift. This is required due to model limitations. The Canadian Government statistics do not include Government-funded Commercial Aerial Reconnaissance (which are included in the Commercial Aerial Reconnaissance source).

population of icebergs in the AOR this Ice Year.

Reported icebergs which can be correlated with existing icebergs in IIP's iceberg database are "re-sighted" to the database with their most recently reported position. If an iceberg cannot be correlated to an existing database iceberg, it is added as a new iceberg to the database. In an Ice Year, the number of icebergs added corresponds to the number of unique, new iceberg sightings. In Ice Year 2026, there were 2,228 icebergs added to the database, representing 39% of all database actions (adding, deleting, re-sighting, and no action) made through the Ice Year.

The OPCEN often receives coincident iceberg reports from multiple sources of the same iceberg or icebergs. For such icebergs, the OPCEN will use the iceberg report received with the most recent sighting of that iceberg for SIM generation and incorporation into the iceberg database.

Table 3.2. Detailed information on this year's icebergs received from each SIM source. The Canadian Government statistics do not include Government-funded Commercial Partner Aerial Reconnaissance (which are included in the Commercial Partner Aerial Reconnaissance source).

Source		Total Number of SIMs		Number of Icebergs Incorporated into Database		Number of Limit-Setting Icebergs		Average Number of Icebergs per SIM
Satellite Reconnaissance	IIP	**1,504**	1,301	**4,340**	1,677	**475**	444	1
	Canadian Government		98		953		0	10
	Commercial Partner		105		1,710		31	16
Aerial Reconnaissance	IIP	**98**	17	**1,175**	149	**72**	42	9
	Commercial Partner		81		1,026		30	13
Other	Canadian Government Ship Reports	**29**	12	**148**	62	**30**	0	5
	Ship Reports		6		7		0	1
	CIIP SIMs		11		79		30	7
Total		**1,631**		**5,663**		**577**		

3.3 Iceberg Reconnaissance

3.3.1 Satellite Iceberg Reconnaissance

IIP generates iceberg SIMs from both internal and external (typically commercial partner) satellite analysis. In the 2026 Ice Year, IIP satellite reconnaissance added 1,677 icebergs and no growlers or radar targets to the iceberg database from the 1,301 IIP satellite reconnaissance iceberg SIMs (see **Table 3.2**). Commercial partner satellite reconnaissance added 1,710 icebergs, and no growlers or radar targets from the 105 commercial partner satellite reconnaissance SIMs. In Ice Year 2026, commercial partner satellite reconnaissance was provided by C-CORE, a Canadian company headquartered in St. John's, Newfoundland which mainly monitors icebergs for the oil and gas industry.

Overall, 4,340 icebergs from all satellite reconnaissance iceberg SIMs were incorporated into the iceberg database, accounting for 77% of icebergs incorporated into the database. Five additional growlers and no radar targets were added to the iceberg database in Ice Year 2026; growlers and radar targets are excluded from **Table 3.2**. See **Section 4.2** for more information on how IIP conducts satellite iceberg reconnaissance.

3.3.2 Aerial Iceberg Reconnaissance

This season IIP conducted a total of five aerial iceberg reconnaissance patrols out of six scheduled due to aerial asset availability. **Section 4** contains detailed information on IIP aerial iceberg reconnaissance processes and equipment.

Commercial partner aerial reconnaissance from PAL Aerospace incorporated 1,026 icebergs and no growlers or radar targets into the iceberg database (see **Table 3.2**). As a private company, they conduct other primary missions for different clients alongside their iceberg specific reconnaissance missions for CIS and the oil/gas industry.

Figure 3.2 differentiates the PAL

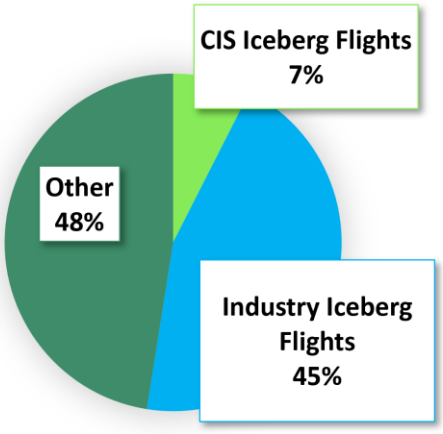


Figure 3.2. PAL Aerospace flights by primary mission type which reported icebergs. The "Other" category includes flights which reported icebergs but had a primary mission other than iceberg reconnaissance.

Aerospace flights which were dedicated to ice reconnaissance (funded by CIS or the oil/gas industry) and other flight operations which resulted in iceberg reports as a byproduct. The largest portion of PAL Aerospace flights (48%) which reported icebergs were flown for primary missions other than iceberg reconnaissance. PAL flights funded by oil and gas companies concerned with icebergs in the vicinity of offshore oil rigs accounted for 45%. Only 7% of PAL flights were funded by CIS specifically for iceberg reconnaissance in areas designated by either IIP or CIS. IIP thanks PAL Aerospace for their willingness to conduct and share iceberg reconnaissance with IIP regardless of funding source and notes that this demonstrates an admirable commitment from PAL Aerospace to maritime safety in the region.

3.4 Iceberg Deletions

IIP deletes a given iceberg from the iceberg database if at least one of the following three criteria are met: 1) its modeled positional circle of uncertainty is determined to be free of icebergs based on recent high-confidence reconnaissance, 2) it has not been observed by any means of reconnaissance for more than 30 days, or 3) its predicted degree of melt is either greater than 125% or 150% if the iceberg is within 60 NM of the iceberg limit.

The positional circle of uncertainty for a given iceberg may be determined to be free of icebergs from high-confidence reconnaissance flights or satellite imagery. IIP defines a high confidence reconnaissance flight as that which has complete visibility of the iceberg circle of uncertainty (visually or by radar) and is flown in environmental conditions with wave heights less than 2 m so as not to mask the presence of growlers. IIP defines a satellite image to be high confidence if it is a high resolution, cloud-free, optical image. A commercial partner flight might fly over a modeled iceberg position but may not observe the entire circle of uncertainty for that iceberg, meaning that an iceberg which is present may not be observed. For this reason, IIP does not typically delete icebergs from its iceberg database from commercial partner flights alone.

If an iceberg has not been observed nor resighted by any means of reconnaissance for more than 30 days, then it will be deleted from the iceberg database.

The drift and deterioration of active icebergs in the iceberg database is estimated using numerical models. The models provide an estimation of melt as a percentage from 0 to 500%. The models assign a newly sighted iceberg with 0% melt and account for increased melt with time using numerical environmental forcing such as wave and convective heat forcing. This allows IIP to employ a conservative approach to determining that an iceberg may be deleted (removed) from the iceberg database based on melting alone.

3.5 Limit-Setting Icebergs

Limit-setting icebergs are monitored by IIP with particular vigilance. Typically, an average of four icebergs (minimum of one and maximum of seven) set the iceberg limit at any time.

In Ice Year 2026, the maximum easternmost extent of the iceberg limit occurred on 8 March 2026 sitting 447 NM east of St. John's at

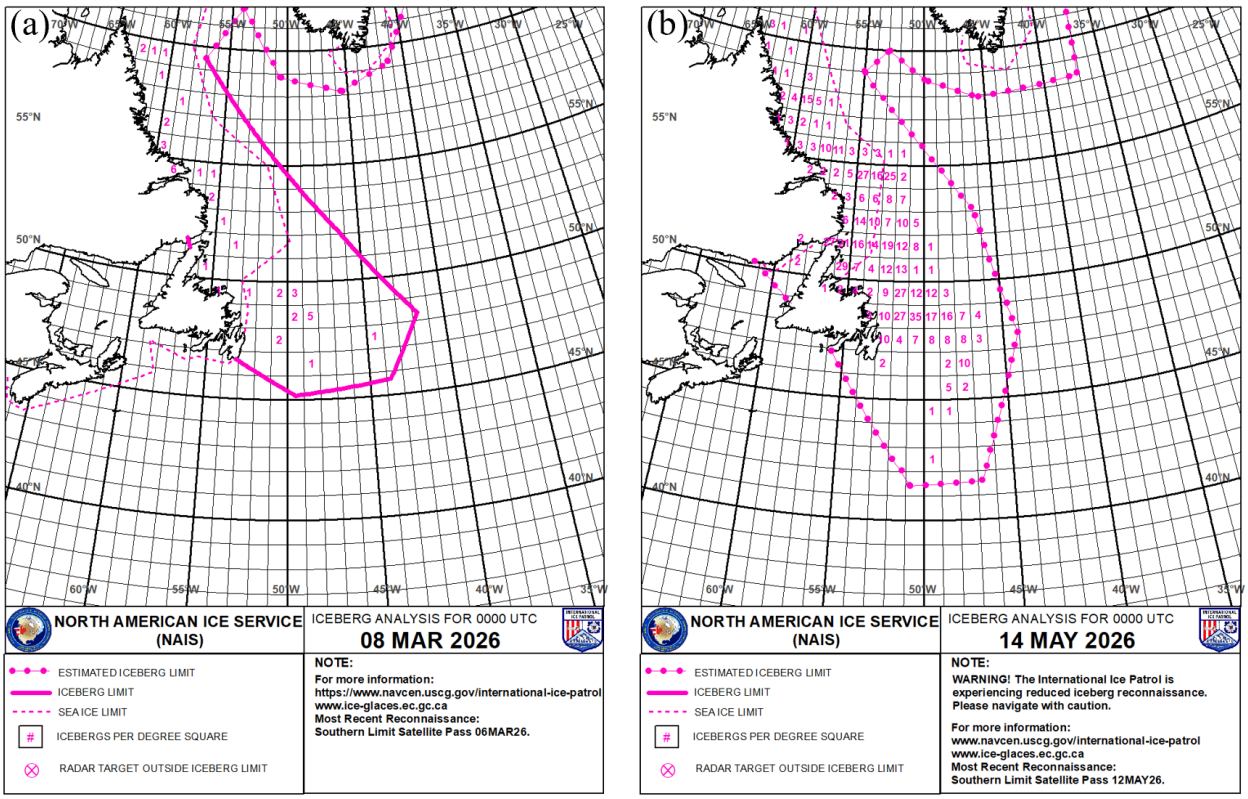


Figure 3.3. Maximum extents of the iceberg limit. **a.** Easternmost extent of the iceberg limit was reached on 8 March 2026. **b.** Southernmost extent of the iceberg limit was reached on 14 May 2026 during a period of reduced reconnaissance.

48°20’ N, 41°40’ W (**Figure 3.3a**). The southernmost extent of the iceberg limit occurred during a period of reduced reconnaissance on 14 May 2026 and sat 378 NM south of St. John’s at 41°25’ N 50°45 W (**Figure 3.3b**).

Reconnaissance from satellite imagery (specifically SAR) was the leading source for observing limit-setting icebergs (87%) in Ice Year 2026. This was an increase from 2025 (85%). Still, it can be challenging to reliably determine ice-free conditions from SAR imagery due to low confidence in analysis from difficulty in eliminating false positives and false negatives. More information on the difficulties with satellite iceberg analysis can be found in **Sections 3.6** and **4.2**.

A false positive iceberg detection occurs when a target which is not an iceberg is determined to be one. This can result in the needless expansion of the iceberg limit, negatively impacting shipping without a corresponding increase in safety. A false negative iceberg detection occurs when it is determined that there is no iceberg where an iceberg actually is present. This situation is especially dangerous to mariners and can result in the iceberg limit not encapsulating the iceberg hazard.

IIP continues its advancement of satellite imagery analysis procedures to reduce these errors through increased understanding of the impact of satellite parameters, image quality, and environmental conditions on detection and classification of targets. As more high-resolution imagery becomes available, IIP anticipates a steady shift towards satellite reconnaissance.

3.6 Icebergs Reported Outside of the Iceberg Limit

If an iceberg or radar target is reported outside of the published iceberg limit, the OPCEN Duty Watch Officer (DWO) will take prompt action to

warn the maritime community.

The DWO will notify the Canadian Coast Guard (CCG) Maritime Communication and Traffic Service (MCTS) Port aux Basques. In turn, MCTS will issue a Navigational Warning (NAVWARN), which is the primary means of relaying immediate iceberg information to the transatlantic shipping community. The NAVWARN will then be sent via NAVTEX and forwarded to the U.S. National Geospatial-Intelligence Agency (NGA). NGA will broadcast the message as a Navigational Area (NAVAREA) IV warning message over satellite (SafetyNET) and post it to their website (https://msi.nga.mil/NavWarnings). NAVAREA IV is one of 21 navigational areas designated by the World-Wide Navigational Warning Service (WWNWS); the United States is the coordinator for NAVAREA IV.

Concurrently, IIP watch standers will generate and transmit revised products to include the reported iceberg or radar target. If IIP receives the report of the iceberg or radar target outside of the iceberg limit during watch hours (1200 UTC to 0000 UTC), the OPCEN will immediately revise products to be valid for 1200 UTC or 0000 UTC the next day, depending on the time the report is received. Otherwise, IIP will revise products by 1400 UTC the following morning, valid for 1200 UTC that day.

Distinguishing between targets in SAR imagery (e.g., icebergs, vessels, marine life, fishing gear, or weather artifacts) remains a challenge. SAR backscatter noise can appear similar to icebergs or vessels and can be unintuitive to interpret. In cases where SAR analysis yields ambiguous targets outside of the iceberg limit, IIP takes a conservative approach and categorizes such a target as an iceberg, ensuring the maritime community receives a timely warning. IIP then maintains the target in the iceberg database until subsequent reconnaissance verifies otherwise. IIP relies on coordination with other data sources such vessels which report location using an Automatic Identification System (AIS) to help reduce target ambiguities.

In the past, several cases of icebergs outside of the iceberg limit were closely linked with the sea ice limit, in which they were undetected within sea ice (from deteriorated aerial or satellite reconnaissance), but subsequently broke free and drifted outside of the published iceberg limit. IIP policy requires the sea ice limit generated by CIS be contained within the iceberg limit.

No icebergs were reported outside of the published iceberg limit during the 2026 Iceberg Season.

3.7 Risk-Based Iceberg Products and Tailored Support

When IIP is tasked with supporting vessels inside the iceberg limit, IIP develops an additional daily experimental iceberg warning product known as the “Isolated/Few/Many” (IFM) product. The IFM product can be used to inform vessel risk assessments for intended movements. In 2026, IIP received no requests for tailored iceberg risk assessments.

IIP’s capability to generate IFM products is the result of collaboration between IIP, DMI, and CIS, and with other government and commercial agencies through the International Ice Charting Working Group (IICWG) and NAIS. DMI employs an automated iceberg detection and classification algorithm that quickly and accurately sorts through satellite images to find the thousands of icebergs in its waters surrounding Greenland. IIP typically relies on that output to create IFM products near Greenland, drifting the icebergs using the NAIS drift and deterioration model to predict the location of relevant icebergs based on when vessels are transiting nearby. Those modeled positions can be used to depict iceberg concentration which are sent out daily to supported vessels.

IIP expects increased demand for IFM tailored support products as vessels unaccustomed to ice navigation venture farther north.


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4 Iceberg Reconnaissance Operations

4.1 Iceberg Reconnaissance Detachments (IRDs)

The IRD is a partnership between IIP and ASEC to conduct aerial iceberg reconnaissance. During the 2026 Ice Year, IRDs were deployed to observe and report icebergs, sea ice, and oceanographic conditions in the North Atlantic Ocean. These critical observations are reported to the IIP OPCEN in Suitland, MD for processing and incorporation into BAPS, and are used to create and distribute the iceberg limits and daily NAIS iceberg warning products. See **Section 5** for semi-monthly NAIS-65 iceberg warning charts during Ice Year 2026.

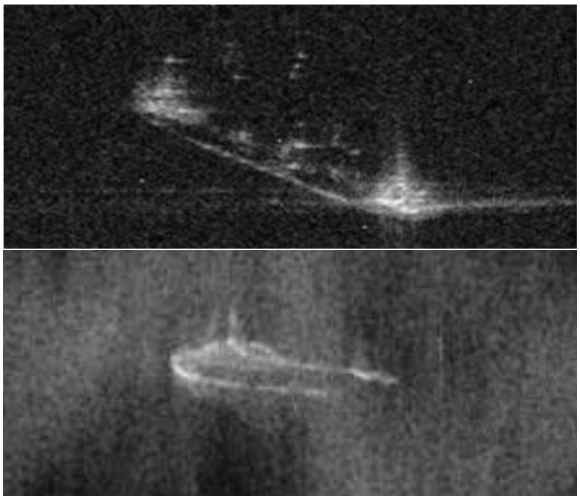


Figure 4.1. ISAR imagery of a ship (*top*) and an iceberg (*bottom*).

4.1.1 IRD Equipment

When flying, IRDs are conducted using USCG HC-130J aircraft equipped with two radars and an integrated AIS that both feed into the mission system suite. The first radar is an ELTA-2022 360° X-Band surface-search radar, which can detect and differentiate surface targets (iceberg, ship, or "other") automatically using AIS. The second radar is an HC-130J Tactical Transport Weather Radar (APN-241), which can detect surface targets but cannot differentiate them automatically.

The 360° coverage provided by the ELTA radar permits IIP to plan for up to 30 NM ground-track spacing between flight patrols, allowing for a 95% probability of detecting (POD) small icebergs (15 to 60 m at the waterline).

If the ELTA radar is inoperable, the IRD will plan flight patrols such that IRD crew can detect icebergs visually with the human eye and Forward-Looking Infrared Camera (FLIR) from the aircraft. These flight plans will space patrol ground tracks 10 NM apart and allow observation of 40% less ocean area than with radar. Because these patrols rely on visibility for iceberg detection, their success depends upon weather and ocean conditions (full visibility between the decreased track lines spacing with few white-capped breaking waves). Unfortunately, these conditions are relatively rare in IIP's meteorologically and oceanographically active AOR, and IRDs thus remain relatively dependent on operable ELTA radar.

IRD crews also frequently utilize the inverse synthetic aperture radar (ISAR), a function of the ELTA radar. ISAR uses target motion to generate high-resolution images of such targets. ISAR imagery is analogous to the satellite SAR imagery IIP analyzes, in that it is created using radar energy pulses in the microwave band of the electromagnetic spectrum. However, SAR relies on the motion of the platform carrying the radar (e.g., satellite motion in orbit) to generate an image, while ISAR relies on the motion of the target. This technology has proven extremely useful for identifying and distinguishing icebergs from ships, especially in poor visibility and for those ships which do not transmit AIS (**Figure 4.1**).

Finally, IRD aircraft are typically equipped with a Minotaur Mission System hardware and software suite. This suite allows for

Table 4.1. An overview of days and flight hours used during the scheduled IRD's for the 2026 Ice Season.

IRD	Number of Deployed Days	Number of Iceberg Patrols	Number of Transit Flights	Number of Patrols En Route	Number of Logistics Flights	Number of Flight Hours
1	8	4	1	1	0	41.4
2	8	4	2	0	0	33.4
3	9	5	2	0	0	49.2
4	9	4	2	0	0	41.1
5	0	0	0	0	0	0
6	6	0	1	0	0	5.7
Totals	**40**	**17**	**8**	**1**	**0**	**170.8**

onboard networking of cameras, radars, navigational instruments, and communications. This also allows OPCEN watch standers to communicate directly with IRD aircraft personnel in flight.

4.1.2 2026 IRD Flight Season

IIP conducted 17 iceberg reconnaissance patrols on USCG HC-130J aircraft over 40 deployed days during five IRDs between March and July 2026 (**Table 4.1**). This 2026 IRD flight season spanned 140 days – more than the 91-day average for Ice Years 2021 to 2025. Five out of the six planned IRDs were flown as scheduled (IRDs 1 through 4 and 6) and IRD 5 was canceled for asset reallocation.

Figure 4.2 shows the use of IIP's deployment days during the 2026 IRD Flight Season for operational, transit, patrol/transit, weather, maintenance, crew rest, or other purposes. Other purposes include meetings with IIP partners, higher priority aircraft tasking (e.g., search and rescue), and logistics flights. During the 2026 IRD Flight Season, deployment days were not used for these other purposes. In accordance with USCG regulations, a (usually) nine-day IRD deployment typically takes one day each for both crew rest and aircraft maintenance and flies every other deployement day when possible. Operations took up the most (42.5%) IRD deployment days in 2026.

The prevailing weather in the AOR

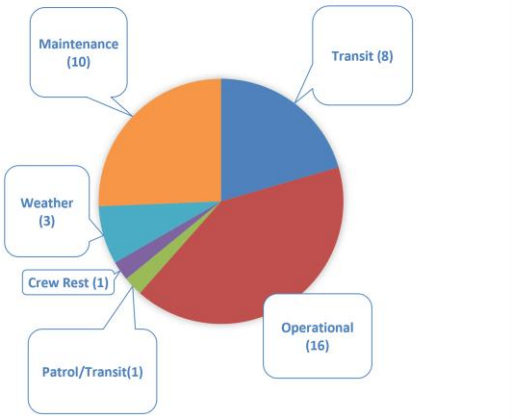


Figure 4.2. Utilization of days for the 2026 Ice Season.

contributed significantly to the number and effectiveness of reconnaissance patrols. Weather conditions prevented patrols on 7.5% of the days while IRDs deployed from Happy Valley-Goose Bay, Labrador. IRD crews capitalized on poor weather opportunities to meet the required rest and maintenance days. This maximized operational iceberg reconnaissance on favorable weather days.

Ten out of the 40 IRD Flight Season days were used for unscheduled maintenance or waiting for aircraft replacement parts to arrive at the deployment location. As in past seasons, IRDs based out of Happy Valley-Goose Bay, Labrador encountered significant logistical challenges with transporting needed spare parts to the deployed aircraft.

Table 4.2. An overview of days and flight hours used during the scheduled IRD's for the 2026 Ice Season.

	Number of Crew Rest Days	Number of Aircraft Maintenance Days
Opportunity (Weather at FBO/OPAREA)	1	0
Scheduled	0	0
Unscheduled	0	10
Totals	1	10

Table 4.2 shows a further breakdown of the crew rest and maintenance days taken when weather conditions did not permit flights (opportunity days), when crew rest or maintenance was required (scheduled), and when issues with maintenance occurred (unscheduled).

4.1.3 2026 IRDs

Thirteen IRDs were planned for Fiscal Year 2026 and six were finalized due to budget constraints. Of the six IRDs officially scheduled for the 2026 IRD Flight Season only five IRDs were completed due to asset reallocation.

A total of 17 iceberg reconnaissance flights throughout five IRDs were completed. Historically, IRDs have been deployed from St. John's, Newfoundland, using hangar space provided by PAL Aerospace. Beginning in 2024, IIP deployed IRDs from Happy Valley-Goose Bay in the province of Newfoundland and Labrador. This is because PAL Aerospace has expanded their aircraft fleet and therefore no longer has the capacity to consistently provide space for USCG assets. IIP has instead utilized the NATO base hangar at Happy Valley-Goose Bay to ensure aircraft protection from snow, ice, and high winds. Goose Bay has been a gracious host, and IIP looks forward to a continued partnership for IRD deployments.

IRD 1 departed from Joint Base Andrews's airport (KADW) on 11 March 2026 and conducted an in-transit patrol of the Western Limit which found no icebergs before arriving at the Royal Canadian Air Force Base in Goose Bay, Newfoundland and Labrador (CYYR) that day. On 12 March, a southwestern patrol of the Eastern Limit found no icebergs and resulted in key contractions to the iceberg limit. On 13 March, no patrol was flown due to adverse weather conditions (high winds and low cloud ceilings) impacting aircraft safety and reconnaissance ability. Instead, IIP conducted training and flight crew performed aircraft maintenance. On 14 March, the IRD revisited the Eastern Limit to assess if icebergs which were predicted to drift into that area had done so but found none. On 15 March, two icebergs were sighted during a patrol of the interior iceberg population ("interior patrol"). On 16 March, a southeastern patrol of the Eastern Limit sighted one iceberg. On 17 March, scheduled maintenance was conducted and IIP members conducted training and administrative work. On 18 March, midflight cracking of the plane's front outer windshield pane cut short a southeastern patrol of the Eastern Limit. The IRD crew returned to KADW and disembarked the six IIP members that day. IRD 1 was an excellent start to the season's operations and successfully re-established a working operational and logistical relationship with the Royal Canadian Air Force 5 Wing at Happy Valley-Goose Bay.

IRD 2 flew from KADW to CYYR on 13 May. A planned in-transit patrol was canceled due to weather concerns in the AOR. On 14 May, a southeastern patrol of the Eastern Limit sighted three icebergs in the Strait of Belle Isle. On 15 May, an interior patrol resighted 78 icebergs. On 16 May, the crew was grounded due to weather with low cloud ceilings, low visibility, high winds, and high waves moving east to west towards Newfoundland. IIP conducted training that day and the flight crew took a day of rest. On 17 May, the crew was grounded due to a member's medical concern. IIP conducted training and air crew conducted maintenance that day. On 18 May, a Western Limit patrol was canceled for safety en route to the patrol area due to severe (< 4 in) icing on the aircraft. The FLIR froze and became completely inoperable. On 19 May, the Western Limit patrol was resumed, resighting 10 icebergs

and sighting 41 ships. A direct radio callout was also issued to the Royal Canadian Coast Guard but received no response. On 20 May, IRD 2 returned to KADW from CYYR and disembarked six IIP members after canceling a planned southeastern patrol of the Eastern Limit due to icing weather concerns.

IRD 3 flew to CYYR from KADW on 27 May. On 28 May, a Western Limit patrol was conducted, resighting 22 icebergs, sighting 20 ships, and diverting twice for radar targets. On 29 May, an interior patrol was conducted, diverting to pursue a radar target which was confirmed to be a ship and ultimately sighting no icebergs. The IRD was grounded on 30 May due to weather (low cloud ceilings and visibility, and high winds and waves moving east to west toward Newfoundland). IIP conducted training instead and the flight crew used the day for aircraft maintenance. On 31 May, a southern patrol of the Eastern Limit sighted 13 icebergs. The IRD was grounded on 1 June due to weather, and the crew took a rest day. On 2 June, a western patrol of the Eastern Limit resighted one iceberg. On 3 June, an Eastern Limit patrol resighted seven icebergs, including one limit setting iceberg. On 4 June, IRD 3 departed CYYR and returned to KADW, disembarking six IIP members before returning to ASEC.

IRD 4 flew from KADW to CYYR on 10 June. On 11 June, an Eastern Limit patrol sighted no icebergs or ships. On 12 June, the aircraft was grounded due to a hydraulic leak in the landing gear. IIP conducted training instead and flight crew performed aircraft maintenance. On 13 and 14 June, the aircraft remained grounded awaiting replacement for the required hydraulic part. Both ASEC and IIP crews conducted crew rest days. On 15 June, a Western Limit patrol sighted 20 icebergs and 16 ships. On 16 June, an interior patrol sighted no icebergs or ships. On 17 June, a southern patrol of the Eastern Limit verified that the area was free of any icebergs and sighted one ship. On 18 June, IRD 4 departed CYYR and returned to KADW, disembarking six IIP members before returning to ASEC.

IRD 5 was canceled due to ASEC reallocation of the aircraft for other operational commitments.

IRD 6 was the last scheduled IRD of the season and departed KADW on 22 July. Upon arrival at CYYR that day, one of the two static pressure transducer units was inoperable, and it was unable to establish communications with the Air Data Computer. This malfunction resulted in the plane being grounded for all scheduled days of IRD 6 as both sensors need to be operational for the aircraft to be fully mission capable. A replacement part was requested and the crew performed training and subsequent rest days until this part arrived. Due to logistics delays in shipping the part to CYYR, the IIP crew was directed to cancel IRD 6 and book commercial flights back to Suitland, MD, ending IRD 6.

IIP determined the IRD flight season should be closed due to the moderate severity Iceberg Season, the vast availability of satellite reconnaissance, and continued partnership with PAL Aerospace. The season was officially closed on 28 July 2026.

4.1.4 2026 IRD Iceberg Detections

IRD personnel detected 149 icebergs over five IRDs during the 2026 IRD flight season. These IRD-detected icebergs were incorporated into the iceberg database, accounting for 3% of icebergs incorporated in 2026.

During IRDs, iceberg detections are made in one of three ways: 1) either with concurrent visual or radar observation or by Electro-Optical Infrared (EOIR) camera alone, 2) by radar alone, or 3) only visually. Iceberg detections made with the onboard EOIR camera are counted as both visual and radar sightings because of the camera's ability to see in the infrared and much farther than the human eye. The EOIR camera is equipped to identify more precise geographical positions of icebergs than observers in flight, who rely on range and bearing to estimate iceberg position.

Table 4.3. IRD iceberg detections by method from over the last ten years.

Year	Percentage of Icebergs Detected by Radar and Visually	Percentage of Icebergs Detected by Radar Only	Percentage of Icebergs Detected Visually Only
2016	20%	32%	48%
2017	21%	39%	40%
2018	24%	31%	45%
2019	44%	26%	30%
2020	67%	3%	30%
2021	69%	8%	23%
2022	38%	2%	60%
2023	71%	1%	28%
2024	29%	1%	70%
2025	0%	0%	0%
2026	70%	10%	20%

In 2026, 70% of the icebergs detected by IRDs were sighted via concurrent radar observations and visual sightings, or by the camera (**Table 4.3**). Only 10% of the remaining icebergs were detected by radar only, and 20% were detected visually only. Concurrent radar and visual detection has generally increased since 2016, illustrating how significant the radar and camera sensors have become to IIP aerial iceberg reconnaissance.

IIP personnel employed a two-tiered IRD aerial iceberg reconnaissance approach in favorable environmental conditions to maximize detection efficiency, focusing visual observations near the aircraft and radar observations farther away. This tactic often resulted in visual-only reported iceberg detections because, even when these icebergs were within range of and detected by the radar, observers needed to sight and record high volumes of icebergs in flight and time did not allow for corroboration of those sightings with the radar.

4.1.5 2026 IRD Flight Hours

IIP was originally allotted 500 Maritime Patrol Aircraft flight hours for Ice Year 2026 operations. After 329.4 hours were canceled (see **Section 4.1.3**), IIP utilized 170.8 flight hours in 2026 for maintenance/logistics, transit, and patrol (**Figure 4.3**). **Figure 4.3** also provides a visual representation of the past six years of flight hours. The following is a description of the typical breakdown of hours tracked in an IRD.

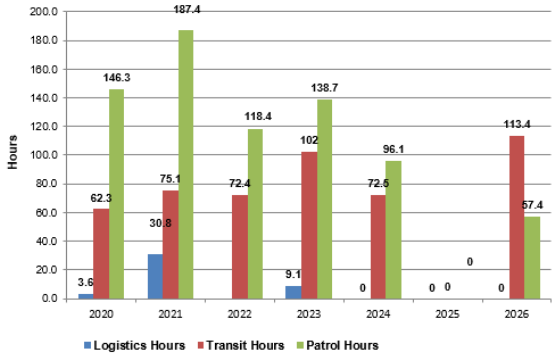


Figure 4.3. Patrol, transit, and logistics flight hours over the past six years.

Logistics hours are the hours used to support the IRD, but do not fall into the the transit or patrol categories. Logistic hours accrue when a Coast Guard aircraft is used to transport parts for an aircraft deployed on an IIP mission. There were zero hours used for logistics this season.

Transit hours are the hours the aircraft is traveling between specific locations in support of the IRD mission without conducting reconnaissance. Those locations include Elizabeth City, NC and the forward operating area with a brief stop at KADW to onload IIP personnel and equipment. There were 113 hours used for transit this season.

Patrol hours are those which the IRD uses to conduct iceberg reconnaissance, including flight time to and from the reconnaissance area. When a patrol is conducted during a regularly planned transit flight, such as a patrol while transiting back to KADW, the patrol hours are accounted for from the total flight time. The remaining flight time from the transit flight is classified as transit flight hours. A total of 57 flight hours were used for patrol this season. A visual representation of 2026 flight hours is provided in **Figure 4.4**.

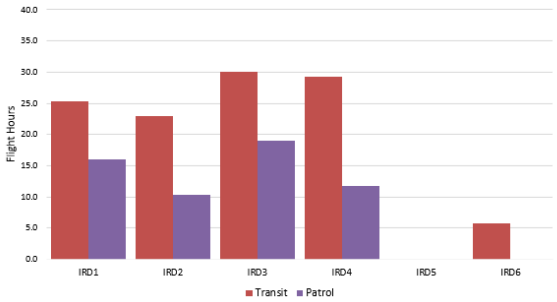


Figure 4.4. 2026 flight hours by IRD.

The spatial and temporal distribution of icebergs, as well as the number drifting south of 48ºN, all contribute to the amount of reconnaissance needed to effectively monitor the iceberg danger and provide relevant warning products. **Figure 4.5** shows a comparison of flight hours to the number of icebergs that drifted south of 48ºN from 2013 to 2026.

In Ice Year 2026, IIP estimated a total count of 377 icebergs that drifted south of 48ºN, making this an Iceberg Season of moderate severity. See **Section 2.1.2** for further details on how Iceberg Season severity is determined.

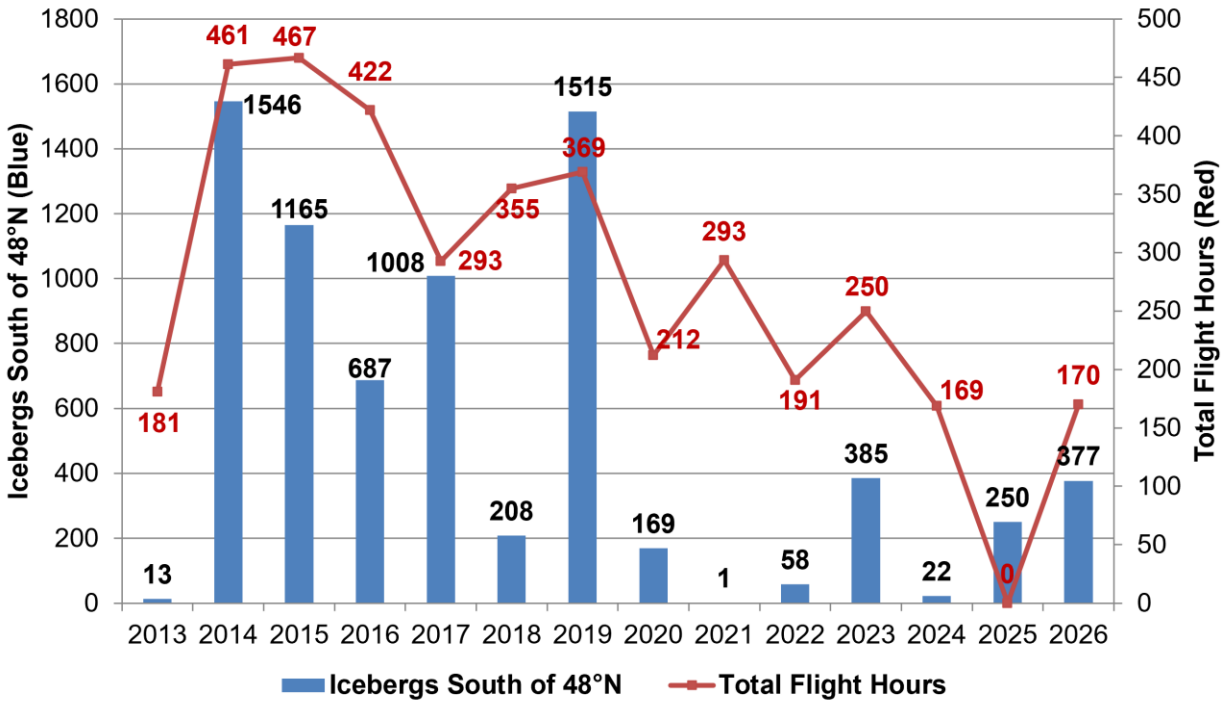


Figure 4.5. Comparison between total IRD flight hours per season and season severity, measured by number of icebergs sighted or drifted below 48ºN for the past 13 years. More icebergs south of 48ºN may require increased reconnaissance efforts.

4.2 Satellite Reconnaissance

4.2.1 Satellite Collections

IIP iceberg satellite reconnaissance is conducted daily by a qualified Duty Satellite Analyst (DSA) when IIP has responsibility for the NAIS iceberg warning products. Every morning, the DSA is responsible for determining daily or emergent reconnaissance requirements and deconflicting (avoiding redundancy) with commercially provided iceberg reconnaissance. The DSA takes all relevant information and determines image analysis priority based on sensor characteristics and strategic region (**Table 4.4, Figure 4.6**).

Satellite reconnaissance strategic regions help analysts prioritize which satellite imagery to download each morning. Strategic Region A (see **Figure 4.6**) is the portion of the IIP AOR south of 52°N, where icebergs pose the greatest threat of collision with transatlantic vessels in the vicinity of the Grand Banks and the Strait of Belle Isle. Higher resolution satellite imagery is required for monitoring this area, as icebergs here are smaller due to advanced deterioration, and are usually in the open ocean. Generally, there are also more ships and fishing gear in this region, making discrimination between ship and iceberg targets more challenging for analysts.

Strategic Region B (see **Figure 4.6**) is the portion of the IIP AOR north of 52°N, where DSAs analyze satellite imagery of greater coverage, but reduced resolution. Such imagery allows the DSA to identify larger, slower moving icebergs, often trapped in sea ice, over a greater area. This region contains the population of icebergs which may eventually drift into high-traffic shipping lanes ("feeder" icebergs). The presence of sea ice in this region early in the season can make target detection more difficult.

IIP continues to rely on the European Space Agency's (ESA) Sentinel-1 (SN1A/C/D) and Sentinel-2 (SN2A/B/C) sensors, which both follow a consistent collection schedule and remain

Table 4.4. Satellites used by IIP satellite analysts.

Satellite	Preferred Acquisition Mode	Revisit Time (Days)	Scene Size (km)	Spatial Resolution (m)	Polarization
Sentinel-1 A/C (SN1A/C)	Interferometric Wide Swath (IW)	12	250 x 250	20	HH/HV
Sentinel-2 A/B/C (SN2A/B/C)	Multispectral: Level 1-C	5	100 x 100	10	EO
RADARSAT Constellation Mission (RCM)	Medium-Maritime	4	350 X 350	50	HH/HV
Radarsat-2 (RS2)	Wide Fine	24	150 x 170	8	Single-/Dual-Pol

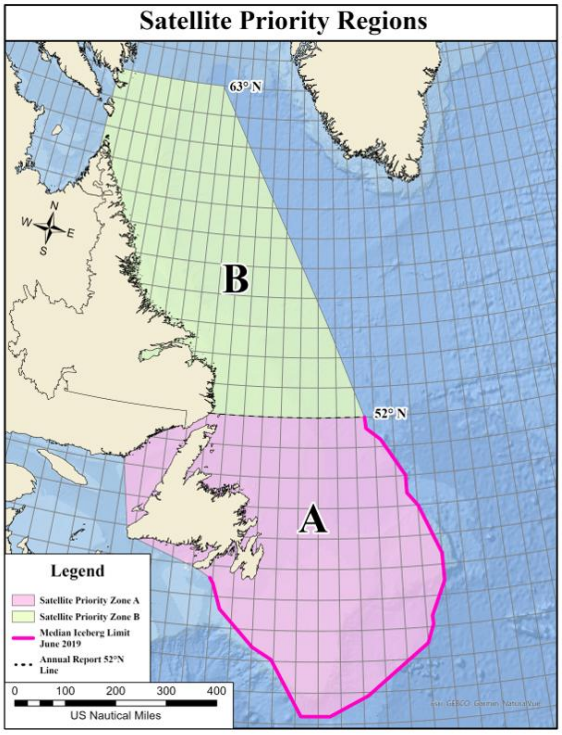


Figure 4.6. Satellite reconnaissance priority regions within the IIP AOR. South of 52°N is generally the area analysts should consider high priority for satellite imagery, where icebergs pose the greatest threat to shipping lanes.

publicly available online in near real-time. SN1 provides SAR imagery. The launch of SN1D in November 2025 has increased the frequency of coverage over our AOR.

Multispectral electro-optical (EO) imagery, in particular from SN2, can be an incredibly useful resource for IIP satellite reconnaissance as it results in very high confidence iceberg classifications. The scenes, imaged in the optical band, are more intuitive for analysts to determine what is and what is not an iceberg compared to SN1, due to the similarity in visual appearance to objects in life and photography. However, frequent cloud cover in the AOR renders many SN2 images unusable for analysis.

This year, IIP continued operational use of imagery from the Canadian Space Agency's (CSA) RADARSAT Constellation Mission (RCM), a direct result of the strong partnership between IIP and CIS. While previously RCM has been used for monitoring the northern AOR, and usually a lower priority sensor for DSAs, several medium to large icebergs that drifted south of 52°N were detected and tracked in Ice Year 2026 using RCM imagery (generated in lower resolution modes) in these higher priority southern regions.

Through partnership with NGA, RADARSAT-2 (RS2) SAR imagery was also made available to IIP for satellite reconnaissance. RS2 imagery requires tasking up to 30 days prior to image collection. Access to this resource is phenomenal since it has a finer resolution than SN1 and RCM images, however, the lag between tasking and collection makes it difficult to use RS2 in dynamic regions, such as at the iceberg limits. See **Table 4.4** for platform specific imaging characteristics.

4.2.2 Satellite Analysis

After satellite sensors and region priority are considered, the DSA downloads relevant imagery from the previous 24 hours, or as directed by the

DWO. The DSA then processes the selected satellite frames through the Iceberg Detection System (IDS) software provided by C-CORE to analyze both SAR and EO imagery.

At this point, the DSA begins the crucial target verification process. The IDS generates a shapefile of potential iceberg targets, which is currently reviewed with GIS tools in ArcGIS Pro. Analysis involves careful examination of each target's size, shape, location relevant to sea ice, and pixel-level properties.

To minimize false positives, AIS data is used to distinguish icebergs from known ships. This is particularly important in high-traffic areas. This comprehensive assessment allows the DSA to make a classification determination and decide if a target is an iceberg, ship, or noise. A SIM is then generated by the DSA, which is passed to the DWO for incorporation into BAPS, where the icebergs detected with satellite imagery are added or resighted to the IIP iceberg database.

4.2.3 Satellite Iceberg Detections

IIP satellite reconnaissance during the 2026 Iceberg Season relied primarily on SN1 and RCM. Watch standers at IIP analyzed 1,301 individual satellite images, to generate SIMs during the 2026 Ice Year. The breakdown of satellite images analyzed at IIP is shown in **Figure 4.7**. RCM is the primary workhorse of IIP satellite reconnaissance.

IIP's analysts identified a total of 1,809 icebergs in satellite imagery in Ice Year 2026, of which 1,677 were incorporated in the iceberg database. The total number of images analyzed in-house by IIP increased from 1,104 in 2025 to 1,301 in 2026 (**Figure 4.8**). As IIP continues to improve its satellite program, streamline analysis methods, and develop DSA expertise and training, an increase is expected in future satellite reconnaissance.

Interestingly, the percentage of icebergs detected by all satellite sources incorporated into the iceberg database slightly decreased, as seen in **Figure 4.9**, from 88% in 2025 to 77% in 2026.

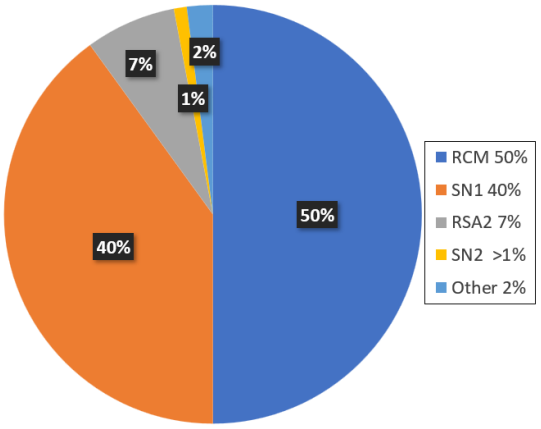


Figure 4.7. Percentage of total frames analyzed by satellite at IIP.

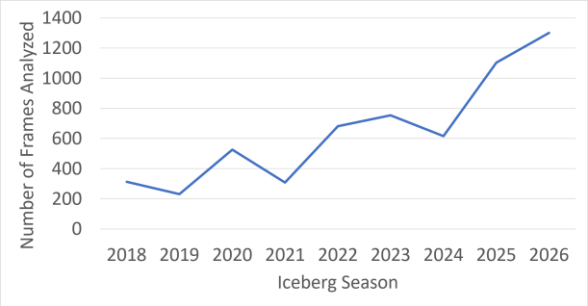


Figure 4.8. Frames analyzed each year by IIP satellite analysts.

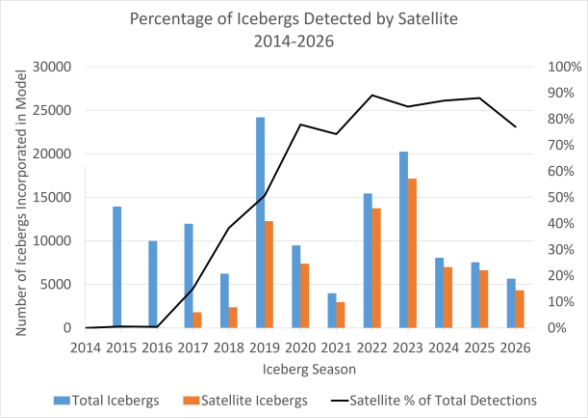


Figure 4.9. Number and percentage of icebergs identified by satellite and incorporated into the model compared to total incorporated icebergs between 2014 and 2026.

This may be attributed to an increase in IRD reconnaissance flight hours and PAL Aerospace flights in the 2026 flight season. There was a steep increase in the percentage of icebergs detected by satellite between 2014 and 2020, after which this number approaches a plateau between 80-90% of

total icebergs detected. IIP expects the percentage will remain around that plateau while the IIP aerial reconnaissance mission continues.

IRDs play a critical role during the height of the ice season to validate icebergs near the limit, outside the limit, and in satellite imagery. Until satellite imagery provides the same level of confidence in detecting icebergs less than 20 m or better, IIP continues to recommend aerial reconnaissance.

4.2.4 Northern Survey

The Northern Survey is a satellite survey that estimates the "upstream" iceberg population that could drive aerial reconnaissance decision-making in the early part of IIP's iceberg reconnaissance season.

In December 2025, IIP conducted the 2026 Northern Survey between 55°N and 70°N along the coast of Labrador, Eastern coast of Baffin Island, and Southwestern Baffin Bay for the 2026 Iceberg Season. The survey investigated 32 RCM and SN1 images from 1 to 5 December 2025, detecting a total of 38 icebergs as seen in **Figure 4.10**.

Within the survey area, 16% of the icebergs were detected in gray-white to first-year sea ice. Sea ice helps to insulate icebergs from ocean waves which quickly deteriorate them (see **Section 2.1.2**). For that reason, these icebergs were deemed the most likely to drift south through the winter, and potentially into shipping lanes, with the movement of the sea ice. The sea ice data used in the Northern Survey is from CIS.

IIP's satellite analysts continue to refine the methodology for repeatable Northern Survey results year by year, building a data set that may be useful in correlating season severity (number of icebergs detected south of 48°N) with icebergs detected in a Northern Survey. This year, the scope of the survey area was confined to the Canadian East Coast.

Based on data collected since IIP started

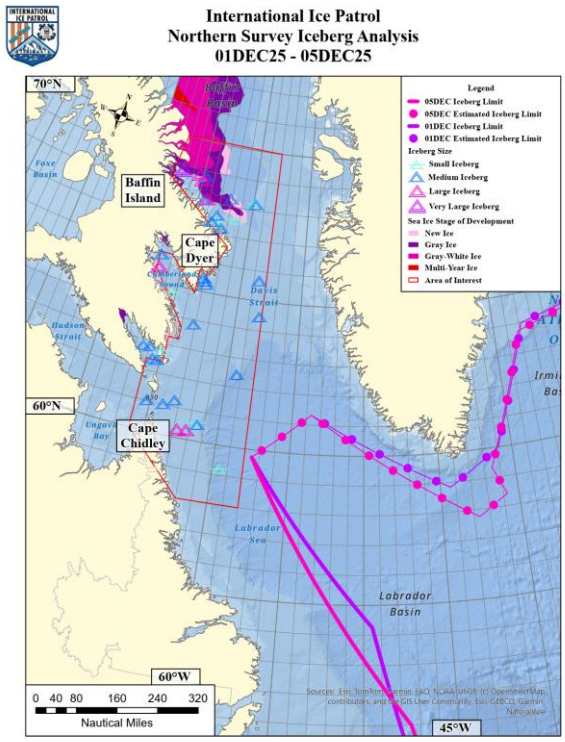


Figure 4.10. Results of the 2026 Northern Survey from December 2025. Iceberg data is collected using the Canadian Space Agency's (CSA) RADARSAT Constellation Mission (RCM) satellite. Sea ice data is from CIS.

implementing satellite analysis in 2017, **Figure 4.11**, there is a weak but statistically significant linear correlation between icebergs identified in the Northern Survey and the number of icebergs detected south of 48°N. The 2025 Northern Survey underestimated the 2026 season severity, predicting a "light" year with only 30 icebergs crossing south of 48°N compared to the 377 icebergs that drifted south of 48°N making this a "moderate" year. Continuing to build a comprehensive data set may be useful in the future for predicting season severity several months before the peak of the iceberg season.

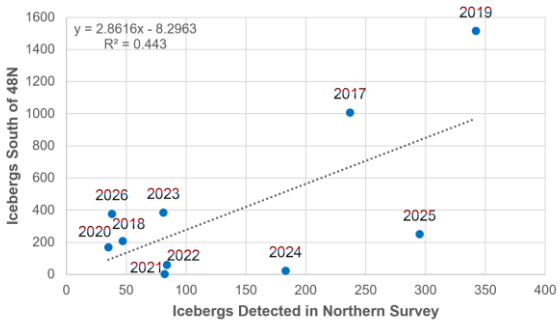


Figure 4.11. Comparison between iceberg detections in Northern Surveys and iceberg crossings South of 48°N between 2017 and 2026.

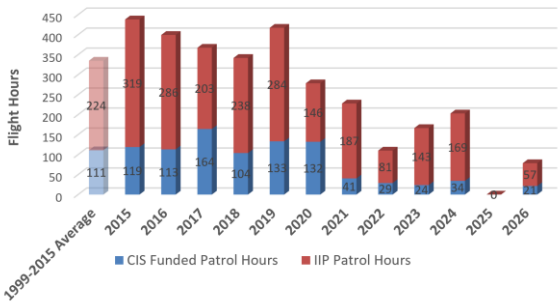


Figure 4.12. NAIS flight hours, a combination of IIP patrol hours and CIS funded PAL Aerospace patrol hours compared to the previous 10-year average. More icebergs south of 48ºN may require increased reconnaissance efforts.

4.3 Other Reconnaissance Activities

4.3.1 NAIS Collaboration

IIP continued to leverage its NAIS partnership with CIS in 2026. CIS contracts flights year-round and during the 2026 Ice Year, CIS contracted six flights to PAL Aerospace. **Figure 4.12** depicts the hours flown by IIP and CIS contracts from the past 11 years.

4.3.2 Ship Interactions

When flying, IRD on-scene patrol time in the HC-130J aircraft is mainly focused on locating and classifying icebergs using visual and radar reconnaissance methods. However, during patrols, the IRD will also communicate directly with the maritime community to request recent iceberg sighting information. This communication takes two forms: a sécurité broadcast to all vessels in the vicinity of the aircraft, and direct call outs to vessels identified by AIS. The information from the individual vessels is especially useful during periods of reduced visibility, or when numerous small vessels not equipped with AIS are present in the reconnaissance area. Vessel observations are valuable for confirmation of data provided by the aircraft's radar. During the 2026 season, there were zero general sécurité broadcasts and one direct vessel callout which was made to the Royal Canadian Coast Guard during IRD 2's patrol of the Western Limit on 19 May which received no response.


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5 Semi-Monthly Iceberg Charts

The NAIS-65 Iceberg Chart is released daily by IIP (in the active Iceberg Season) and CIS (outside the active Iceberg Season). It depicts the iceberg limit which delineates the iceberg population from open water, the estimated distribution and frequency of icebergs within this limit, and the sea ice limit.

The Iceberg Limit is comprised of the following: the iceberg limit over the Grand Banks and east of Newfoundland and Labrador (Eastern Limit, *solid/dotted magenta line to the south and east of Newfoundland and Labrador*), the iceberg limit to the west of Newfoundland (Western Limit, *solid/dotted magenta line within the Strait of Belle Isle and the Gulf of St. Lawrence*), and the Greenland iceberg limit (Estimated Limit, *dotted magenta line south of Greenland*, from DMI). The Grand Banks iceberg limit is the primary component of the chart, as it affects transatlantic navigation, and IIP allots the most detection and monitoring efforts to ensure its accuracy and reliability. See **Figures 5.1** through **5.24** for bi-monthly iceberg warning products for the 2026 Ice Year.

The Western Iceberg Limit is drawn when icebergs drift south into the Strait of Belle Isle and the Gulf of St. Lawrence, which is a heavily trafficked area. If icebergs begin to approach Anticosti Island, IIP may elect to split the western limit into two segments to account for icebergs to the north and south of the island. Rarely, when icebergs drift south of the line between Port aux Basques, Newfoundland and the southeastern tip of Anticosti Island, IIP may draw the iceberg limit across Cabot Strait between Newfoundland and Cape Brenton Island. This would likely adversely affect shipping traffic, as vessels headed to the St. Lawrence Seaway would have to cross the iceberg limit.

The Greenland Iceberg Limit (termed the "estimated iceberg limit") is provided by DMI to IIP and CIS semi-weekly. DMI uses an automated approach to detect icebergs around Greenland and does not model an individual iceberg's drift and deterioration as IIP does. For this reason, the Greenland Iceberg Limit is assigned a lower level of confidence and reported in the NAIS iceberg warning products as estimated. The Greenland Iceberg Limit affects primarily specialized ice navigators who take on their own risk by crossing it.

The sea ice limit (see **Figures 5.1** through **5.24,** *dashed magenta line*) is provided daily by CIS and delineates ice-covered from ice-free waters. The sea ice limit provides no additional information on sea ice concentration or stage of development and is meant only as a rough indicator of the presence or absence of sea ice.

Finally, the estimated distribution of icebergs is depicted as the estimated number of icebergs per square degree. IIP does not report the individual estimated locations of the icebergs in the database due to uncertainties associated with iceberg detection and modeling. The reported iceberg distribution should not be used for navigation.

It should be noted that IIP may report radar targets within the NAIS iceberg warning products. Radar targets are targets detected by spaceborne, aircraft, or vessel radars that were observed with low confidence and were indistinguishable as icebergs, vessels, or other targets. In the NAIS-65 chart, radar targets are depicted as small circles encompassing an "x". IIP attempts to minimize the number of radar targets reported and prioritizes reconnaissance to investigate and accurately classify them.

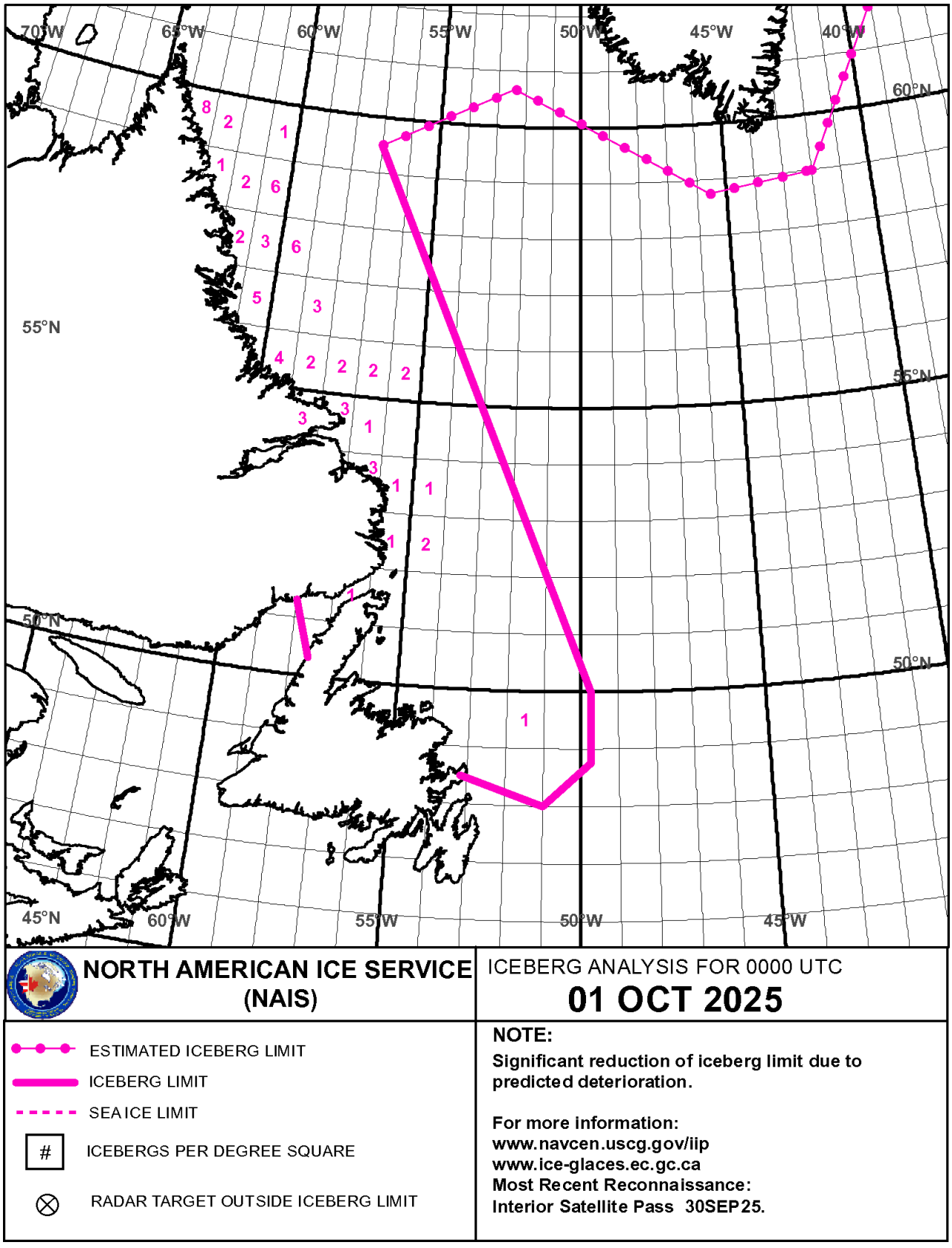


Figure 5.1. NAIS-65 Iceberg Chart for 01 October 2025.

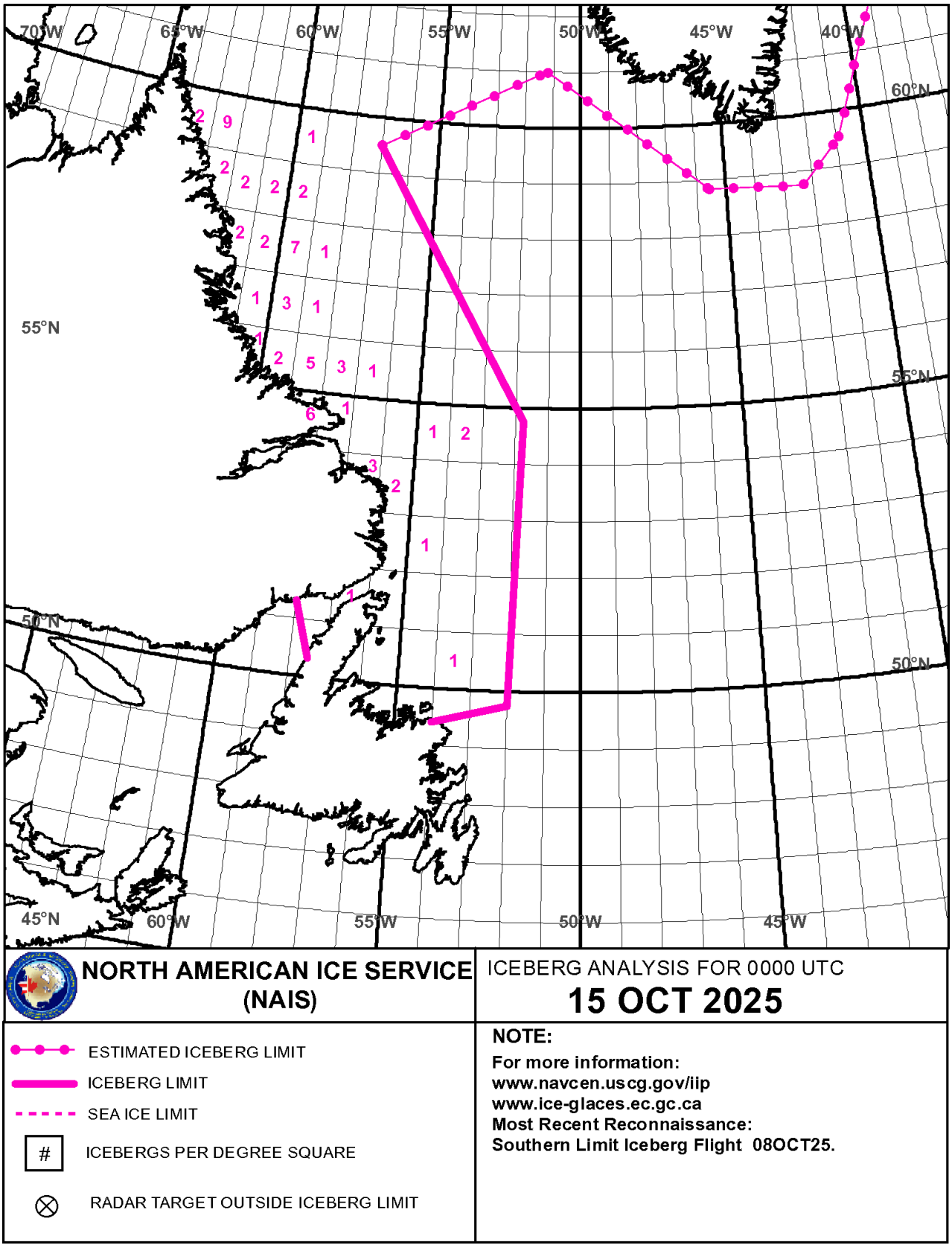


Figure 5.2. NAIS-65 Iceberg Chart for 15 October 2025.

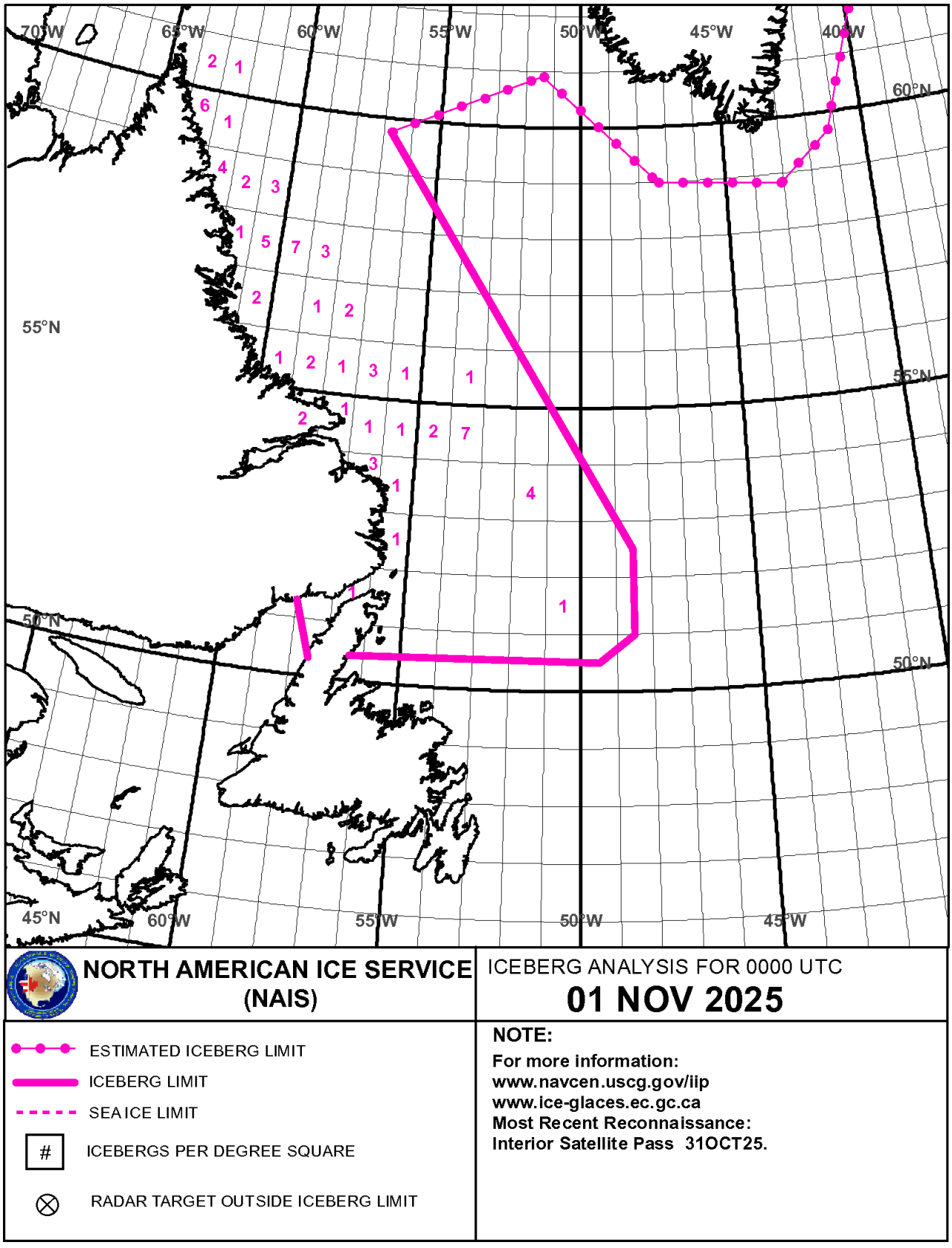


Figure 5.3. NAIS-65 Iceberg Chart for 01 November 2025.

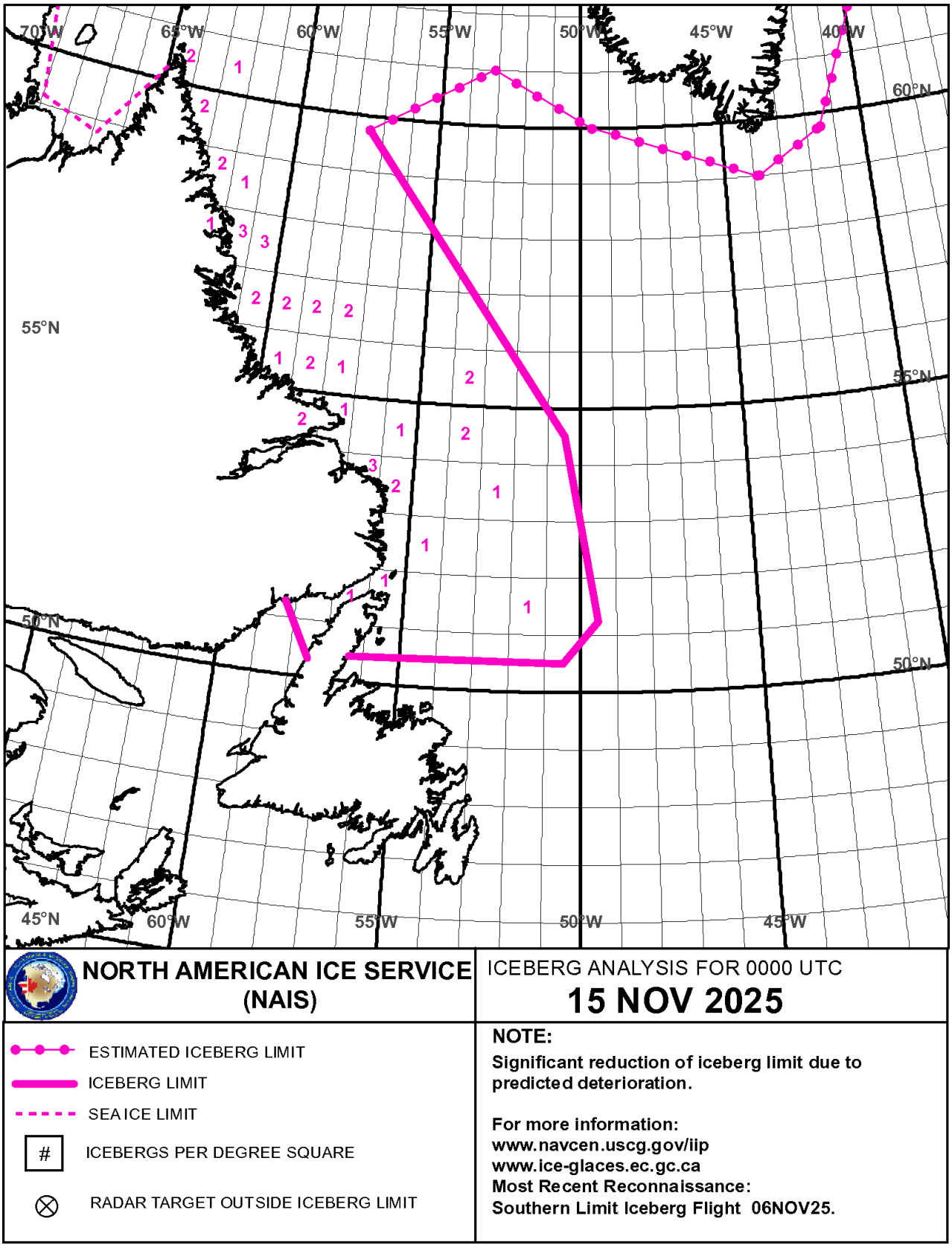


Figure 5.4. NAIS-65 Iceberg Chart for 15 November 2025.

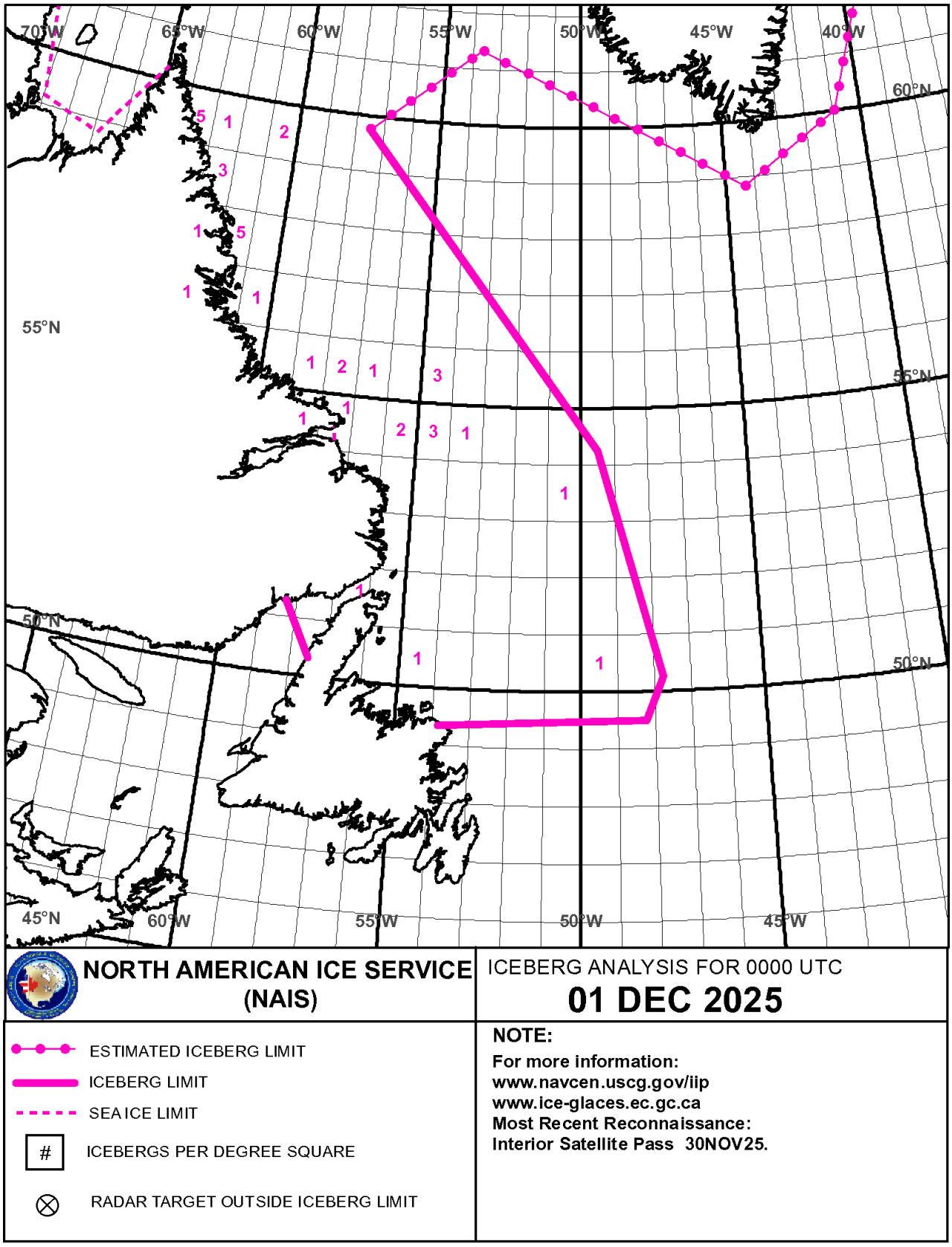


Figure 5.5. NAIS-65 Iceberg Chart for 01 December 2025.

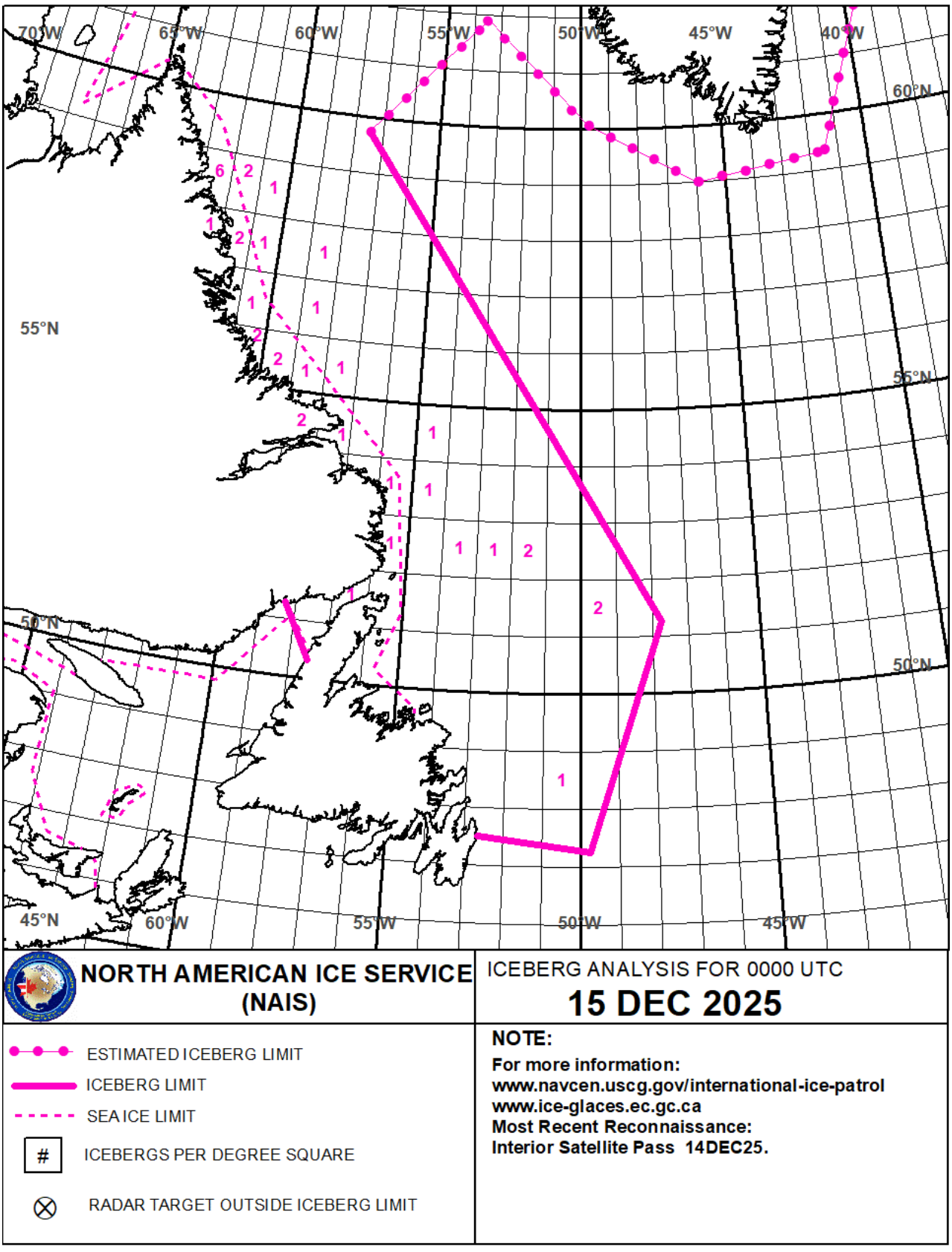


Figure 5.6. NAIS-65 Iceberg Chart for 15 December 2025.

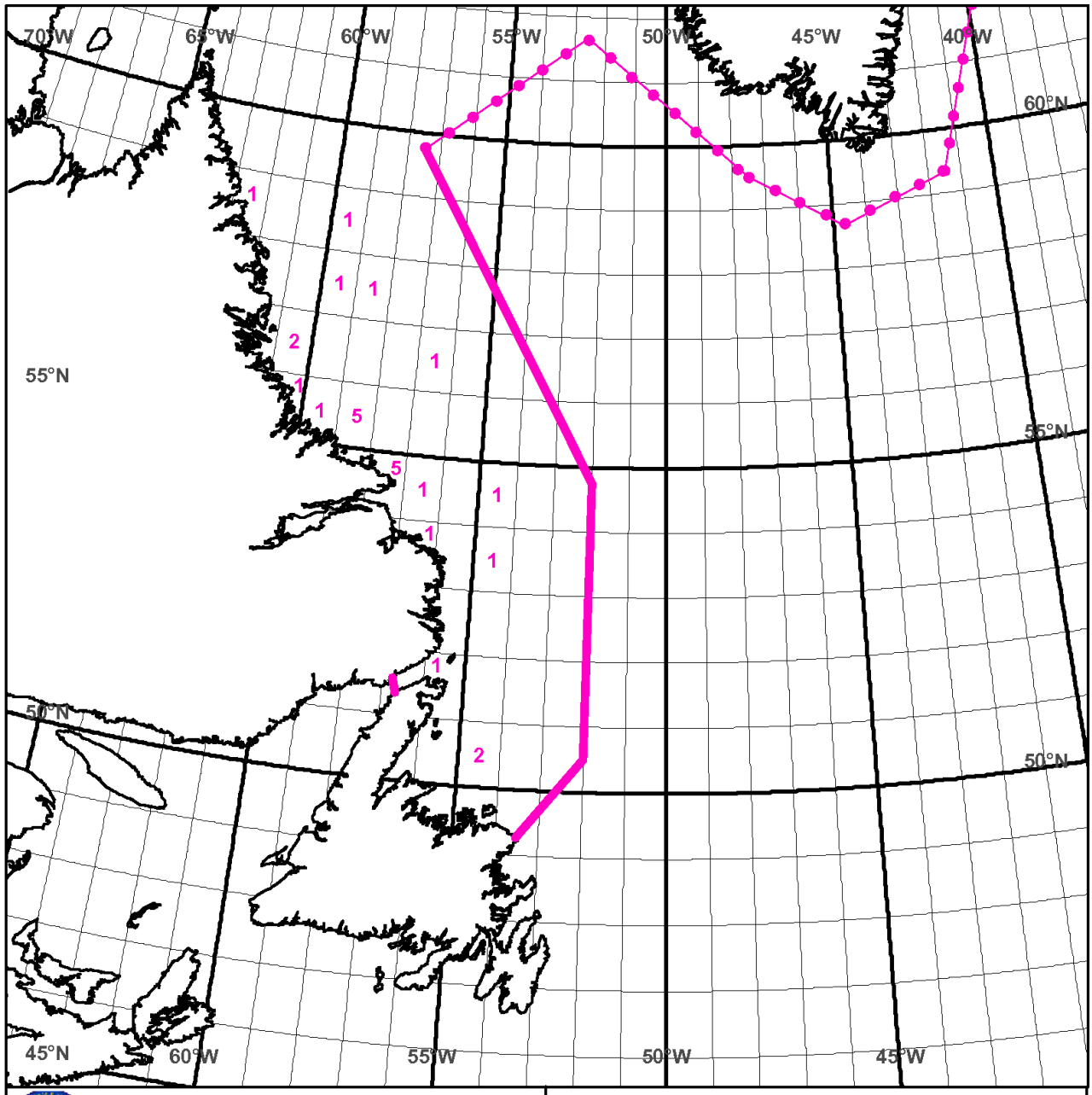


Figure 5.7. NAIS-65 Iceberg Chart for 01 January 2026.

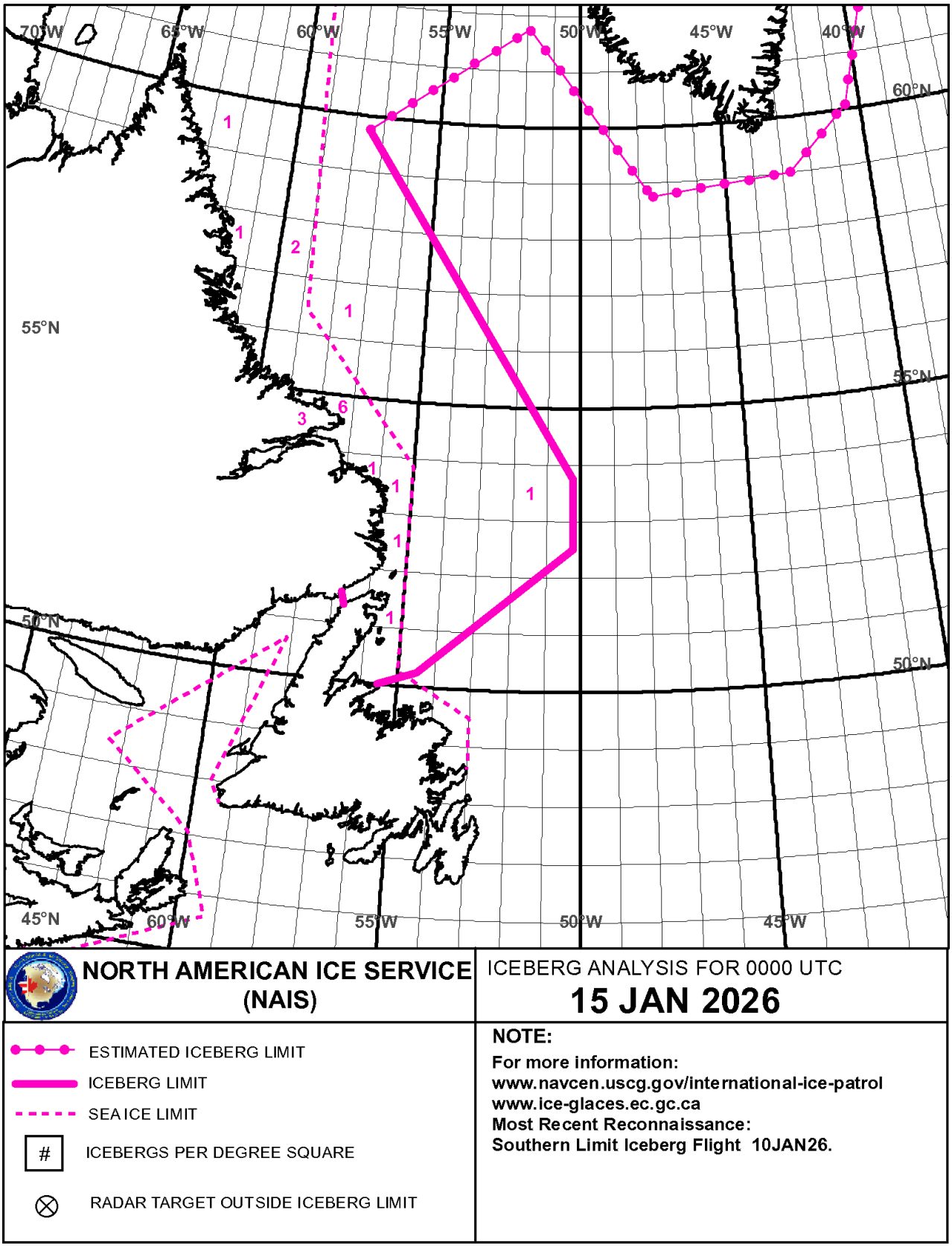


Figure 5.8. NAIS-65 Iceberg Chart for 15 January 2026.

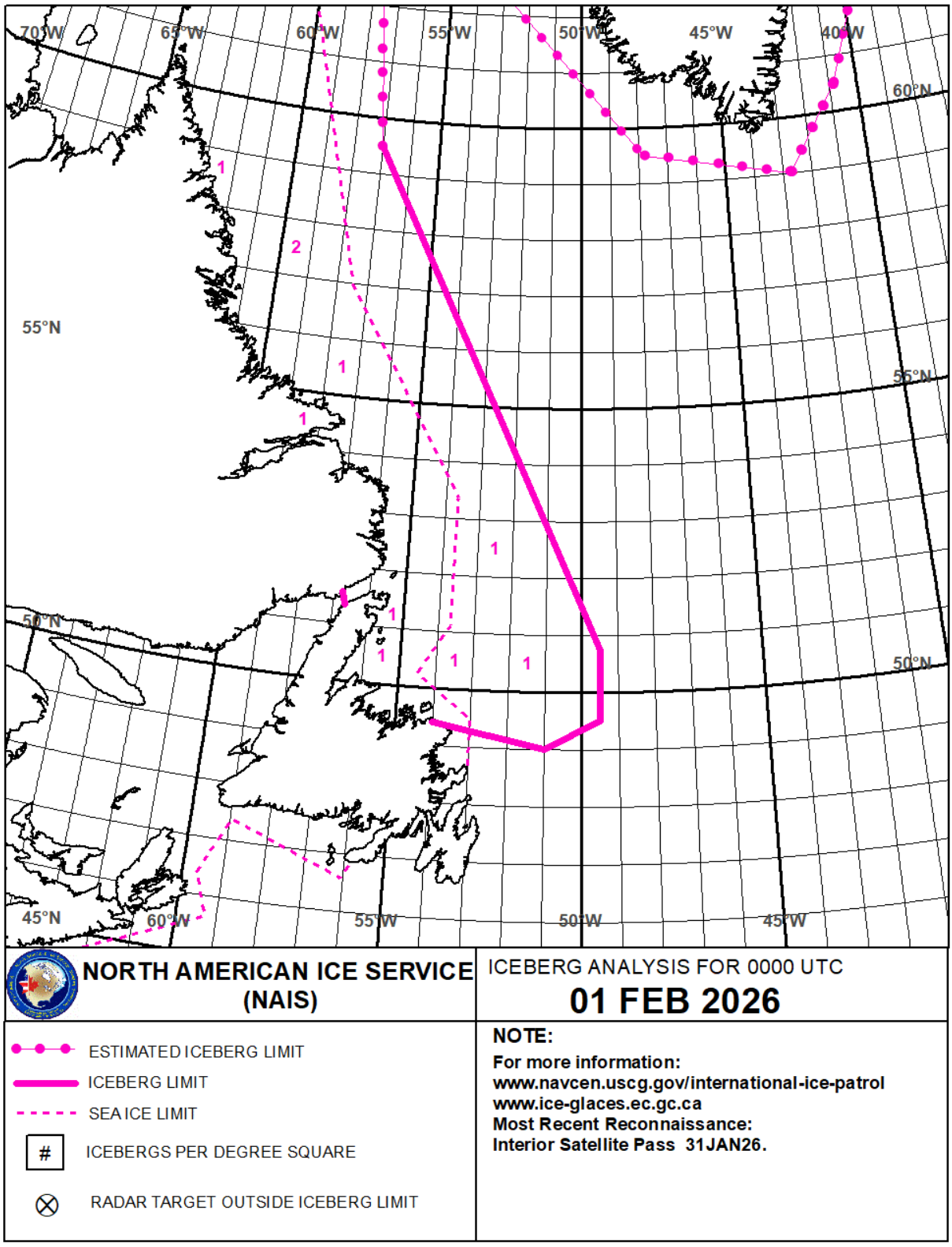


Figure 5.9. NAIS-65 Iceberg Chart for 01 February 2026.

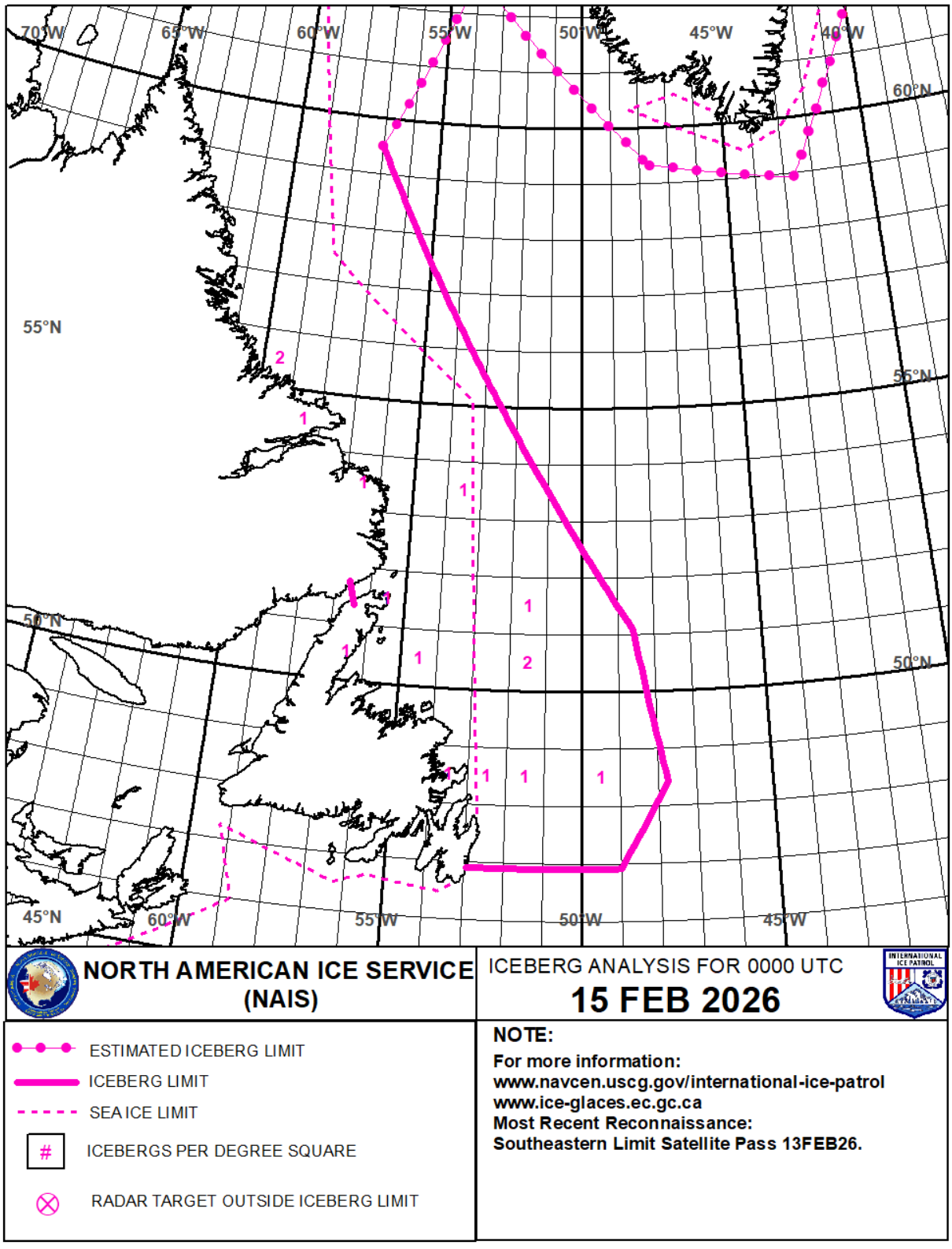


Figure 5.10. NAIS-65 Iceberg Chart for 15 February 2026.

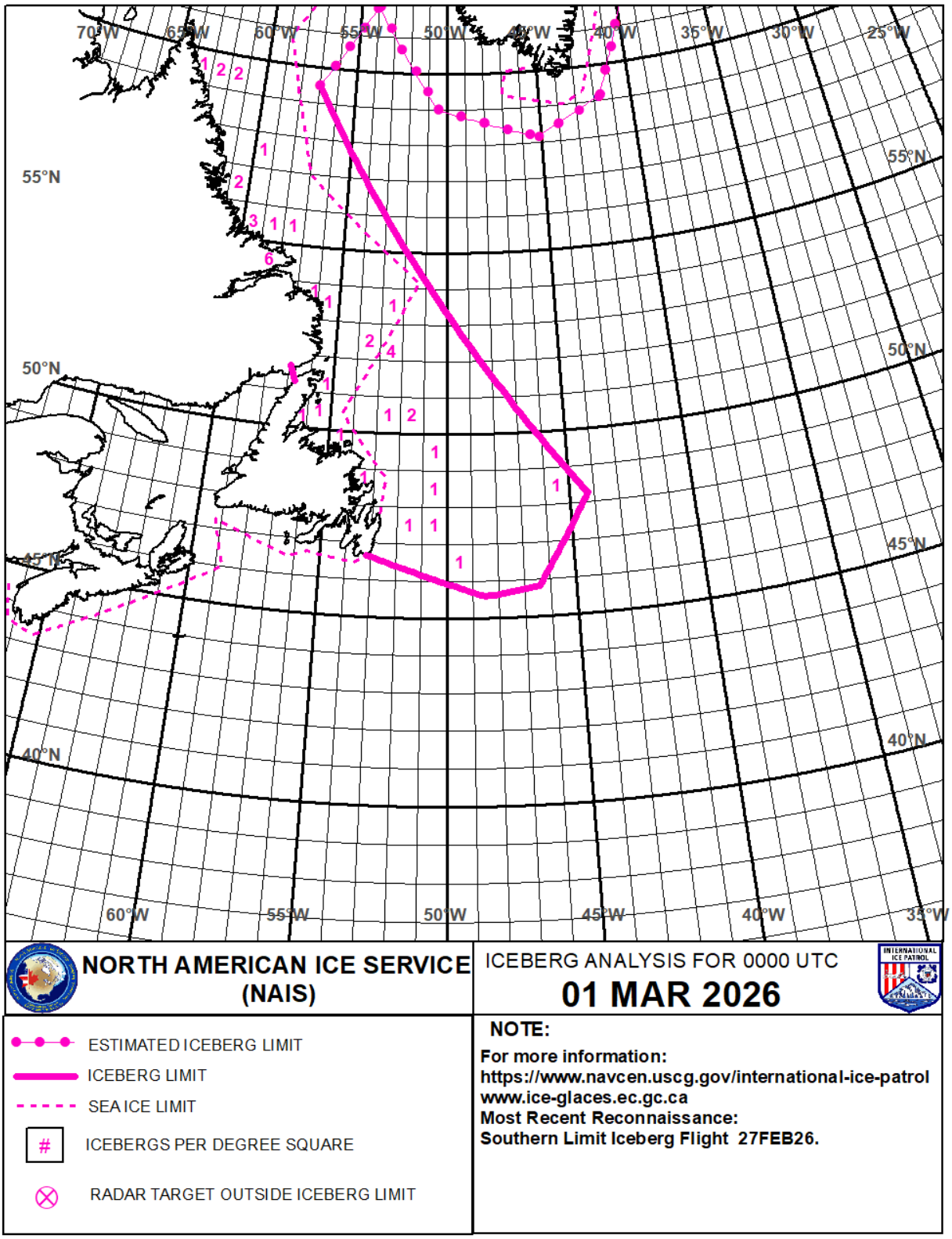


Figure 5.11. NAIS-65 Iceberg Chart for 01 March 2026.

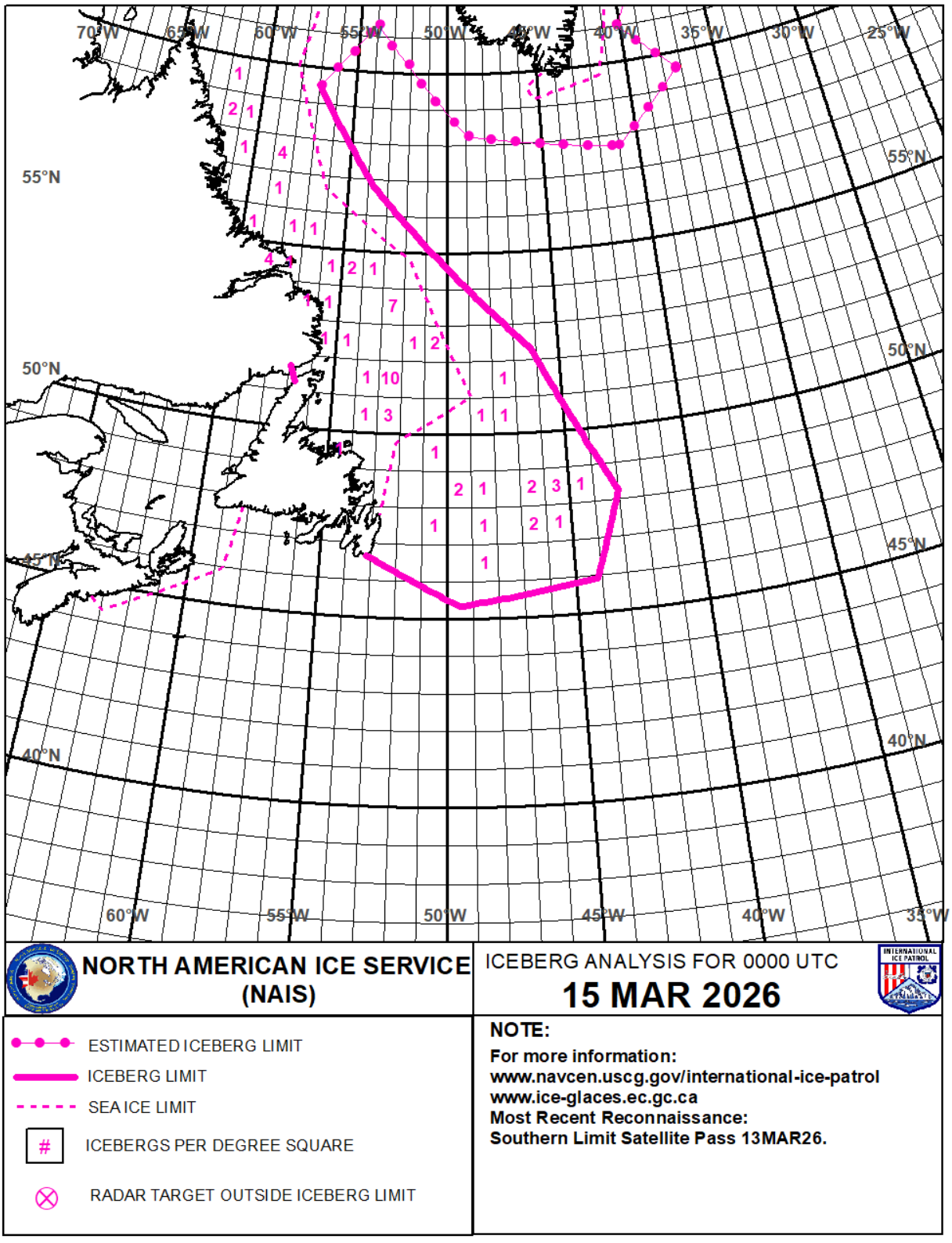


Figure 5.12. NAIS-65 Iceberg Chart for 15 March 2026.

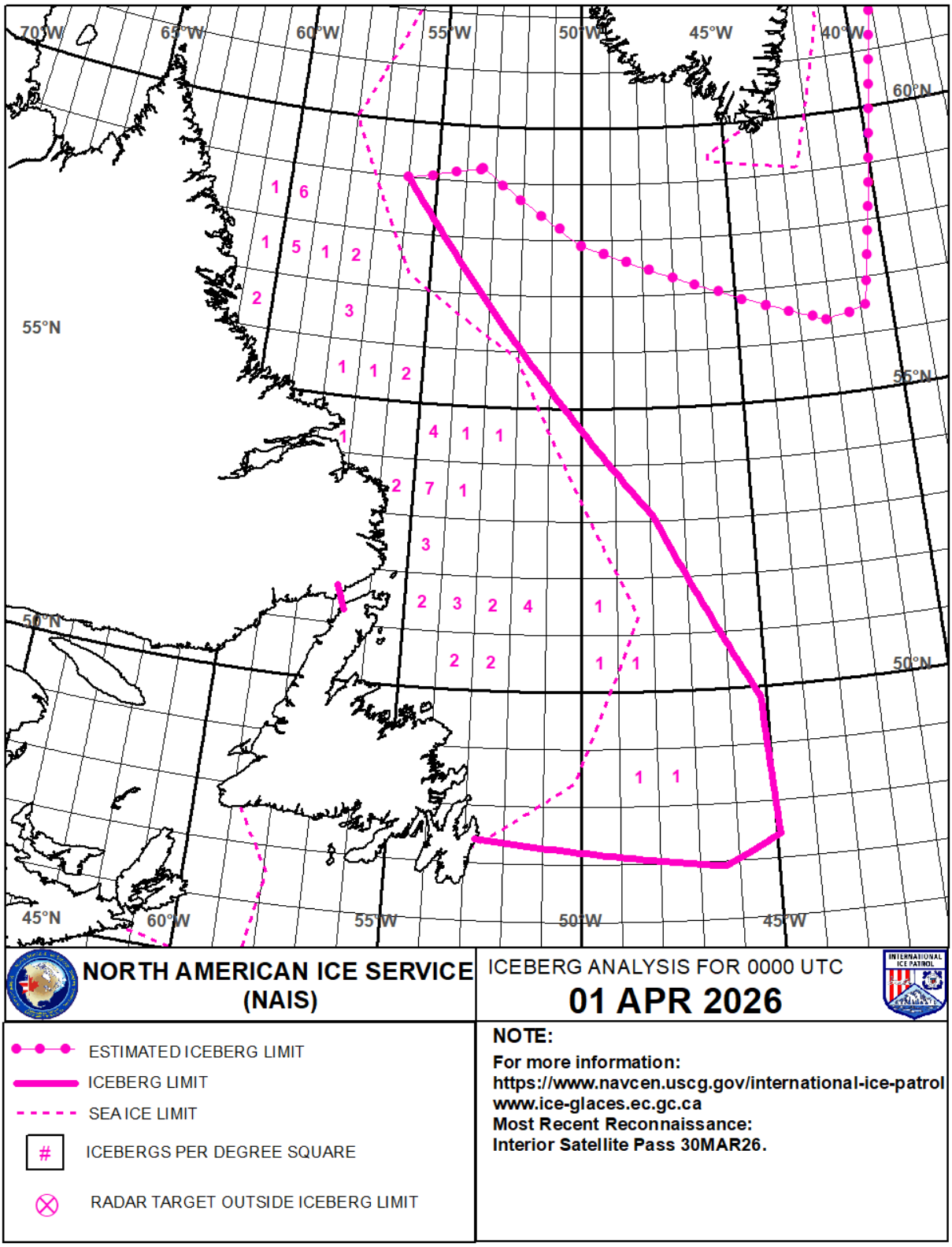


Figure 5.13. NAIS-65 Iceberg Chart for 01 April 2026.

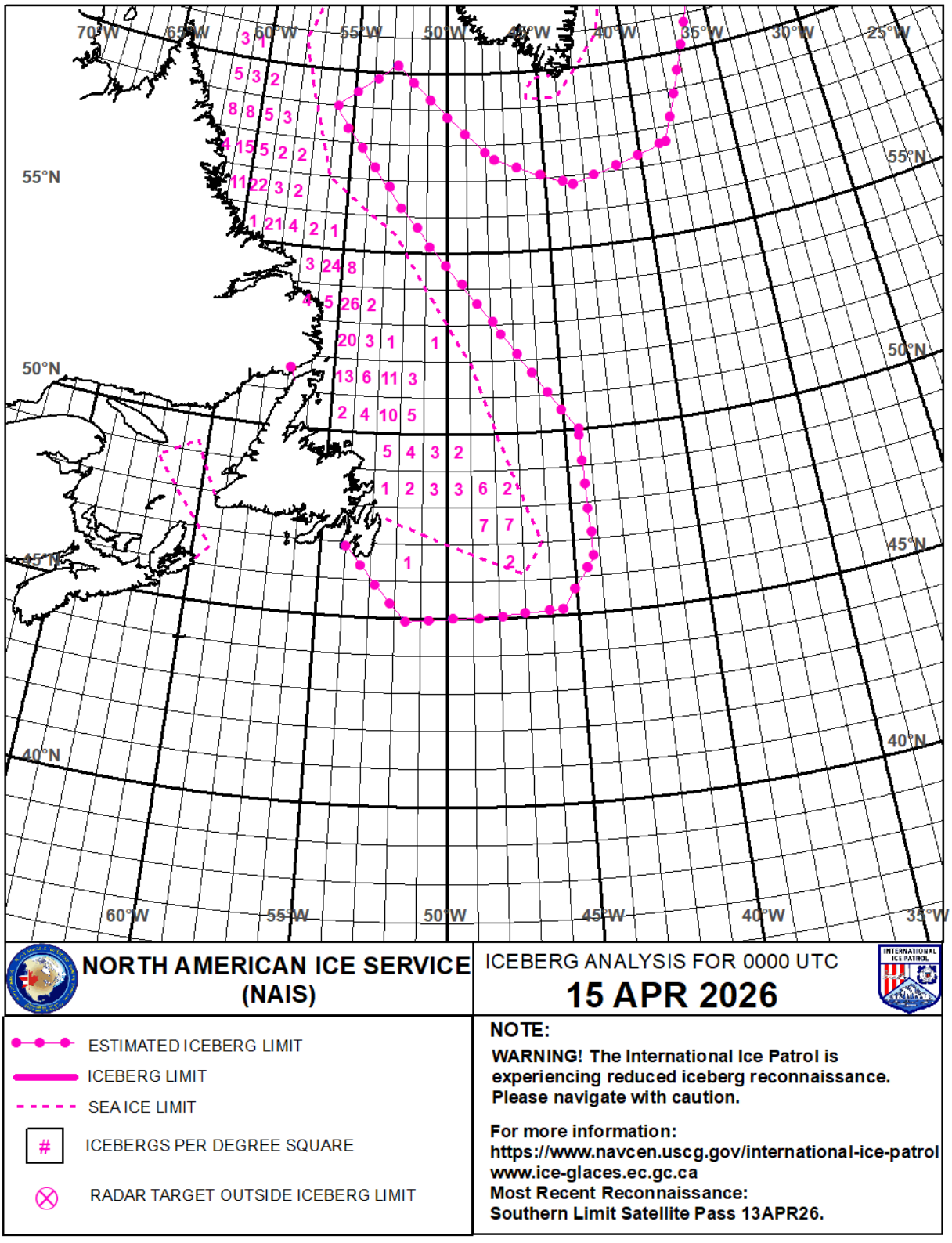


Figure 5.14. NAIS-65 Iceberg Chart for 15 April 2026.

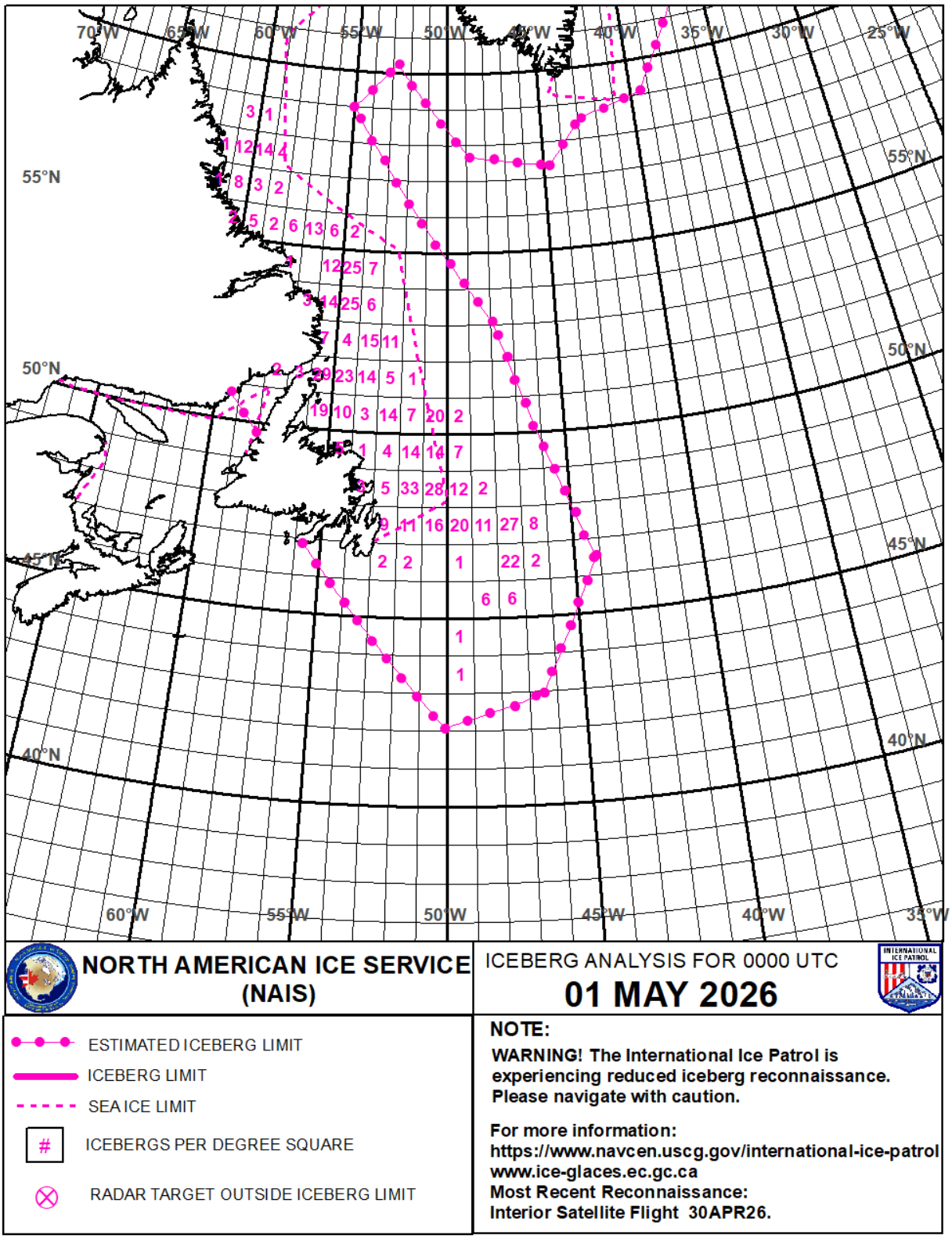


Figure 5.15. NAIS-65 Iceberg Chart for 01 May 2026.

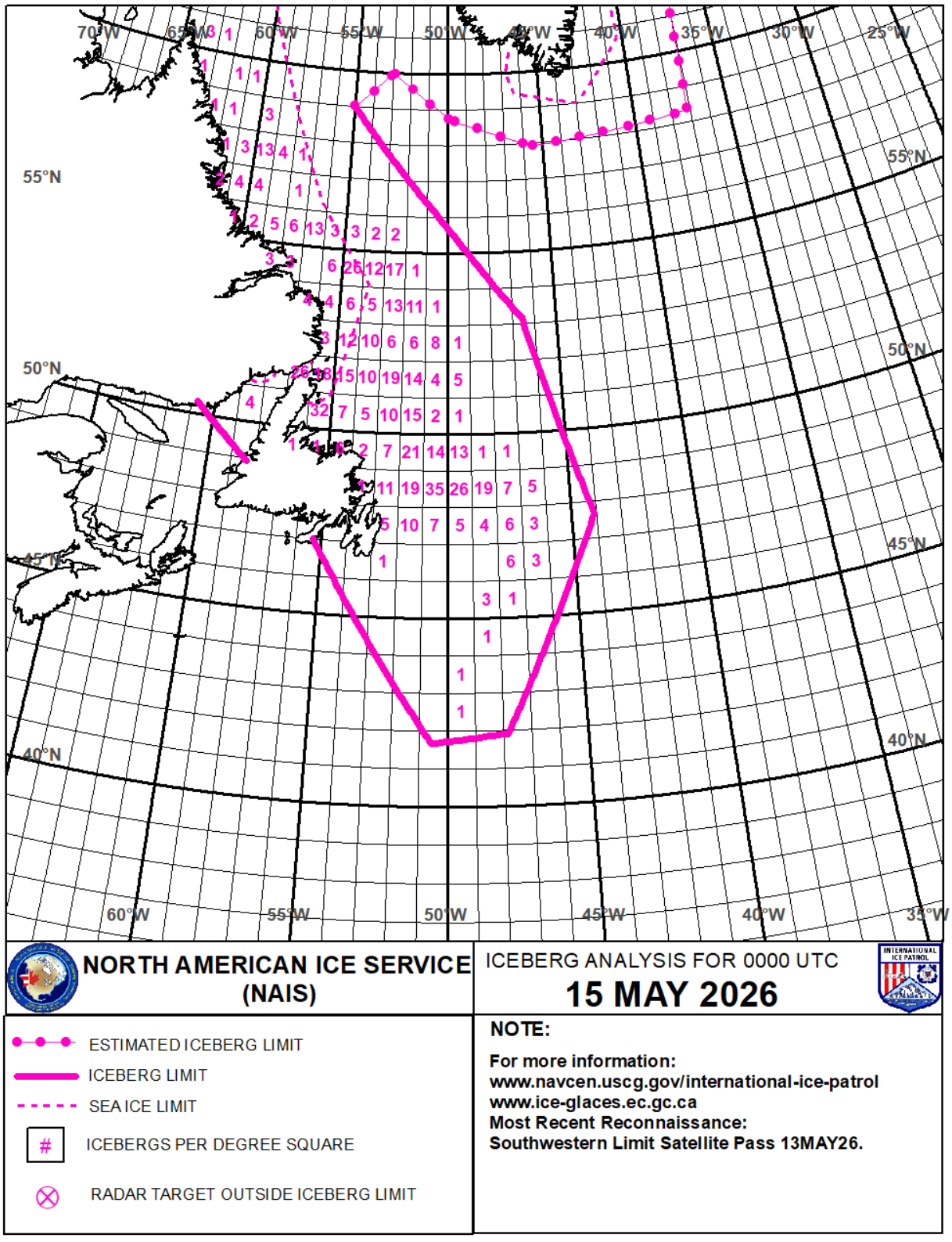


Figure 5.16. NAIS-65 Iceberg Chart for 15 May 2026.

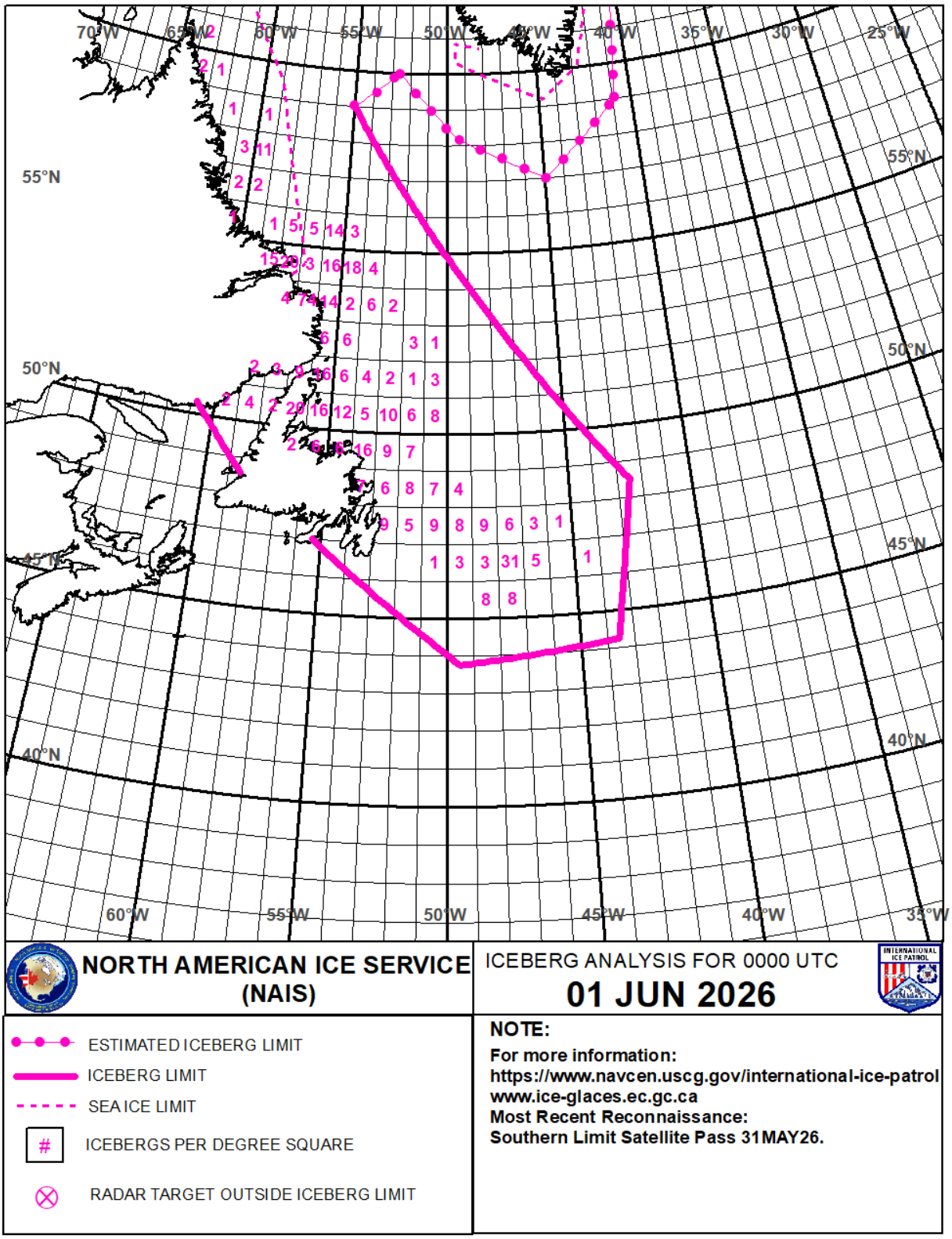


Figure 5.17. NAIS-65 Iceberg Chart for 01 June 2026.

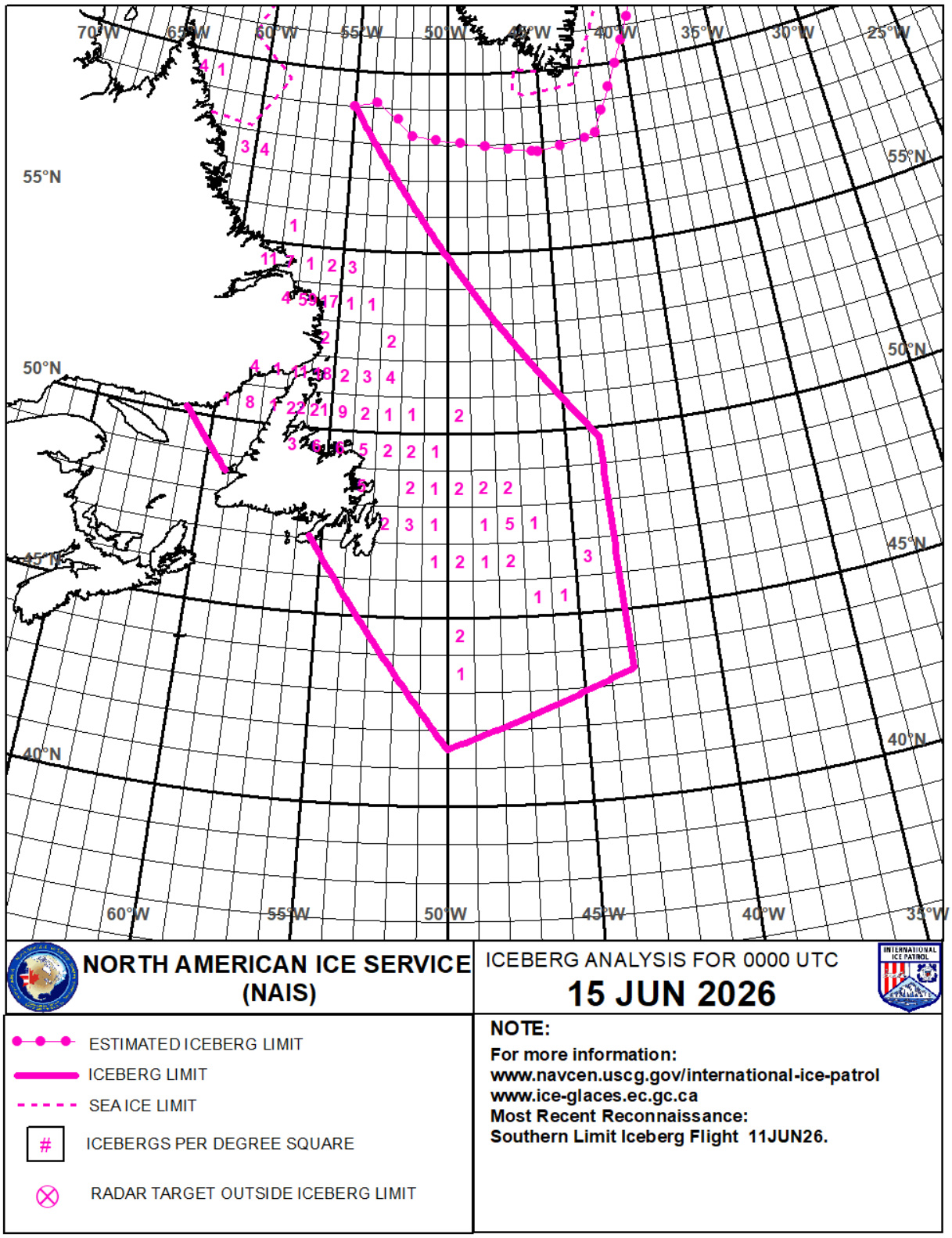


Figure 5.18. NAIS-65 Iceberg Chart for 15 June 2026.

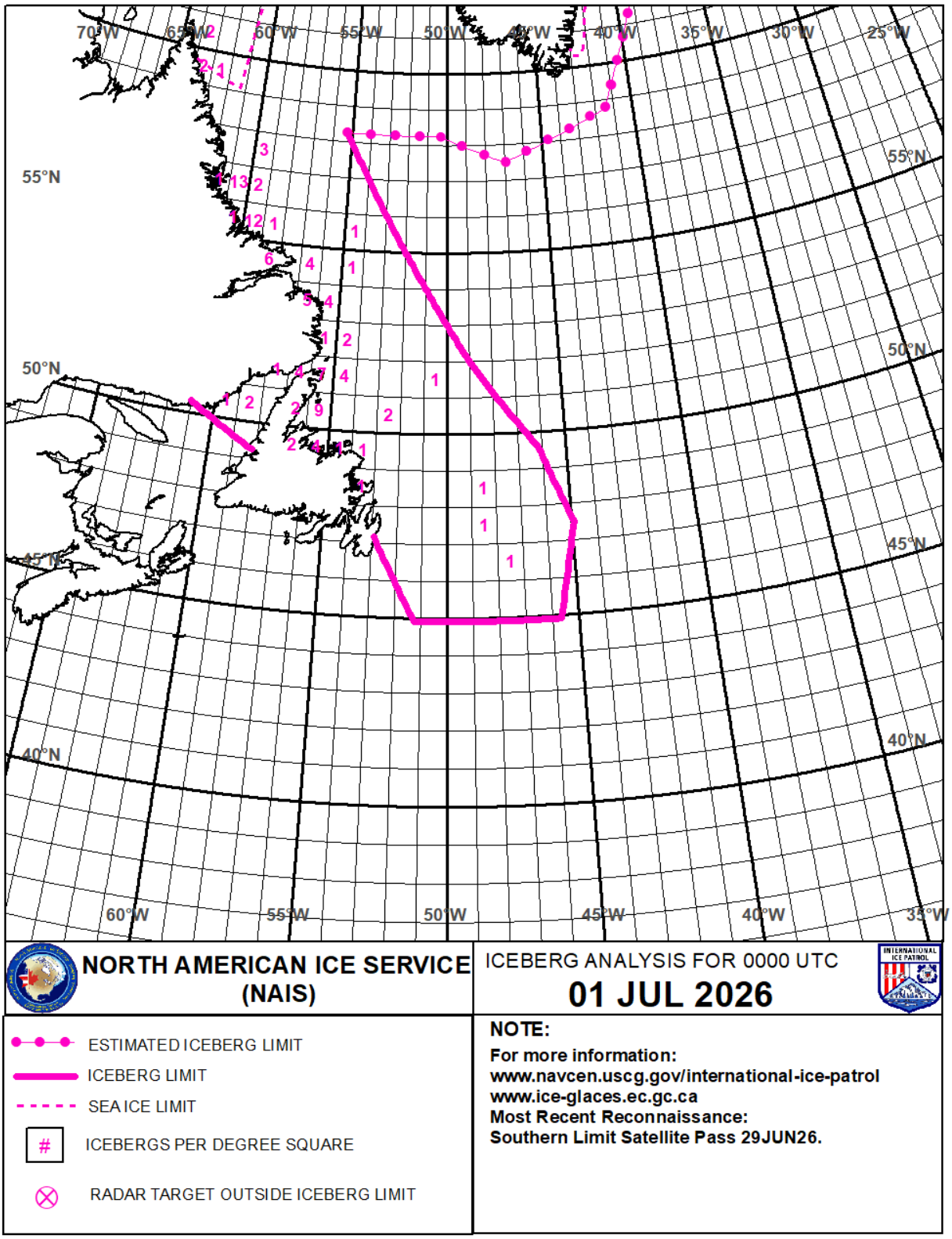


Figure 5.19. NAIS-65 Iceberg Chart for 01 July 2026.

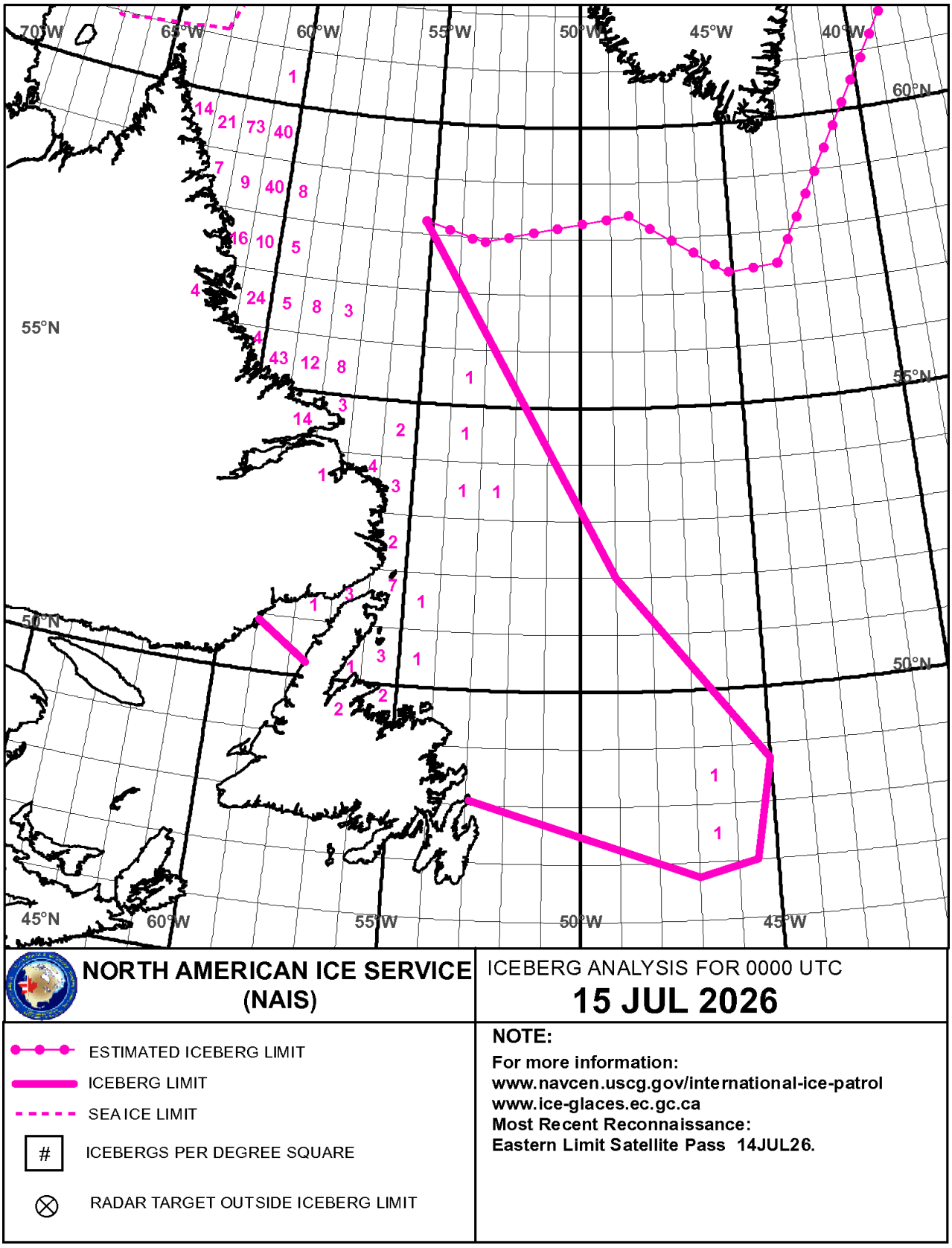


Figure 5.20. NAIS-65 Iceberg Chart for 15 July 2026.

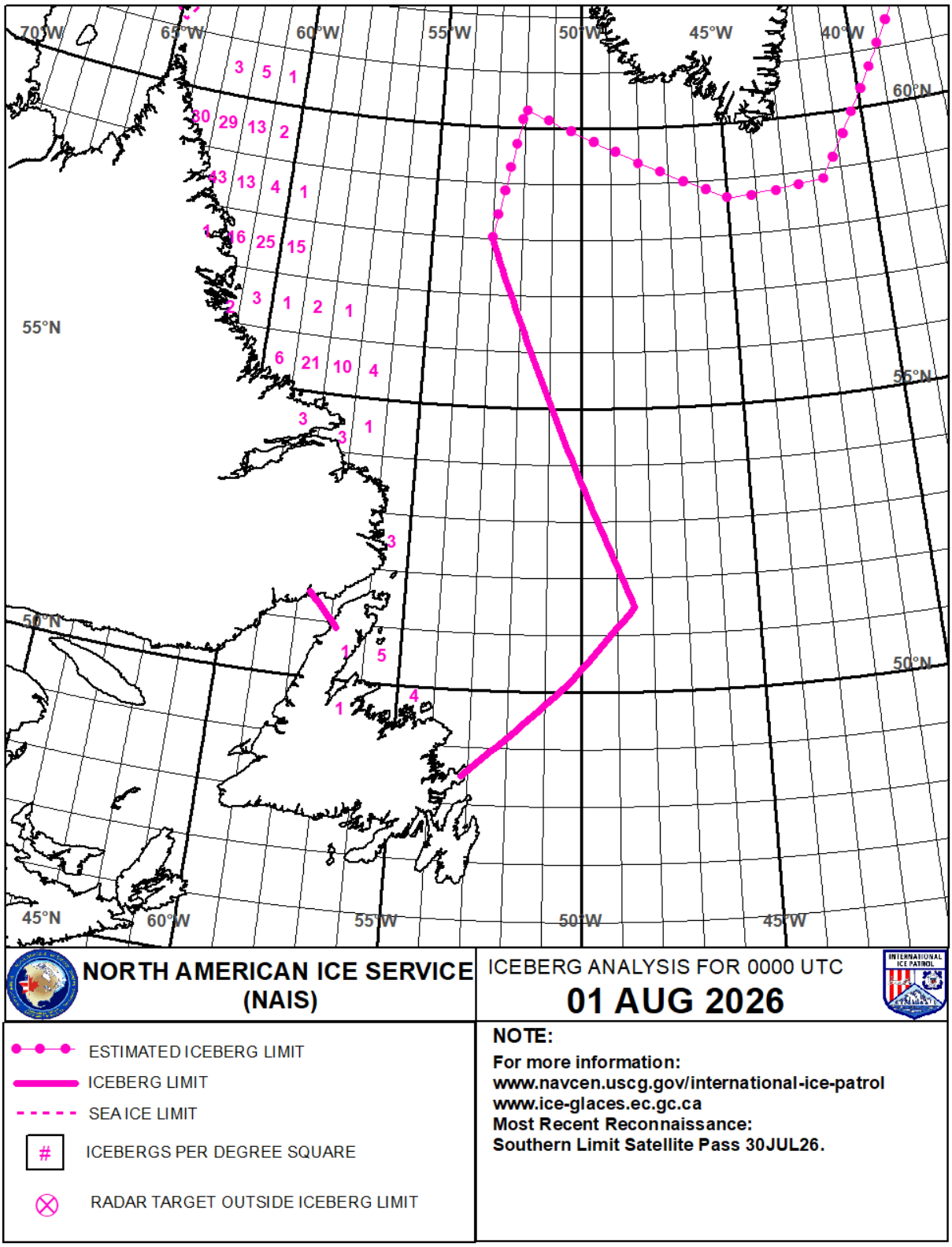


Figure 5.21. NAIS-65 Iceberg Chart for 01 August 2026.

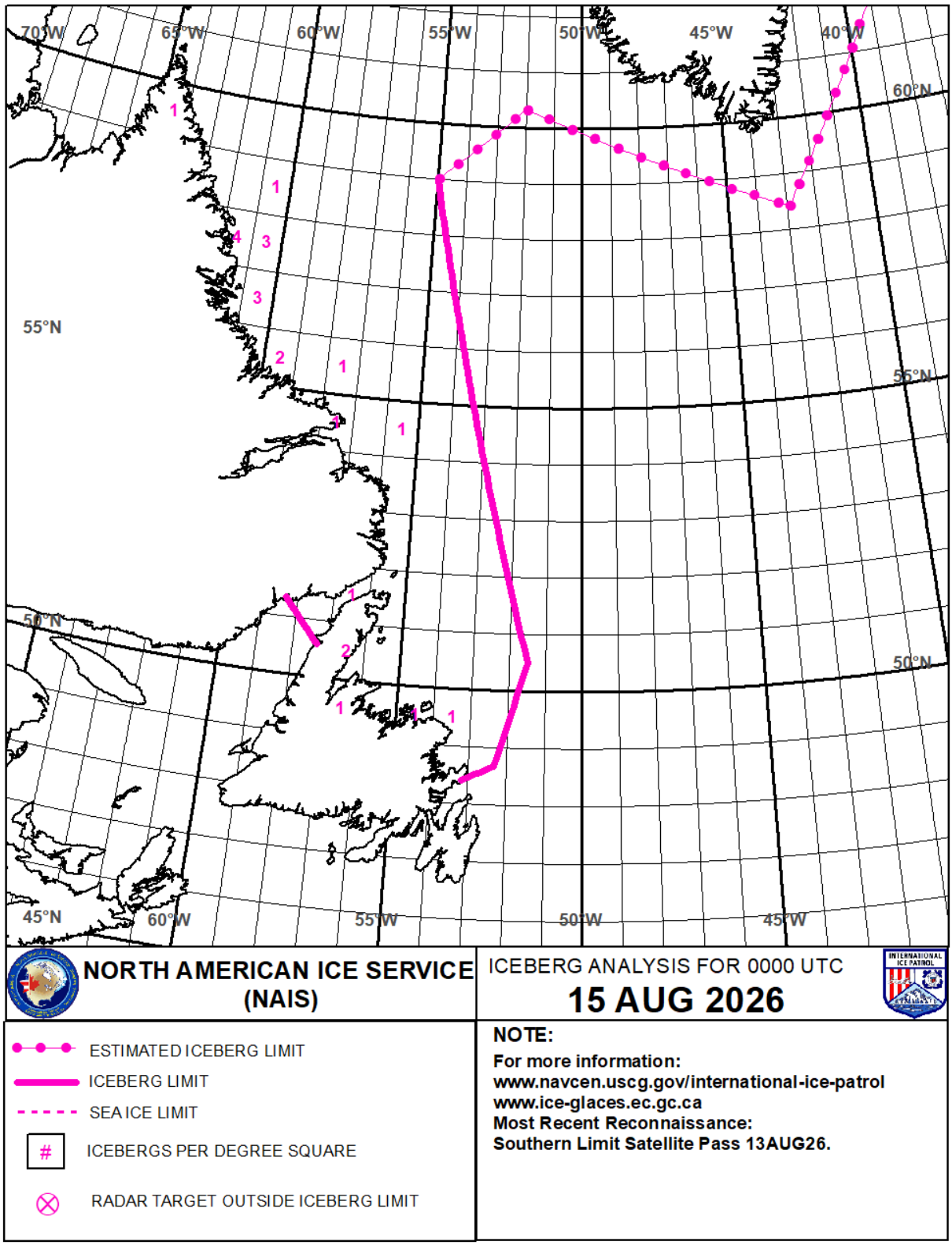


Figure 5.22. NAIS-65 Iceberg Chart for 15 August 2026.

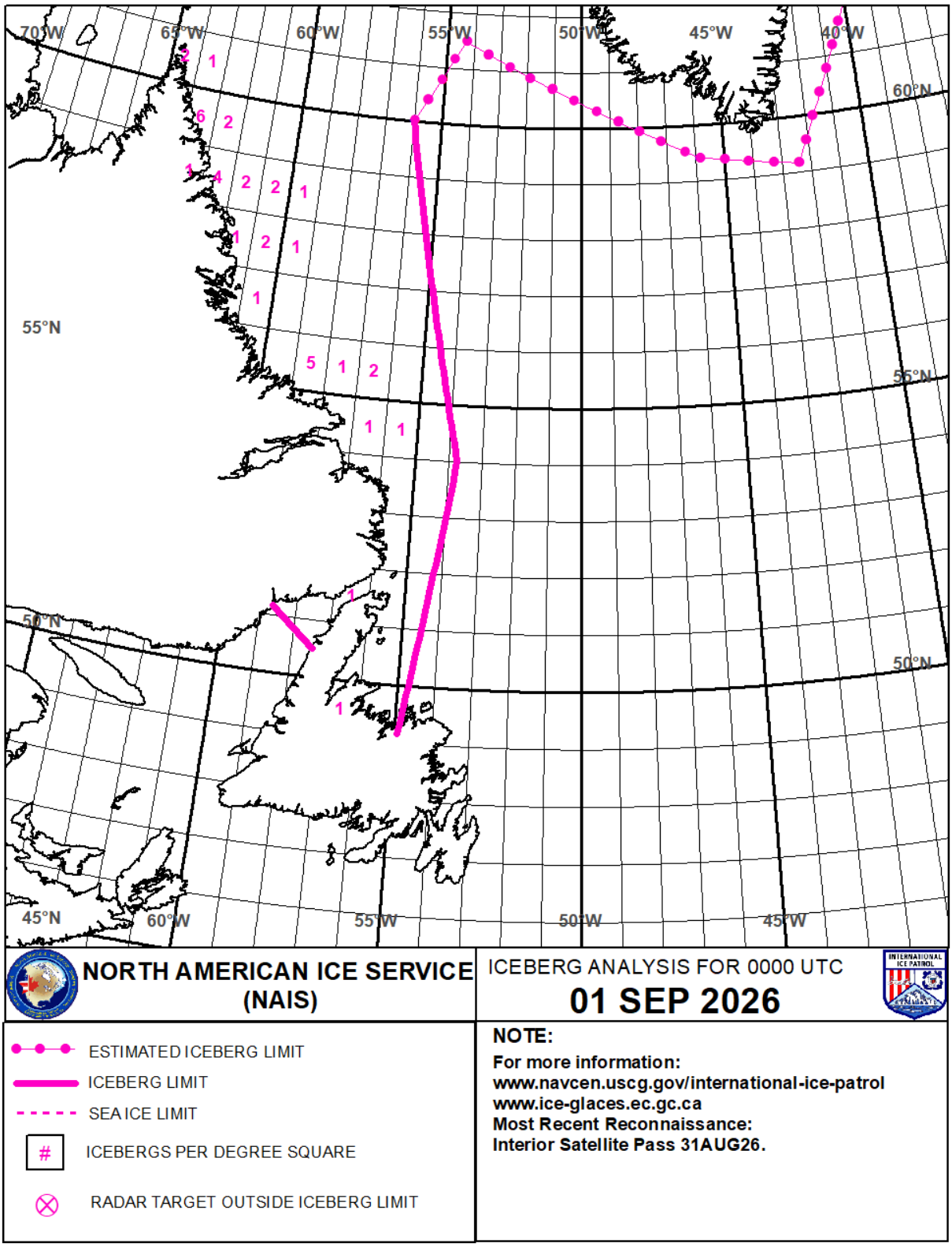


Figure 5.23. NAIS-65 Iceberg Chart for 01 September 2026.

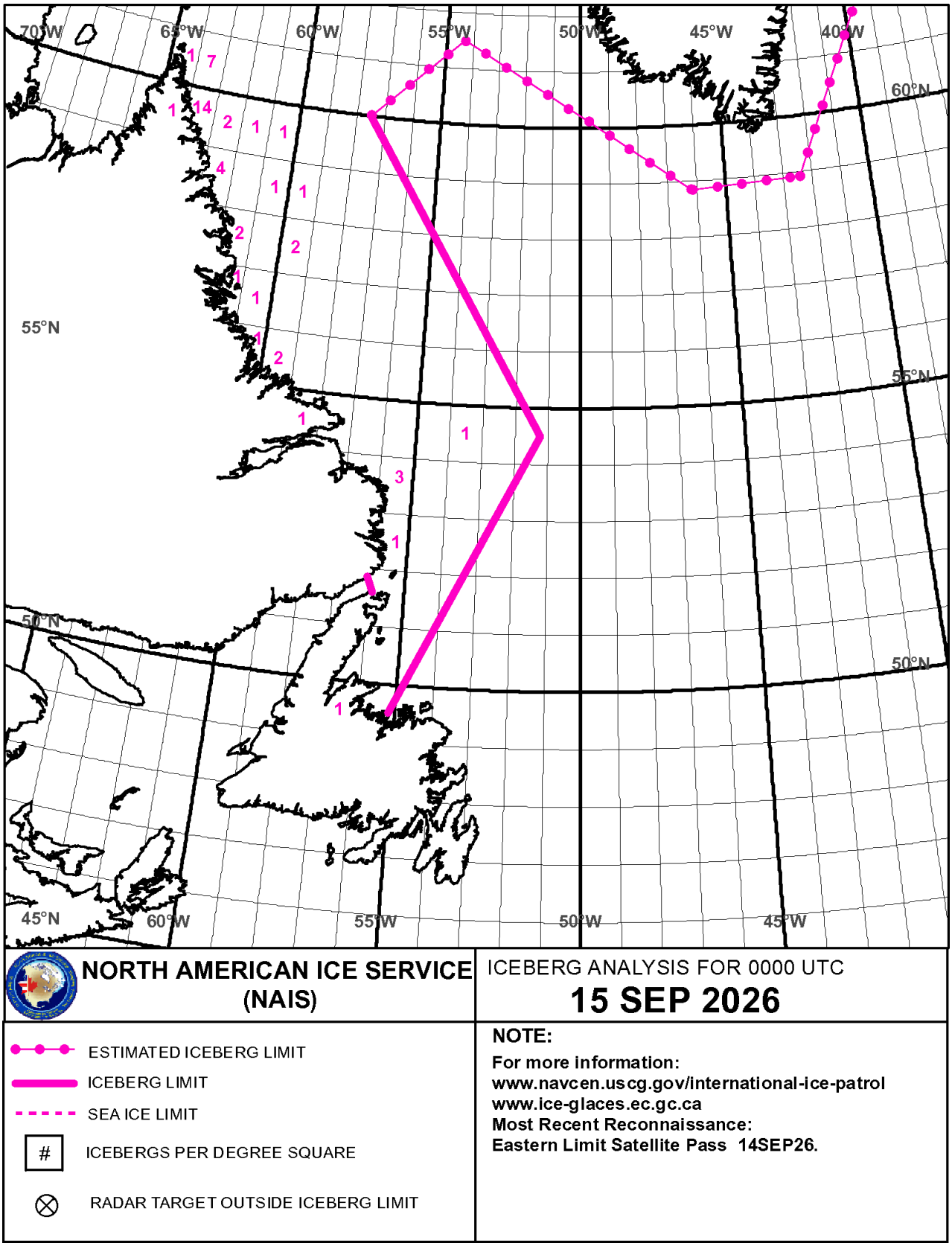


Figure 5.24. NAIS-65 Iceberg Chart for 15 September 2026.


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6 Data, Information, and Research Requests

6.1 Public Provision of IIP Information Other than Iceberg Warning Products

IIP is required under SOLAS to guard the vicinity of the Grand Banks of Newfoundland "for the purpose of informing passing ships of the extent of this dangerous region; for the study of ice conditions in general; and for the purpose of affording assistance to ships and crews requiring aid within the limits of operation of the patrol ships and aircraft" (International Maritime Organization 1974).

As a part of executing this mandate, IIP receives and responds to public and mariner requests for IIP data, information, and research related to ice and environmental conditions, outside of IIP's public provision of iceberg warning products.

IIP defines a data request as a request for IIP or other relevant North Atlantic ice and environmental conditions data. IIP defines an information request as a request for information on how IIP conducts its mandated mission. Finally, IIP defines a research request as a request for study from or with support from IIP, most often from a member of academia, which results in an answer to a research question. Most often, IIP will receive these requests from members of the public via email to the IIP official DWO email: SMB-IIP-Comms@uscg.mil.

If you would like to contact IIP regarding a request for data, information, or relevant research, please use the email above. Please visit our official website contact page (https://www.navcen.uscg.gov/international-ice-patrol-contact-us) to learn about other ways to contact IIP or to report an iceberg.

Section 6.2 describes the requests IIP received in Ice Year 2026 and how IIP responded to them.

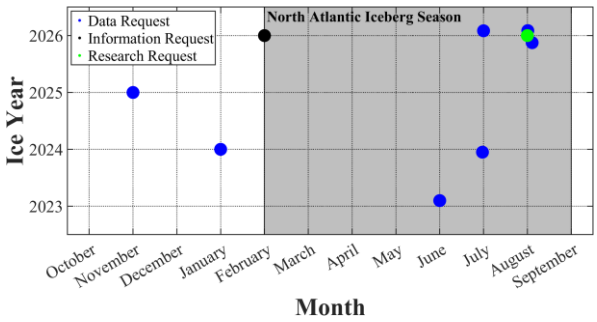


Figure 6.1. Monthly data (*blue dots*), information (*black dots*), and research (*green dots*) requests received by IIP in Ice Years 2023 to 2026.

6.2 Ice Year 2026 Data, Information, and Research Requests

IIP received five requests for data, information, and research in Ice Year 2026, all within the Iceberg Season (**Figure 6.1**).

6.2.1 Ice Year 2026 Data Requests

In Ice Year 2026, IIP received three data requests (see **Figure 6.1**, *blue dots*): one for historical environmental data for the Labrador Sea, one for archived iceberg warning NAIS 10 text bulletins, and one for iceberg climatology on the East Coast of Canada and in the Gulf of St. Lawrence.

IIP directed the requestor of the Labrador Sea historical environmental data to IIP's archive of NAIS 65 iceberg warning charts (https://www.navcen.uscg.gov/archives), to our archive of Annual Reports (https://www.navcen.uscg.gov/international-ice-patrol-annual-reports), both of which are on IIP's website, and to the ECMWF ERA5 Reanalysis monthly averaged data on single levels from 1940 to present (Hersbach, et al. 2023).

IIP responded to the requestor of the archived NAIS 10 bulletins by providing them with the bulletins for the date range which they requested.

Finally, IIP directed the requestor of East Coast iceberg climatology to our archived Annual Reports (https://navcen.uscg.gov/international-ice-patrol-annual-reports) which contain historical iceberg information through the entirety of the archive as well as IIP's official climatology from 1991 to 2020 since the 2023 Annual Report.

6.2.2 Ice Year 2026 Information Requests

In Ice Year 2026, IIP received one information request on IIP numerical modeling methods and validation of iceberg sightings (see **Figure 6.1**, *black dots*). IIP responded directly to the requestor with the relevant information.

6.2.3 Ice Year 2026 Research Requests

In Ice Year 2026, IIP received one research request for validation of an iceberg sighting outside of IIP's AOR on the southeastern coast of Greenland (see **Figure 6.1**, *green dots*). IIP coordinated with DMI to confirm the presence of this iceberg and the request resulted in the publication of a story on the iceberg sighting in NASA's Earth Observatory Image of the Day (**Figure 6.2**, https://science.nasa.gov/earth/earth-observatory/an-uncommon-drifter-in-the-denmark-strait/).

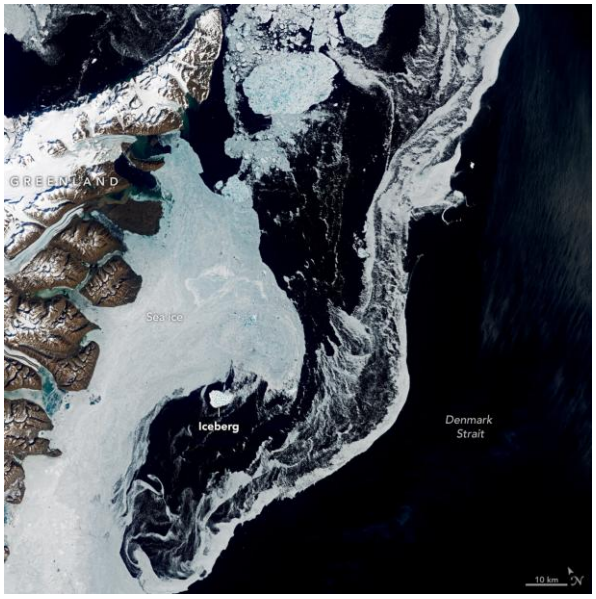


Figure 6.2. NASA Earth Observatory Image of the Day for 20 August 2026, from the Operational Land Imager (OLI) on the United States Geological Survey (USGS) satellite Landsat 9, featuring an iceberg off the southeast coast of Greenland for which IIP received a research request. Image from NASA Earth Observatory/Lauren Dauphin.

6.3 Notable Community Feedback for IIP

IIP thanks those members of the public who reach out to provide us feedback on our services and the carrying out of our mandate. We would like to share one such point of positive feedback from a mariner in Ice Year 2026:

"Thank you and the entire International Ice Patrol team for your continued dedication to safety of life at sea across the North Atlantic. Your daily monitoring and broadcast limits provide an invaluable service to the international maritime community."

While IIP carries out its mission regardless of affirmation from the public it aims to protect, receiving words such as these is a strong reminder to the IIP crew that what we do matters.

Data and Acknowledgments

Iceberg data is from IIP. Sea ice extents are from the NSIDC, Sea Ice Index, Version 4 (F. Fetterer, et al. 2025). NAOI values are from the National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Prediction (NCEP) Climate Prediction Center (CPC) (NOAA/NWS NCEP Climate Prediction Center 2024). Temperature, pressure, wind, precipitation, wave, and sea ice concentration data are from the ECMWF ERA5 Reanalysis monthly averaged data on single levels from 1940 to present (Hersbach, et al. 2023). This report was generated using or contains modified Copernicus Climate Change Service information <2026_2>. Neither the European Commission nor ECMWF is responsible for any use that may be made of the Copernicus information or data it contains. Sea ice data in **Section 4.2.4** is from CIS. The NASA Earth Observatory Image of the Day in **Section 6.2.3** is from NASA Earth Observatory/Lauren Dauphin.

IIP Commander, CDR Hillary Adams, wrote the **Bulletin** and **Section 1**. IIP Chief Scientist and Oceanographer, Dr. Alexis Denton, wrote **Sections 2 and 6**. IIP Satellite Reconnaissance Branch Chief, LT Lauren Kowalski, and IIP Iceberg Operations Branch Chief, LTJG Madison Wilbanks, coordinated, compiled, and edited **Sections 3** and **4.** The following 10 Branch members contributed to the following sections: IS1 Cole Grant created the **Cover** and wrote **Sections 3.3.1**, **3.4**, **4.1.2**, and **4.2.1**; YN1 Pablo Diaz-Hidalgo wrote **Sections 3.3.2**, **4.1.3**, and **4.3.2**; IS2 Josiah Hansen wrote **Sections 3.5**, **3.7**, **4.1.4**, and **4.2.3**; LTJG Madison Wilbanks wrote **Sections 3**, **3.1**, and **3.1.1**; IS3 Michael Frey wrote **Sections 3.6**, **4.1.1**, **4.1.5**, **4.3.1**; IS3 Brendan Greggs wrote **Sections 3.2**, **4.1**, **4.2.2**, and **4.2.4**. IIP Command Chief, ISC Alden Eubanks, compiled **Section 5.** CDR Hillary Adams, LCDR Gamaliel Baer, Dr. Alexis Denton, Ms. Jennifer Sabal, LT Lauren Kowalski, LTJG Madison Wilbanks and ISC Alden Eubanks contributed to the editing of all sections.

IIP Members During the 2026 Ice Year

The following people were IIP members ("Ice Picks") and contributed to the 2026 Ice Year (in alphabetical order by surname): CDR Hillary Adams, LCDR Gamaliel Baer, IS2 Erik Balboa, CDR Erin Caldwell, Dr. Alexis Denton, YN1 Pablo Diaz-Hidalgo, ISC Alden Eubanks, IS3 Michael Frey, IS1 Cole Grant, IS3 Brendan Greggs, IS2 Josiah Hansen, LT Lauren Kowalski, IS3 Reif Madrid, IS2 Olivia McKenzie, IS2 Chistian Nieves, LCDR Rebecca Prendergast, IS2 Jeffrey Rojas, IS2 Tyler Romaine, Ms. Jennifer Sabal, LT Megan Toomey, and LTJG Madison Wilbanks.

IIP acknowledges all of its 2026 Ice Year members for their individual and collective contribution to the IIP mission and relentless work on data collection, statistical analysis, and figures which are reported here.

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References

Bigg, G. R., H. L. Wei, D. J. Wilton, Y. Zhao, S. A. Billings, E. Hanna, and V. Kadirkamanathan. 2014. "A century of variation in the dependence on ice sheet surface mass balance and regional climate change." *Proceedings of the Royal Society* 470 (20130662): 14. Accessed November 6, 2023. doi:http://dx.doi.org/10.1098/rspa.2013.0662.

Copernicus Climate Change Service. 2023. "ERA5 monthly averaged data on single levels from 1940 to present." Copernicus Climate Change Service (C3S) Climate Data Store (CDS). Accessed August 25, 2025. doi:10.24381/cds.f17050d7 .

Fetterer, F., K. Knowles, W. Meier, M. Savoie, A. Windnagel, and T. Stafford. 2025. "Sea Ice Index. (G02135, Version 4)." Boulder, Colorado: National Snow and Ice Data Center. Accessed August 25, 2025. doi:https://doi.org/10.7265/a98x-0f50.

Fetterer, Florence, K Knowles, Walt Meier, Matt Savoie, and Ann Windnagel. 2017. "Sea Ice Index, (G02135, Version 3)." Boulder, Colorado: National Snow and Ice Data Center. Accessed October 20, 2025. doi:https://doi.org/10.7265/N5K072F8.

Fettweis, X., E. Hanna, C. Lang, A. Belleflamme, M. Erpicum, and H. Gallée. 2013. "Brief communication "Important role of the mid-tropospheric atmospheric circulation in the recent surface melt increase over the Greenland ice sheet"." *The Cryosphere* 7: 241-248. Accessed November 7, 2023. doi:https://doi.org/10.5194/tc-7-241-2013.

Hanna, Edward, Philippe Huybrechts, John Cappelen, Konrad Steffen, Roger C. Bales, Evan Burgess, Joseph R. McConnell, et al. 2011. "Greenland Ice Sheet surface mass balance 1870 to 2010 based on Twentieth Century Reanalysis, and links with global climate forcing." *Journal of Geophysical Research* 116 (D24121): 20. Accessed November 7, 2023. doi:https://doi.org/10.1029/2011JD016387.

Hersbach, H., B. Bell, P. Berrisford, G. Biavati, A. Horányi, J. Muñoz Sabater, J. Nicolas, et al. 2023. "ERA5 monthly averaged data on single levels from 1940 to present." Copernicus Climate Change Service (C3S) Climate Data Store (CDS). Accessed August 25, 2025. doi:10.24381/cds.f17050d7.

International Ice Patrol. 2018. "Report of the International Ice Patrol in the North Atlantic." Annual Report, Department of Homeland Security, United States Coast Guard, New London, CT, USA. Accessed September 14, 2023. https://navcen.uscg.gov/sites/default/files/pdf/iip/2018_Annual_Report_FINAL.pdf.

International Maritime Organization. 1974. "International Convention for the Safety of Life at Sea, 1974." International Maritime Organization. https://treaties.un.org/doc/Publication/UNTS/Volume%201184/volume-1184-I-18961-English.pdf.

Larsen, Poul-Henrik, Marc Overgaard Hansen, Jørgen Buus-Hinkler, Klaus Harnvig Krane, and Carsten Sønderskov. 2015. "Field tracking (GPS) of ten icebergs in eastern Baffin Bay, offshore Upernavik, northwest Greenland." *Journal of Glaciology* (Cambridge University Press) 61 (227): 421-437. Accessed September 11, 2023. doi:https://doi.org/10.3189/2015JoG14J216.

Marko, J. R., D. B. Fissel, P. Wadhams, P. M. Kelly, and R. D. Brown. 1994. "Iceberg Severity off Eastern North America: Its Relationship to Sea Ice Variability and Climate Change." *Journal of Climate* 7:

1335-1351. Accessed September 11, 2023. doi:https://doi.org/10.1175/1520-0442(1994)007%3C1335:ISOENA%3E2.0.CO;2.

National Snow and Ice Data Center. 2025. "2025 Arctic sea ice minimum squeezes into the ten lowest minimums." September 17. Accessed February 18, 2026. https://nsidc.org/sea-ice-today/analyses/2025-arctic-sea-ice-minimum-squeezes-ten-lowest-minimums.

Newell, John P. 1993. "Exceptionally Large Icebergs and Ice Islands in Eastern Canadian Waters: A Review of Sightings from 1900 to Present." *Arctic* 46 (3): 205-211. Accessed September 11, 2023. doi:https://journalhosting.ucalgary.ca/index.php/arctic/article/view/64400.

NOAA/NWS NCEP Climate Prediction Center. 2024. "Daily NAO index since January 1950." October. Accessed October 7, 2024. https://www.cpc.ncep.noaa.gov/products/precip/CWlink/pna/norm.nao.monthly.b5001.current.ascii.table.

Noël, B., X. Fettweis, W. J. van de Berg, M. R. van den Broeke, and M. Erpicum. 2014. "Sensitivity of Greenland Ice Sheet surface mass balance to perturbations in sea surface temperature and sea ice cover: a study with the regional climate model MAR." *The Cryosphere* 8: 1871-1883. Accessed November 7, 2023. doi:https://doi.org/10.5194/tc-8-1871-2014.

Rignot, Eric, and Pannir Kanagaratnam. 2006. "Changes in the Velocity Structure of the Greenland Ice Sheet." *Science* 311 (5763): 986-990. Accessed September 6, 2023. doi:10.1126/science.1121381.

Smith, Edward H. 1926. "Summary of Iceberg Records in the Northwestern North Atlantic, 1880-1926." In *International Ice Observation and Ice Patrol Service in the North Atlantic: Season of 1926*, by International Ice Observation and Ice Patrol Service, 75-77. Accessed October 13, 2023. https://www.navcen.uscg.gov/international-ice-patrol-annual-reports.

2021. "Title 46, United States Code § 80301." Accessed August 30, 2023. https://www.govinfo.gov/content/pkg/USCODE-2021-title46/pdf/USCODE-2021-title46.pdf.

Trivers, Geoffrey. 1994. "International Ice Patrol's Iceberg Season Severity." In *Bulletin No. 80: Report of the International Ice Patrol in the North Atlantic, Season of 1994*, by International Ice Patrol, 49-59. Groton, Connecticut. Accessed October 13, 2023. https://www.navcen.uscg.gov/international-ice-patrol-annual-reports.

Wilton, David J., Grant R. Bigg, and Edward Hanna. 2015. "Modelling twentieth century global ocean circulation and iceberg flux at 48°N: implications for west Greenland iceberg discharge." *Progress in Oceanography* 138: 194-210. Accessed September 12, 2023. doi:https://doi.org/10.1016/j.pocean.2015.07.003.


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