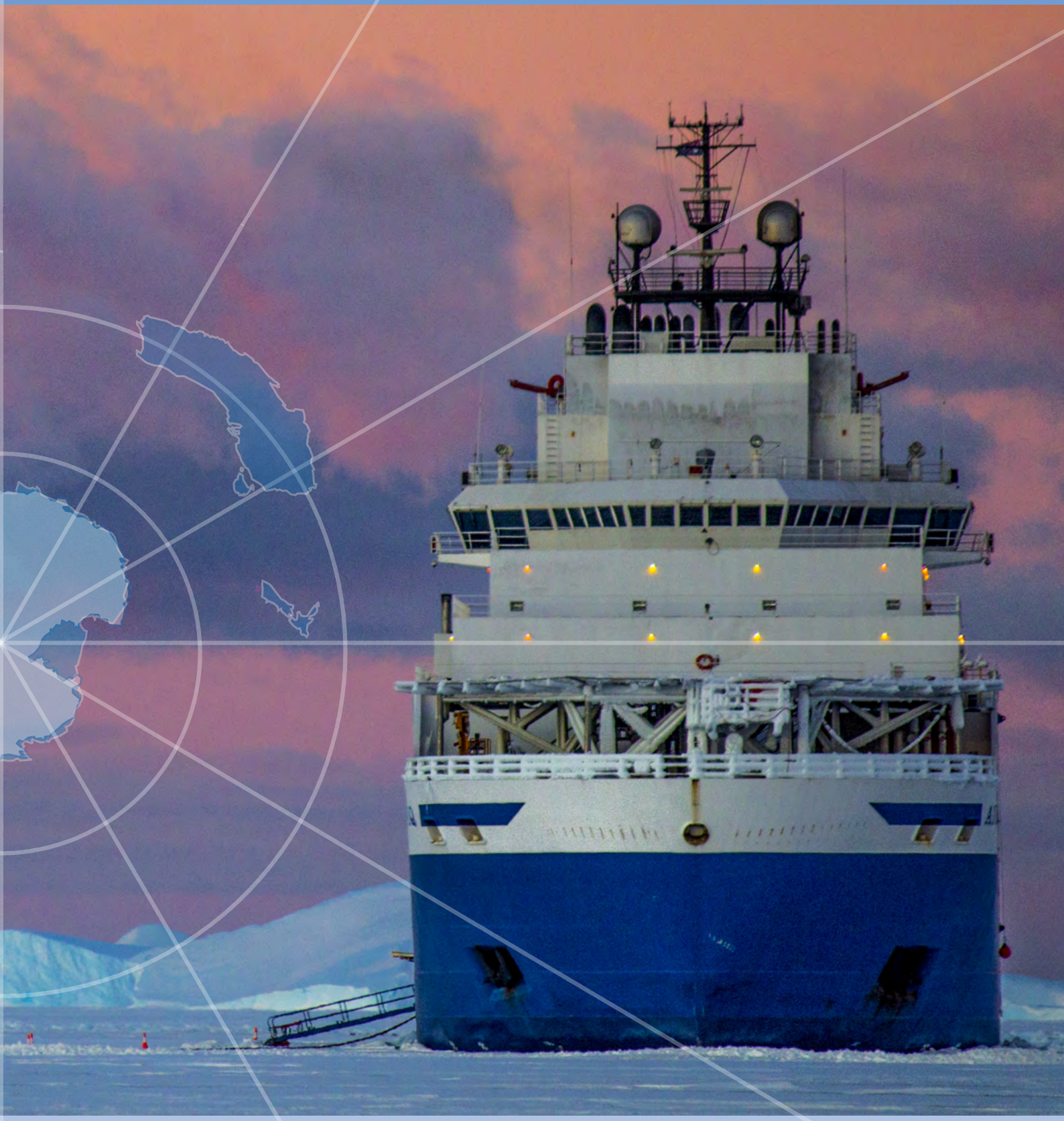
TECHNICAL REPORT

Ice Bulletins for the Antarctic Shipping Season 2022 – 2023



Prepared by Dr Jan L Lieser

Antarctic Meteorology Section — Bureau of Meteorology

Ice Bulletins for the Antarctic shipping season 2022–2023

Prepared by: Dr Jan L Lieser (Jan.Lieser@bom.gov.au)

Cover design: Suzie Gaynor

Cover photo: © Ben Hawkins/Australian Antarctic Division

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Executive summary

The Ice Bulletins compiled in this document are weekly reports on ice conditions for predominantly East Antarctica, including sub-weekly updates. They were prepared to support ship operations in East Antarctica during the 2022/2023 shipping season. These bulletins were primarily used to inform the Australian Antarctic program, but were provided to other Antarctic operators as well. In particular, we assisted New Zealand's National Institute of Water and Atmospheric Research (RV *Tangaroa*) and the Australian Marine National Facility (RV *Investigator*).

Throughout the shipping season, the focus of individual bulletins shifts with the main purpose of respective voyages of the Australian Antarctic program. The voyages of the 2022/2023 season were (totalling roughly 46 200 km, roughly 25 000 nautical miles):

No.	Depart port	Main Purpose	Return to port
V2	04/11/2022	Davis - Personnel Deployment; Refuel Station; Deliver Fresh Water	12/12/2022
V4	17/12/2022	Casey - Refuel Station; Whale Mooring Changeover	16/01/2023
V5	24/12/2022	Casey - Dry Cargo Resupply; Davis - Dry Cargo Resupply; Mawson - Dry Cargo Resupply	04/03/2023
V6	18/01/2023	Mawson - Winter Personnel Changeover; Refuel Station; Davis Summer Personnel Retrieval; Moorings Changeover	08/03/2023

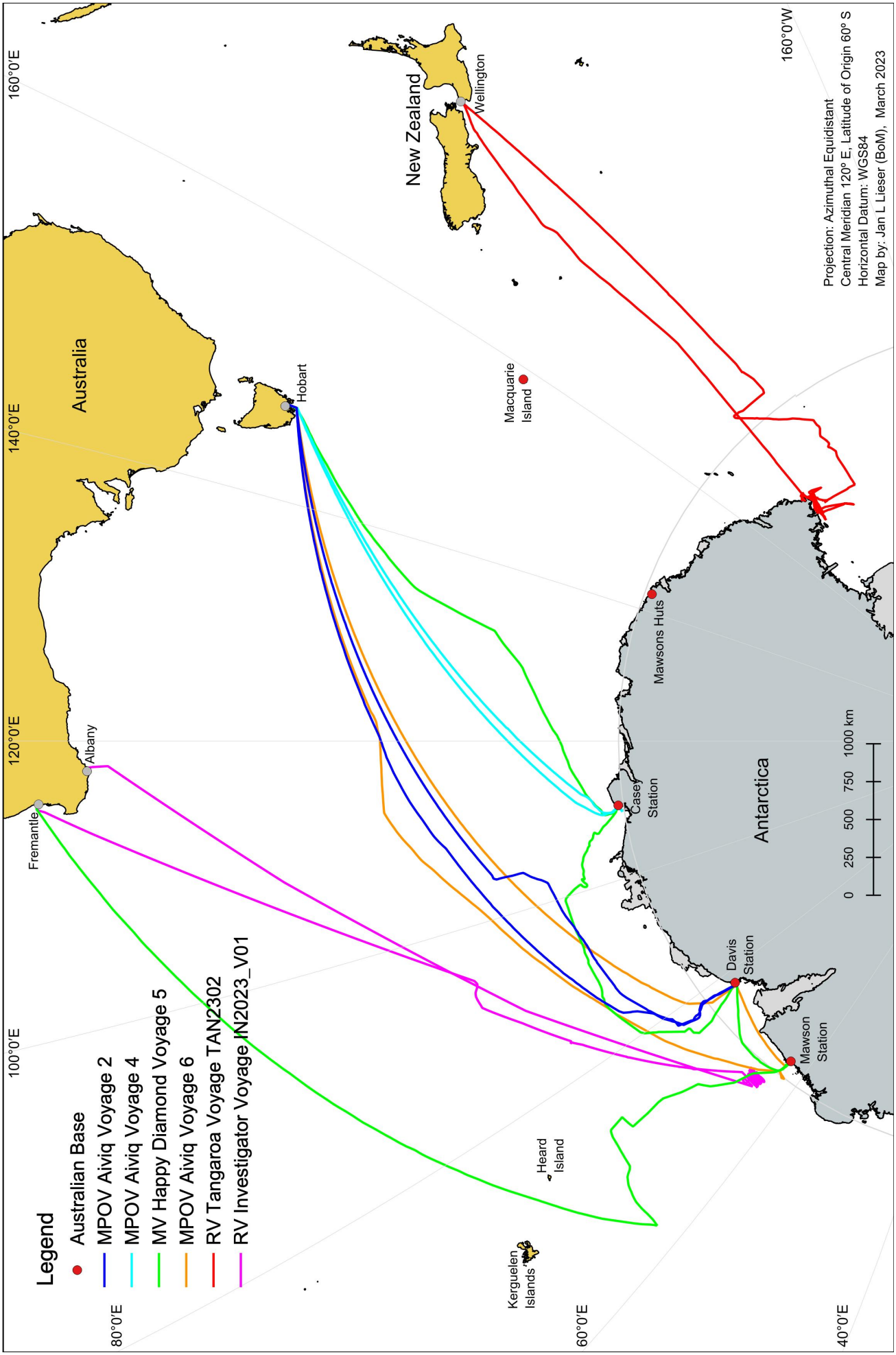
In 2022, total sea-ice cover around the Antarctic continent was recovering from below average conditions early in the year to slightly above average conditions in August before collapsing to record low conditions towards the end of the year. As the sea-ice distribution is not only determined by oceanic forcing (currents and waves) but also by atmospheric drivers (large-scale and regional wind pattern) this year appears to be dominated by an intricate interplay of various climate modes of the Southern Hemisphere including the Southern Annual Mode and atmospheric circulation patterns typically associated with La Niña events amongst others.

The annual daily sea-ice extent minimum was 1.910×10^6 km^2 and observed on 25 February 2022, the lowest on record and the first time below 2.0×10^6 km^2 since records began in 1979. Four days earlier, the annual minimum sea-ice area was observed to be 1.219×10^6 km^2, again the lowest on record. The annual daily sea-ice extent maximum was 18.224×10^6 km^2 and observed on 13 September 2022, the fifth lowest of the 44-year observation record. However, the annual maximum sea-ice area was observed a day earlier on 12 September 2022 at 14.381×10^6 km^2, the third lowest on record.

The sea-ice extent of the year 2022 in context: up until 2014, pan-Antarctic sea-ice extent was on a slightly upwards trend and reached its highest recorded daily extent on 20 September 2014. It has since then turned to record minimum conditions when it reached the lowest recorded daily extent in 2022. Considering the major negative sea-ice extent trend since September 2016, a potential shift in Antarctica's tightly-coupled sea ice-ocean-atmosphere-ice sheet system is currently being investigated. Notwithstanding that, an unprecedented atmospheric heatwave impacted East Antarctica in mid-March 2022, which resulted in a delayed onset of northward sea-ice advance in the region.

During 2022, notable new large tabular icebergs calved off the Fimbul Ice Shelf (D-31 in January), the Larsen-D Ice Shelf (A-79 in March), the Glenzer Ice Shelf (C-37 in March) and the Conger Ice Shelf (C-38 and subsequently breaking into C-38A and C-38B in March), the Shackleton Ice Shelf (C-39 in April from the Scott Glacier area), iceberg A-74 (breaking into A-74A and A-74B in June), the Amery Ice Shelf (D-32 in October), the Larsen-D Ice Shelf (A-80A, A-80B and A-80C in November). In 2023 so far, notable new large tabular icebergs calved off the Brunt Ice Shelf (A-81 in January) and iceberg D-80A (D-80D in February).

ICE BULLETINS 2022/2023 VOYAGES

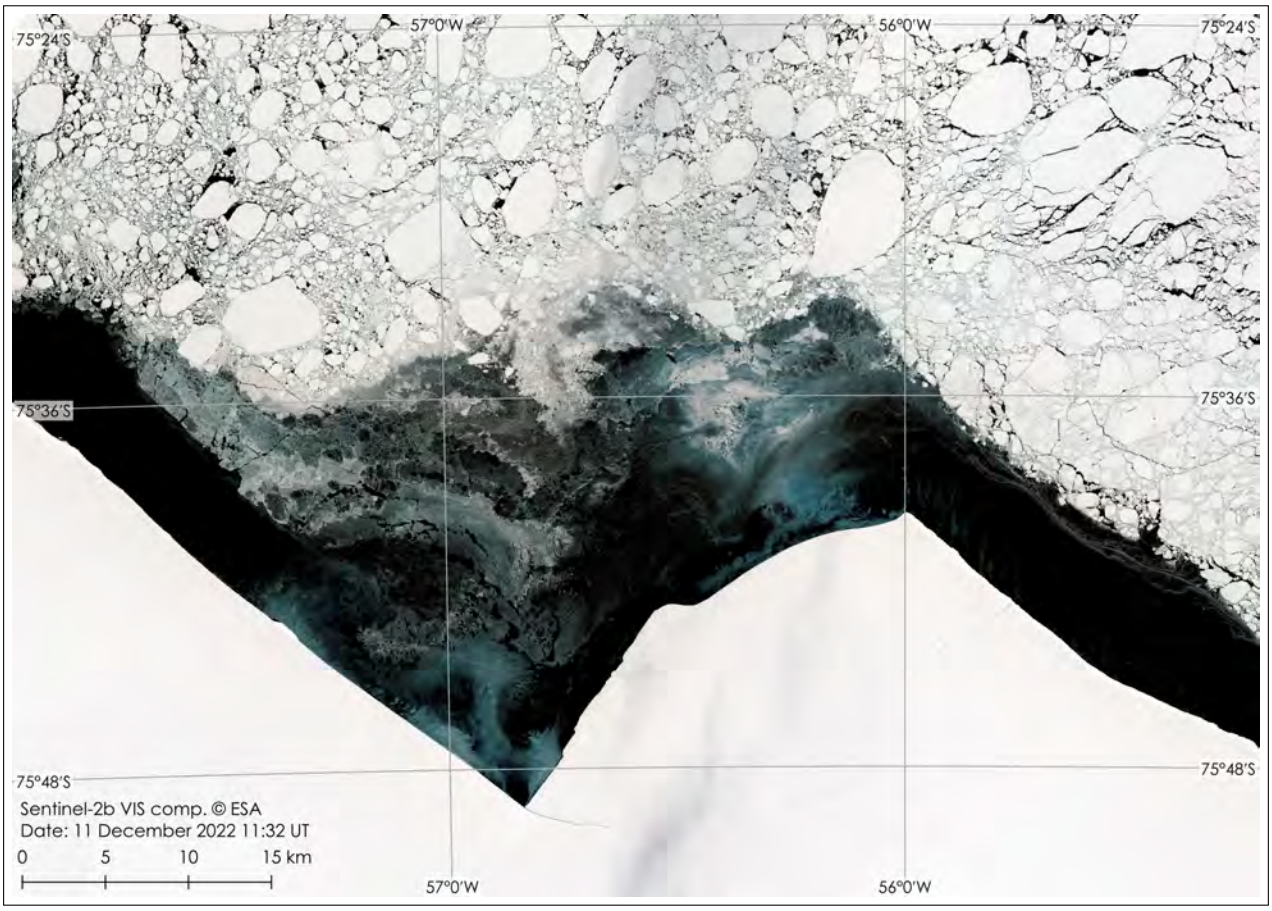


Contents

Contents by station – Mawson Station

Icescape © Jan L Lieser.

Contents by station – Davis Station



New sea ice forming in the polynya off the Ronne Ice Shelf.

Contents by station – Casey Station

MV Happy Dragon © Dave Wardle/Australian Antarctic Division.

Frequently used acronyms

AMSR-2 [1]	Advanced Microwave Scanning Radiometer 2
AWS	Automatic Weather Station
DNB	Day-Night Band (panchromatic VIIRS channel)
ESA	European Space Agency
EW	Extra Wide swath (a Sentinel-1 SAR mode)
GMRT	Global Multi-Resolution Topography
IBCSO	International Bathymetric Chart of the Southern Ocean
ICDC	Integrated Climate Data Centre, University of Hamburg (GER)
IW	Interferometric Wide swath (a Sentinel-1 SAR mode)
JAXA	Japan Aerospace Exploration Agency
MODIS [2]	Moderate Resolution Imaging Spectroradiometer
NASA	National Aeronautics and Space Administration (USA)
OLCI	Ocean and Land Colour Instrument (instrument payload on Sentinel-3 satellites)
OLI	Operational Land Imager (instument payload on Landsat-8/9 satellites)
SAR	Synthetic Aperture RADAR
Suomi NPP	Suomi National Polar-orbiting Partnership
USGS	United States Geological Survey
VIIRS	Visible Infrared Imaging Radionmeter Suite
VIS	Visible Spectrum

Data sources

The authors acknowledge the use of data from:

NASA Worldview application (https://worldview.earthdata.nasa.gov), part of the NASA Earth Observing System Data and Information System (EOSDIS);

Landsat-8 and Landsat-9 courtesy of the U.S. Geological Survey;

Copernicus programme Sentinel satellites © ESA (2022, 2023);

SCAR Antarctic Digital Database (2021).

About this compendium

This compilation is the fourth volume of Ice Bulletins prepared by the Antarctic Meteorology Section's Ice Service at the Australian Bureau of Meteorology. It is a continuation of previous years' Technical Reports, which were also provided by the Sea Ice Service of the Antarctic Climate & Ecosystems Cooperative Research Centre at the University of Tasmania.
The first bulletin of this compilation was issued on 2 May 2022, after the 2021/2022 Australian Antarctic shipping season ended.

[1] The AMSR-2 instrument is onboard the GCOM-W1 satellite, which is operated by JAXA.
[2] The MODIS instrument is operational on two satellites: AQUA and TERRA, both operated by NASA.

Ice Bulletin: Davis Station

Issued: Monday 2nd May 2022

Analyst: Damien Everett

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data of Davis Station and surrounds. Fast-ice areas are outlined by red lines.

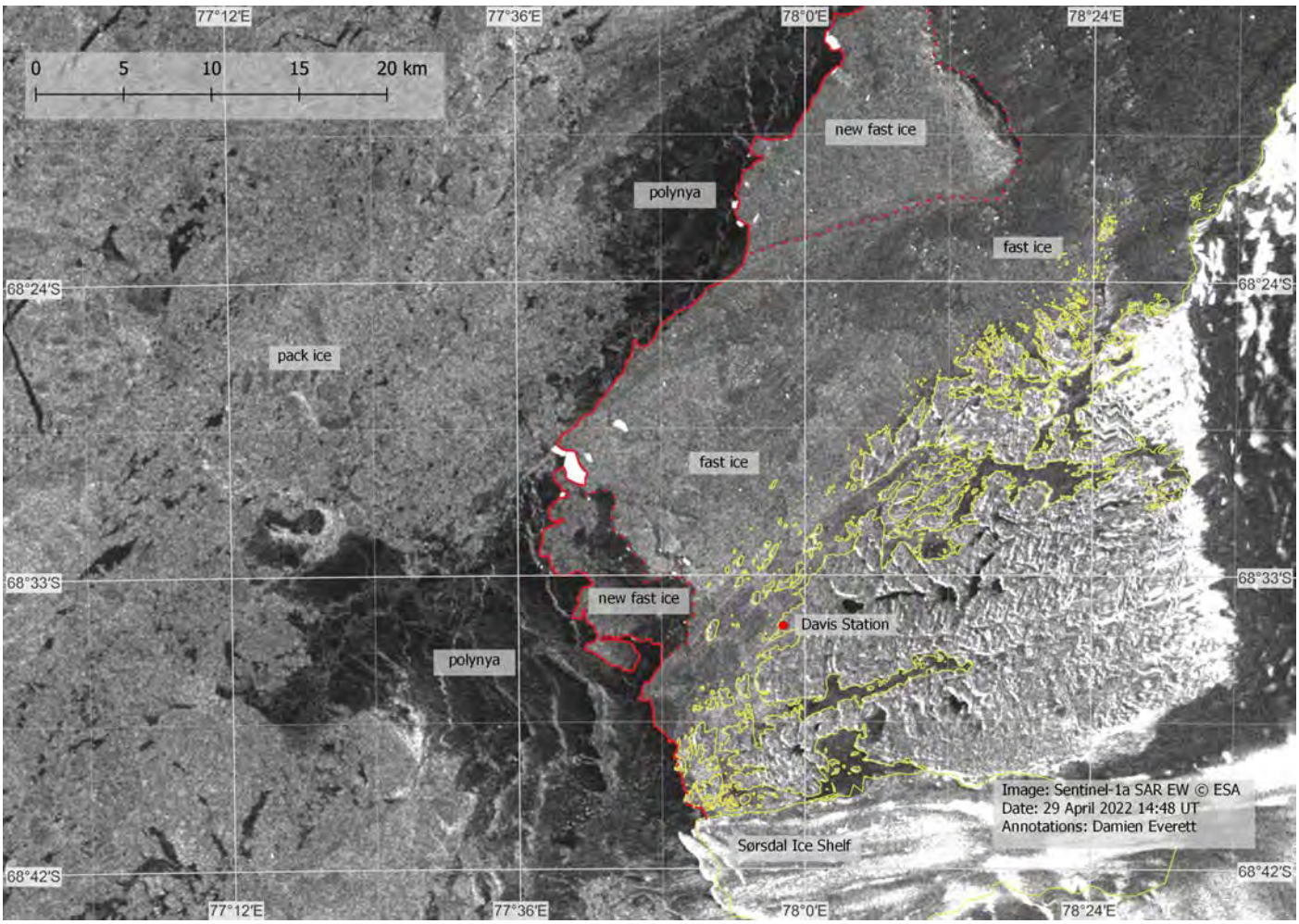


***Figure 1**: Sentinel-1a SAR EW data acquired 29 April 2022 at 14:48 UT and provided by Polar View.*

Off Davis Station, the fast-ice edge has recently been dynamic, forming and shifting back and forth (depicted by the dashed red lines) at the mercy of wind and current.

Off the Vestfold Hills, most icebergs offshore are frozen in while off the fast-ice edge, some icebergs continue to drift. Off the southwest facing fast-ice edge, polynyas are present as the pack ice is generally drifting southwestward offshore. Another polynya is also evident to the north.

Ice Bulletin: Mawson Station

Issued: Tuesday 3rd May 2022

Analyst: Damien Everett

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off the Mawson coast and well offshore.

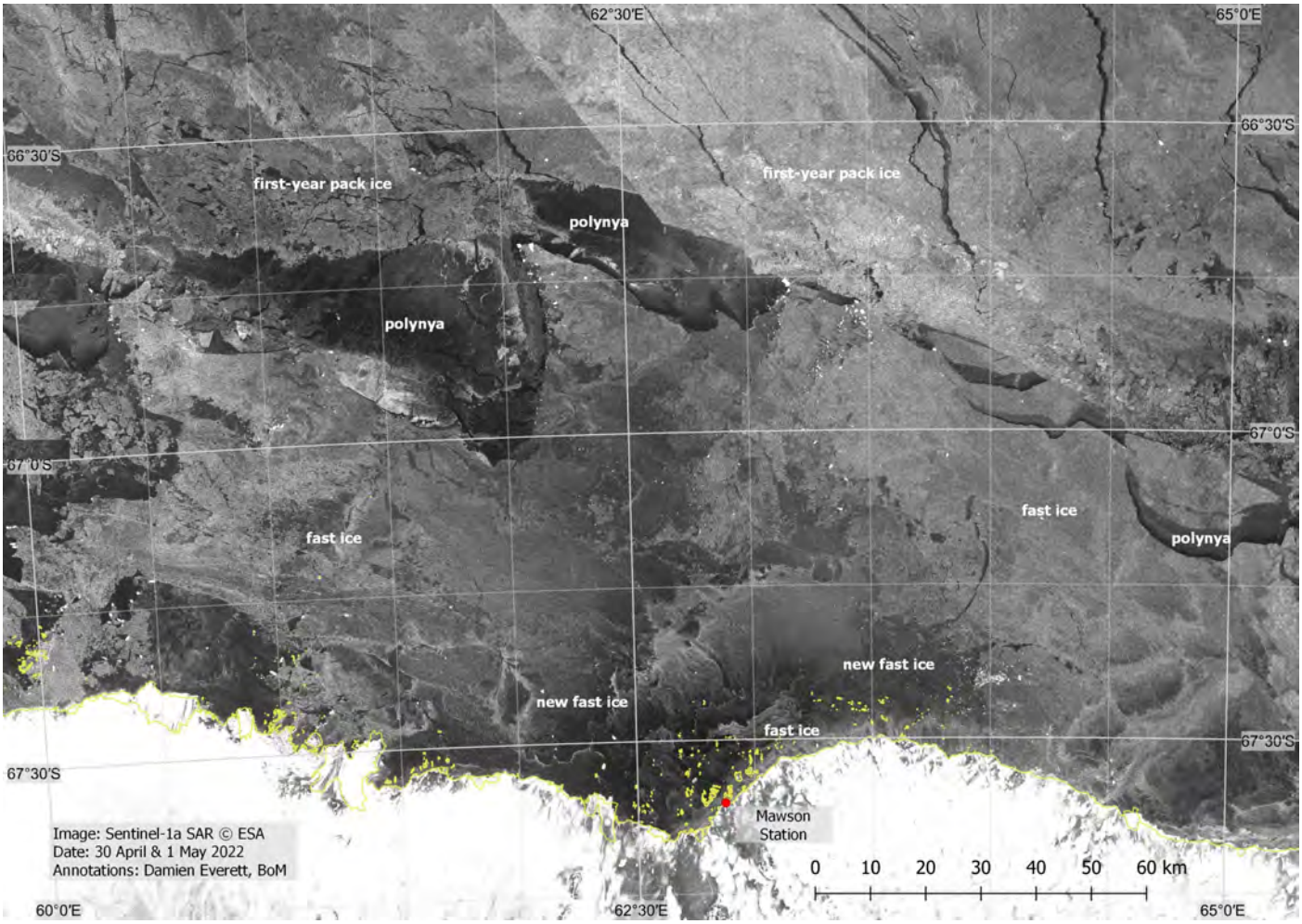


***Figure 1**: Sentinel-1a SAR EW/IW data composite acquired 30 April 2022 at 15:28 UT and 1 May 2022 at 16:10 UT, both provided by Polar View.*

After the complete breakout of ice north of Mawson Station last summer, new sea-ice growth and development in the region has been slow and extremely dynamic. Katabatic winds have forced new coastal sea ice offshore during April where the leading edge has merged with first-year pack ice, with several former polynyas evident along this interface.

Off Mawson Station, fast ice has started to thicken between the coast and islands, but further afield new fast ice remains thinner as it replaces the more mature fast ice that has been blown further offshore.

Beyond the offshore islands, the newly formed fast ice may visually appear more homogeneous than it is structurally underneath.

Ice Bulletin: Davis Station

Issued: Tuesday 10th May 2022

Analyst: Damien Everett

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data of Davis Station and surrounds. Current fast-ice areas are outlined by the solid red line while the fast-ice edge from the 29th April 2022 is outlined by the dotted red line.

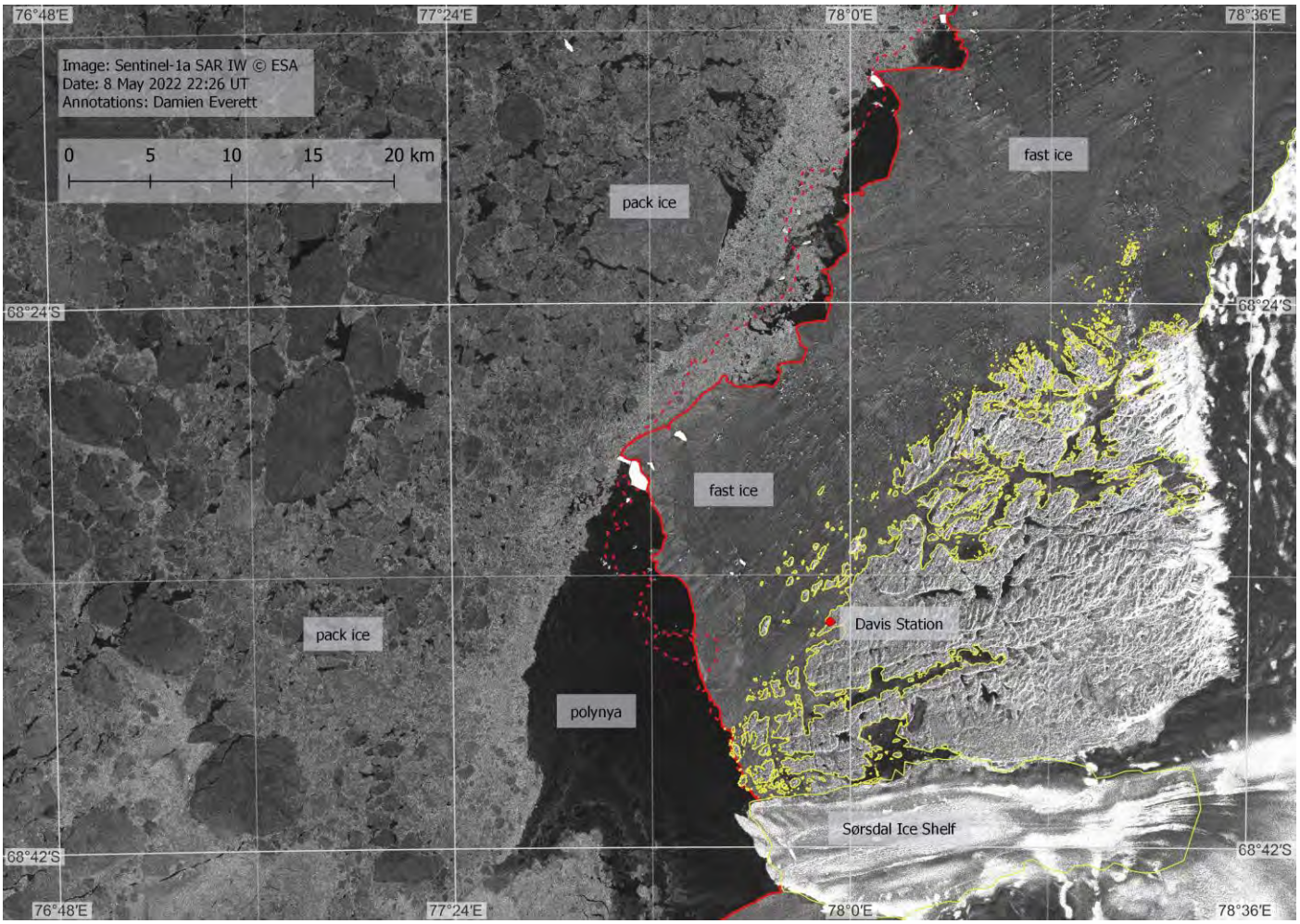


***Figure 1**: Sentinel-1a SAR IW data acquired 8 May 2022 at 22:26 UT and provided by Polar View.*

Off Davis Station, the fast-ice edge remains dynamic (illustrated by the solid and dotted red lines) due to wind and current. Broken fragments of last week's fast-ice edge are floating near the current fast-ice edge in the north.

Off the Vestfold Hills, most icebergs offshore are frozen in while off the fast-ice edge, some icebergs continue to drift. Off the southwest facing fast-ice edge, a large polynya is present as the pack ice generally drifts southwestward offshore. Smaller polynyas are also evident to the north.

Ice Bulletin: Antarctica

Issued: Friday 13th May 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows the pan-Antarctic sea-ice concentration anomaly based on passive microwave remote sensing data.

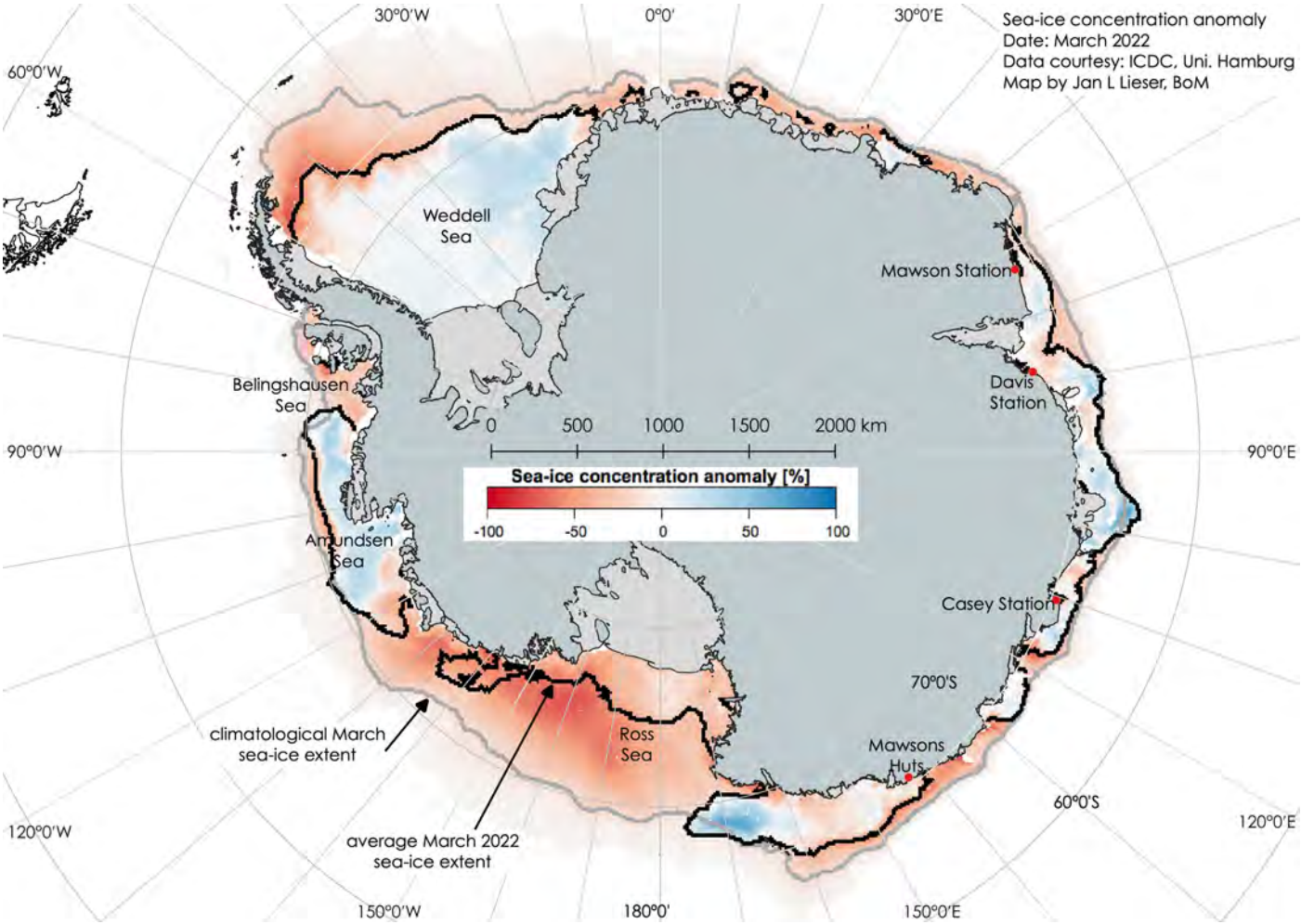


***Figure 1**: Sea-ice concentration anomaly for March 2022 provided by ICDC (Universität Hamburg).*

In March 2022, pan-Antarctic sea-ice conditions remained at near record low conditions. Regionally, sea-ice extent and associated concentration anomalies varied however, only between 80º0'E and 100º0'E in East Antarctica and in parts of the Amundsen Sea and western Bellingshausen Sea near average conditions prevailed through summer. In the Ross Sea, a small positive anomaly patch persisted around 170º0'E north of Cape Adare.

Otherwise, persistent negative anomalies were widespread around the continent including coast exposed to the sea off Dronning Maud Land (10º0'E to 30º0'E) and parts of East Antarctica, including off Enderby Land (west of Mawson Station), and parts of the coast between Casey Station and Dumont D'Urville Station. The entire Ross Sea shows a large negative sea-ice concentration anomaly. West of the Antarctic Peninsula (Bellingshausen Sea) and almost the entire western Weddell Sea (between 60º0'W and 10º0'W) are also below average conditions.

Ice Bulletin: Iceberg C-39

Issued: Friday 13th May 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data of the eastern Shackleton Ice Shelf around Mill Island. The positions of four large icebergs in the vicinity on 17 April 2022 are marked by dashed pink shapes.

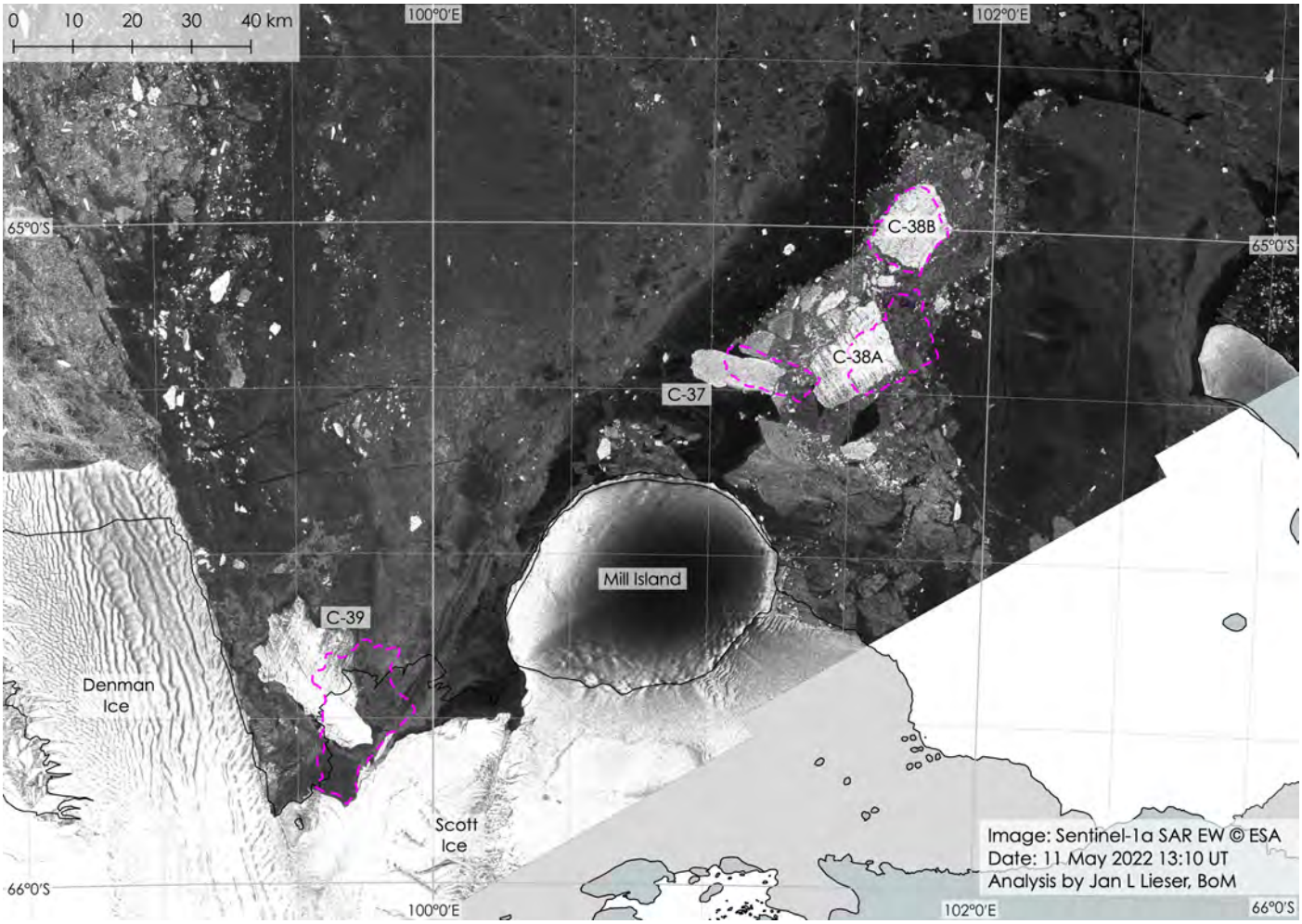


***Figure 1**: Sentinel-1a SAR EW data acquired 11 March 2022 at 13:10 UT and provided by PolarView.*

On 17 April 2022, a large iceberg calved off the Shackleton Ice Shelf, the part that is fed by the Scott Glacier southwest of Mill Island. This new iceberg C-39 is roughly 270 km^2 (about ¾ the size of Bruny Island, Tasmania).

Since 17 April 2022, iceberg C-37 has pushed almost 6 km westward and iceberg C-38A roughly 7 km westward compressing the sea ice between these two icebergs. Iceberg C-38B has moved less than 1 km south-westward during that time.

Ice Bulletin: Casey Station

Issued: Monday 16th May 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution SAR data off Casey Station. Fast-ice areas are marked with a red line.

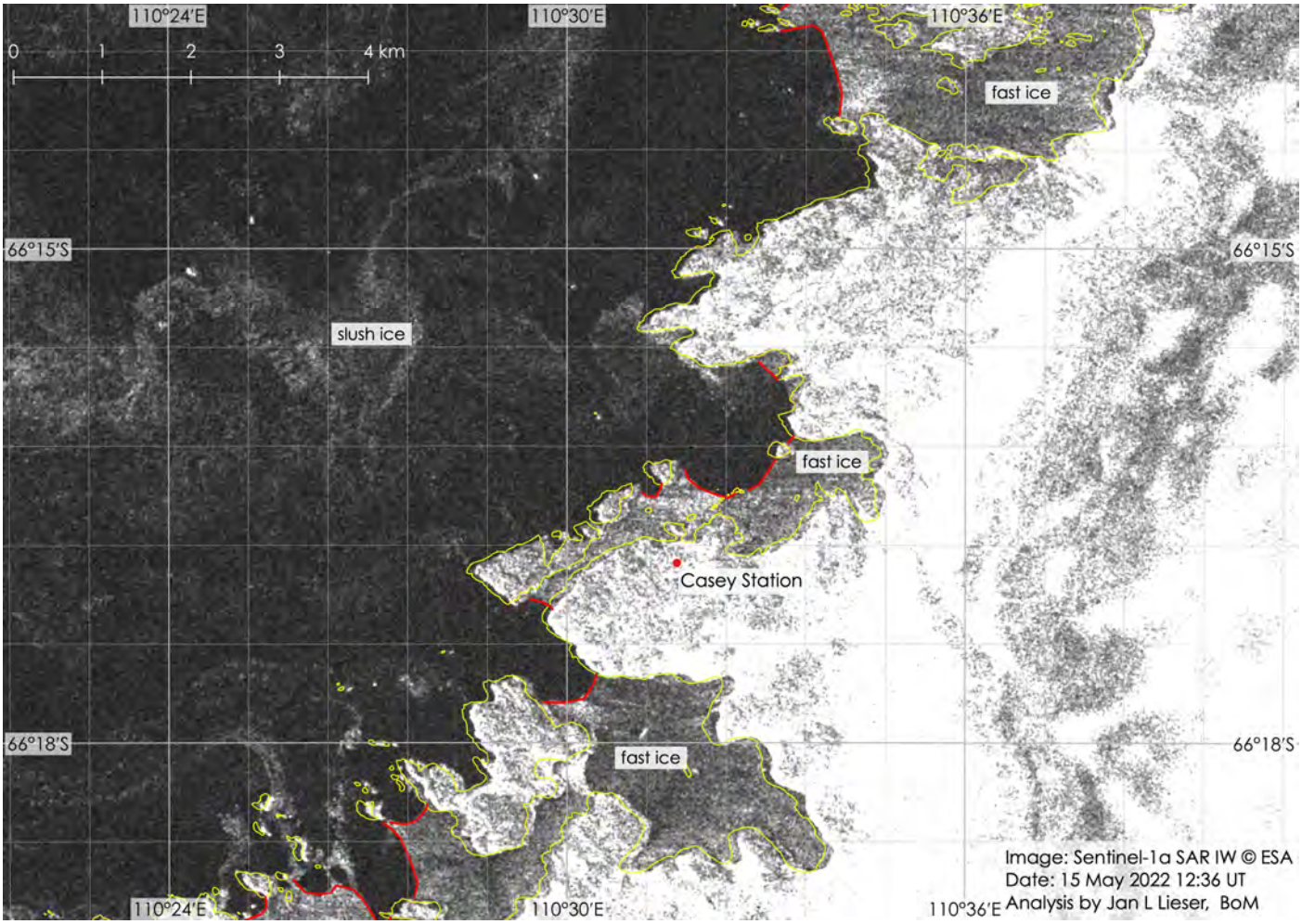


Figure 1: *Sentinel-1a SAR IW data acquired 15 May 2022 at 12:36 UT and provided by ESA.*

Off Casey Station, seasonal fast ice has formed nearshore and between the offshore islands. Off the fast-ice edge, new sea ice and slush ice is forming and transported by wind and ocean surface currents.

Ice Bulletin: Mawson Station

Issued: Tuesday 16th May 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figures of this bulletin show almost entirely cloud-free panchromatic Day-Night-Band data off Mawson Station.

The Visible Infrared Imaging Radiometer Suite (VIIRS) Night-time Imagery (Day/Night Band or Enhanced Near Constant Contrast) is mainly a qualitative product and should be strictly used for image display purposes only. It shows the Earth's surface and atmosphere using a sensor designed to capture low-light emission sources, under varying illumination conditions. It is displayed as a grayscale image.

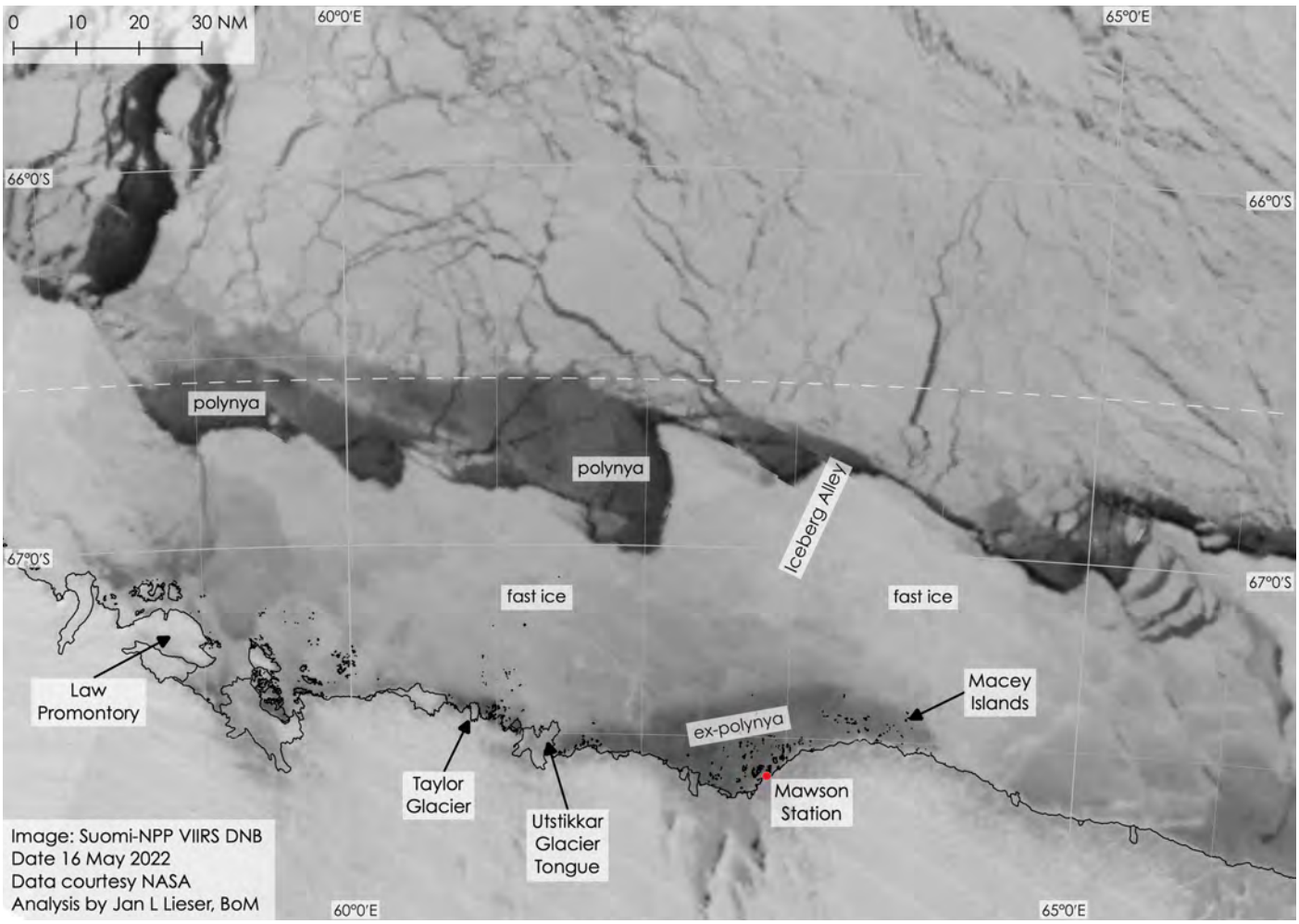


Figure 1: *Suomi-NPP VIIRS DNB data acquired 16 May 2022 and provided by NASA.*

The scene presented in the figures of this bulletin is illuminated by the near-full moon under cloud-free conditions. While ice and snow-covered surfaces appear in lighter grey, open ocean and polynya areas appear darker.

Last summer, the fast ice off Mawson Coast broke out completely and new sea-ice (and fast-ice) growth and development in the region has been slow and dynamic. In the meantime, however, the northern fast-ice edge has assumed its typical shape for the time of year east and west of Iceberg Alley.

Nearshore Mawson Station, fast ice has started to thicken between the coast and offshore islands, but further afield new fast ice of an ex-polynya remains thinner and appears darker compared to the more mature fast ice further offshore. This ex-polynya can be seen stretching from Utstikkar Glacier Tongue in the west to Macey Islands in the east and similarly thinner fast ice is also around the ice shelf of Taylor Glacier. North of Law Promontory, more inhomogeneous fast ice is present.

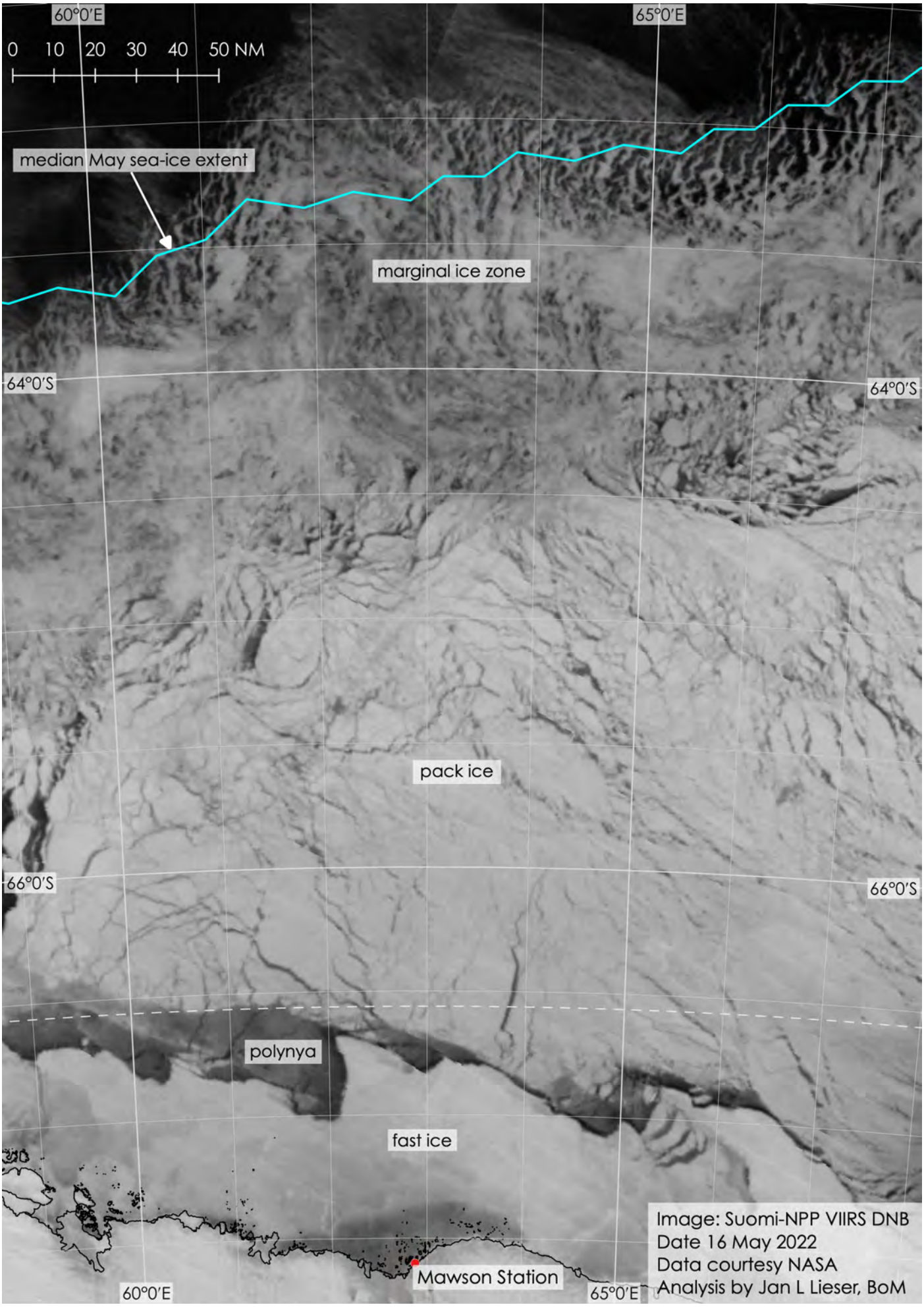


Figure 2: *Suomi-NPP VIIRS DNB data acquired 16 May 2022 and provided by NASA.*

Ice Bulletin: Antarctica

Issued: Thursday 19th May 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows the pan-Antarctic sea-ice concentration anomaly based on passive microwave remote sensing data.

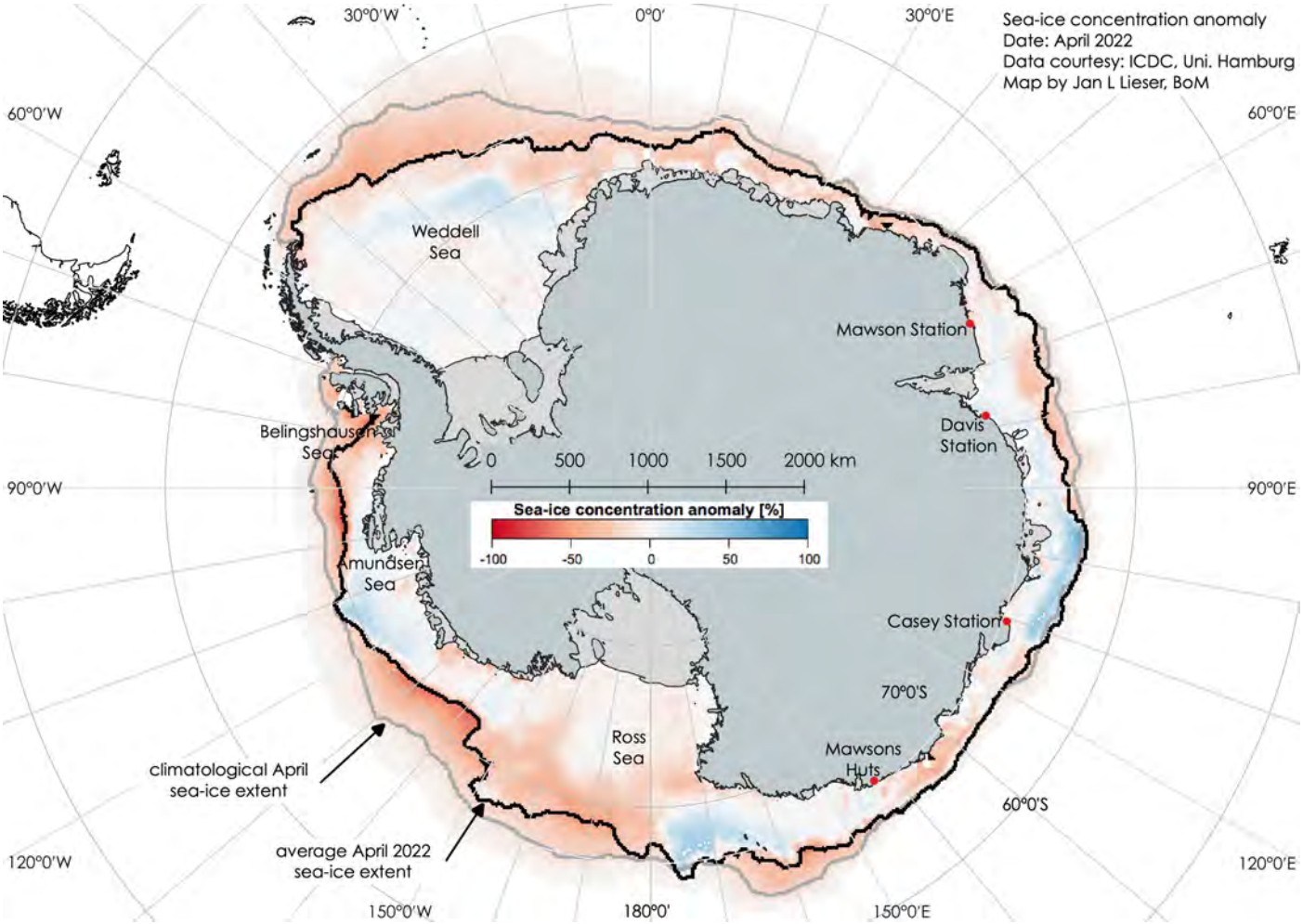


***Figure 1**: Sea-ice concentration anomaly for April 2022 provided by ICDC (Universität Hamburg).*

While February and March 2022 saw the Antarctic sea-ice extent at respective second-lowest levels, sea-ice growth has picked up slightly in April 2022 but pan-Antarctic sea-ice conditions remained at low conditions (ranking sixth since records began).

Regionally, sea-ice extent and associated concentration anomalies varied with large parts of East Antarctica at near-climatological sea-ice extent but below average concentration except for the region between 95º0'E and 110º0'E. Also, in very small regions of the Amundsen Sea (around 110º0'W) and western Ross Sea (near 175º0'E) close to average conditions are seen.

Otherwise, persistent negative anomalies were widespread around the continent including the Weddell Sea, almost the entire Ross Sea and west of the Antarctic Peninsula (Bellingshausen Sea) exhibiting below average conditions.

Ice Bulletin: Mawson Station

Issued: Monday 30th May 2022

Analyst: Jan L. Lieser and Damien Everett

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data of Mawson Station and surrounds. Fast-ice areas are outlined by the solid red line. Recent fast-ice drilling sites are marked by green dots and their respective thickness annotated.

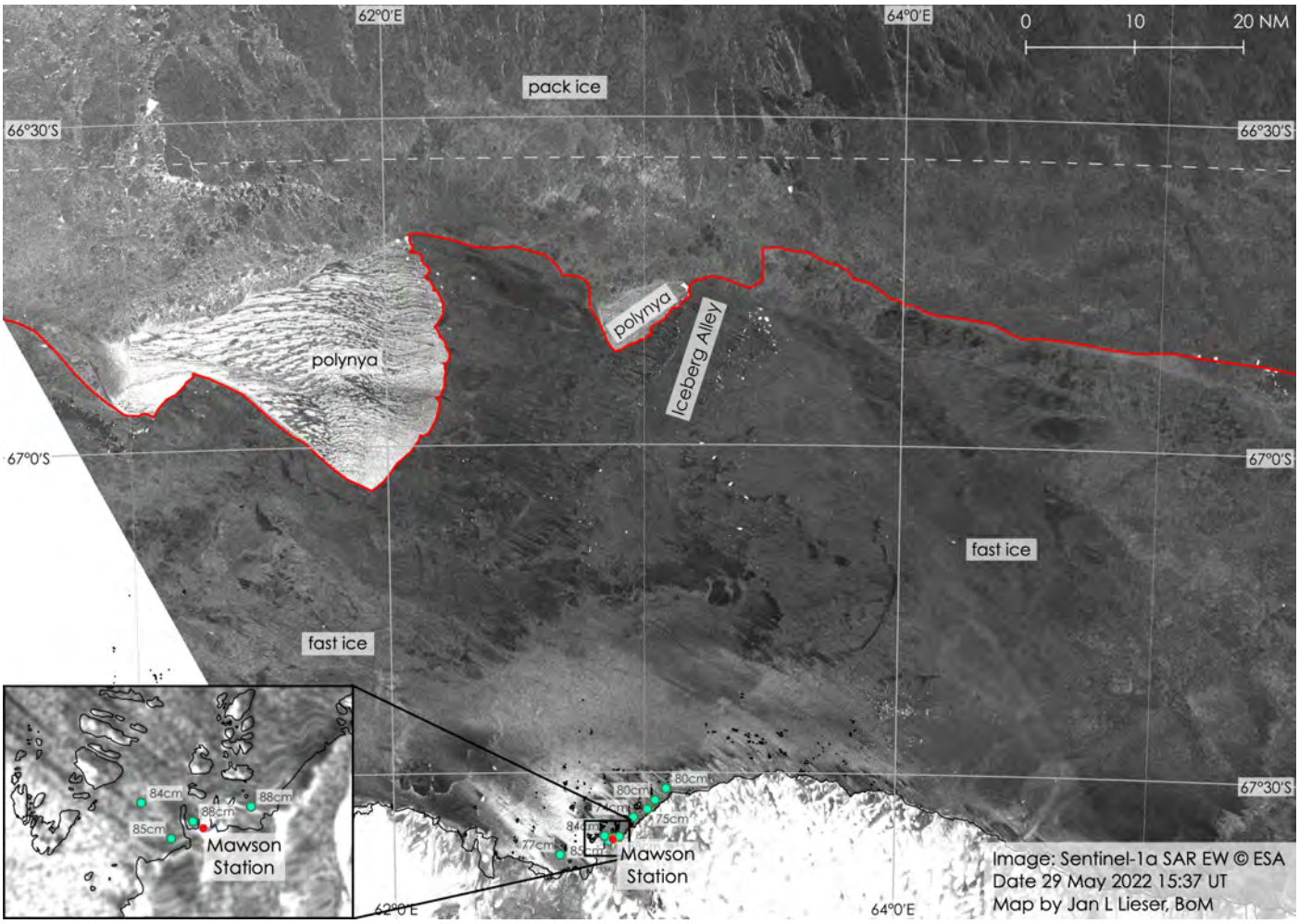


***Figure 1**: Sentinel-1a SAR EW data acquired 29 May 2022 at 15:37 UT and provided by Polar View.*

North of Mawson Station, the fast-ice edge has assumed roughly its typical shape for the season. The large polynya in the northwest acts as an 'ice factory' with new sea ice forming that is then exported west- and northwards by the wind to merge with the pack ice.

Nearshore, fast ice has continued to thicken between the coast and offshore islands and the surface is significantly scoured by katabatic winds, which is visible by the 'shark tooth' pattern north and east offshore.

Ice Bulletin: Davis Station

Issued: Friday 3rd June 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) SAR data off Davis Station. The fast-ice edge is marked by a red line.

The fast-ice edge has assumed its typical shape for the time of year. The westernmost edge of the fast ice is stabilised by a large, grounded iceberg at 68º30'S and 77º41'E.

Off the fast-ice edge, pack ice and some icebergs are drifting generally south-westward.

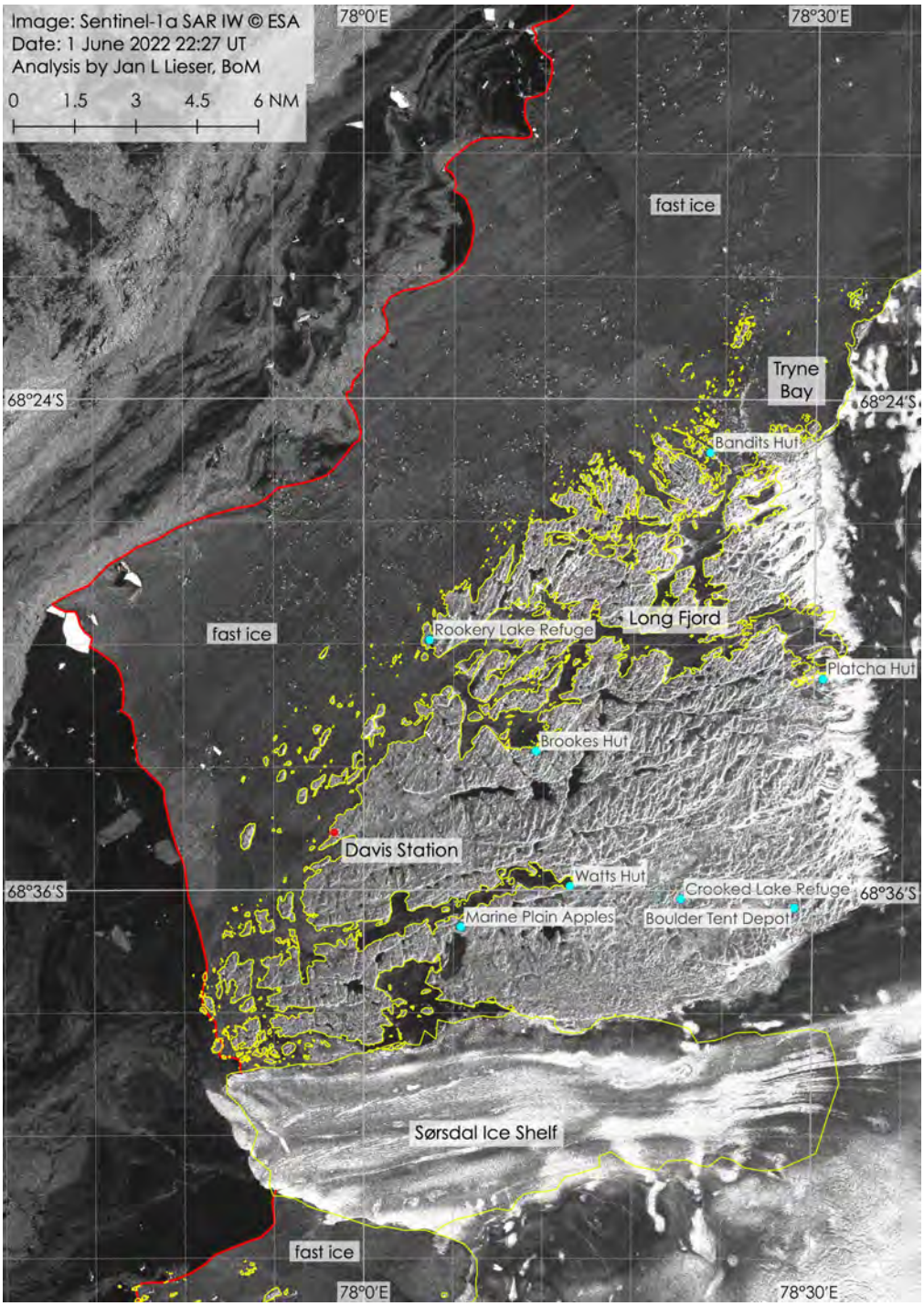


Figure 1: *Sentinel-1a SAR IW data acquired 1 June 2022 at 22:27 UT and provided by PolarView.*

Ice Bulletin: Antarctica

Issued: Friday 10th June 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows the pan-Antarctic sea-ice concentration anomaly based on passive microwave remote sensing data.

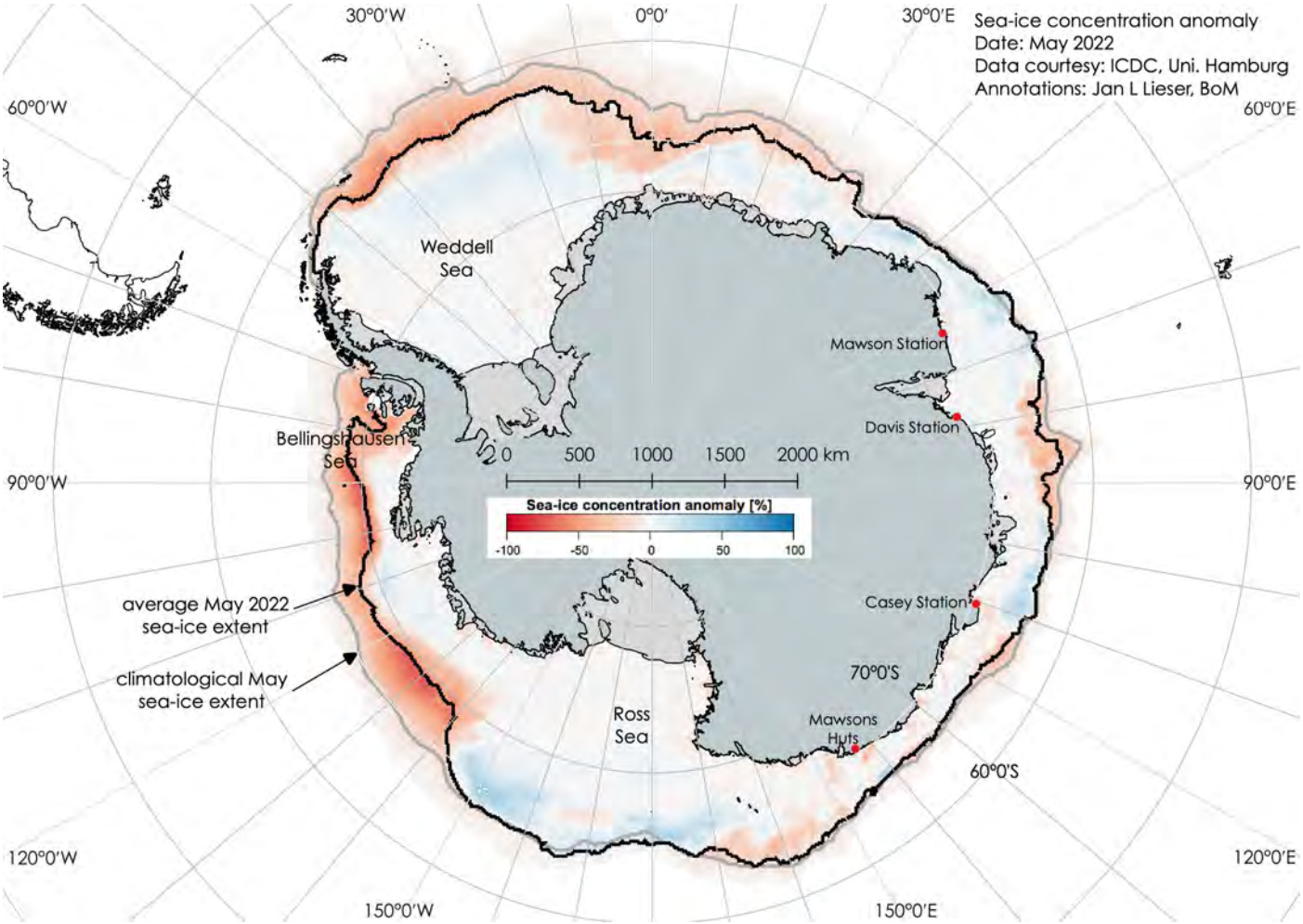


***Figure 1**: Sea-ice concentration anomaly for May 2022 provided by ICDC (Universität Hamburg).*

In May 2022, pan-Antarctic sea-ice conditions remained at low conditions continuing to rank sixth since records began.

Regionally, sea-ice extent and associated concentration anomalies varied with large parts of East Antarctica at near-climatological sea-ice extent but below average extent in the region between 85º0'E and 100º0'E as well as 110º0'E and 120º0'E. Also, the central Ross Sea (between 175º0'E and 145º0'W) experienced close to average conditions.

Otherwise, persistent negative anomalies were widespread around the continent including the Weddell Sea, the western Ross Sea and further west from there towards the Antarctic Peninsula (Amundsen Sea and Bellingshausen Sea) exhibiting below average conditions.

Ice Bulletin: Davis Station

Issued: Tuesday 14th June 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Davis Station. The fast-ice edge is marked by a red line (dashed red for 1 June 2022).

The fast ice has lost a large part offshore (more than 300 km^2) and the fast-ice edge retreated towards the coast compared to early June.

Off the fast-ice edge, a polynya is present with pack ice and some icebergs are drifting generally south-westward.

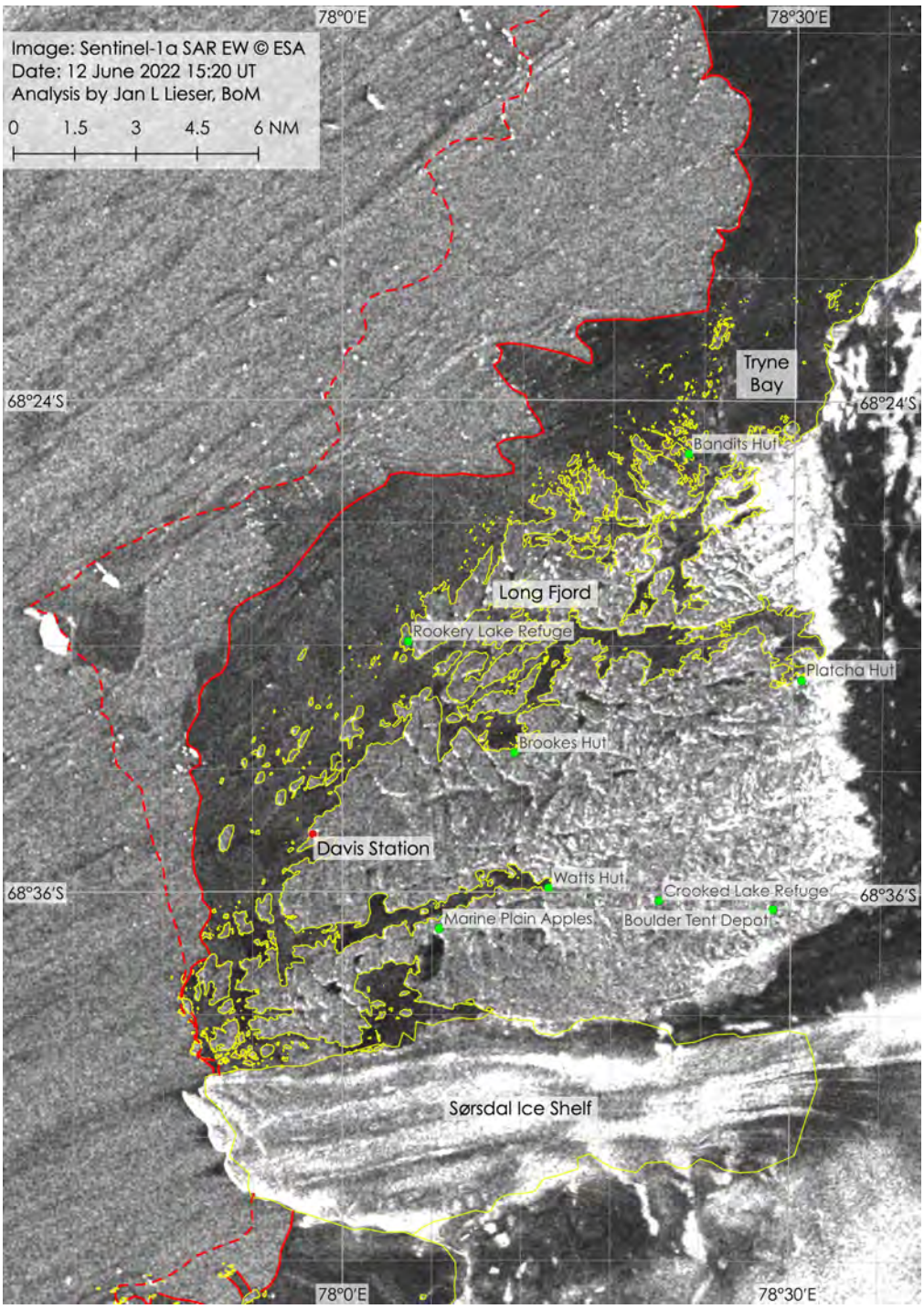


Figure 1: *Sentinel-1a SAR EW data acquired 12 June 2022 at 15:20 UT and provided by PolarView.*

Ice Bulletin: Casey Station

Issued: Thursday 16th June 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Casey Station. The fast-ice edge is marked with a red line.

Off Casey Station, seasonal fast ice has formed nearshore and between the offshore islands.

South of the station, a large polynya is currently maintained by strong offshore winds.

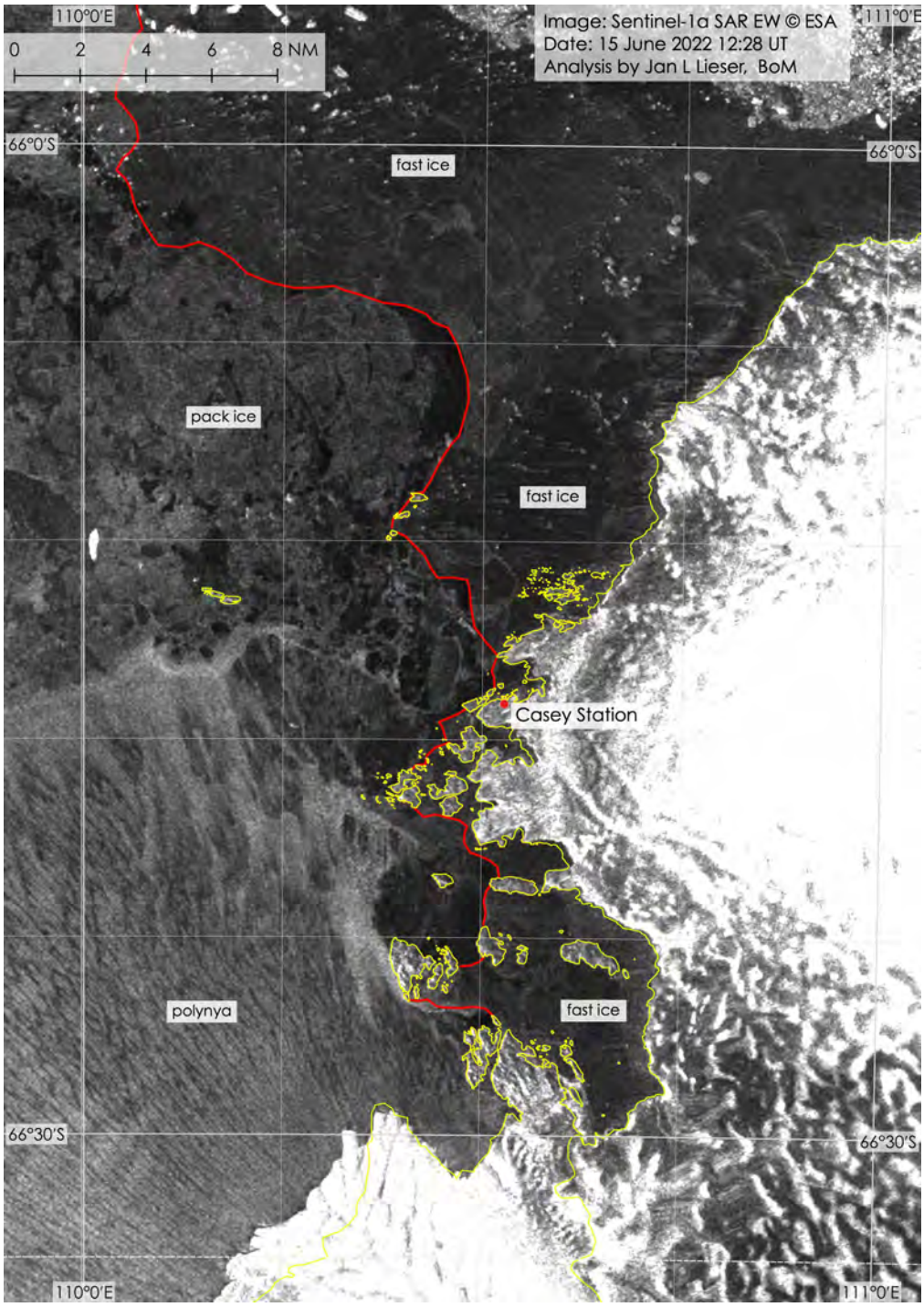


Figure 1: *Sentinel-1a SAR EW data acquired 15 June 2022 at 12:28 UT and provided by ESA.*

Ice Bulletin: Mawson Station

Issued: Thursday 16th June 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows Day-Night-Band data of Mawson Station and surrounds. The scene is illuminated by the early stages of the waning full moon. The fast-ice edge on 29 May 2022 is included as a dashed red line.

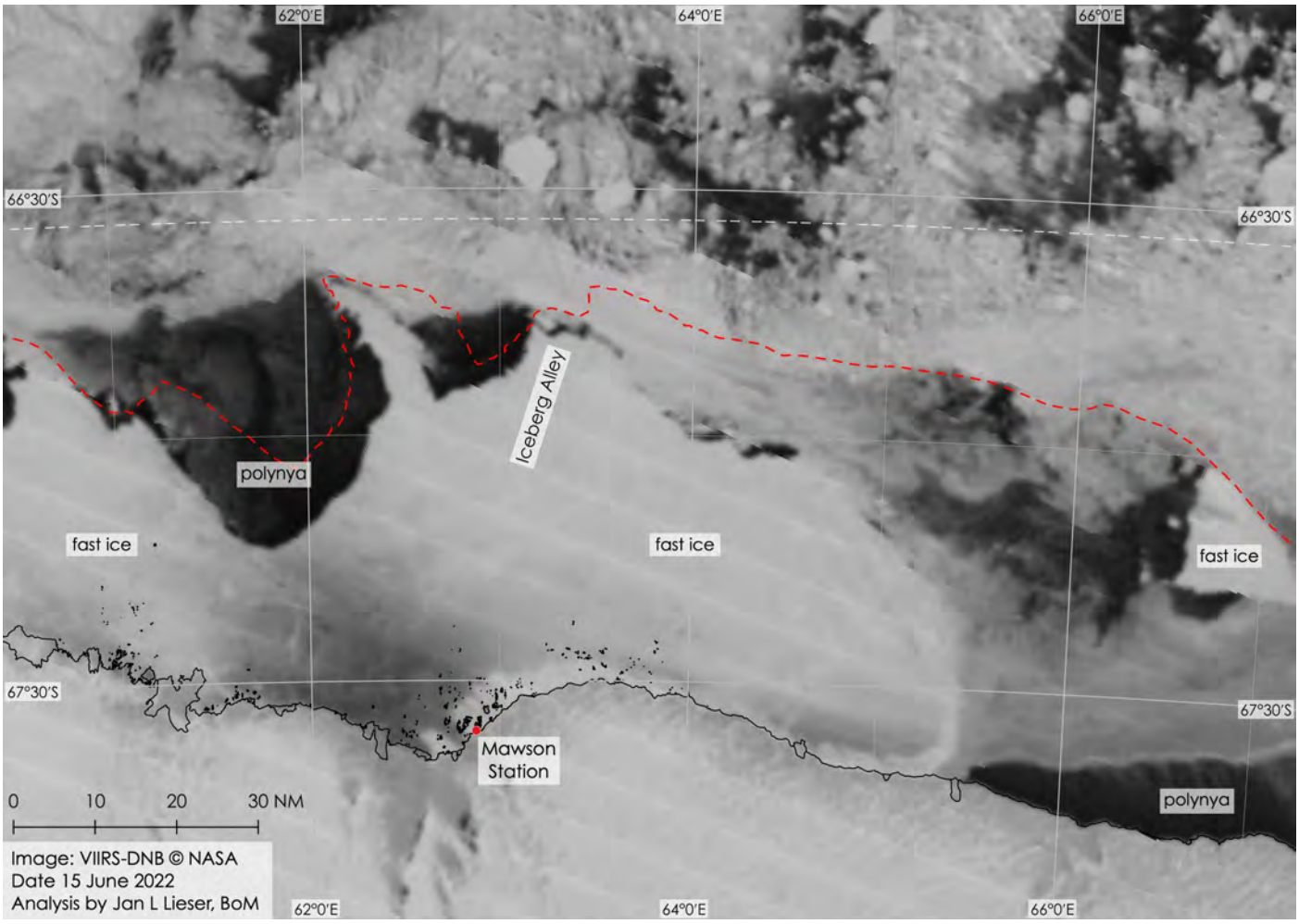


***Figure 1**: VIIRS DNB data acquired 15 June 2022 and provided by NASA.*

Northwest of Mawson Station, the polynya is significantly larger than at the beginning of the month. Also west of Iceberg Alley, the open water is clearly larger than before. East of the station, fast ice that was temporarily locked between the large sheet off station and a smaller patch locked in by grounded icebergs (roughly at 65º30'E) has been moved northwards and away from the region.

Figure 2 shows a larger frame of the same data as Figure 1. The median sea-ice extent is included as a light blue line and yesterday's sea-ice edge based on passive microwave data is shown as a darker blue line.

The region of the Cooperation Sea (off the Amery Ice Shelf) and further east experiences severely depleted sea-ice conditions compared to the climatological median in the region.

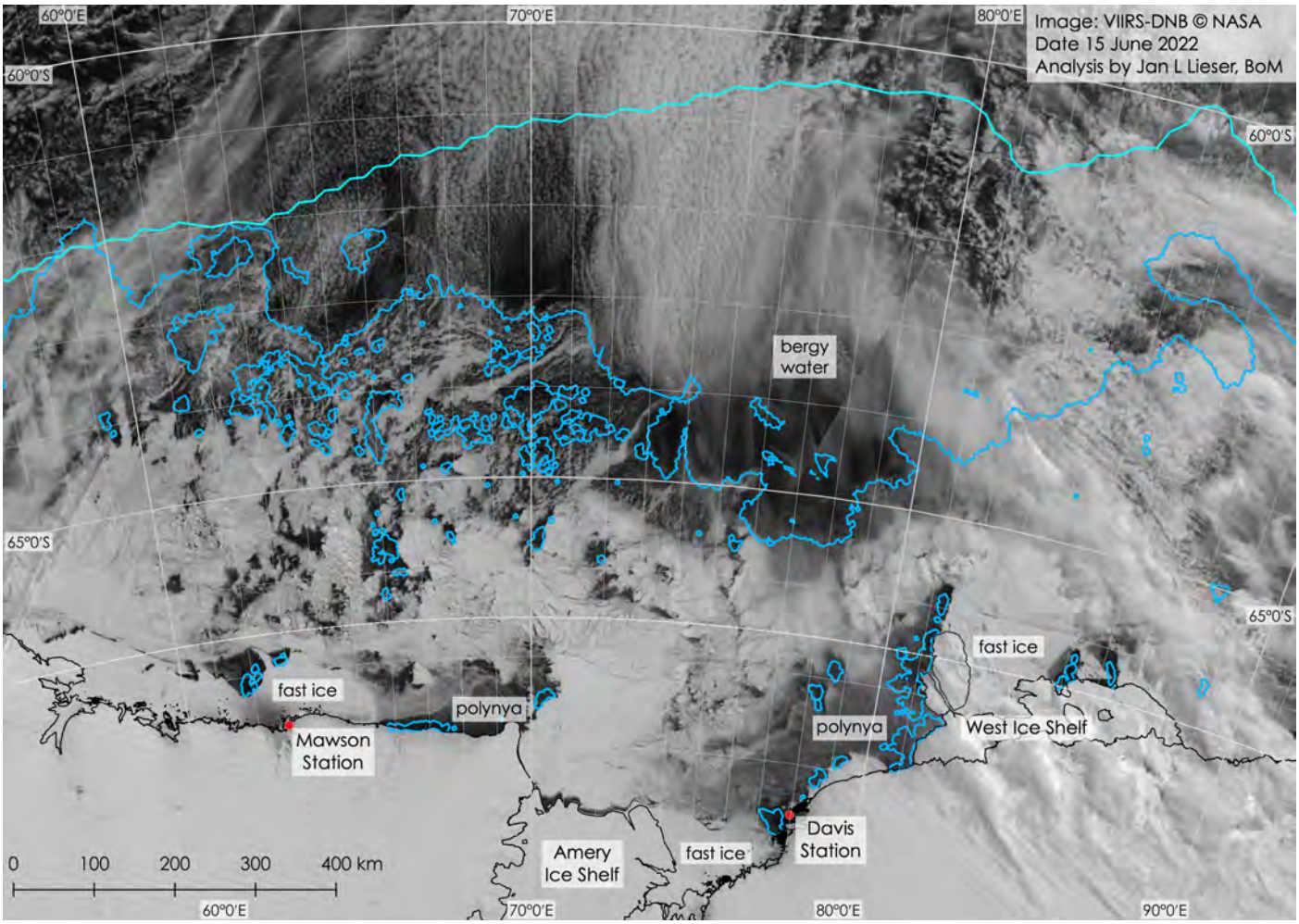


***Figure 2**: VIIRS DNB data acquired 15 June 2022 and provided by NASA.*

Ice Bulletin: Weddell Sea

Issued: Friday 17th May 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows Day-Night-Band data of the western Weddell Sea. The drift of large iceberg A-76A is marked by colour-coded shapes.

Since the end of summer (sea-ice minimum was recorded on 21 February 2022), iceberg A-76A has travelled roughly 720 km and is about to exit the pack-ice zone into the southern Atlantic Ocean.

The iceberg calved off the Ronne Ice Shelf in mid-May 2021 and travelled northward roughly 510 km until mid-February 2022 (the red shape). Since January 2022, the iceberg appears to have gained momentum. During the early phase of the drift (between May 2021 and the end of 2021), the iceberg drifted at roughly 2 km per day but is averaging more than 6 km per day since February 2022.

The smaller fragments of the iceberg (A-76B and A-76C) have remained closer to the coast and exhibit much slower drift speeds since February 2022, even though A-76B travelled significantly farther than A-76C, which had remained further north than A-76B.

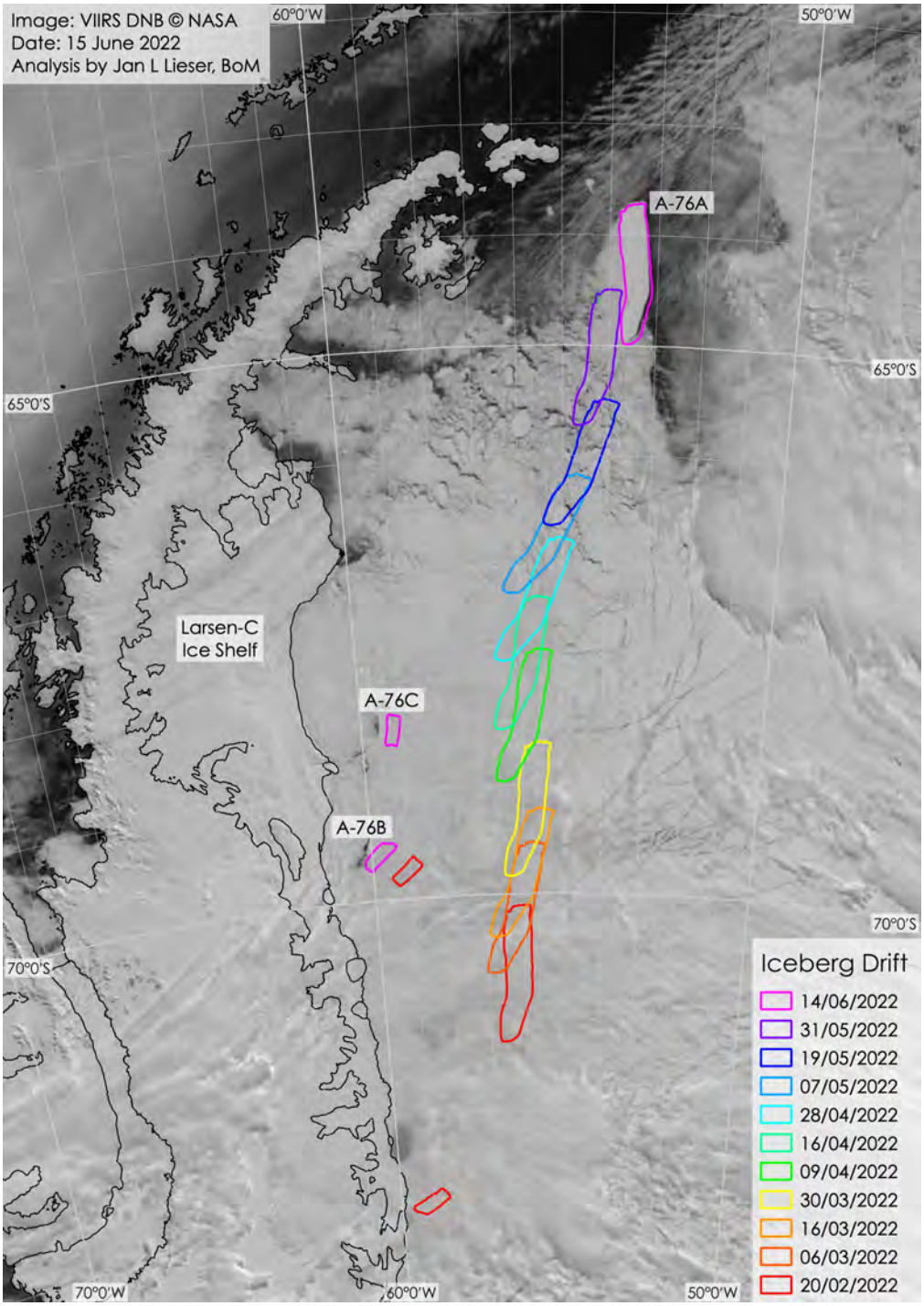


Figure 1: *VIIRS Day-Night-Band data acquired 15 June 2022 and provided by NASA.*

Ice Bulletin: Mawson Station

Issued: Monday 20th June 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution SAR data of Mawson Station and surrounds. The typical route between the station and Colbeck Archipelago (east of the Taylor Ice Shelf) is marked by a green and cyan line. A black diagonal line is a stitching artefact where two consecutive scenes are joined.

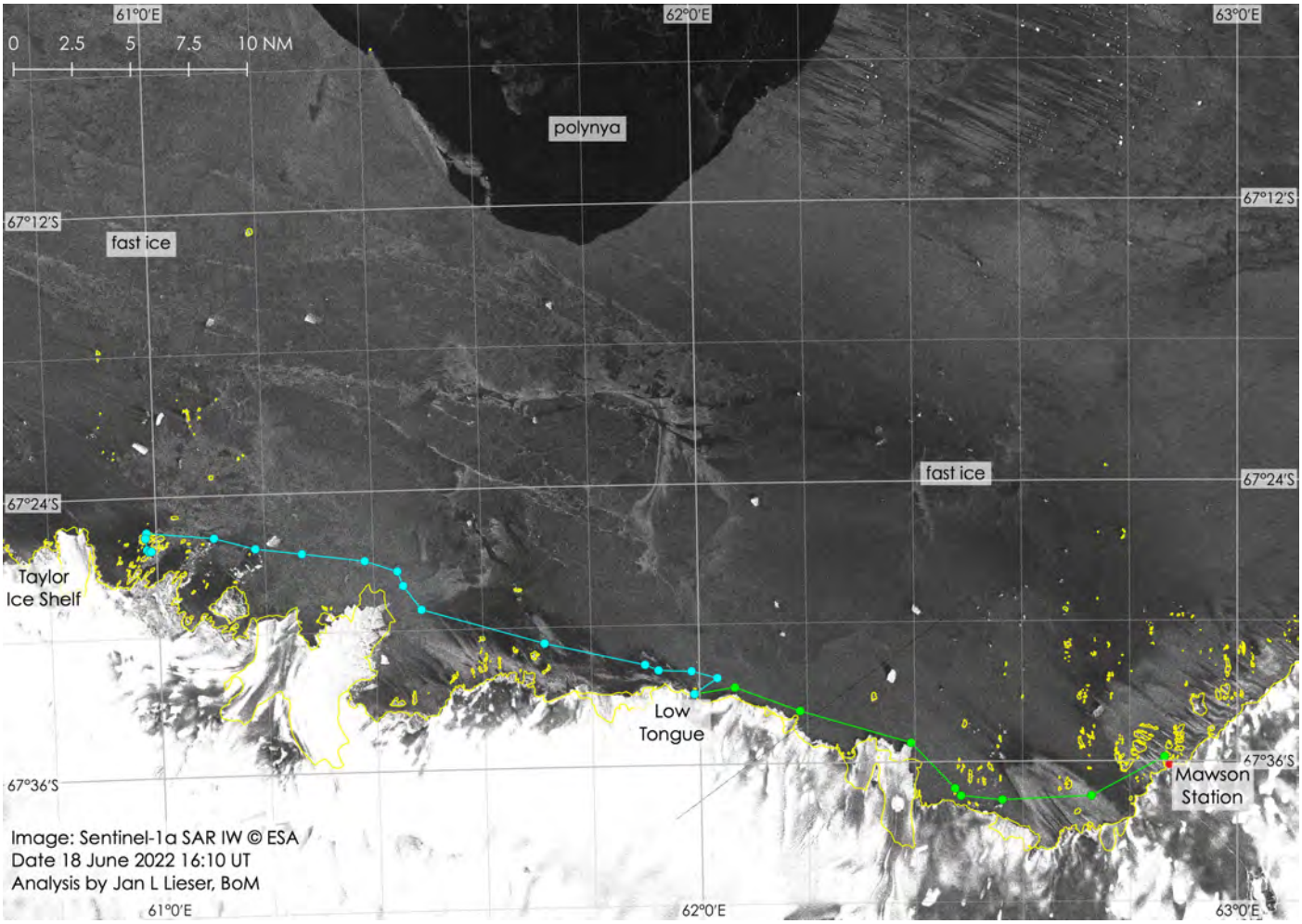


***Figure 1**: Sentinel-1a SAR IW data acquired 18 June 2022 at 16:10 UT and provided by PolarView.*

West of Mawson Station, mostly homogenous fast ice is present.

Nearshore around the station, fast ice has continued to thicken between the coast and offshore islands and the surface is significantly scoured by katabatic winds, which is visible by the 'shark tooth' pattern north and south of the station offshore. The polynya northwest of the station has progressed southward in recently.

Off the Forbes Ice Shelf, Day-Night-Band data from the VIIRS instrument (see Figure 2) still show a significantly different signature to what ‘established’ fast ice would appear like. More established fast ice seems to be present nearshore northeast of the station and off Utstikkar Ice Shelf for example.

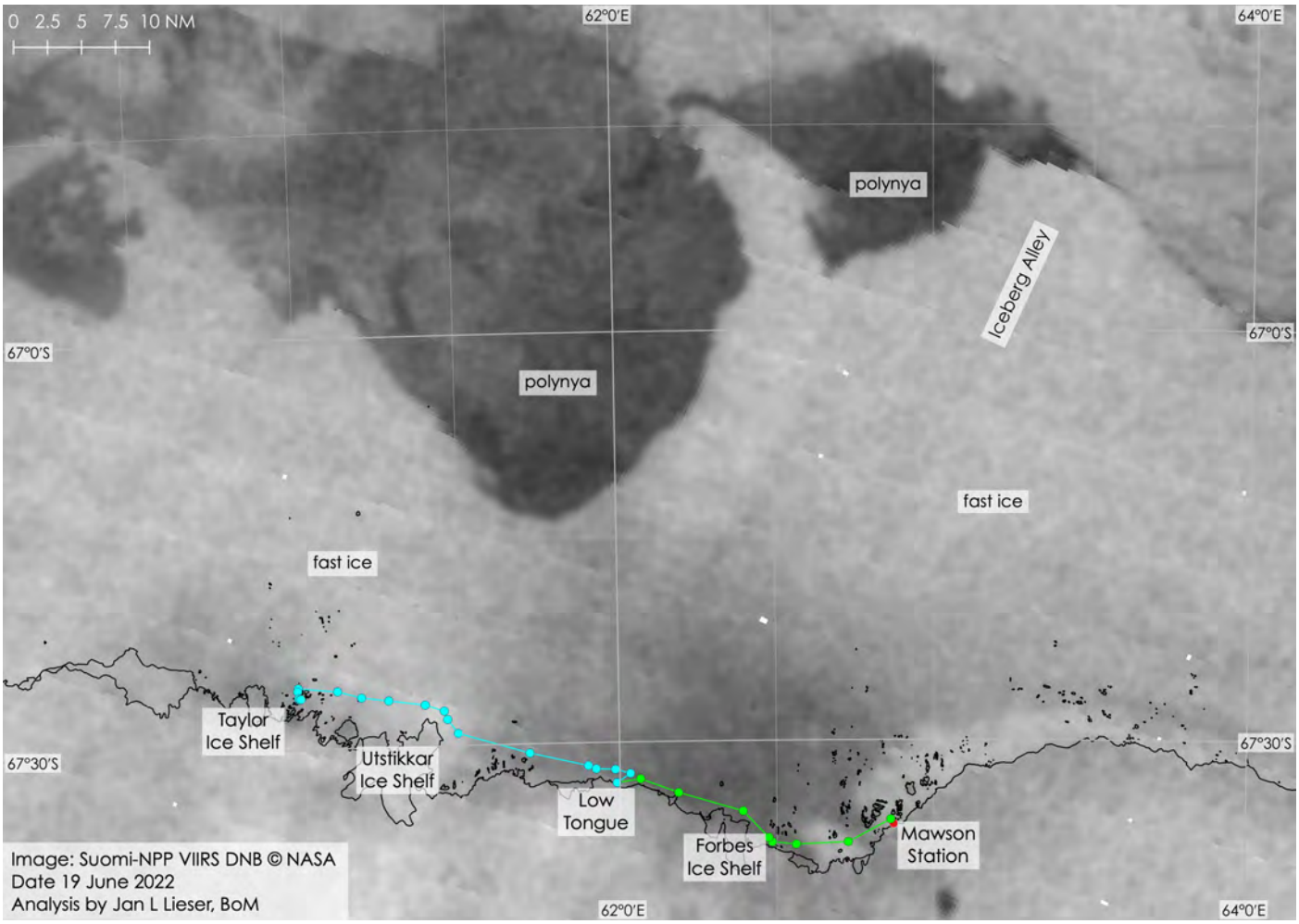


***Figure 2**: Suomi-NPP VIIRS Day-Night-Band data acquired 19 June 2022 and provided by NASA.*

Ice Bulletin: Casey Station

Issued: Tuesday 21st June 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Casey Station. The fast-ice edge is marked with a red line.

Off Casey Station, seasonal fast ice has formed nearshore and between the offshore islands.

South of the station, a polynya is currently maintained by strong offshore winds.

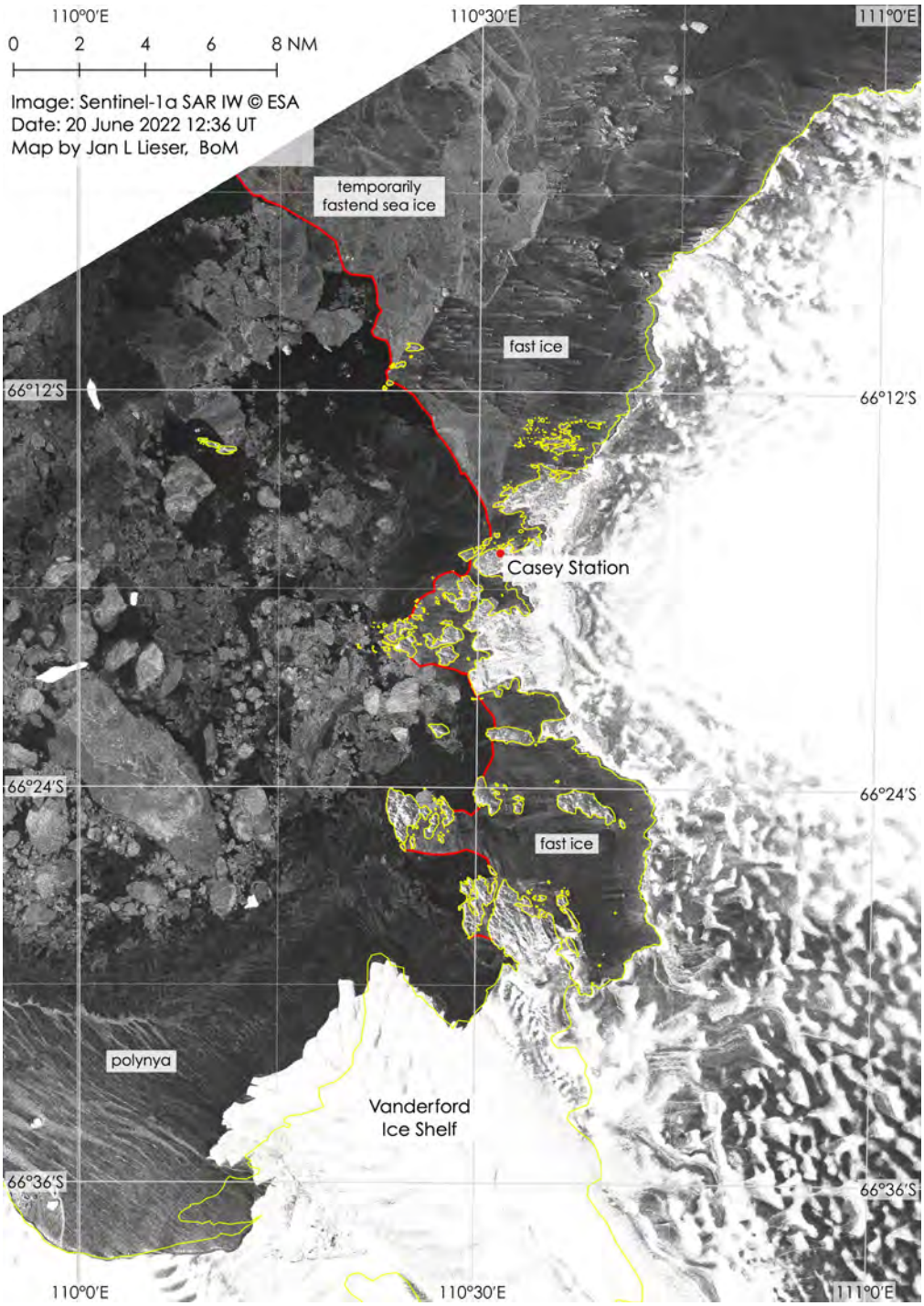


Figure 1: *Sentinel-1a SAR EW data acquired 20 June 2022 at 12:36 UT and provided by PolarView.*

Ice Bulletin: Davis Station

Issued: Monday 27th June 2022

Analyst: Jan L. Lieser and Damien Everett

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Davis Station. The fast-ice edge for the 14 June 2022 is marked by the dashed red line.

Off Davis Station, the fast-ice edge has generally retained its shape over the last two weeks. New sea ice and nilas is now forming offshore to the west.

In the north, the fast-ice edge has been more dynamic. Fast ice has started to consolidate further offshore but remains unstable west of the dashed line.

Off the Vestfold Hills, most icebergs are frozen in while off the fast-ice edge, some icebergs have shifted during dynamic periods resulting in ice breakout.

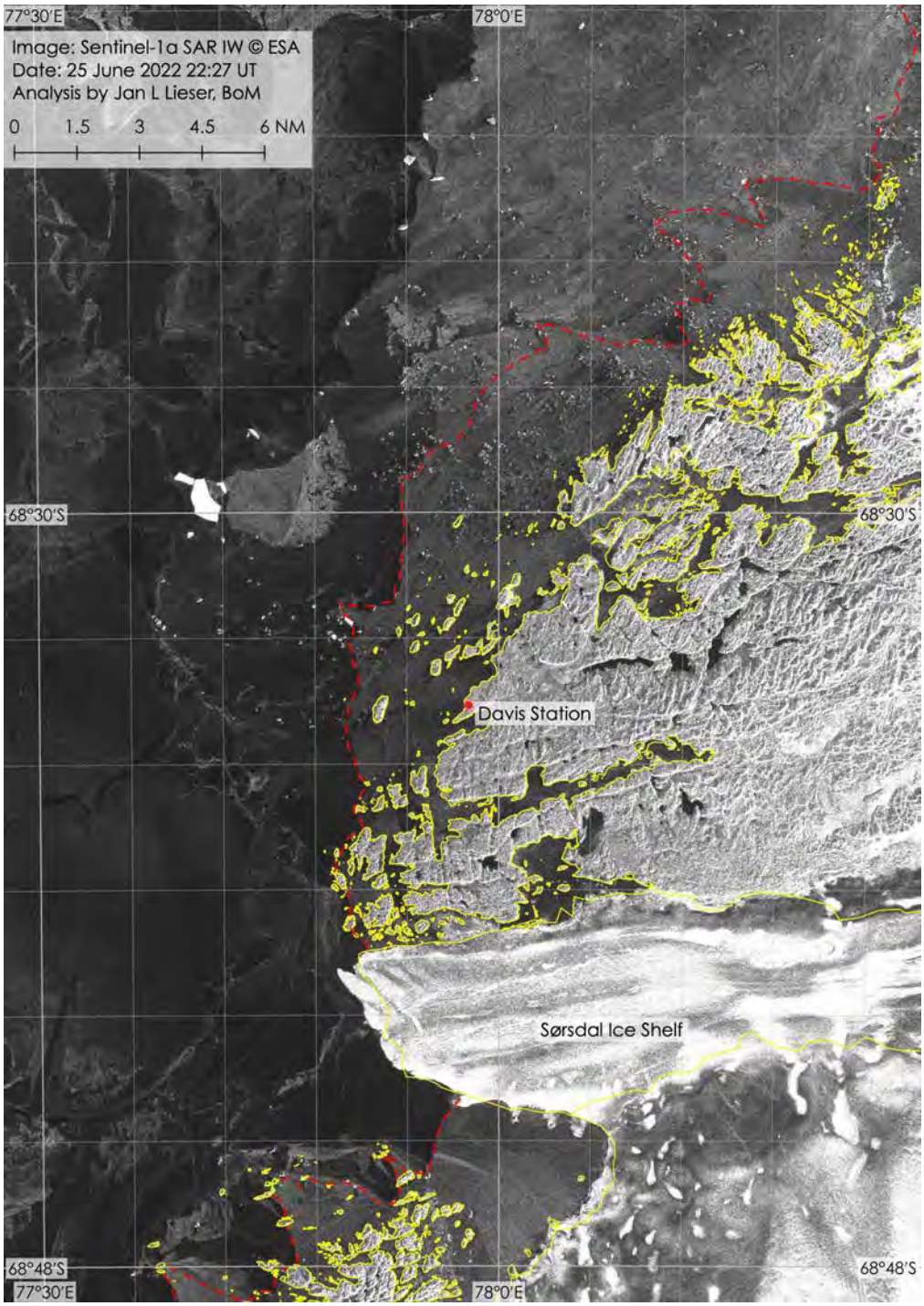


***Figure 1**: Sentinel1-a SAR IW data acquired 25 June 2022 at 22:27 UT and provided by Polar View.*

Ice Bulletin: Mawson Station

Issued: Tuesday 5th July 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data of Mawson Station and surrounds. The fast-ice edge is marked by a red line (dashed red for 29 May 2022).

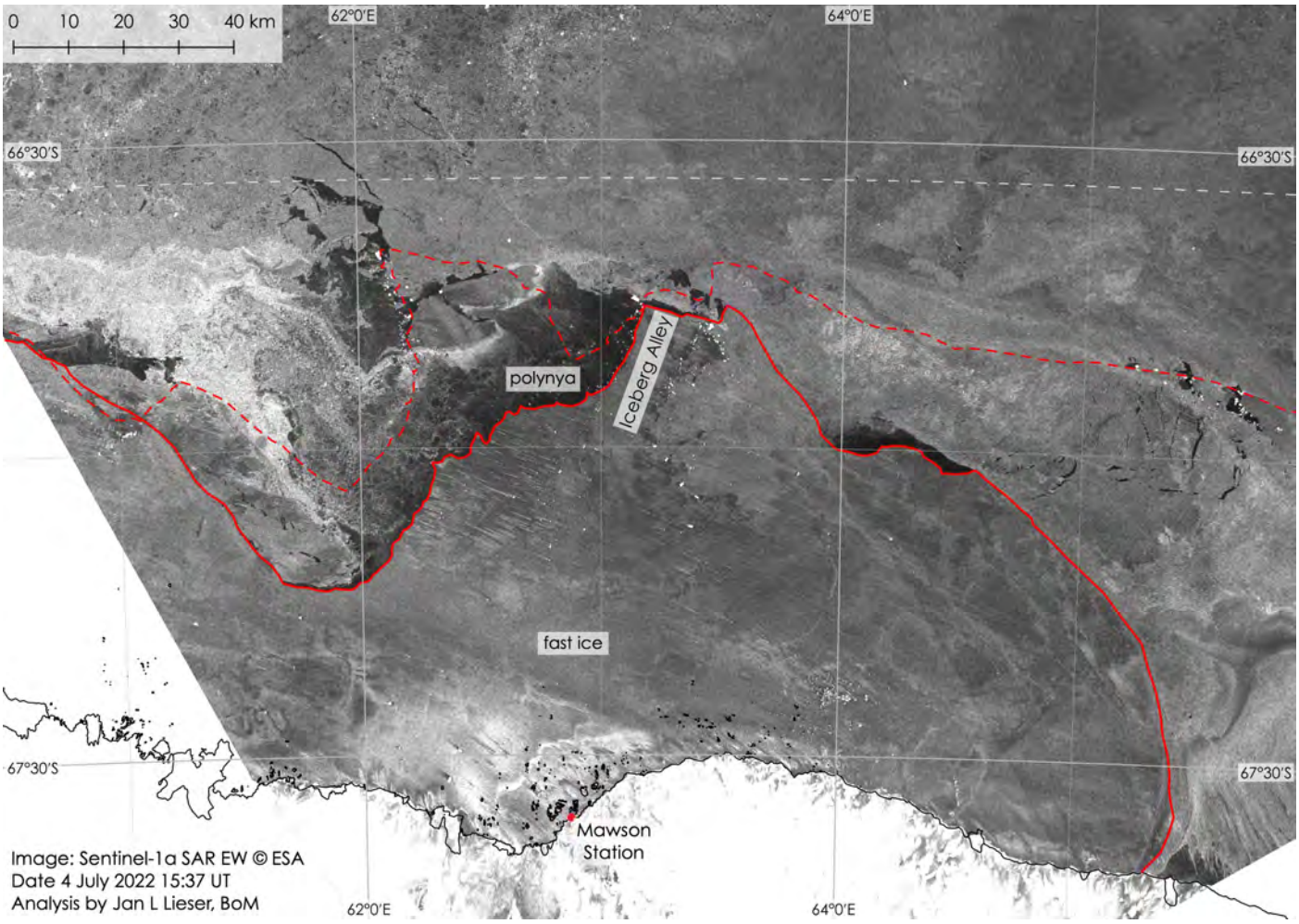


***Figure 1**: Sentinel-1a SAR EW data acquired 4 July 2022 at 15:37 UT and provided by PolarView.*

The fast-ice edge has been moving southward in recent weeks. North of Mawson Station, a polynya is now immediately west of Iceberg Alley. The shortest distance between the station and the polynya northwest of the station is currently roughly 31 nautical miles.

Ice Bulletin: Antarctica

Issued: Tuesday 12th July 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows the pan-Antarctic sea-ice concentration anomaly based on passive microwave remote sensing data.

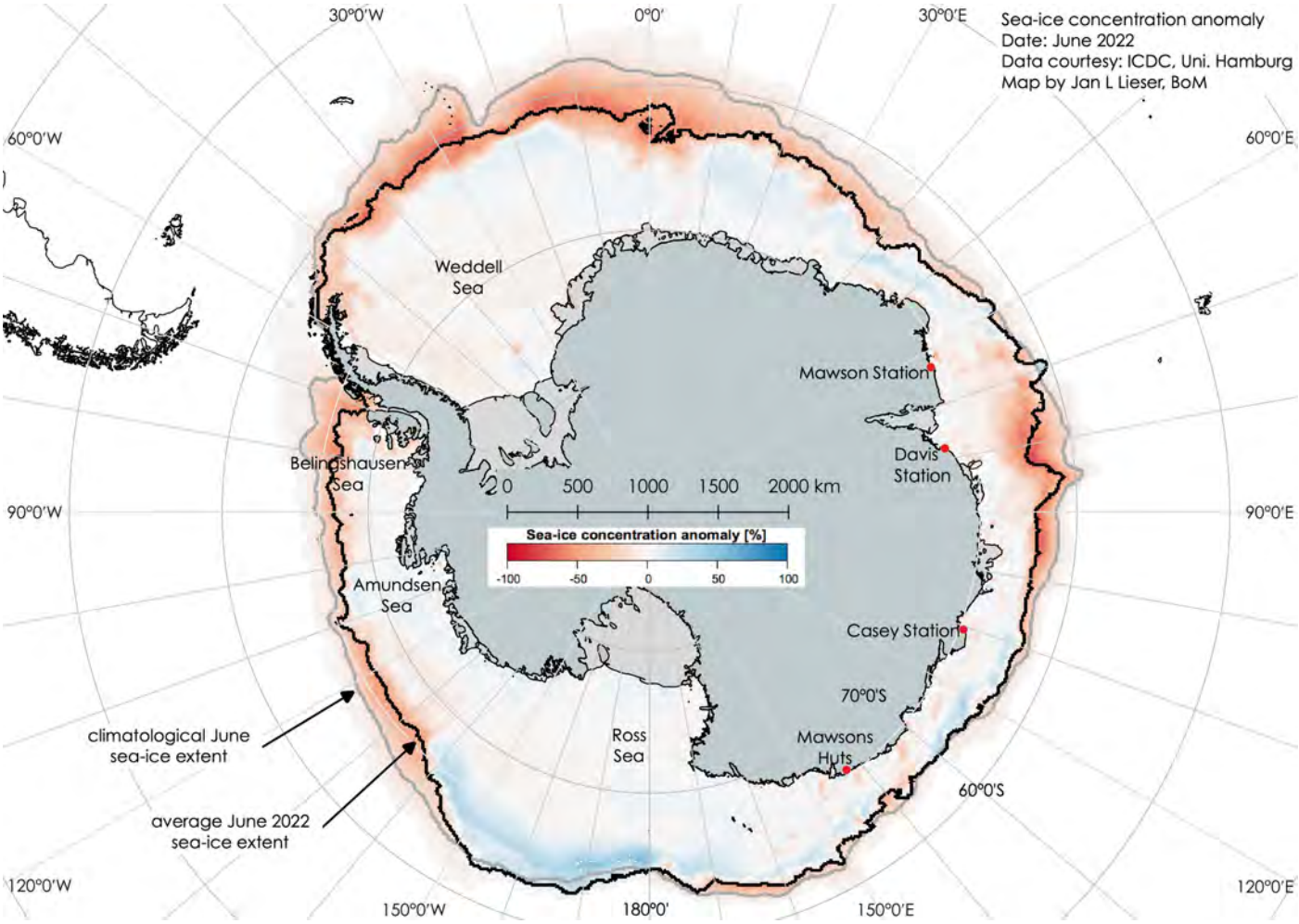


***Figure 1**: Sea-ice concentration anomaly for June 2022 provided by ICDC (Universität Hamburg).*

In June 2022, pan-Antarctic sea-ice conditions reached the lowest June conditions since records began.

Only in isolated areas of East Antarctica and in the central Ross Sea, sea-ice extent reached and partly exceeded climatological values. The rest of the sea-ice zone around the continent exhibited below average sea-ice extent and associated concentration.

In the eastern Weddell Sea near Maud Rise (66º0'S, 3º0'E) and off the West Ice Shelf, the largest negative anomalies are found. It is also noted that the waters around the South Sandwich Islands (along 26º0'W in the northern Weddell Sea) were largely free of sea ice, which is anomalous for this time of year. East of Joinville Island (63º15'S, 55º45'W; at the northern tip of the Antarctic Peninsula), an elongated negative anomaly is understood to be associated with the drift of large iceberg A-76A, which creates a local polynya on its lee side while the iceberg is drifting northward into the southern South Atlantic.

Nearshore west of Mawson Station (at 66º50'S and 61º30'E), another negative anomaly is noted relating to a fast-ice edge that is farther south than typical.

Ice Bulletin: Casey Station

Issued: Friday 15th July 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution SAR data off Casey Station.

The entire scene is covered by some form of ice. Off the Vanderford Ice Shelf, a small polynya is active and further north pack ice and fast ice have closed in.

Off Casey Station, seasonal fast ice has formed nearshore and between the offshore islands, but the fast-ice edge is not positively identified.

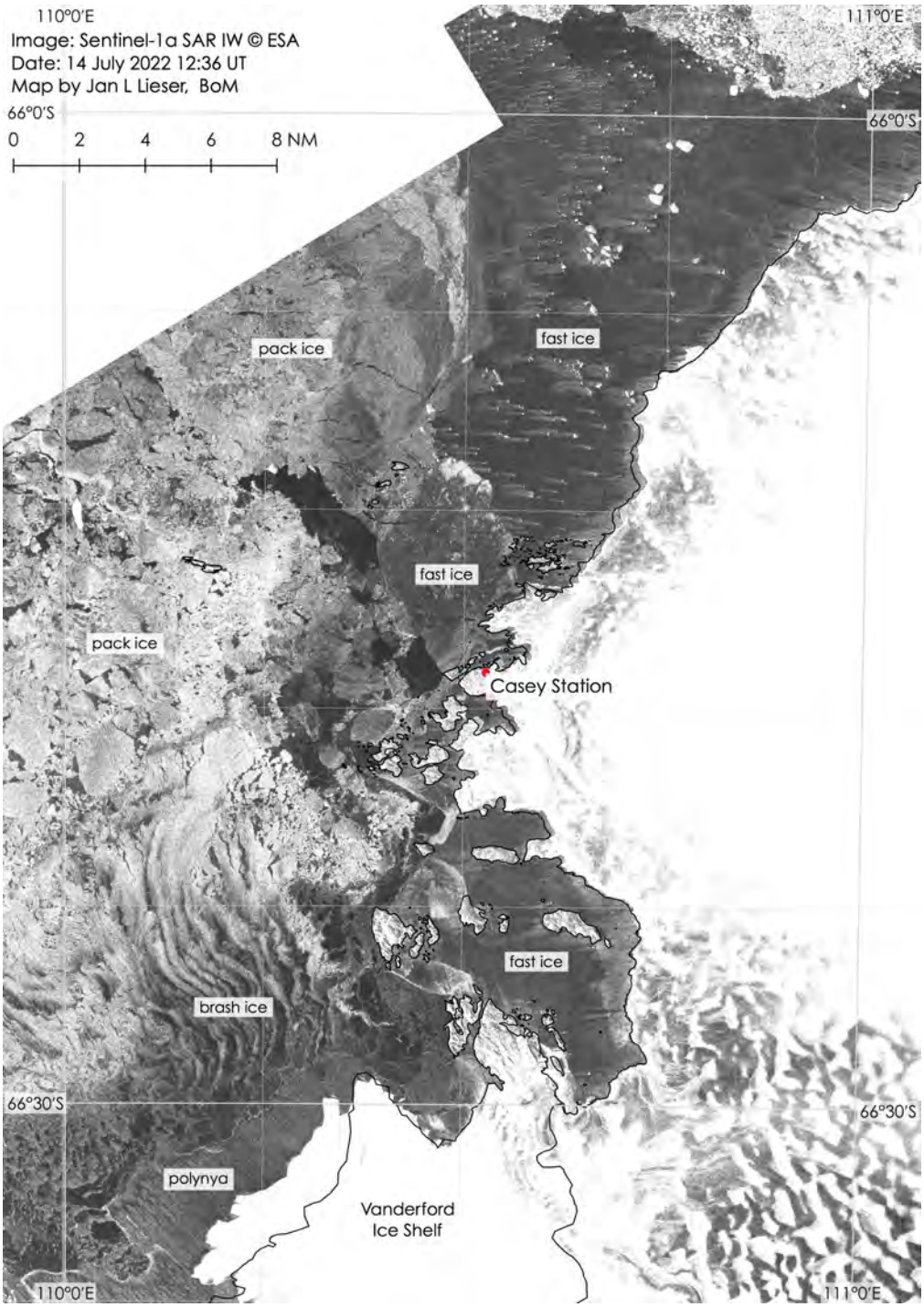


Figure 1: *Sentinel-1a SAR IW data acquired 14 July 2022 at 12:36 UT and provided by PolarView.*

Ice Bulletin: Davis Station

Issued: Friday 15th July 2022

Analyst: Jan Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data of Davis Station and surrounds. The fast-ice edge on 13 June 2022 is outlined by a dashed red line.

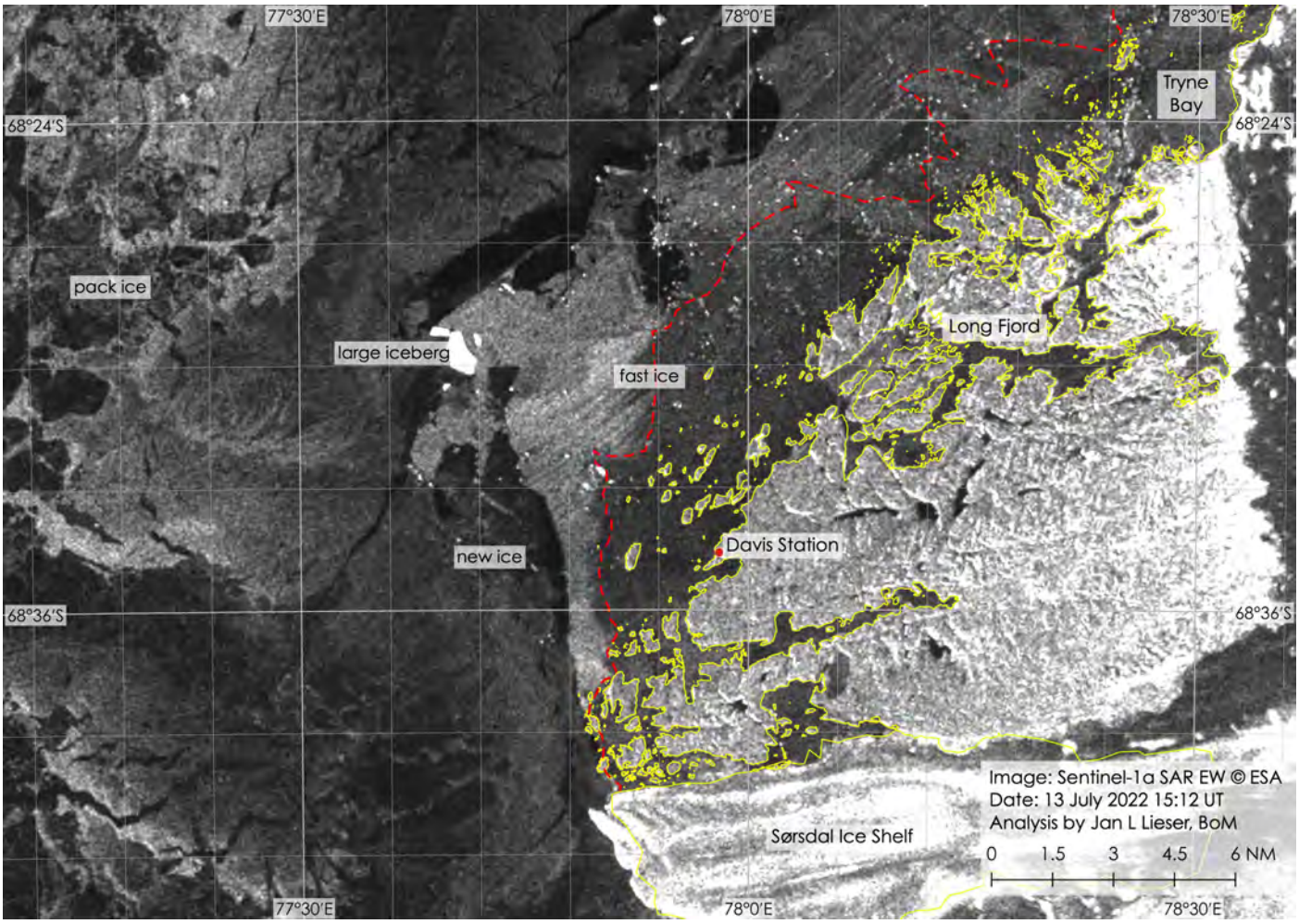


***Figure 1**: Sentinel-1a SAR EW data acquired 13 July 2022 at 15:12 UT and provided by PolarView.*

The entire scene is covered by some form of ice. Off Davis Station, the fast-ice edge has progressed westward temporarily and is enclosing a large iceberg that is grounded offshore. Off the fast-ice edge, new sea ice has grown, and pack ice is present further offshore.

Off the Vestfold Hills, most icebergs offshore are frozen in while some icebergs continue to drift within the pack ice.

Ice Bulletin: Davis Station

Issued: Thursday 21st July 2022

Analyst: Jan Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution SAR data of Davis Station and surrounds. The fast-ice edge is marked by a red line.

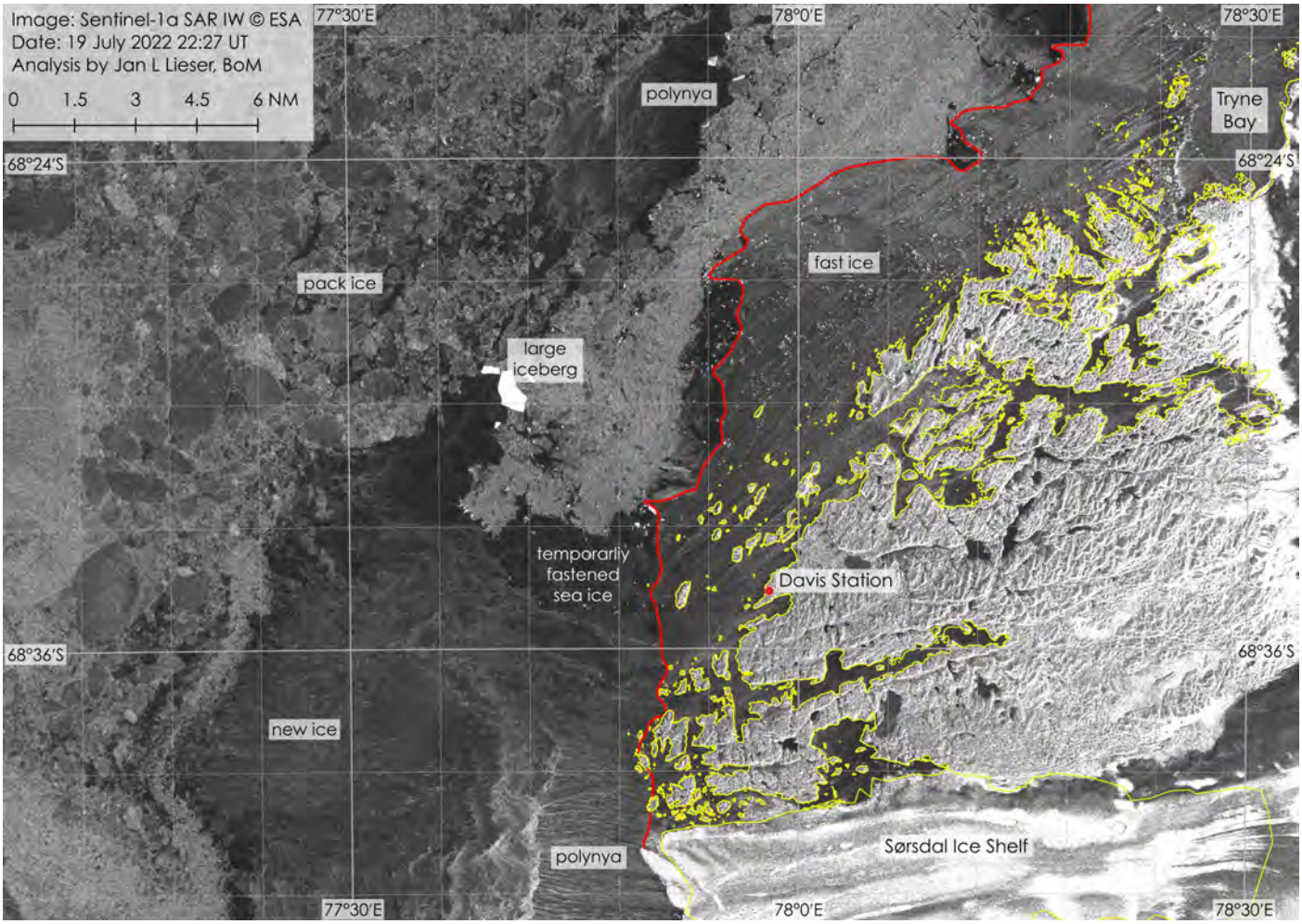


***Figure 1**: Sentinel-1a SAR IW data acquired 19 July 2022 at 22:27 UT and provided by PolarView.*

Off Davis Station, the fast-ice edge had progressed westward temporarily but the ice that was enclosing a large iceberg grounded offshore is broken up again. Off the fast-ice edge, new sea ice is growing, and pack ice is present further offshore.

Off the Vestfold Hills, most icebergs offshore are frozen in and only some icebergs continue to drift within the pack ice.

Ice Bulletin: Mawson Station

Issued: Monday 25th July 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution SAR data west of Mawson Station. The fast-ice edge on 4 July 2022 is marked by a dashed red line. A white diagonal hairline is a stitching artefact where two consecutive SAR scenes connect. The typical route between the station and the Colbeck Archipelago (east of Taylor Ice Shelf) is marked by a green line.

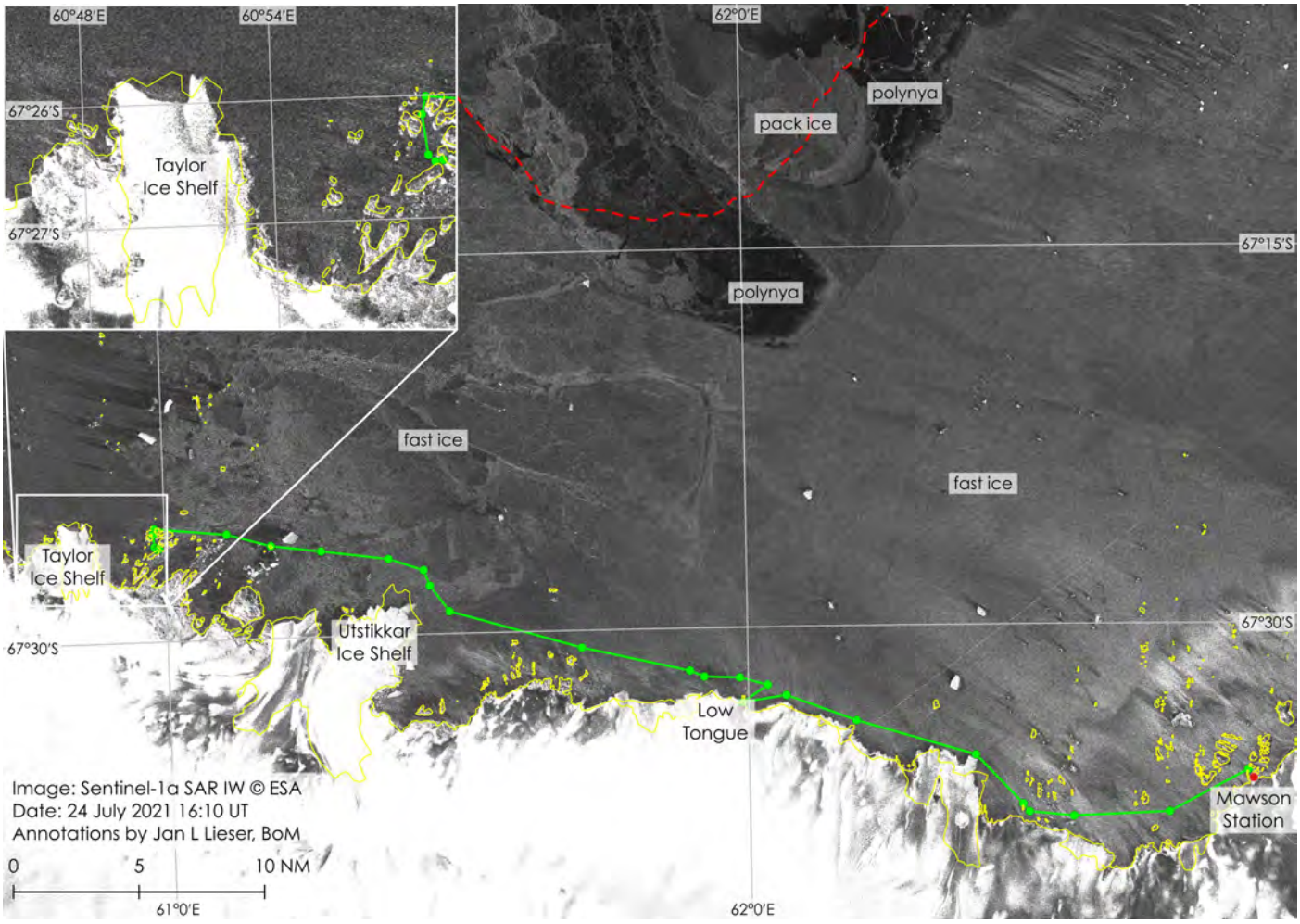


***Figure 1**: Sentinel-1a SAR IW data acquired 24 July 2022 at 16:10 UT and provided by PolarView.*

The fast-ice edge has been moving southward again in recent weeks. The shortest distance between the station and the polynya northwest of the station is currently roughly 25 nautical miles.

Figure 2 shows the fast-ice conditions east of Mawson Station. The typical route between the station and the Macey Islands is marked by a cyan line. The Auster penguin colony is located between grounded icebergs northeast of the Macey Islands.

East and west of Mawson Station, the fast-ice surface appears largely homogenous but wind scouring remains a prominent feature nearshore and between the island off station.

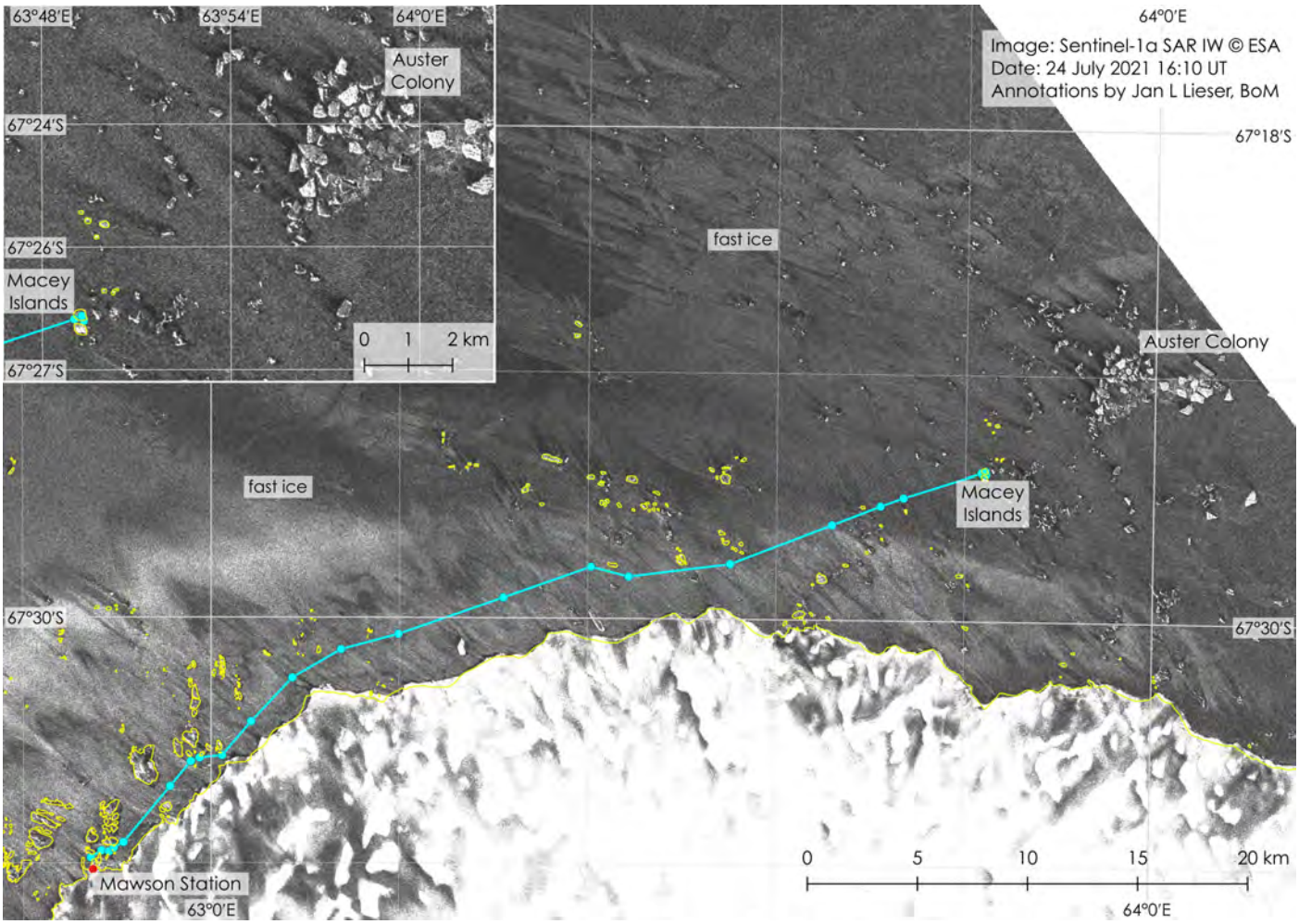


***Figure 2**: Sentinel-1a SAR IW data acquired 24 July 2022 at 16:10 UT and provided by PolarView.*

Ice Bulletin: Casey Station

Issued: Wednesday 27th July 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution SAR data off Casey Station. Fast-ice areas are marked with a red line.

Off Casey Station, recent offshore winds have pushed pack ice further west and created a clear fast-ice edge, which has moved eastward (closer to the shore) as well.

North of the station, the outer fast ice shows already further signs of breaking some clear fractures are visible in the SAR data.

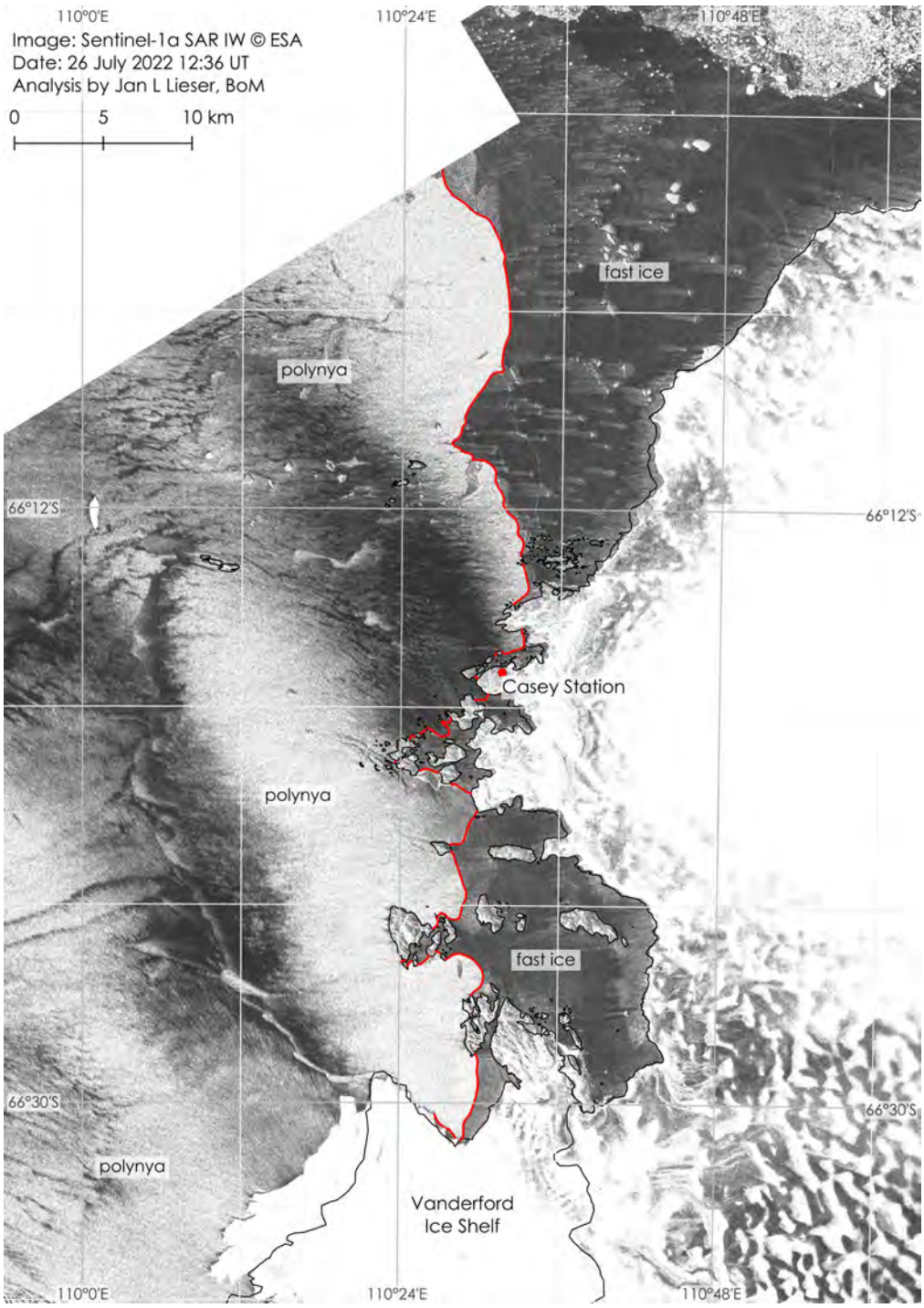


Figure 1: *Sentinel-1a SAR IW data acquired 26 July 2022 at 12:36 UT and provided by PolarView.*

Ice Bulletin: Mill Island

Issued: Thursday 28th July 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data of the eastern Shackleton Ice Shelf around Mill Island. The positions of four large icebergs in the vicinity are marked by pink shapes.

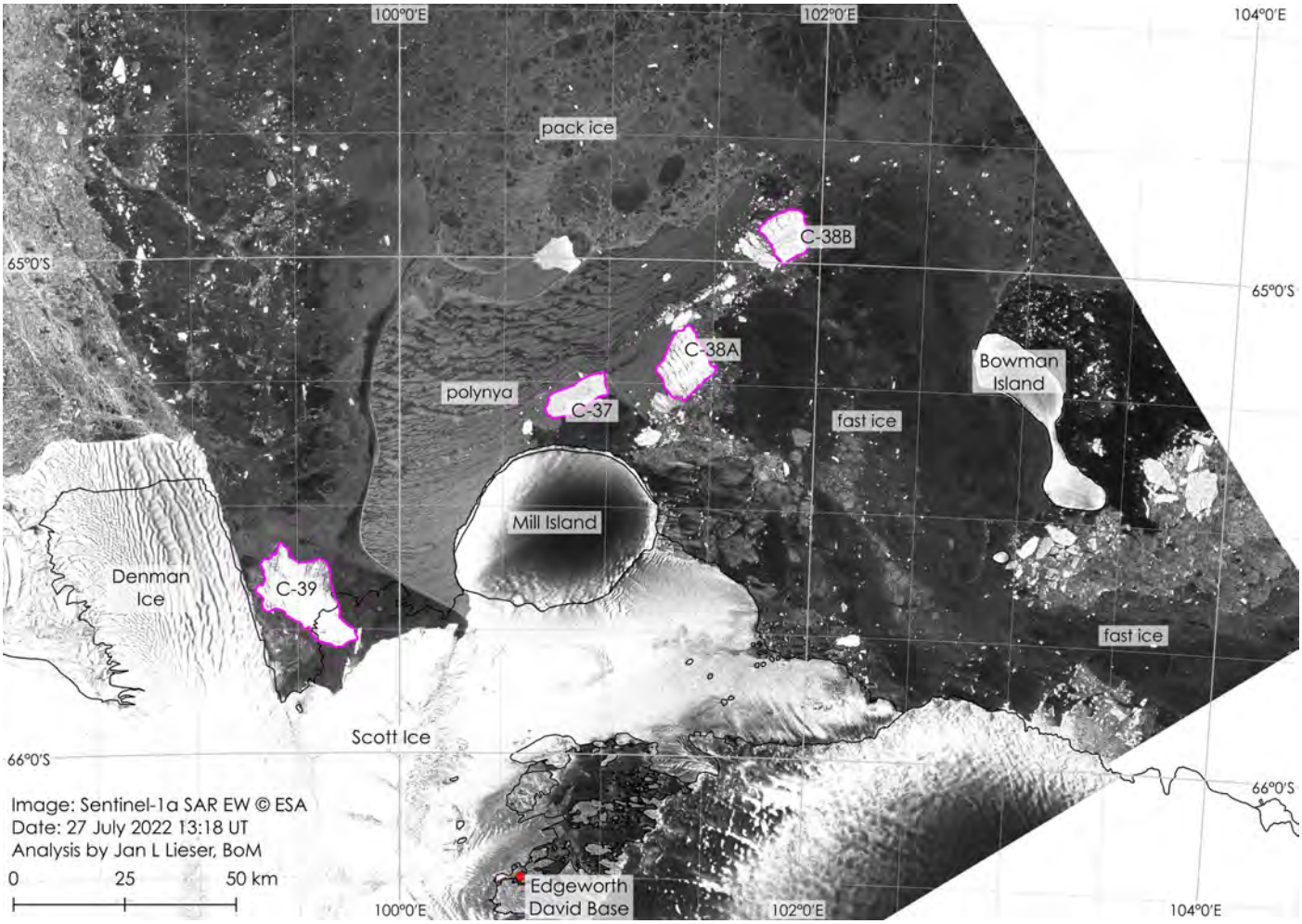


***Figure 1**: Sentinel-1a SAR EW data acquired 27 July 2022 at 13:18 UT and provided by PolarView.*

Since the sea ice consolidated largely in the region, the four large icebergs have not moved significantly but the C-38 icebergs show signs of breakup by spawning smaller icebergs.

A small polynya is present northwest of Mill Island. The sea-ice edge (not shown in the figure) is roughly 150 nautical miles north of the polynya and roughly 70 nautical miles south of the median sea-ice extent for July.

Ice Bulletin: D'Urville Sea

Issued: Friday 29th July 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data of southern D'Urville Sea off Mawson's Huts/Cape Denison. The positions of three large icebergs on 22 July 2021 (roughly one year ago) are shown by dashed pink shapes.

Off Mawson's Huts, fast ice has grown. Further north, icebergs C-15 and C-29 remain grounded but have moved slightly north-westward during the past year.

Iceberg B-9B appears mobile even though it is surrounded and trapped by grounded smaller icebergs and fast ice. Off the north-western side of the iceberg, a bow-shaped crack appears in darker grey and indicates recent movement even with fast ice attached to the iceberg.

Further north, the northern sea-ice edge is between 50 and 100 nautical miles below (south of) the median sea-ice extent for July (not shown in the figure).

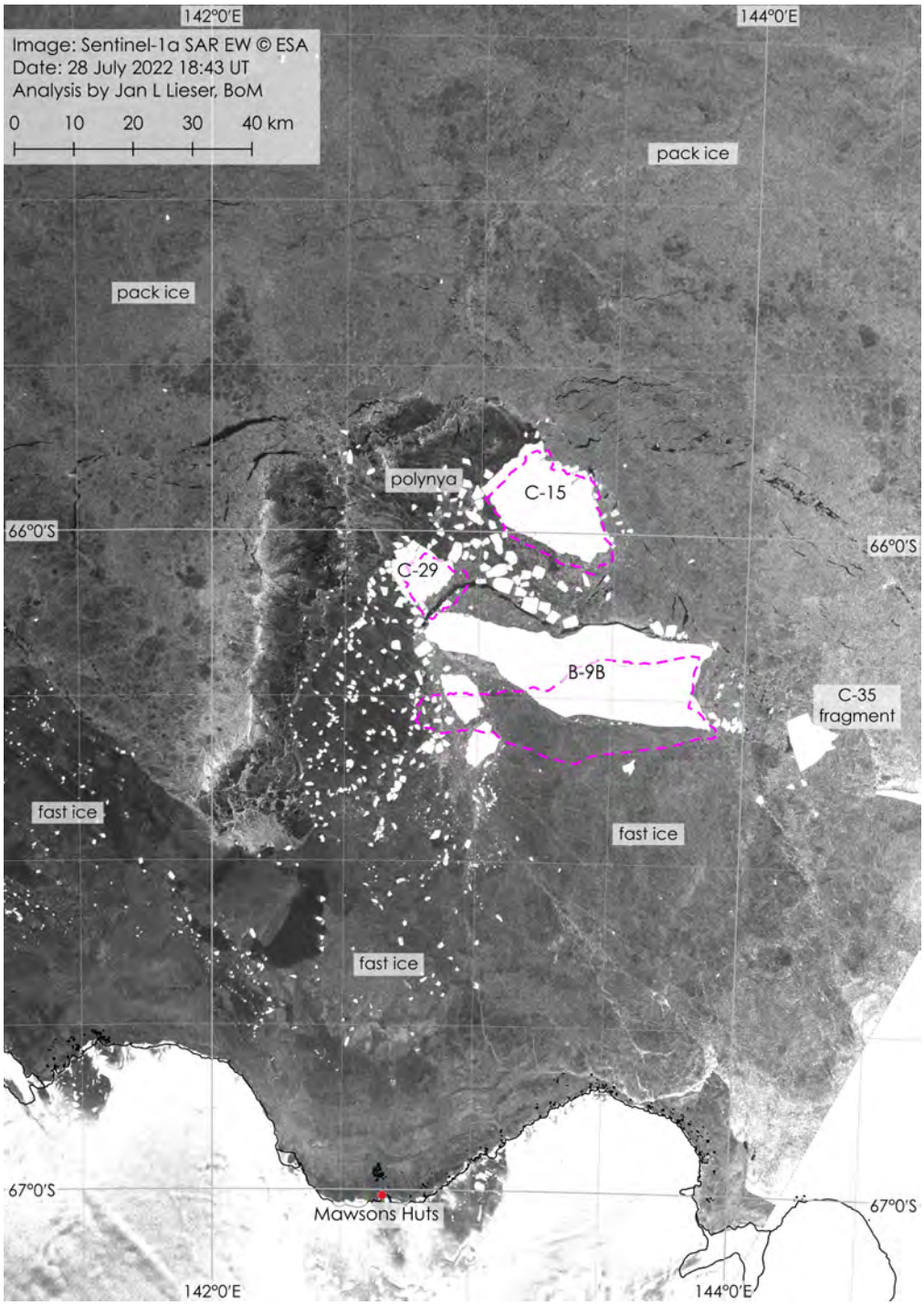


Figure 1: *Sentinel-1a SAR EW data acquired 28 July 2021 at 18:43 UT and provided by PolarView.*

Ice Bulletin: Mawson Station

Issued: Friday 29th July 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Mawson Station.

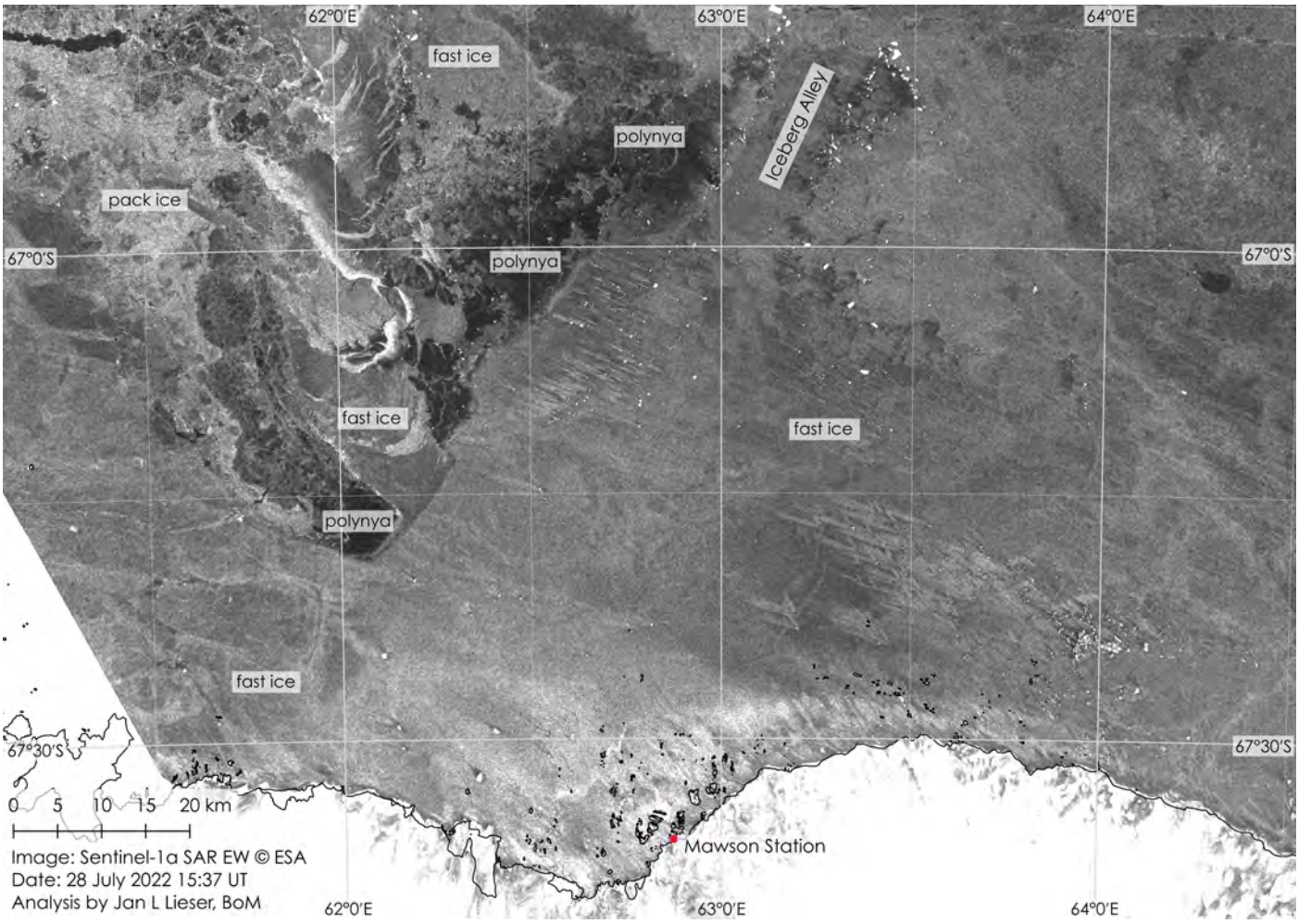


Figure 1: *Sentinel-1a SAR EW data acquired 28 July 2022 at 15:37 UT and provided by PolarView.*

Northwest of the station, small polynyas are reduced in size but active. The shortest distance to open water is roughly 25 km.

The northern sea-ice edge (not shown in the figure) is meandering around the median sea-ice extent for July between 60º0'E and 70º0'E but with a tendency to be below (south of) the median.

Ice Bulletin: Davis Station

Issued: Monday 1st August 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution SAR data of Davis Station and the Vestfold Hills. Fast-ice areas are outlined by red lines.

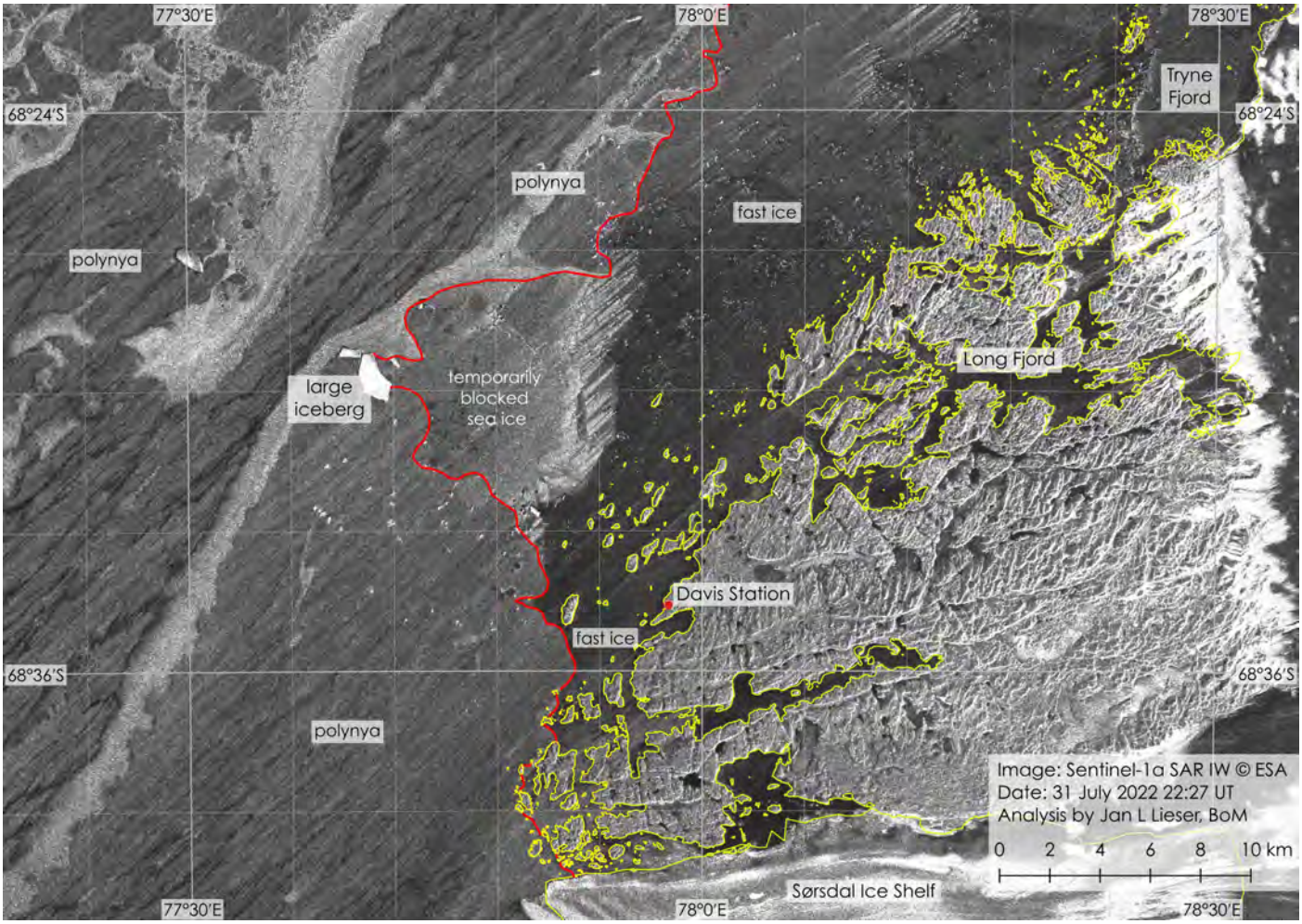


Figure 1: *Sentinel-1a SAR IW data acquired 31 July 2022 at 22:27 UT and provided by PolarView.*

West of Davis Station, some fast ice has broken up recently due to strong wind forcing. Some sea ice and ex-fast ice is temporarily blocked in its south-westward drift by grounded icebergs (including one large one). Off the fast-ice edge, a large polynya is present and new sea ice is forming as grease ice.

Off the Vestfold Hills, most icebergs offshore are frozen in and only some icebergs continue to drift within the pack ice.

Ice Bulletin: Brunt Ice Shelf

Issued: Thursday 4th August 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off the Brunt Ice Shelf in the south-eastern Weddell Sea.

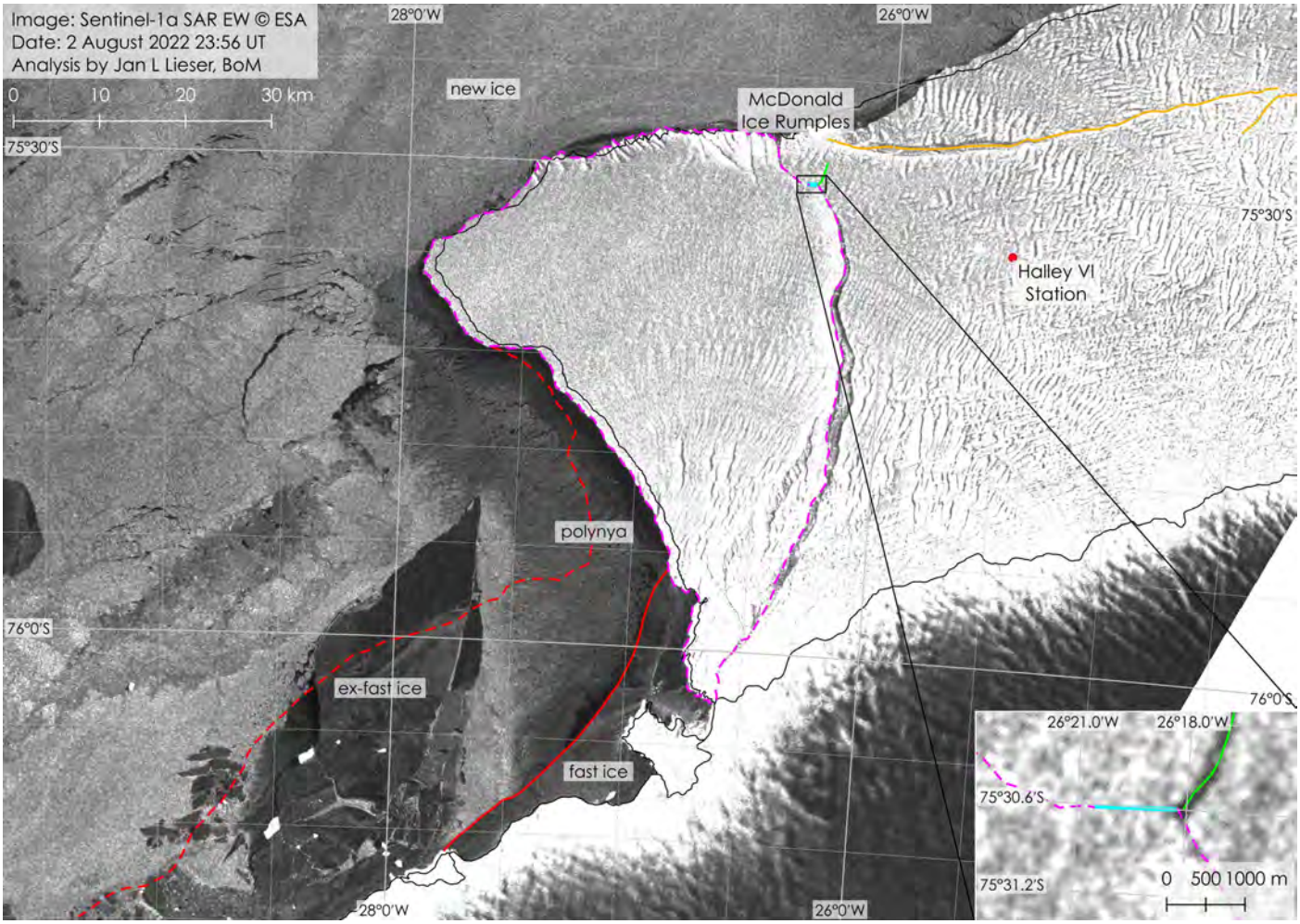


***Figure 1**: Sentinel-1a SAR EW data acquired 2 August 2022 at 23:56 UT and provided by PolarView.*

Cracks continue to develop at the Brunt Ice Shelf. A potential new iceberg (outlined by a dashed pink shape west of Halley-VI Station) has not yet separated from the shelf but a new fissure opened south of the McDonald Ice Rumples north-eastward (marked in green). The last remaining connection between the potential iceberg and the ice shelf is less than 1 km (marked in cyan; see inset). When this last nexus fails, the new iceberg could be roughly 1700 km^2, which compares to the area of Greater Hobart, Tasmania.

During autumn and winter, fast ice had been forming at the southwestern edge of the ice shelf but a large portion of it has recently broken off (the red dashed line marks the fast-ice edge on 23 July 2022 and the solid red the current edge).

Ice Bulletin: Iceberg A-76A

Issued: Thursday 4th August 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off the northern tip of the Antarctic Peninsula in the north-western Weddell Sea.

Iceberg A-76A continues its drift within the marginal ice zone and close to the southern South Atlantic Ocean. During the month of July, the iceberg has turned 90 degrees anti-clockwise westward.

Figure 2 illustrates the bathymetry along which the iceberg has been travelling since March 2022. The iceberg's drift followed closely the peninsula's continental shelf break at the western side of the Weddell Abyssal Plain. Currently, the iceberg is along the western side of the Powell Basin.

In 2020, the large iceberg A-68A followed a similar path and turned north-eastward south of Clarence Island and continued on a north-eastern trajectory from there.

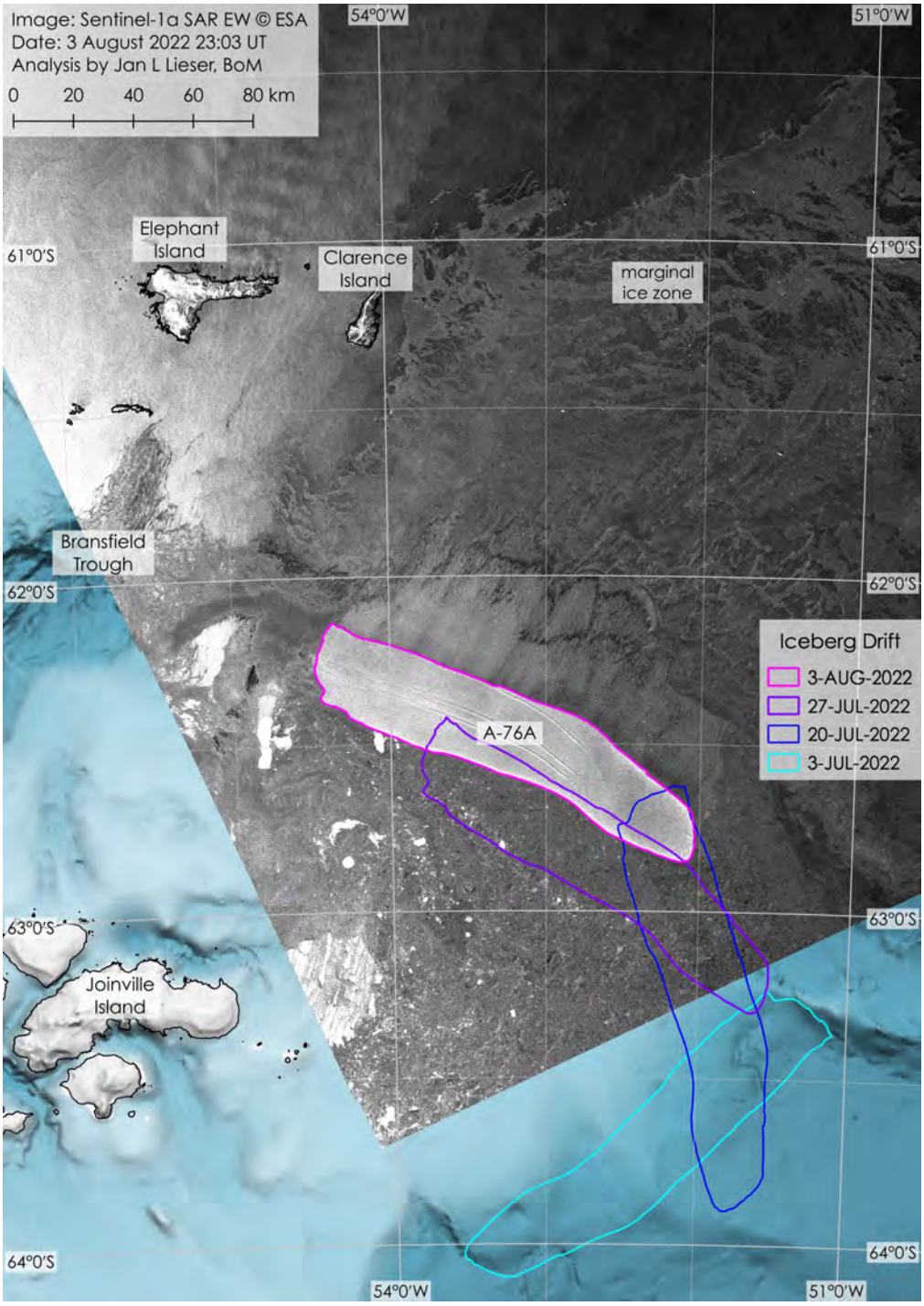


***Figure 1**: Sentinel-1a SAR EW data acquired 3 August 2022 at 23:03 UT and provided by PolarView.*

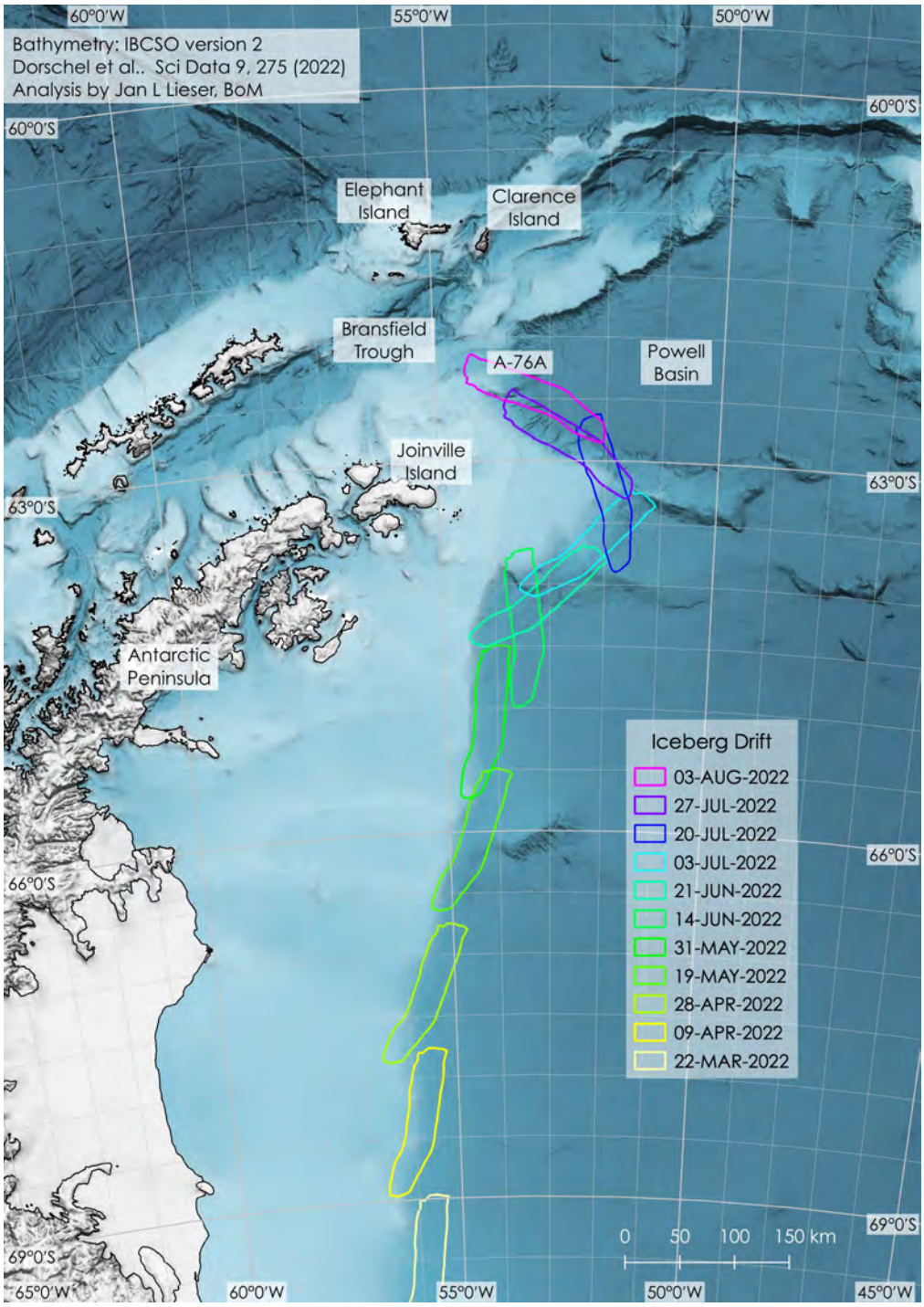


***Figure 2**: Iceberg A-76A drift illustrated by colour-coded shapes; background: The International Bathymetric Chart of the Southern Ocean Version 2 (Dorschel, B. et al. Sci Data **9**, 275, 2022 doi: 10.1038/s41597-022-01366-7).*

Ice Bulletin: Casey Station

Issued: Monday 8th August 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution SAR data off Casey Station. The fast-ice edge is marked by a red line.

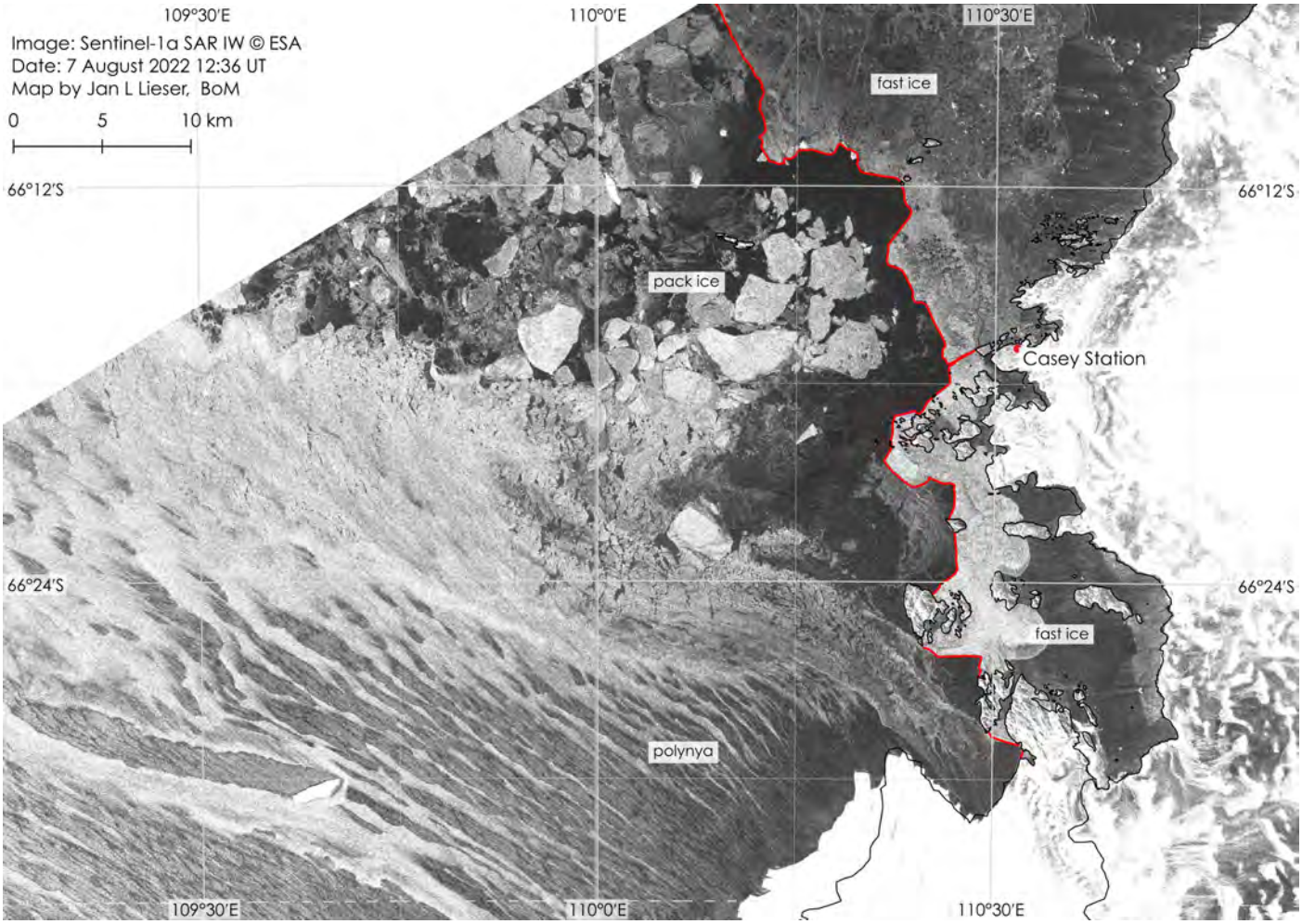


Figure 1: *Sentinel-1a SAR IW data acquired 7 August 2022 at 12:36 UT and provided by PolarView.*

West of Casey Station, the fast-ice edge has progressed westward during the past two weeks. Two different types of fast ice can be identified offshore, where nearshore fast ice appears smooth (dark) and outer fast ice appears rough (lighter grey). This outer fast ice is prone to break out under stormy conditions.

North of the station, the northern sea-ice edge (not shown in the figure) is meandering between 30 and 70 nautical miles below (south of) median sea-ice extent for August.

Ice Bulletin: Davis Station

Issued: Monday 8th August 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Davis Station. The fast-ice edge is marked by a red line.

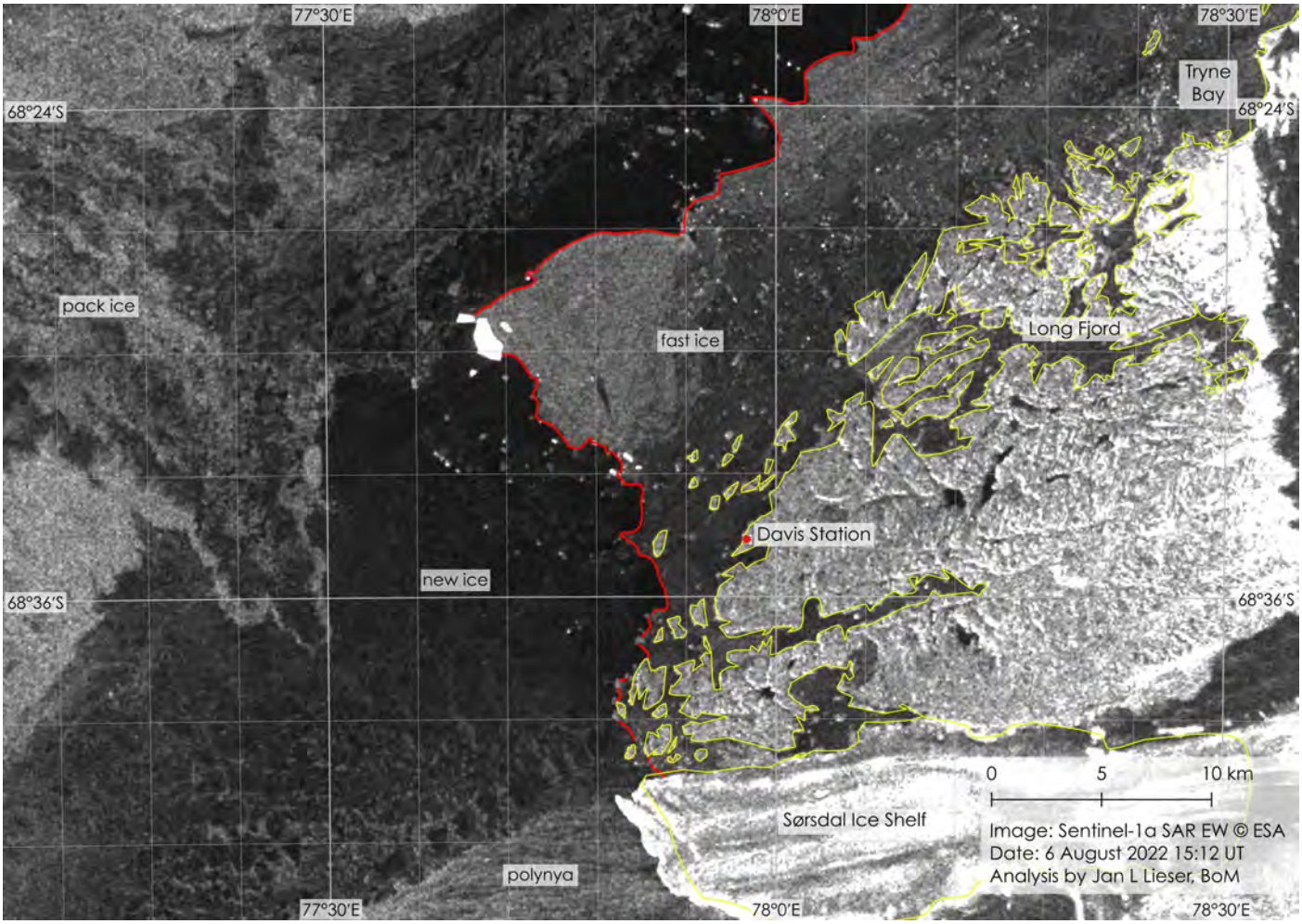


Figure 1: *Sentinel-1a SAR EW data acquired 6 August 2022 at 15:12 UT and provided by PolarView.*

West of the station, the fast-ice edge is only 2.5 nautical miles away from the shore. North of the Vestfold Hills, the fast-ice edge has not changed significantly during the past week.

North of Davis Station, the northern sea-ice edge (not shown in the figure) is roughly 90 nautical miles below (south of) median sea-ice extent for August.

Ice Bulletin: Mawson Station

Issued: Monday 8th August 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution SAR data off Mawson Station. A diagonal hairline is a stitching artefact where two consecutive scenes join.

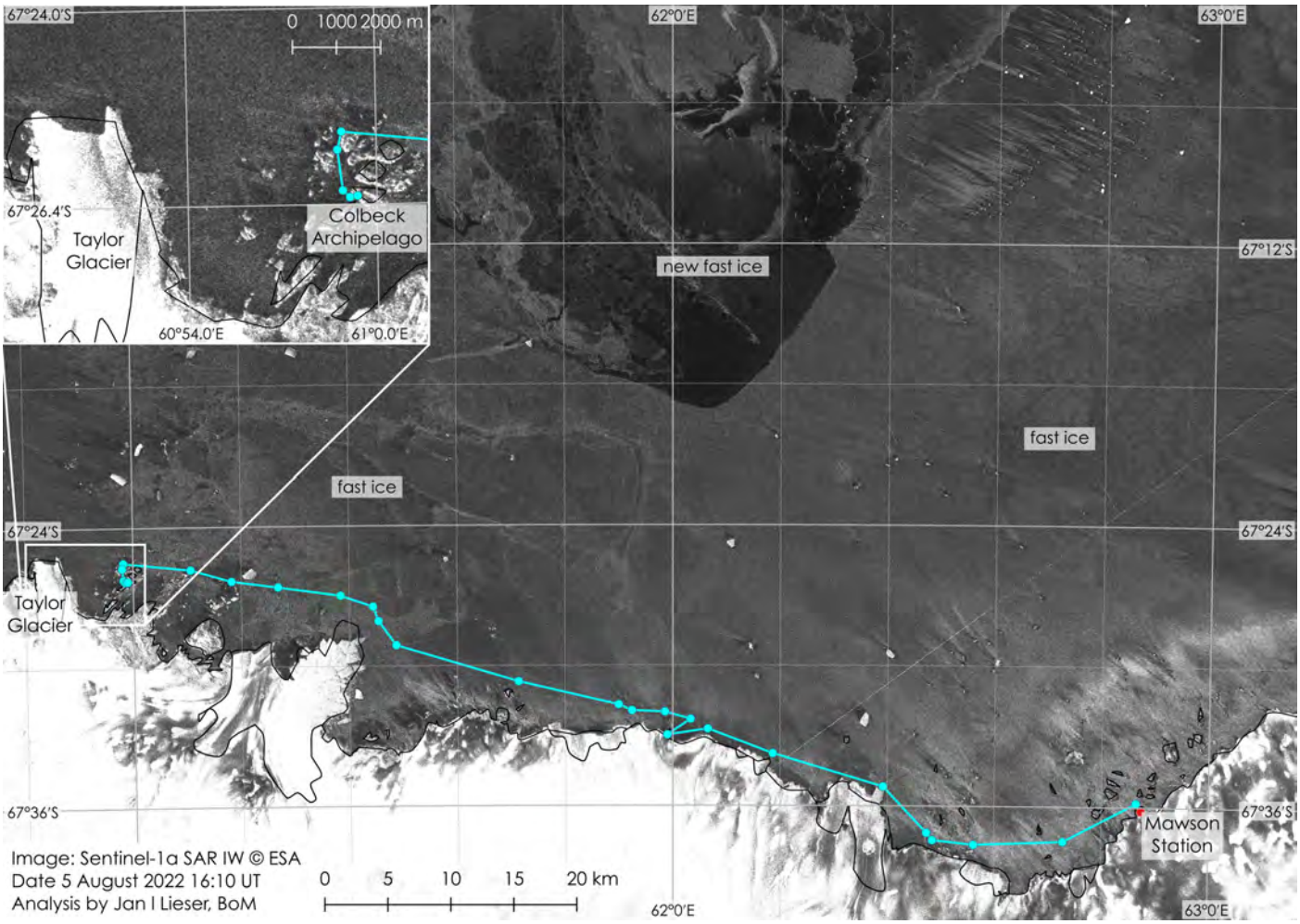


Figure 1: *Sentinel-1a SAR IW data acquired 5 August 2022 at 16:10 UT and provided by PolarView.*

Northwest of the station, the southern polynya is temporarily frozen over by new ice that is locked in place. The distance to the nearest open water further north (outside of the figure) is roughly 39 nautical miles.

North of Mawson Station, the northern sea-ice edge (not shown in the figure) is roughly 80 nautical miles below (south of) median sea-ice extent for August.

Ice Bulletin: Antarctica

Issued: Wednesday 10th August 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows the pan-Antarctic sea-ice concentration anomaly based on passive microwave remote sensing data.

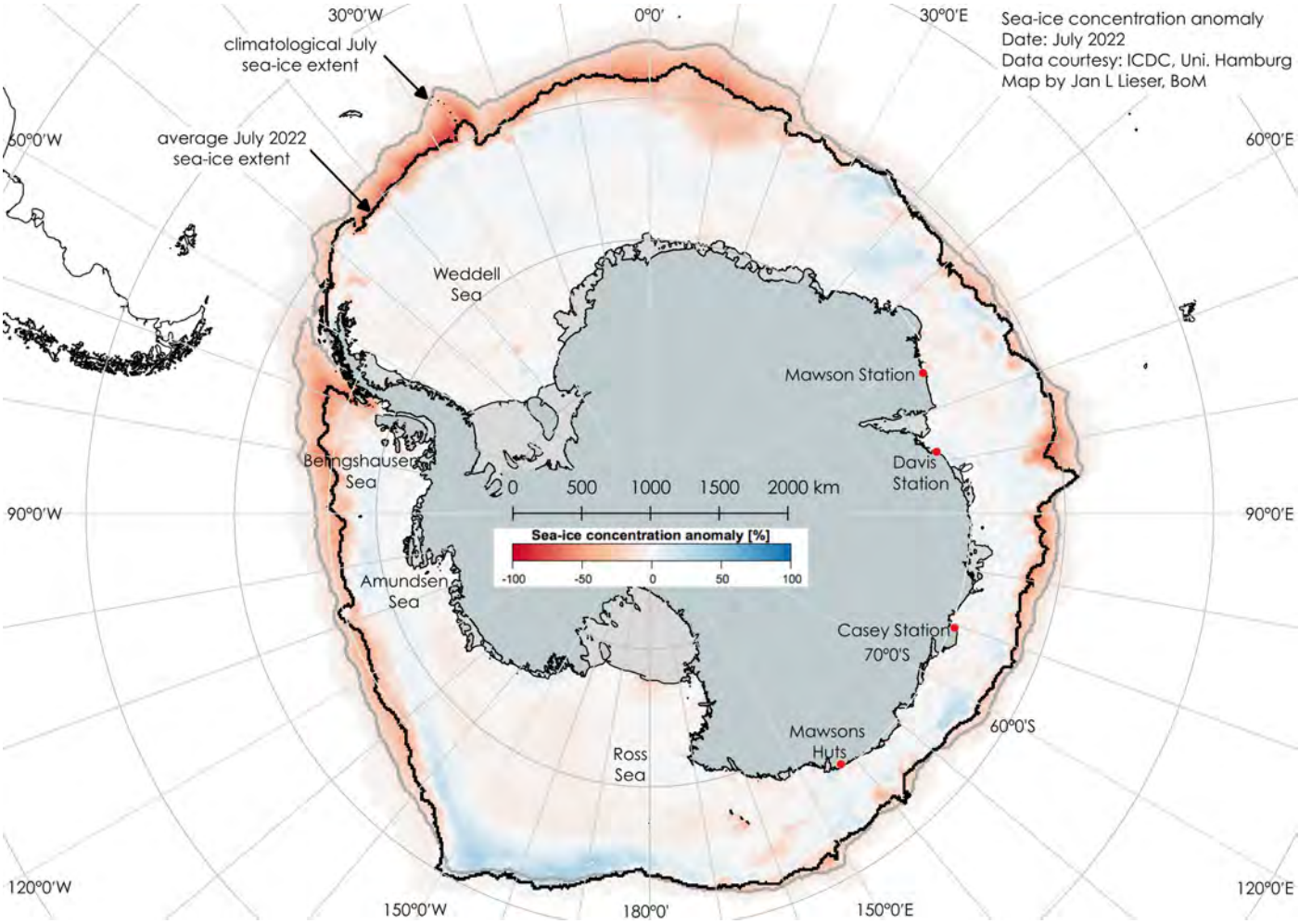


***Figure 1**: Sea-ice concentration anomaly for July 2022 provided by ICDC (Universität Hamburg).*

In July 2022, pan-Antarctic sea-ice conditions ranked again the lowest monthly (July) conditions since records began.

Only in isolated areas of East Antarctica and in the central Ross Sea, sea-ice extent reached and partly exceeded climatological values. The rest of the sea-ice zone around the continent exhibited below average sea-ice extent and associated concentration.

The largest negative anomalies are found in the northern Weddell Sea, in East Antarctic between 70º0'E and 110º0'E and west of the Antarctic Peninsula. It is again noted that the waters around the South Sandwich Islands (along 26º0'W in the northern Weddell Sea) were largely free of sea ice, which is still anomalous for this time of year. Northeast of Joinville Island (63º15'S, 55º45'W; at the northern tip of the Antarctic Peninsula), an elongated negative anomaly is understood to be associated with the drift of large iceberg A-76A, which creates a local polynya on its lee side while the iceberg is drifting northward into the southern South Atlantic.

Ice Bulletin: Iceberg A-76A

Issued: Friday 12th August 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows visible data off the northern tip of the Antarctic Peninsula in the north-western Weddell Sea.

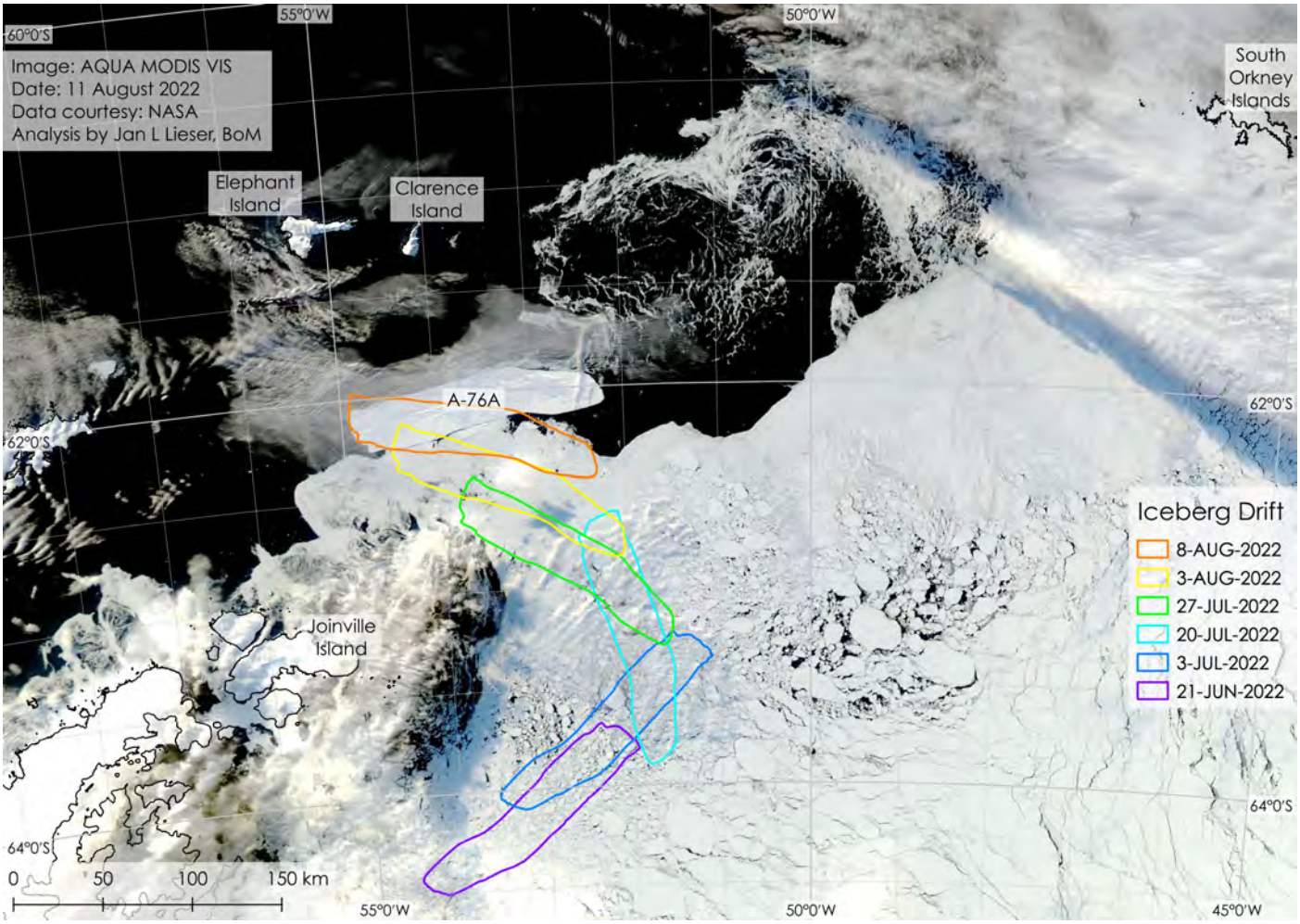


***Figure 1**: AQUA MODIS VIS data acquired 11 August 2022 and provided by NASA.*

As previously anticipated, iceberg A-76A has now exited the marginal ice zone and and is entering the southern South Atlantic Ocean but remains along the western side of the Powell Basin (centred roughly at 50º0'W and 62º0'S).

In 2020, the large iceberg A-68A followed a similar path and turned north-eastward south of Clarence Island and continued on a north-eastern trajectory from there.

Ice Bulletin: Davis Station

Issued: Wednesday 17th August 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Davis Station. The fast-ice edge is marked by a red line (dashed red for 6 August 2022).

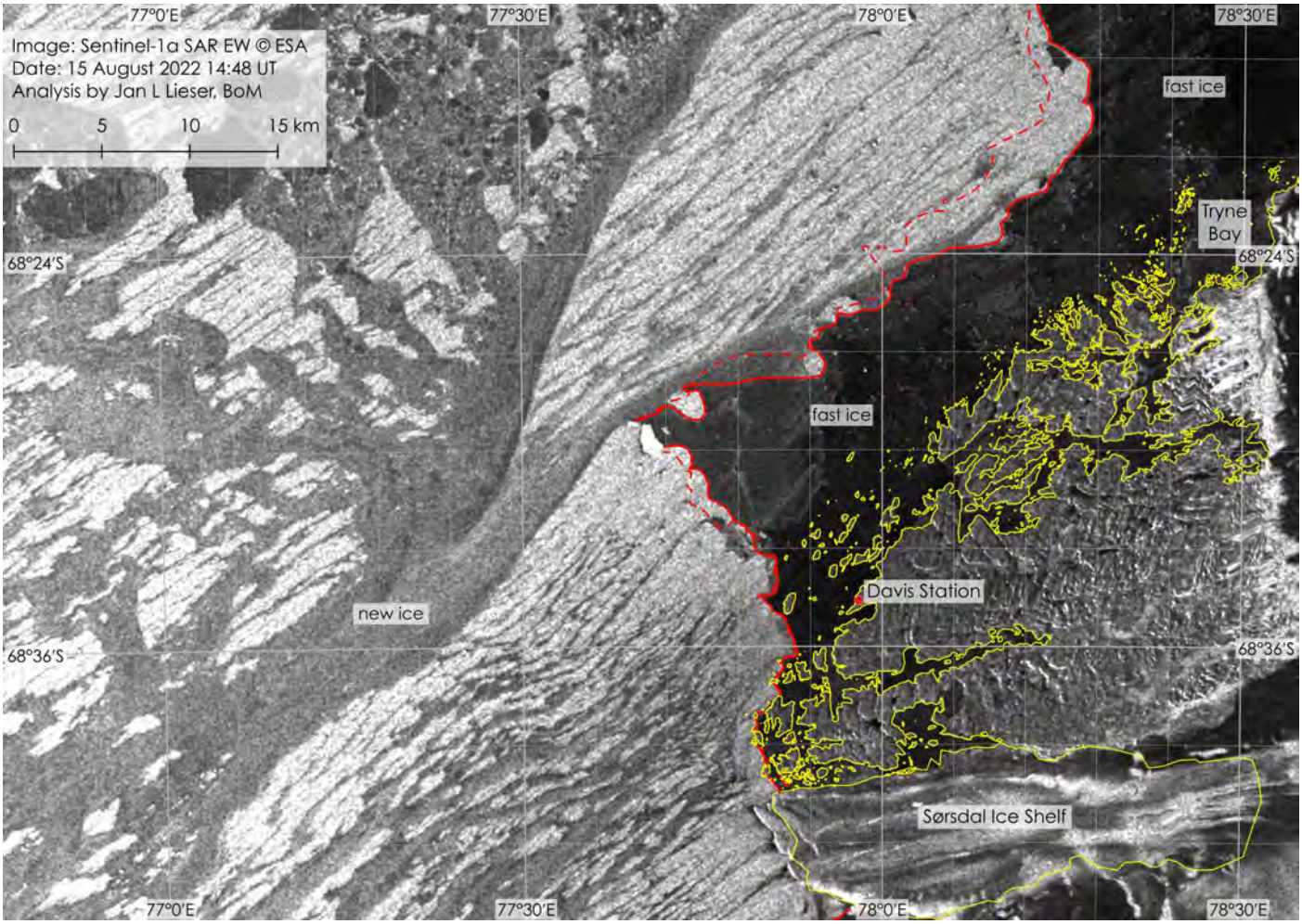


Figure 1: *Sentinel-1a SAR EW data acquired 14 August 2022 at 14:48 UT and provided by PolarView.*

West of the station, the fast-ice edge remains only 2.5 nautical miles away from the shore. North of the Vestfold Hills, the fast-ice edge has moved closer to the shore during the past week.

North of Davis Station, the northern sea-ice edge (not shown in the figure) is roughly 130 nautical miles below (south of) median sea-ice extent for August.

Ice Bulletin: Mawson Station

Issued: Thursday 18th August 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution SAR data off Mawson Station. The fast-ice edge is marked by a red line.

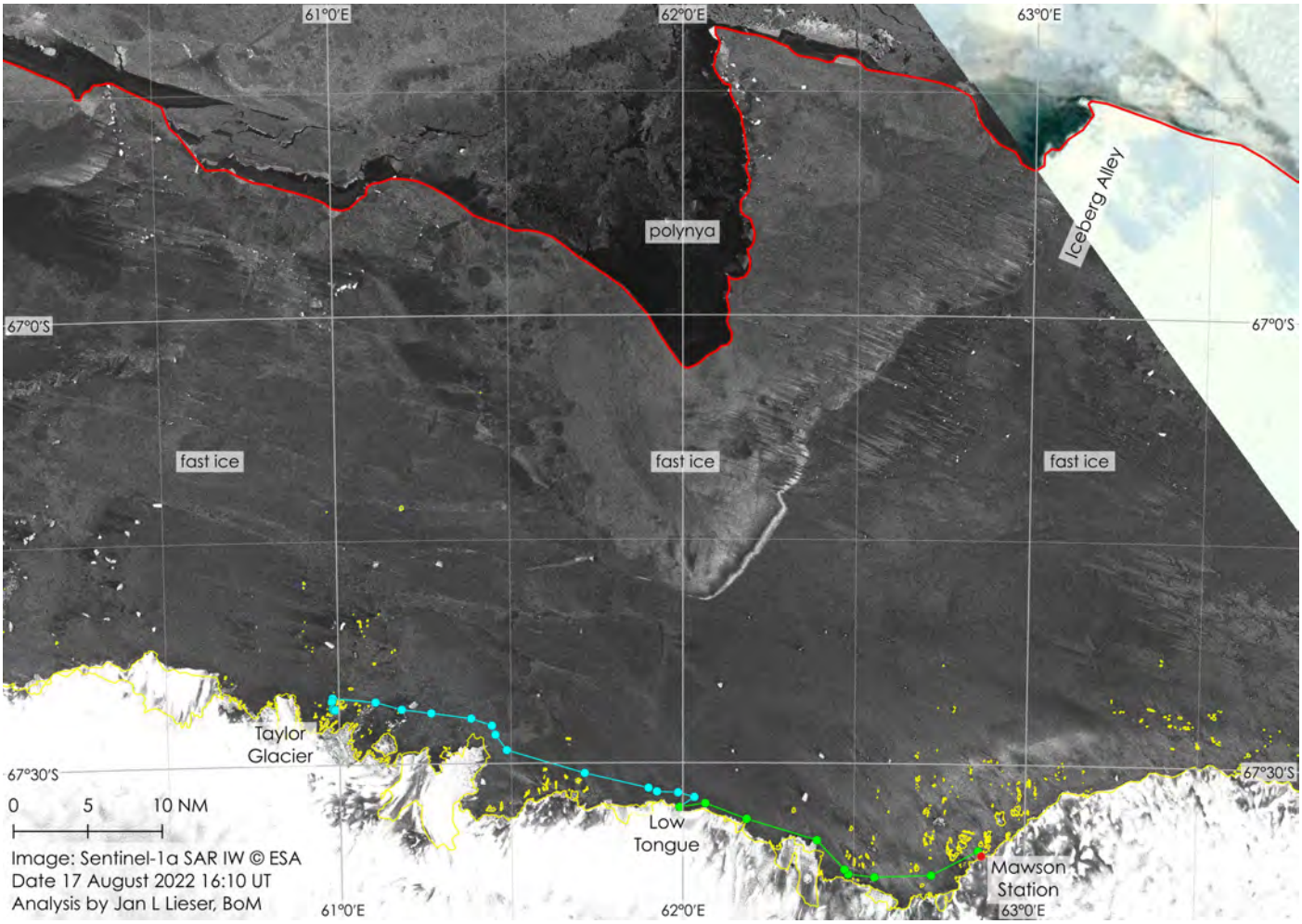


Figure 1: *Sentinel-1a SAR IW data acquired 17 August 2022 at 16:10 UT and provided by PolarView; complemented by AQUA MODIS VIS data acquired 17 August 2022 and provided by NASA.*

West of Mawson Station, the fast ice appears largely homogenous and not many icebergs are frozen in nearshore. Northwest of the station, the distance to nearest open water of the polynya is roughly 38 nautical miles.

North of Mawson Station, the northern sea-ice edge (not shown in the figure) is meandering and 40–70 nautical miles below (south of) median sea-ice extent for August.

Ice Bulletin: D'Urville Sea

Issued: Thursday 18th August 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution SAR data of southern D'Urville Sea off Mawson's Huts/Cape Denison. The positions of three large icebergs on 5 July 2022 are shown by dashed pink shapes.

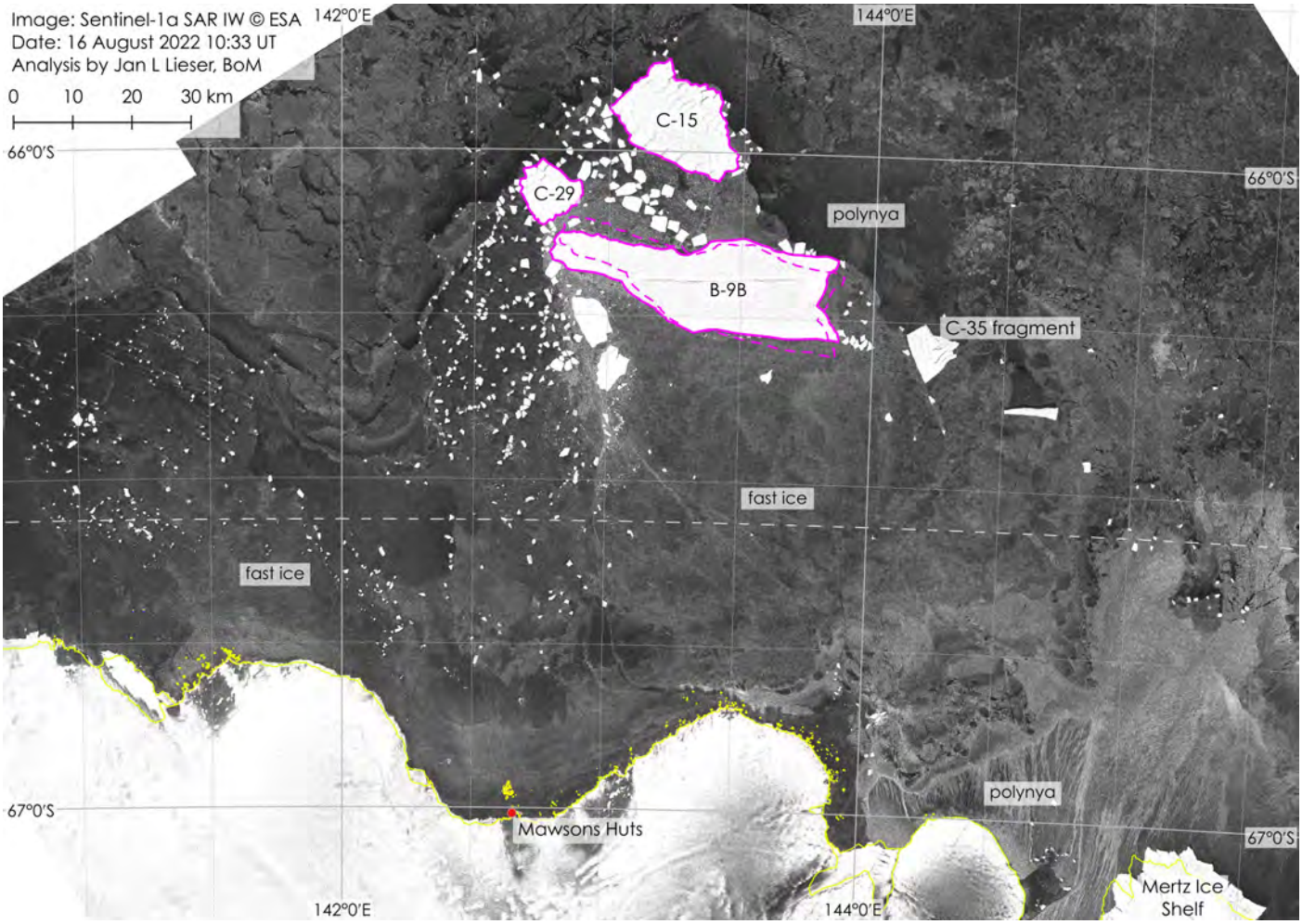


Figure 1: *Sentinel-1a SAR IW data acquired 16 August 2022 at 10:33 UT and provided by PolarView.*

Off Mawson's Huts, fast ice has grown. Further north, icebergs C-15 and C-29 remain grounded but iceberg B-9B appears mobile even though it is surrounded and trapped by grounded smaller icebergs and fast ice. South of the western side of the iceberg, two larger icebergs are also slightly mobile within the fast ice. Furthermore, iceberg B-9B is pushing small but grounded icebergs at its north-eastern side northward and therefore working to eventually free itself from the trap of small icebergs it is surrounded by.

The northern sea-ice edge (not shown in the figure) is within a few nautical miles of the median sea-ice extent for August.

Ice Bulletin: Totten Ice Shelf

Issued: Friday 19th August 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data of the Totten Ice Shelf east of Law Dome.

During late-July 2022, roughly 173 km^2 of the north-western front of the ice shelf broke off (shaded pink in the top panel of the figure) and formed many small to medium-sized icebergs and only one larger iceberg (roughly 28 km^2) that are all drifting northward.

So far this winter, fast ice has only been forming further west along the shore of Law Dome and further north between grounded icebergs. In front of the Totten Ice Shelf is drifting pack ice and occasionally a small temporary polynya that is formed by offshore winds.

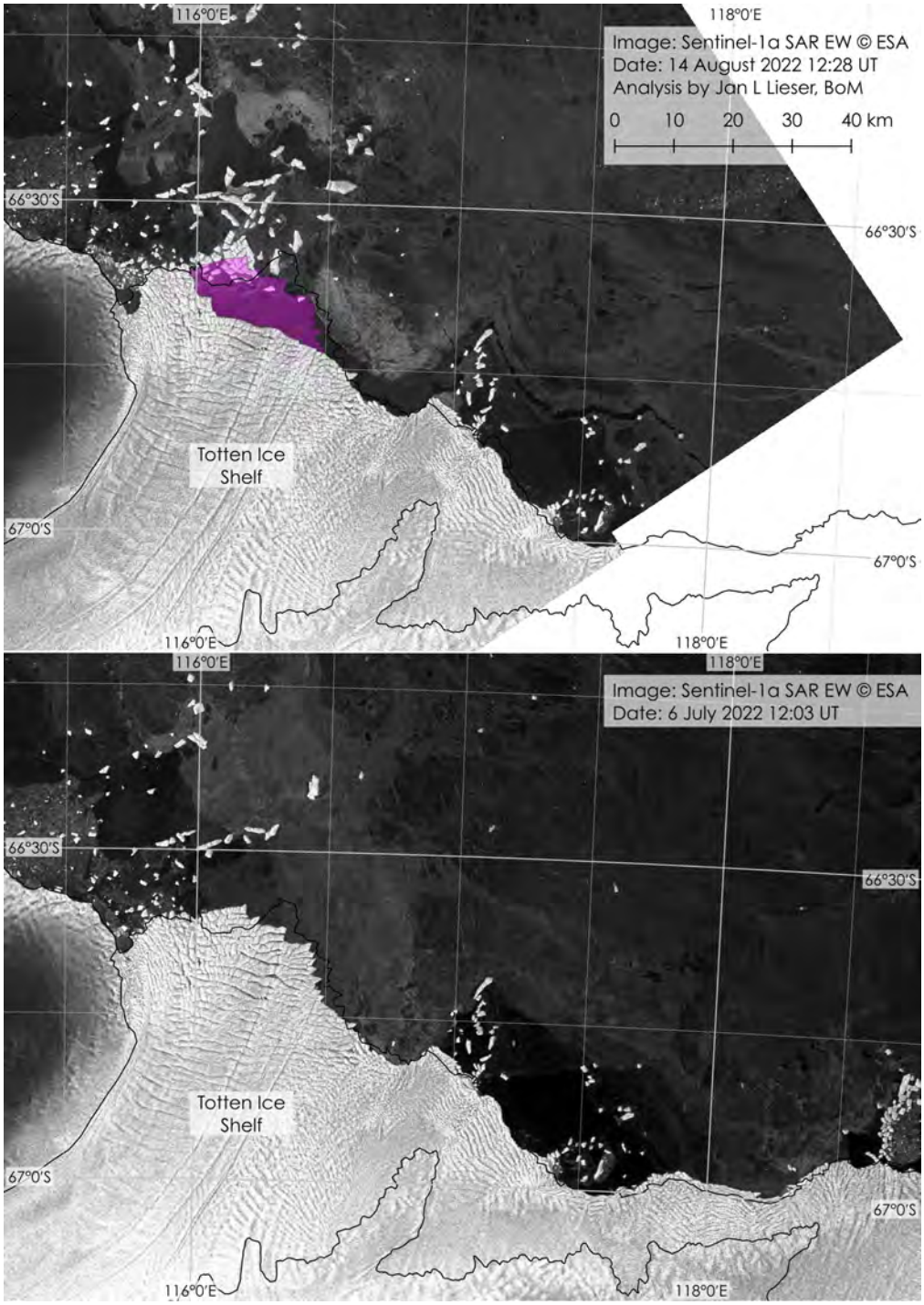


***Figure 1**: Top Panel: Sentinel-1a SAR EW data acquired 14 August 2022 at 12:28 UT; Bottom Panel: Sentinel-1a SAR EW data acquired 6 July 2022 at 12:28 UT; both provided by PolarView.*

Ice Bulletin: Mill Island

Issued: Friday 26th August 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution visible data of the eastern Shackleton Ice Shelf around Mill Island. The positions of four large icebergs in the vicinity are marked by pink shapes.

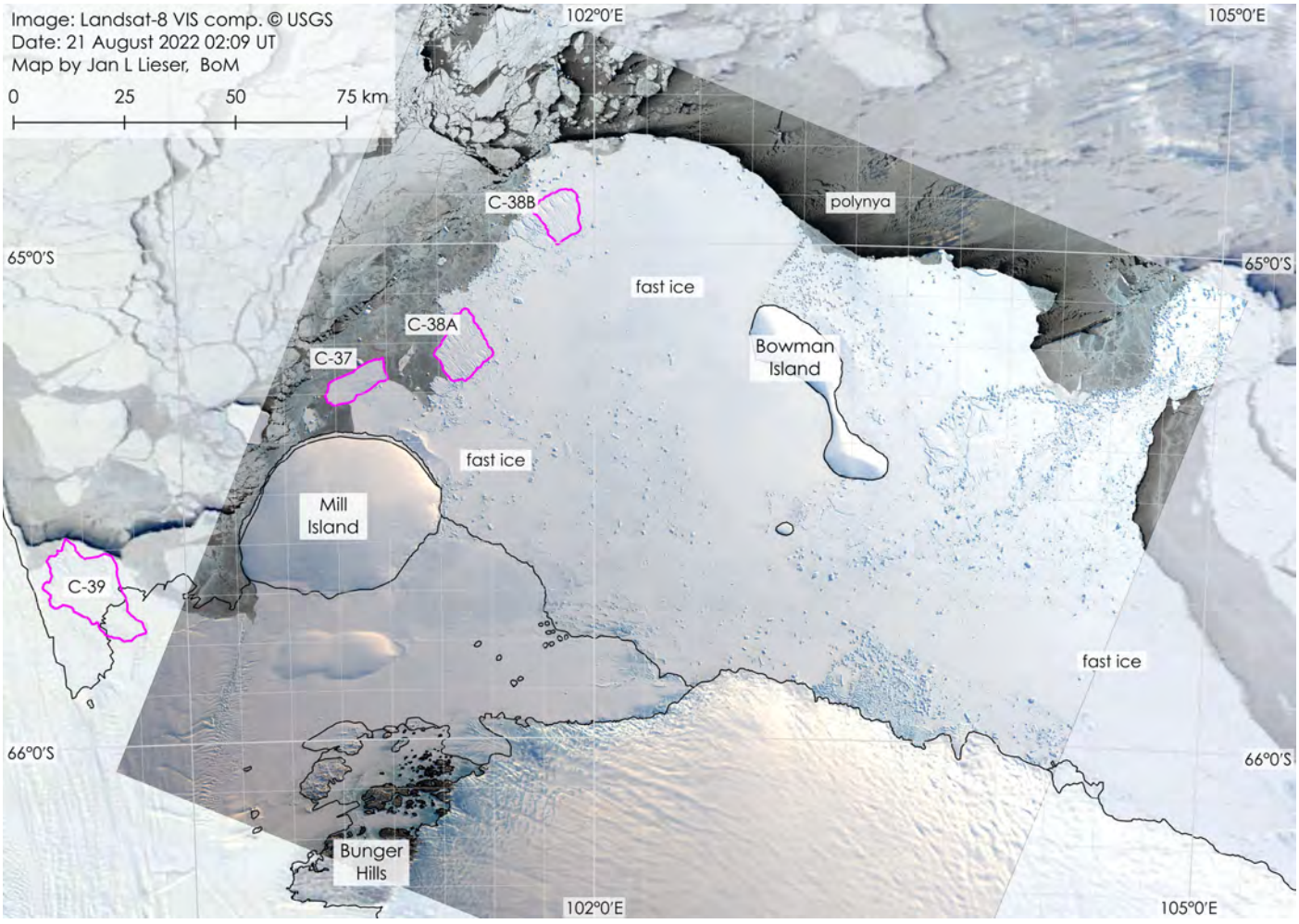


***Figure 1**: Landsat-8 visible composite data acquired 21 August 2022 at 02:09 UT and provided by USGS; Background: TERRA MODIS VIS data acquired 21 August 2022 and provided by NASA.*

Since the fast ice consolidated between Mill Island and Bowman Island, the four large icebergs have not moved but the C-38 icebergs show signs of breakup by spawning smaller icebergs.

A small polynya is frozen over north of both islands. The northern sea-ice edge (not shown in the figure) is between 20 and 80 nautical miles south of the median sea-ice extent for August.

Ice Bulletin: Wilkins Aerodrome

Issued: Monday 29th August 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of Wilkins Aerodrome.

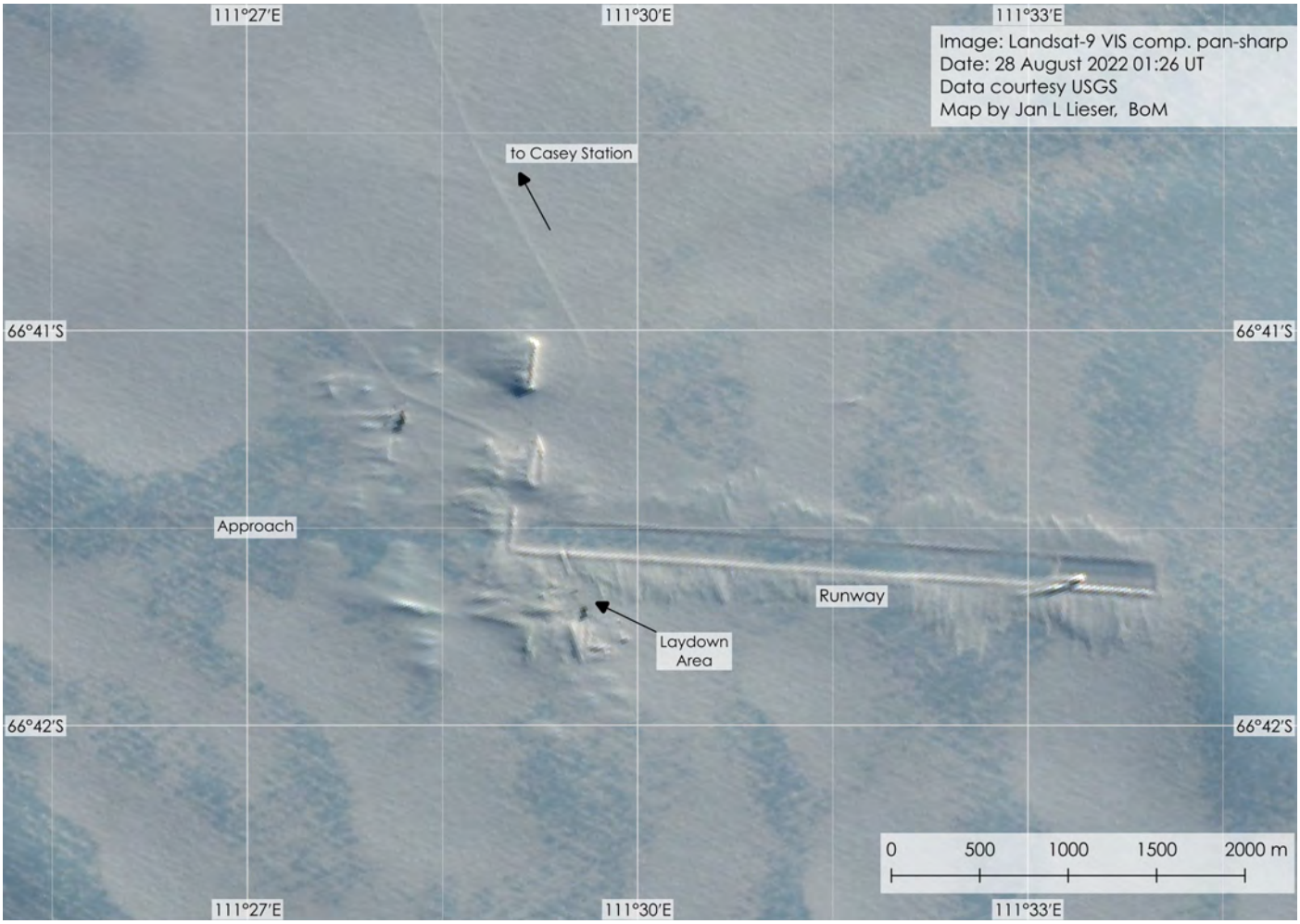


Figure 1: *Landsat-9 visible composite data acquired 28 August 2022 at 01:26 UT and provided by USGS.*

The ice runway is clearly visible. North and south of the runway, snow dunes are left from previous clearing the runway.

Snow dunes have also accumulated in the lee of the camp and other structures.

Ice Bulletin: Casey Station

Issued: Monday 29th August 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution visible data off Casey Station. The northern part of the image is slightly affected by cloud shadows.

West of Casey Station, the fast-ice edge has progressed westward temporarily. Two different types of fast ice can be identified offshore, where nearshore fast ice appears firmer (white) and outer fast ice appears thinner (grey). This outer fast ice is prone to break out under stormy conditions.

North of the station, the northern sea-ice edge (not shown in the figure) is up to 25 nautical miles below (south of) median sea-ice extent for August.

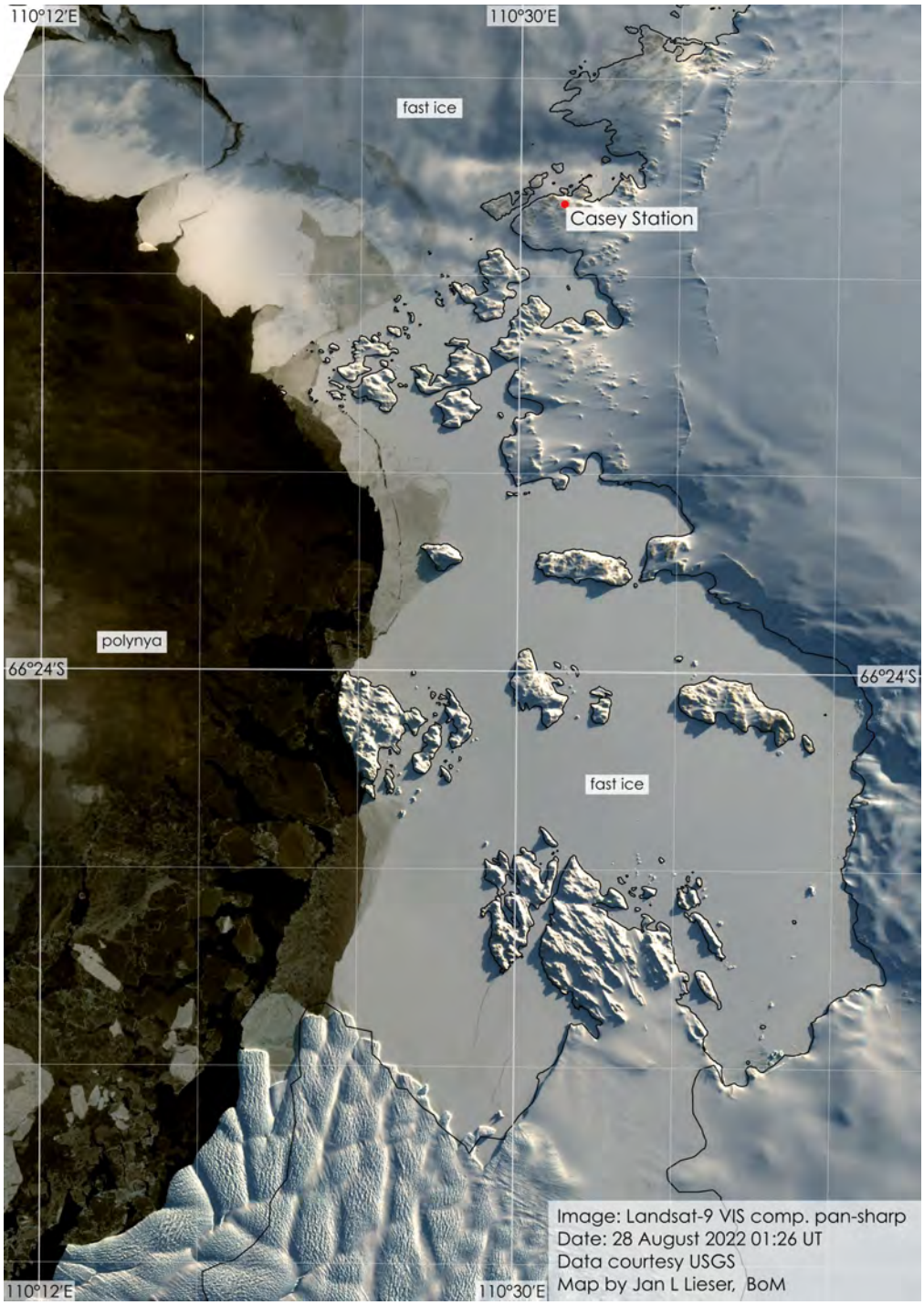


Figure 1: *Landsat-9 visible composite data pan-sharpened acquired 28 August 2022 at 01:26 UT and provided by USGS.*

Ice Bulletin: Mawson Station

Issued: Tuesday 30th August 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution visible data off Mawson Station.

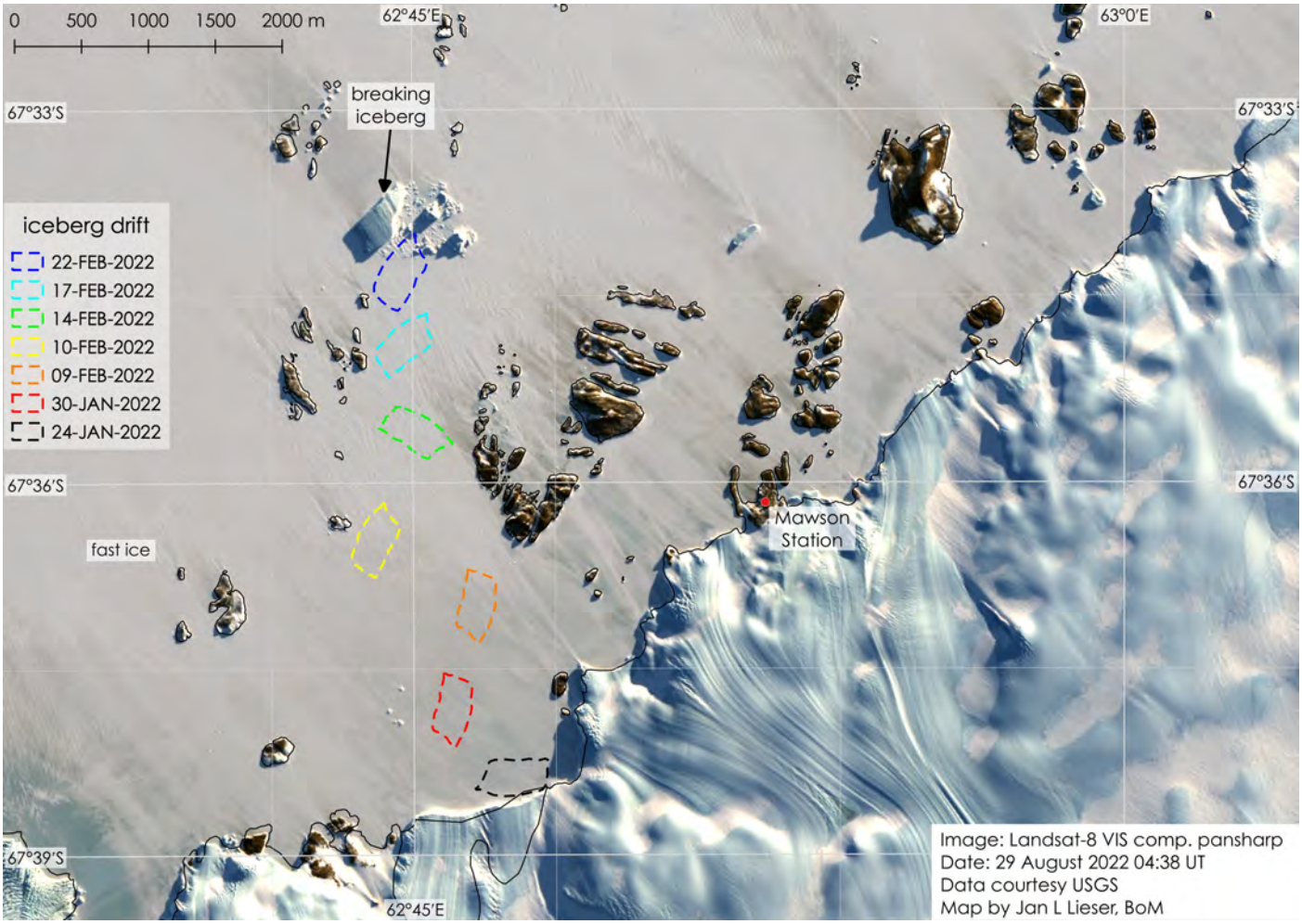


Figure 1: *Landsat-8 visible composite pan-sharpened data acquired 29 August 2022 at 04:38 UT and provided by USGS.*

Off Mawson Station, the fast ice appears largely homogenous. One large iceberg that broke off an ice shelf southwest of the station in January this year remains trapped in the fast ice and is crumbling now in situ.

Further afield, not many icebergs are frozen in nearshore. Northwest of the station, the distance to nearest open water of the polynya is roughly 38 nautical miles (outside of the frame of Figure 1).

North of Mawson Station, the northern sea-ice edge (also not shown in the figure) is meandering and up to 50 nautical miles below (south of) median sea-ice extent for August.

Figure 2 shows a different section of the same data shown in Figure 1. The location of the Auster penguin colony is visible by the stained patch of fast ice between icebergs (see inset).

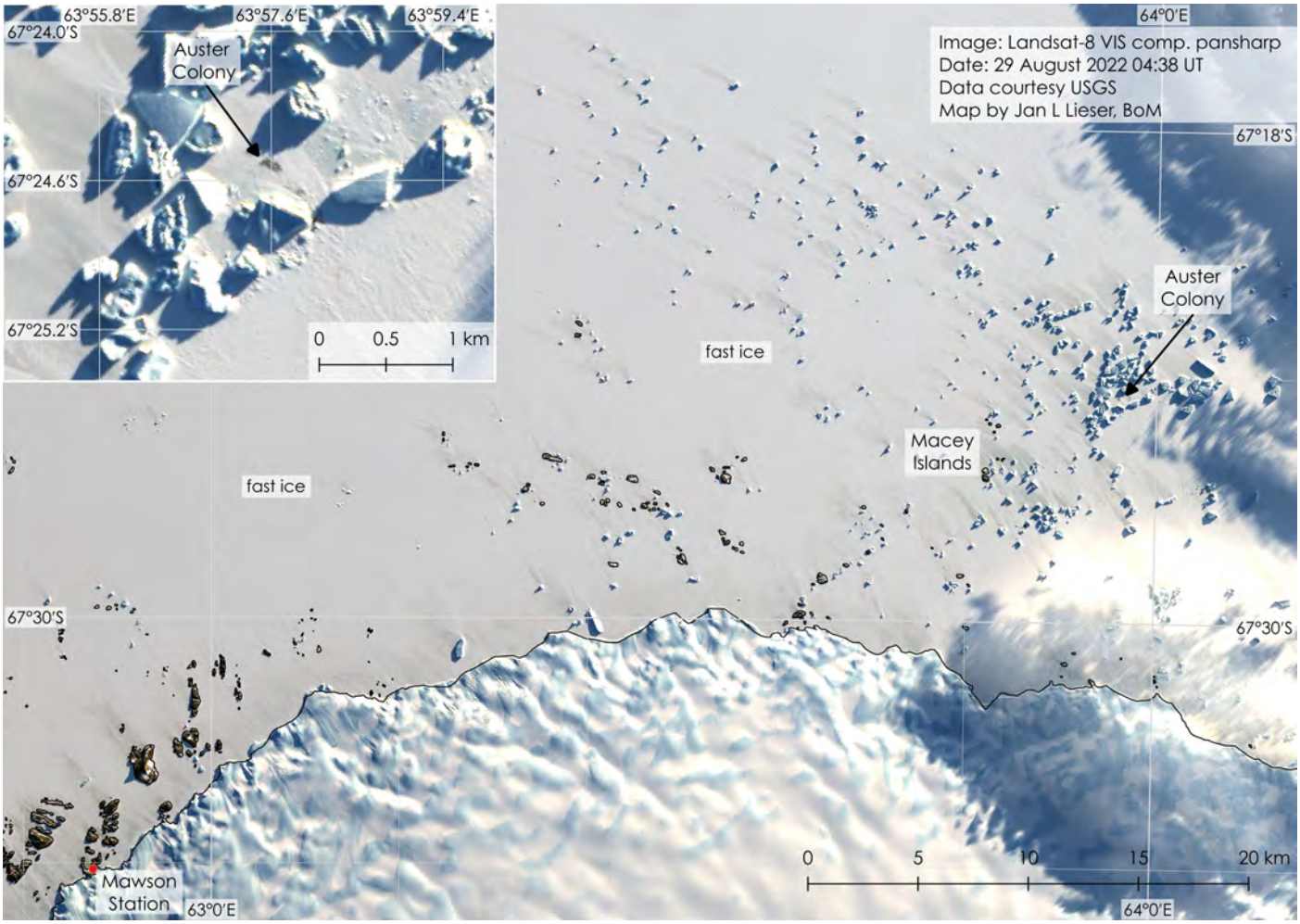


Figure 2: *Landsat-8 visible composite pan-sharpened data acquired 29 August 2022 at 04:38 UT and provided by USGS.*

Ice Bulletin: Iceberg A-76A

Issued: Friday 2nd September 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off the northern tip of the Antarctic Peninsula in the north-western Weddell Sea.

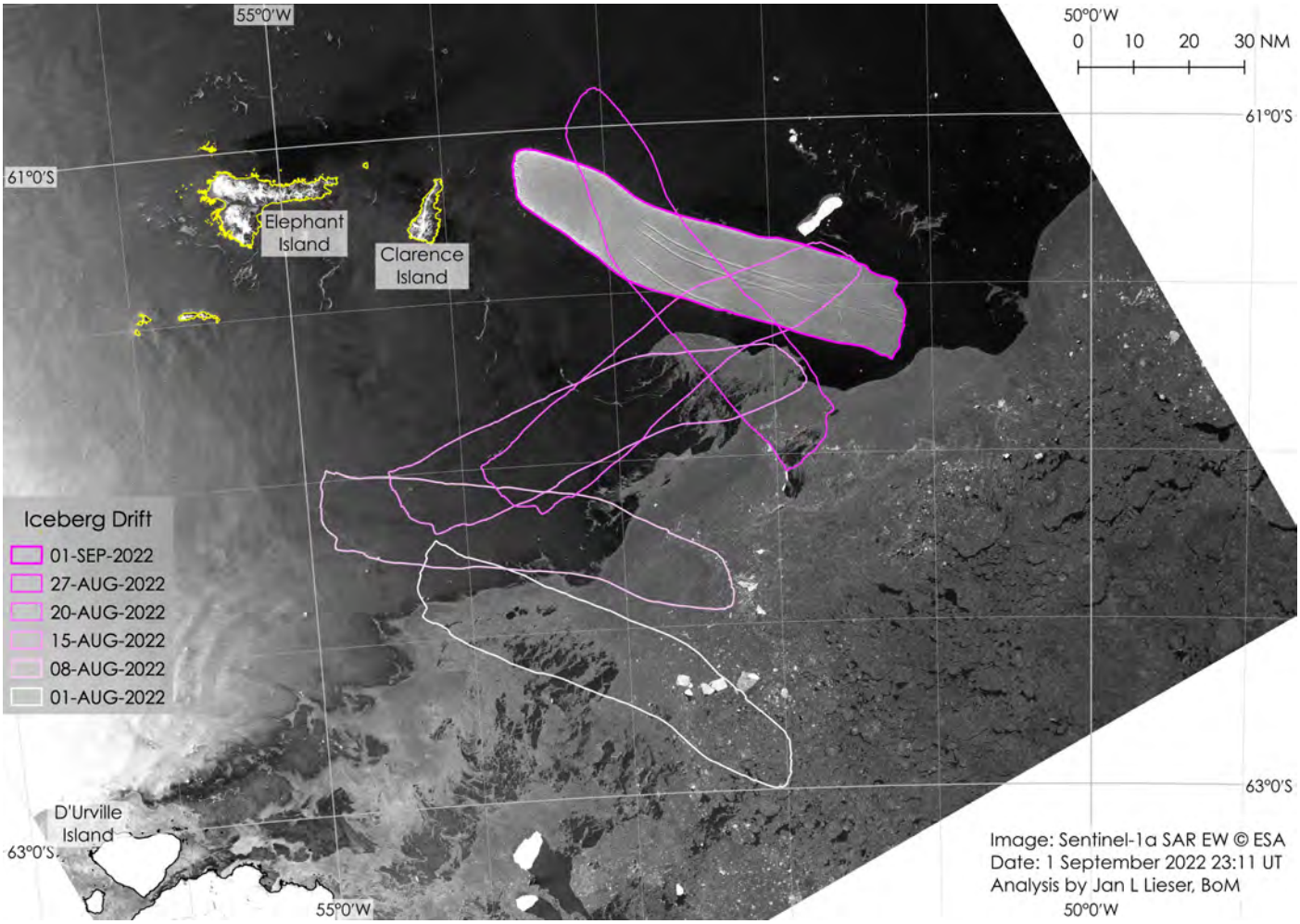


***Figure 1**: Sentinel-1a SAR EW data acquired 1 September 2022 at 23:11 UT and provided by PolarView.*

As previously confirmed, iceberg A-76A has exited the marginal ice zone and is drifting in the southern South Atlantic Ocean but remains along the northern side of the Powell Basin (centred roughly at 50º0'W and 62º0'S; see Figure 2). During August, the iceberg completed a turn of 180 degrees while generally drifting north-eastward.

This general drift pattern follows largely the path of large iceberg A-68A in 2020, which turned north-eastward south of Clarence Island and turned 180 degrees as well before continuing a north-eastern trajectory from there.

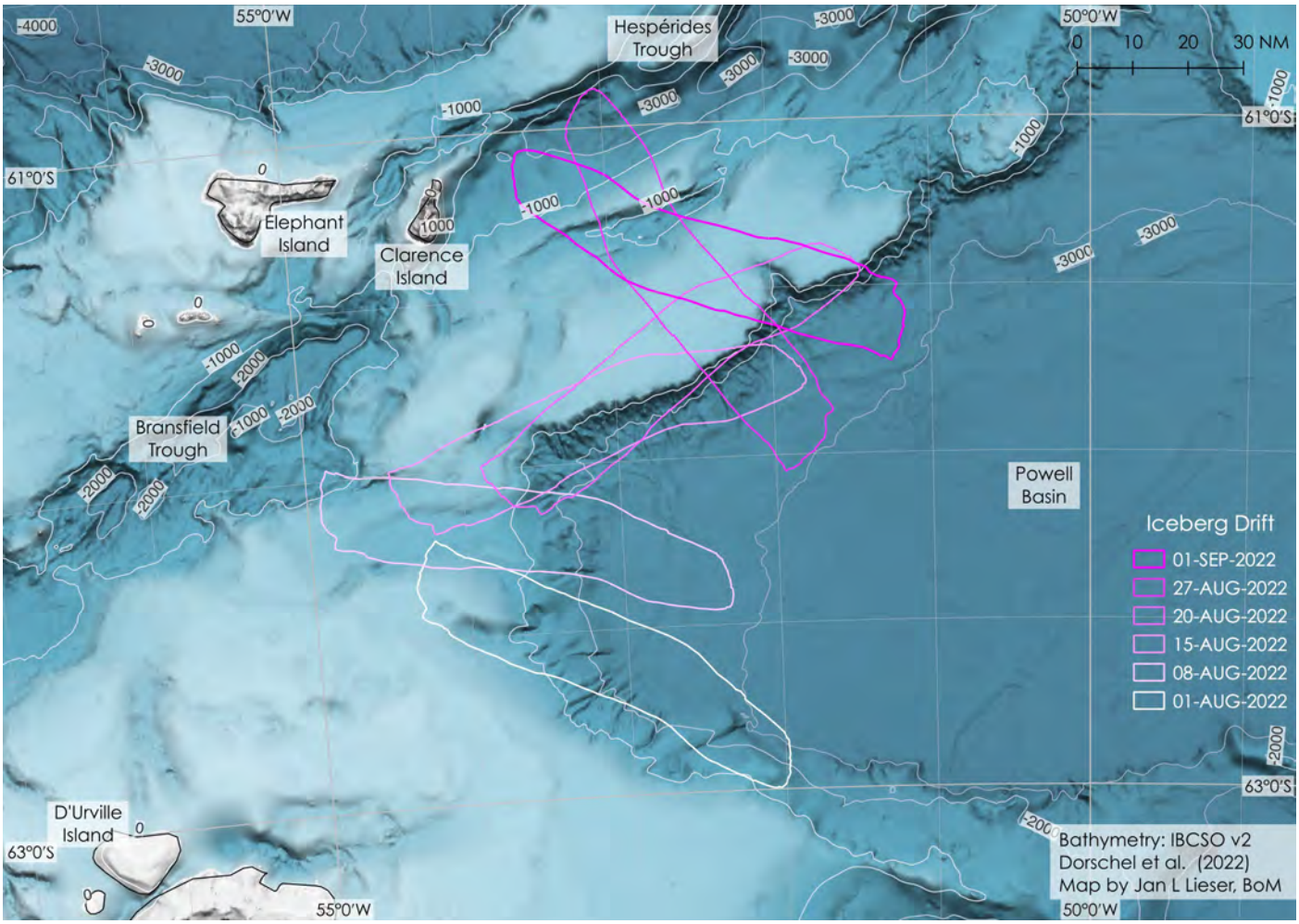


***Figure 2**: Bathymetry [metres] data provided by IBCSO (Dorschel et al., 2022).*

Ice Bulletin: D'Urville Sea

Issued: Tuesday 6th September 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows VIS and DNB composite data of southern D'Urville Sea off Mawson's Huts/Cape Denison. The positions of three large icebergs are shown by pink shapes.

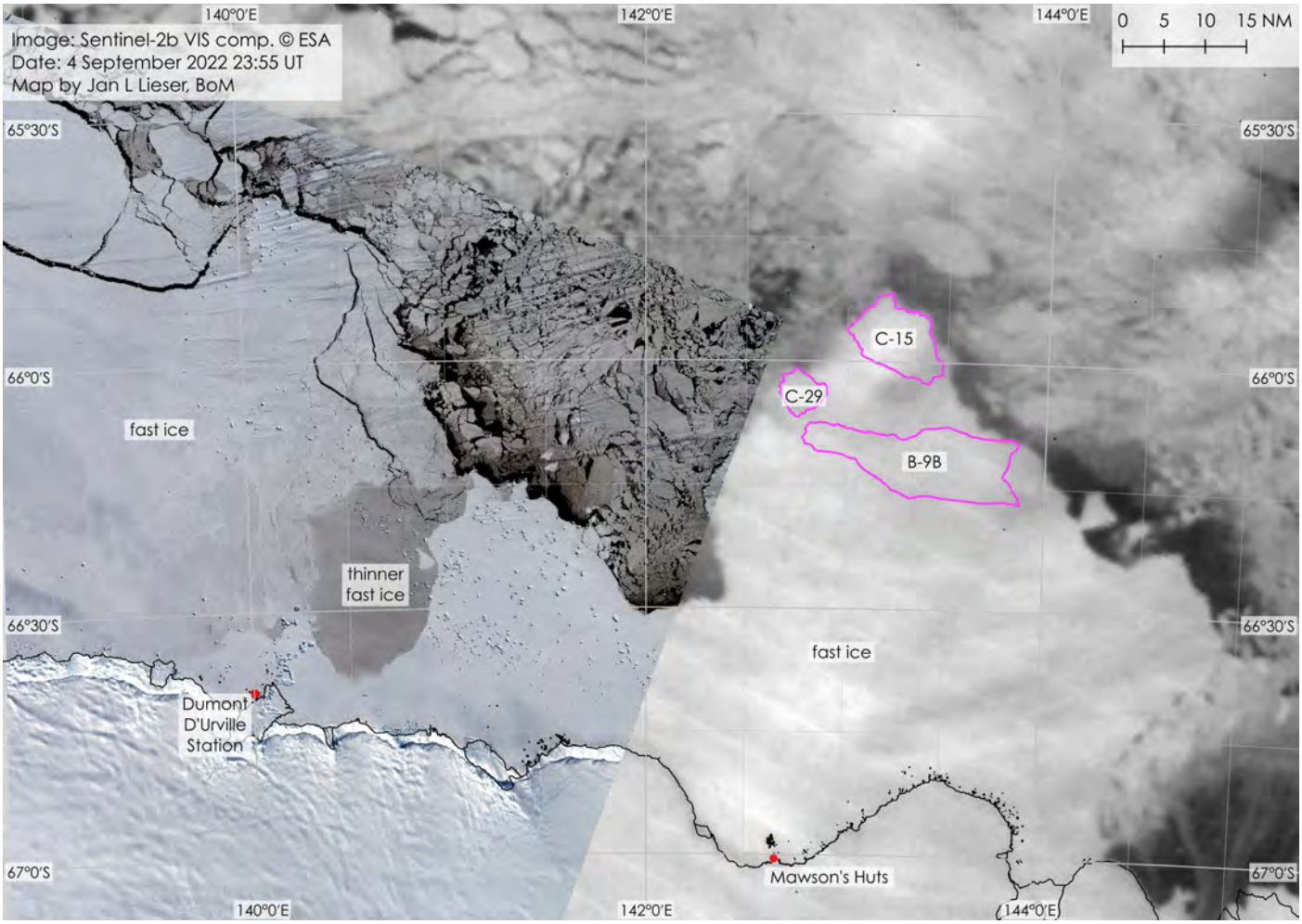


Figure 1: *Sentinel-2b visible composite data acquired 4 September 2022 at 23:55 UT and provided by ESA; background of VIIRS Day-Night-Band data acquired 5 September 2022 and provided by NASA.*

Off Mawson's Huts and Dumont D'Urville Station, fast ice has grown. Icebergs C-15 and C-29 remain grounded and iceberg B-9B is now surrounded and trapped by grounded smaller icebergs and fast ice.

Off Dumont D'Urville Station, the nearest open water is roughly 37 nautical miles away.

Further north, the northern sea-ice edge is between 20 and 50 nautical miles above (north of) the median sea-ice extent for September (not shown in the figure).

Figure 2 shows a closer zoom of the region off Dumont D'Urville Station as seen by the high-resolution (10 m horizontal) visible data.

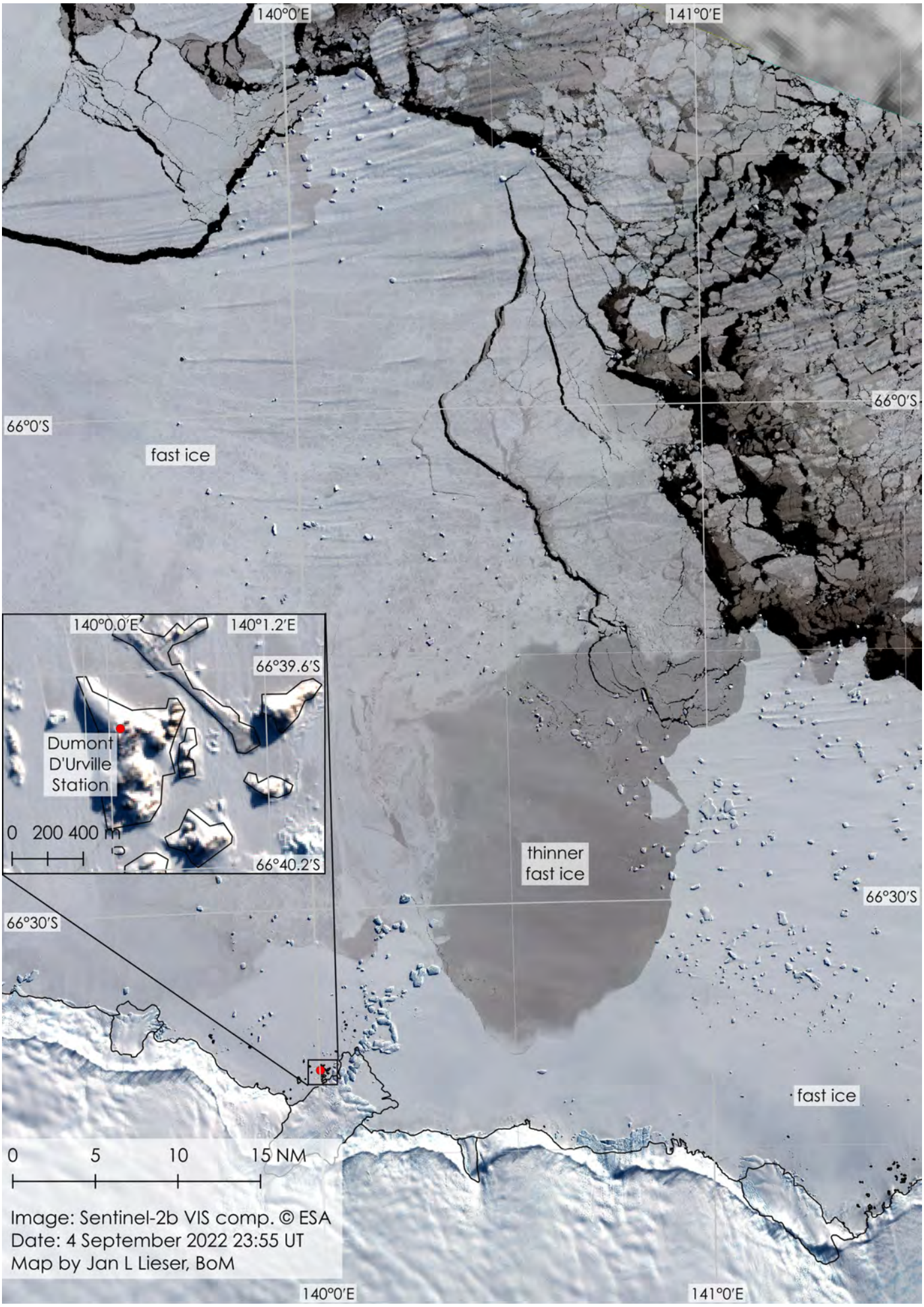


Figure 2: *Sentinel-2b visible composite data acquired 4 September 2022 at 23:55 UT and provided by ESA.*

Ice Bulletin: Davis Station

Issued: Thursday 8th September 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 and Figure 2 show high-resolution (10 m horizontal) VIS data off Davis Station.

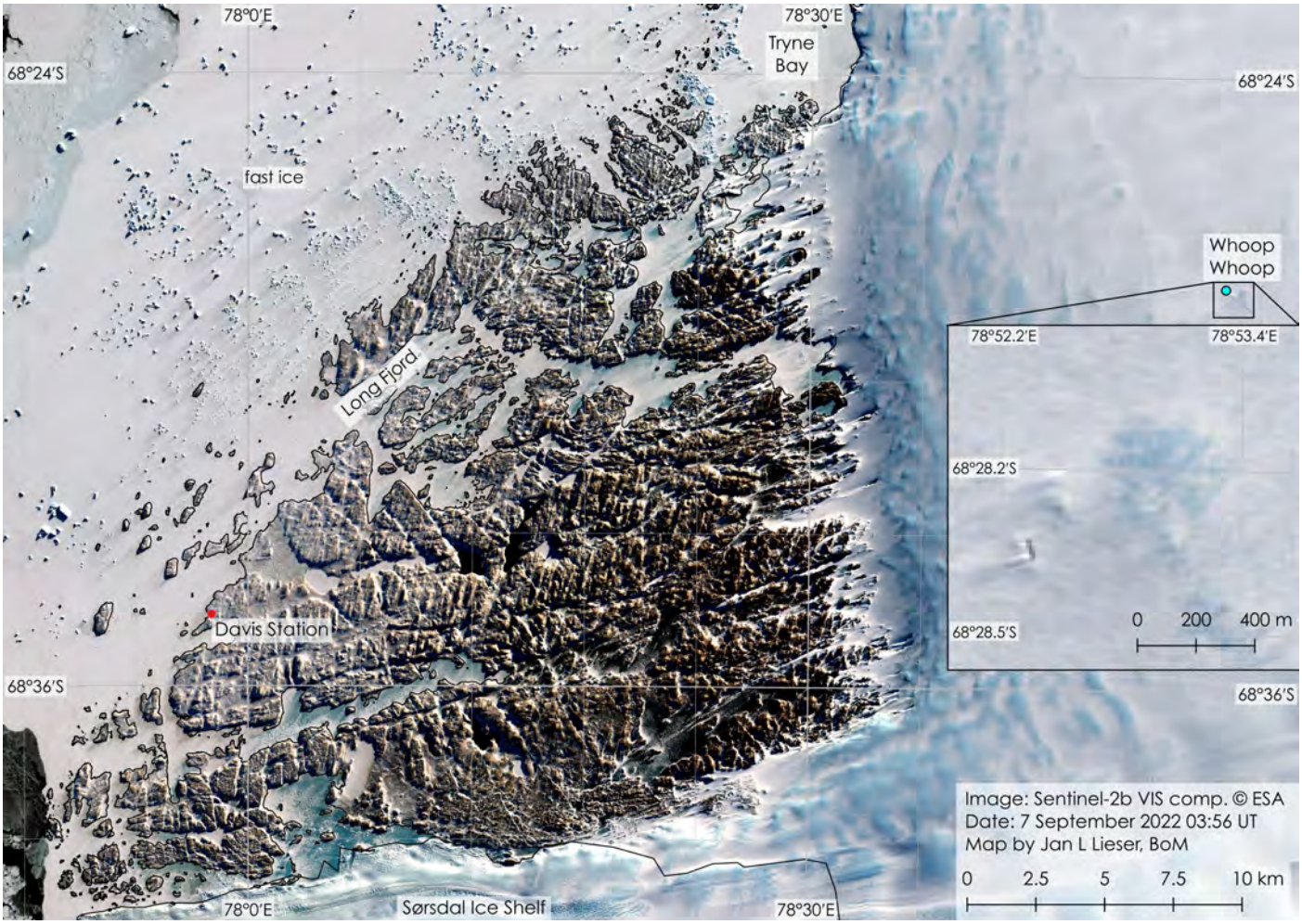


Figure 1: *Sentinel-2b VIS data acquired 7 September 2022 at 03:56 UT and provided by USGS.*

The hinterland airfield Whoop Whoop is marked by a cyan dot (see inset for full resolution).

West of the station, the fast-ice edge is roughly 5 nautical miles away from the shore. North of the Vestfold Hills, the fast ice has consolidated more offshore during the past few weeks.

North of Davis Station, the northern sea-ice edge (not shown in the figure) is more than 150 nautical miles below (south of) median sea-ice extent for September.

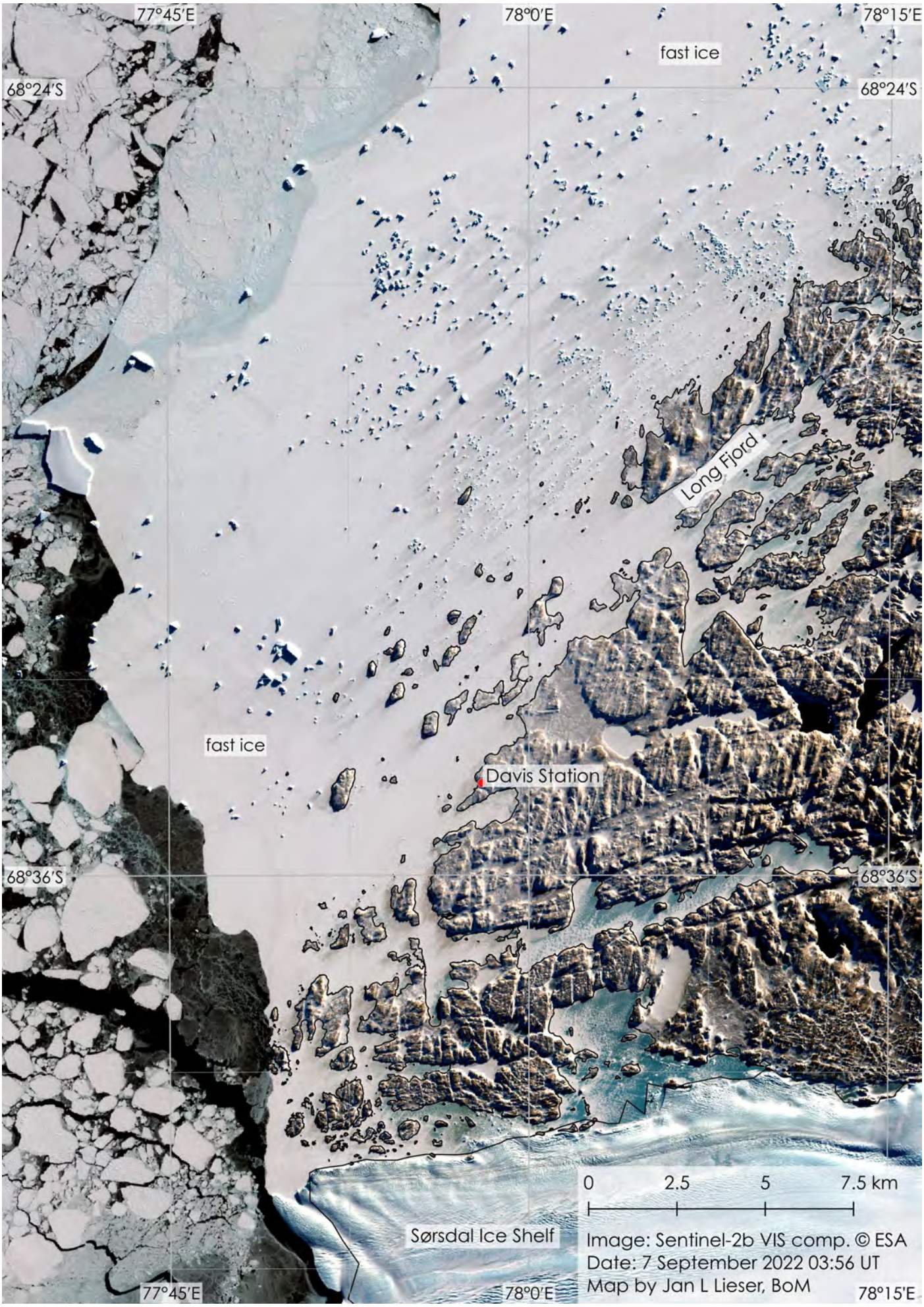


Figure 2: *Sentinel-2b VIS data acquired 7 September 2022 at 03:56 UT and provided by USGS.*

Ice Bulletin: Mawson Station

Issued: Thursday 8th September 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) VIS data off Mawson Station.

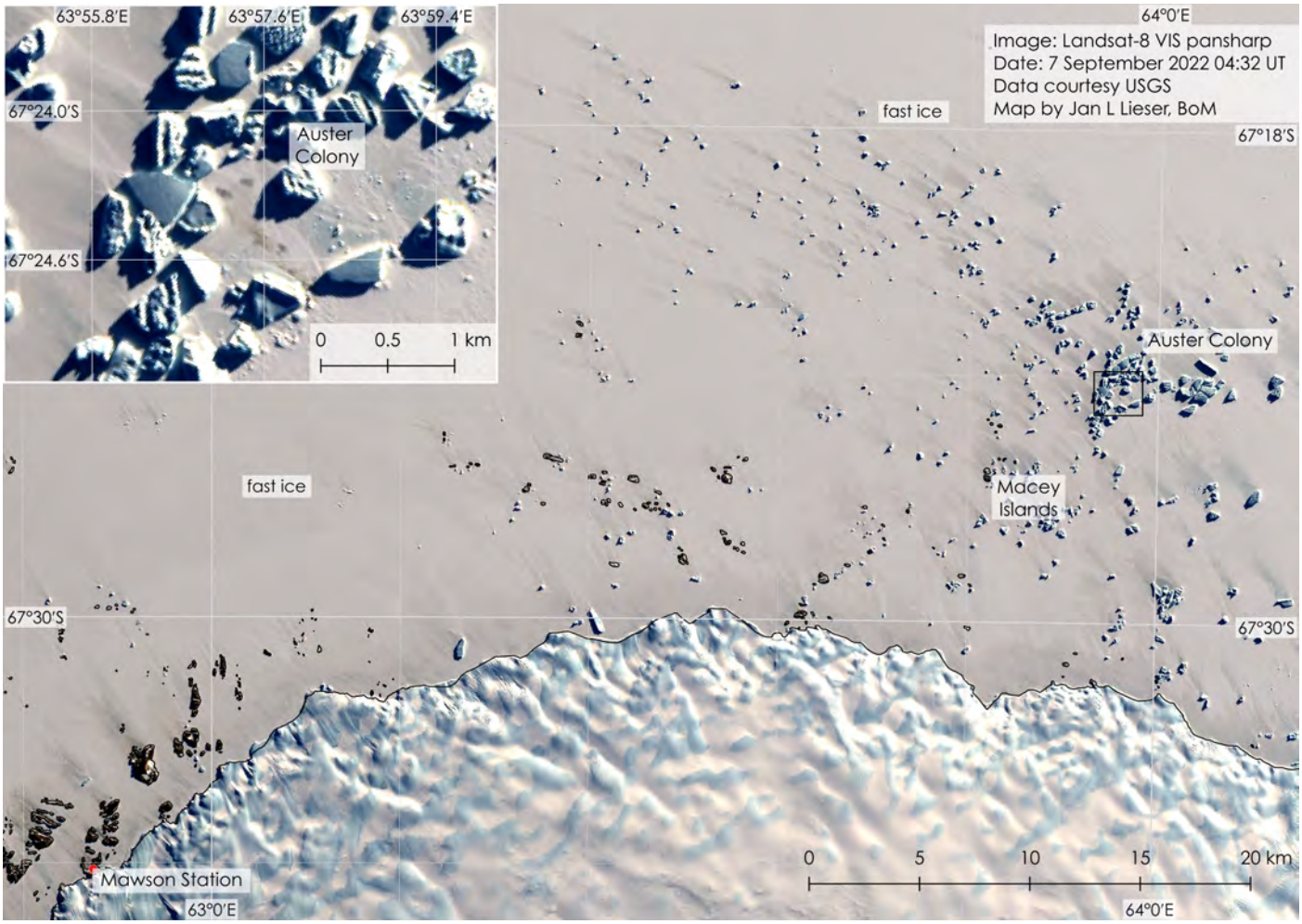


Figure 1: *Landsat-8 VIS pan-sharp data acquired 7 September 2022 at 04:32 UT and provided by USGS.*

The Auster penguin colony can be seen between grounded icebergs east of the station (see discoloured surface patches in the inset for full resolution).

Northwest of the station, a polynya (not shown in the figure) is roughly 39 nautical miles away from the station.

North of Mawson Station, the northern sea-ice edge (also not shown in the figure) is more than 55 nautical miles below (south of) median sea-ice extent for September.

Ice Bulletin: D'Urville Sea

Issued: Thursday 8th September 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) VIS data of southern D'Urville Sea between Dumont D'Urville Station and Mawson's Huts/Cape Denison. The scene is partly obscured by thin clouds. The positions of three large icebergs are shown by pink shapes.

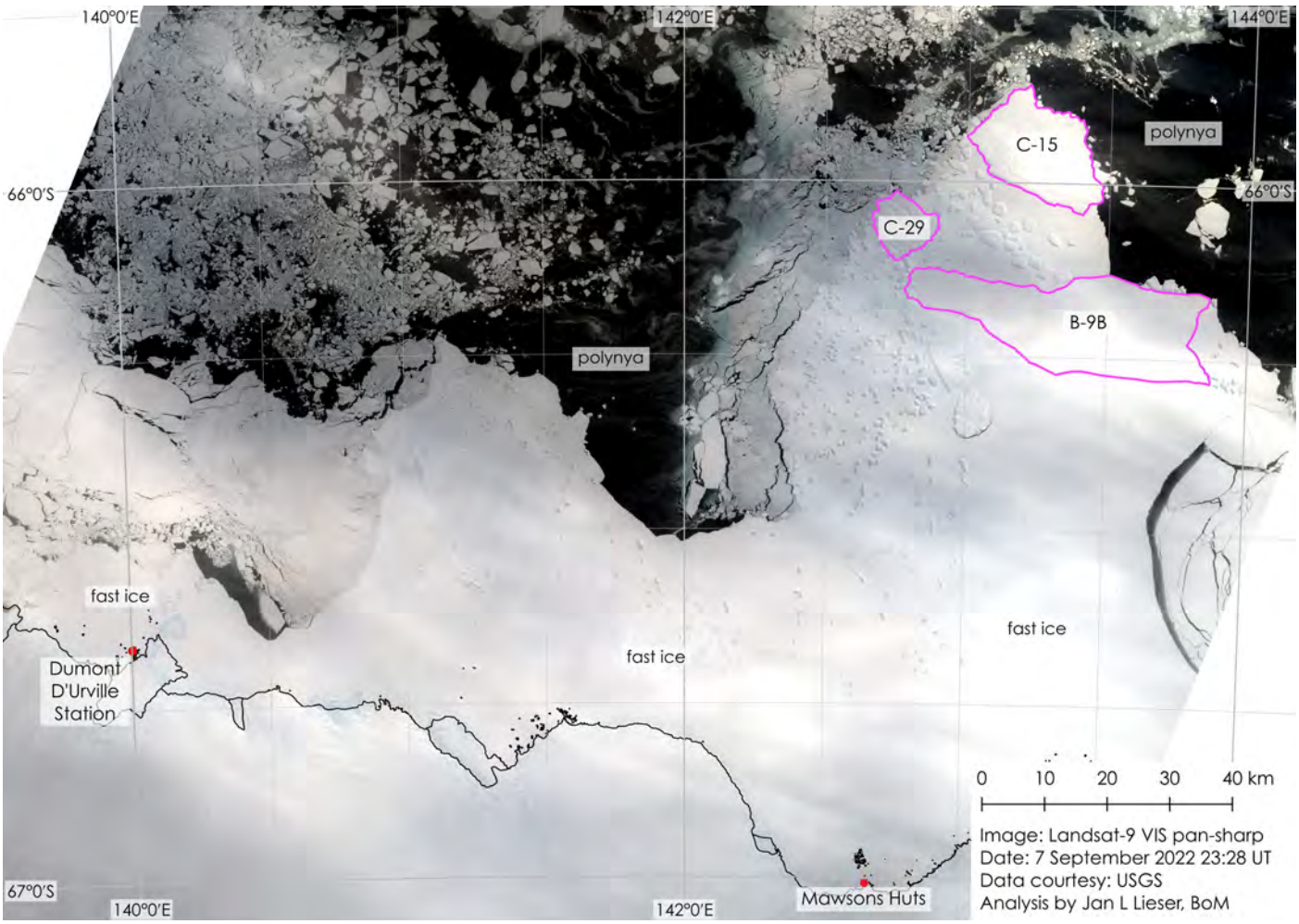


Figure 1: *Landsat-9 visible composite data acquired 7 September 2022 at 23:28 UT and provided by USGS.*

Off Mawson's Huts and Dumont D'Urville Station, fast ice has grown. Icebergs B-9B, C-15 and C-29 remain grounded and surrounded and trapped by grounded smaller icebergs and fast ice.

Off Dumont D'Urville Station, the nearest open water is roughly 9 nautical miles away.

Further north, the northern sea-ice edge is between 25 and 60 nautical miles above (north of) the median sea-ice extent for September (not shown in the figure).

Ice Bulletin: Antarctica

Issued: Monday 12th September 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows the pan-Antarctic sea-ice concentration anomaly based on passive microwave remote sensing data.

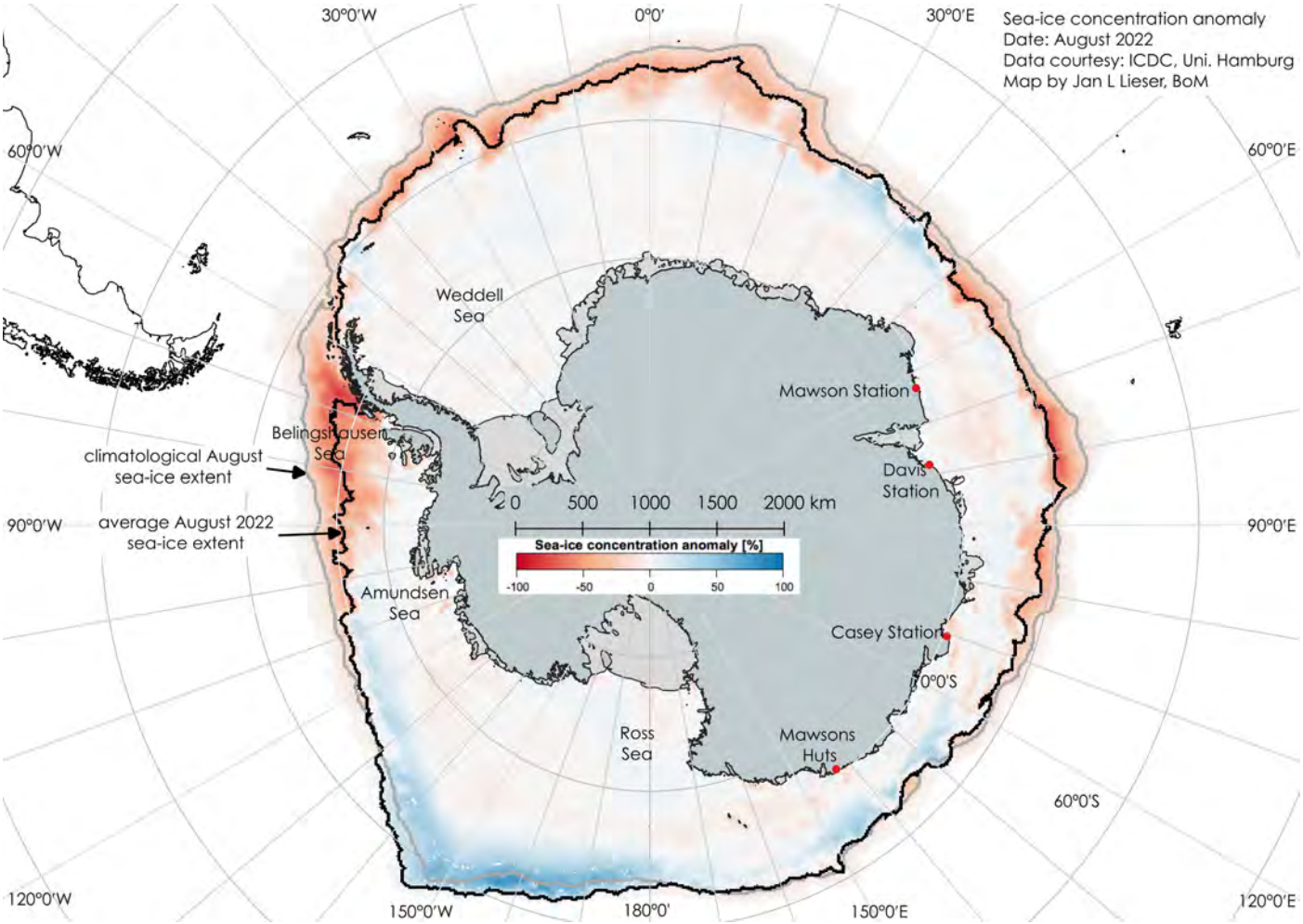


***Figure 1**: Sea-ice concentration anomaly for August 2022 provided by ICDC (Universität Hamburg).*

In August 2022, pan-Antarctic sea-ice conditions ranked third-lowest monthly (August) conditions since records began.

Only in the central and eastern Ross Sea, sea-ice extent reached and partly exceeded climatological values. The rest of the sea-ice zone around the continent exhibited below average sea-ice extent and associated concentration.

Negative extent anomalies are found in the entire Weddell Sea, in East Antarctic between 50º0'E and 120º0'E and west of the Antarctic Peninsula. It is again noted that the northern part the South Sandwich Islands (along 26º0'W in the northern Weddell Sea) remains largely free of sea ice, which is still anomalous for this time of year. Northeast of Joinville Island (63º15'S, 55º45'W; at the northern tip of the Antarctic Peninsula), a negative anomaly is associated with the drift of large iceberg A-76A, which creates a local polynya in its lee while the iceberg is drifting northward into the southern South Atlantic.

Ice Bulletin: Mawson Station

Issued: Monday 12th September 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 and Figure 2 show high-resolution (15 m horizontal) SAR data west off Mawson Station. The typical route between the station and Depot Island is marked by colour-coded segments. The upper panel of Figure 1 has a white diagonal hairline, which is a stitching artefact where two consecutive scenes join.

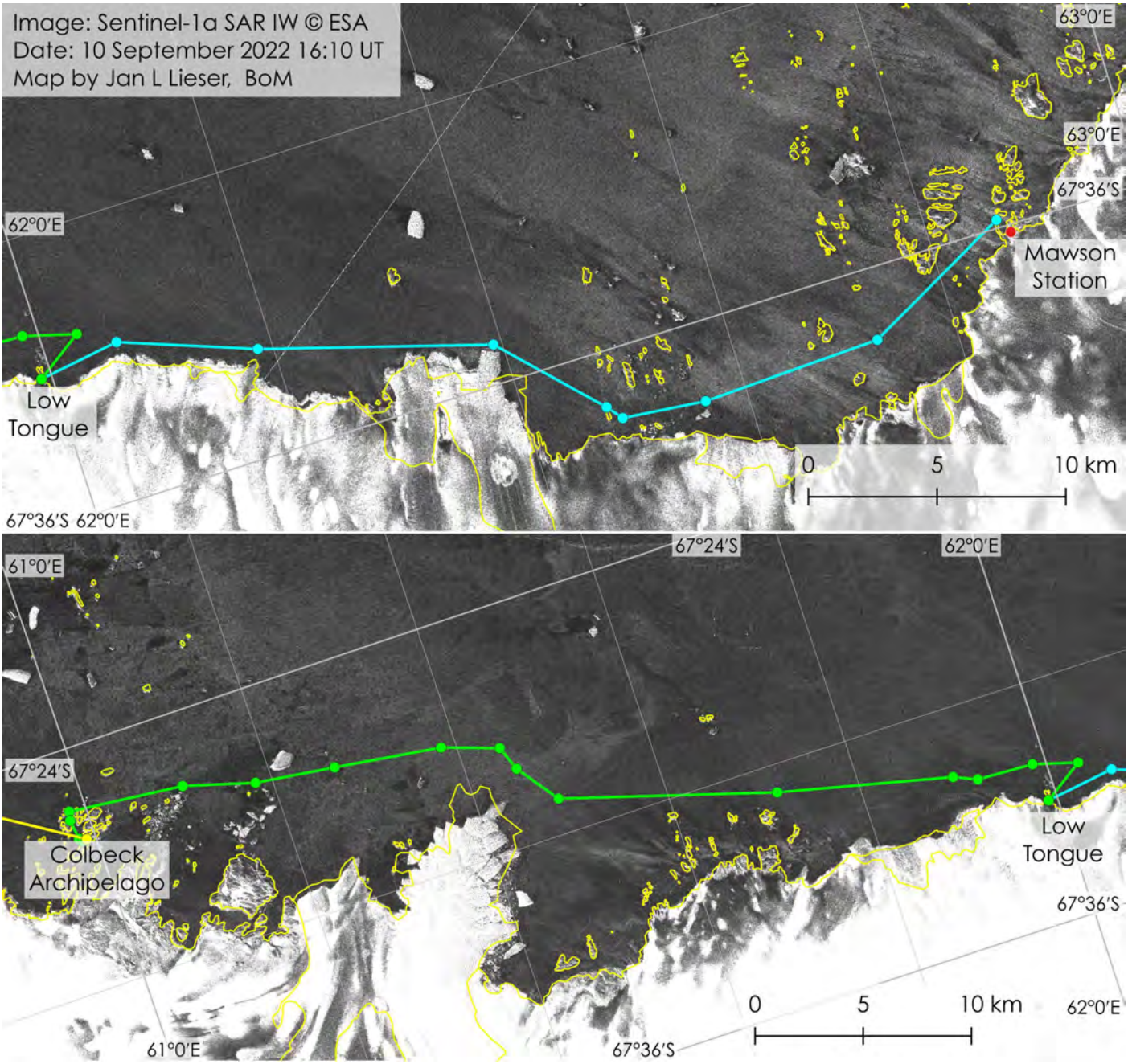


Figure 1: *Sentinel-1a SAR IW data acquired 10 September 2022 at 16:10 UT and provided by PolarView.*

The route between the station and Depot Island is covered by largely homogenous fast ice and only a few icebergs are trapped nearshore. The entire coast was free of fast ice by mid-March 2022 and the present fast ice has been growing in-situ since April 2022.

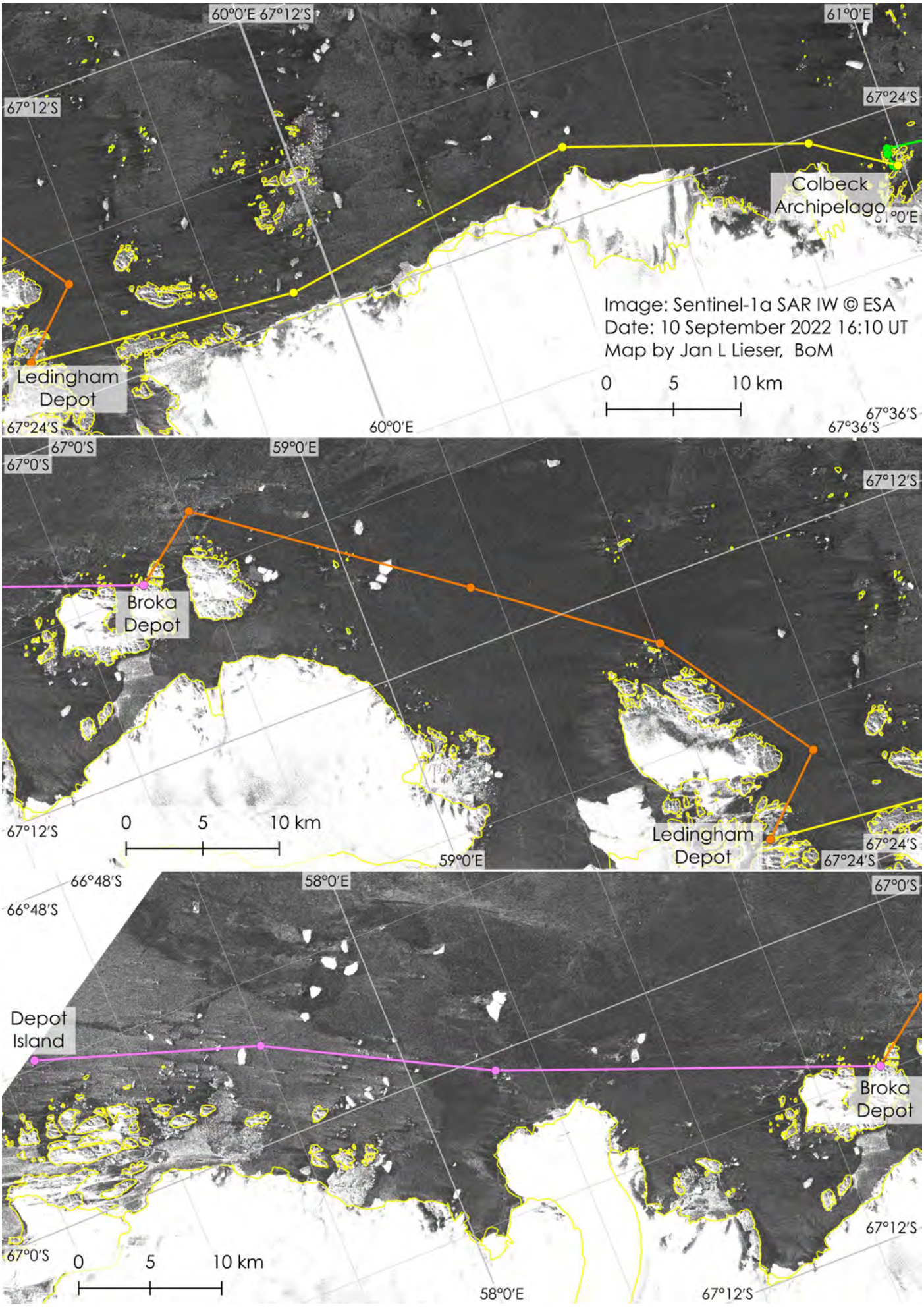


Figure 2: *Sentinel-1a SAR IW data acquired 10 September 2022 at 16:10 UT and provided by PolarView.*

Ice Bulletin: Casey Station

Issued: Monday 12th September 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data off Casey Station. The fast-ice edge is marked by a red line; the area of fast ice is slightly affected by low clouds.

Southerly winds have re-opened the polynya off the Vanderford Ice Shelf and new sea ice is being formed there in strips and patches. New ice accumulates along the southern edge of the fast ice north of the station.

North of the station, the northern sea-ice edge (not shown in the figure) is up to 50 nautical miles below (south of) median sea-ice extent for September.

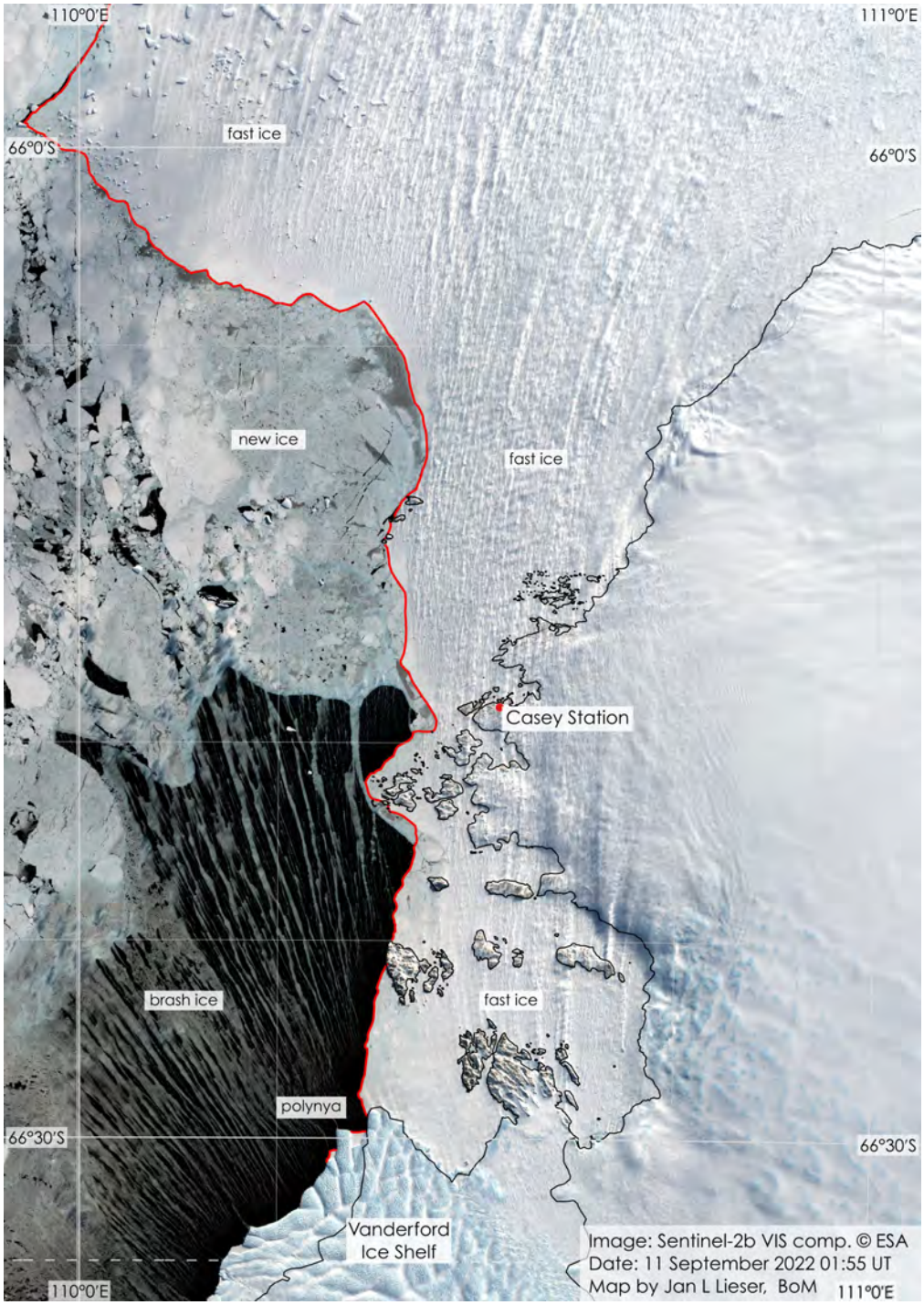


Figure 1: *Sentinel-2b visible composite data acquired 11 September 2022 at 01:55 UT and provided by USGS.*

Ice Bulletin: Wilkins Aerodrome

Issued: Monday 12th September 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data of Wilkins Aerodrome.

Figure 1: *Sentinel-2b visible composite data acquired 11 September 2022 at 01:55 UT and provided by USGS.*

The ice runway appears covered by fresh snow. North and south of the runway, snow dunes are left from previous clearing the runway.

Snow dunes have also accumulated in the lee of the camp and other structures.

Ice Bulletin: Wilkins Aerodrome

Issued: Wednesday 14th September 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of Wilkins Aerodrome.

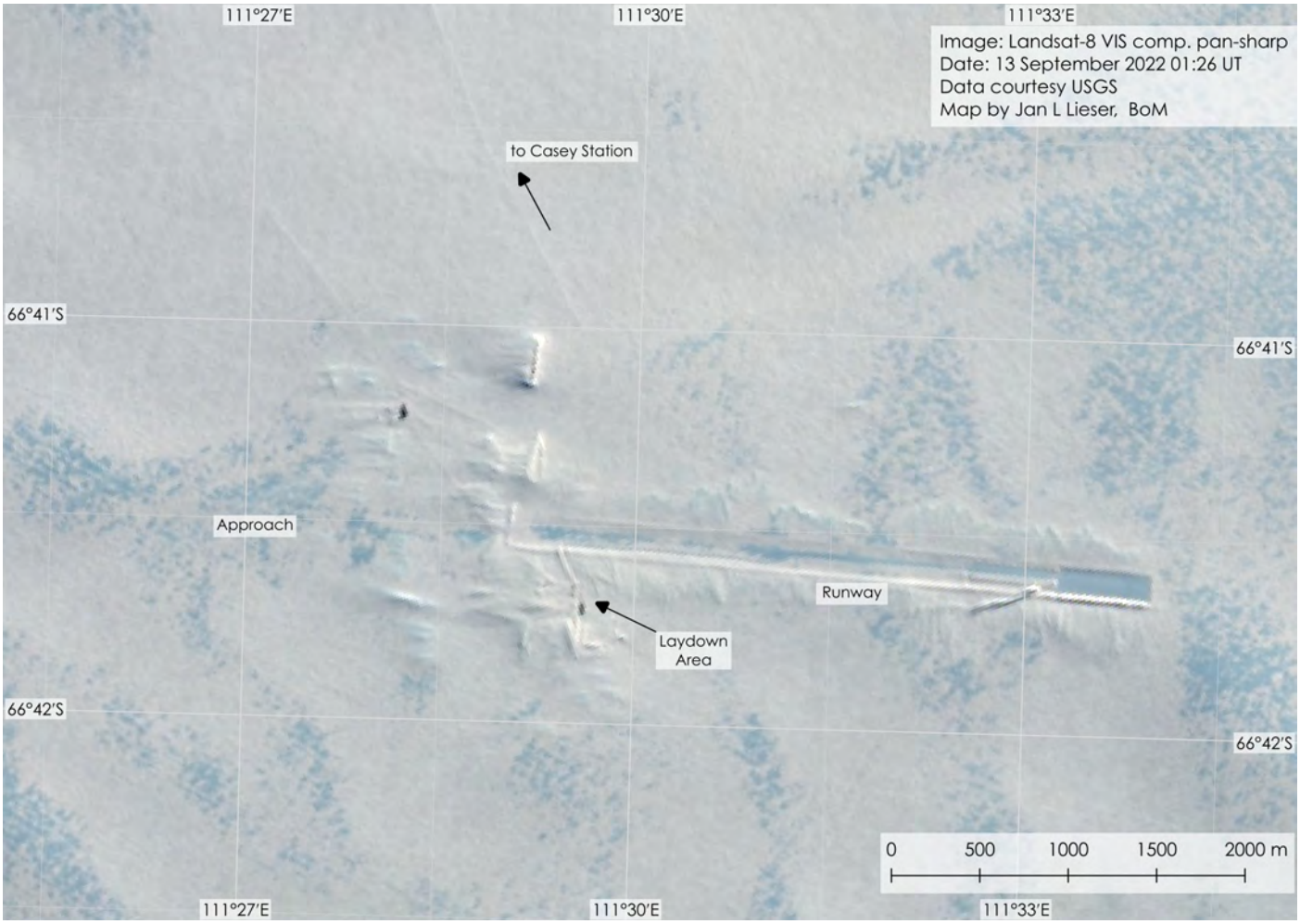


Figure 1: *Landsat-8 visible composite pan-sharpened data acquired 13 September 2022 at 01:26 UT and provided by USGS.*

The ice runway appears covered by fresh snow. North and south of the runway, snow dunes are left from previous clearing the runway.

Snow dunes have also accumulated in the lee of the camp and other structures.

Ice Bulletin: D'Urville Sea

Issued: Thursday 15th September 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) VIS data of southern D'Urville Sea around Dumont D'Urville Station.

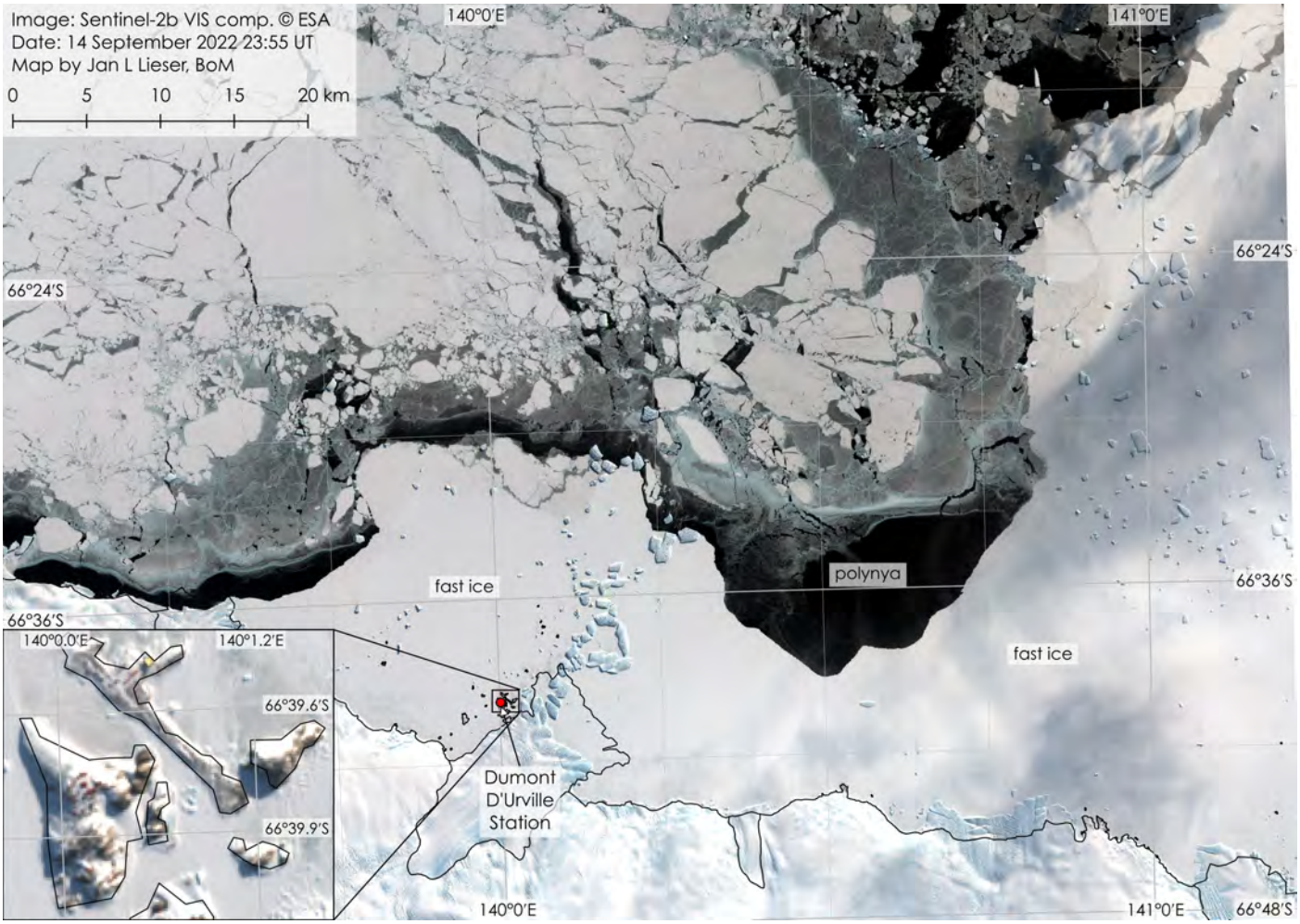


Figure 1: *Sentinel-2b visible composite data acquired 14 September 2022 at 23:55 UT and provided by USGS.*

Off Dumont D'Urville Station, the nearest open water is roughly 10 nautical miles away.

Further north, the northern sea-ice edge is roughly 50 nautical miles above (north of) the median sea-ice extent for September (not shown in the figure).

Ice Bulletin: Casey Station

Issued: Friday 16th September 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data off Casey Station. The fast-ice edge on 11 September 2022 is marked by a dashed red line.

Southerly winds had re-opened the polynya off the Vanderford Ice Shelf and new sea ice is forming there in strips and patches. This new ice is currently being redistributed in the polynya.

North of the station, the northern sea-ice edge (not shown in the figure) is roughly 60 nautical miles below (south of) median sea-ice extent for September.

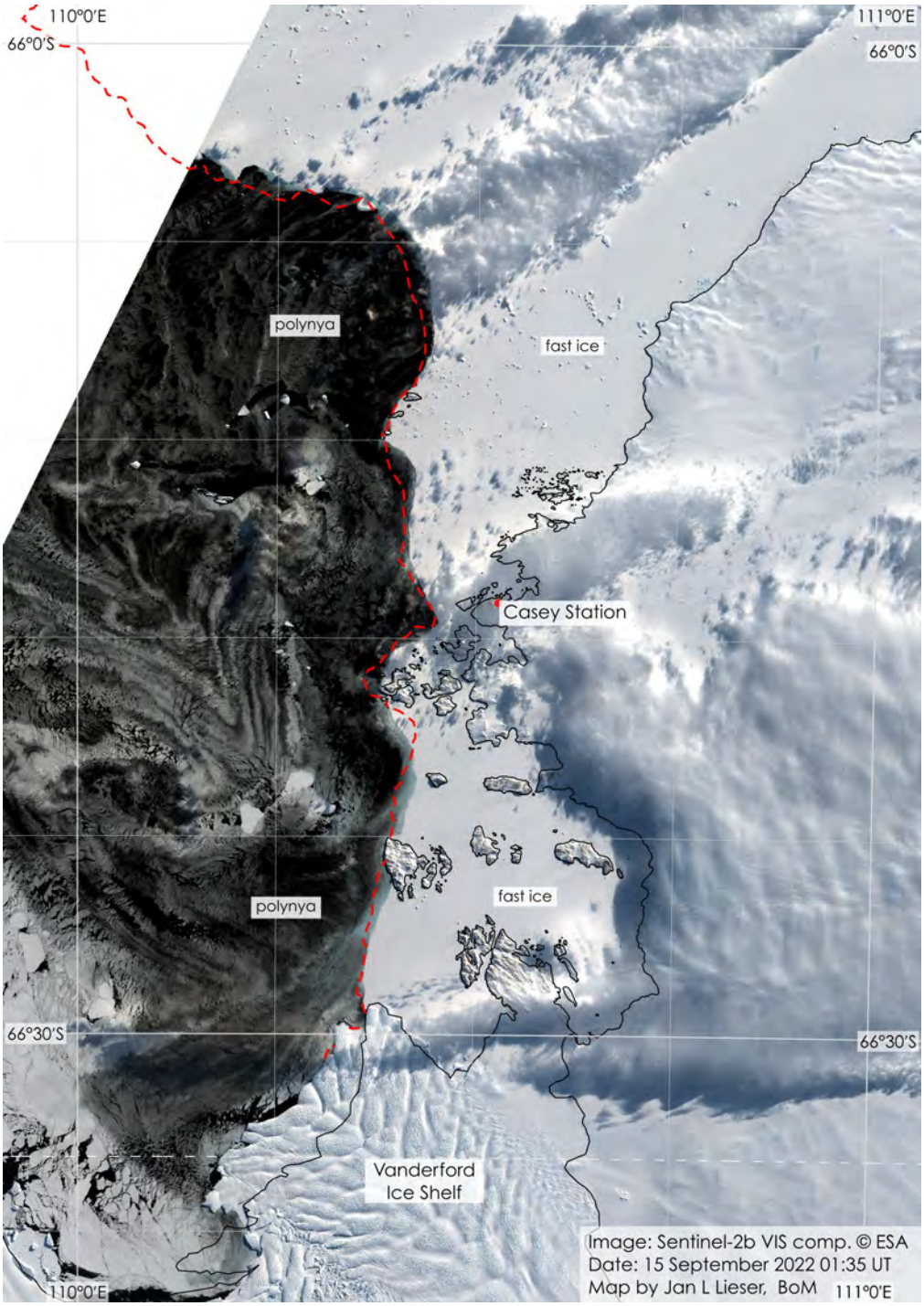


Figure 1: *Sentinel-2b visible composite data acquired 15 September 2022 at 01:35 UT and provided by USGS.*

Ice Bulletin: Mawson Station

Issued: Friday 16th September 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

The figures of this Bulletin show SAR data west off Mawson Station. The typical route between the station and Kloa Point is marked by colour-coded segments. The middle panel of Figure 2 has a white diagonal hairline, which is a stitching artefact where two consecutive scenes join.

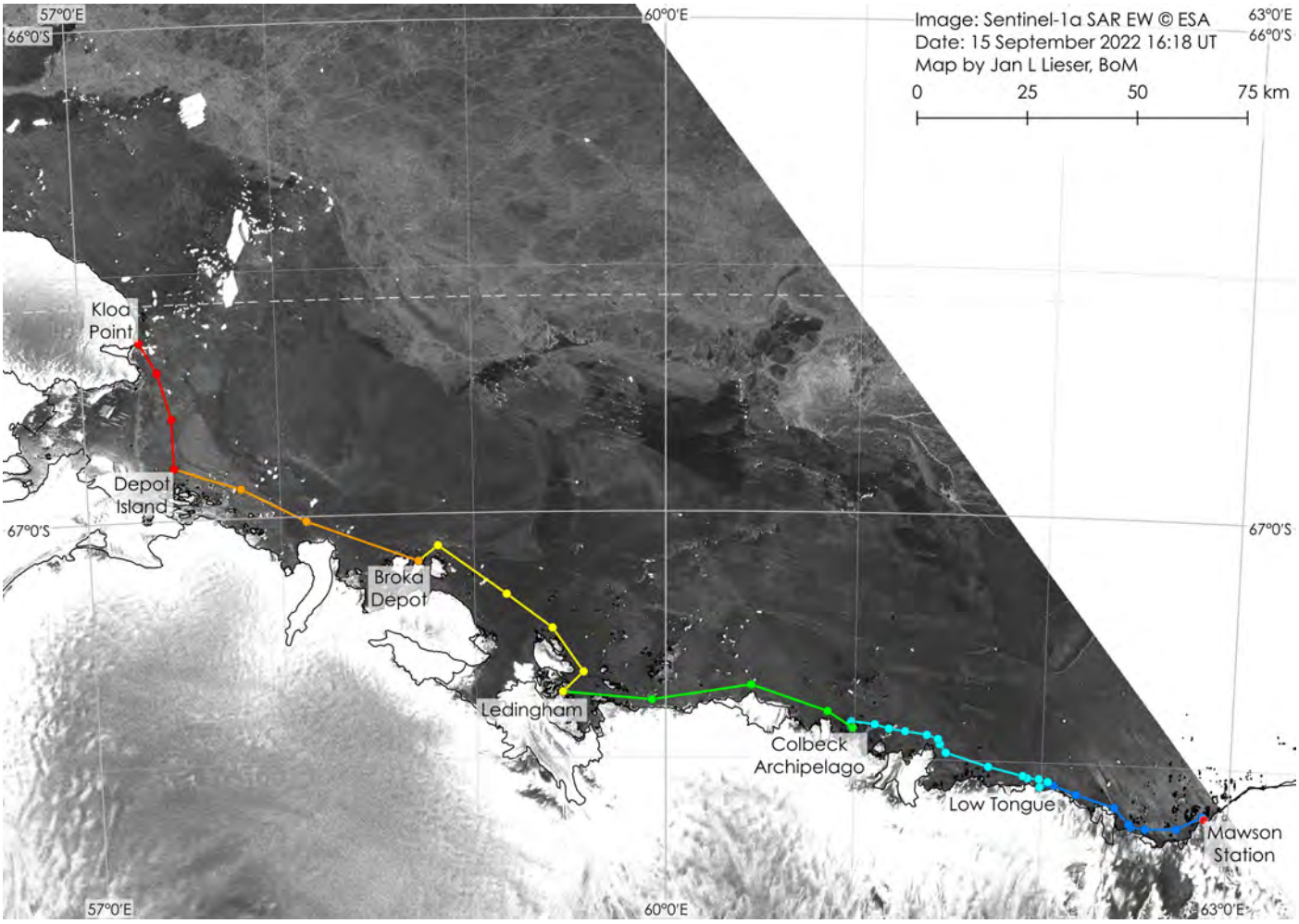


Figure 1: *Sentinel-1a SAR EW data acquired 15 September 2022 at 16:18 UT and provided by PolarView.*

The route between the station and Kloa Point is over largely homogenous fast ice and only a few icebergs are trapped nearshore. Note: immediately east of Kloa Point, a group of large icebergs is trapped close to the shore (see inset of Figure 3 lower panel for details).

The entire coast was free of fast ice by mid-March 2022 and the present fast ice has been growing in-situ since April 2022.

North of the region shown in Figure 1, the northern sea-ice edge (not shown in the figure) is 50–70 nautical miles below (south of) the median sea-ice extent for September.

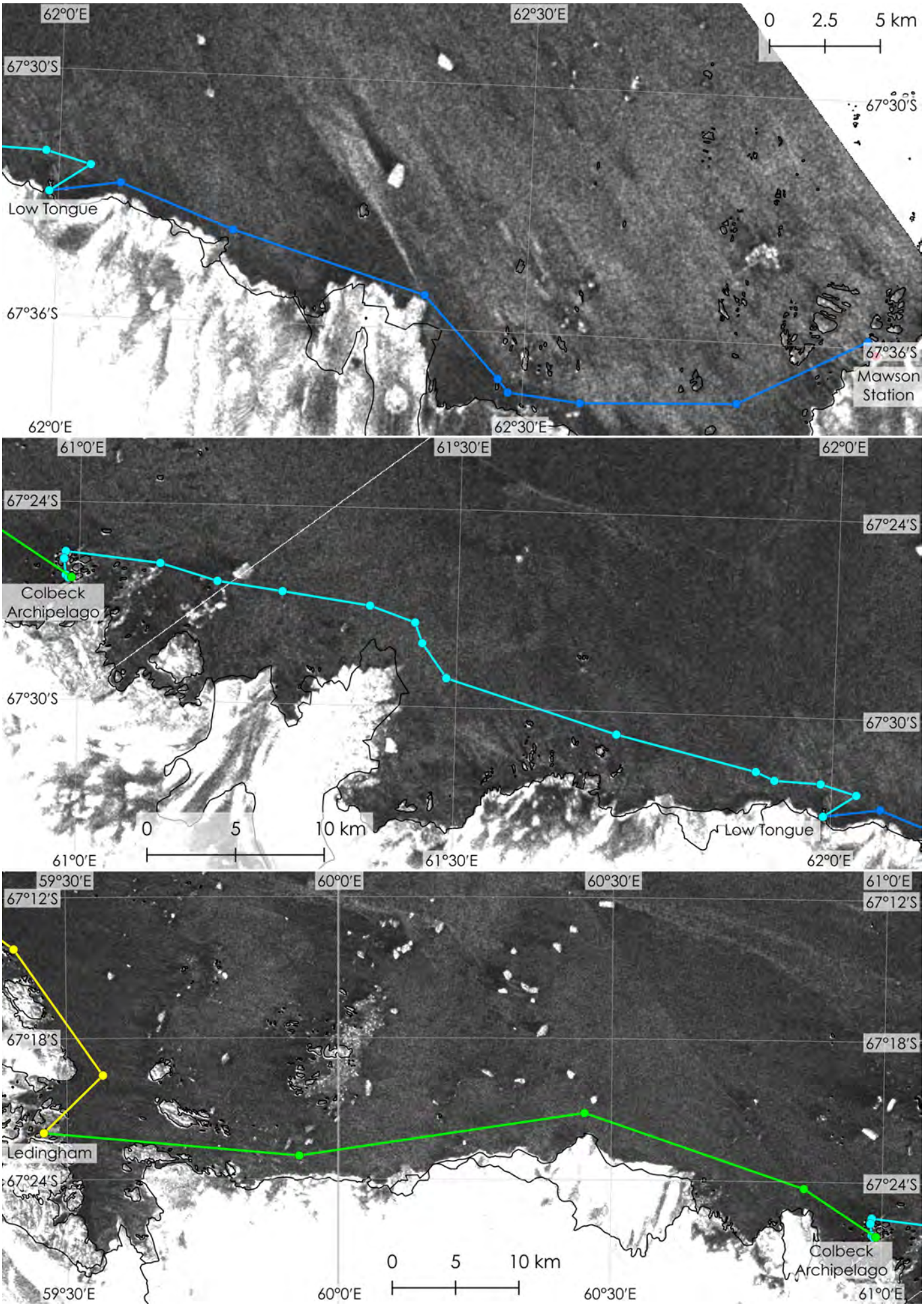


Figure 2: *Sentinel-1a SAR EW data acquired 15 September 2022 at 16:18 UT and provided by PolarView.*

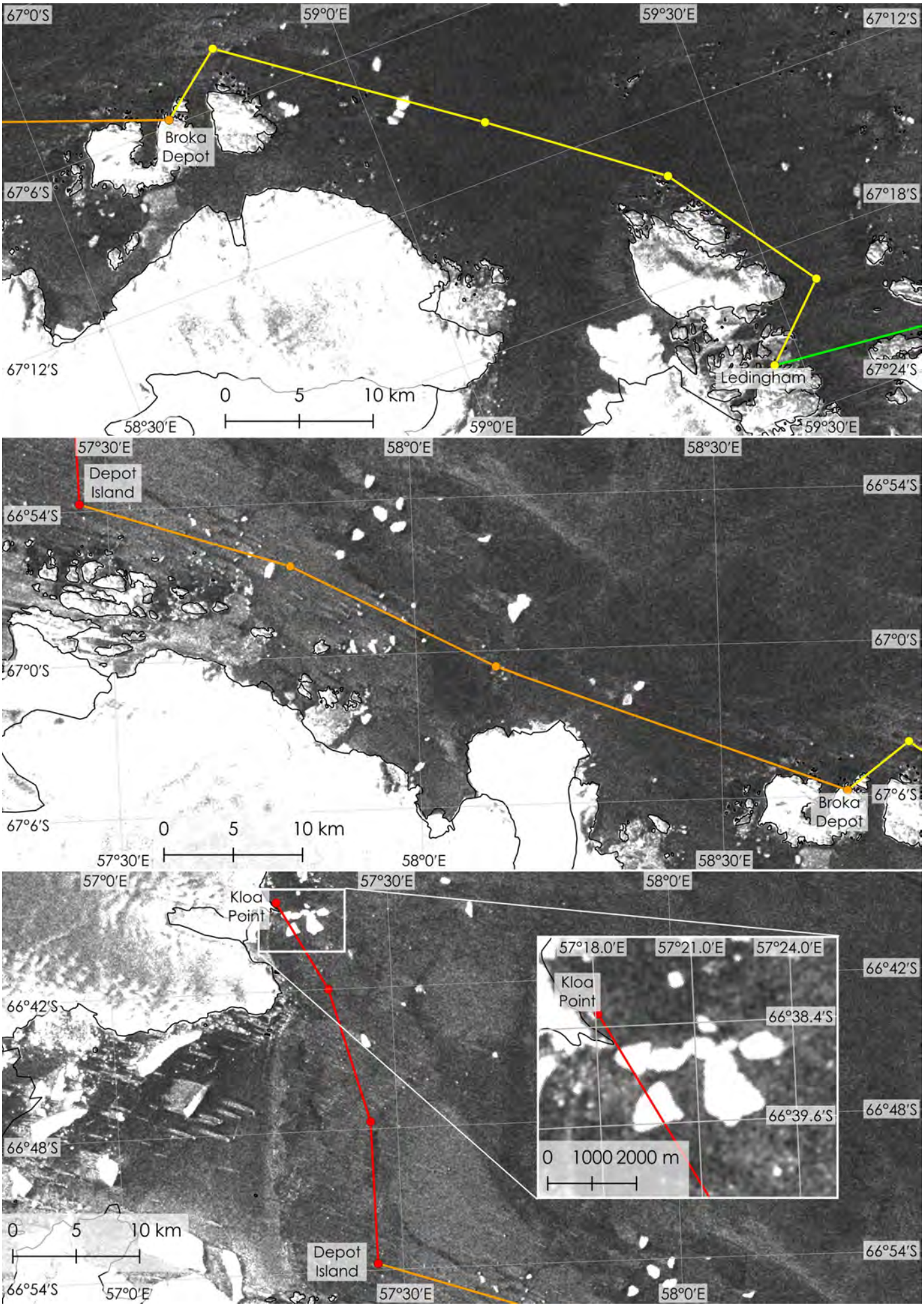


Figure 3: *Sentinel-1a SAR EW data acquired 15 September 2022 at 16:18 UT and provided by PolarView.*

Ice Bulletin: Wilkins Aerodrome

Issued: Friday 16th September 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data of Wilkins Aerodrome.

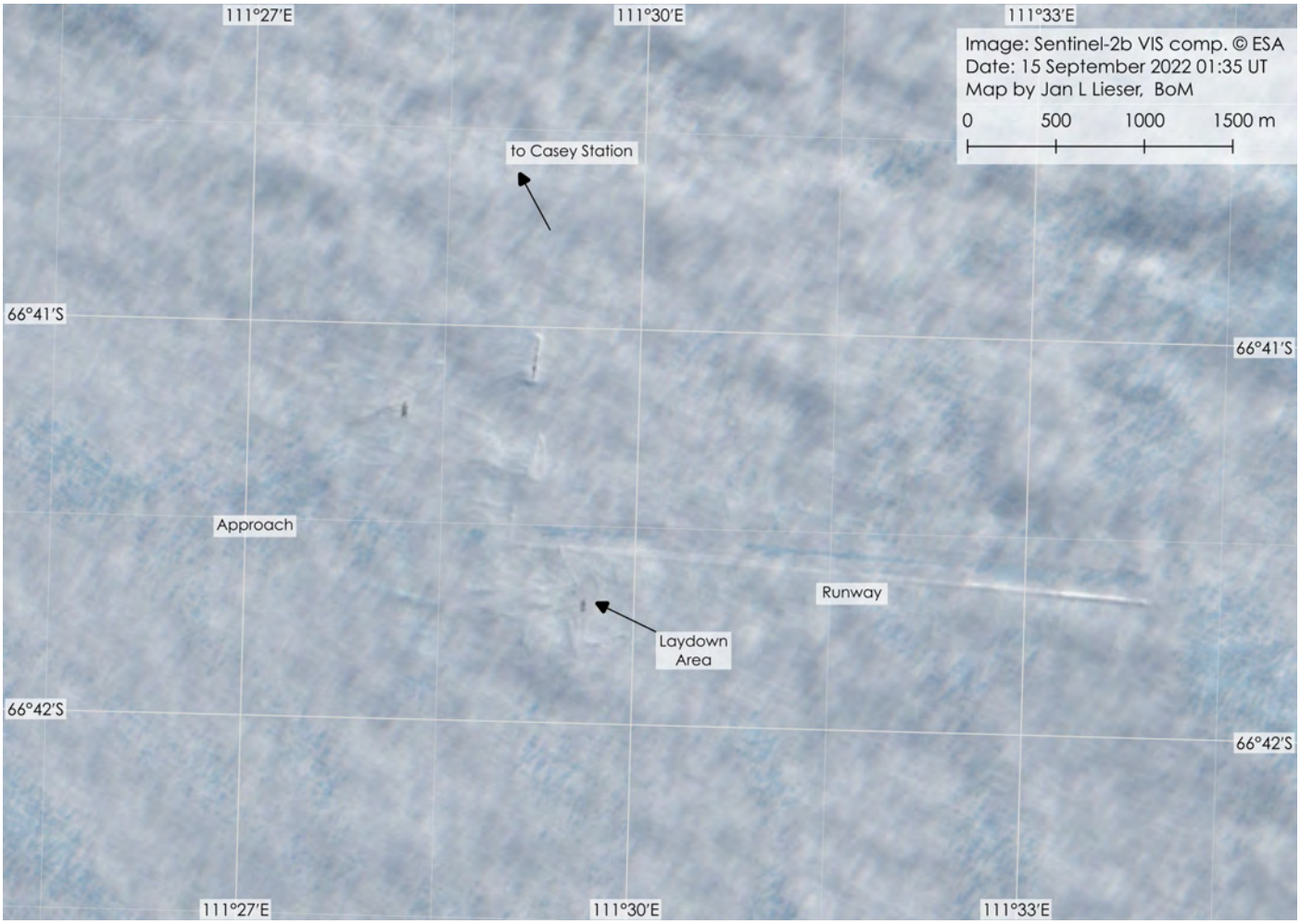


Figure 1: *Sentinel-2b visible composite data acquired 15 September 2022 at 01:35 UT and provided by USGS.*

The scene is slightly obscured by thin clouds. North and south of the runway, snow dunes are left from previous clearing the runway.

Snow dunes have also accumulated in the lee of the camp and other structures.

Ice Bulletin: Mawson Station

Issued: Tuesday 20th September 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data around Fold Island west of Mawson Station.

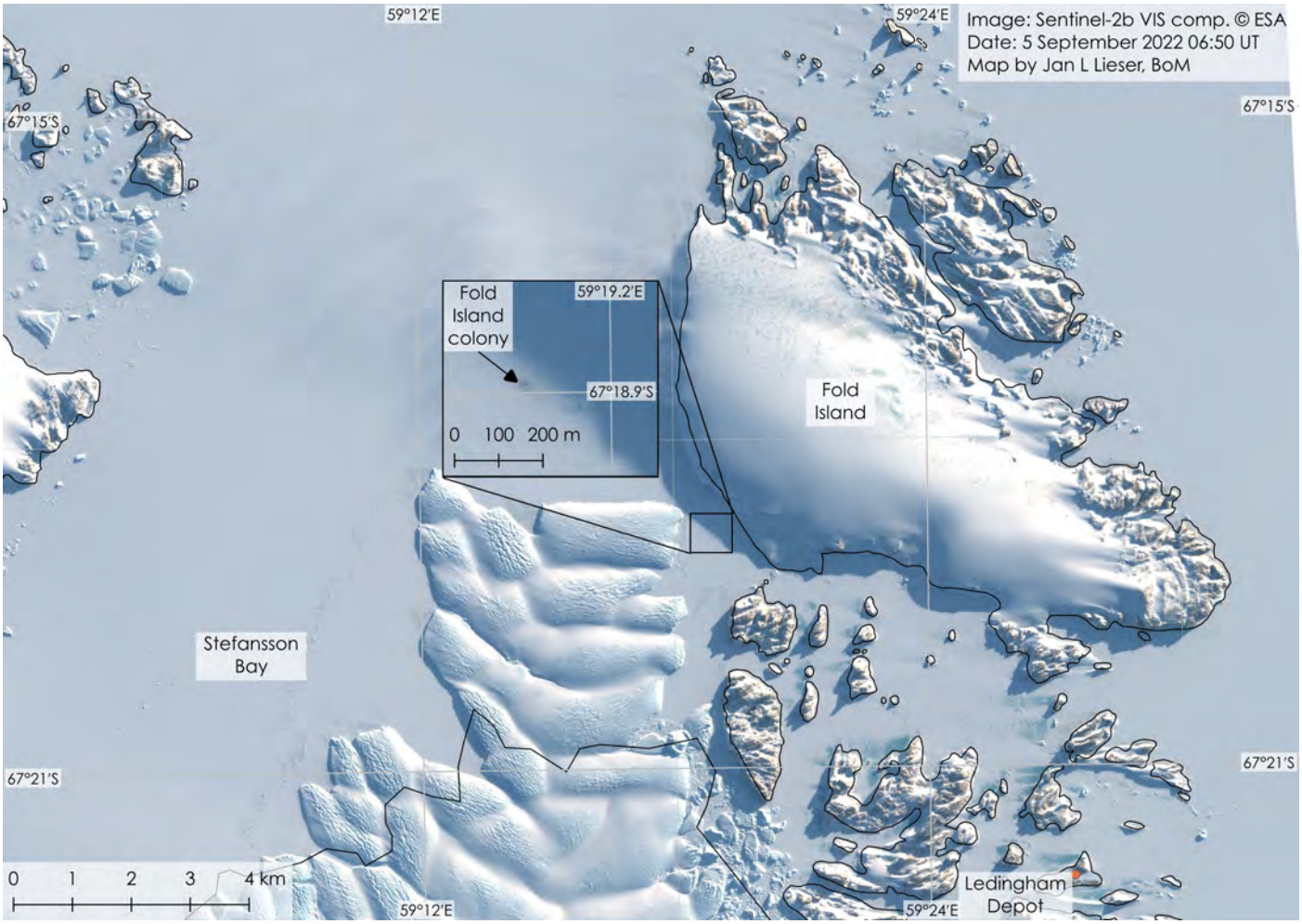


Figure 1: *Sentinel-2b VIS composite data acquired 5 September 2022 at 06:50 UT and provided by USGS.*

A penguin colony is southwest of Fold Island and a discoloured spot can be seen.

Figure 2 shows high-resolution (15 m horizontal) data southeast of Kloa Point west of Fold Island (west of Mawson Station).

A penguin colony is south of a land promontory around Kloa Point and a discoloured spot can be seen.

North of the region west of Mawson Station, the northern sea-ice edge (not shown in the figures) is roughly 45 nautical miles below (south of) the median sea-ice extent for September.

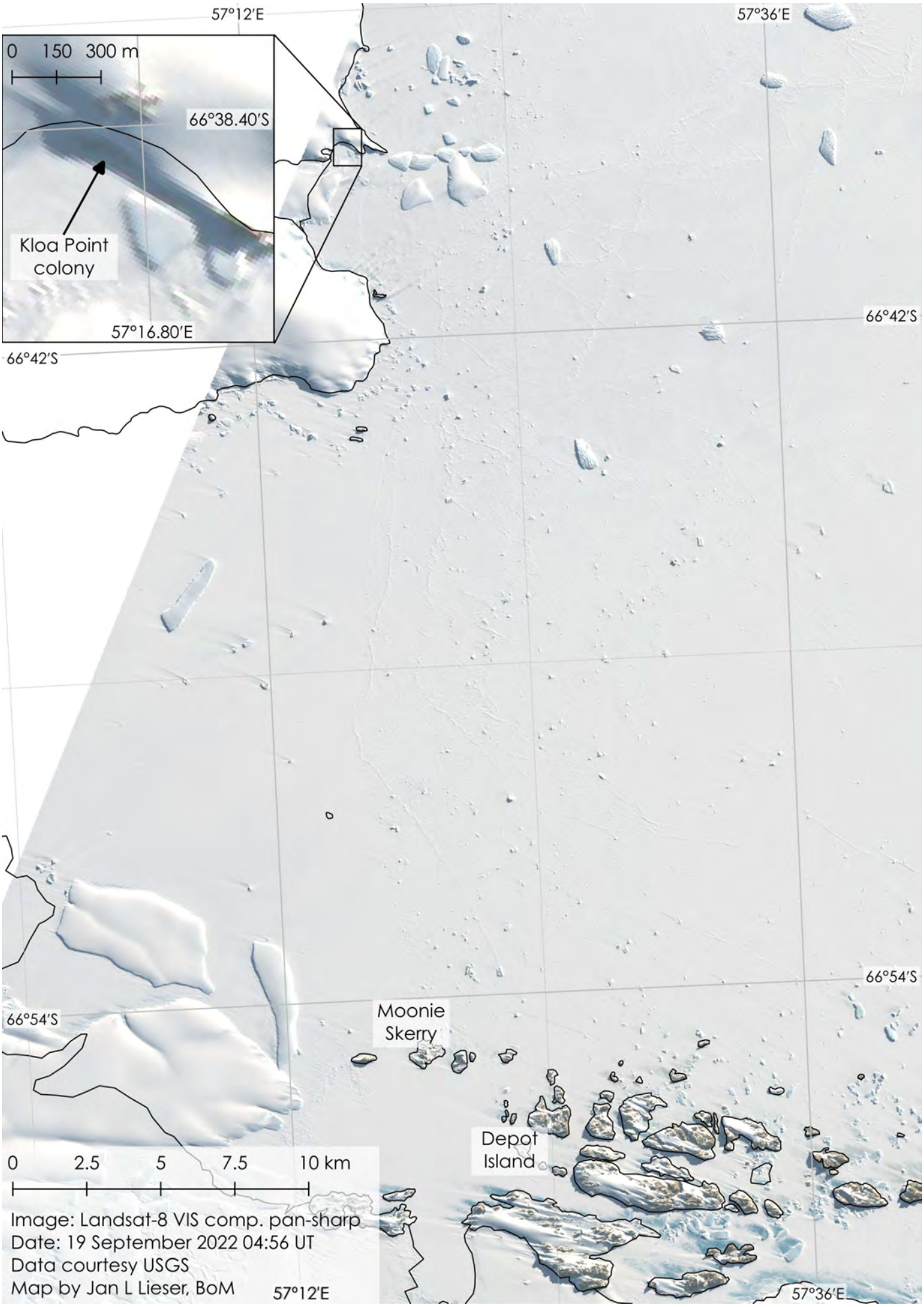


Figure 2: *Landsat-8 VIS composite pansharpened data acquired 19 September 2022 at 04:56 UT and provided by USGS.*

Ice Bulletin: Casey Station

Issued: Monday 26th September 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data off Casey Station. The fast-ice edge is marked by a red line.

Off the Vanderford Ice Shelf, a polynya is active and new sea ice is forming there in strips and patches. This new ice is currently being pushed northward in the polynya.

North of the station, the northern sea-ice edge (not shown in the figure) is 25 to 75 nautical miles below (south of) median sea-ice extent for September.

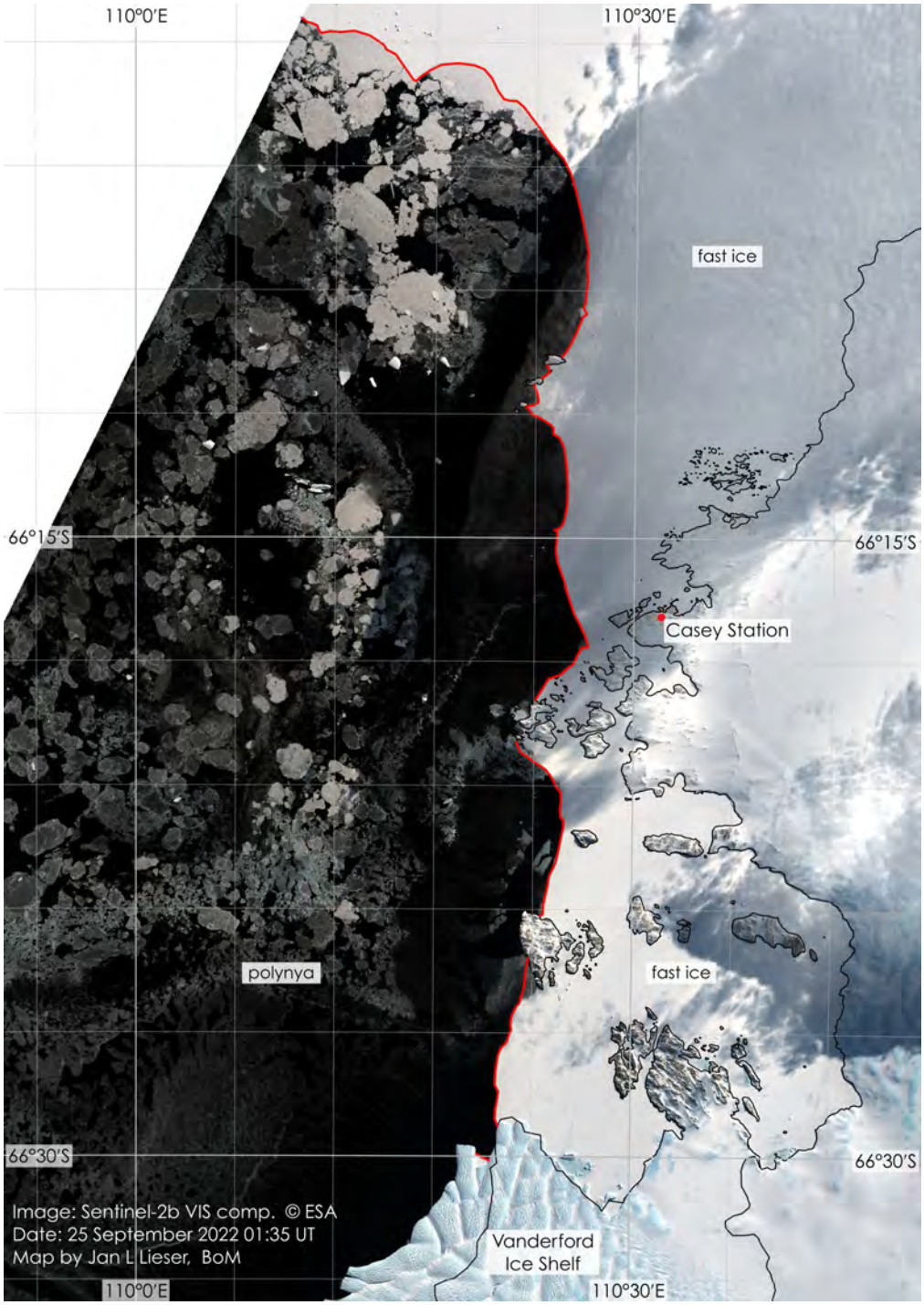


Figure 1: *Sentinel-2b visible composite data acquired 25 September 2022 at 01:35 UT and provided by USGS.*

Ice Bulletin: Mawson Station

Issued: Monday 26th September 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data east of Mawson Station.

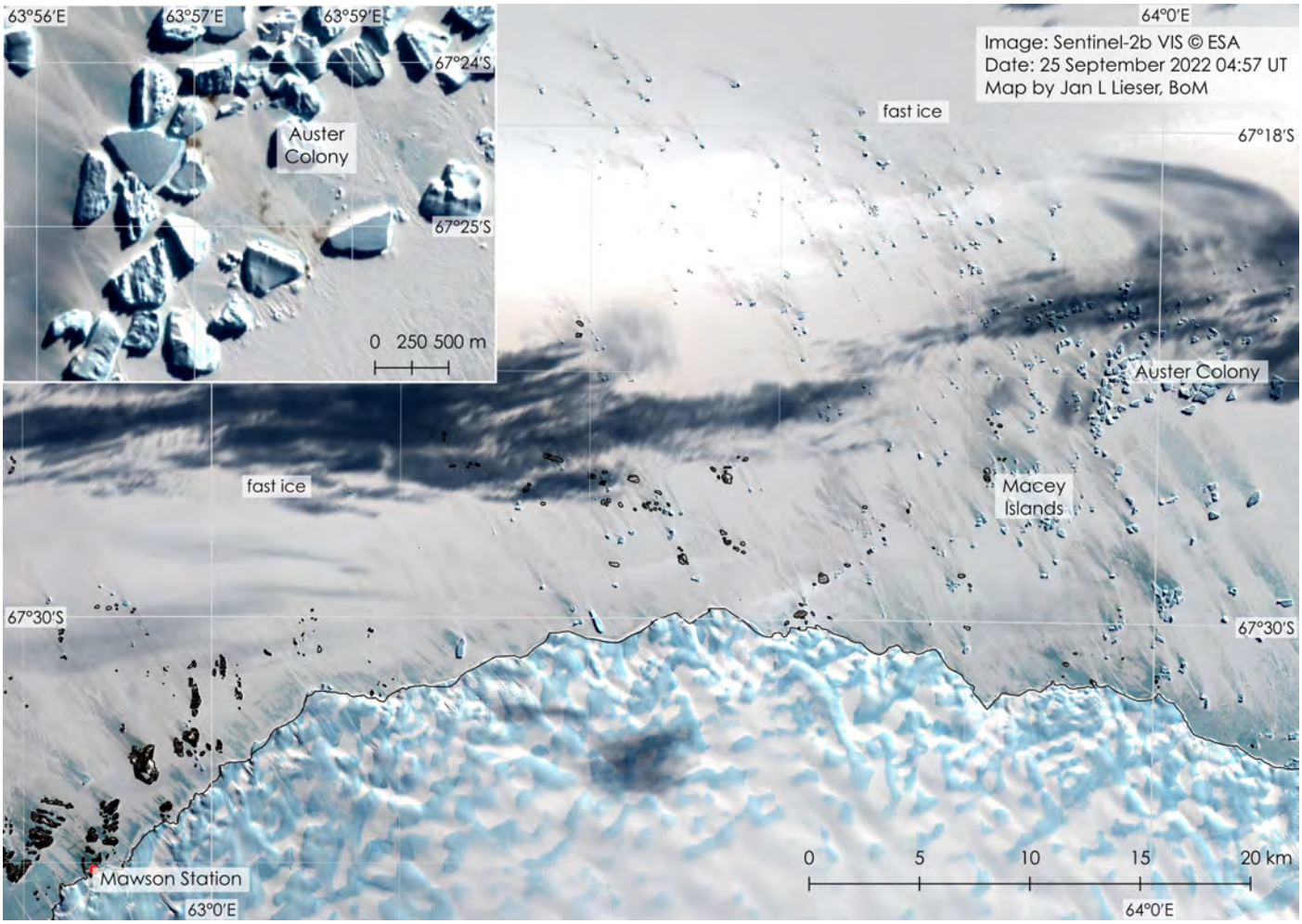


Figure 1: *Sentinel-2b VIS composite data acquired 25 September 2022 at 04:57 UT and provided by USGS.*

The Auster penguin colony is between icebergs east of the station and discoloured spots can be seen.

Figure 2 shows high-resolution (15 m horizontal) data southeast of Kloa Point west of Mawson Station.

A penguin colony is south of a land promontory around Kloa Point and a discoloured spot can be seen.

North of Mawson Station, the northern sea-ice edge (not shown in the figures) remains roughly 45 nautical miles below (south of) the median sea-ice extent for September.

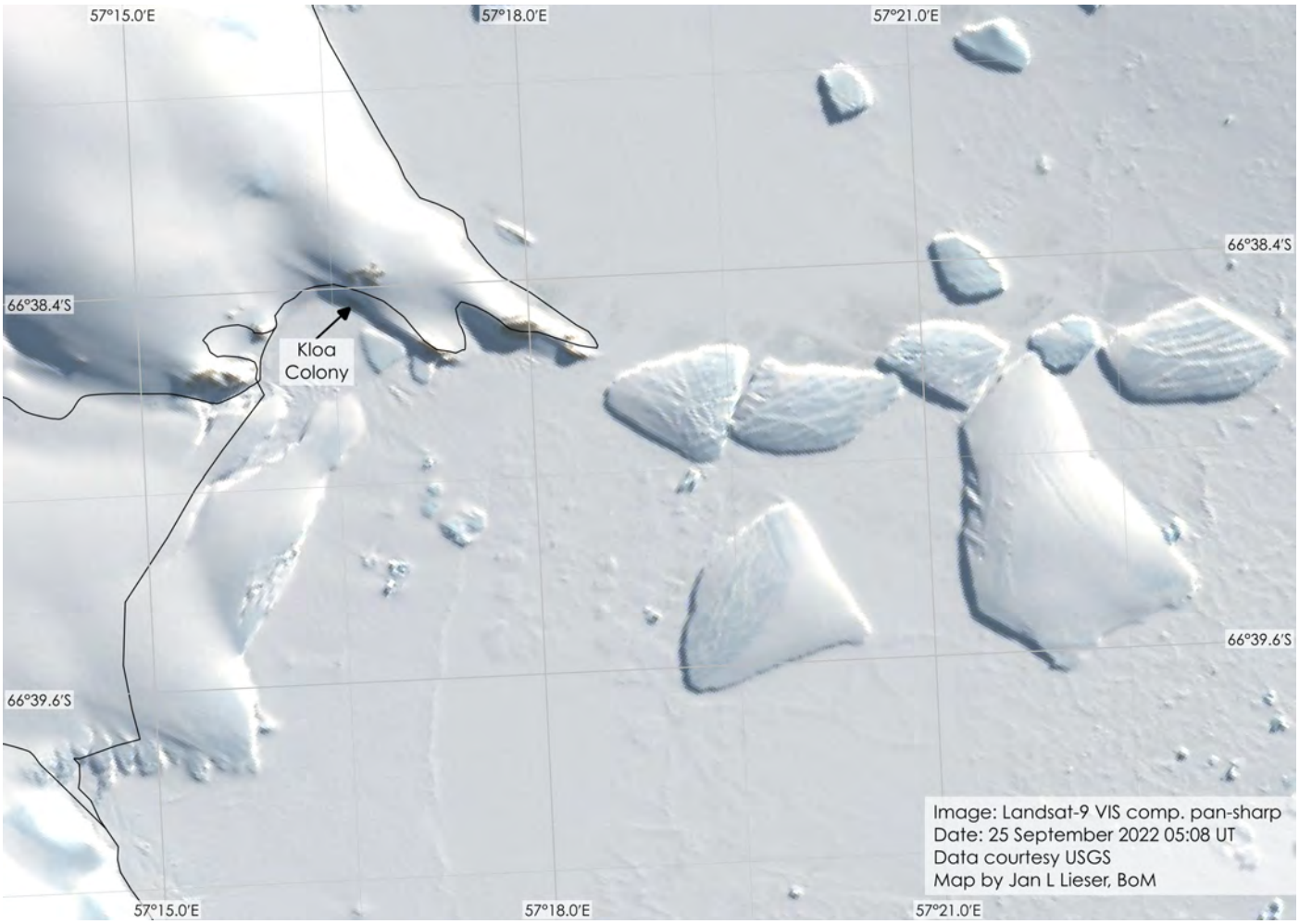


Figure 2: *Landsat-9 VIS composite pansharpened data acquired 25 September 2022 at 05:08 UT and provided by USGS.*

Ice Bulletin: Iceberg A-76A

Issued: Wednesday 28th September 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off the northern tip of the Antarctic Peninsula in the north-western Weddell Sea.

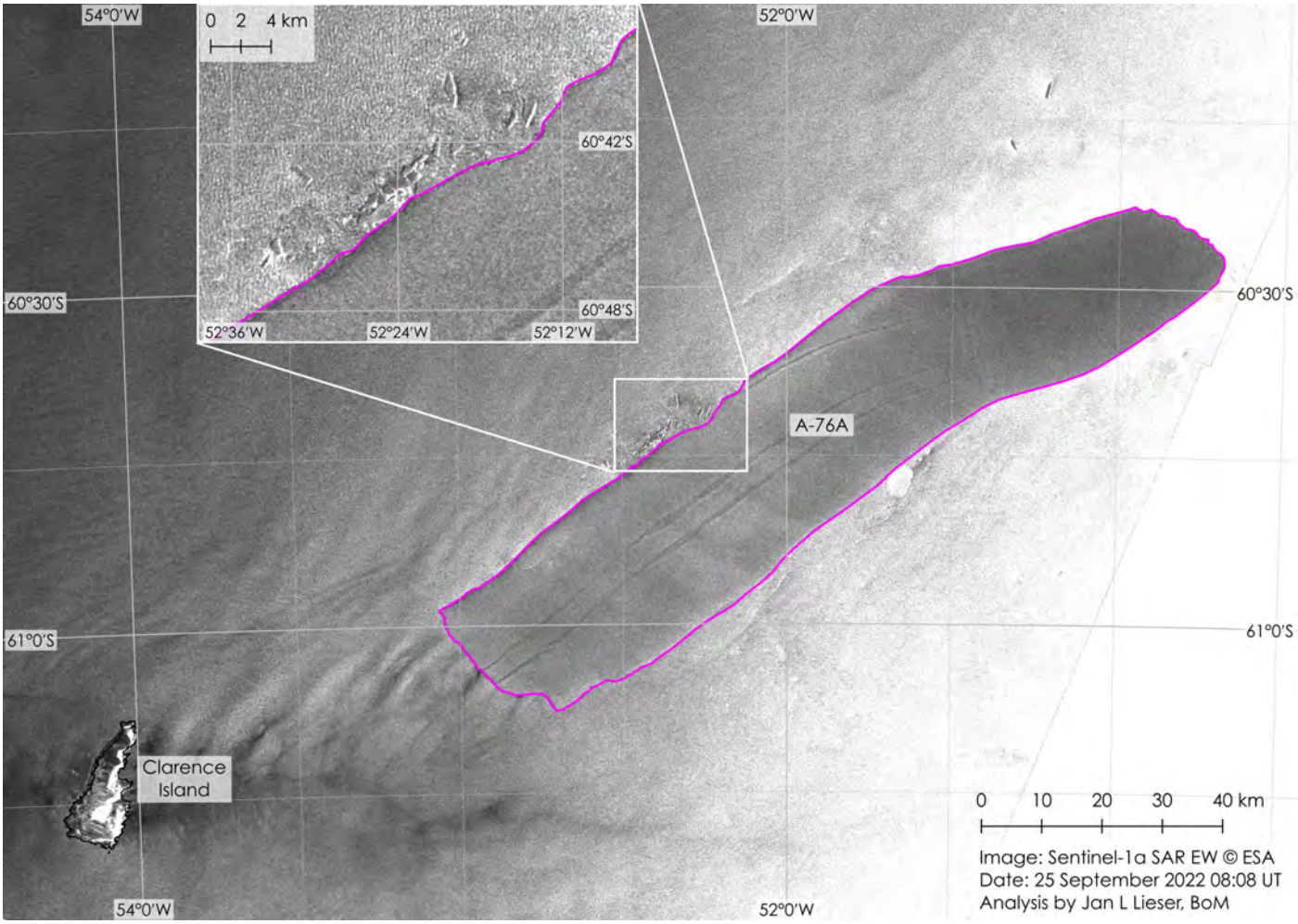


***Figure 1**: Sentinel-1a SAR EW data acquired 25 September 2022 at 08:08 UT and provided by PolarView.*

Iceberg A-76A has exited the marginal ice zone and is drifting in the southern South Atlantic Ocean. The iceberg is now roughly 150 nautical miles north of the sea-ice edge. During September, the iceberg completed another turn of 90 degrees while generally drifting north-eastward.

The inset in the figure shows an area of the northern flank of the iceberg, where smaller icebergs of up to 2 km length are flaking off the side of the iceberg. Further north, two more splinter icebergs of roughly 3 km and 2 km length, respectively, can be seen drifting in the vicinity of 51º15'W and 60º15'S.

Ice Bulletin: Wilkins Aerodrome

Issued: Wednesday 28th September 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of Wilkins Aerodrome.

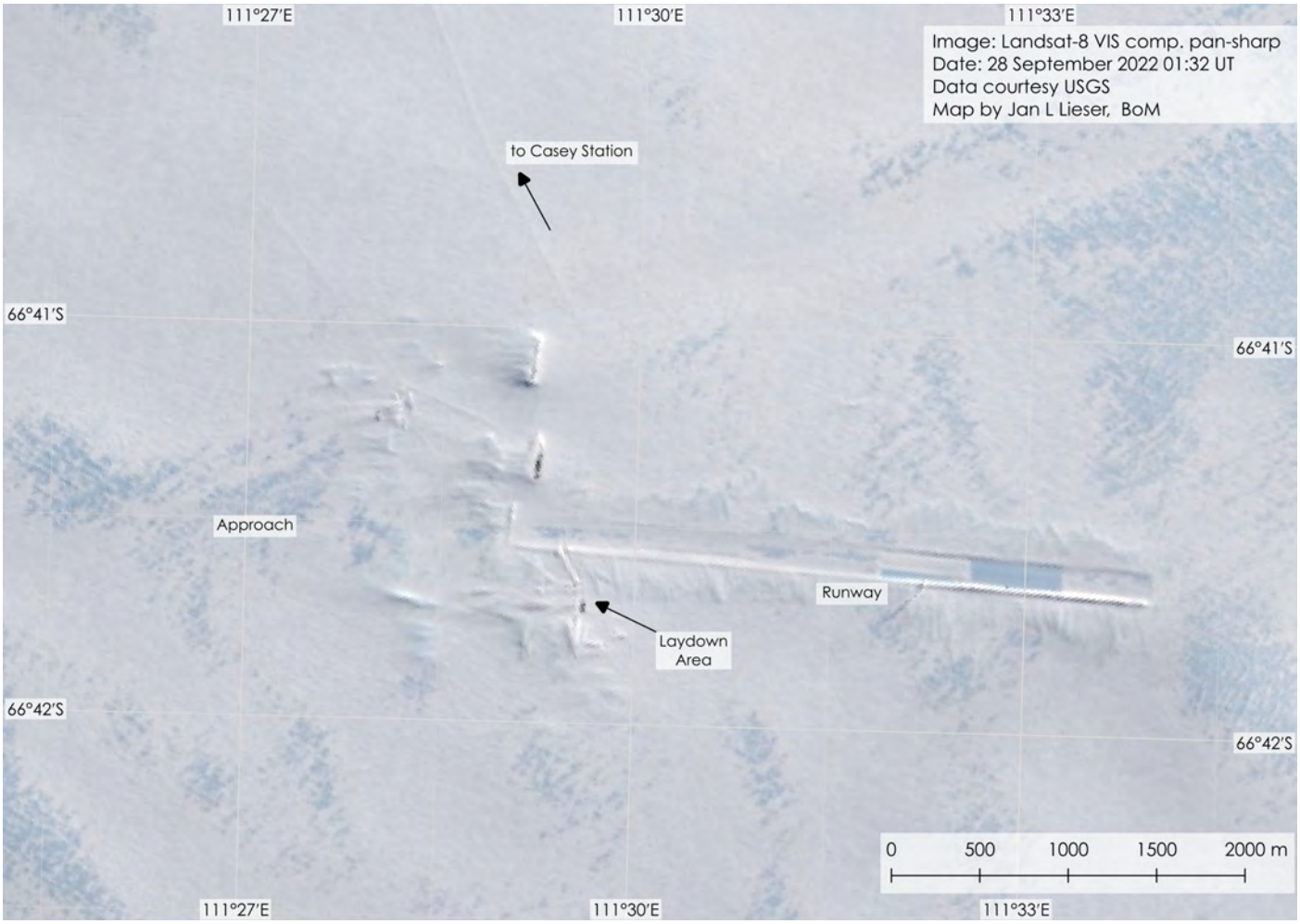


Figure 1: *Landsat-8 visible composite pan-sharpened data acquired 28 September 2022 at 01:32 UT and provided by USGS.*

The ice runway appears covered by fresh snow. North and south of the runway, snow dunes are left from previous clearing the runway.

Snow dunes have also accumulated in the lee of the camp and other structures.

Ice Bulletin: Iceberg A-76A

Issued: Friday 30th September 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution visible data off the northern tip of the Antarctic Peninsula in the north-western Weddell Sea.

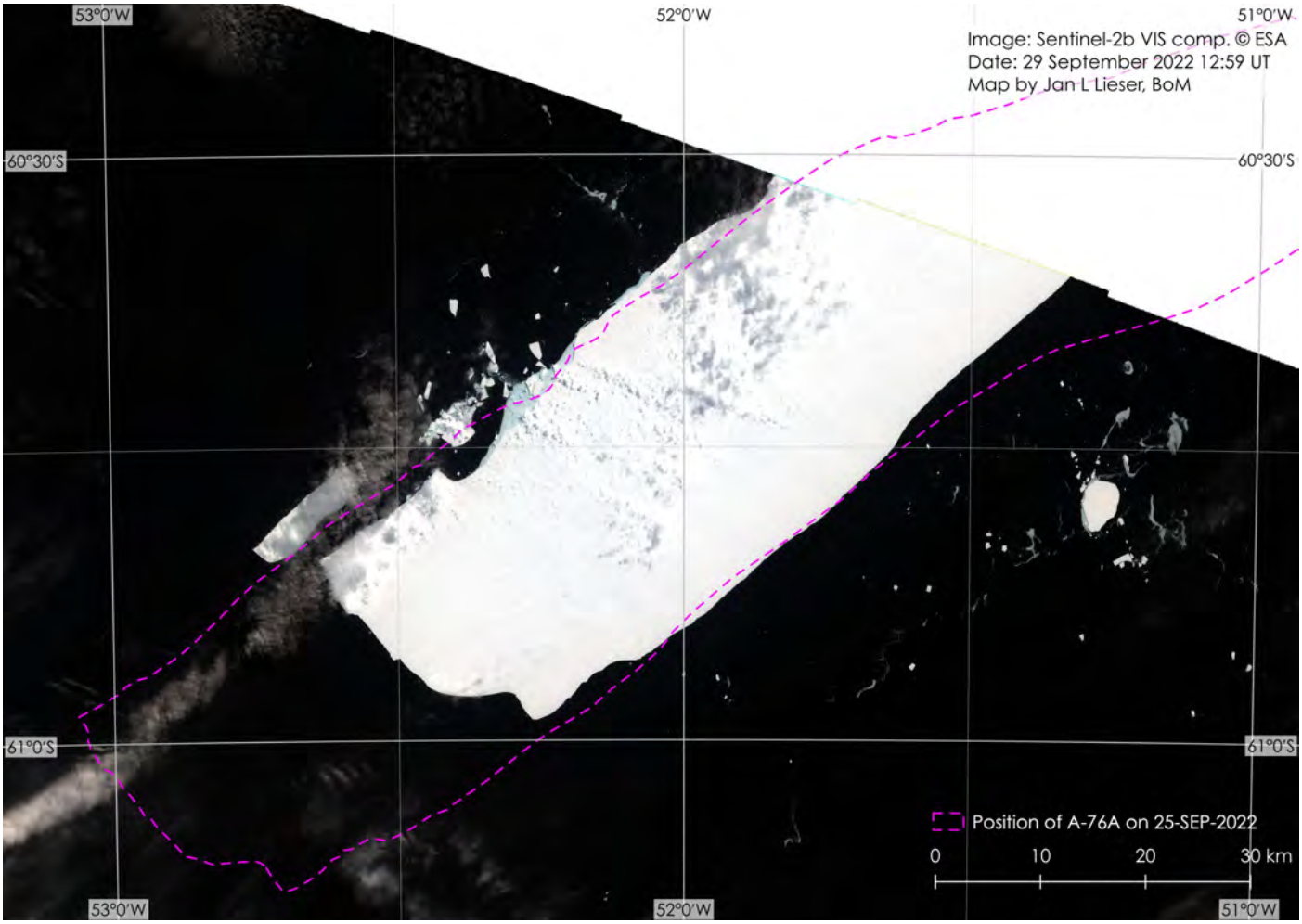


***Figure 1**: Sentinel-2b VIS composite data acquired 29 September 2022 at 12:59 UT and provided by USGS.*

Iceberg A-76A contiues drifting in the southern South Atlantic Ocean. The iceberg is now roughly 130 nautical miles north of the sea-ice edge and is generally drifting north-eastward, since 25 September 15 nautical miles.

The iceberg is increasingly starting the show signs of breaking up. At the western edge of the iceberg, substantial fragments can be seen separating from the berg as well as smaller icebergs and glacial debris.

Ice Bulletin: Casey Station

Issued: Monday 3rd October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data off Casey Station. The fast-ice edge on 11 September 2022 and 25 September 2022 is marked by a dashed red and orange line, respectively.

Off the Vanderford Ice Shelf, a polynya is active and new brash ice is forming there in strips and patches.

West of the station, the fast-ice edge is slowly retreating towards the shore.

North of the station, the northern sea-ice edge (not shown in the figure) is up to 100 nautical miles below (south of) median sea-ice extent for October.

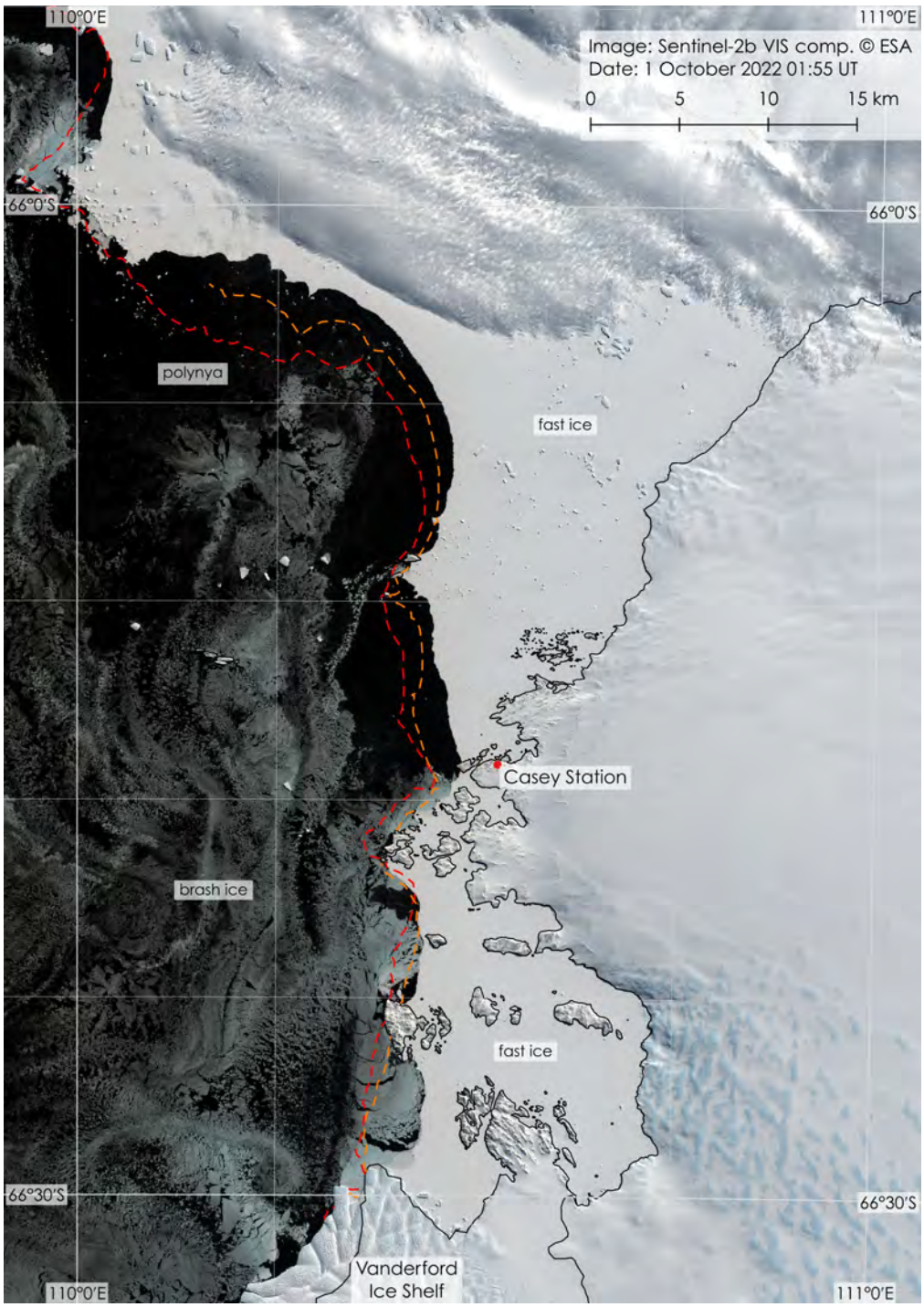


Figure 1: *Sentinel-2b visible composite data acquired 1 October 2022 at 01:55 UT and provided by USGS.*

Ice Bulletin: Wilkins Aerodrome

Issued: Monday 3rd October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data of Wilkins Aerodrome.

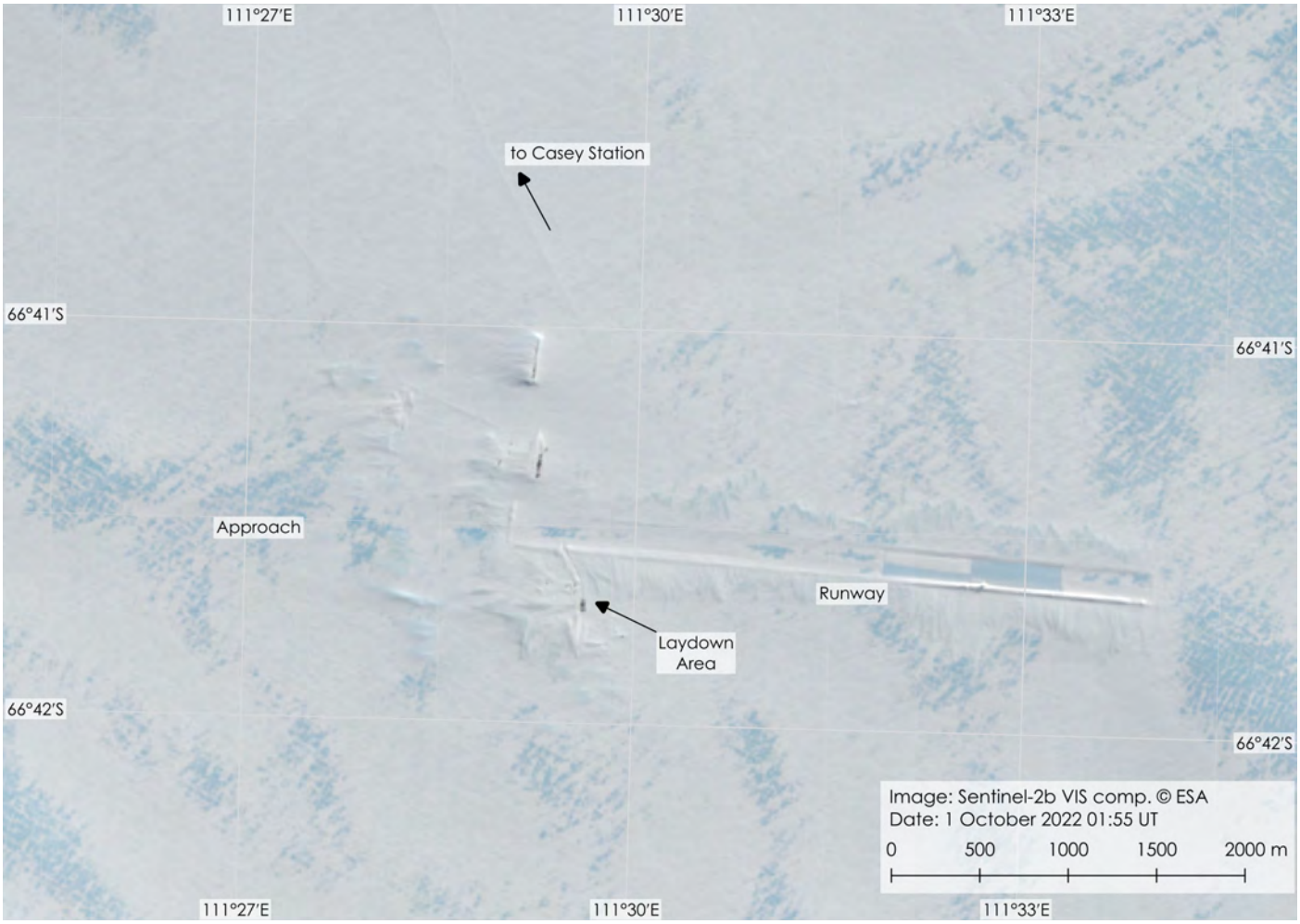


Figure 1: *Sentinel-2b visible composite data acquired 1 October 2022 at 01:55 UT and provided by USGS.*

The ice runway appears partly covered by fresh snow. North and south of the runway, snow dunes are left from previous clearing the runway.

Snow dunes have also accumulated in the lee of the camp and other structures.

Ice Bulletin: Davis Station

Issued: Monday 3rd October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Davis Station. The fast-ice edge is marked by a red line.

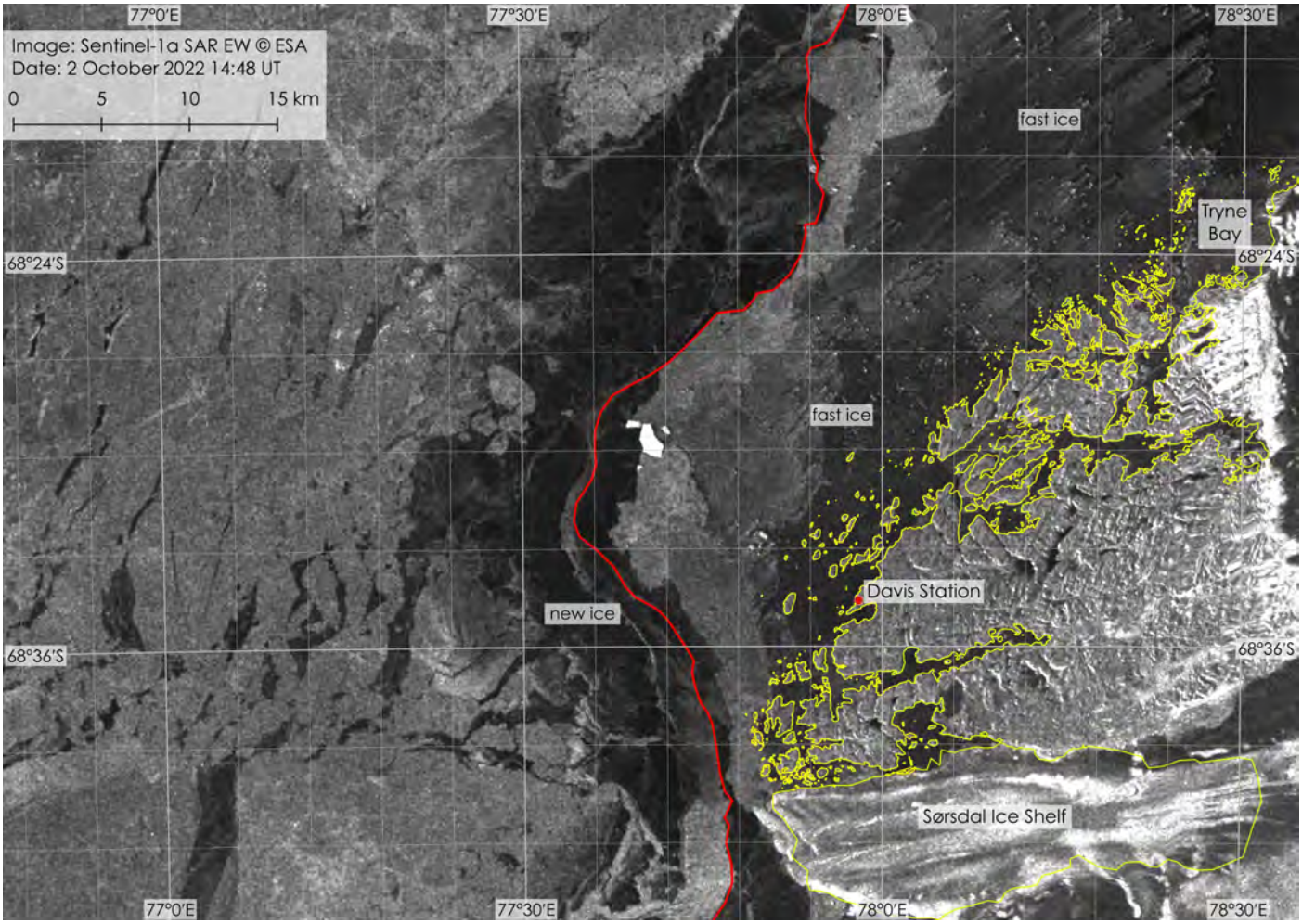


Figure 1: *Sentinel-1a SAR data acquired 2 October 2022 at 14:48 UT and provided by PolarView.*

West of the station, the fast-ice edge is roughly 7.5 nautical miles away from the shore. North of the Vestfold Hills, more fast ice has consolidated offshore during the past few weeks.

North of Davis Station, the northern sea-ice edge (not shown in the figure) is up to 140 nautical miles below (south of) median sea-ice extent for October.

Ice Bulletin: Iceberg A-76A

Issued: Monday 3rd October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off the northern tip of the Antarctic Peninsula in the north-western Weddell Sea.

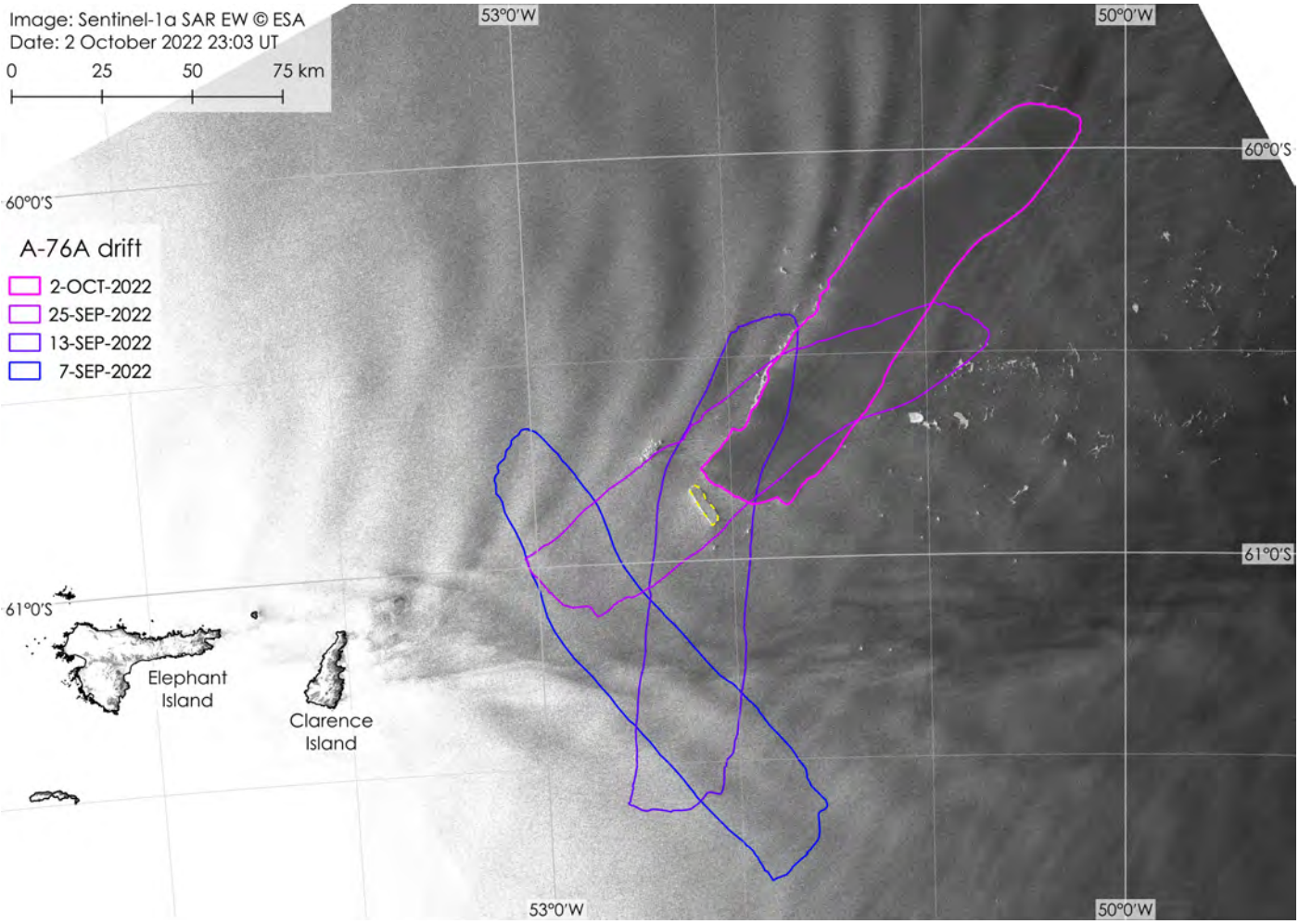


***Figure 1**: Sentinel-1a SAR EW data acquired 2 October 2022 at 23:03 UT and provided by PolarView.*

After exiting the marginal ice zone earlier, iceberg A-76A is now crossing the Hespérides Trough into the Scotia Sea and drifting in the southern South Atlantic Ocean. The iceberg is roughly 150 nautical miles north of the sea-ice edge.

The iceberg is increasingly starting the show signs of breaking up. In late-September, a substantial fragment separated from the berg's south-western edge (31.5 km^2; marked by a yellow outline south of the berg), as well as smaller icebergs and glacial debris surrounding the iceberg.

Ice Bulletin: Davis Station

Issued: Tuesday 4th October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution visible data off Davis Station.

West of the station, the fast-ice edge remains roughly 7.5 nautical miles away from the shore. Three different fast-ice types can be identified offshore, where the oldest fast ice near the shore extends to roughly 1 nautical mile west of Gardner Island, secondary (thinner) fast ice extending roughly further 2 nautical miles westward and a very thin outer edge of fast ice close to the open water.

North of Davis Station, the northern sea-ice edge (not shown in the figure) is up to 100 nautical miles below (south of) the median sea-ice extent for October.

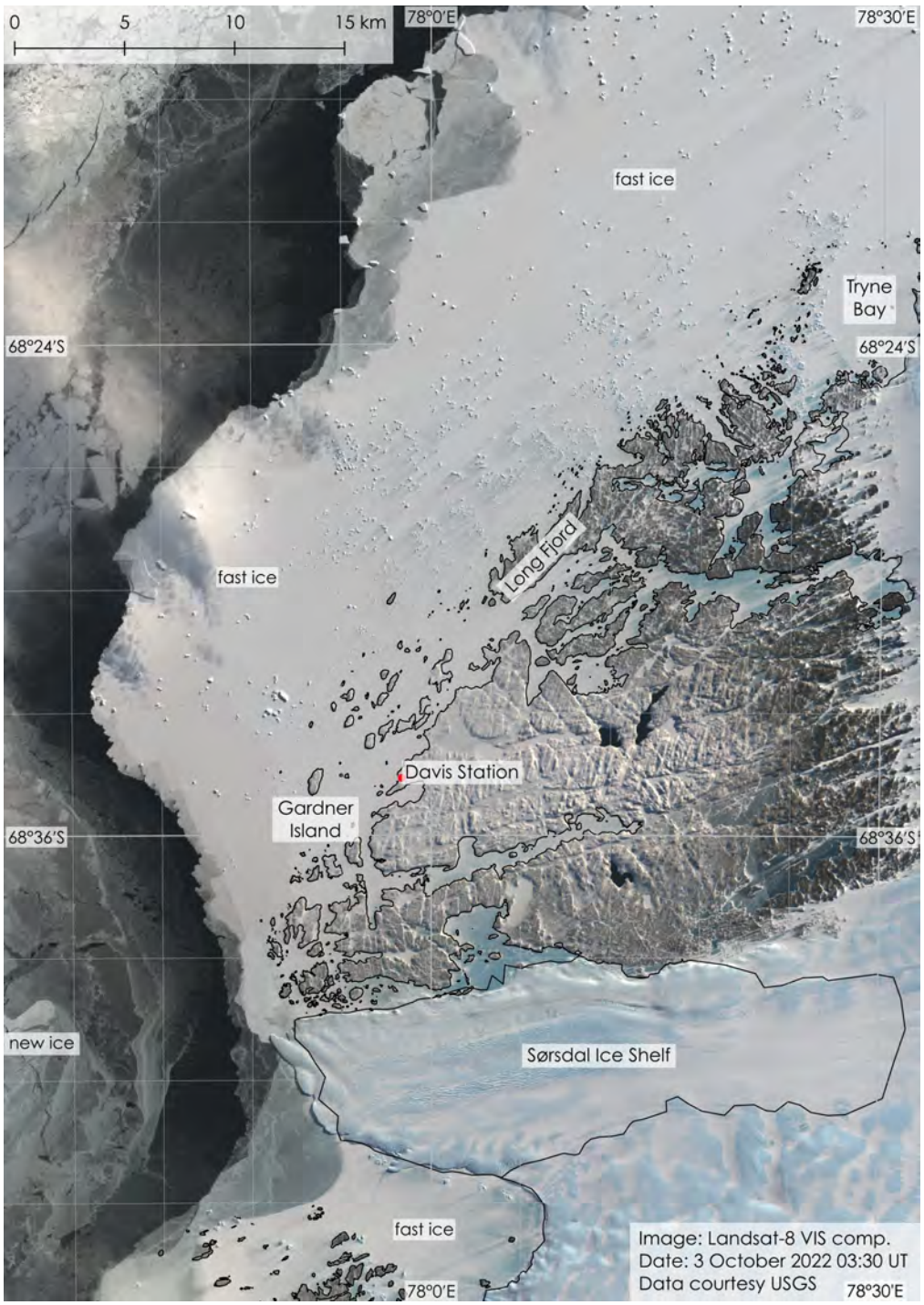


Figure 1: *Landsat-8 VIS composite data acquired 3 October 2022 at 03:30 UT and provided by USGS.*

Ice Bulletin: Casey Station

Issued: Thursday 6th October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution SAR data off Casey Station. The fast-ice edge on 11 September 2022 and 25 September 2022 is marked by a dashed orange and red line, respectively.

West of the station, the fast-ice edge has been retreating towards the shore due to recent weather.

North of the Vanderford Ice Shelf, a very large polynya is active and new brash ice is forming there in strips and patches.

North of the station, the northern sea-ice edge (not shown in the figure) is up to 125 nautical miles below (south of) median sea-ice extent for October.

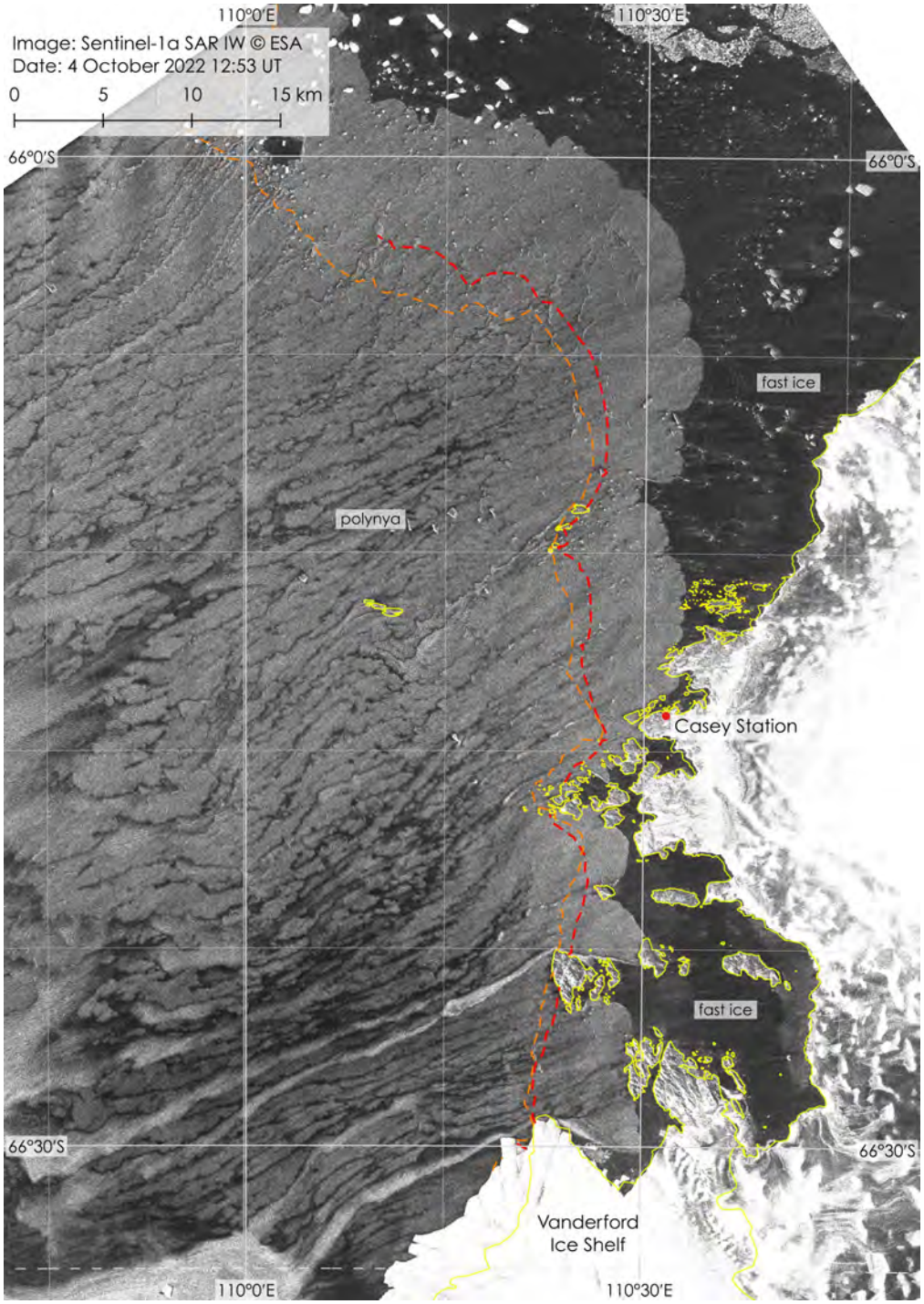


Figure 1: *Sentinel-1a SAR IW data acquired 4 October 2022 at 12:53 UT and provided by USGS.*

Ice Bulletin: Iceberg A-76A

Issued: Thursday 6th October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data northeast of the Antarctic Peninsula in the north-western Weddell Sea.

After exiting the marginal ice zone earlier, iceberg A-76A continues to cross the Hespérides Trough into the Scotia Sea and drifting in the southern South Atlantic Ocean. The iceberg remains roughly 150 nautical miles north of the sea-ice edge.

The iceberg is increasingly starting the show signs of breaking up. Yellow lines indicate new fault lines (3 and 5 nautical miles, respectively) radiating from the location where a substantial fragment broke away in late September. Smaller icebergs and glacial debris are surrounding the iceberg.

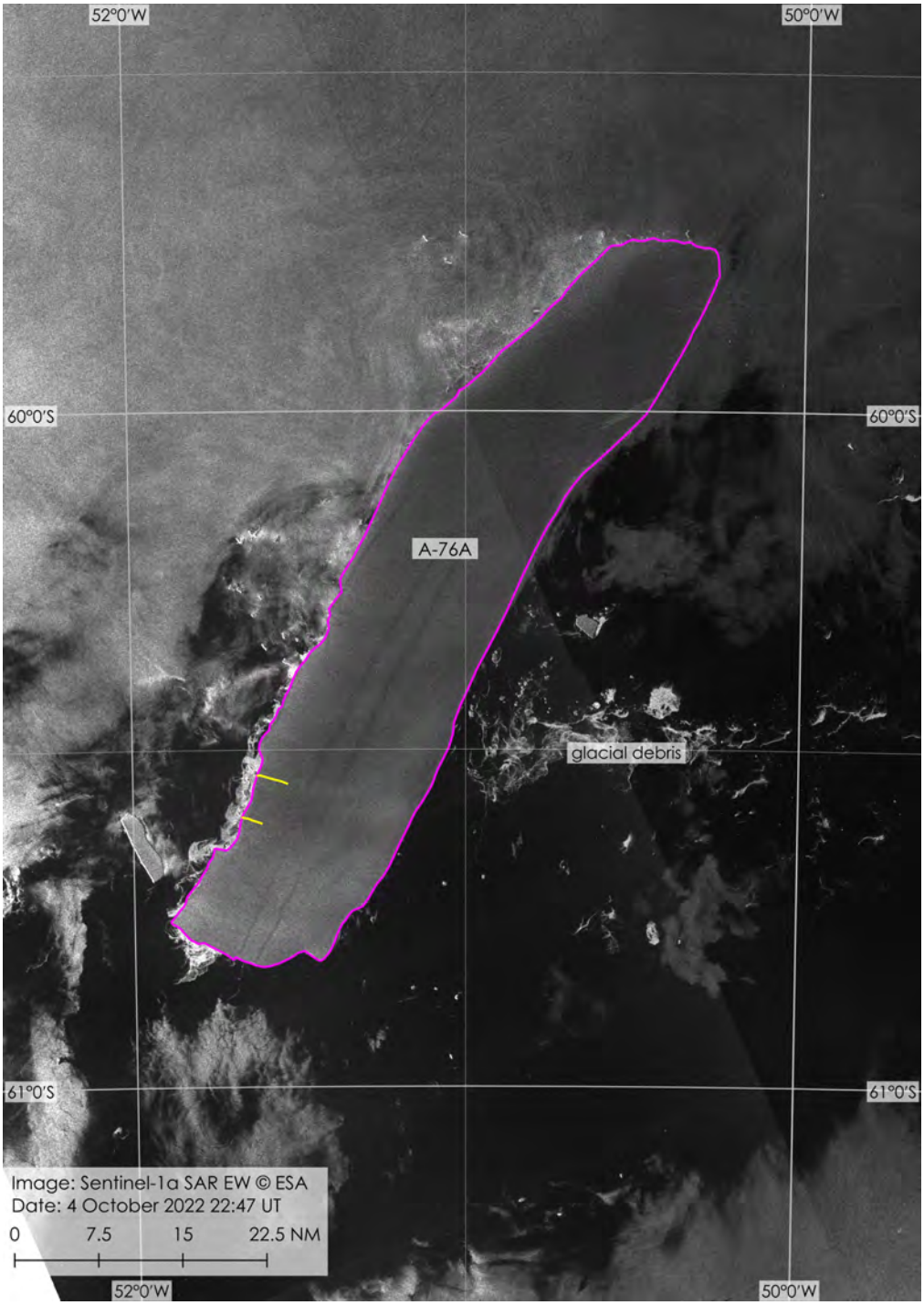


***Figure 1**: Sentinel-1a SAR EW data acquired 4 October 2022 at 22:47 UT and provided by PolarView.*

Ice Bulletin: Mill Island

Issued: Friday 7th October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows a composite of high-resolution (15 m horizontal) visible data and SAR data around Mill Island. The positions of four large icebergs are marked by colour-coded outlines.

The inset shows high-resolution (15 m horizontal) visible data around Edgeworth David Base of the Bunger Hills south of Mill Island (just outside of the mainframe of the figure).

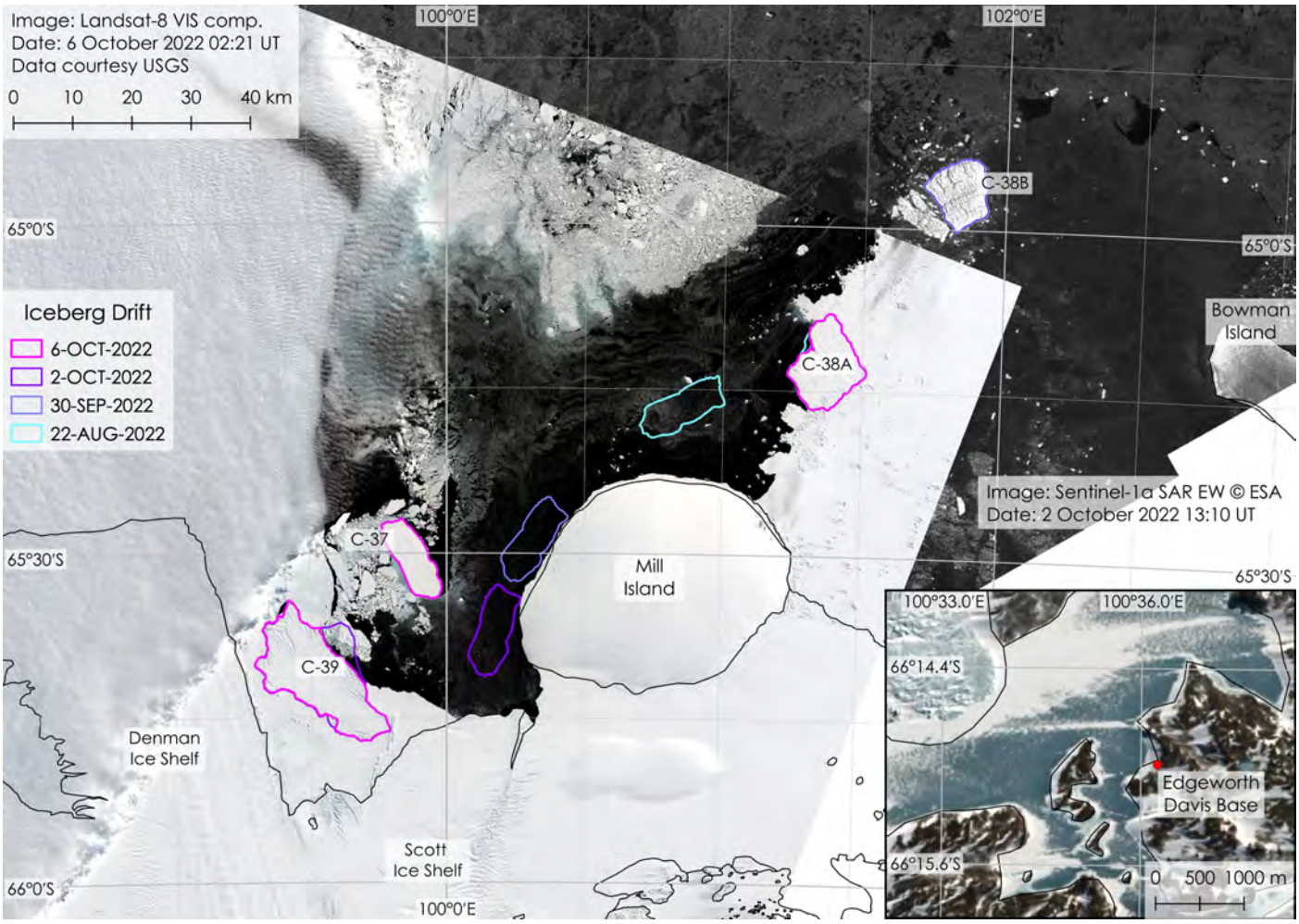


Figure 1: *Landsat-8 visible composite pan-sharpened data acquired 6 October 2022 at 02:21 UT and provided by USGS; complemented by Sentinel-1a SAR EW data acquired 2 October 2022 at 13:10 UT and provided by PolarView.*

Northeast of Mill Island, three large icebergs were enclosed by fast ice in late August 2022. During September 2022, iceberg C-37 was released again and drifted south-westward along the island before turning north-westward in early October 2022. Icebergs C-38A and C-38B remain grounded and enclosed by fast ice but iceberg C-38A has lost a bit of mass on its western flank. Since 2 October 2022, iceberg C-39 has lost roughly 34 km^2 on its north-eastern flank but remains enclosed by fast ice between the Denman Ice Shelf and the Scott Ice Shelf west of Mill Island.

North of Mill Island, the northern sea-ice edge (not shown in the figure) is up to 60 nautical miles below (south of) median sea-ice extent for October.

Ice Bulletin: Dalton Iceberg Tongue

Issued: Monday 10th October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data (within the black frame) of the Dalton Iceberg Tongue east of Casey Station. A typical fast-ice edge is marked by a dashed red line.

Up until mid-September, the fast ice east of the iceberg tongue was showing close to typical extent for the time of year. During the recent weeks, the fast ice has been eroded from the east and the cloud-free scene of the figure shows the extent to which the fast ice has been shattered now. Compared to the typical extent, the fast ice has been reduced by roughly 5200 km^2 east of the iceberg tongue.

Further north, the northern sea-ice edge (not shown in the figure) is between 10 and 30 nautical miles below (south of) median sea-ice extent for October, which is within the expected synoptical range of the variable sea-ice edge.

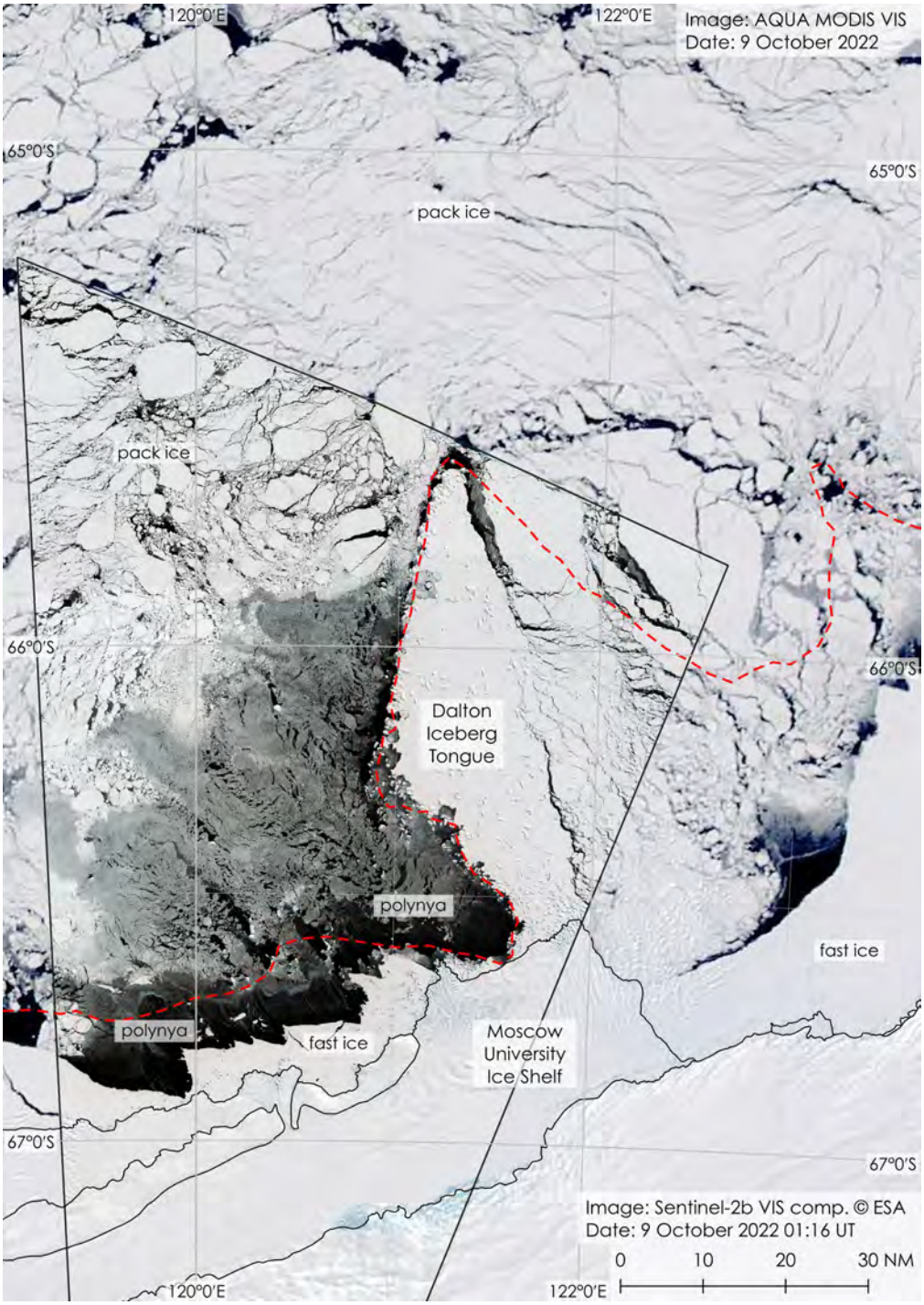


Figure 1: *Sentinel-2b visible data acquired 9 October 2022 at 01:16 UT and provided by USGS; complemented by AQUA MODIS VIS data acquired 9 October 2022 and provided by NASA.*

Ice Bulletin: Antarctica

Issued: Monday 17th October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows the pan-Antarctic sea-ice concentration anomaly based on passive microwave remote sensing data.

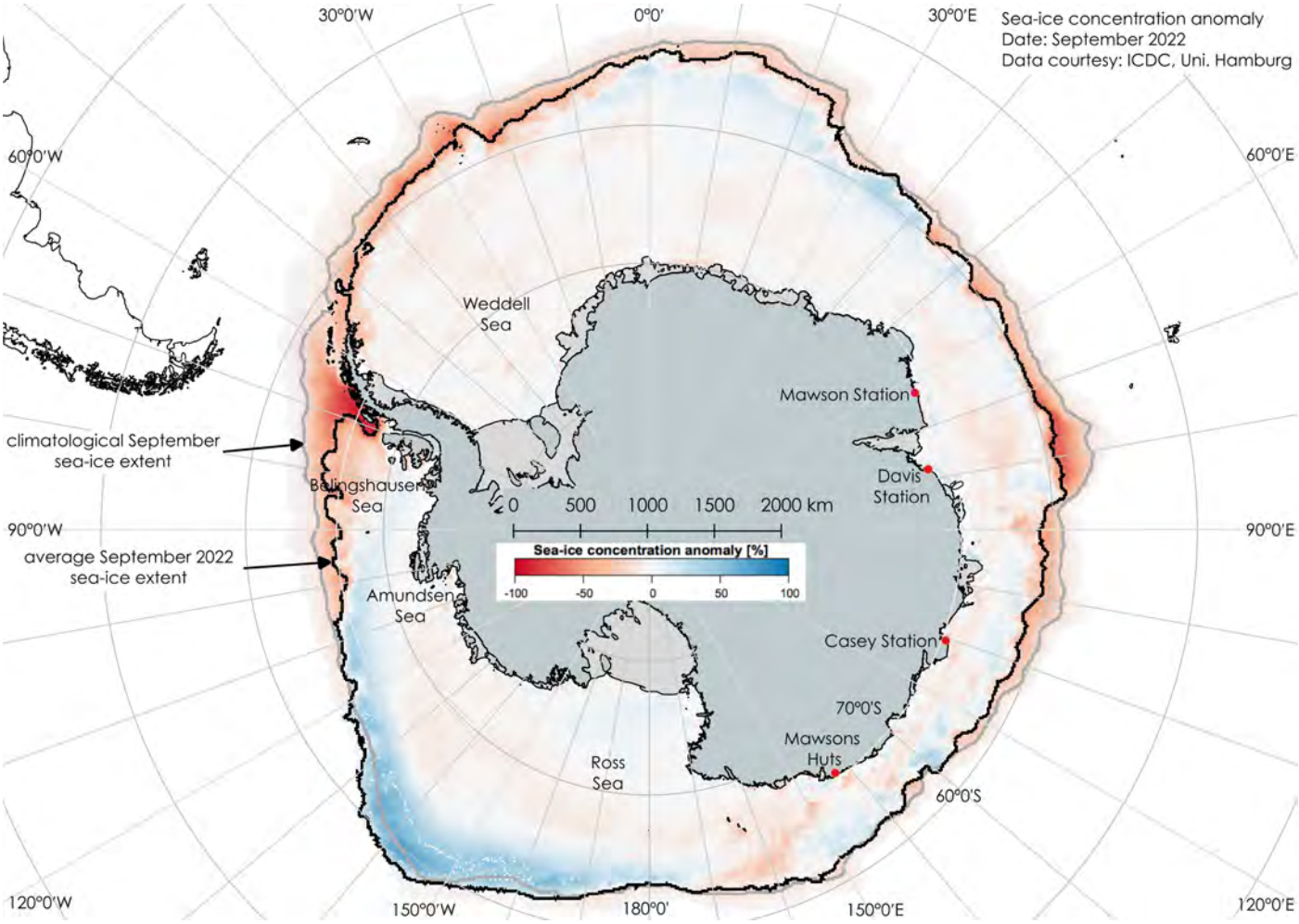


***Figure 1**: Sea-ice concentration anomaly for September 2022 provided by ICDC (Universität Hamburg).*

Pan-Antarctic sea-ice conditions continue to be overall low but not record-breaking during September.

Only in the central and eastern Ross Sea, sea-ice extent reached and partly exceeded climatological values. The rest of the sea-ice zone around the continent exhibited below average sea-ice extent and associated concentration.

The most pronounced negative anomaly is found west of the Antarctic Peninsula and negative extent anomalies stretch the entire Weddell Sea and are continuing throughout East Antarctica.

Northeast of the northern tip of the Antarctic Peninsula, a positive anomaly is associated with the drift of large iceberg A-76A, which is now north (outside) of the sea-ice zone and drifting further northward into the southern South Atlantic.

Ice Bulletin: Mawson Station

Issued: Monday 17th October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 and Figure 2 show high-resolution (15 m horizontal) visible data off Mawson Station. Due to multiple cloud reflections, the region around the station is over-saturated.

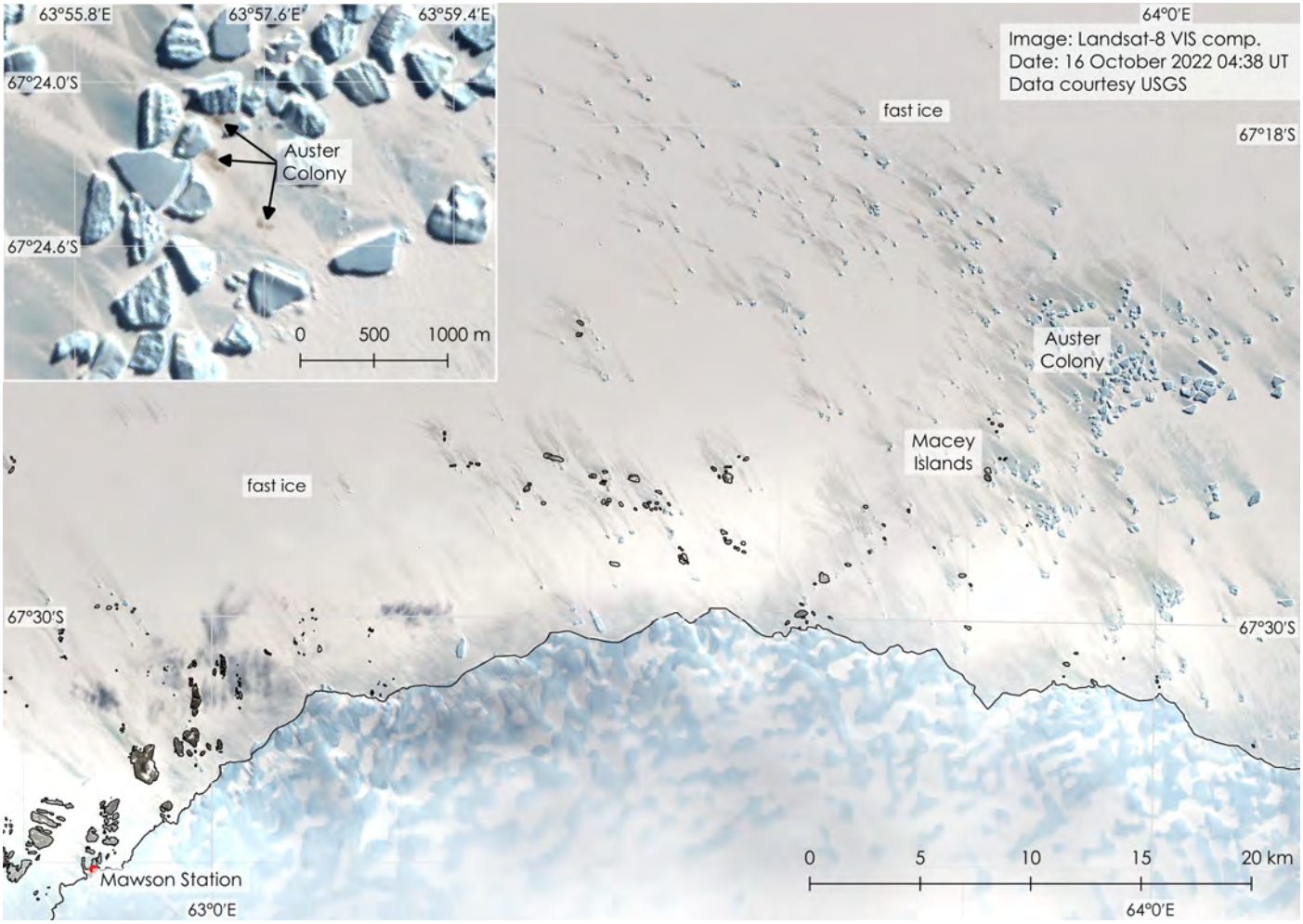


Figure 1: *Landsat-8 VIS composite pan-sharpened data acquired 16 October 2022 at 04:38 UT and provided by USGS.*

The Auster penguin colony is between icebergs northeast of the station and discoloured spots can be seen.

Northwest of the station, the nearest open water of the polynya is 38 nautical miles away.

The northern sea-ice edge (not shown in the figures) remains roughly 35 nautical miles below (south of) the median sea-ice extent for October.

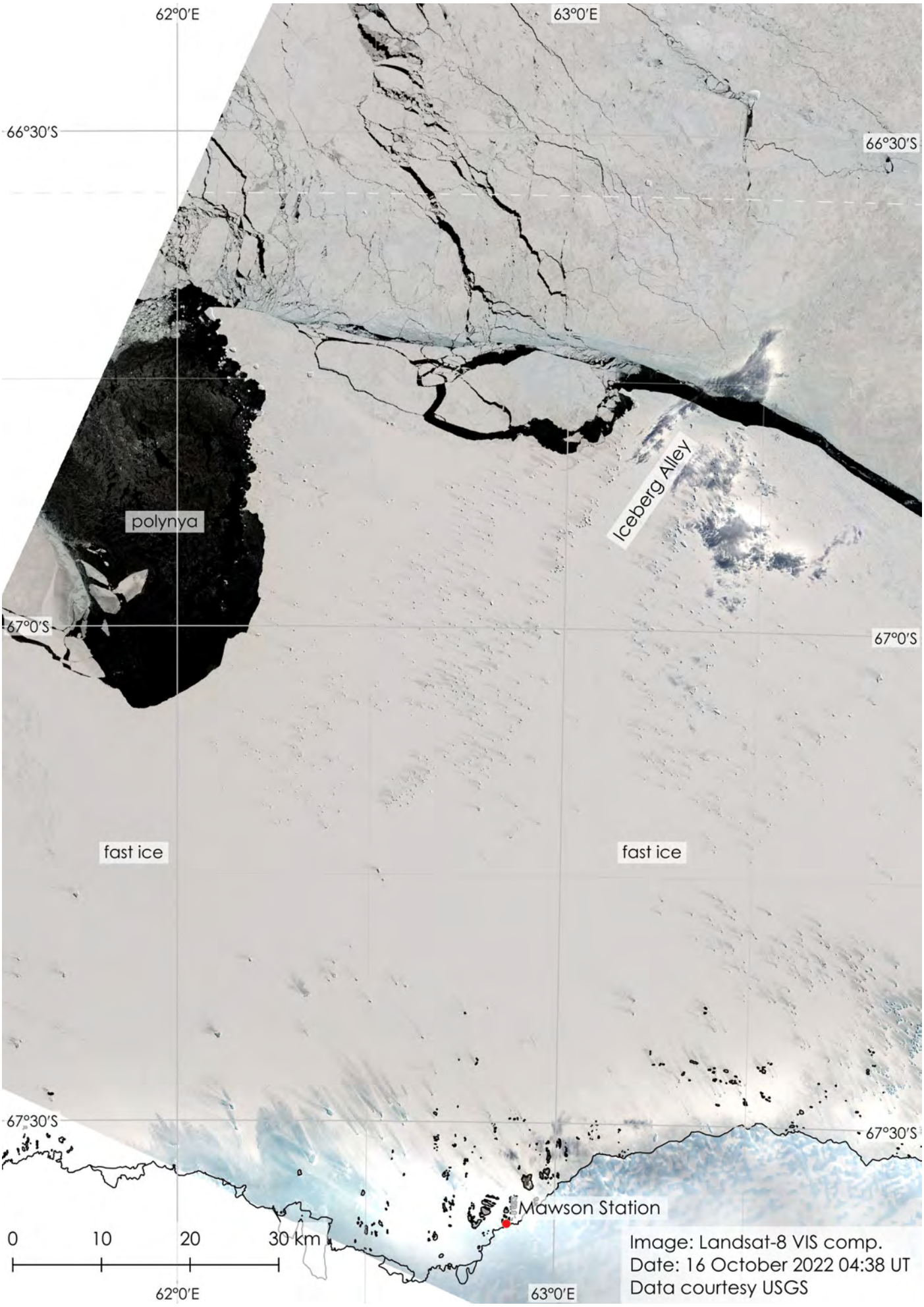


Figure 2: *Landsat-8 VIS composite pan-sharpened data acquired 16 October 2022 at 04:38 UT and provided by USGS.*

Ice Bulletin: Casey Station

Issued: Monday 17th October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution visible data off Casey Station.

West of the station, the fast-ice edge has been retreating towards the shore due to recent weather.

Off the fast-ice edge, a very large polynya is active and new brash ice is forming there.

North of the station, the northern sea-ice edge (not shown in the figure) is up to 140 nautical miles below (south of) median sea-ice extent for October.

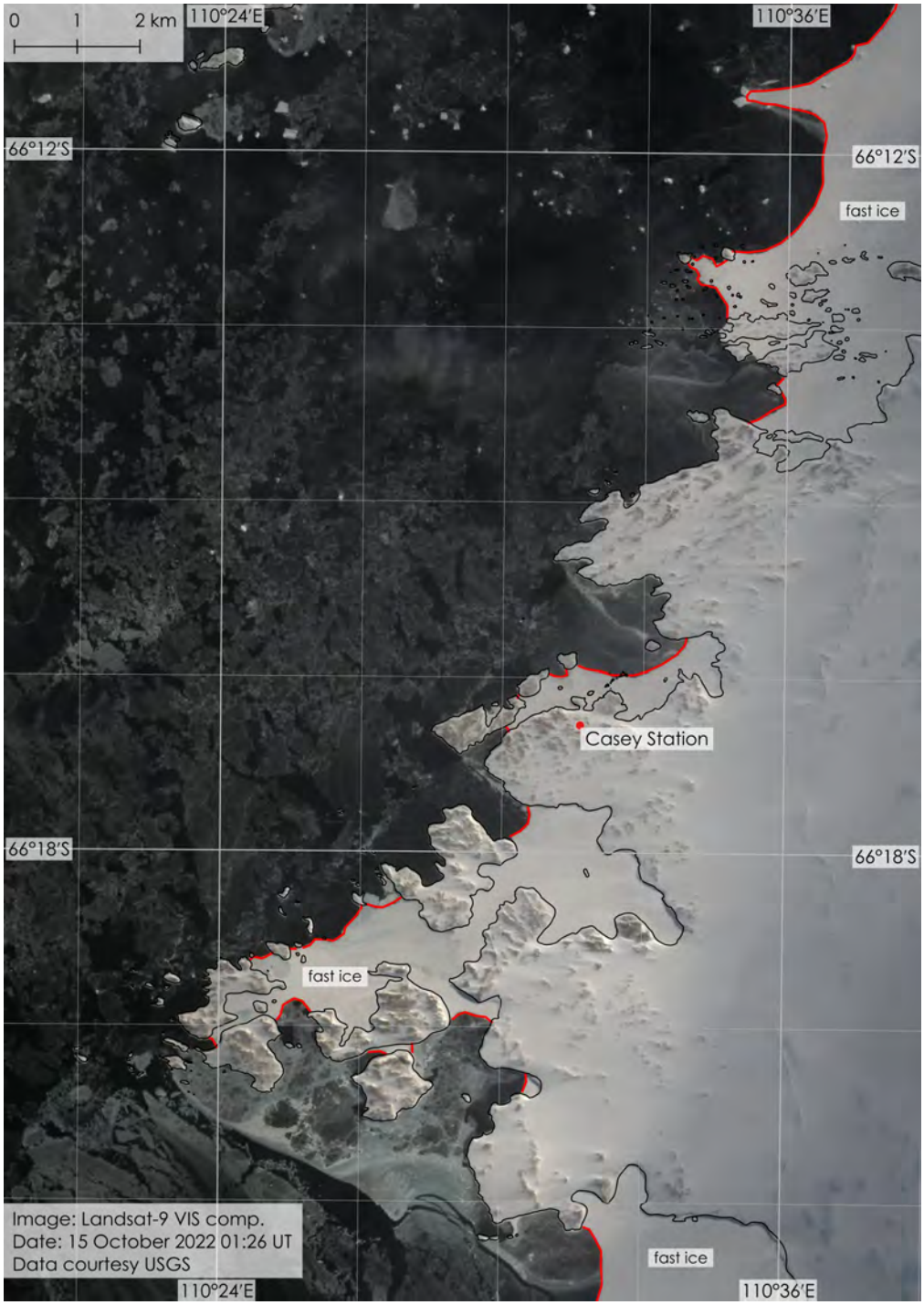


Figure 1: *Landsat-9 visible composite pansharpened data acquired 15 October 2022 at 01:26 UT and provided by USGS.*

Ice Bulletin: Davis Station

Issued: Tuesday 18th October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data off Davis Station. The scene is slightly obscured by clouds. The fast-ice edge on 2 October 2022 is indicated by the dashed red line.

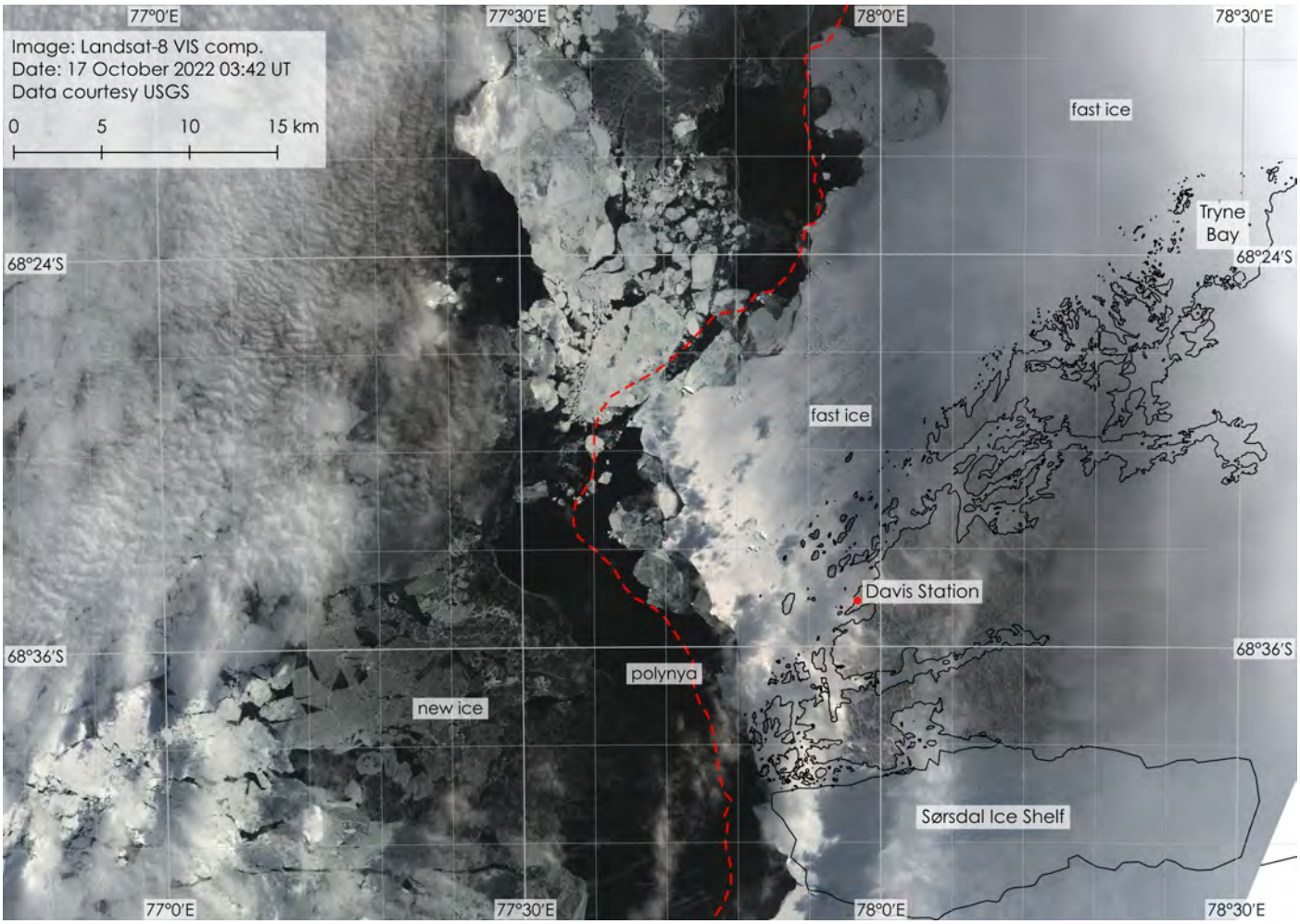


Figure 1: *Landsat-8 VIS composite pan-sharpened data acquired 17 October 2022 at 03:42 UT and provided by USGS.*

West of the station, the fast-ice edge has been progressing eastward during October and is roughly 5 nautical miles away from the shore. A small polynya has opened off the fast-ice edge and some new ice is forming there.

North of Davis Station, the northern sea-ice edge (not shown in the figure) is up to 90 nautical miles below (south of) the median sea-ice extent for October.

Ice Bulletin: Davis Station

Issued: Wednesday 19th October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data off Davis Station.

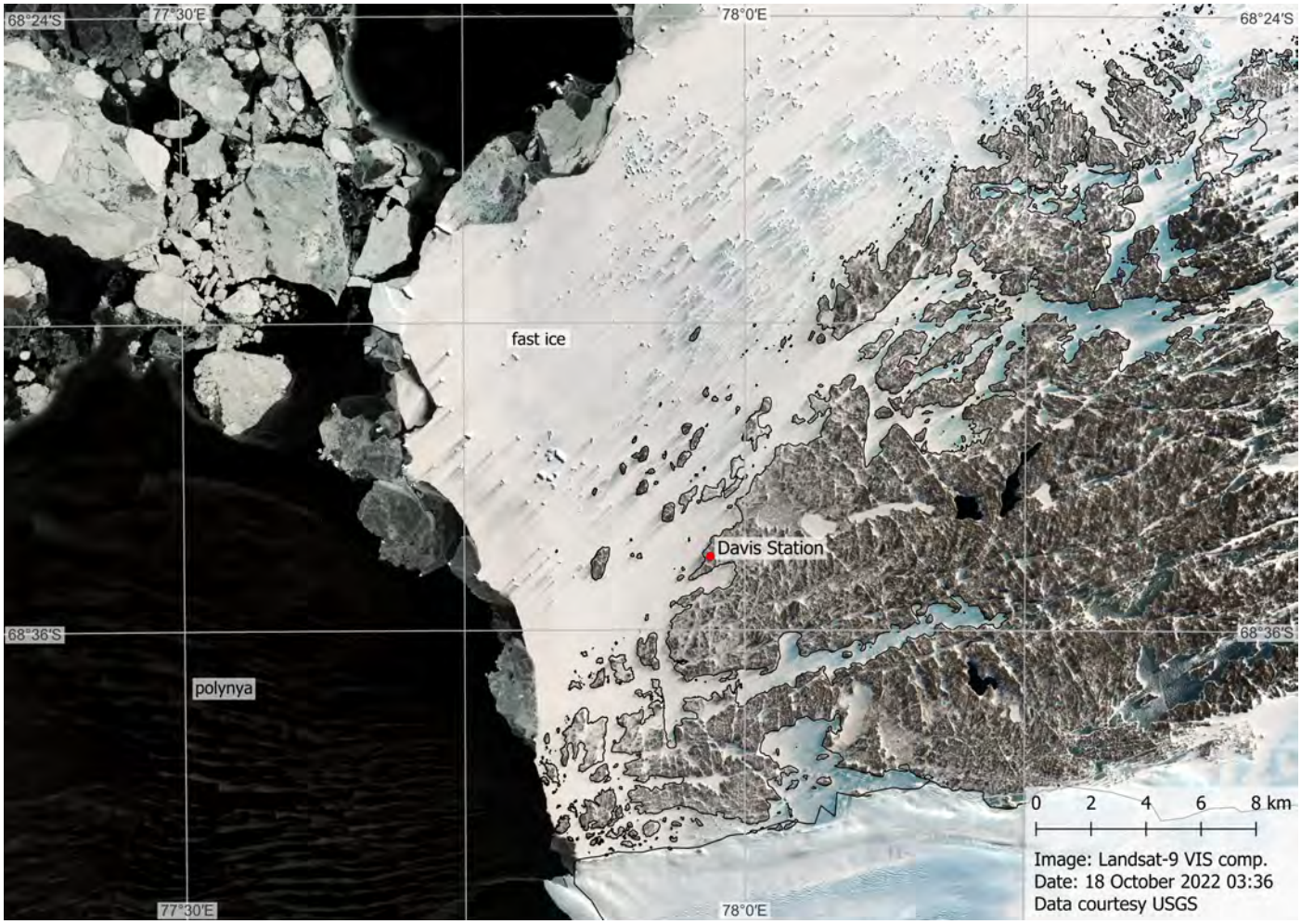


Figure 1: *Landsat-9 visible composite pansharpened data acquired 18 October 2022 at 03:06 UT and provided by USGS.*

West of the station, the fast-ice edge remains 5 nautical miles away from the shore. The polynya has grown, and new ice is forming in there.

Figure 2 and Figure 3 show different scales of the same data as Figure 1.

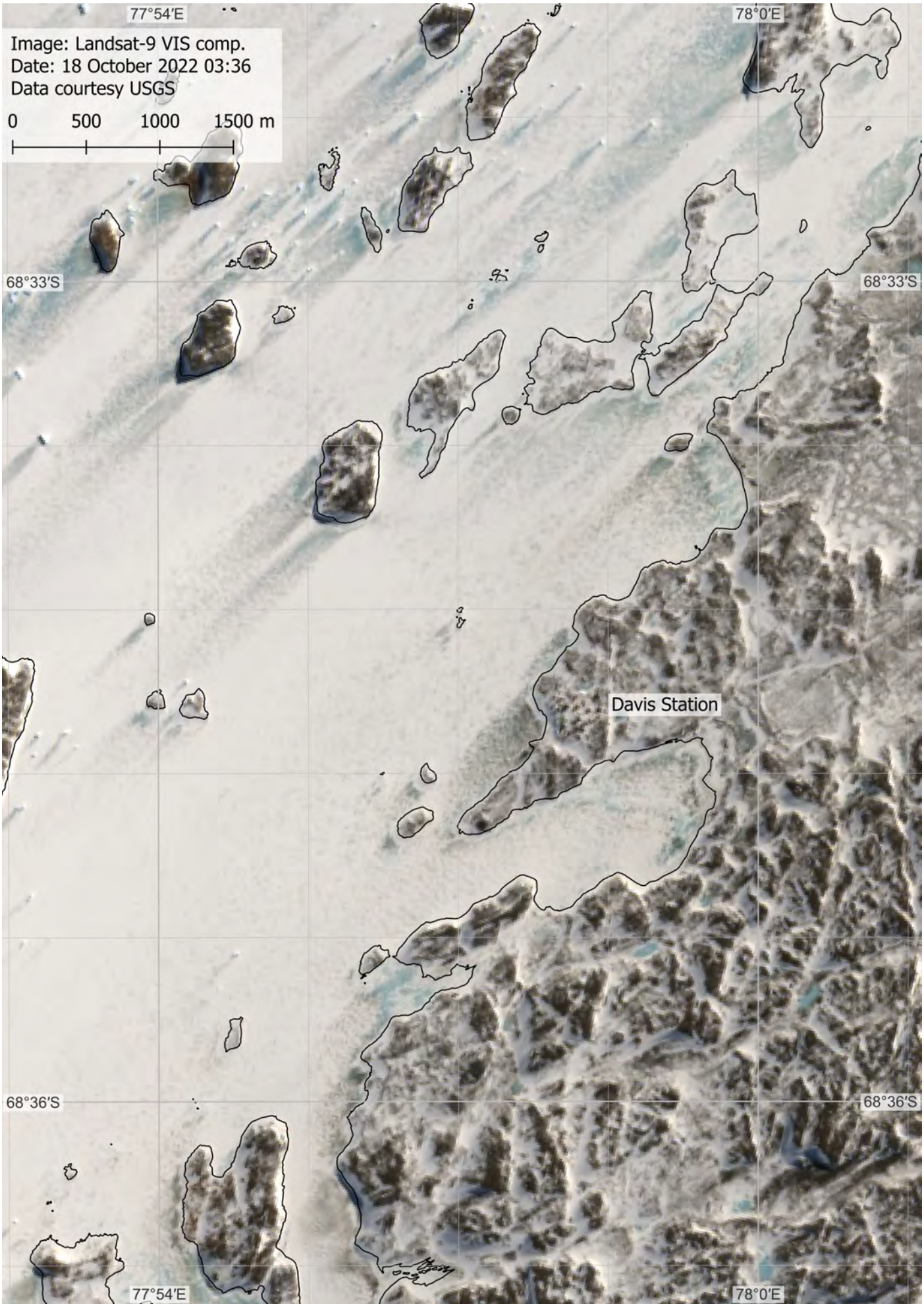


Figure 2: *Landsat-9 visible composite pansharpened data acquired 18 October 2022 at 03:06 UT and provided by USGS.*

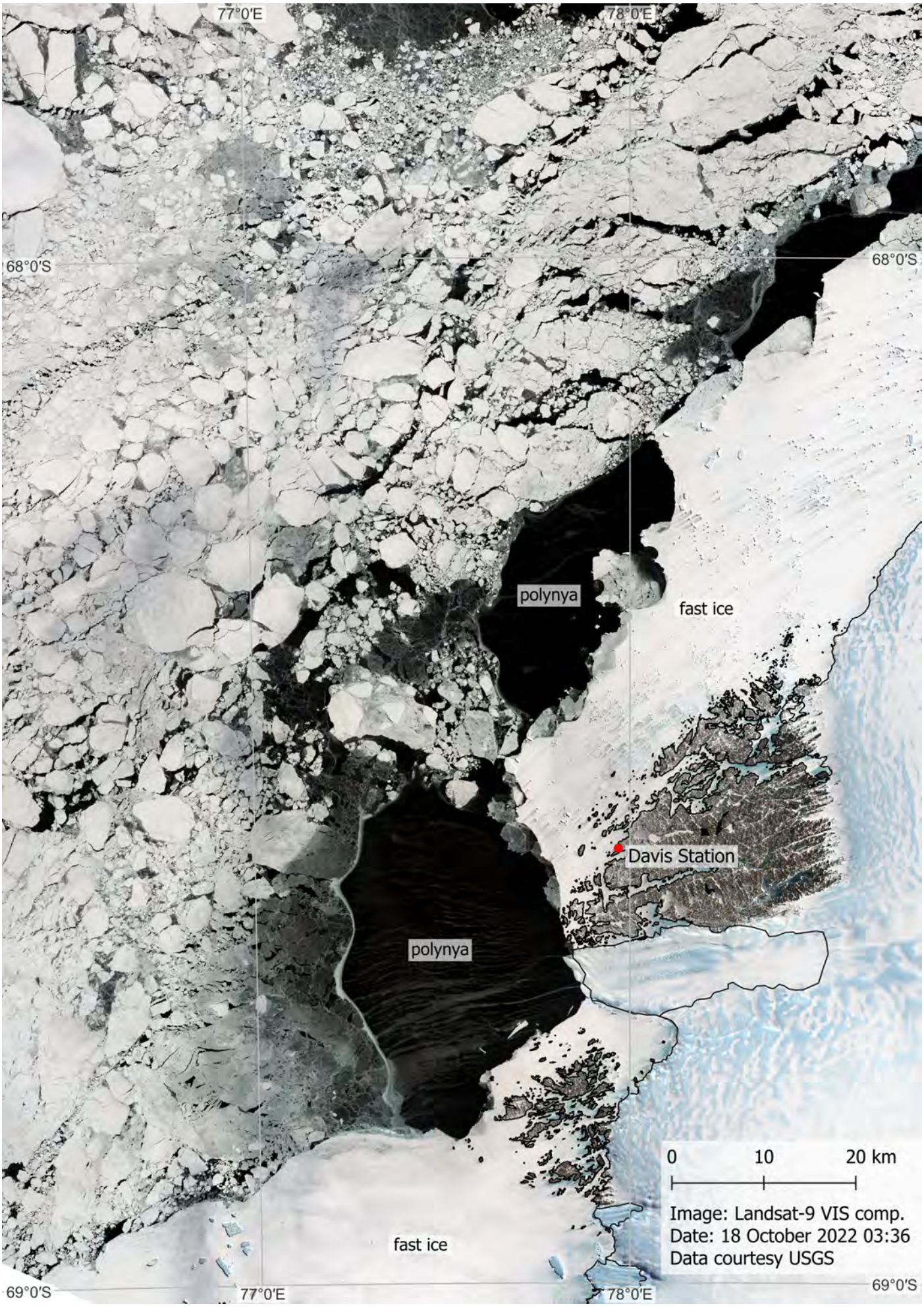


Figure 3: *Landsat-9 visible composite pansharpened data acquired 18 October 2022 at 03:06 UT and provided by USGS.*

Ice Bulletin: Terra Nova Bay

Issued: Wednesday 19th October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of Terra Nova Bay. The scene is slightly obscured by thin clouds.

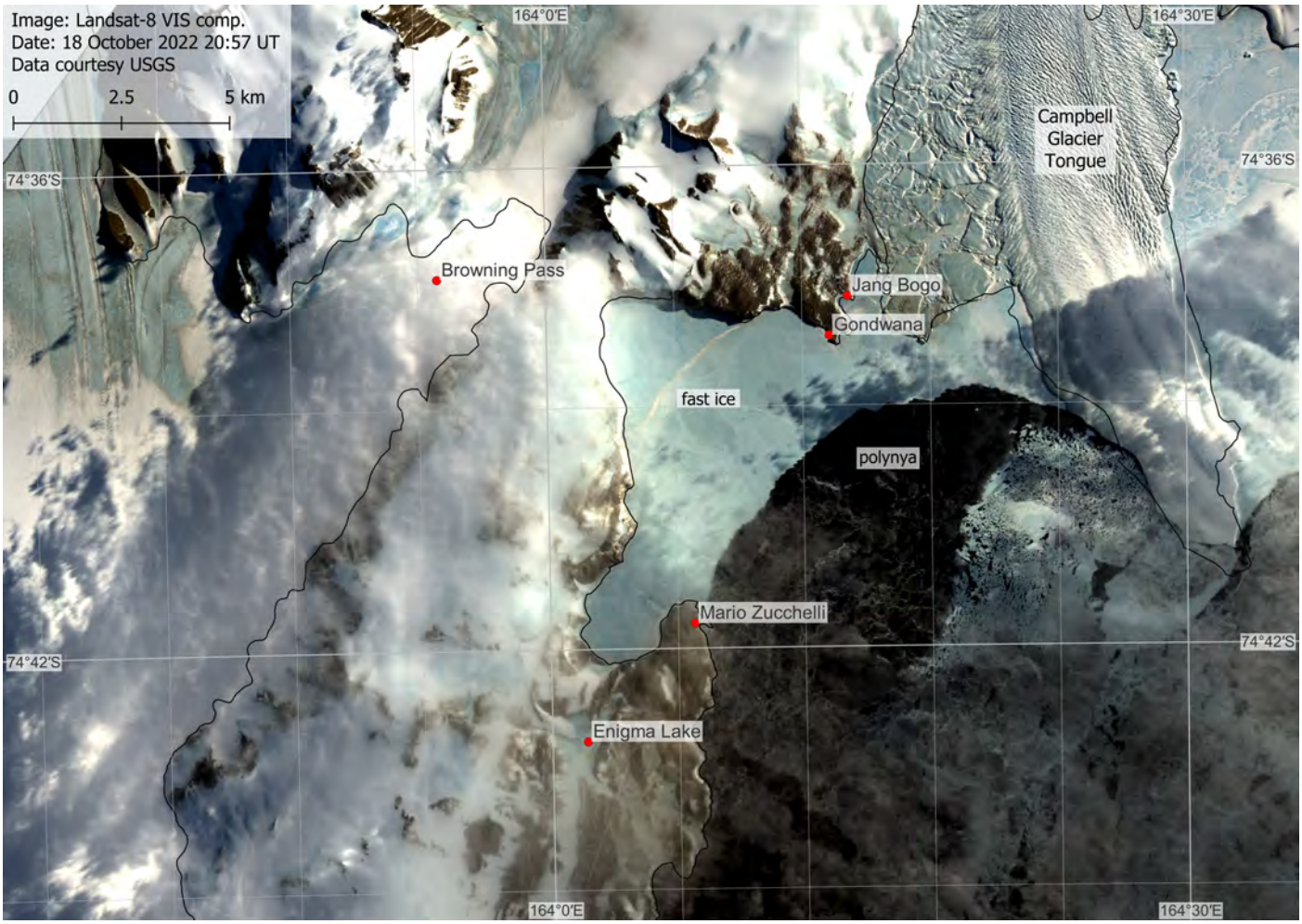


Figure 1: *Landsat-8 visible composite pansharpened data acquired 18 October 2022 at 20:57 UT and provided by USGS.*

North of Mario Zucchelli Station, some fast ice is anchored in Gerlache Inlet. A small polynya is offshore, and new ice is forming in there.

Figure 2 shows a larger overview of the same data as Figure 1.

North of the Drygalski Glacier Tongue, a larger polynya is active and new ice is forming there.

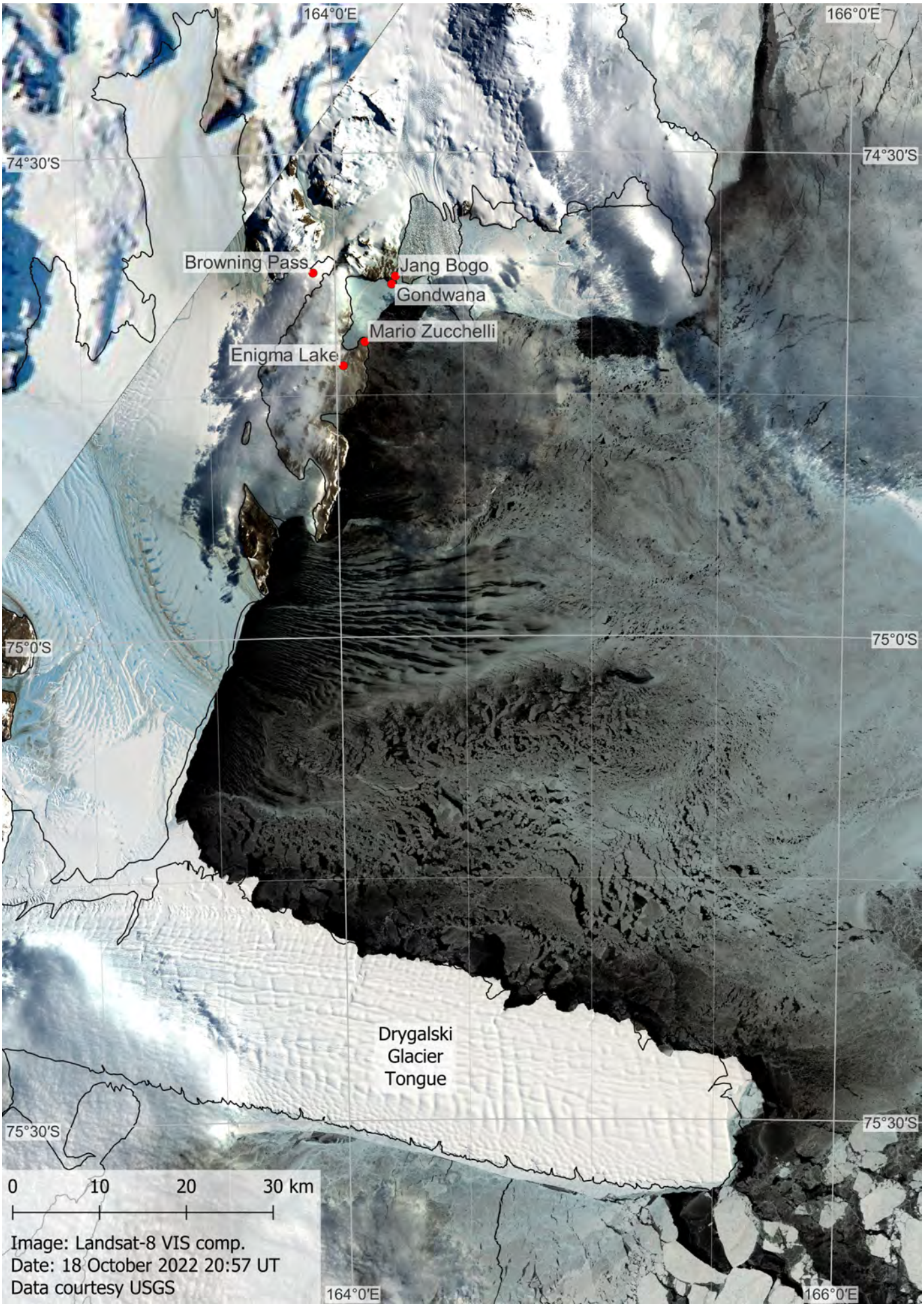


Figure 2: *Landsat-8 visible composite pansharpened data acquired 18 October 2022 at 20:57 UT and provided by USGS.*

Ice Bulletin: McMurdo Sound

Issued: Wednesday 19th October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of McMurdo Sound. Airfields near McMurdo Station are marked by blue dots.

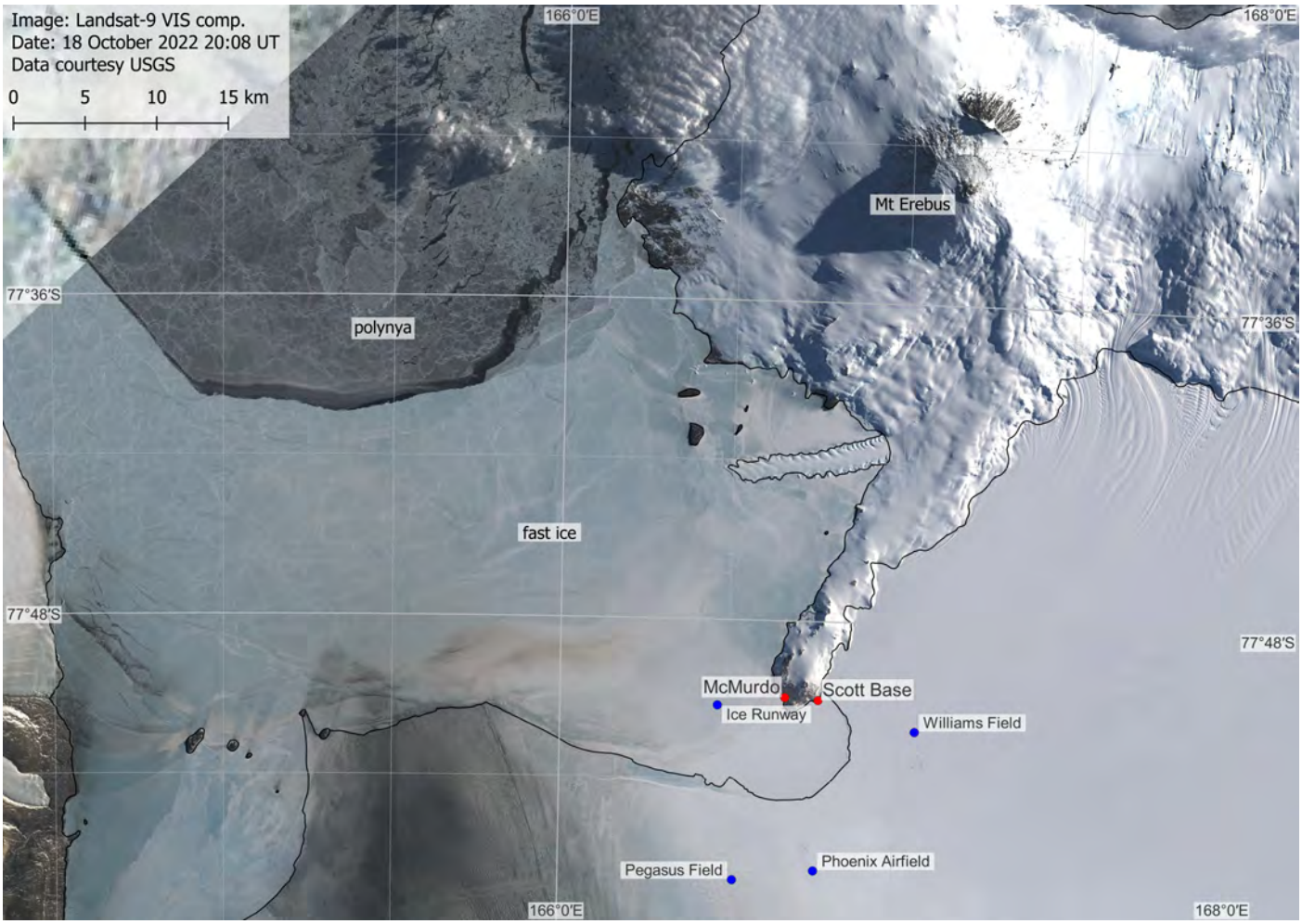


Figure 1: *Landsat-9 visible composite pansharpened data acquired 18 October 2022 at 20:08 UT and provided by USGS.*

North of the fast ice anchored in southern part of McMurdo Sound, a polynya is offshore and currently frozen over.

Ice Bulletin: New Amery Iceberg

Issued: Thursday 20th October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows visible data off the Amery Ice Shelf in East Antarctica.

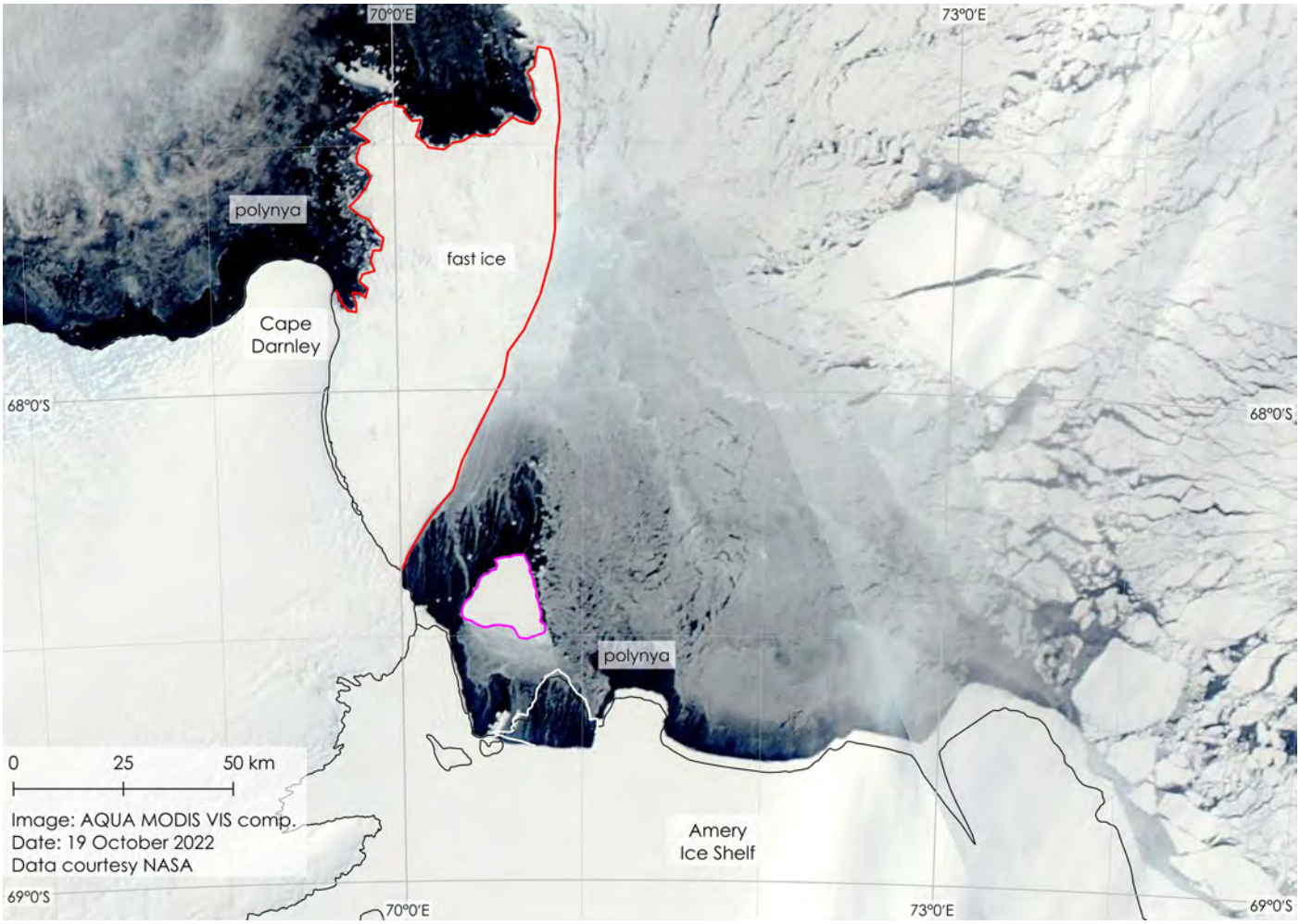


***Figure 1**: AQUA MODIS VIS composite data acquired 19 October 2022 and provided by NASA.*

A new iceberg (the pink shape, expected D-32) calved off the Amery Ice Shelf on 15 October 2022; its initial position is indicated by the white line at the western side of the ice-shelf front. The iceberg is roughly 225 km^2 and has drifted roughly 30 km north-westward since breaking away while rotating 90 degrees anti-clockwise.

Ice Bulletin: Iceberg D-32

Issued: Friday 21st October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows composite visible and SAR data off the Amery Ice Shelf in East Antarctica.

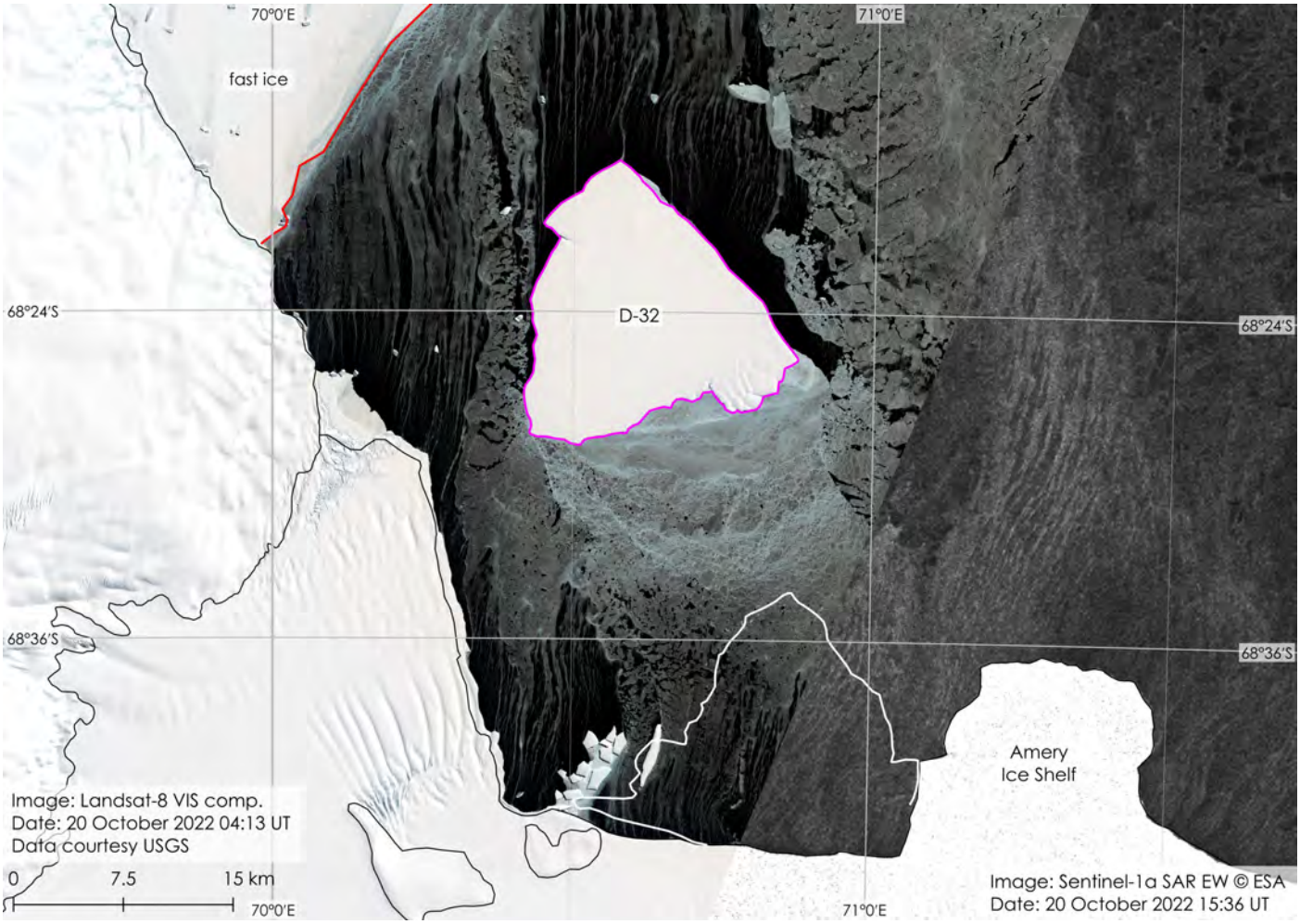


***Figure 1**: Composite of visible and SAR data acquired 20 October 2022 and provided by USGS and PolarView, respectively.*

Newly identified iceberg D-32 (the pink shape) continues its drift north of the Amery Ice Shelf; its initial position is indicated by the white outline in the central part of the figure (at the western side of the ice-shelf front). The iceberg is roughly half the size of Cape Barren Island (of the Furneaux Group, Tasmania).

Iceberg D-32 has drifted roughly 32 km north-westward since breaking away continues rotating anti-clockwise.

Figure 2 shows the same frame as Figure 1 but SAR data acquired roughly 12 hours after the visible data of Figure 1. The position of iceberg D-32 based on the visible data is included as a dashed pink shape in Figure 2.

The iceberg has almost completed a 180 degrees turn during the five days since calving.

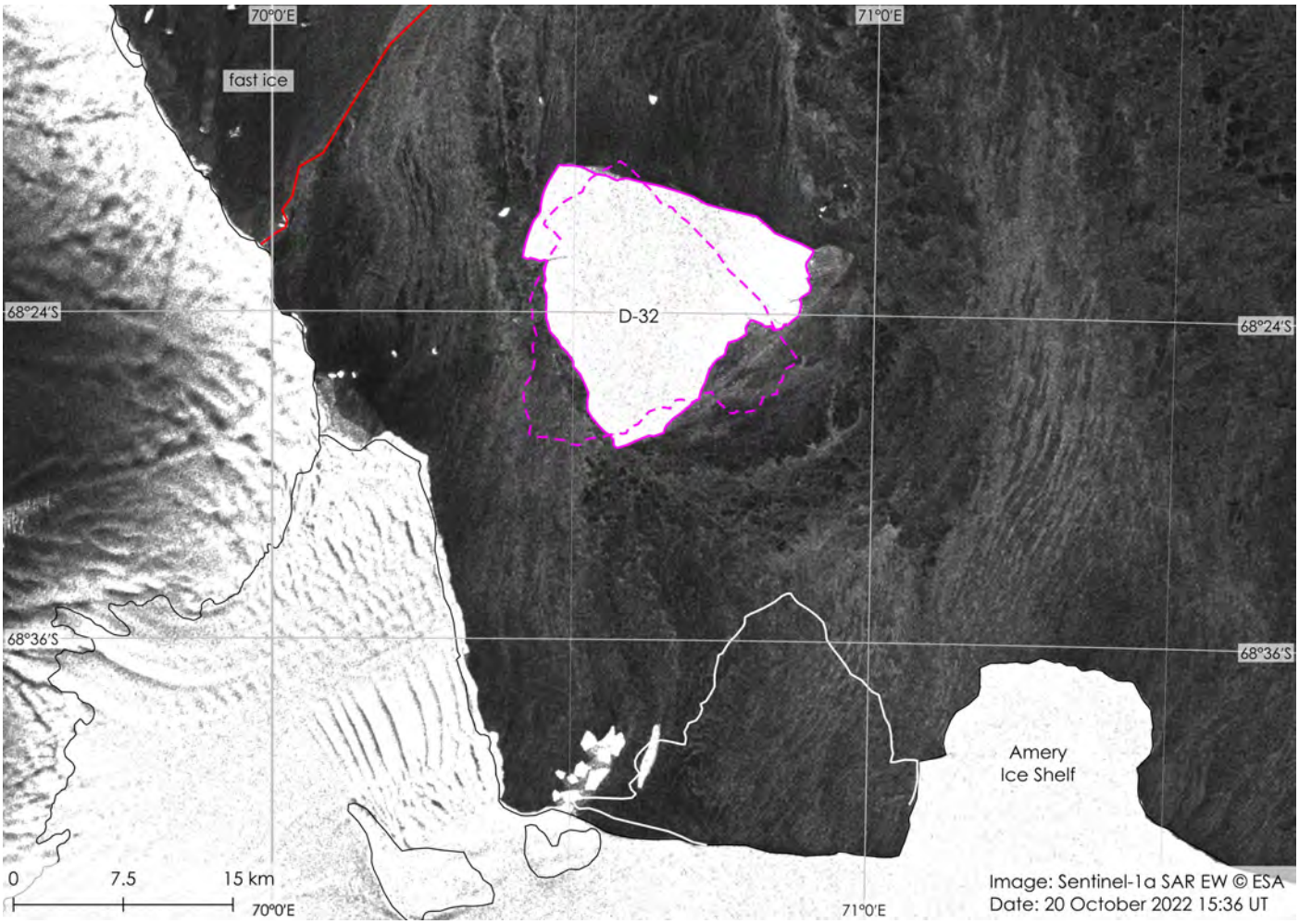


***Figure 2**: Sentinel-1a SAR EW data acquired 20 October 2022 at 15:36 UT and provided by PolarView.*

Ice Bulletin: Mawson Station

Issued: Friday 21st October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data off Mawson Station.

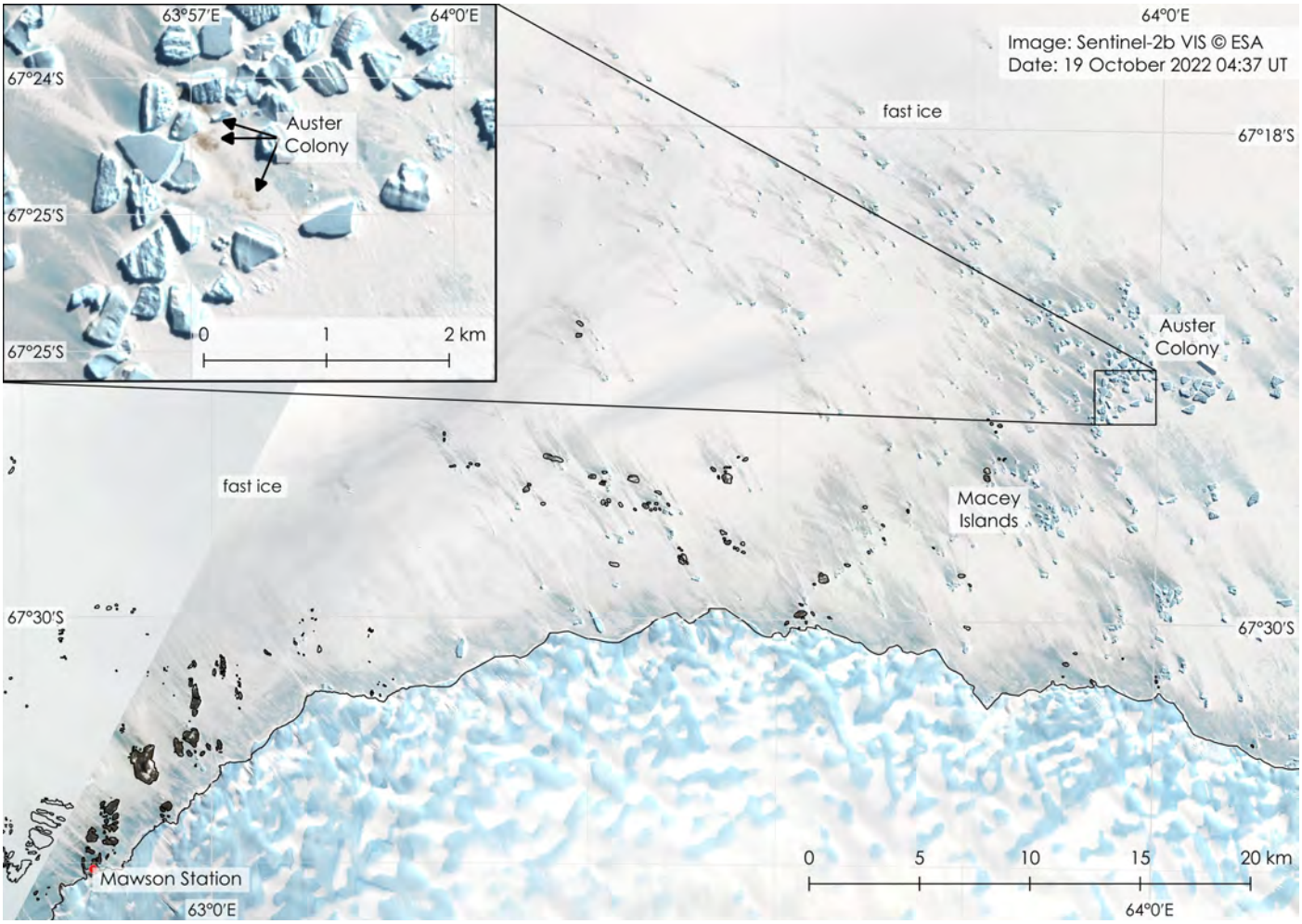


Figure 1: *Sentinel-2b VIS composite data acquired 19 October 2022 at 04:37 UT and provided by ESA.*

The Auster penguin colony is between icebergs northeast of the station and discoloured spots can be seen.

Northwest of the station, the nearest open water of the polynya (not shown in the figure) remains 38 nautical miles away.

The northern sea-ice edge (also not shown) is up to roughly 30 nautical miles below (south of) the median sea-ice extent for October.

Ice Bulletin: Totten Ice Shelf

Issued: Monday 24th October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off the Totten Ice Shelf east of Casey Station.

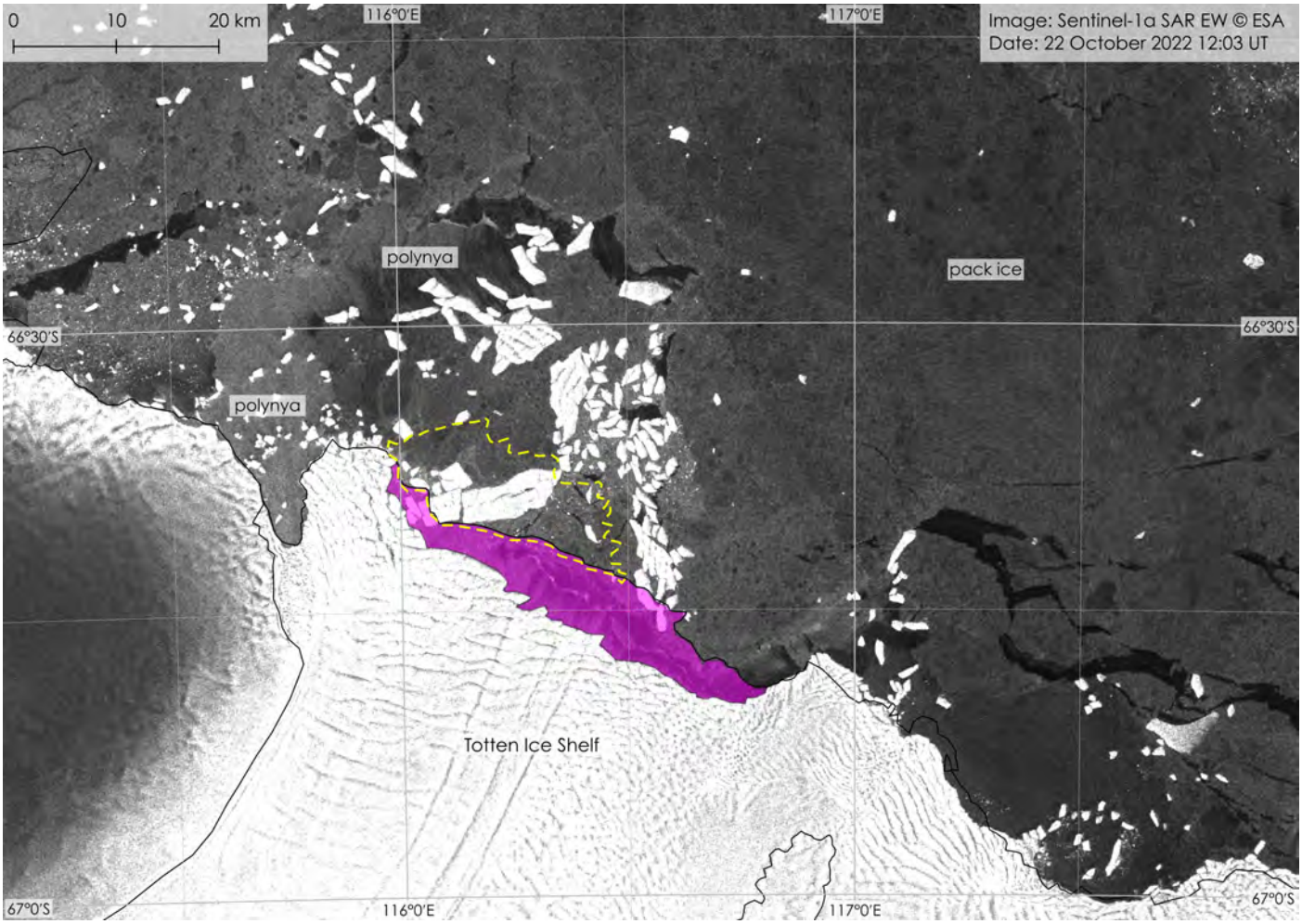


Figure 1: *Sentinel-1a SAR EW data acquired 22 October 2022 at 12:03 UT and provided by PolarView.*

On 14 October 2022, a 180 km^2 section of the front of the Totten Ice Shelf (indicated by the pink shape) calved and created predominantly many small icebergs. The largest fragment is roughly 31.5 km^2 and off the western flank of the shelf front. Overall, an area roughly one third larger than sub-Antarctic Macquarie Island has broken off the shelf.

At the western end of the ice shelf, a polynya is present.

In mid-August 2022, a similarly large section of the western front of the ice shelf (indicated by the yellow dashed shape) calved creating many small icebergs.

The northern sea-ice edge (not shown in the Figure) is currently roughly 140 nautical miles below (south of) the median sea-ice extent for October.

Ice Bulletin: Davis Station

Issued: Monday 24th October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution SAR data off Davis Station.

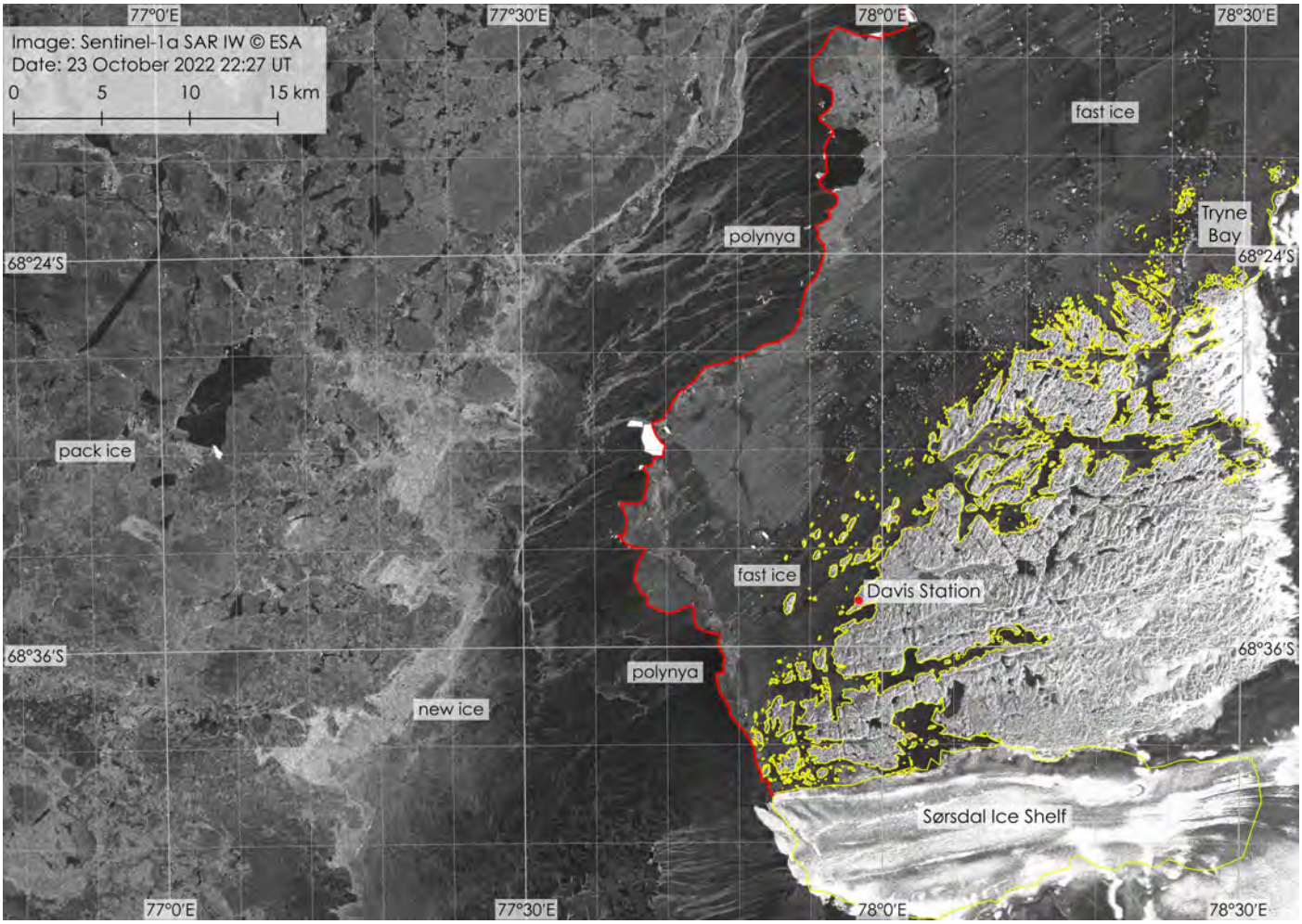


Figure 1: *Sentinel-1a SAR IW data acquired 23 October 2022 at 22:27 UT and provided by PolarView.*

West of the station, the fast-ice edge has temporarily progressed westward and is now roughly 7 nautical miles away from the shore. New ice is forming in the polynya offshore.

Further north, the northern sea-ice edge (not shown in the figure) is currently up to 60 nautical miles below (south of) the median sea-ice extent for October.

Ice Bulletin: Iceberg A-76A

Issued: Tuesday 25th October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows composite visible and SAR data northeast of the Antarctic Peninsula in the north-western Weddell Sea.

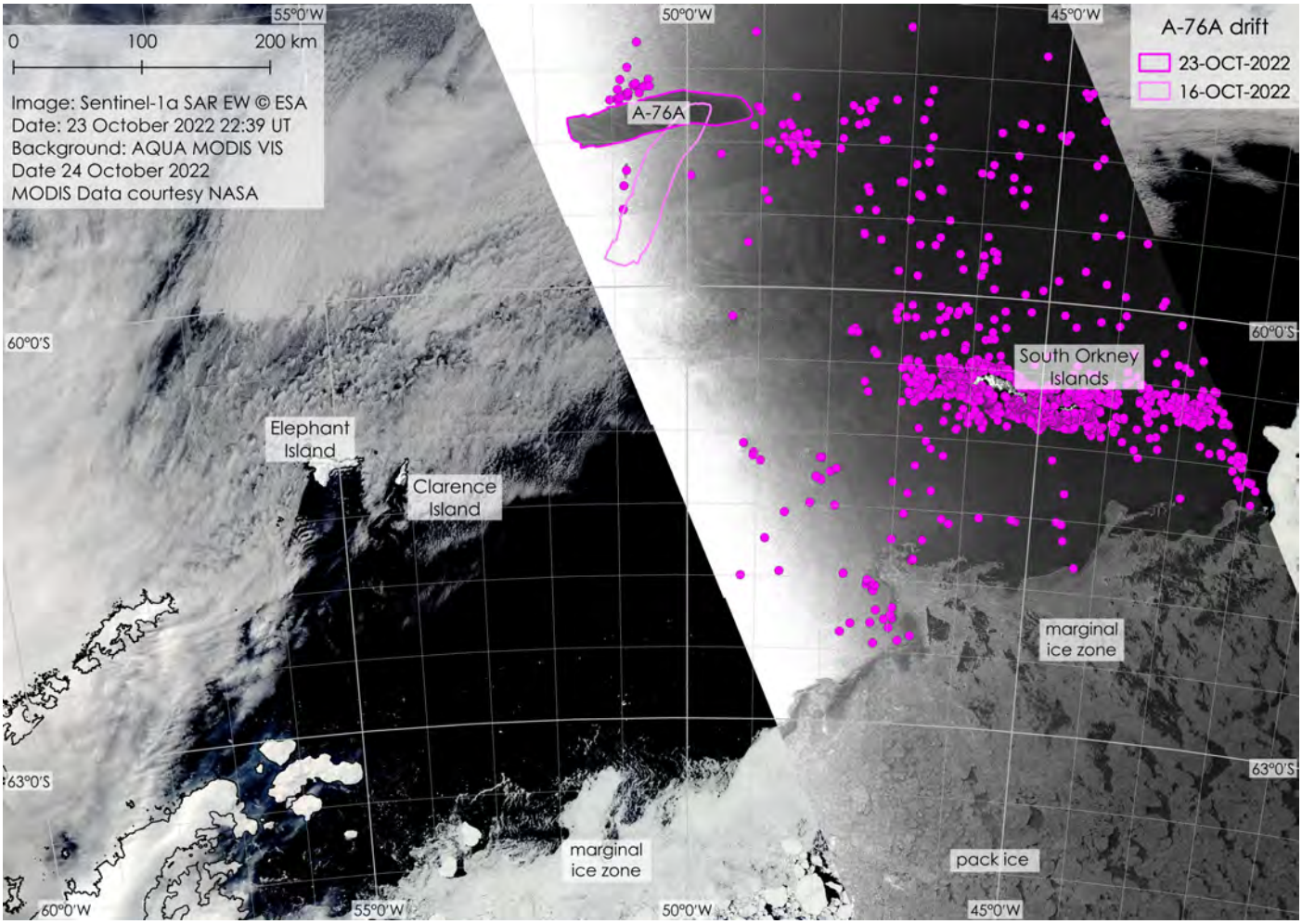


***Figure 1**: Sentinel-1a SAR EW data acquired 23 October 2022 at 22:39 UT and provided by PolarView; Background: AQUA MODIS VIS data acquired 24 October 2022 and provided by NASA.*

Iceberg A-76A has crossed the Hespérides Trough into the Scotia Sea and drifting in the southern South Atlantic Ocean. Since mid-October, the iceberg has turned 50 degrees clockwise and is now roughly 280 nautical miles north of the sea-ice edge.

The iceberg is increasingly starting the show signs of breaking up. Smaller icebergs and glacial debris are surrounding the iceberg and more than 1300 icebergs have been identified in the SAR data north of the marginal ice zone. Most of those icebergs are in the vicinity if the South Orkney Islands and partly grounded there but some icebergs are as far north as 57º30'S.

Ice Bulletin: Casey Station

Issued: Wednesday 26th October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Casey Station. The inset shows a close-up south of the station.

Off station, the fast-ice edge continues retreating towards the shore due to recent weather.

Off the fast-ice edge, a very large polynya is active and new brash ice is forming there.

North of the station, the northern sea-ice edge (not shown in the figure) is up to 180 nautical miles below (south of) median sea-ice extent for October.

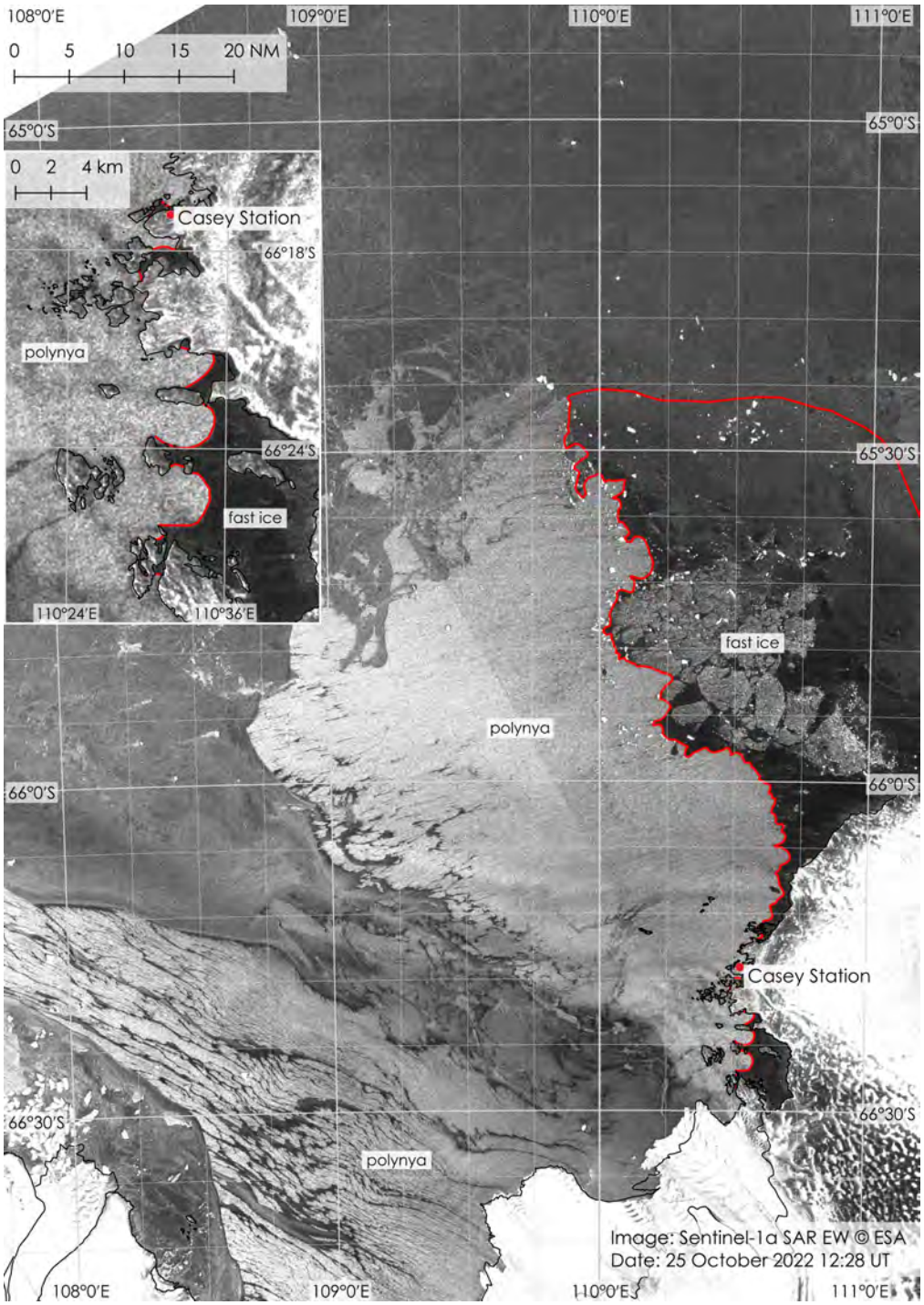


Figure 1: *Sentinel-1a SAR EW data acquired 25 October 2022 at 12:28 UT and provided by PolarView.*

Ice Bulletin: Davis Station

Issued: Thursday 27th October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Davis Station. The fast-ice edge is marked by a red line (dashed red for 23 October 2022).

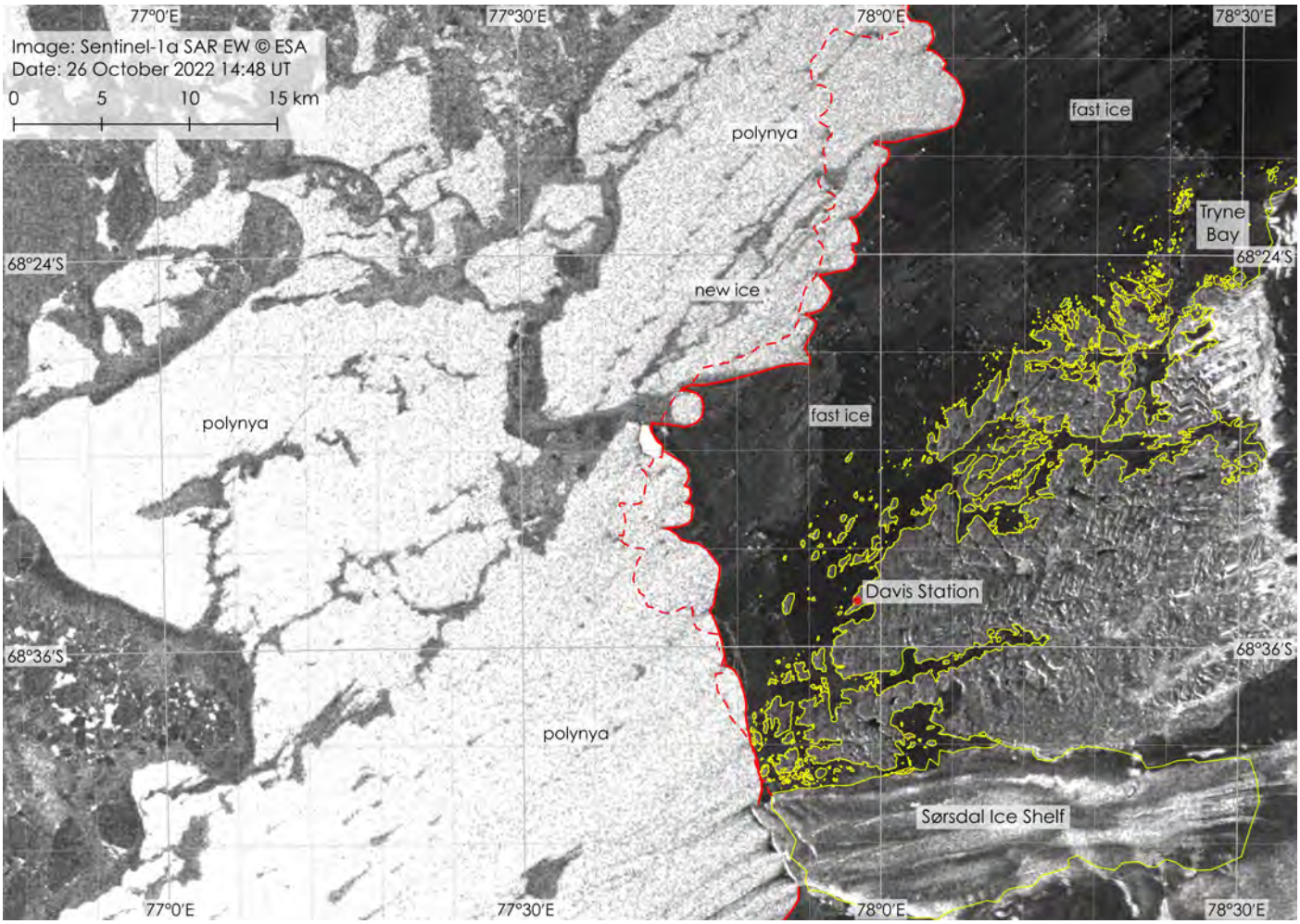


Figure 1: *Sentinel-1a SAR EW data acquired 26 October 2022 at 14:48 UT and provided by PolarView.*

West of the station, the fast-ice edge has progressed eastward and is now roughly 4.5 nautical miles away from the shore. New ice is forming in the polynya offshore.

Further north, the northern sea-ice edge (not shown in the figure) remains up to 60 nautical miles below (south of) the median sea-ice extent for October.

Ice Bulletin: D'Urville Sea

Issued: Thursday 27th October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows visible data composite of southern D'Urville Sea. The fast-ice edge on 20 October 2022 is marked by a dashed red line.

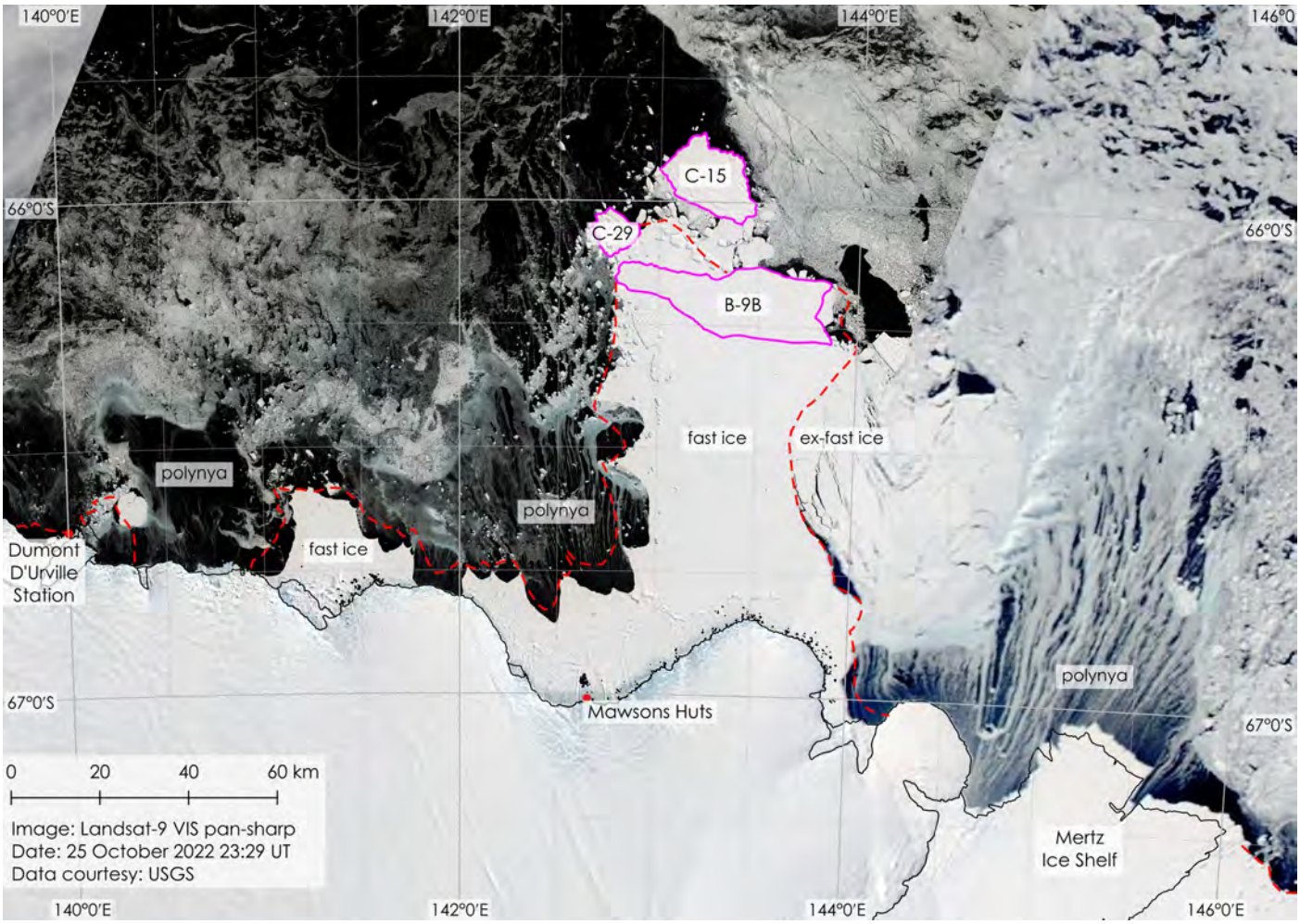


Figure 1: *Landsat-9 visible pan-sharpened data acquired 25 October 2022 at 23:29 UT and provided by USGS; Background of AQUA MODIS VIS data acquired 26 October 2022 and provided by NASA.*

Off Dumont D'Urville Station, fast ice has completely disintegrated during the last week. Further east, the fast-ice edge is also retreating. Three large named icebergs remain grounded and partly enclosed by fast ice.

Further north, the northern sea-ice edge (not shown in the figure) is roughly 100 nautical miles below (south of) the median sea-ice extent for October.

Ice Bulletin: Casey Station

Issued: Monday 31st October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution visible data off Casey Station. The fast-ice edge on 25 October 2022 is included as a dashed red line.

Off station, the fast ice continues breaking up and ex-fast ice is floating in the polynya offshore.

A very large polynya is active and a mixture of new brash ice and ex-fast ice is present.

North of the station, the northern sea-ice edge (not shown in the figure) is up to 190 nautical miles below (south of) median sea-ice extent for October and already roughly 115 nautical miles below (south of) the median sea-ice extent for November.

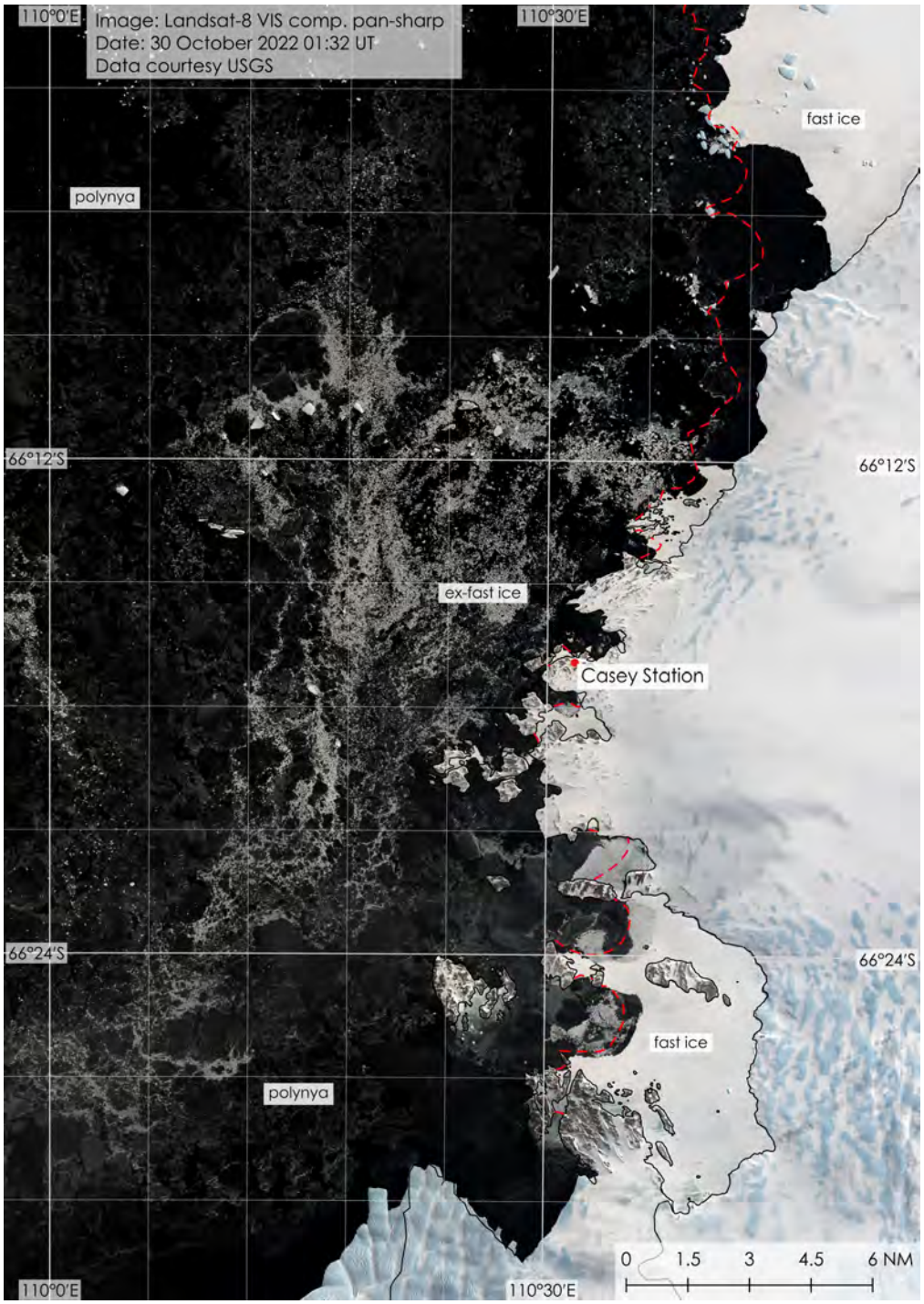


Figure 1: *Landsat-8 visible composite pansharpened data acquired 30 October 2022 at 01:32 UT and provided by USGS.*

Ice Bulletin: Wilkins Aerodrome

Issued: Monday 31st October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of Wilkins Aerodrome.

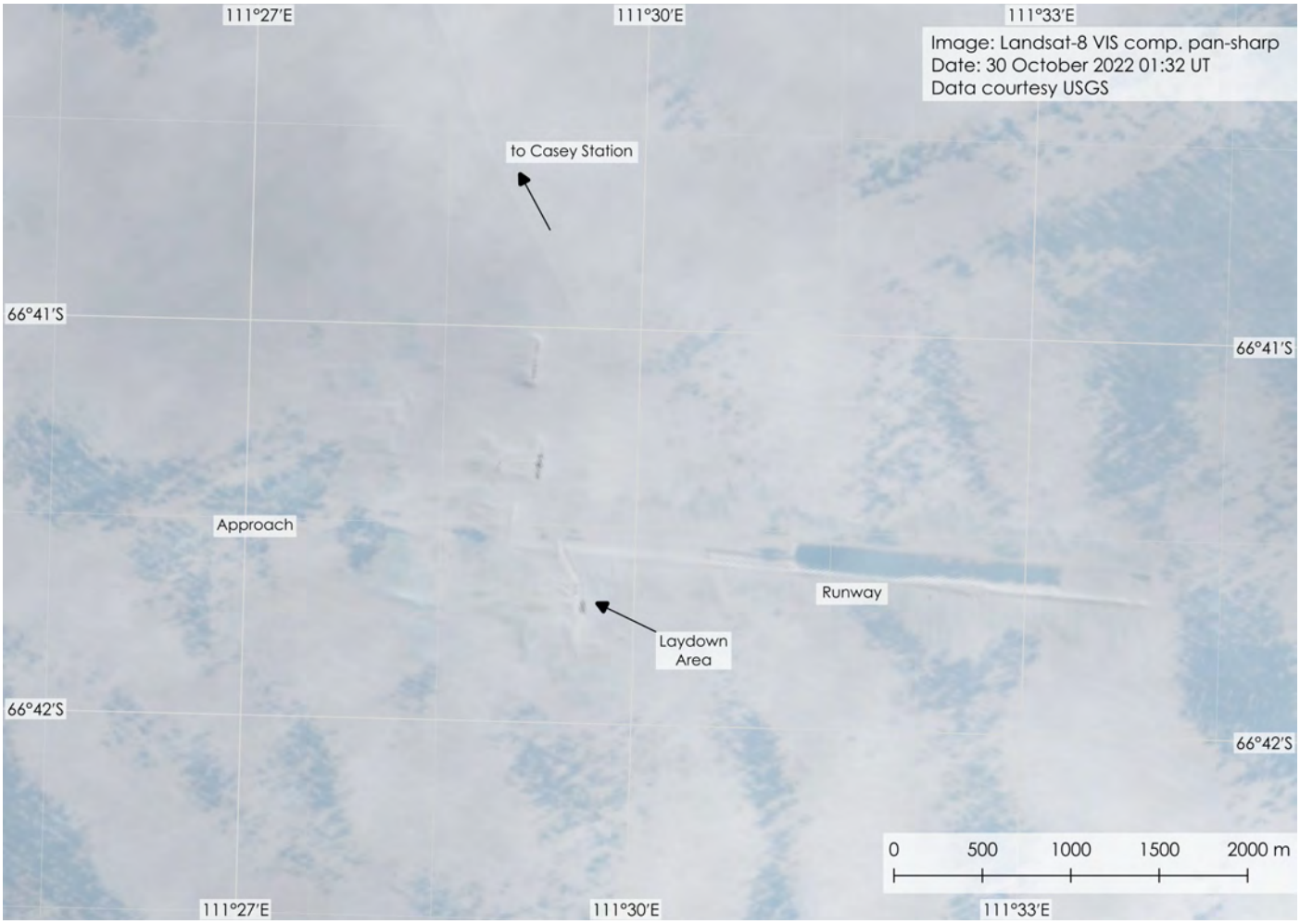


Figure 1: *Landsat-8 visible composite pan-sharpened data acquired 30 October 2022 at 01:32 UT and provided by USGS.*

The ice runway appears partly covered by fresh snow. North and south of the runway, snow dunes are left from previous clearing the runway.

Snow dunes have also accumulated in the lee of the camp and other structures.

Ice Bulletin: Davis Station

Issued: Monday 31st October 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Davis Station. The fast-ice edge is marked by a red line (dashed red line for 26 October 2022).

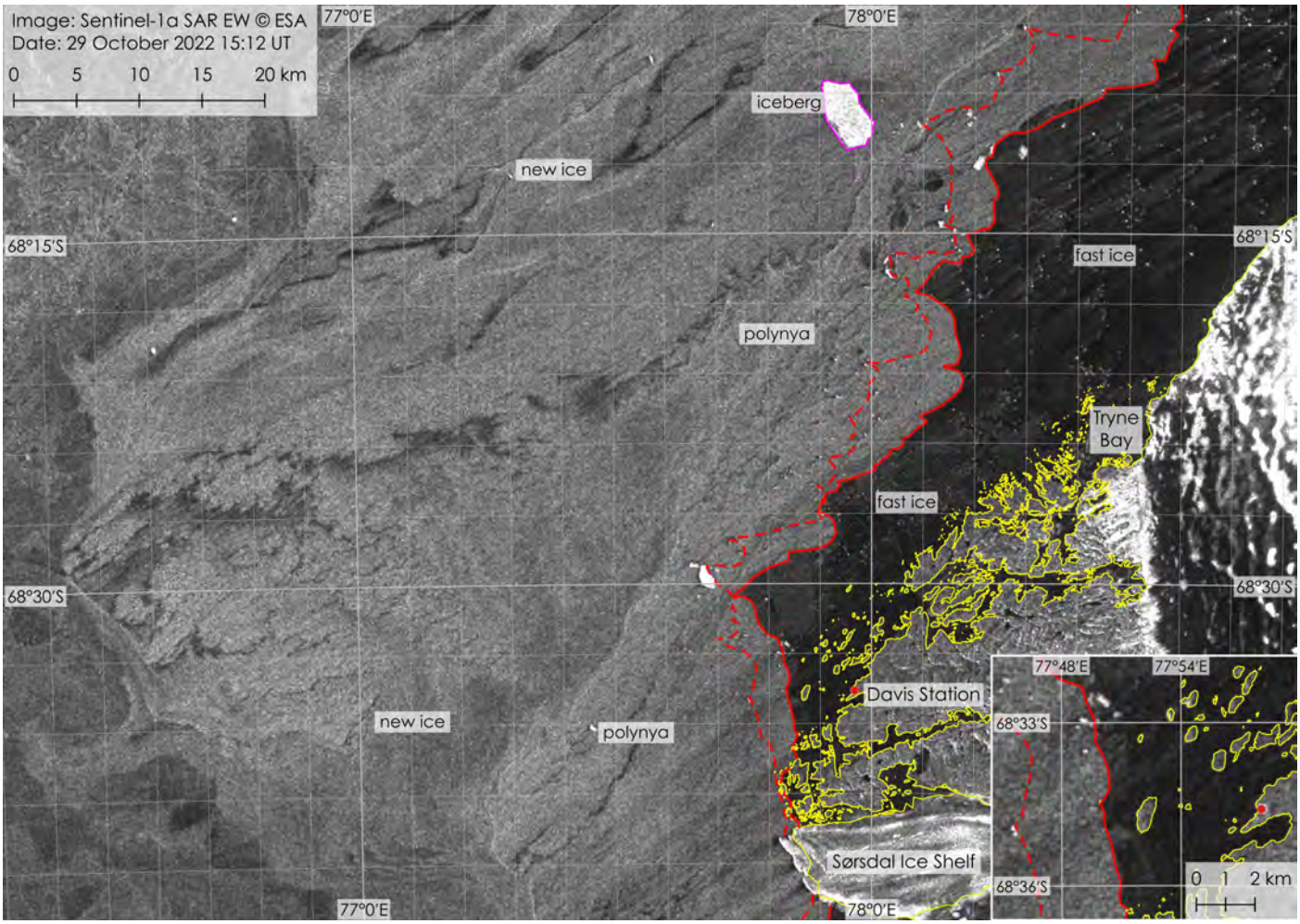


Figure 1: *Sentinel-1a SAR EW data acquired 29 October 2022 at 15:12 UT and provided by PolarView.*

West of the station, the fast-ice edge continues progressing eastward and is now roughly 2.5 nautical miles away from the shore. The inset shows a close-up of the region off station. New ice is forming in the polynya offshore.

A large iceberg (roughly 15 km^2; marked by a pink outline) is drifting south-westward roughly 18 nautical miles offshore.

Further north, the northern sea-ice edge (not shown in the figure) remains up to 110 nautical miles below (south of) the median sea-ice extent for October.

Ice Bulletin: Davis Station

Issued: Tuesday 1st November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Davis Station. The fast-ice edge on 29 October 2022 is marked by a dashed red line.

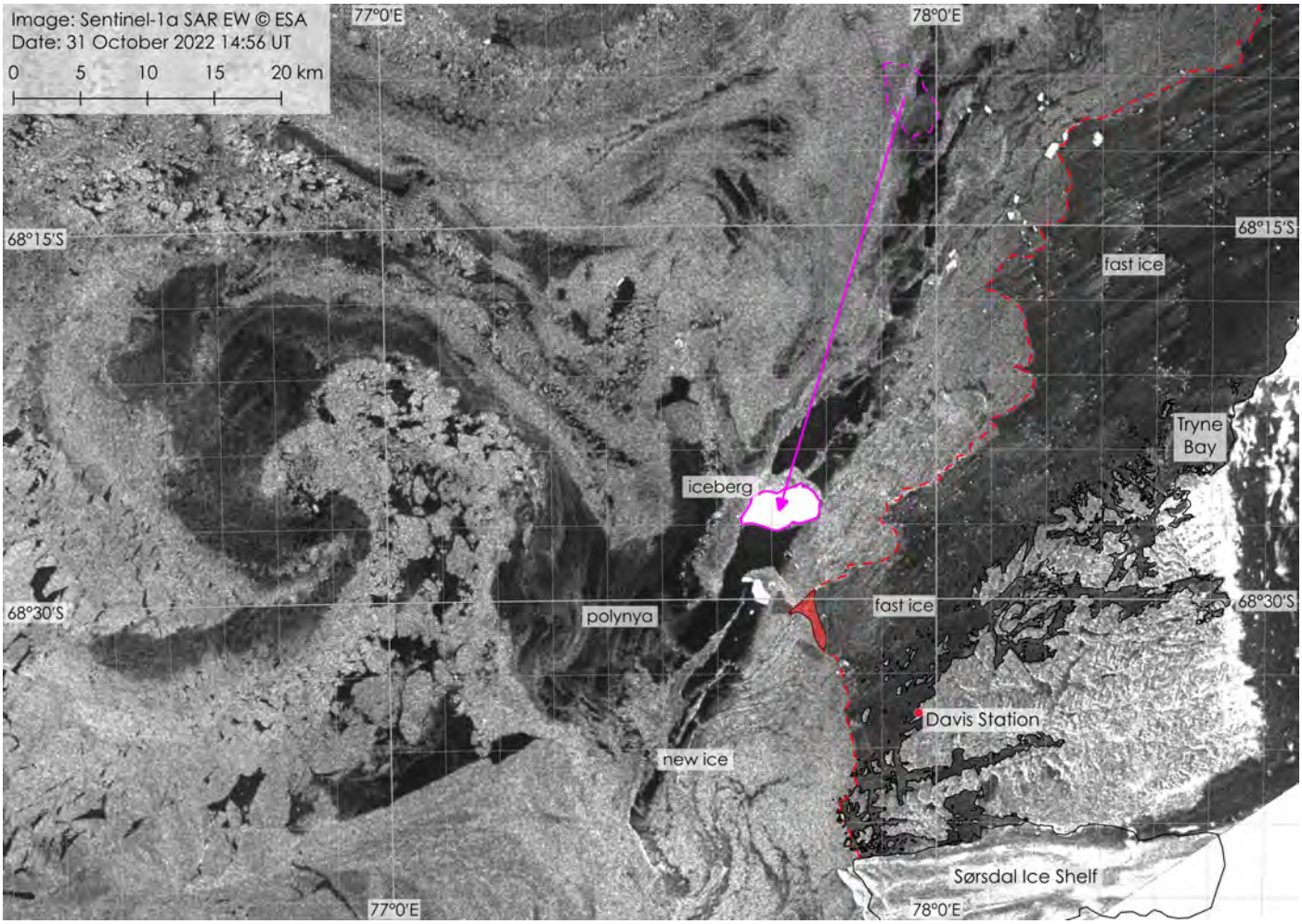


Figure 1: *Sentinel-1a SAR EW data acquired 31 October 2022 at 14:56 UT and provided by PolarView.*

West of the station, the fast-ice edge continues progressing eastward and is roughly 2.5 nautical miles away from the shore. The red shaded area at the fast-ice edge marks an area of roughly 3.8 km^2, which broke off since 29 October 2022. New ice is forming in the polynya offshore.

A large iceberg (roughly 15 km^2; marked by a pink outline) has drifted south-westward roughly 17 nautical miles since 29 October 2022 (the dashed pink outline) and is currently heading towards a group of icebergs that is grounded off station.

The northern sea-ice edge (not shown in the figure) is up to 110 nautical miles below (south of) the median sea-ice extent for October and is already at the median sea-ice extent for November further afield.

Ice Bulletin: Mill Island

Issued: Tuesday 1st November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Mill Island west of Casey Station. The drift of large iceberg C-37 is marked by colour-coded shapes, the other named icebergs are grounded and did not move during October 2022.

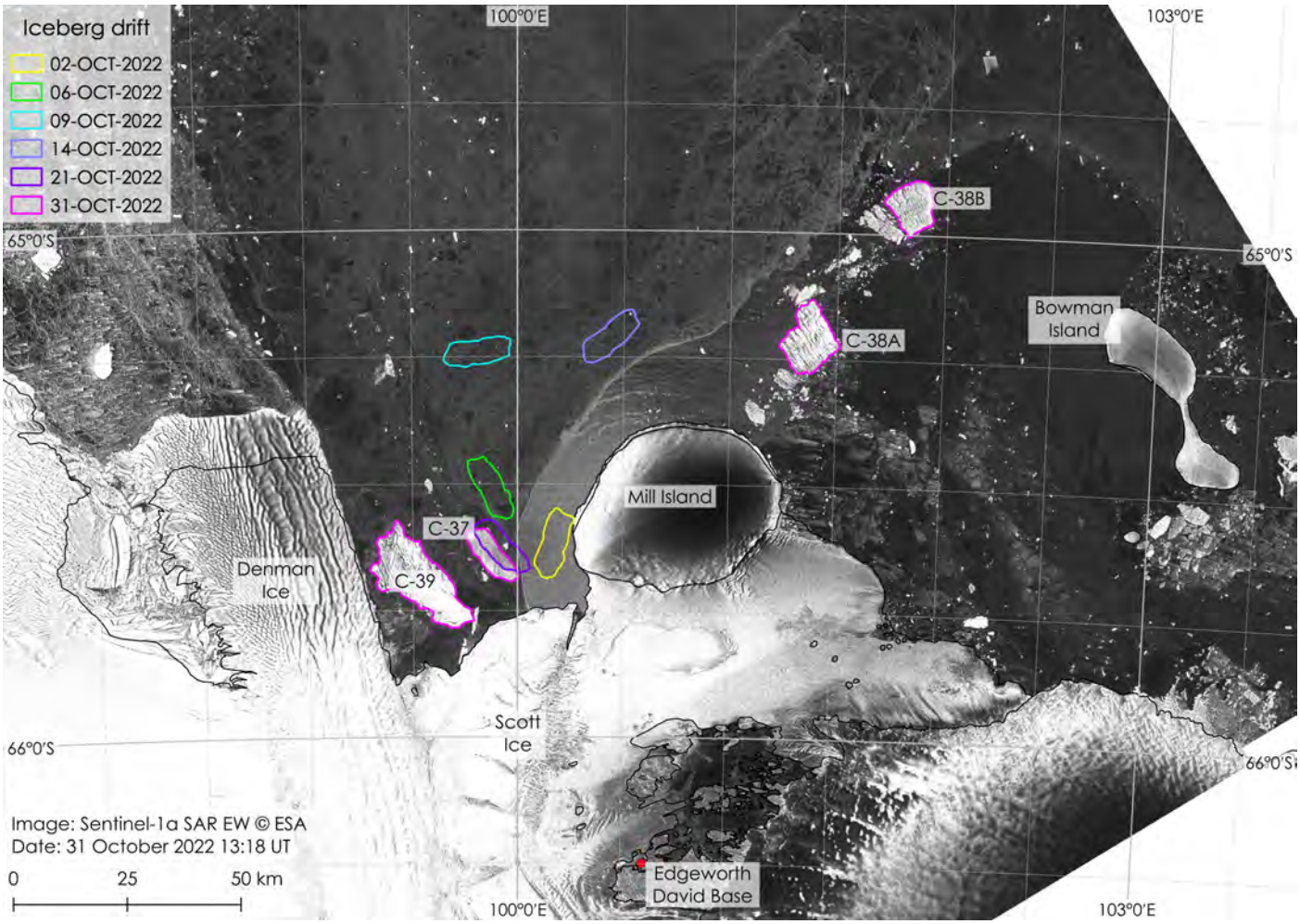


Figure 1: *Sentinel-1a SAR EW data acquired 31 October 2022 at 13:18 UT and provided by PolarView.*

Iceberg C-37 has been drifting northwest of Mill Island and is currently close to iceberg C-39. Only a small polynya is present north and west of the island and a bit further northeast.

Further north, the northern sea-ice edge (not shown in the figure) is roughly 190 nautical miles below (south of) the median sea-ice extent for October and already 85 nautical miles below (south of) the median sea-ice extent for November.

Ice Bulletin: Iceberg A-76A

Issued: Tuesday 1st November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data northeast of the Antarctic Peninsula in the north-western Weddell Sea. The drift of iceberg A-76A in October 2022 is indicated by colour-coded shapes.

The iceberg is 100 nautical miles north of the Hespérides Trough in the Scotia Sea and drifting into the southern South Atlantic Ocean.

Since 16 October, the iceberg turned almost 180 degrees clockwise and remains roughly 250 nautical miles north of the sea-ice edge (not shown in the figure).

The iceberg is increasingly showing signs of breaking up and smaller icebergs and glacial debris are surrounding the iceberg.

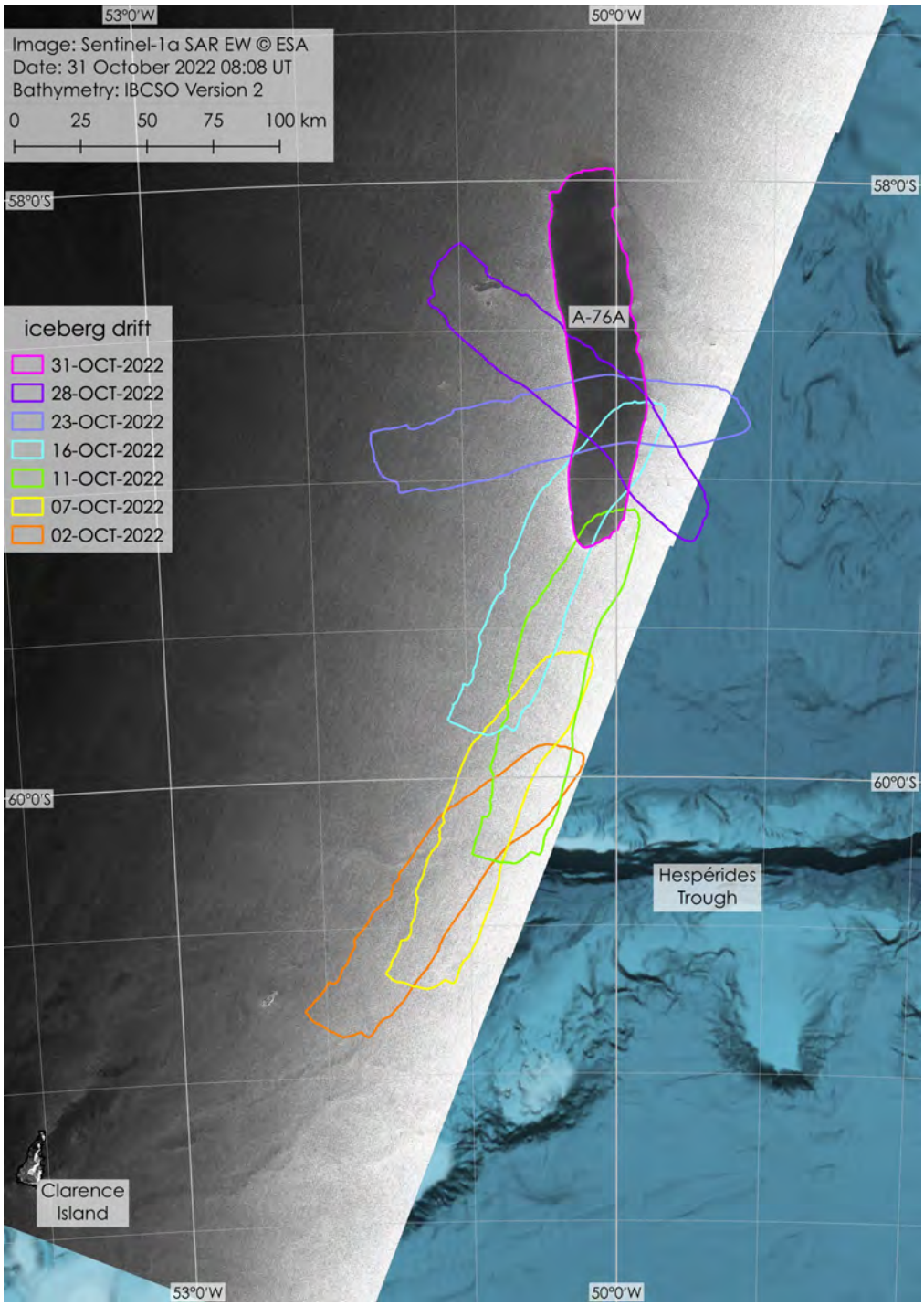


***Figure 1**: Sentinel-1a SAR EW data acquired 31 October 2022 at 08:08 UT and provided by PolarView;*

Background: International Bathymetric Chart of the Southern Ocean - Version 2.

Ice Bulletin: Davis Station

Issued: Thursday 3rd November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution visible data off Davis Station. The scene is partly obscured by clouds.

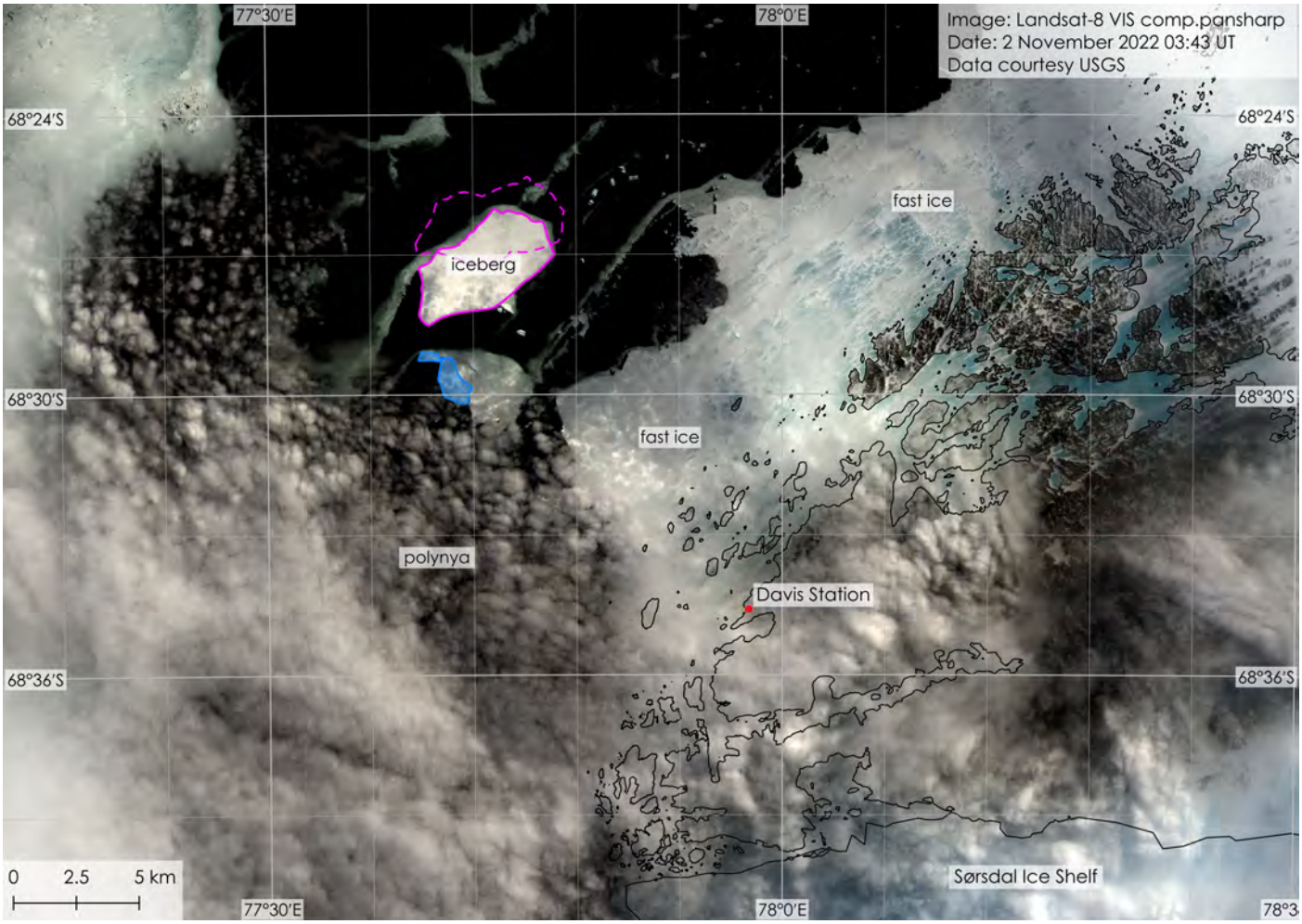


Figure 1: *Landsat-8 visible composite pansharpened data acquired 2 November 2022 at 03:43 UT and provided by USGS.*

West of the station, the fast-ice edge is obscured but remains roughly 2.5 nautical miles away from the shore. New ice is forming in the polynya offshore.

A large iceberg (roughly 15 km^2; marked by a pink outline) drifted from the north and appears to have hit bottom topography on 31 October 2022 (the dashed pink outline) and is currently north of a group of icebergs (the blue shapes) that is already grounded off station.

The northern sea-ice edge (not shown in the figure) is already at the median sea-ice extent for November and up to 150 nautical miles below (south of) the November median sea-ice extent north of the West Ice Shelf.

Ice Bulletin: Mawson Station

Issued: Thursday 3rd November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows a composite of SAR and high-resolution visible data off Mawson Station. The typical route between the station and Colbeck Hut is marked with a cyan line. The inset shows a close-up view of the area between the Colbeck Archipelago and the Taylor Ice Shelf.

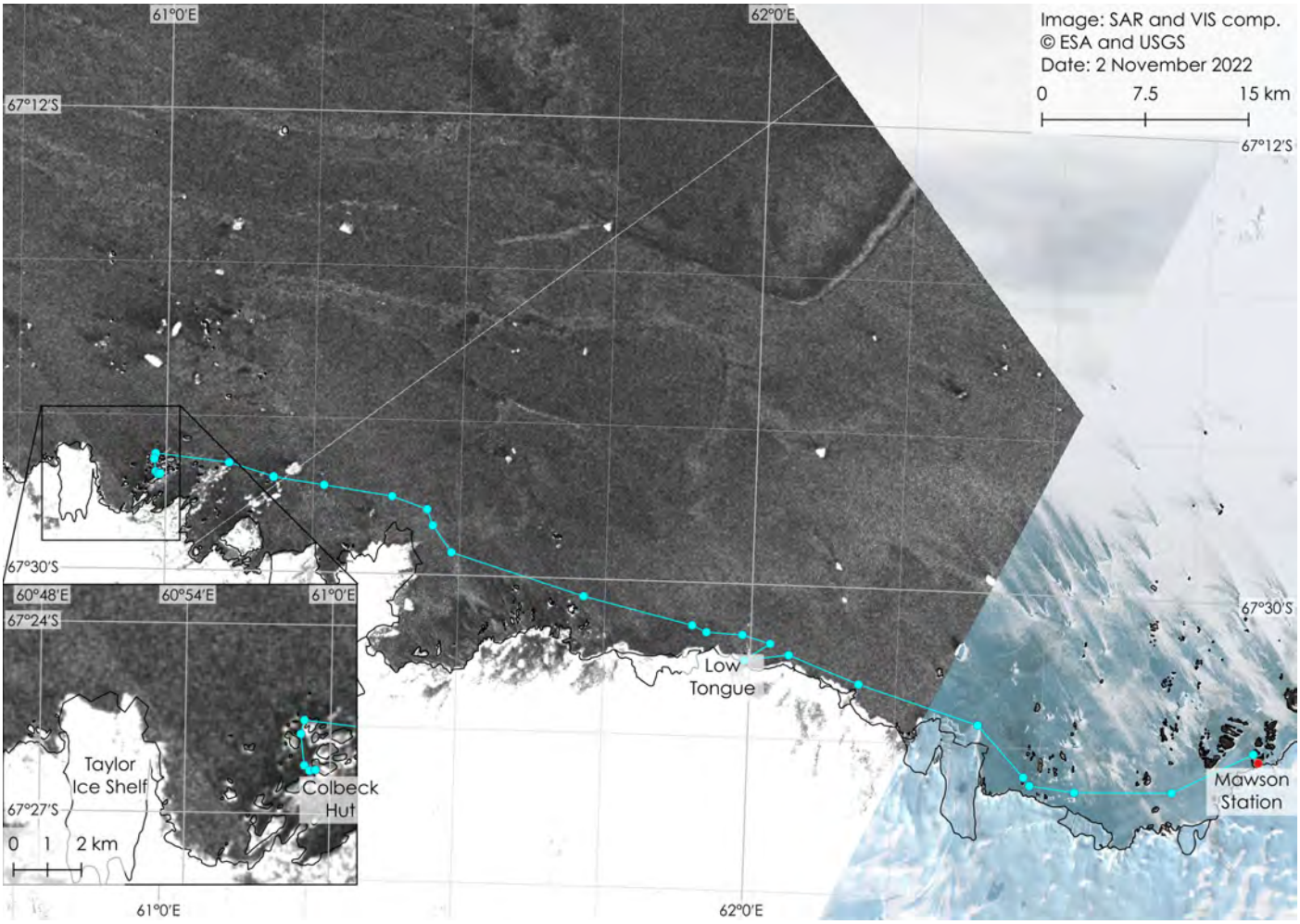


Figure 1: *Western part: Sentinel-1a SAR EW data acquired 2 November 2022 at 16:17 UT and provided by PolarView; Eastern part: Landsat-9 visible composite pansharpened data acquired 2 November 2022 at 04:32 UT and provided by USGS.*

Off station, the fast ice extends east and west along the coast. Isolated icebergs are trapped within the fast ice near shore. The northern fast-ice edge (not shown in the figure) has its typical shape for the time of year.

North of the station, the northern sea-ice edge (not shown in the figures) is already at the median sea-ice extent for November and below (south of) the November median sea-ice extent further east.

Figure 2 shows high-resolution visible data northeast of the station. The inset shows the location of the Auster penguin colony between grounded icebergs.

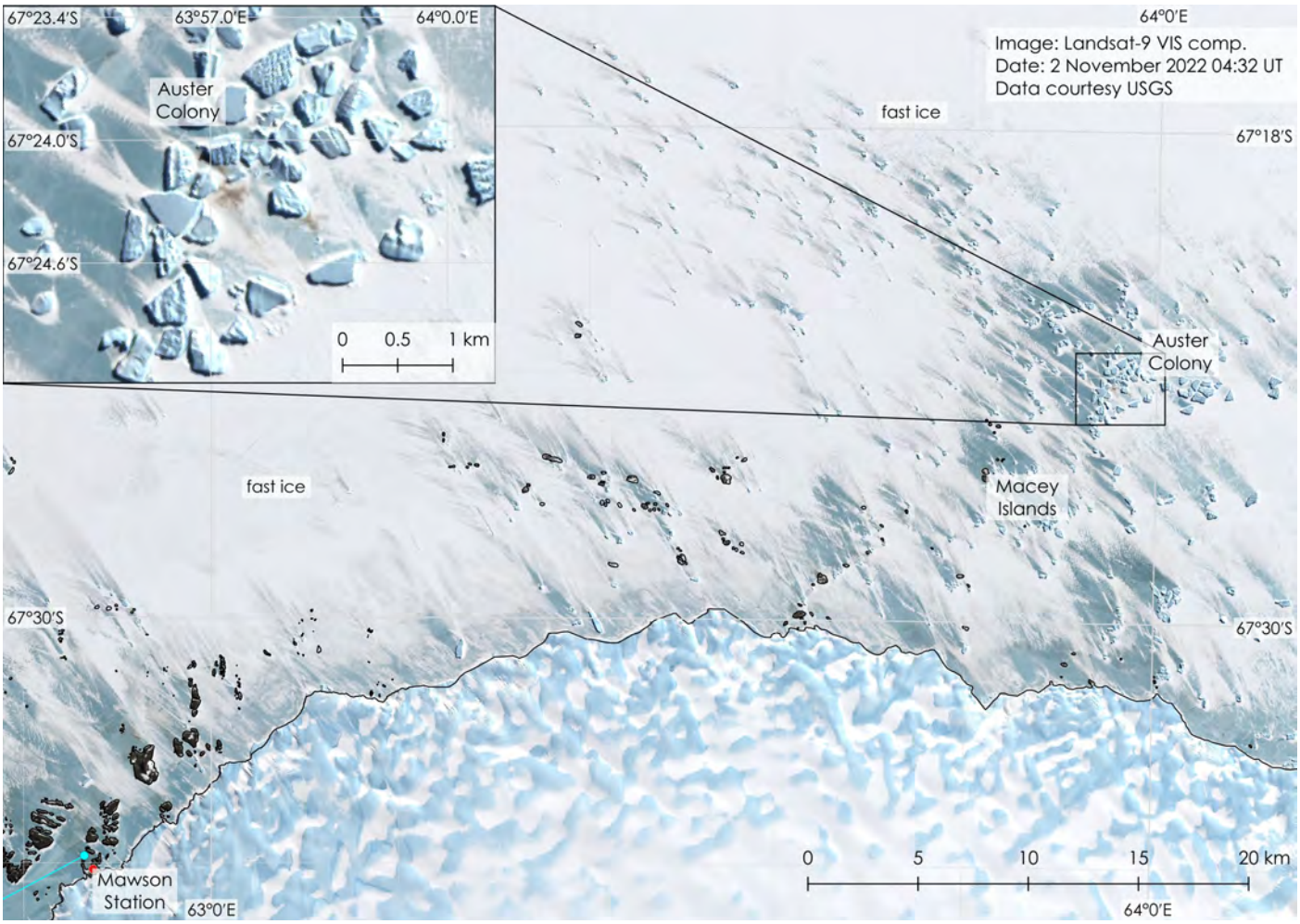


Figure 2: *Landsat-9 visible composite pansharpened data acquired 2 November 2022 at 04:32 UT and provided by USGS.*

Ice Bulletin: Iceberg D-32

Issued: Friday 4th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off the Amery Ice Shelf in East Antarctica.

The recently identified iceberg D-32 (the pink shape) continues drifting north of the Amery Ice Shelf. Its initial position is indicated by the white outline in the central part of the figure (at the western side of the ice-shelf front) and its drift is inicated by colour-coded shapes.

Since breaking away in mid-October, the iceberg has drifted roughly 45 nautical miles northward and has completed an anti-clockwise rotation and a bit more.

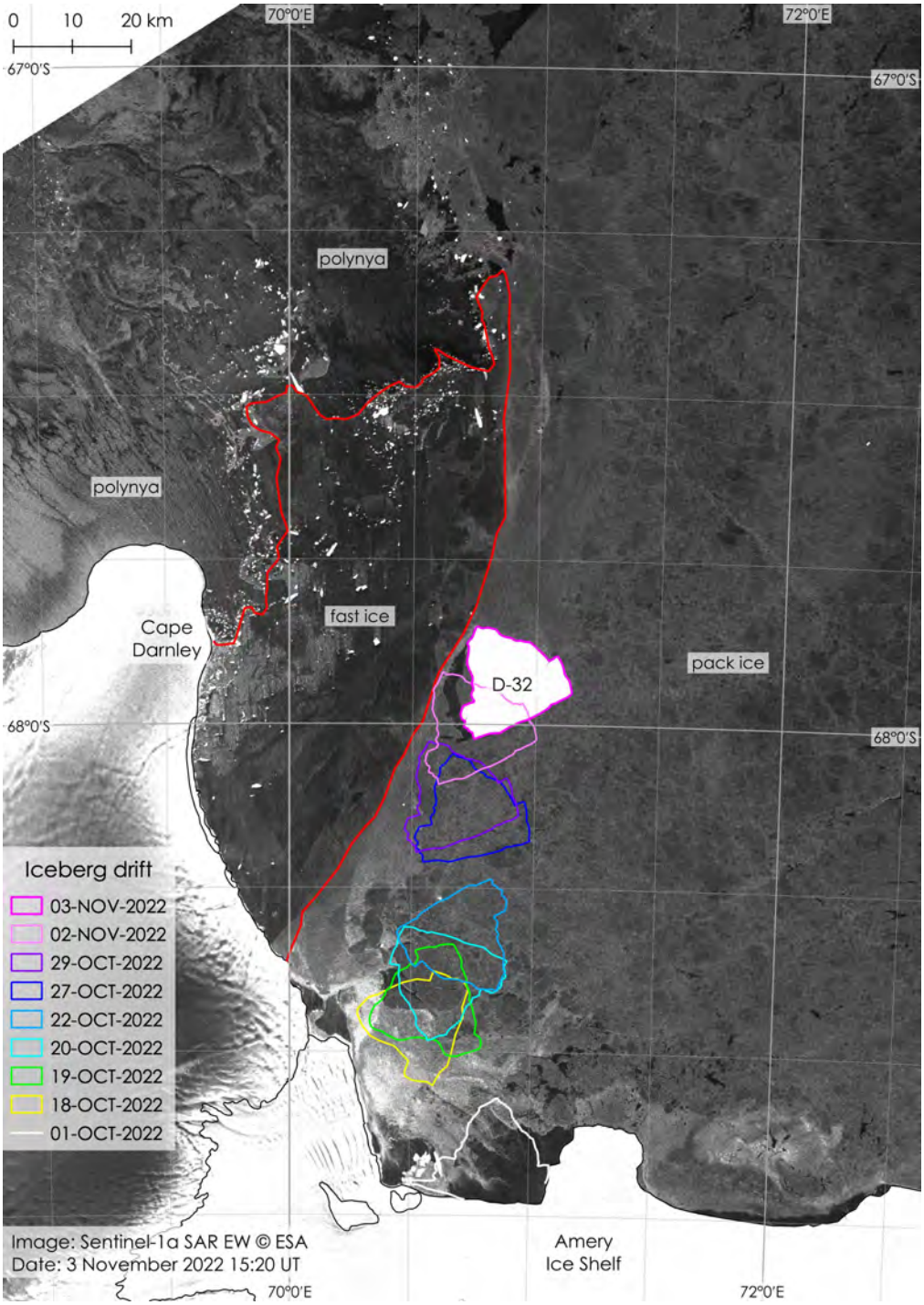


***Figure 1**: Sentinel-1a SAR EW data acquired 3 November 2022 at 15:20 UT and provided by PolarView.*

Ice Bulletin: Davis Station

Issued: Friday 4th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Davis Station. The fast-ice edge is marked by a red line (dashed red line for 29 October 2022).

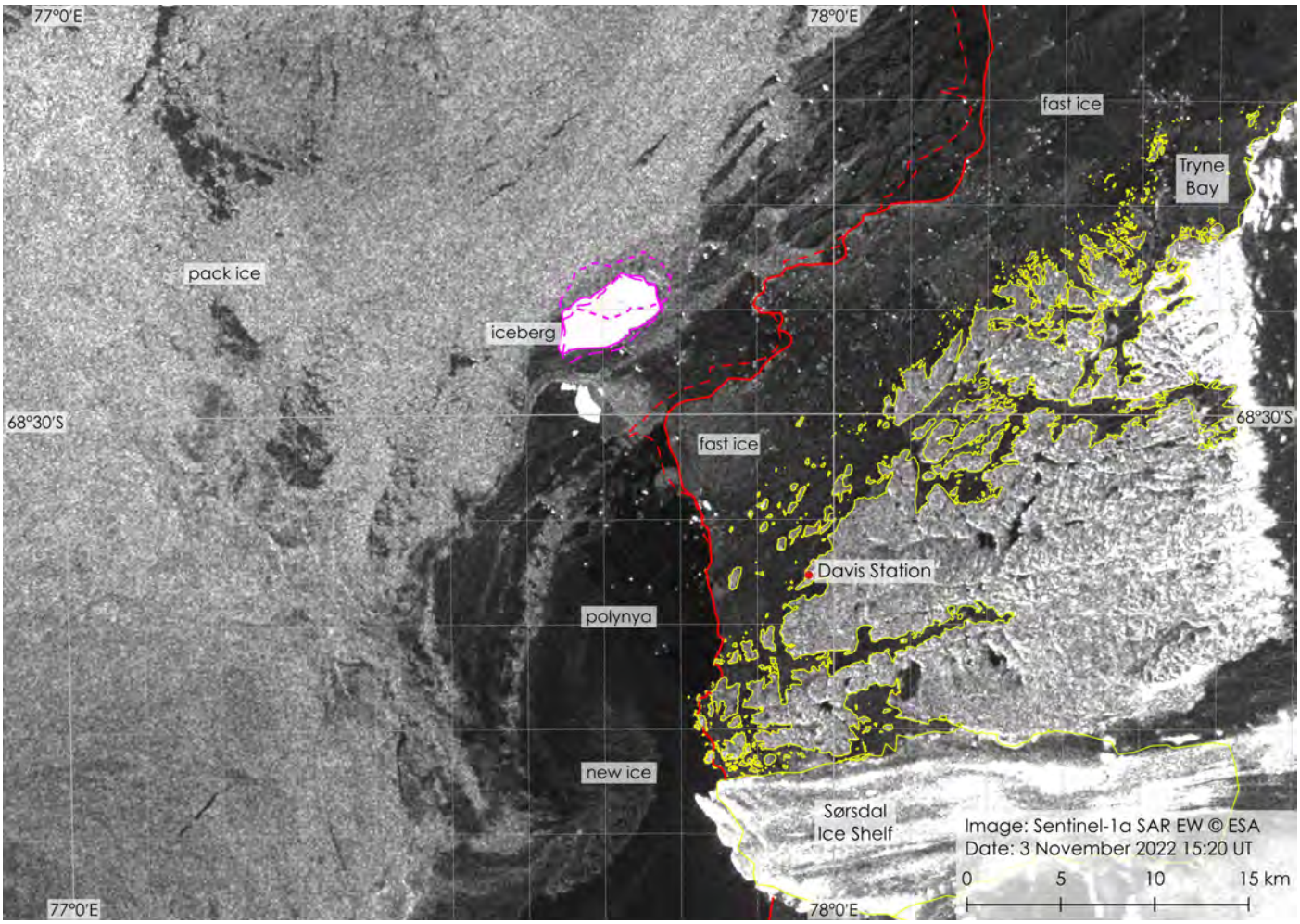


Figure 1: *Sentinel-1a SAR EW data acquired 3 November 2022 at 15:20 UT and provided by PolarView.*

West of the station, the fast-ice edge remains roughly 2.5 nautical miles away from the shore. New ice is forming in the polynya offshore. Further north off the Vestfold Hills, the fast-ice edge is retreating towards the shore.

A large iceberg (roughly 15 km^2; marked by a pink outline) drifted from the north and is confirmed grounded since 31 October 2022 (the dotted pink outline) north of a group of medium-sized icebergs that is already grounded off station.

The northern sea-ice edge (not shown in the figure) is progressing southward and up to 150 nautical miles below (south of) the November median sea-ice extent north of the West Ice Shelf.

Ice Bulletin: Davis Station

Issued: Monday 7th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data off Davis Station. The fast-ice edge on 3 November 2022 is marked by a dashed red line. The scene is slightly obscured by thin clouds.

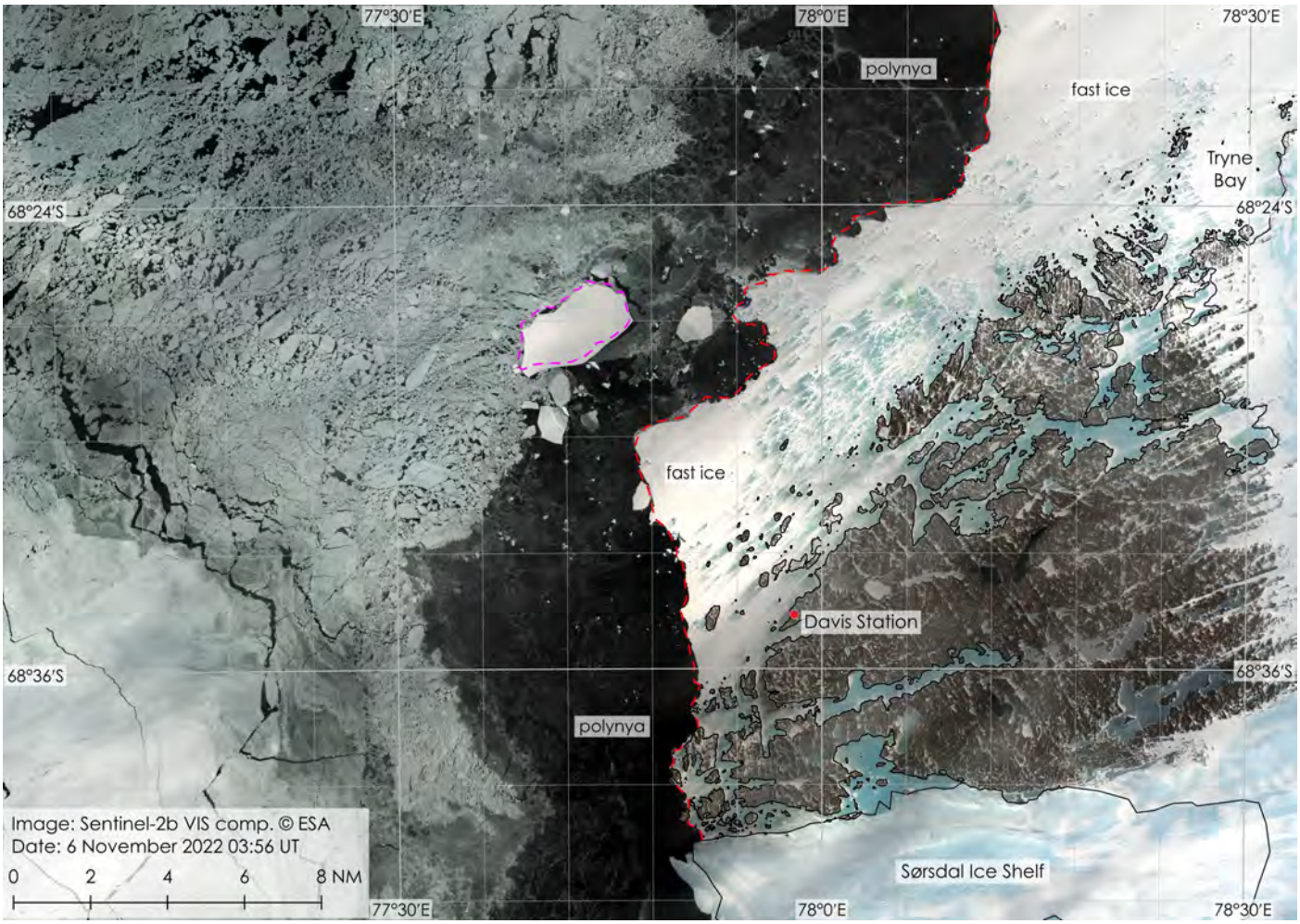


Figure 1: *Sentinel-2b visible composite data acquired 6 November 2022 at 03:56 UT and provided by ESA.*

West of the station, the fast-ice edge remains roughly 2.5 nautical miles away from the shore. New ice is forming in the small polynya offshore.

A large iceberg (roughly 15 km^2; marked by a pink outline on 3 November 2022) drifted from the north and is confirmed grounded since 31 October 2022 north of a group of medium-sized icebergs that is already grounded off station.

The northern sea-ice edge (not shown in the figure) is progressing southward and up to 150 nautical miles below (south of) the November median sea-ice extent north of the West Ice Shelf.

Figure 2 provides a close-up view of the fast ice off Davis Station.

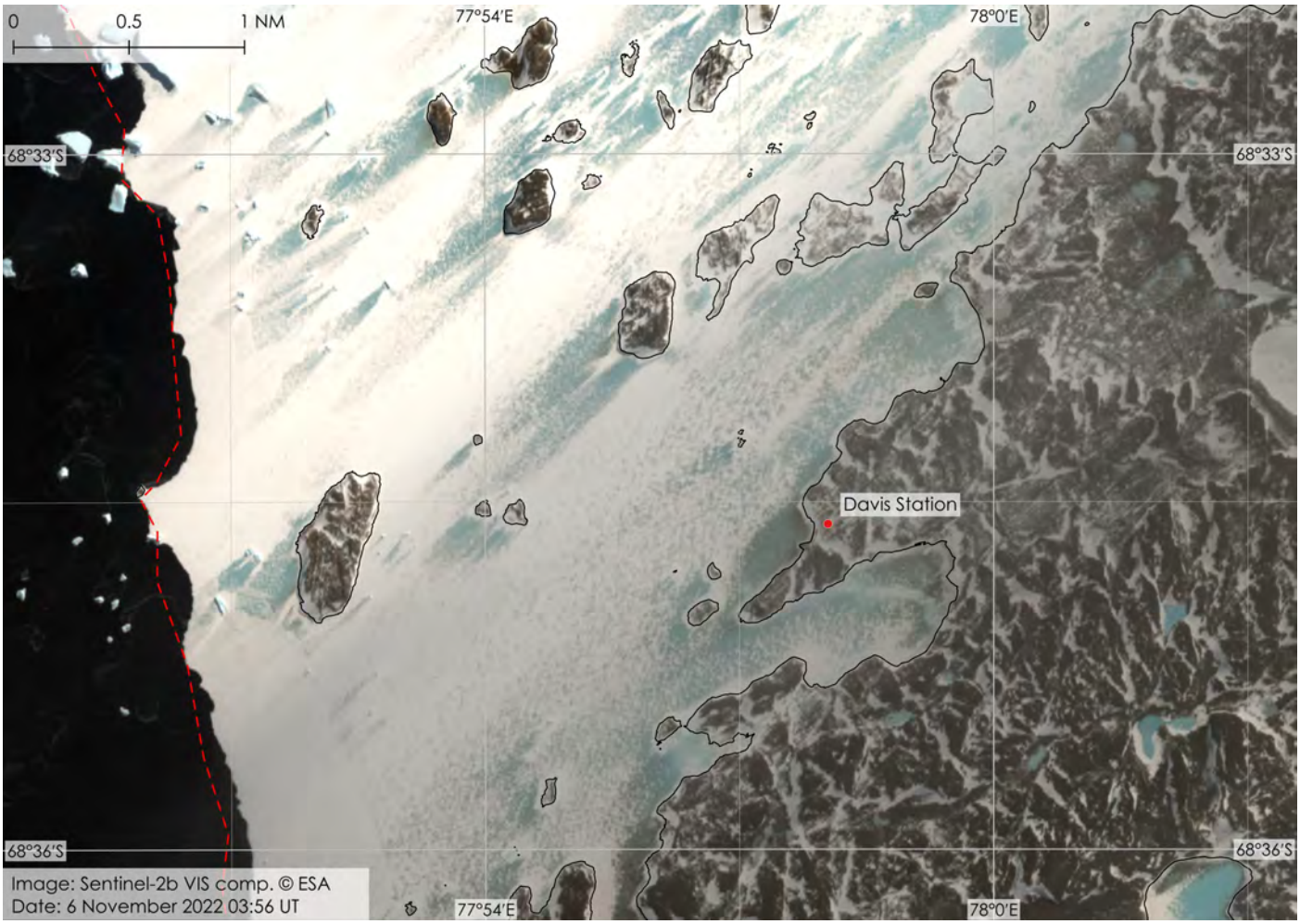


Figure 2: *Sentinel-2b visible composite data acquired 6 November 2022 at 03:56 UT and provided by ESA.*

Ice Bulletin: West Ice Shelf

Issued: Monday 7th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data north of the West Ice Shelf east of the Davis Station. The sea-ice edge based on passive microwave data is marked by a light blue line. The November median sea-ice extent is provided by the dark blue line.

The SAR data show clearly strips and patches of decaying sea ice and some small to the medium-sized icebergs north of the sea-ice edge as analysed from passive microwave data. This spread-out sea ice is below the detection limit of the passive microwave instrument and processing algorithm.

While a comparison between the median sea-ice extent and the current automatically detected sea-ice edge suggests that sea ice in the region is much further south, the SAR data highlight that very open ice (below 15% sea-ice concentration) is present as strips and patches as far north as 59º0’S at 80º0’E.

Notwithstanding what is stated above, East Antarctic sea-ice conditions in general are much below average for the time of year and higher concentration of sea ice is only found south of roughly 63º30’S in the region shown in Figure 1.

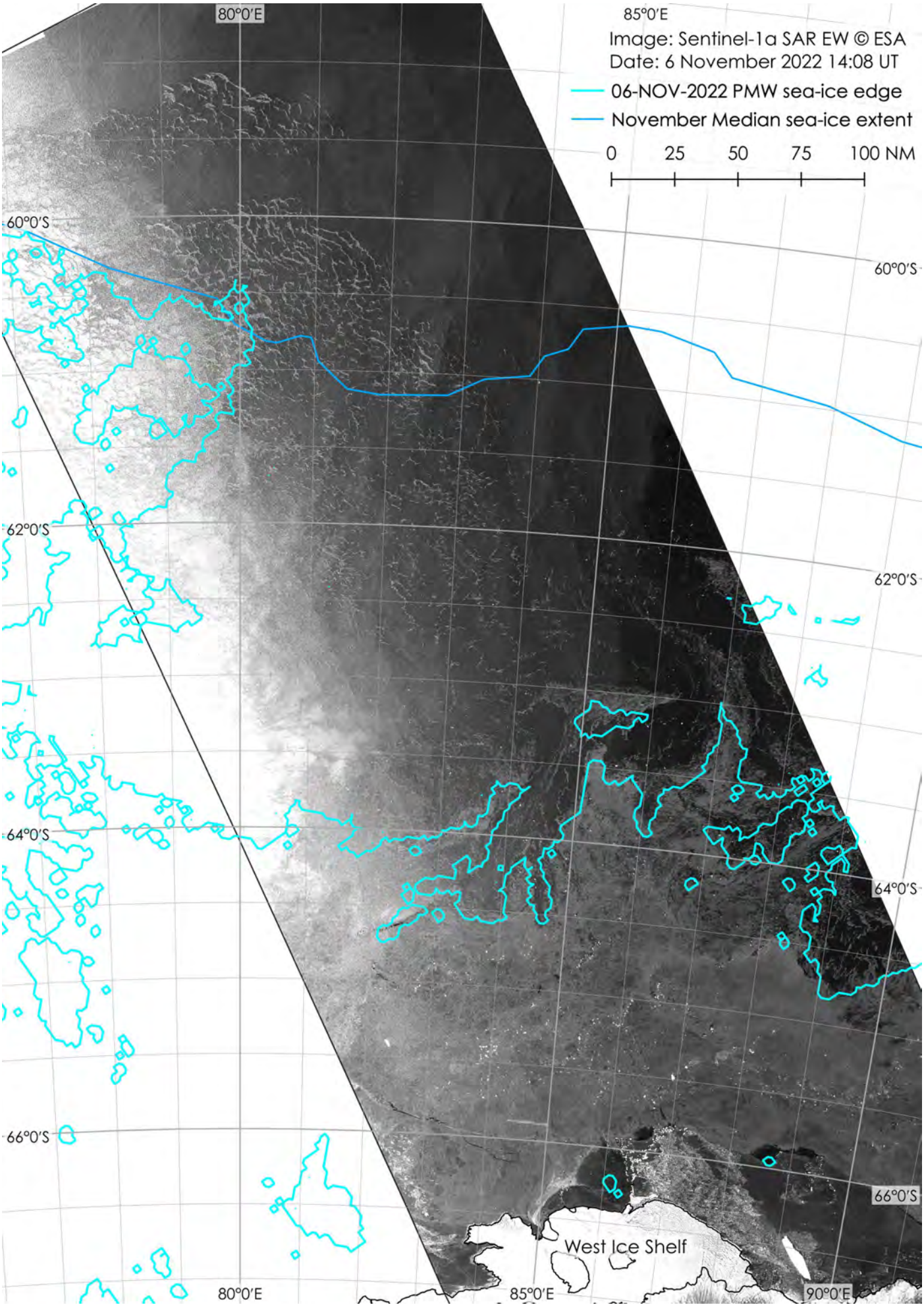


Figure 1: *Sentinel-1a SAR EW data acquired 6 November 2022 at 14:08 UT and provided by PolarView.*

Ice Bulletin: Casey Station

Issued: Tuesday 8th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data off Casey Station. The fast-ice edge is marked by a red line.

Off station, fast ice continues breaking up and ex-fast ice is floating in the polynya offshore.

A large polynya is active, and a mixture of new brash ice and ex-fast ice is present.

North of the station, the northern sea-ice edge (not shown in the figure) is roughly 135 nautical miles below (south of) the median sea-ice extent for November.

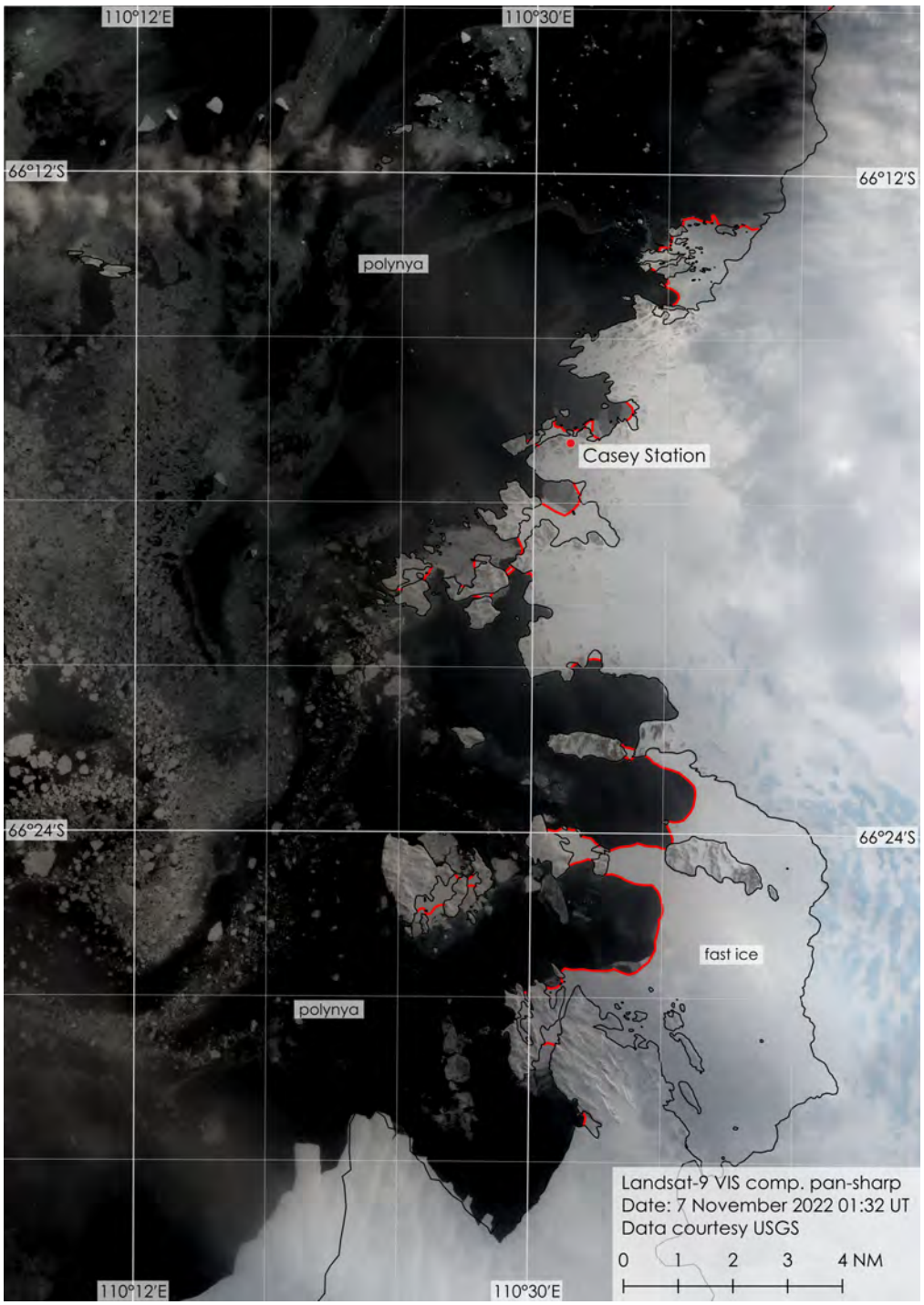


Figure 1: *Landsat-9 visible composite pansharpened data acquired 7 November 2022 at 01:32 UT and provided by USGS.*

Ice Bulletin: Wilkins Aerodrome

Issued: Tuesday 8th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of Wilkins Aerodrome.

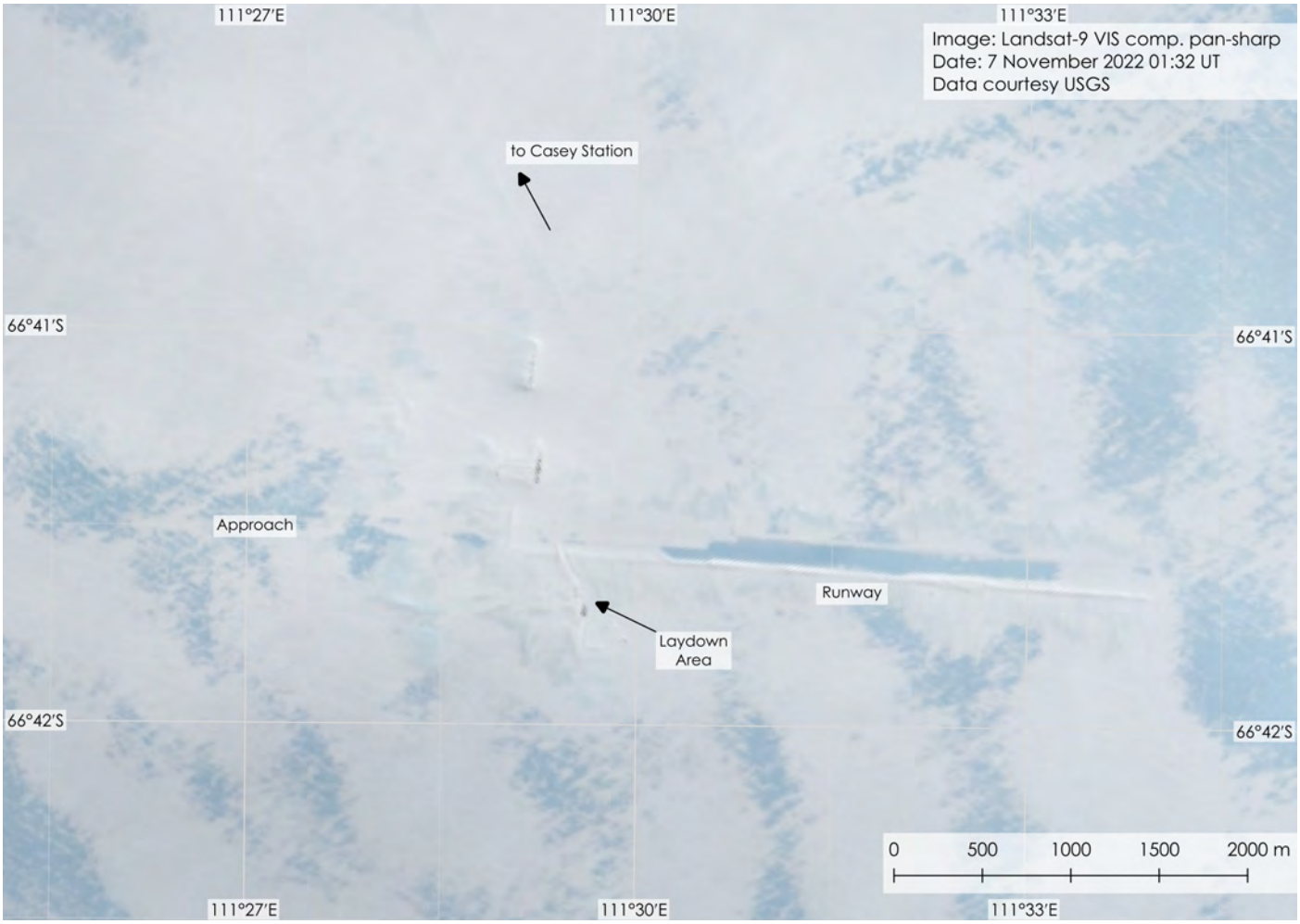


Figure 1: *Landsat-9 visible composite pan-sharpened data acquired 7 November 2022 at 01:32 UT and provided by USGS.*

The ice runway appears partly covered by fresh snow. North and south of the runway, snow dunes are left from previous clearing the runway.

Snow dunes have also accumulated in the lee of the camp and other structures.

Ice Bulletin: Mawson Station

Issued: Tuesday 8th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows a composite of visible data off Mawson Station.

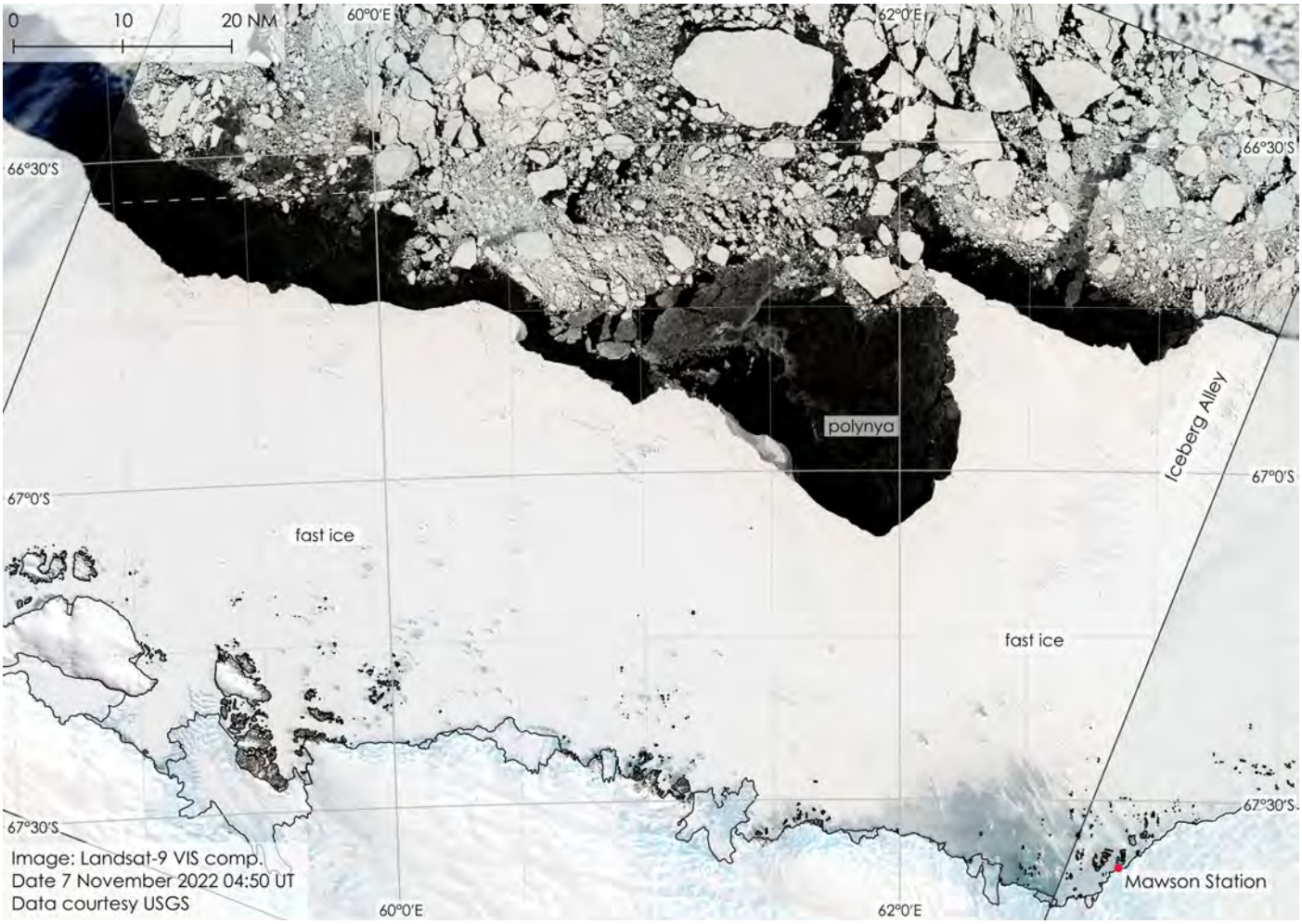


Figure 1: *Landsat-9 visible composite data acquired 7 November 2022 at 04:50 UT and provided by USGS; complemented by AQUA MODIS VIS data acquired 7 November 2022 and provided by NASA.*

Off station, the fast ice extends east and west along the coast. Isolated icebergs are trapped within the fast ice near shore. The northern fast-ice edge has its typical shape for the time of year and the nearest open water of the polynya northwest of the station is roughly 37.5 nautical miles away.

North of the station, the northern sea-ice edge (not shown in the figure) remains at the median sea-ice extent for November and below (south of) the November median sea-ice extent further east.

Ice Bulletin: Antarctica

Issued: Thursday 10th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows the pan-Antarctic sea-ice concentration anomaly based on passive microwave remote sensing data.

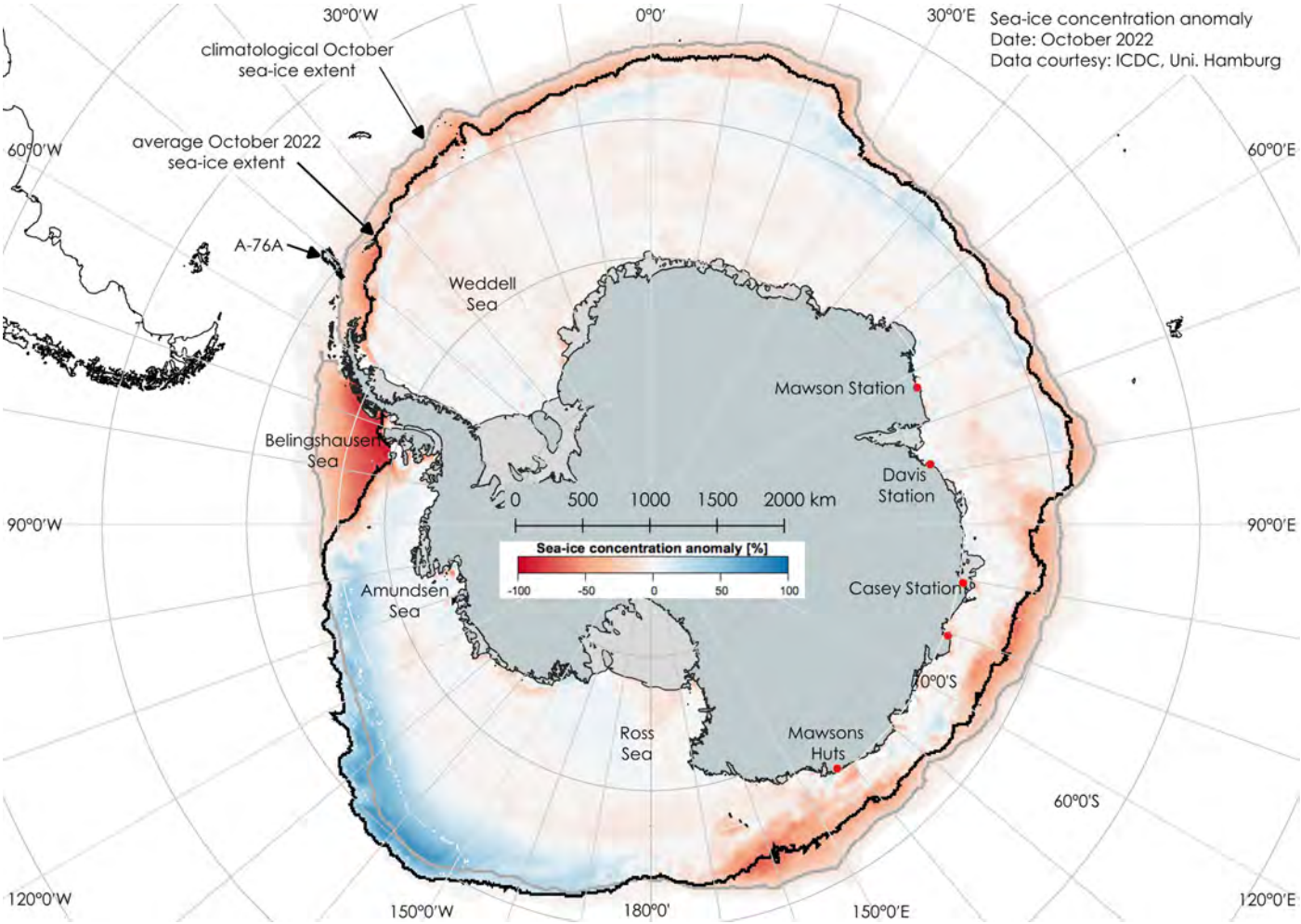


***Figure 1**: Sea-ice concentration anomaly for October 2022 provided by ICDC (Universität Hamburg).*

Pan-Antarctic sea-ice conditions continue to be overall low but not record-breaking (4th lowest) during October.

Only in the central and eastern Ross Sea, sea-ice extent continued to reach and partly exceed climatological values. The rest of the sea-ice zone around the continent exhibited below average sea-ice extent and associated concentration.

The most pronounced negative anomaly has increased west of the Antarctic Peninsula and negative extent anomalies stretch the entire Weddell Sea and are continuing throughout East Antarctica.

Northeast of the northern tip of the Antarctic Peninsula, a positive anomaly is associated with the drift of large iceberg A-76A, which is now north (outside) of the sea-ice zone and drifting further northward into the southern South Atlantic.

Ice Bulletin: Mawson Station

Issued: Thursday 10th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data off Mawson Station.

Off station, fast ice extends east and west along the coast. Isolated icebergs are trapped within the fast ice near shore. The northern fast-ice edge has its typical shape for the time of year and the nearest open water of the polynya northwest of the station remains roughly 37.5 nautical miles away.

The northern sea-ice edge (not shown in the figure) remains at the median sea-ice extent for November and below (south of) the November median sea-ice extent further east.

Figure 2 shows a close-up view around Mawson Station.

Figures 3 and 4 show the region east of the station towards the Auster penguin colony. Figure 4 shows high-resolution (10 m horizontal) visible data acquired a day earlier than the data of the other figures in this Bulletin.

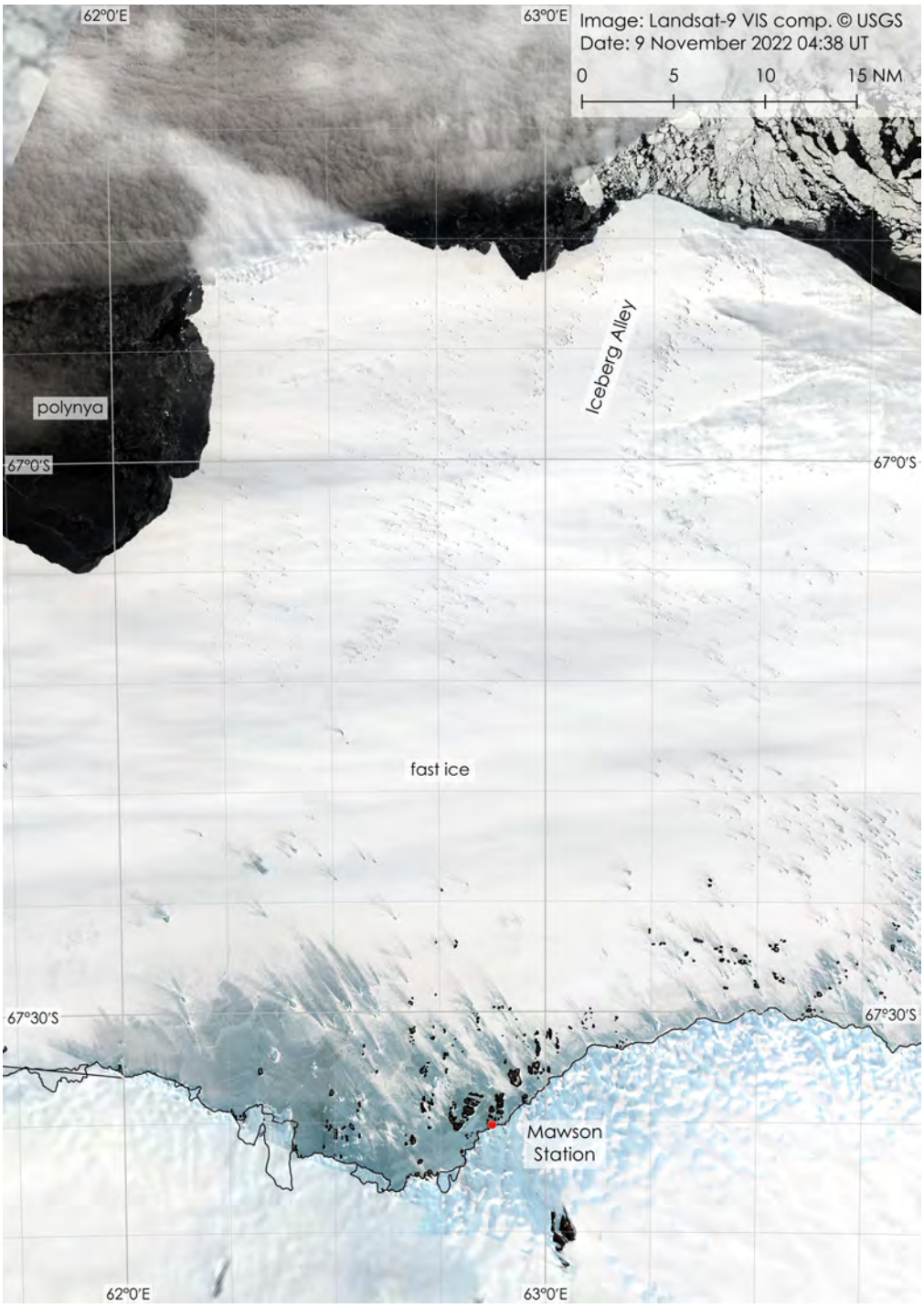


Figure 1: *Landsat-9 visible composite pansharpened data acquired 9 November 2022 at 04:38 UT and provided by USGS; complemented by AQUA MODIS VIS data acquired 9 November 2022 and provided by NASA.*

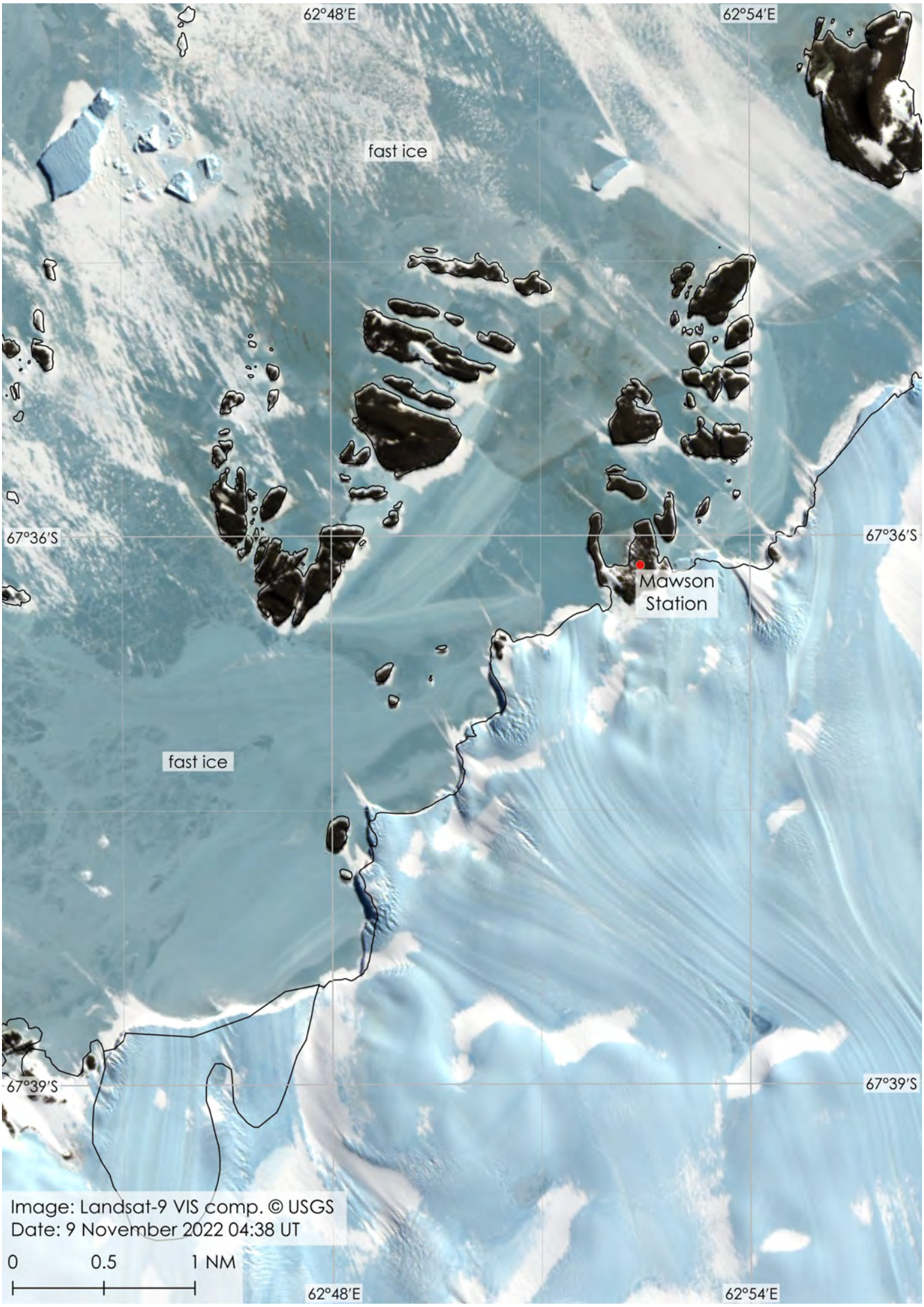


Figure 2: *Landsat-9 visible composite pansharpened data acquired 9 November 2022 at 04:38 UT and provided by USGS.*

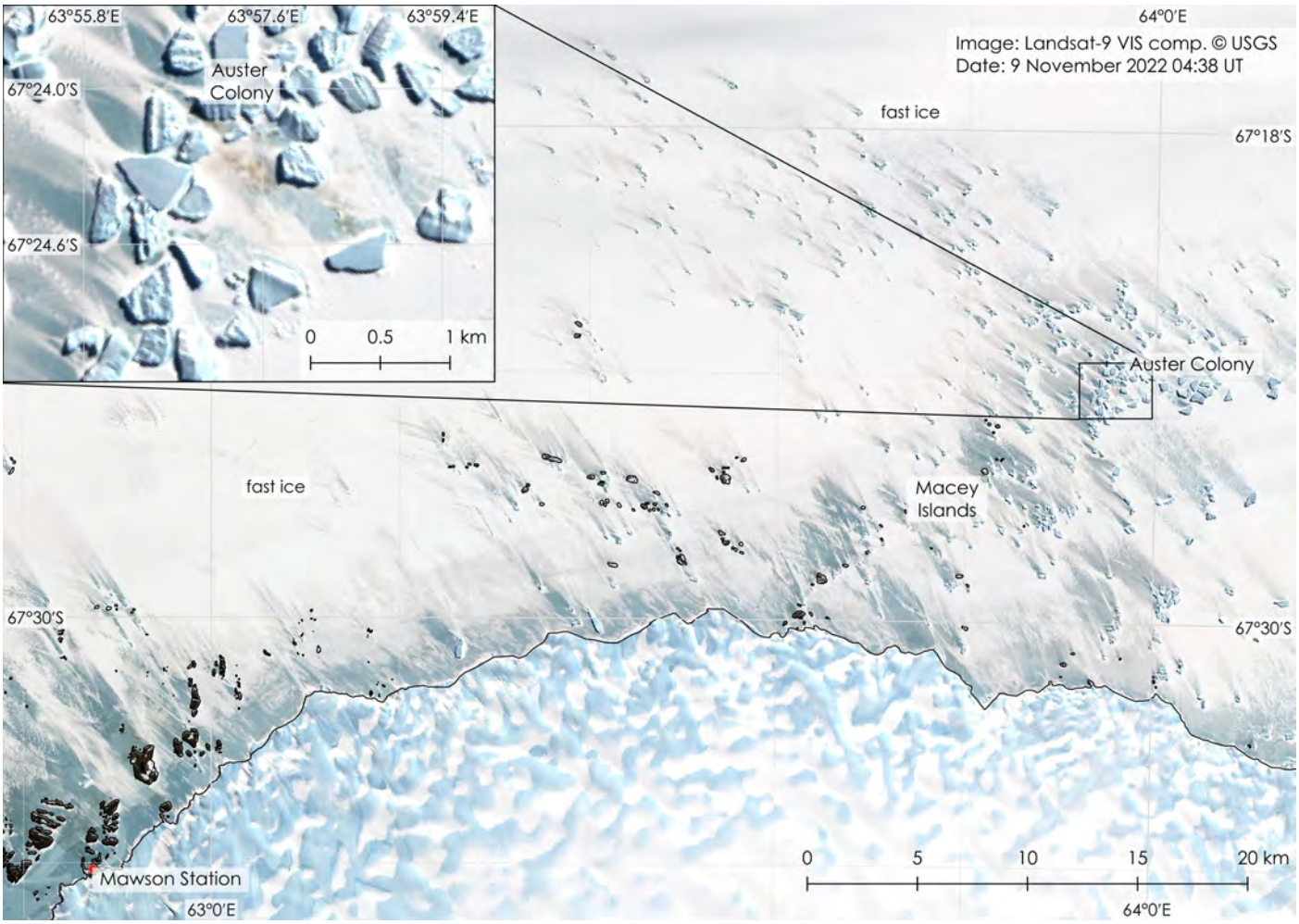


Figure 3: *Landsat-9 visible composite pansharpened data acquired 9 November 2022 at 04:38 UT and provided by USGS.*

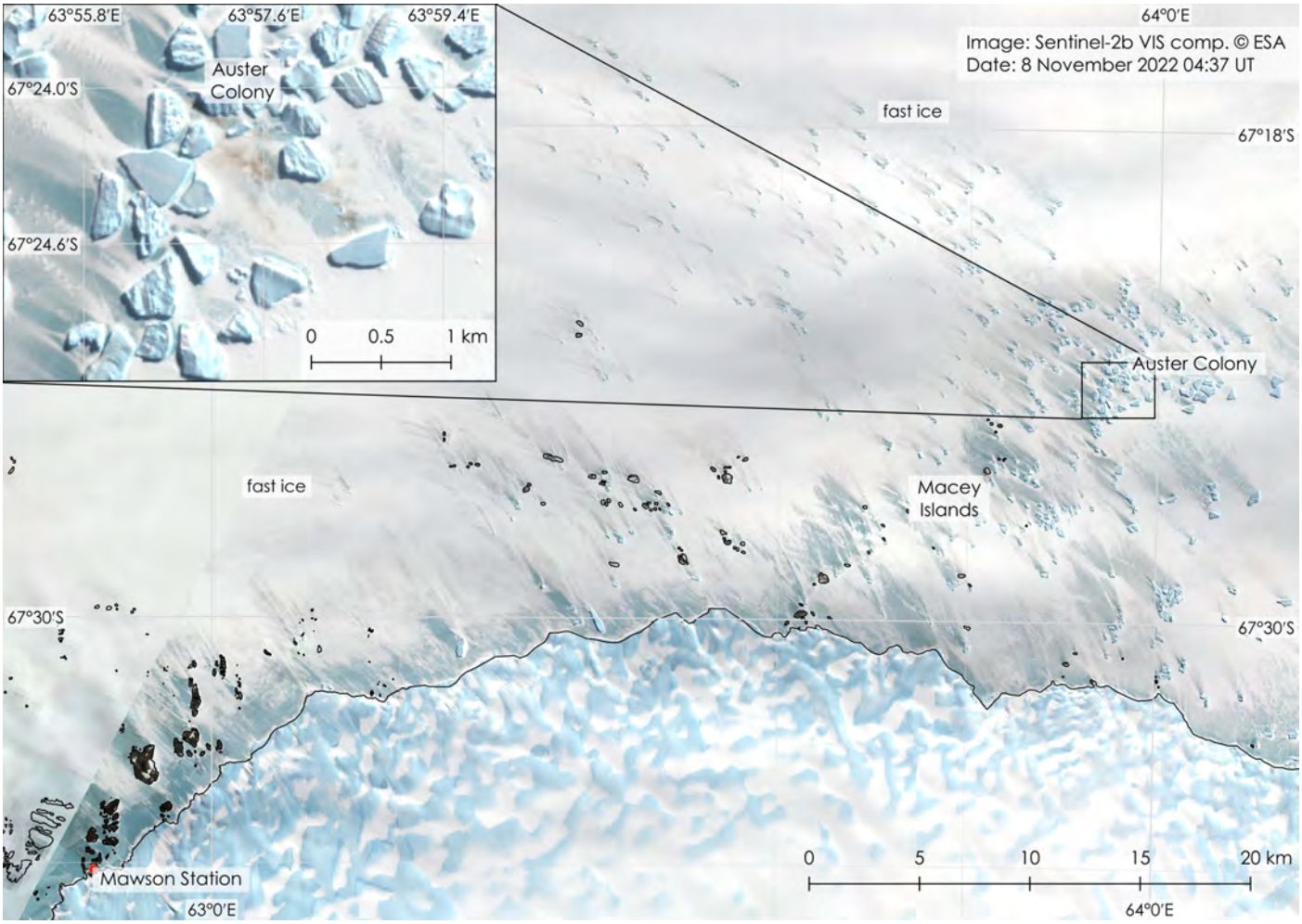


Figure 4: *Sentinel-2b visible composite data acquired 8 November 2022 at 04:37 UT and provided by ESA.*

Ice Bulletin: West Ice Shelf

Issued: Thursday 10th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows a composite of sea-ice concentration and SAR data north of the West Ice Shelf east of Davis Station. The sea-ice edge based on passive microwave (sea-ice concentration) data is marked by a cyan line. The November median sea-ice extent is provided by the dashed black/white line.

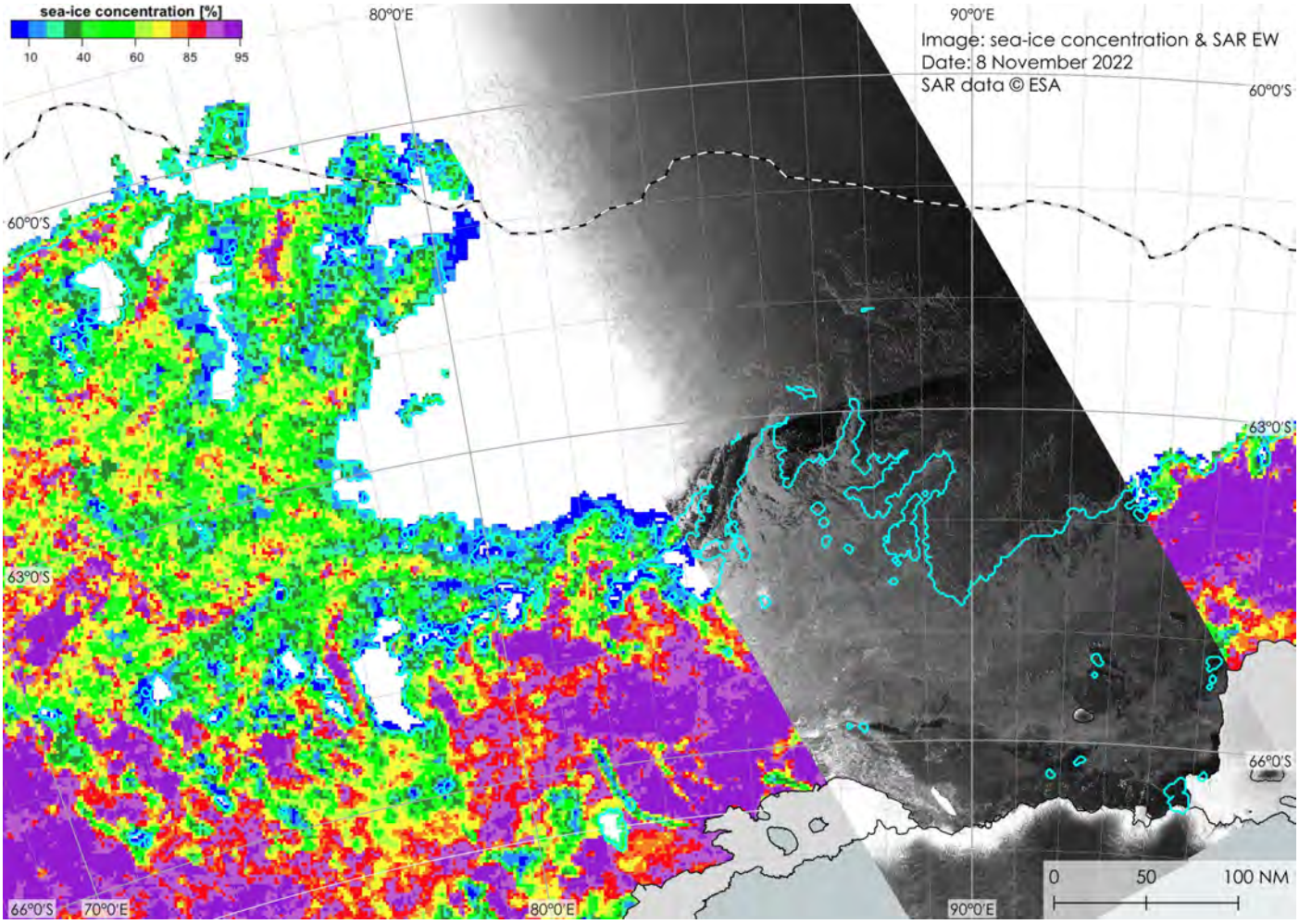


Figure 1: *Sea-ice concentration data acquired 8 November 2022 and provided by ICDC; Sentinel-1a SAR EW data acquired 8 November 2022 at 13:53 UT and provided by PolarView.*

The SAR data show strips and patches of decaying sea ice and some small to the medium-sized icebergs north of the sea-ice edge as analysed from passive microwave data. This spread-out sea ice is below the detection limit of the passive microwave instrument and processing algorithm.

A comparison between the median sea-ice extent and the automatically detected sea-ice edge may suggest that sea ice in the region is much further south but the SAR data highlight that very open ice (below 15% sea-ice concentration) is present as strips and patches as far north as 59º0'S at 82º0'E.

Figure 2 shows a portion of the SAR data shown in Figure 1. The sea-ice edge and median sea-ice extent is provided as in Figure 1. The orientation of the map is chosen to allow for maximum data coverage. The SAR data has been processed into a pseudo-visible (RGB) data set through a combination of co-polarised amplitude and cross-polarised intensity data, which makes sea ice appear with a reddish tint and icebergs as almost white.

Icebergs are present as far north as 58º30'S (outside of Figure 2).

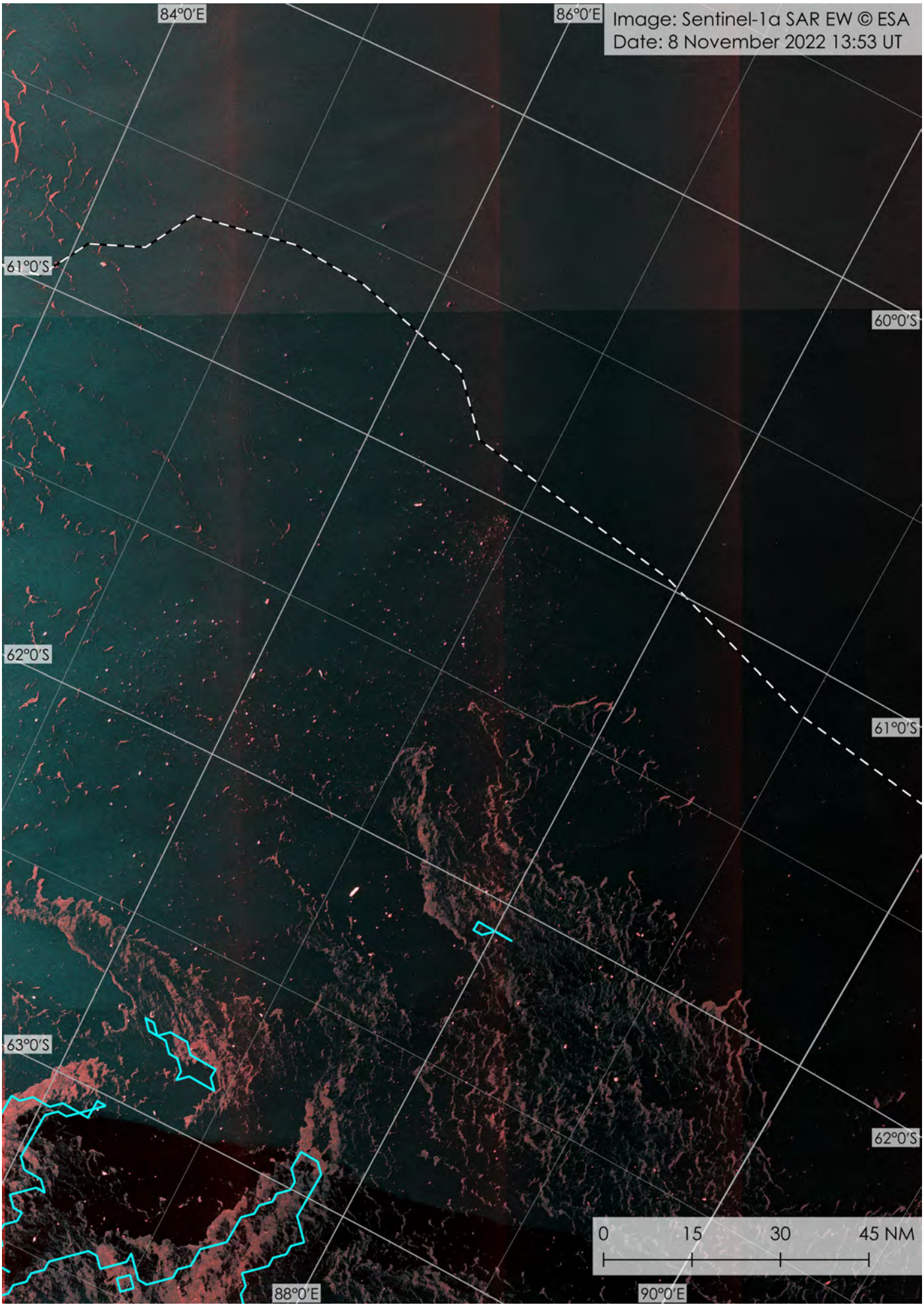


Figure 2: *Sentinel-1a SAR EW data acquired 8 November 2022 at 13:53 UT and provided by ESA.*

Ice Bulletin: Davis Station

Issued: Friday 11th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data off Davis Station. The fast-ice edge on 3 November 2022 is marked by a dashed red line. The scene is slightly obscured by thin clouds.

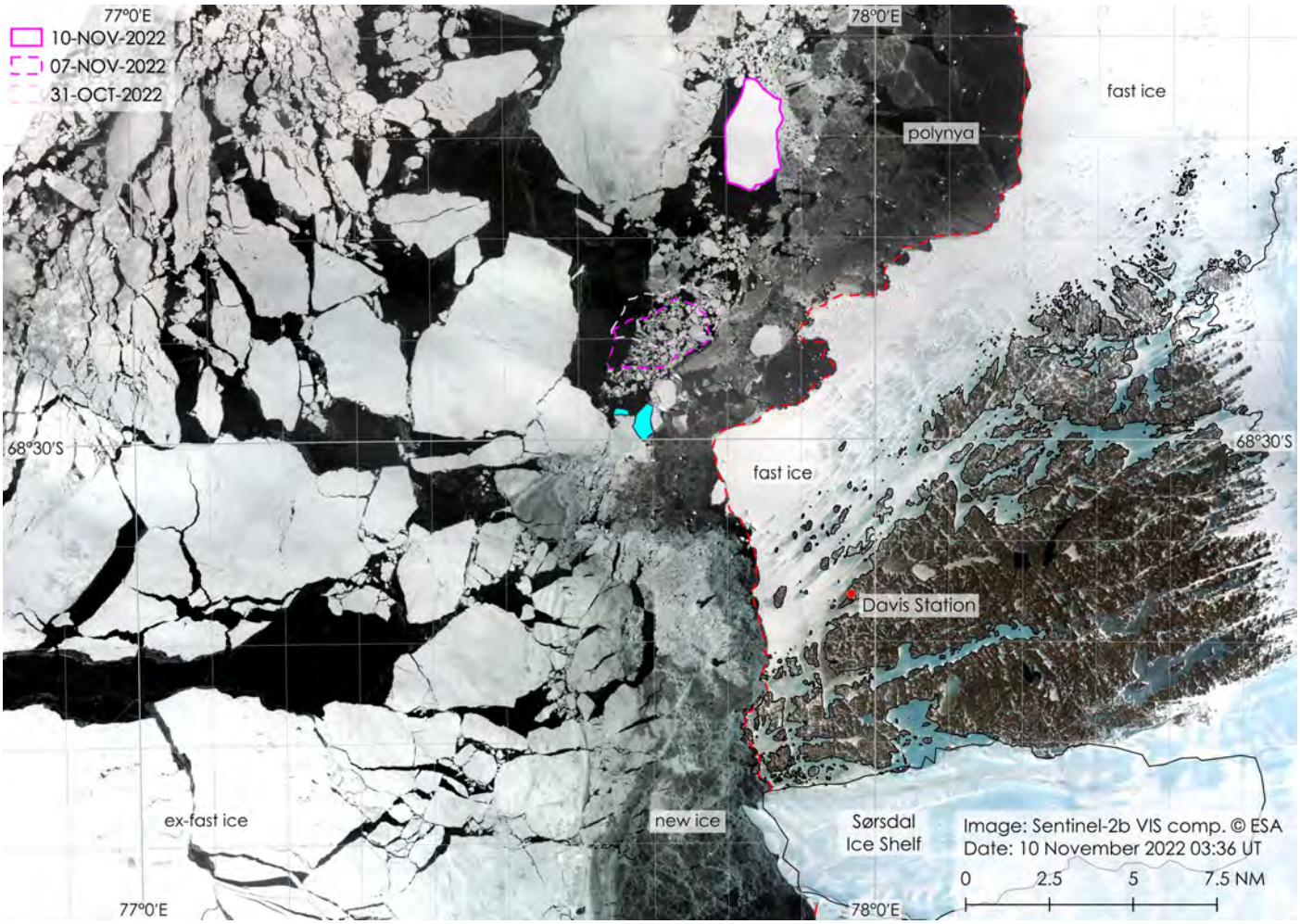


Figure 1: *Sentinel-2b visible composite data acquired 10 November 2022 at 03:36 UT and provided by ESA.*

West of the station, the fast-ice edge remains roughly 2.5 nautical miles away from the shore. New ice is present off the fast-ice edge.

A large iceberg (roughly 15 km^2; drift marked by a pink outlines) is dislodged from its grounding position off station north of a pair of medium-sized icebergs (the light-blue shapes). The larger of those two appears also dislodged and slightly on the move again.

The northern sea-ice edge (not shown in the figure) is progressing southward and up to 180 nautical miles below (south of) the November median sea-ice extent north of the West Ice Shelf.

Ice Bulletin: West Ice Shelf

Issued: Friday 11th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows a composite of sea-ice concentration and SAR data north of the West Ice Shelf east of Davis Station. The sea-ice edge based on passive microwave (sea-ice concentration) data is marked by a cyan line. The November median sea-ice extent is provided by the dashed black/white line.

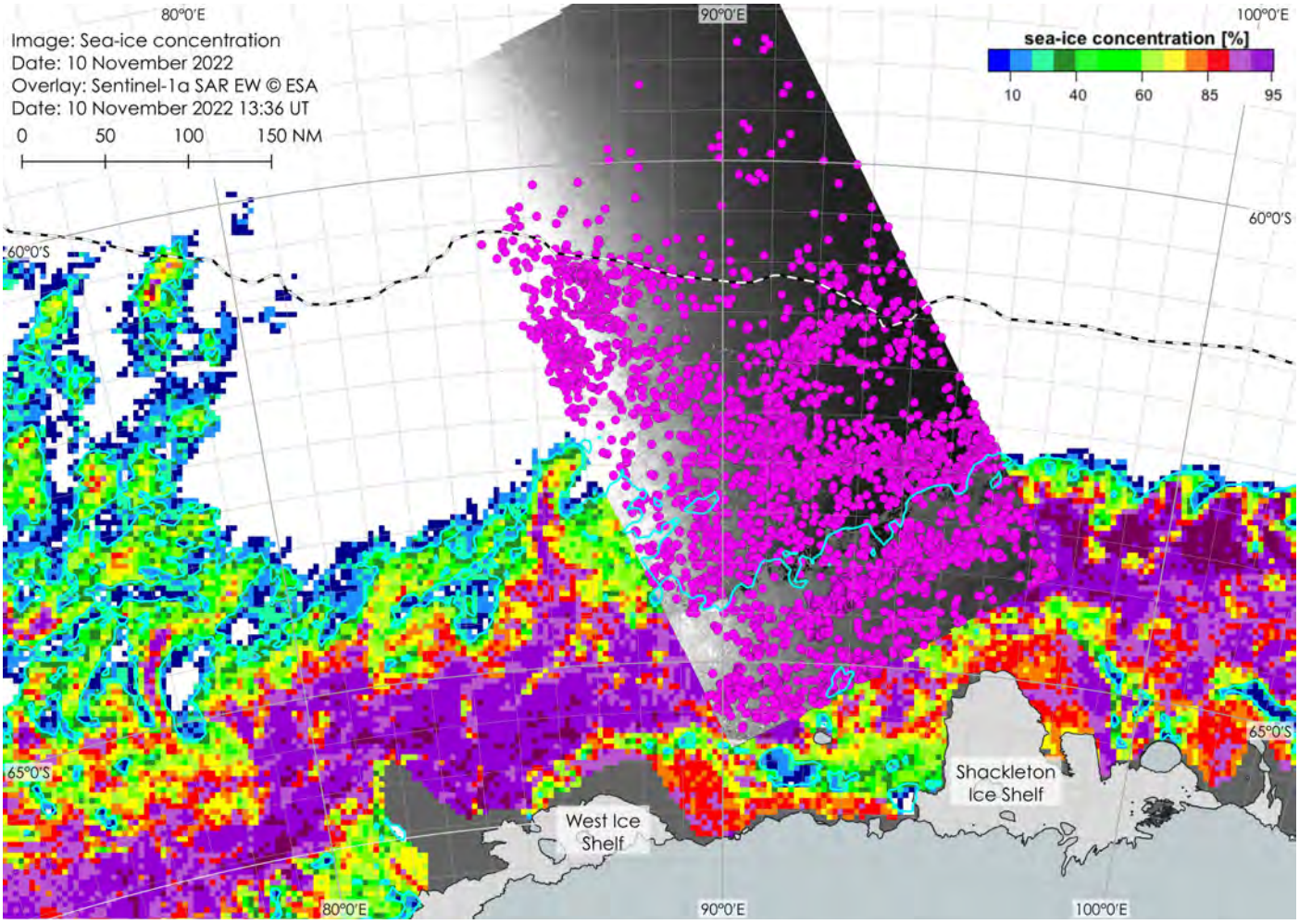


Figure 1: *Sea-ice concentration data acquired 10 November 2022 and provided by Polarview; Sentinel-1a SAR EW data acquired 10 November 2022 at 13:36 UT and provided by PolarView.*

The SAR data have been analysed for iceberg presence and more than 4000 features have been marked with pink dots. The SAR data also show strips and patches of decaying sea ice, which is below the detection limit of the passive microwave instrument and processing algorithm. Strips and patches of sea ice reach as far north as 62º0'S at 89º0'E.

Figure 2 shows a portion of the SAR data shown in Figure 1. The sea-ice edge and median sea-ice extent is provided as in Figure 1. The orientation of the map is chosen to allow for maximum data coverage. The SAR data has been processed into a pseudo-visible (RGB) data set through a combination of co-polarised amplitude and cross-polarised intensity data, which makes sea ice appear with a reddish tint and icebergs as almost white.

Icebergs and strips and patches of sea ice are present north of the sea-ice edge that is based on passive microwave data. Icebergs are present as far north as 58º30'S.

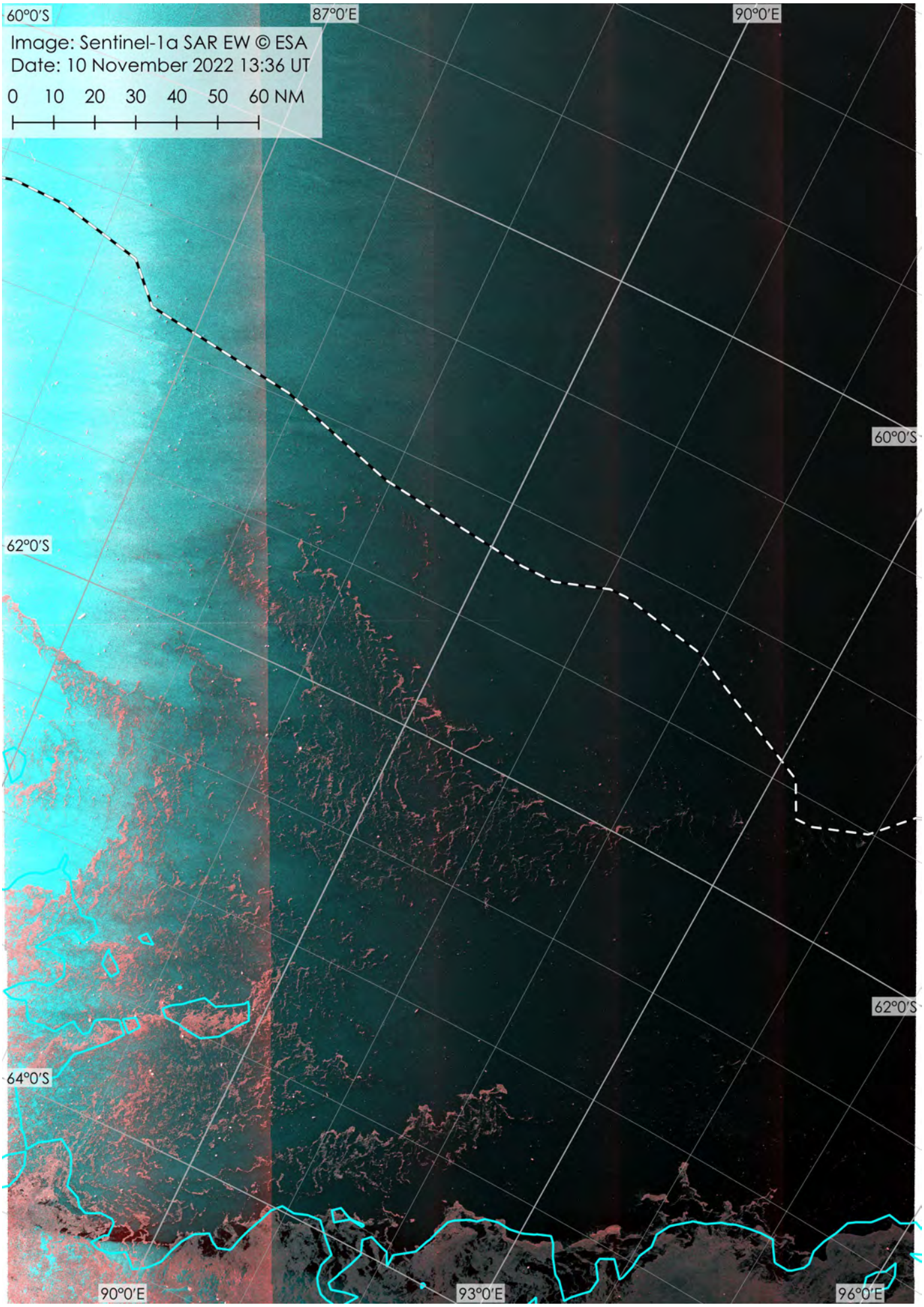


Figure 2: *Sentinel-1a SAR EW data acquired 10 November 2022 at 13:36 UT and provided by ESA.*

Ice Bulletin: West Ice Shelf

Issued: Monday 14th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows a composite of sea-ice concentration and SAR data north of the West Ice Shelf east of Davis Station. The sea-ice edge based on passive microwave (sea-ice concentration) data is marked by a cyan line. The November median sea-ice extent is provided by the dashed black/white line.

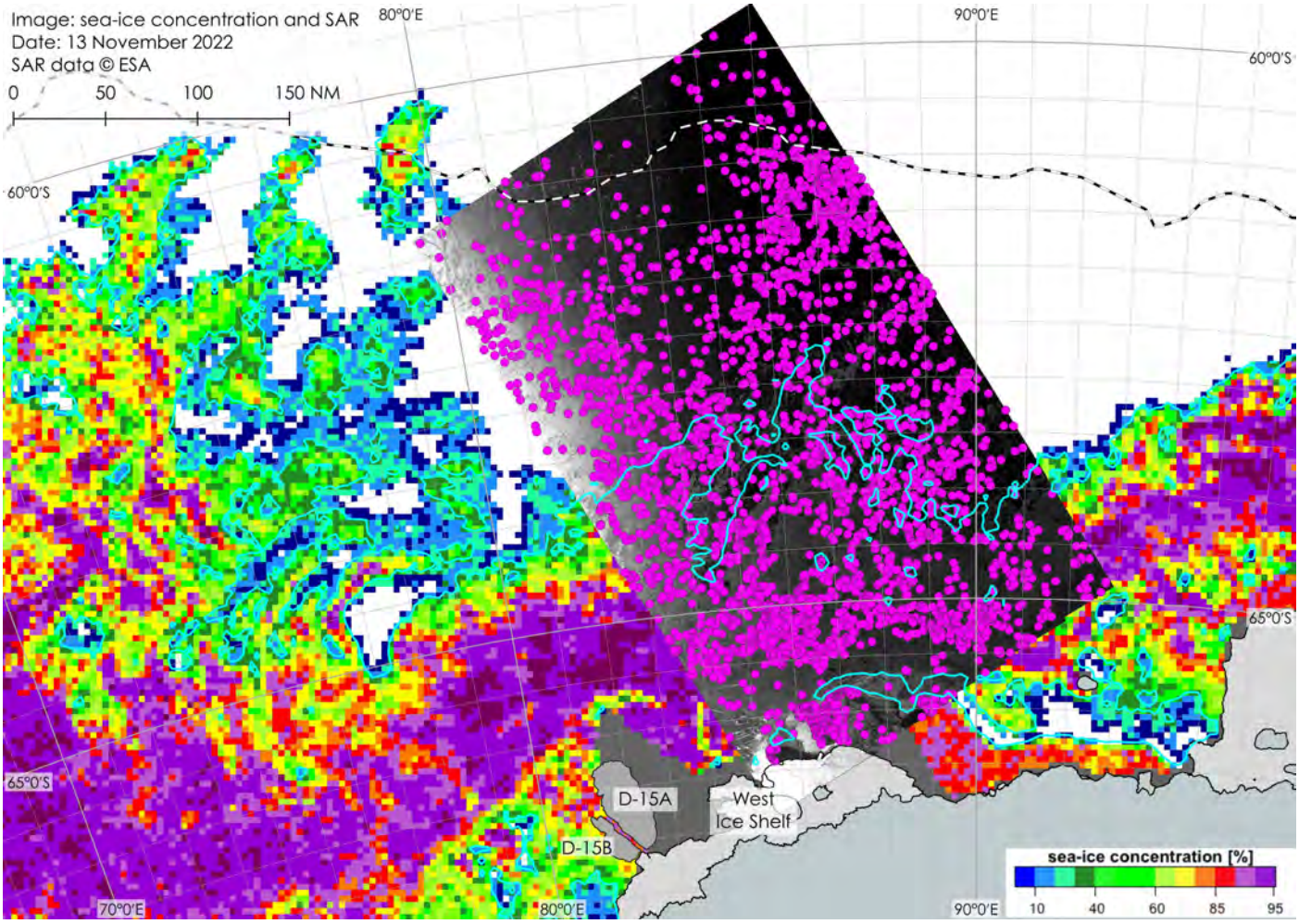


Figure 1: *Sea-ice concentration data acquired 13 November 2022 and provided by Polarview; Sentinel-1a SAR EW data acquired 13 November 2022 at 14:00 UT and provided by PolarView.*

The SAR data have been analysed for iceberg presence and more than 3500 features have been marked with pink dots. The SAR data also show strips and patches of decaying sea ice, which is below the detection limit of the passive microwave instrument and processing algorithm. Strips and patches of sea ice reach as far north as 60º30'S at 84º0'E.

Figure 2 shows a portion of the SAR data shown in Figure 1. The sea-ice edge and median sea-ice extent is provided as in Figure 1. The orientation of the map is chosen to allow for maximum data coverage. The SAR data has been processed into a pseudo-visible (RGB) data set through a combination of co-polarised amplitude and cross-polarised intensity data, which makes sea ice appear with a reddish tint and icebergs as almost white.

Icebergs and strips and patches of sea ice are present north of the sea-ice edge that is based on passive microwave data. Icebergs are present as far north as 59º45'S.

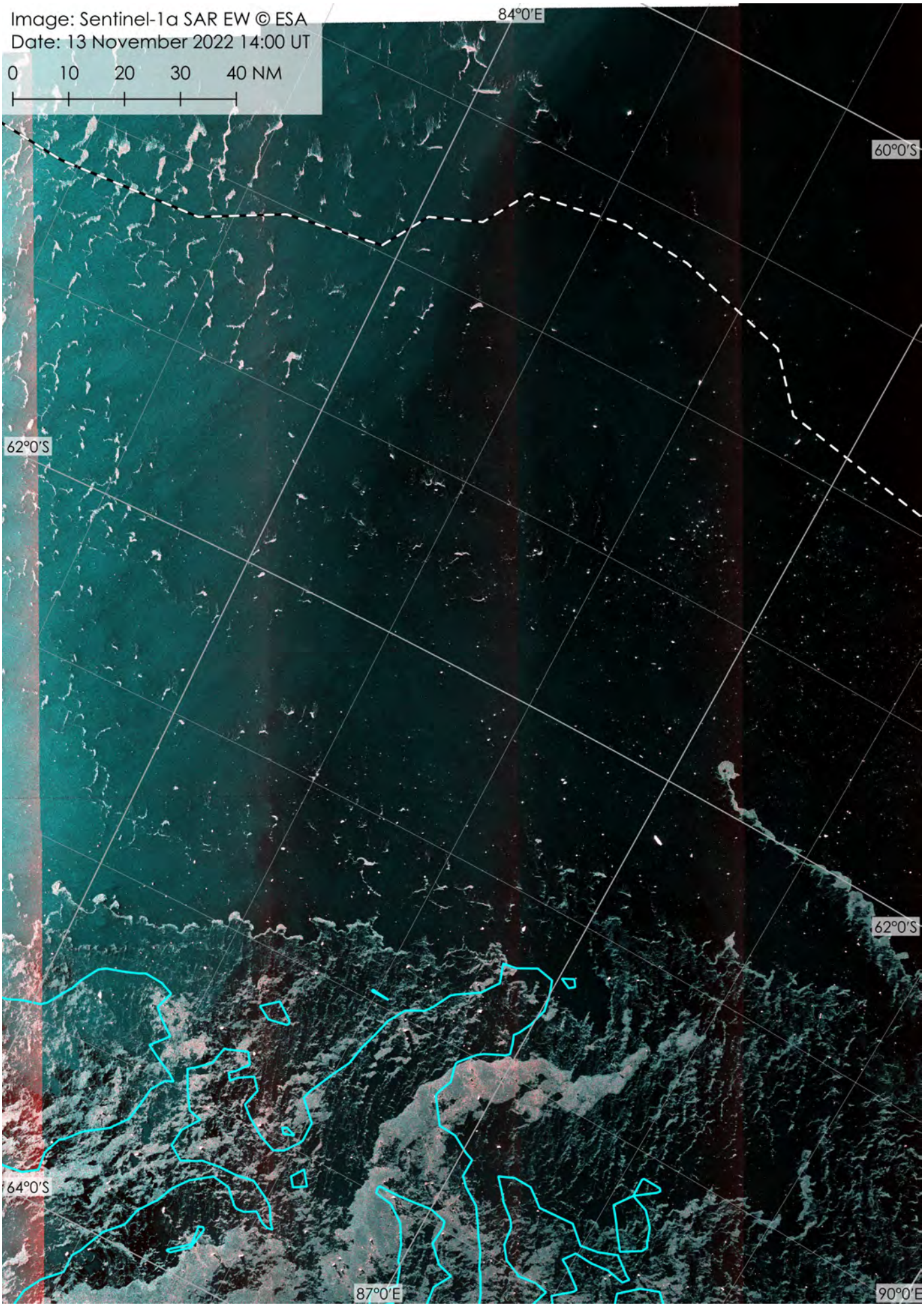


Figure 2: *Sentinel-1a SAR EW data acquired 13 November 2022 at 14:00 UT and provided by ESA.*

Ice Bulletin: Casey Station

Issued: Monday 14th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data off Casey Station. The fast-ice edge is marked by a red line (dashed yellow line for 7 November 2022).

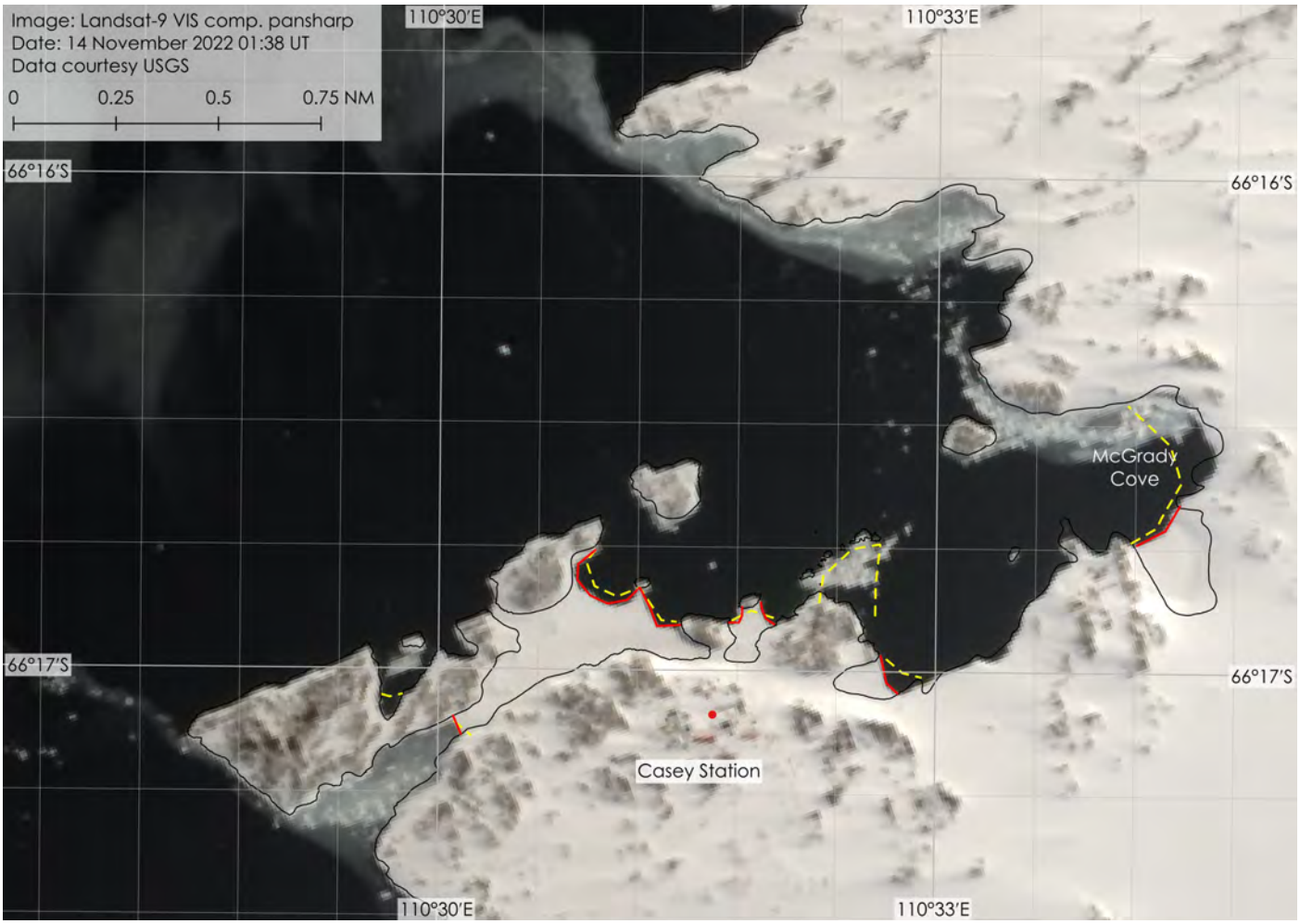


Figure 1: *Landsat-9 visible composite pansharpened data acquired 14 November 2022 at 01:38 UT and provided by USGS.*

Off station, fast ice continues breaking up and ex-fast ice is floating in the polynya offshore.

Figure 2 shows a larger-scale overview north and south of the station.

A large polynya is active, and a mixture of new brash ice, ex-fast ice and freely floating icebergs is present.

North of the station, the northern sea-ice edge (not shown in the figure) is up to 140 nautical miles below (south of) the median sea-ice extent for November.

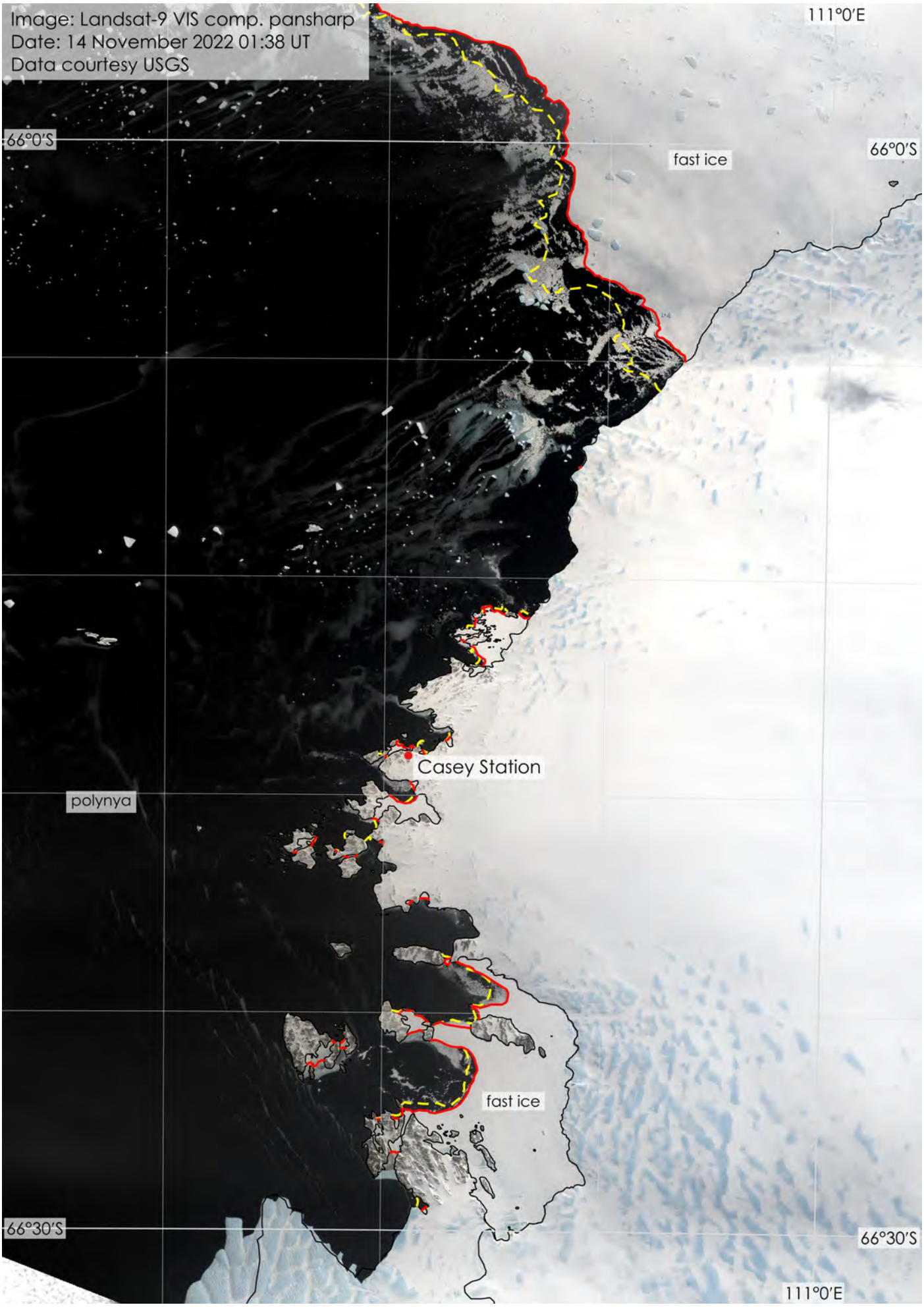


Figure 1: *Landsat-9 visible composite pansharpened data acquired 14 November 2022 at 01:38 UT and provided by USGS.*

Ice Bulletin: Wilkins Aerodrome

Issued: Monday 14th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data of Wilkins Aerodrome.

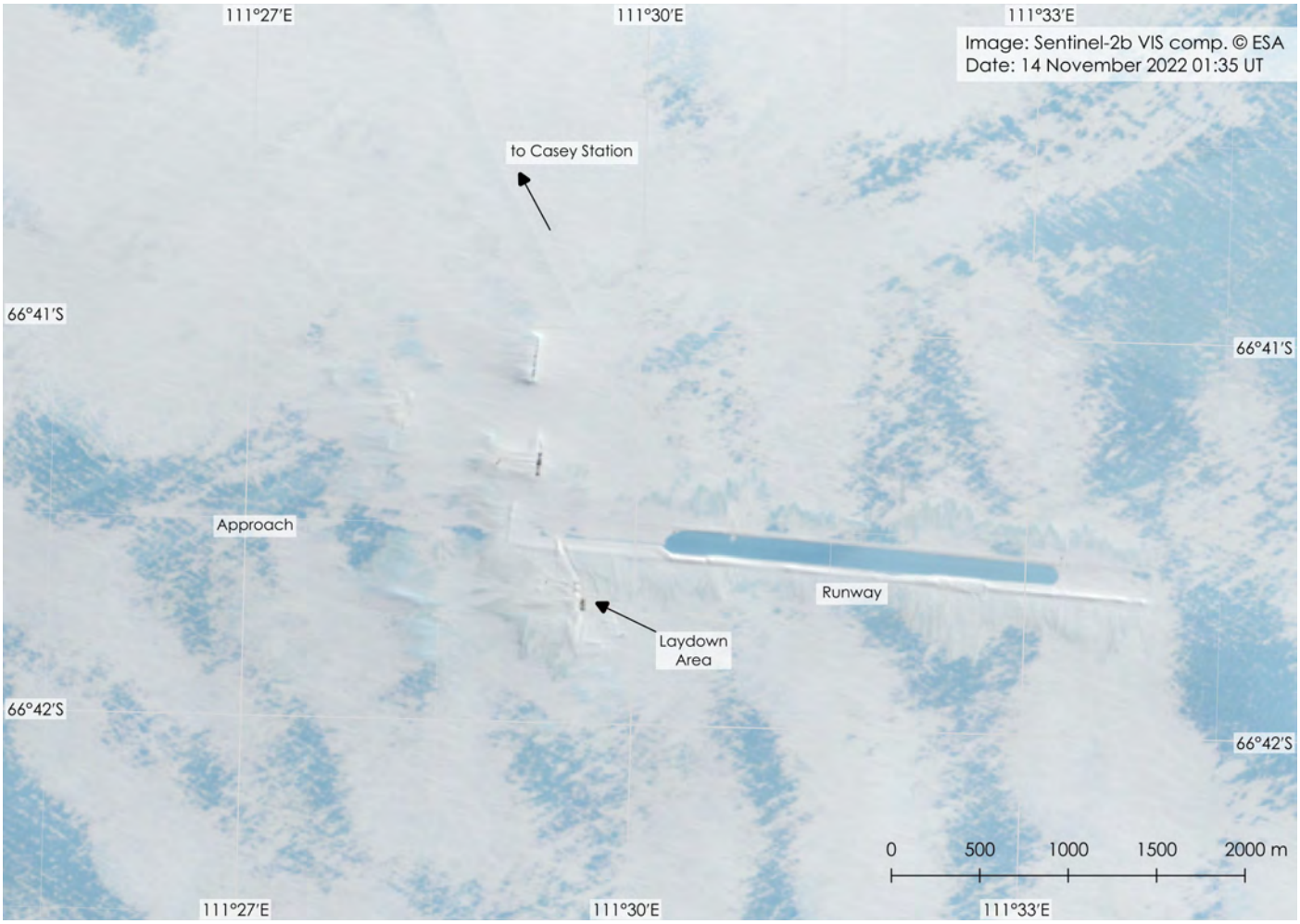


Figure 1: *Sentinel-2b visible composite data acquired 14 November 2022 at 01:35 UT and provided by ESA.*

The ice runway is partly covered by fresh snow. North and south of the runway, snow dunes are left from previous clearing the runway.

Snow dunes have also accumulated in the lee of the camp and other structures.

Ice Bulletin: Casey Station

Issued: Monday 14th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data off Casey Station. The fast-ice edge is marked by a red line.

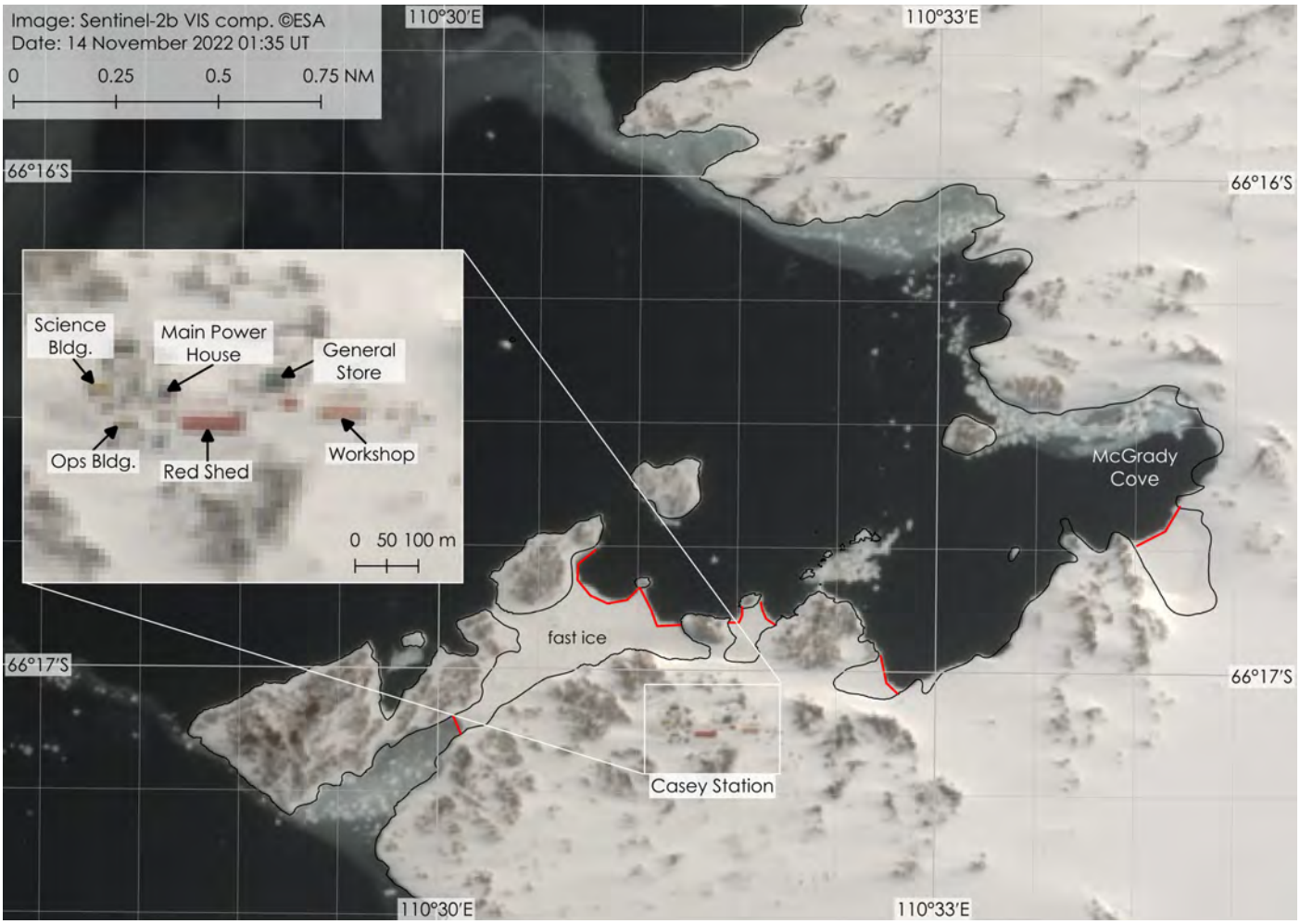


Figure 1: *Sentinel-2b visible composite data acquired 14 November 2022 at 01:35 UT and provided by ESA.*

Off station, fast ice continues breaking up and ex-fast ice is floating in the polynya offshore.

The inset highlights the buildings of the station.

Ice Bulletin: Shackleton Ice Shelf

Issued: Tuesday 15th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows a composite of visible and SAR data north of the Shackleton Ice Shelf west of Casey Station. The November median sea-ice extent is provided by the dashed black/white line. The cruise track of MPOV *Aiviq* is included as a blue line (up until 14 November 2022 22:10 UT).

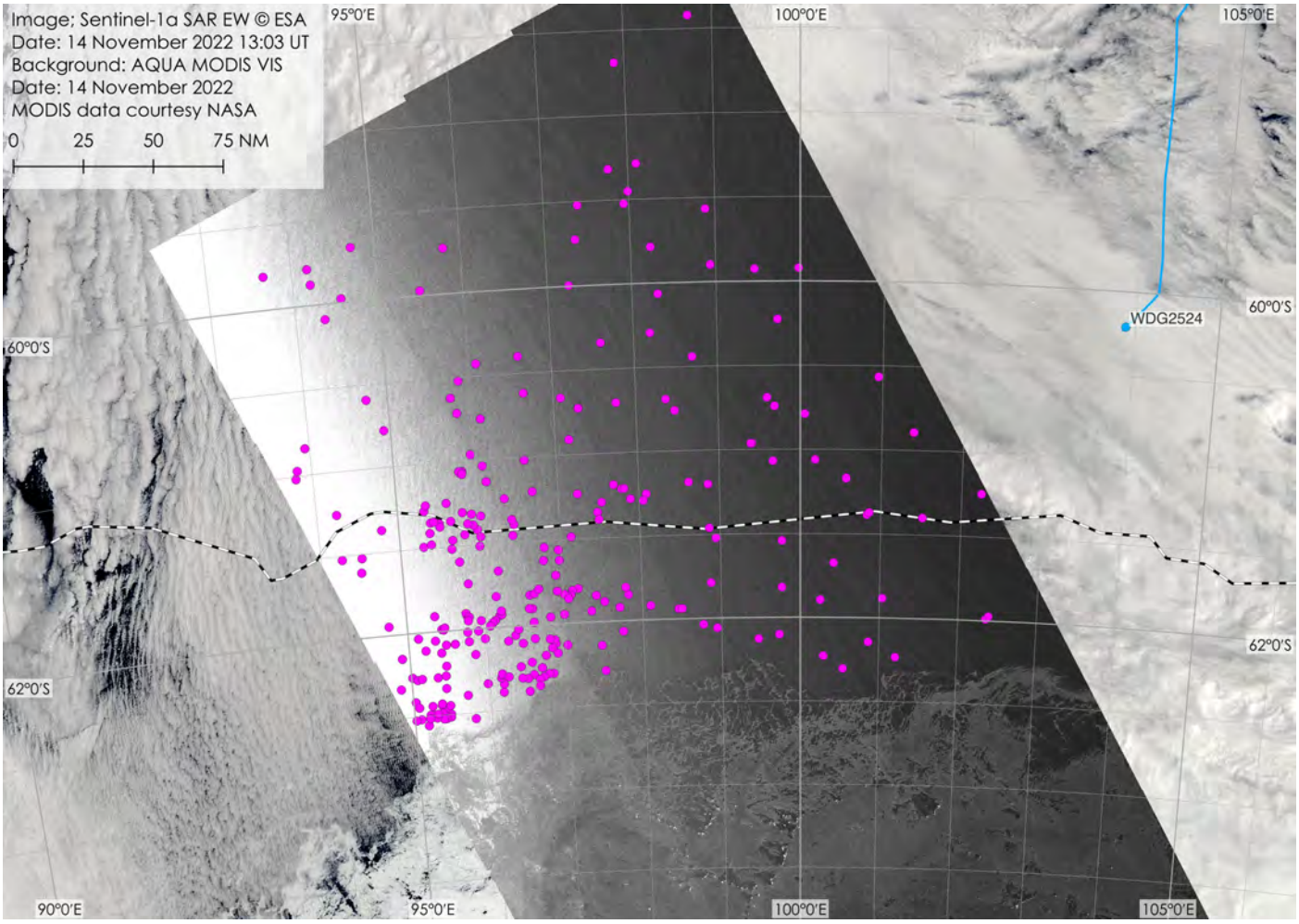


Figure 1: *AQUA MODIS VIS data acquired 14 November 2022 and provided by NASA;*
Overlay: Sentinel-1a SAR EW data acquired 14 November 2022 at 13:03 UT and provided by PolarView.

The SAR data have been analysed for iceberg presence north of the sea-ice edge and more than 250 features have been marked with pink dots. Strips and patches of sea ice are present as far north as 62º30'S.

Ice Bulletin: Davis Region Survey

Issued: Tuesday 15th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

The figures of this report show the areas around proposed penguin colony surveys in the vicinity of Davis Station.

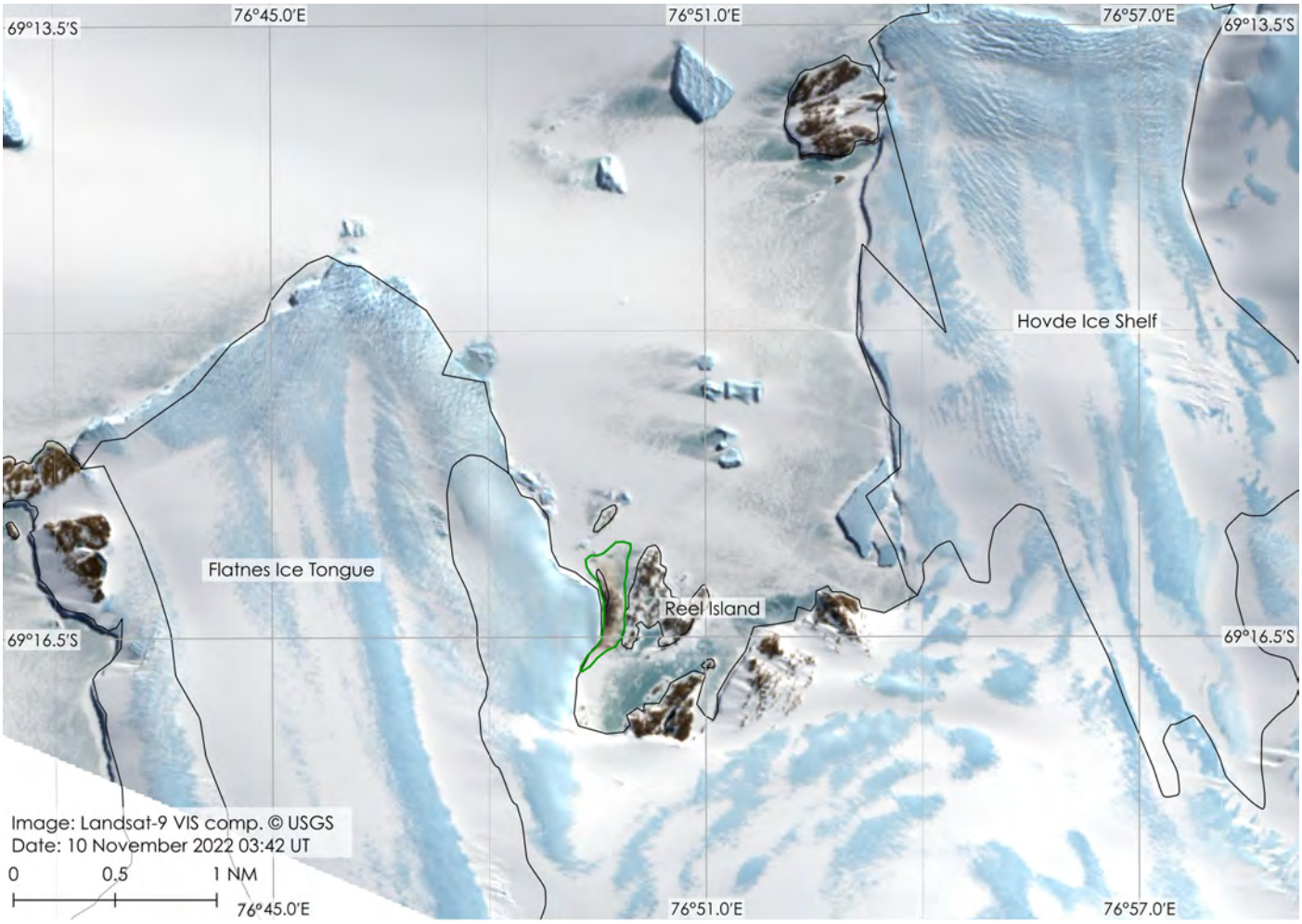


Figure 1: *Landsat-9 visible composite pan-sharpened data acquired 10 November 2022 at 03:42 UT and provided by USGS.*

Discoloured sea-ice surface (indicating recent penguin colony presence) has been outlined with green shapes.

In Karelin Bay (Figure 2 lower left panel), no stain has been found and the location typically occupied by the local colony shows open water.

The latest clear-sky image of the region north of the West Ice Shelf/iceberg D-15A is only from 19 October 2022, which shows the discolouration clearly at that time.

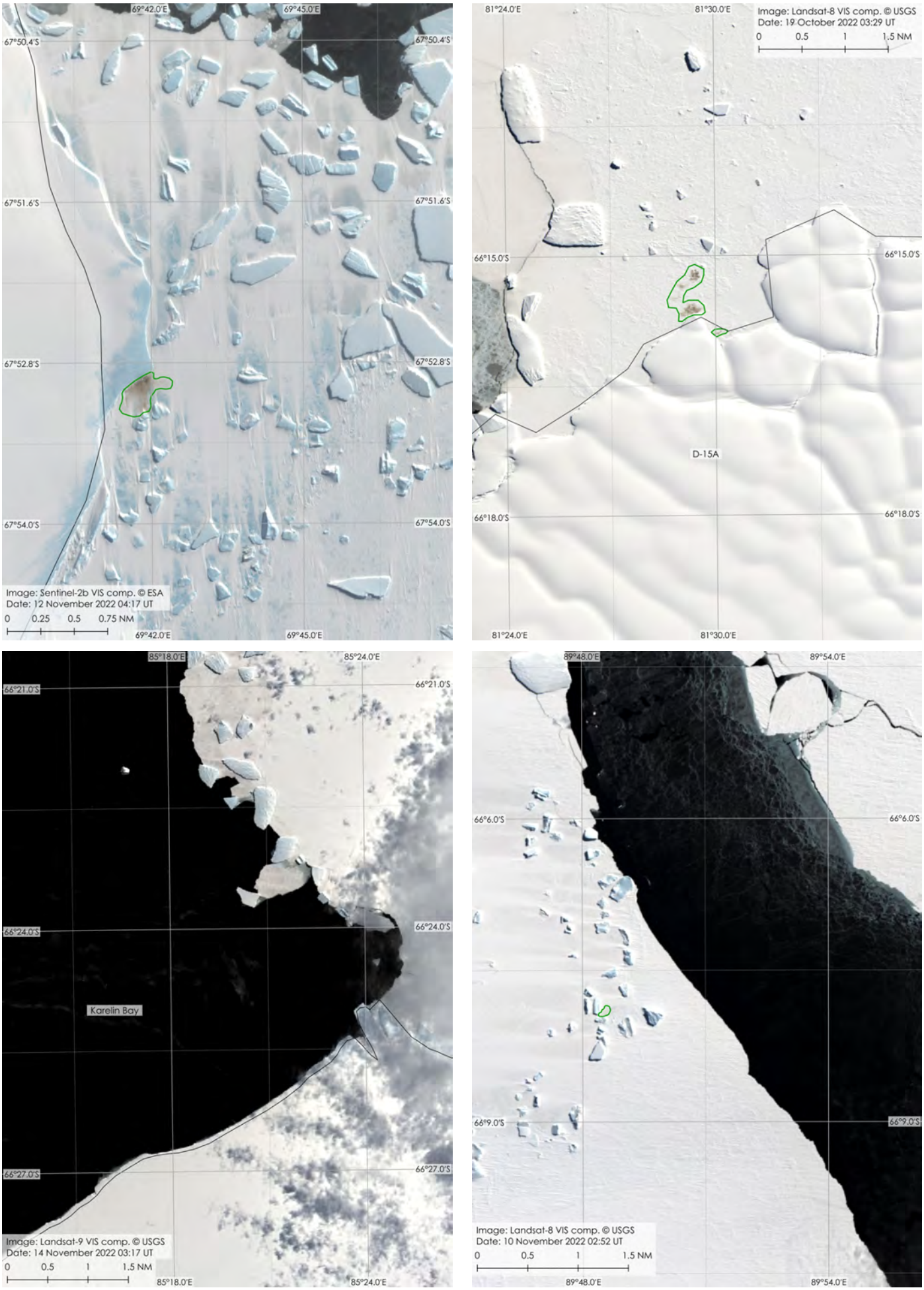


Figure 2: *Upper Left panel: Sentinel-2b visible composite data acquired 12 November 2022 at 04:17 UT and provided by ESA; Upper Right panel: Landsat-8 visible composite pan-sharpened data acquired 19 October 2022 at 03:29 UT and provided by USGS; Lower Left panel: Landsat-9 visible composite pan-sharpened data acquired 14 November 2022 at 03:17 UT and provided by USGS; Lower Right panel: Landsat-8 visible composite pan-sharpened data acquired 10 November 2022 at 02:52 UT and provided by USGS.*

Ice Bulletin: West Ice Shelf

Issued: Wednesday 16th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows a composite of sea-ice concentration and SAR data north of the West Ice Shelf east of Davis Station. The sea-ice edge based on passive microwave (sea-ice concentration) data is marked by a cyan line. The November median sea-ice extent is provided by the dashed black/white line.

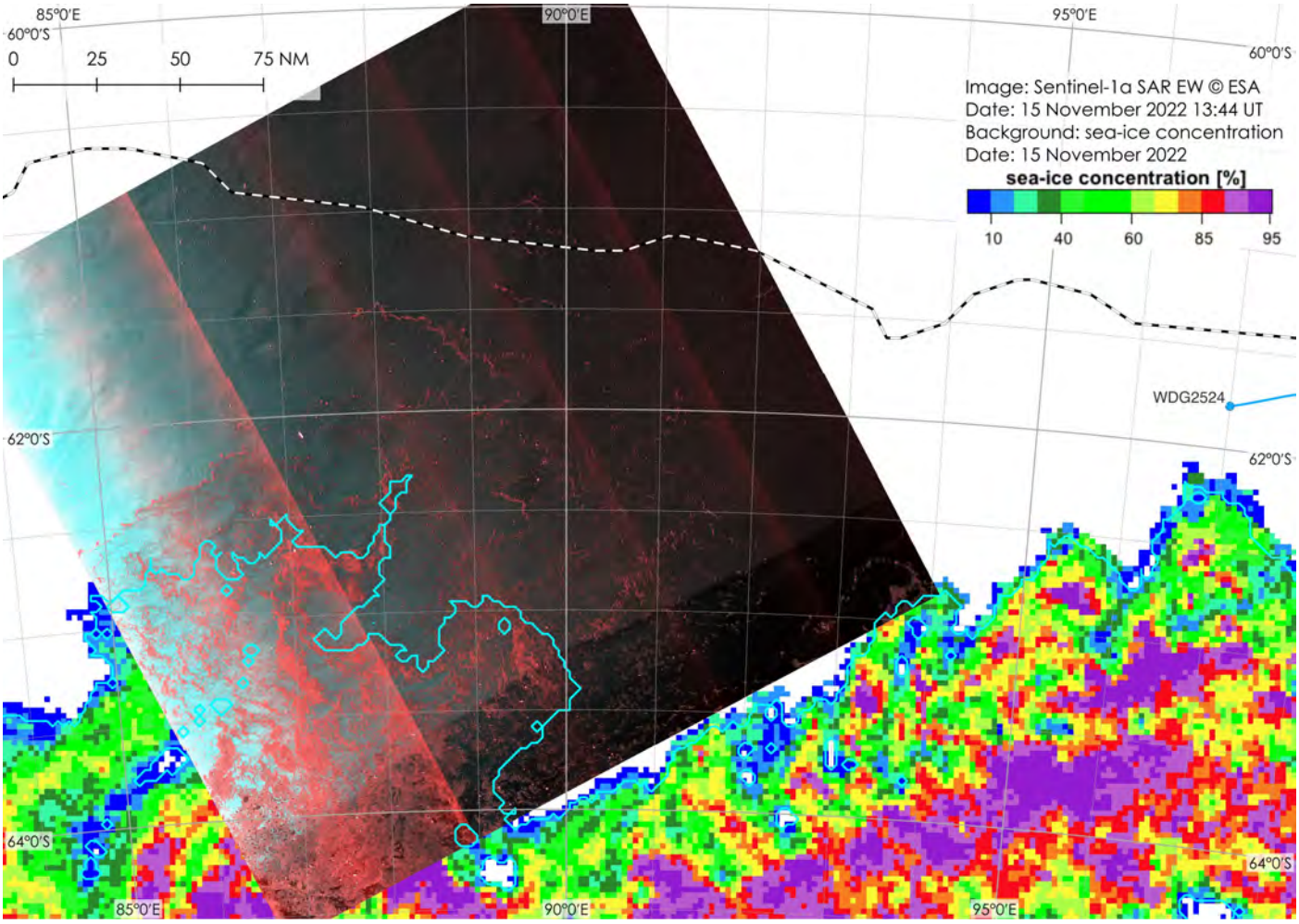


Figure 1: *Sea-ice concentration data acquired 15 November 2022 and provided by PolarView; Sentinel-1a SAR EW data acquired 15 November 2022 at 13:44 UT and provided by ESA.*

The SAR data has been processed into a pseudo-visible (RGB) data set through a combination of co-polarised amplitude and cross-polarised intensity data, which makes sea ice appear with a reddish tint and icebergs as almost white.

The SAR data show strips and patches of decaying sea ice, which is below the detection limit of the passive microwave instrument and processing algorithm. Strips and patches of sea ice reach as far north as 61º45'S around 90º0'E.

Ice Bulletin: Mill Island

Issued: Thursday 17th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) data off Mill Island west of Casey Station.

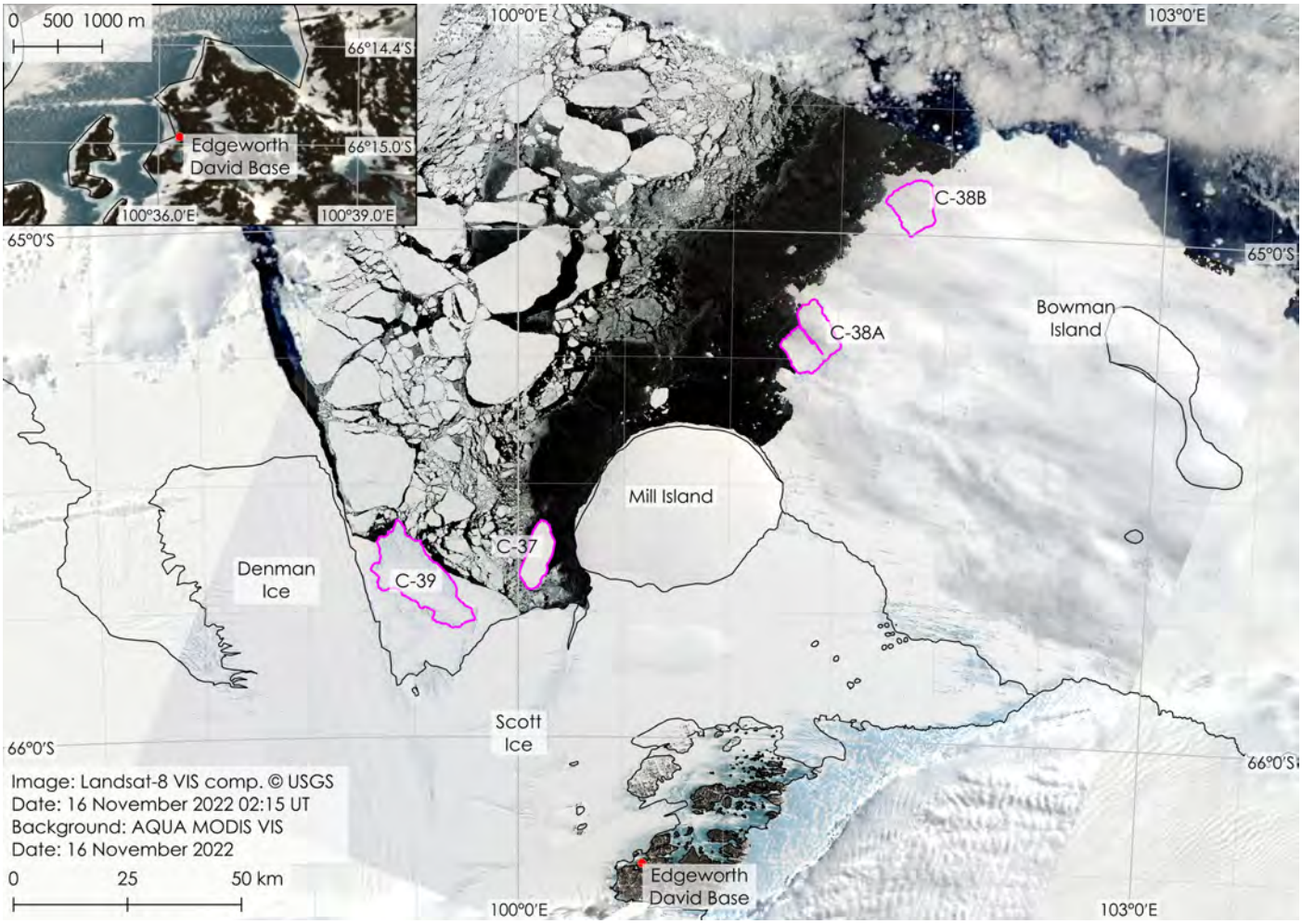


Figure 1: *Landsat-8 visible composite pansharpened data acquired 16 October 2022 at 02:15 UT and provided by USGS; Background: AQUA MODIS VIS data acquired 16 October 2022 and provided by NASA.*

Iceberg C-37 continues drifting west of Mill Island and is currently close to iceberg C-39, which is locked in by fast ice, as are icebergs C-38A and C-38B. Iceberg C-38A, however, has developed an almost cutting-through rift that will split it in half.

A small polynya is present north and west of the island and a bit further northeast.

Further north, the northern sea-ice edge (not shown in the figure) is up to 65 nautical miles below (south of) the median sea-ice extent for November.

Ice Bulletin: Davis Station

Issued: Thursday 17th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data off Davis Station.

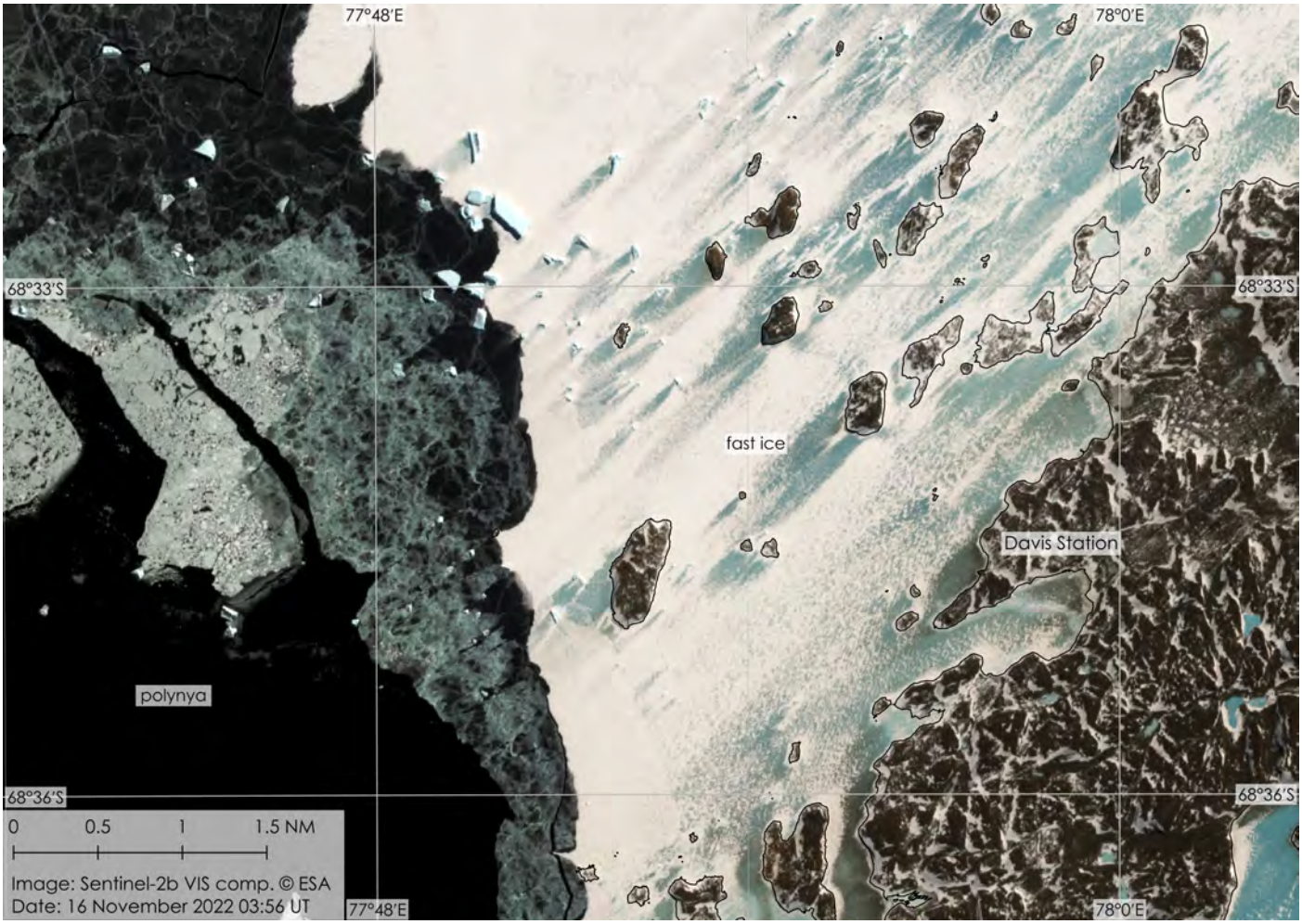


Figure 1: *Sentinel-2b visible composite data acquired 16 November 2022 at 03:56 UT and provided by ESA.*

The fast-ice edge remains currently stable at roughly 3 nautical miles offshore. Some new ice has formed in the polynya off the fast ice.

Figure 2 shows a larger scale overview of the region north of Davis Station. Fast-ice areas have been outlined by a red line.

North of the station, two patches of fast ice are not connected to any land features but have formed locally between grounded icebergs.

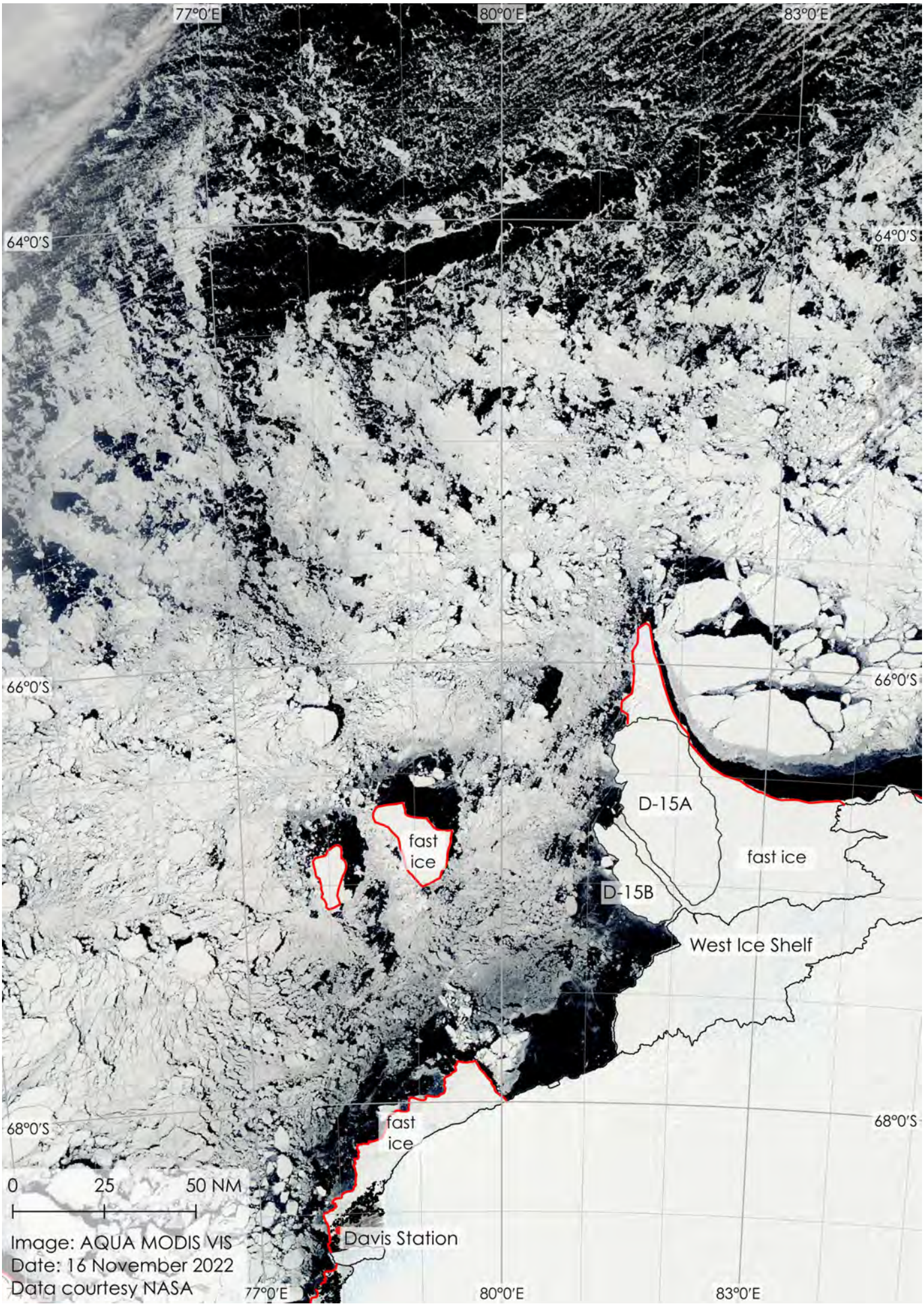


Figure 2: *AQUA MODIS VIS data acquired 16 November 2022 and provided by NASA.*

Ice Bulletin: Wilkins Aerodrome

Issued: Thursday 17th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of Wilkins Aerodrome. The scene is partly obscured by clouds.

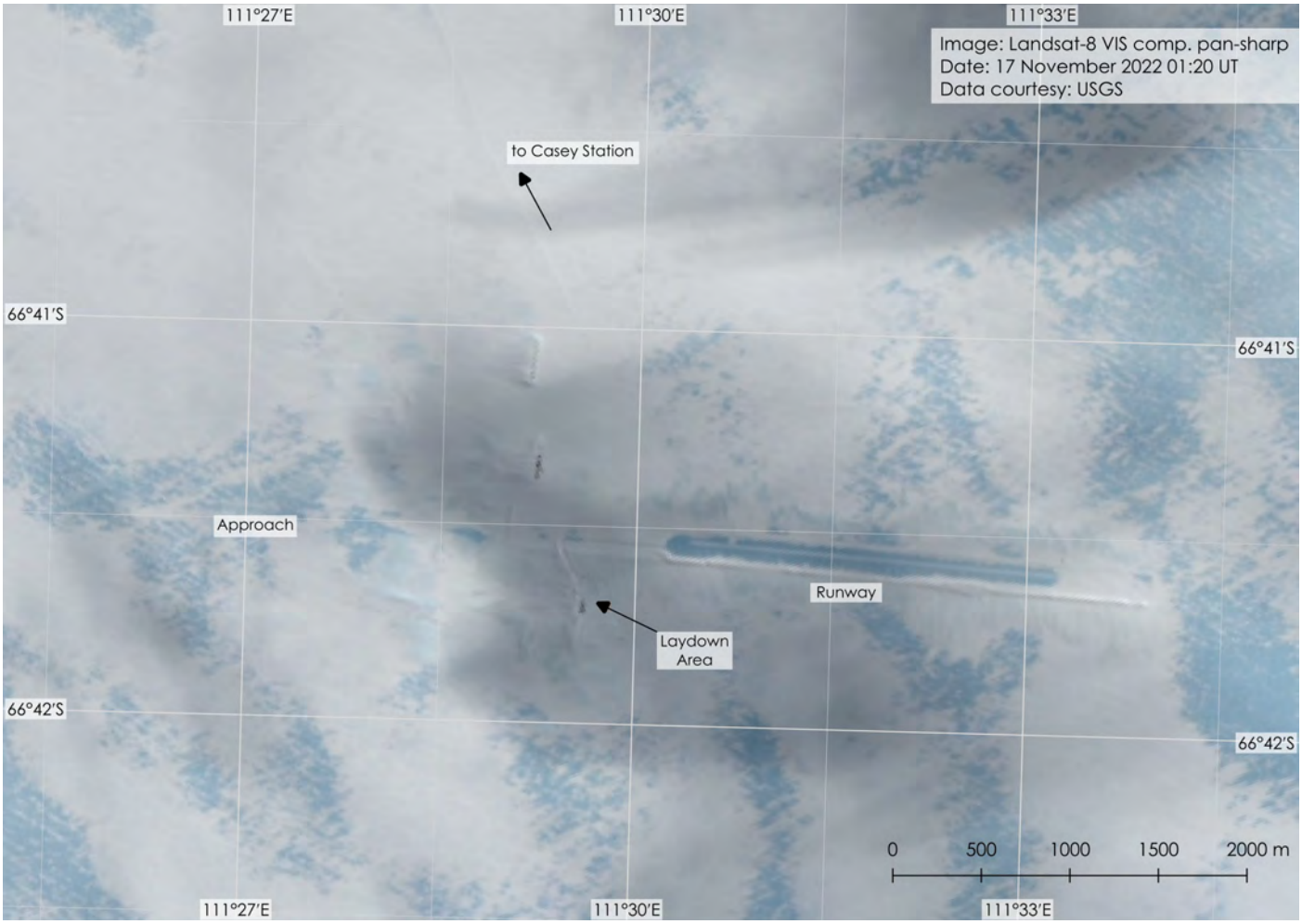


Figure 1: *Landsat-8 visible composite pansharpened data acquired 17 November 2022 at 01:20 UT and provided by USGS.*

The ice runway is partly covered by fresh snow. North and south of the runway, snow dunes are left from previous clearing the runway.

Snow dunes have also accumulated in the lee of the camp and other structures.

Ice Bulletin: Mawson Station

Issued: Friday 18th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data off Mawson Station and to the east towards the Auster penguin colony.

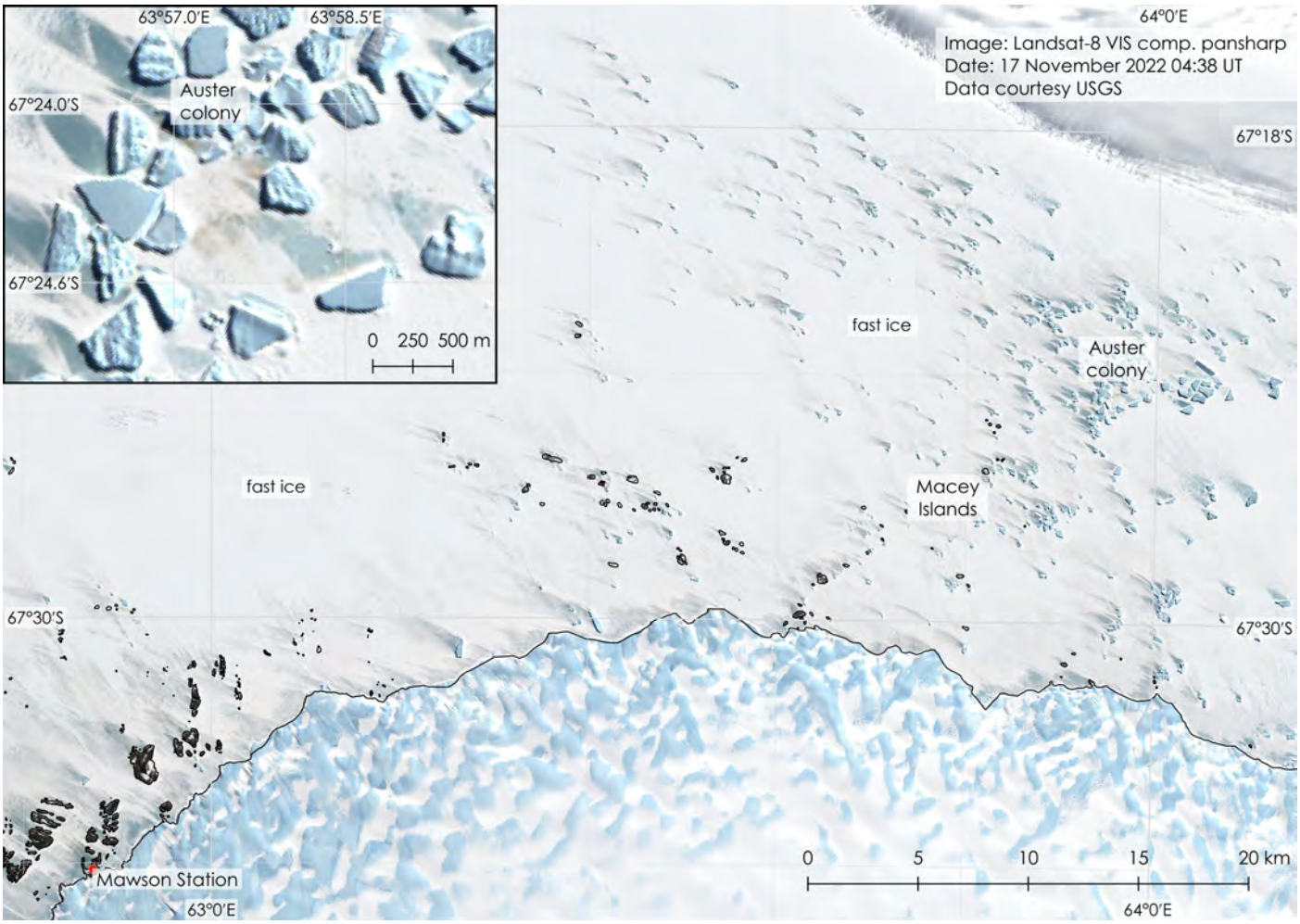


Figure 1: *Landsat-8 visible composite pansharpened data acquired 17 November 2022 at 04:38 UT and provided by USGS;*

The penguin colony is moving around within the grounded icebergs at Auster.

Figure 2 shows a larger scale overview north of Mawson Station.

Off station, fast ice extends east and west along the coast. Isolated icebergs are trapped within the fast ice near shore. The northern fast-ice edge has its typical shape for the time of year. Northwest of the station, the nearest open water of the polynya started to move south and is currently roughly 33 nautical miles away.

Further north of the station, the northern sea-ice edge (not shown in the figure) is up to 60 nautical miles below (south of) the median sea-ice extent for November.

Figure 2: *Landsat-8 visible composite pansharpened data acquired 17 November 2022 at 04:38 UT and provided by USGS.*

Ice Bulletin: Davis Station

Issued: Friday 18th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data off Davis Station.

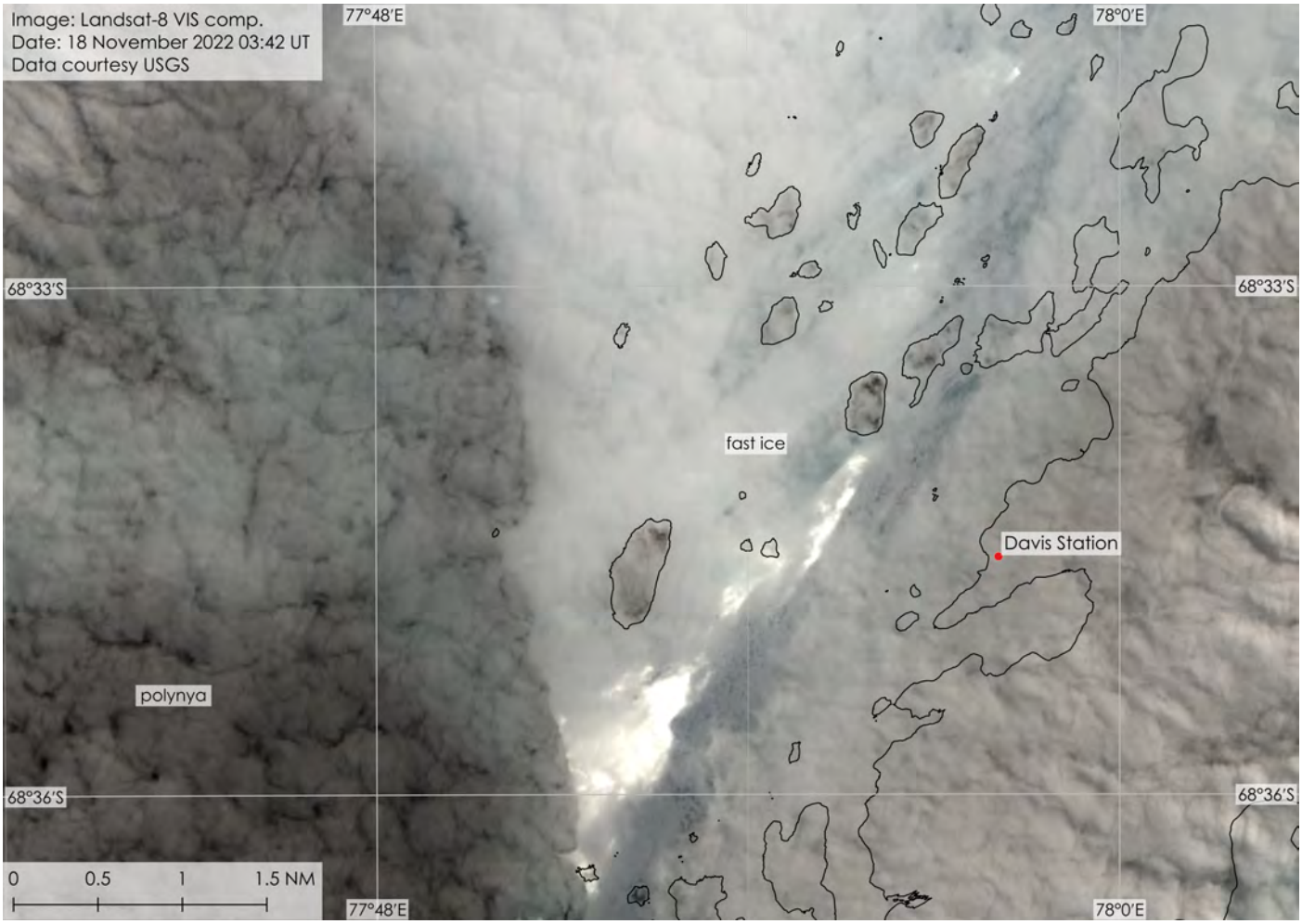


Figure 1: *Landsat-8 visible composite pansharpened data acquired 18 November 2022 at 03:42 UT and provided by USGS.*

Although the scene is obscured by thin clouds it can be determined that the fast-ice edge has remained stable since 16 November 2022 and is roughly 3 nautical miles offshore.

Figure 2 shows a larger scale overview of the region north of Davis Station.

Fast-ice areas as identified on 17 November 2022 have been marked by a dashed red line.

North of the station, two patches of fast ice are not connected to any land features but have formed locally between grounded icebergs.

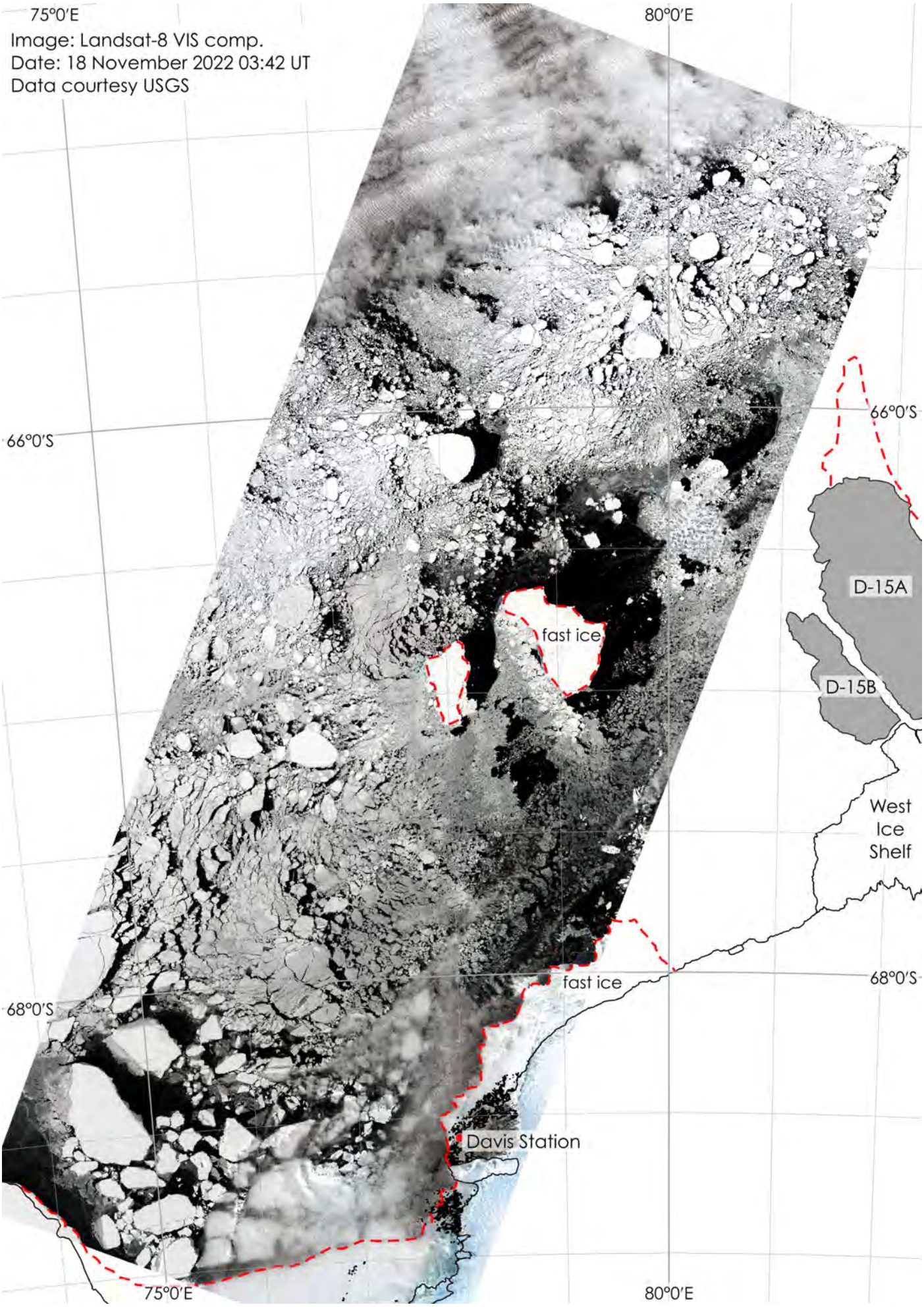


Figure 2: *Landsat-8 visible composite data acquired 18 November 2022 at 03:42 UT and provided by USGS.*

Ice Bulletin: Mawson Station

Issued: Saturday 19th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data of Mawson Station.

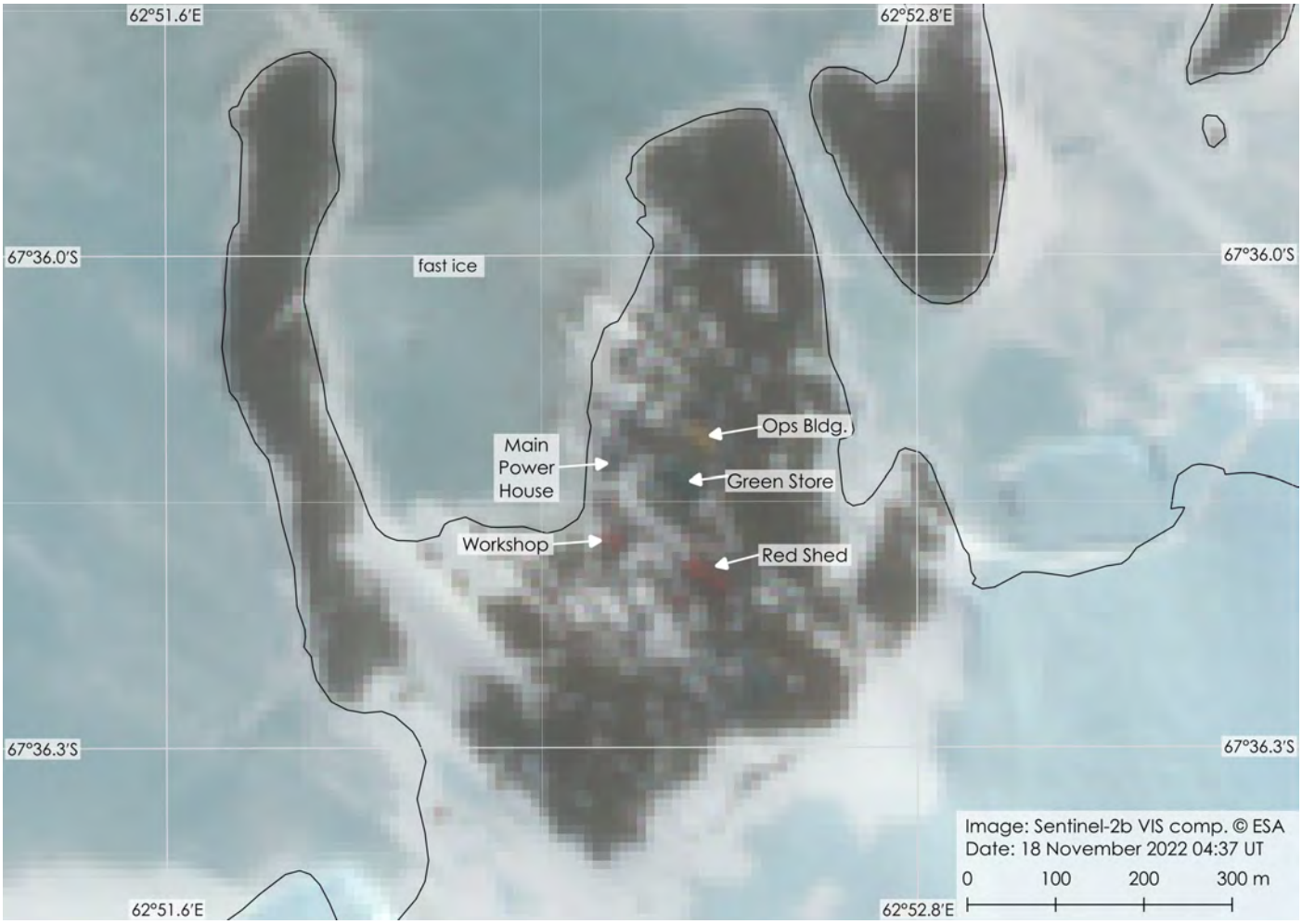


Figure 1: *Sentinel-2b visible composite data acquired 18 November 2022 at 04:37 UT and provided by ESA.*

Figure 2 shows a larger scale overview north and east of Mawson Station towards the Auster penguin colony. The upper panel shows high-resolution (15 m horizontal) visible data and the lower panel the same data as Figure 1.

Off station, fast ice extends east and west along the coast. Isolated icebergs are trapped within the fast ice near shore.

Further north of the station, the northern sea-ice edge (not shown in the figure) is retreating rapidly and currently up to 90 nautical miles below (south of) the median sea-ice extent for November.

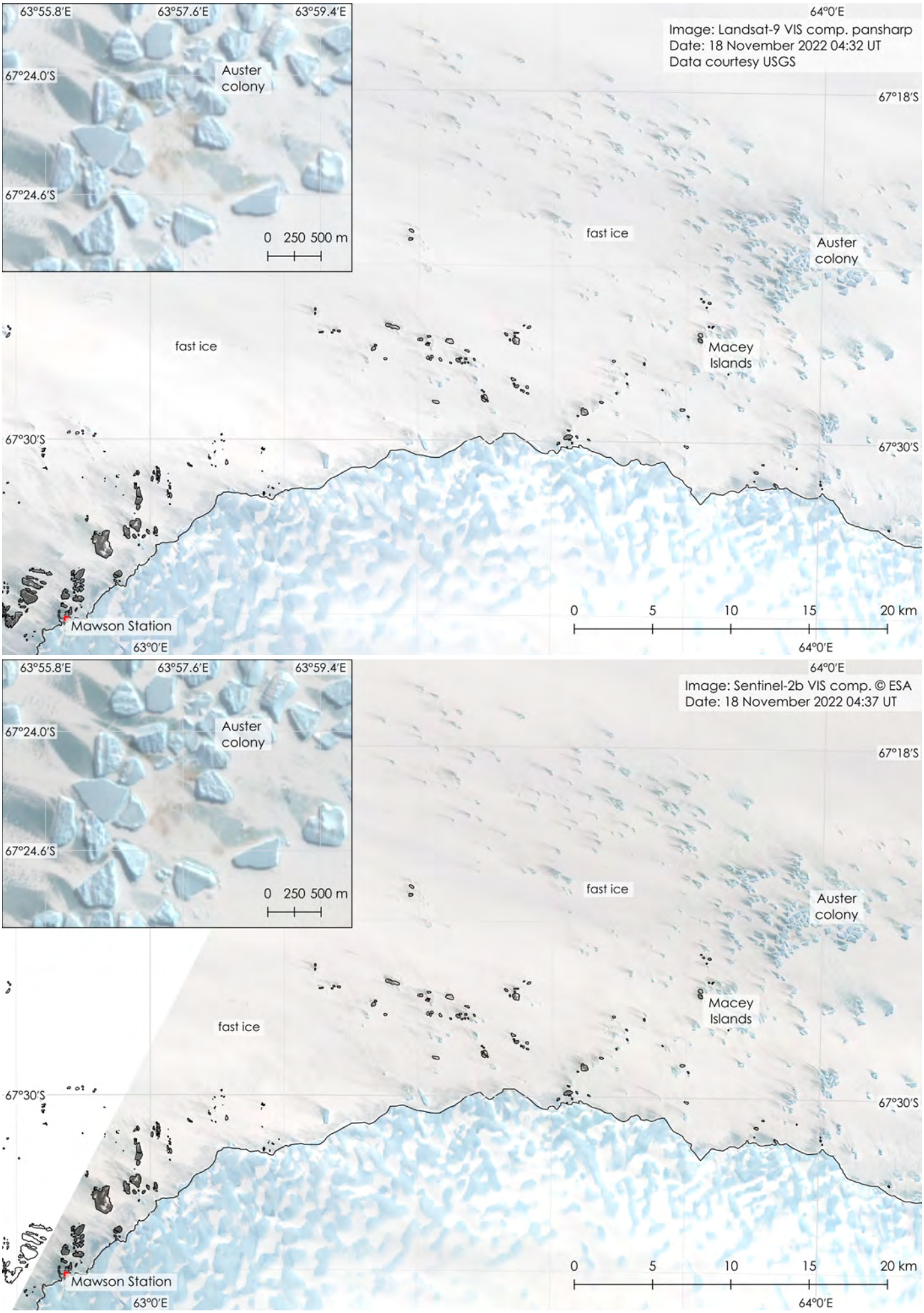


Figure 2: *Upper panel: Landsat-9 visible composite pansharpened data acquired 18 November 2022 at 04:32 UT and provided by USGS; Lower panel: Sentinel-2b visible composite data acquired 18 November 2022 at 04:37 UT and provided by ESA.*

Ice Bulletin: Davis Station

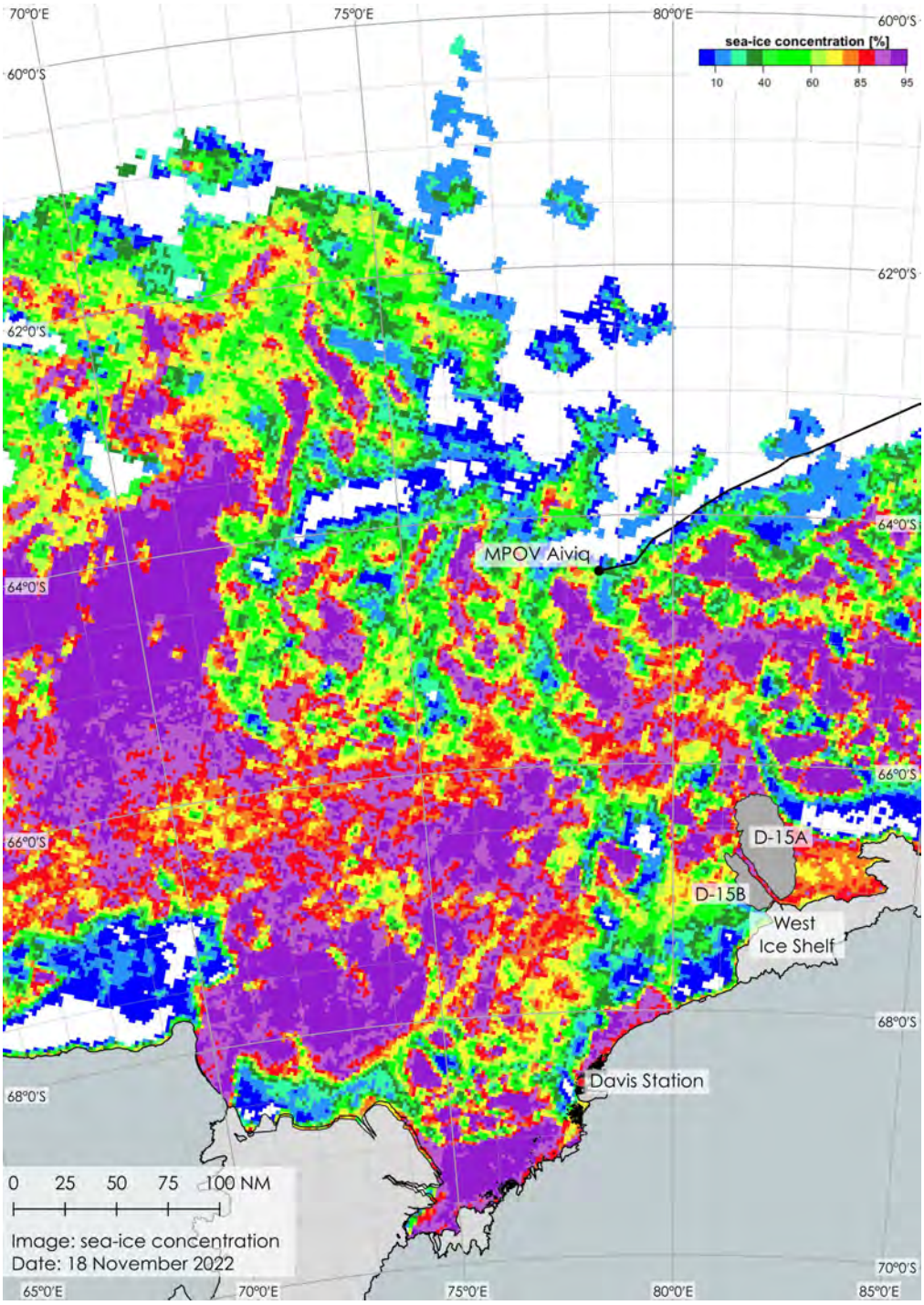
Issued: Saturday 19th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (3.125 km horizontal) sea-ice concentration data off Davis Station. The cruise track of MPOV *Aiviq* has been included as a black line (up until 19 November 2022 05:30 UT).



The general drift direction of the pack ice appears to be northeast during the past 24 hours.

North of the station, two patches of fast ice are not connected to any land features but have formed locally between grounded icebergs. Their respective centre coordinates are roughly 78º0'E and 66º56'S and 78º2'E and 66º47'S.

Figure 1: *AMSR-2 sea-ice concentration data acquired 18 November 2022 at 03:42 UT and provided by ICDC.*

Ice Bulletin: Davis Station

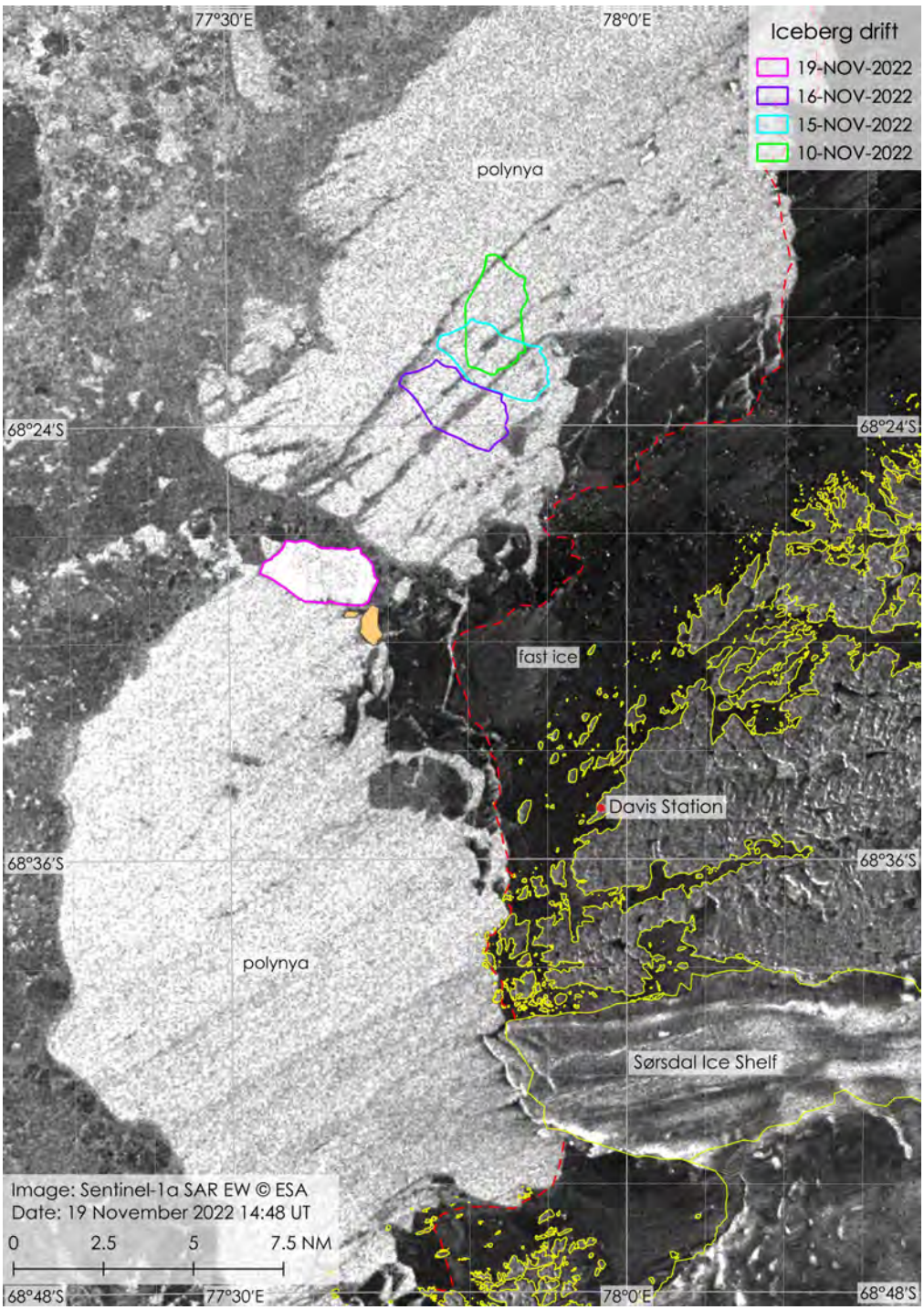
Issued: Sunday 20th November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Davis Station. The drift of a large (unnamed) iceberg is indicated by colour-coded shapes. The fast-ice edge on 17 November 2022 has been included as a dashed red line.



Since mid-November, the iceberg has drifted south again after a brief northward excursion. This iceberg had been grounded north of two smaller grounded icebergs (marked with orange shapes) but re-floated northward in early-November and appears to have a more westerly course now and may be clearing the local seafloor topography this time.

Figure 1: *Sentinel-1a SAR EW data acquired 19 November 2022 at 14:48 UT and provided by PolarView.*

Ice Bulletin: Davis Station

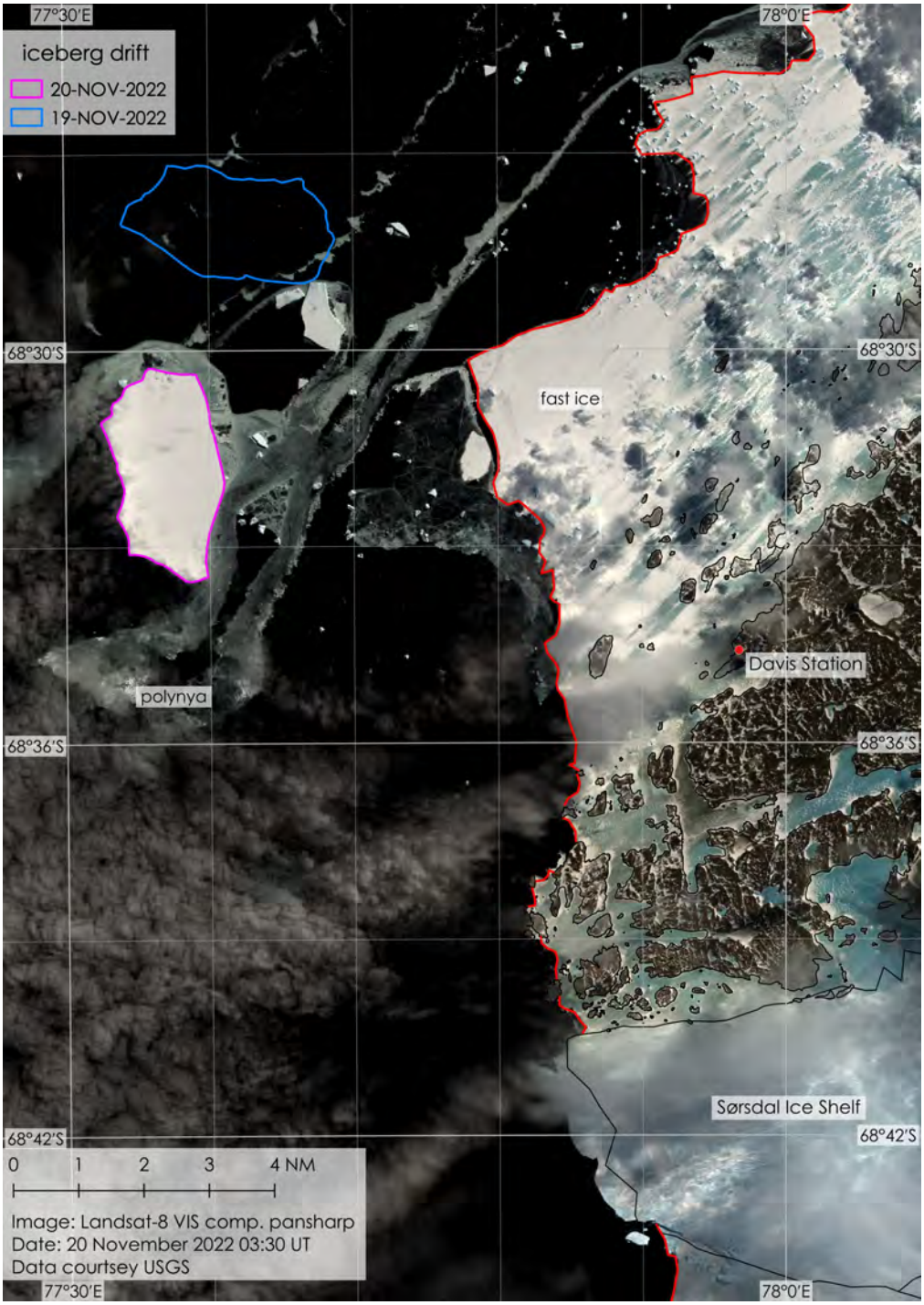
Issued: Monday 21st November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data off Davis Station. The drift of a large (unnamed) iceberg is indicated by colour-coded shapes. The fast-ice edge has been included as a red line.



The large iceberg appears to have cleared the local seafloor topography now as it drifted west of two grounded icebergs off Davis Station that have been grounded since autumn 2022.

The fast-ice edge appears generally stable but small pieces of fast ice are breaking off the edge and floating in the polynya westward.

Figure 1: *Landsat-8 visible composite pan-sharpened data acquired 20 November 2022 at 03:30 UT and provided by USGS.*

Ice Bulletin: Wilkins Aerodrome

Issued: Monday 21st November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data of Wilkins Aerodrome.

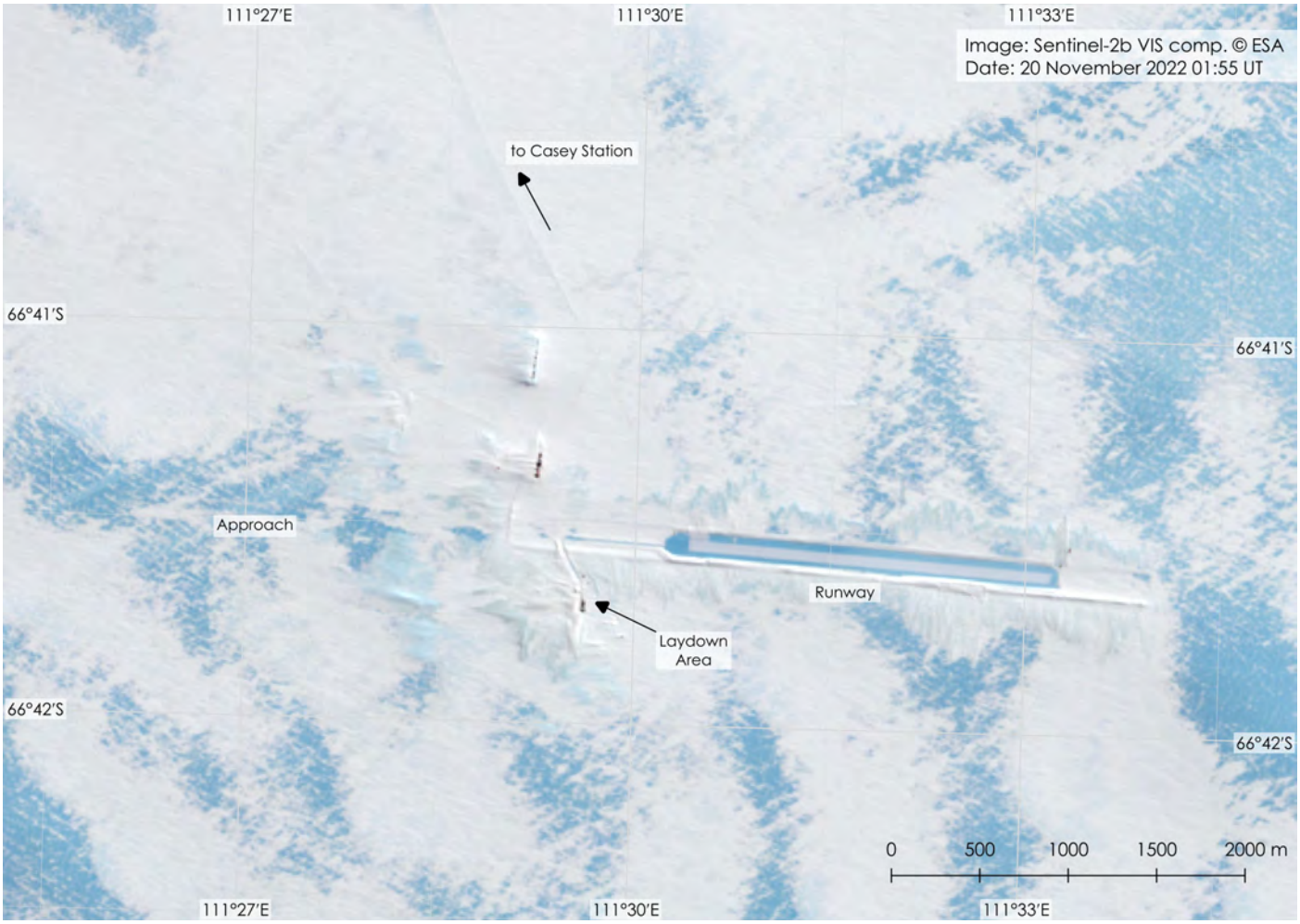


Figure 1: *Sentinel-2b visible composite data acquired 20 November 2022 at 01:55 UT and provided by ESA.*

The ice runway is partly covered by fresh snow. North and south of the runway, snow dunes are left from previous clearing the runway.

Snow dunes have also accumulated in the lee of the camp and other structures.

Ice Bulletin: Casey Station

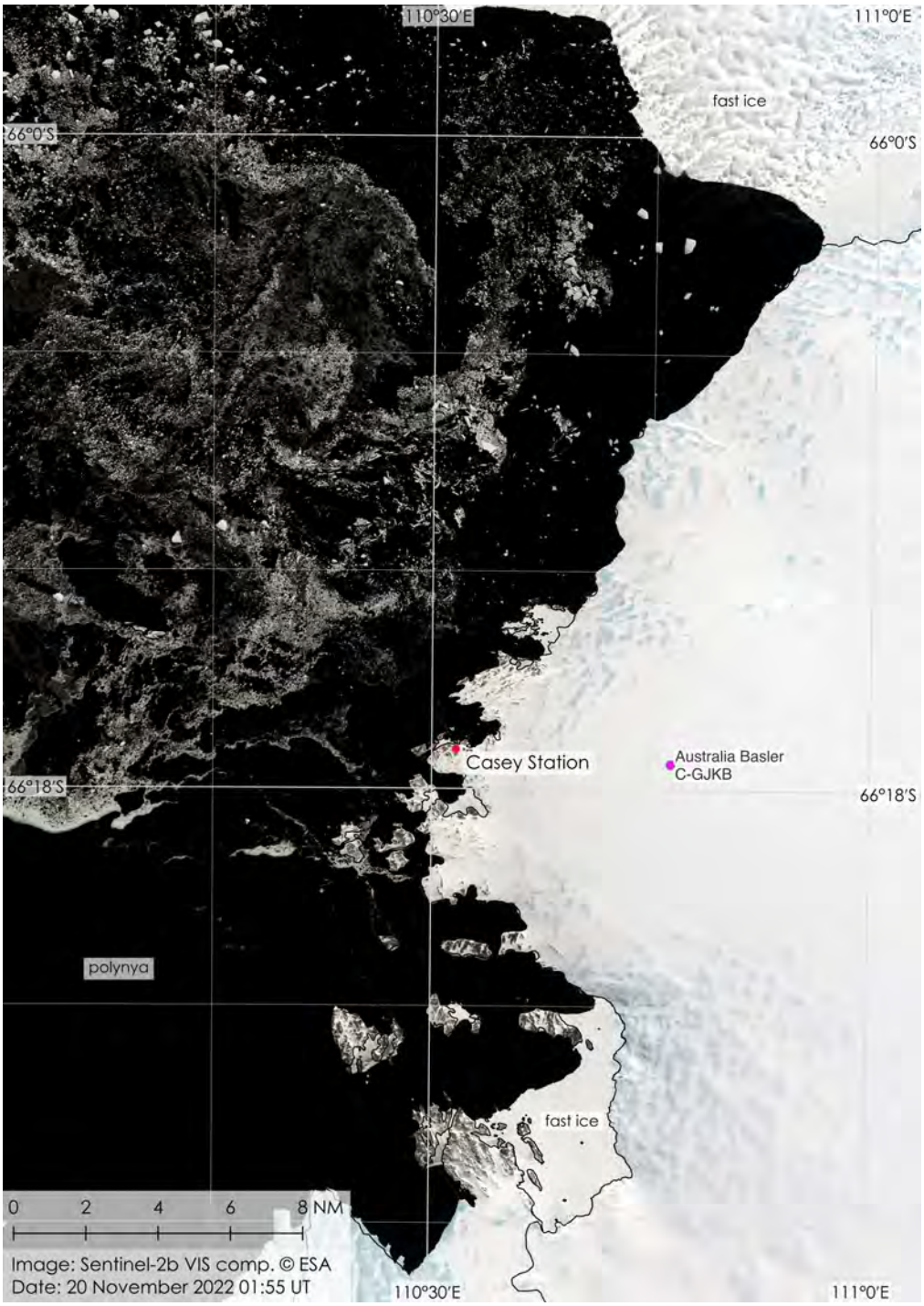
Issued: Monday 21st November 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

The figures of this bulletin show high-resolution (10 m horizontal) visible data of the Casey Station region.



North and south of the station, fast ice continues to break up and pieces of ex-fast ice are floating in the polynya westward.

Figure 2 shows larger details around the station vicinity (upper panel) and the Casey Skiway (YCSK) (lower panel).

Figure 1: *Sentinel-2b visible composite data acquired 20 November 2022 at 01:55 UT and provided by ESA.*

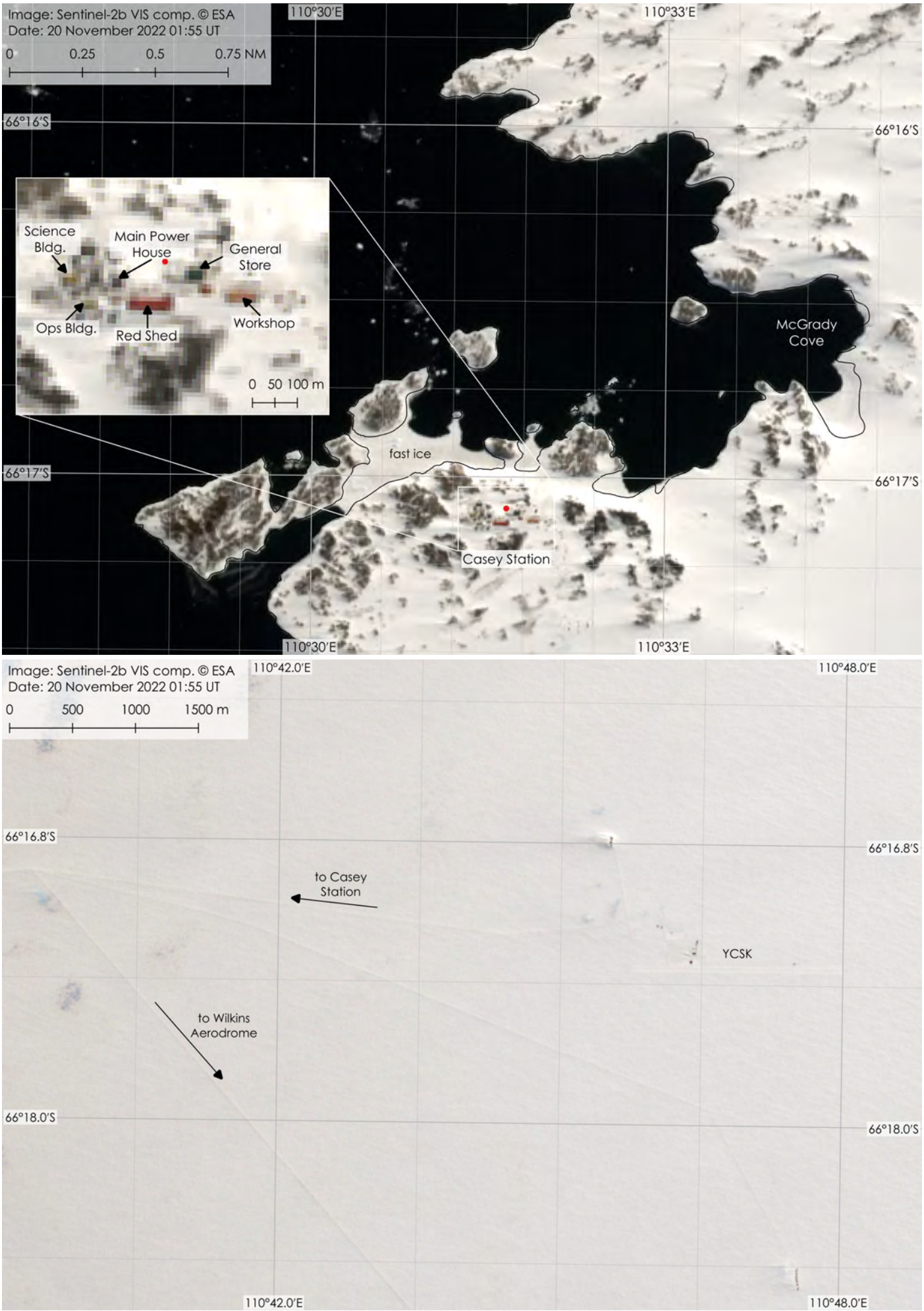


Figure 2: *Sentinel-2b visible composite data acquired 20 November 2022 at 01:55 UT and provided by ESA*

Ice Bulletin: Davis Station

Issued: Wednesday 23rd November 2022

Analyst: Damien Everett

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Davis Station. The fast-ice edge is marked by the solid red line, with new fast-ice marked with a dashed red line.

Off Davis station, the fast-ice edge remains stable at roughly 2.5 to 3 nautical miles offshore. Over the last week, new ice has consolidated along the existing fast-ice edge northwest of Davis Station.

The large unnamed iceberg that recently cleared the seabed near the smaller grounded iceberg to the north, has continued to drift southwards, passing to the west of Davis Station.

Off the Vestfold Hills, most icebergs remain frozen in while off the fast-ice edge, some icebergs have shifted during dynamic periods.

Closer to Davis Station, the Aiviq's track through the fast ice can be clearly seen, with the ship appearing as a bright feature in position south of Anchorage Island.

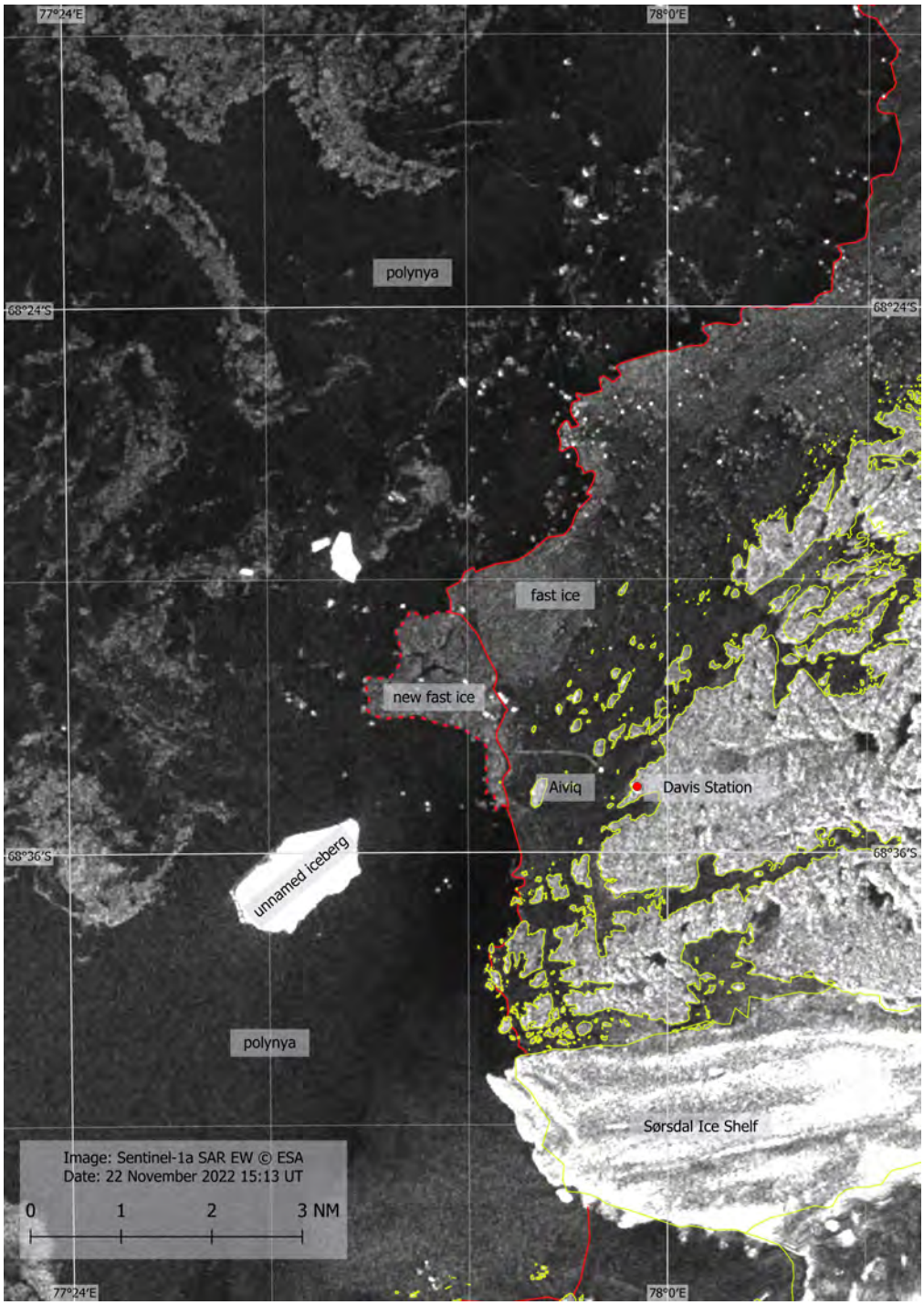


***Figure 1**: Sentinel-1a SAR EW data acquired 22 November 2022 at 15:13 UT and provided by Polar View.*

Ice Bulletin: Davis Station

Issued: Wednesday 30th November 2022

Analyst: Damien Everett

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Davis Station. The fast-ice edge is marked by the solid red line.

Off Davis station, the fast-ice edge remains relatively stable at roughly 2.5 to 3 nautical miles offshore. Over the last week, the new ice which consolidated northwest of Davis Station has fractured and refrozen near the fast-ice edge.

The large unnamed iceberg that recently drifted southwards appears to have grounded west of Davis Station.

Off the Vestfold Hills, most icebergs remain frozen in while off the fast-ice edge, some icebergs have shifted during dynamic periods.

Closer to Davis Station, the Aiviq's track of departure through the fast ice can be clearly seen.

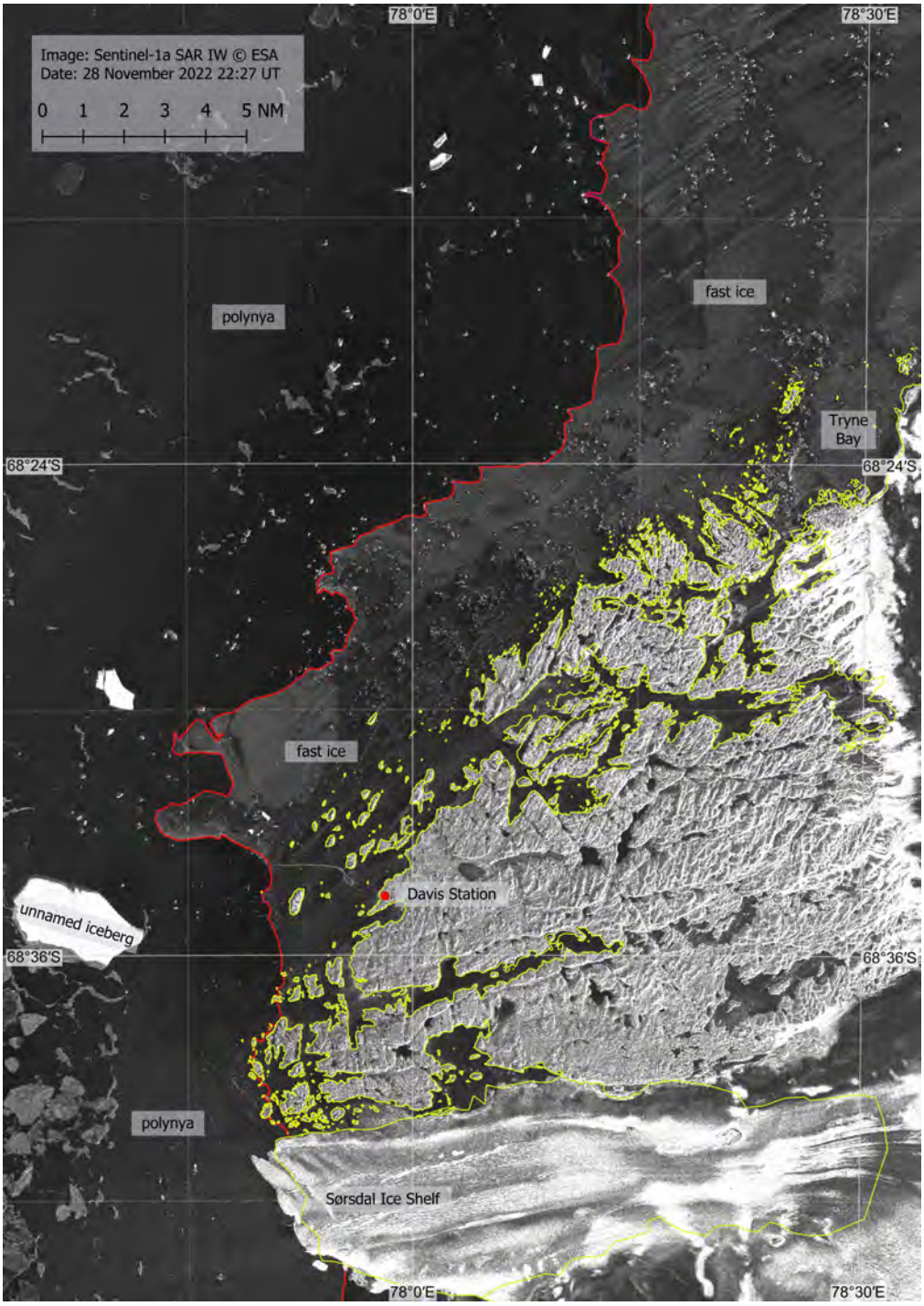


***Figure 1**: Sentinel-1a SAR IW data acquired 30 November 2022 at 22:27 UT and provided by Polar View.*

Ice Bulletin: New A-80 Icebergs

Issued: Friday 9th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data of the Larsen-D ice shelf in the south-western Weddell Sea.

On 28 November 2022, a 1200 km^2 section of the Larsen-D ice shelf calved (indicated by the pink shaded shape; almost the size of Flinders Island, Tasmania).

The entire mass broke into many icebergs during the calving and initially three large tabular icebergs were identified as A-80A, A-80B and A-80C (marked by yellow shapes).

The latest data set shows that iceberg A-80B has already lost roughly 17 km^2 and iceberg A-80C has crumbled to below tracked size (only approximated by the dashed pink shape). Iceberg A-80A is currently stable at roughly 450 km^2.

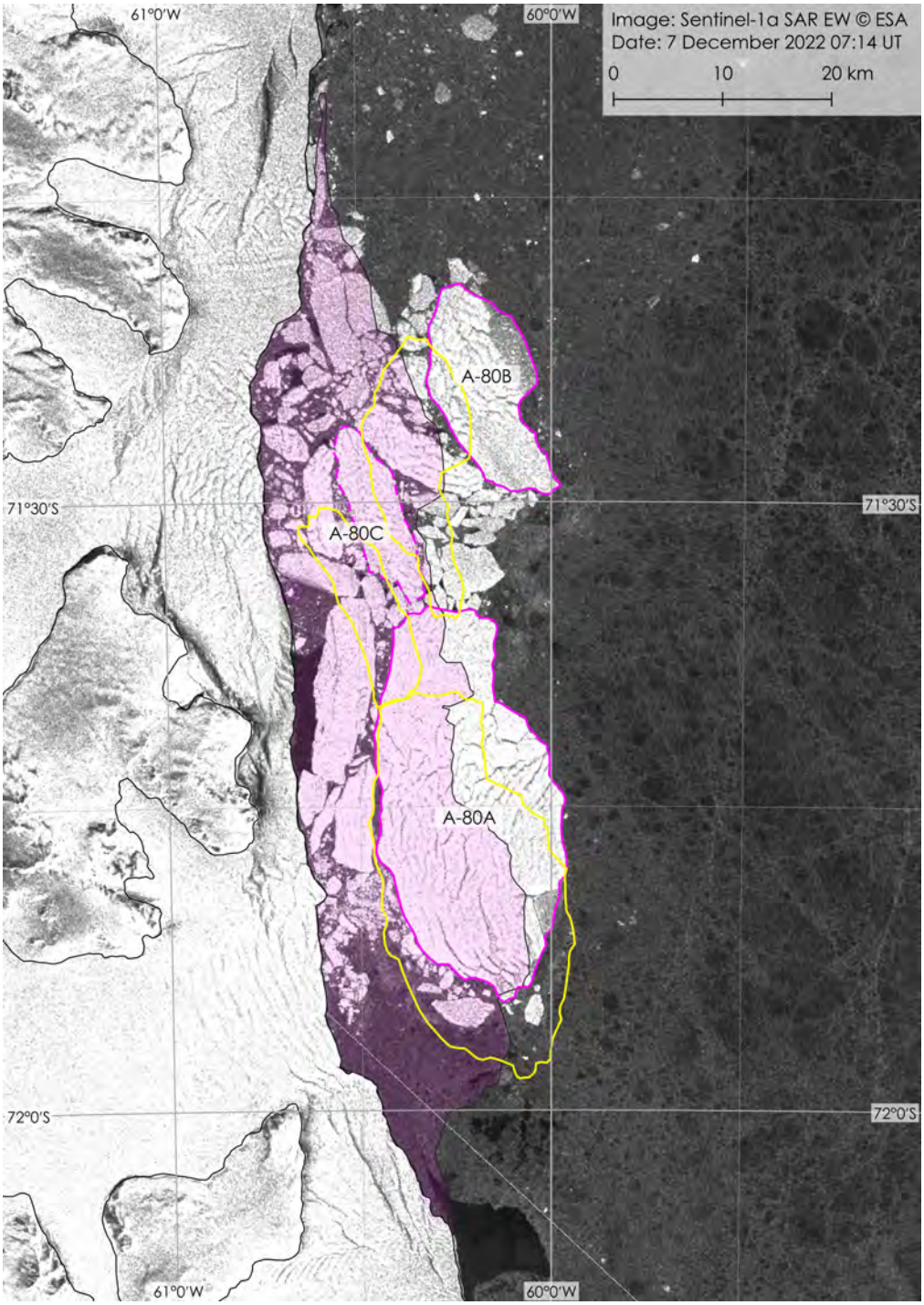


Figure 1: *Sentinel-1a SAR EW data acquired 7 December 2022 at 07:14 UT and provided by PolarView.*

Ice Bulletin: Mill Island

Issued: Friday 9th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Mill Island west of Casey Station.

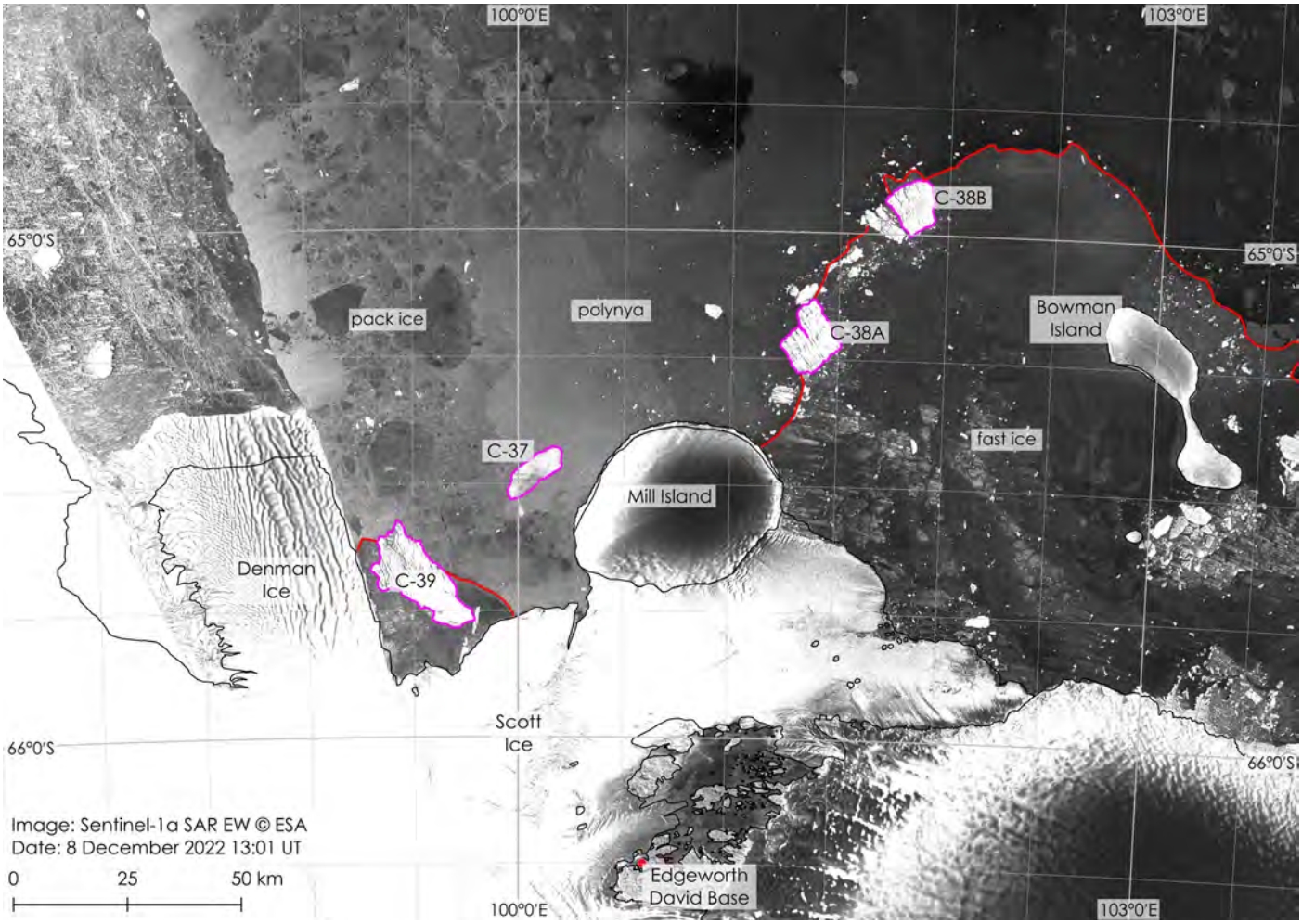


Figure 1: *Sentinel-1a SAR EW data acquired 8 December 2022 at 13:01 UT and provided by PolarView.*

Iceberg C-37 continues drifting freely west of Mill Island close to iceberg C-39, which is locked in by fast ice, as are icebergs C-38A and C-38B.

A polynya is present north and west of the island and a bit further northeast.

Further north, the northern sea-ice edge (not shown in the figure) is close to the median sea-ice extent for December.

Ice Bulletin: Davis Station

Issued: Friday 9th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Davis Station.

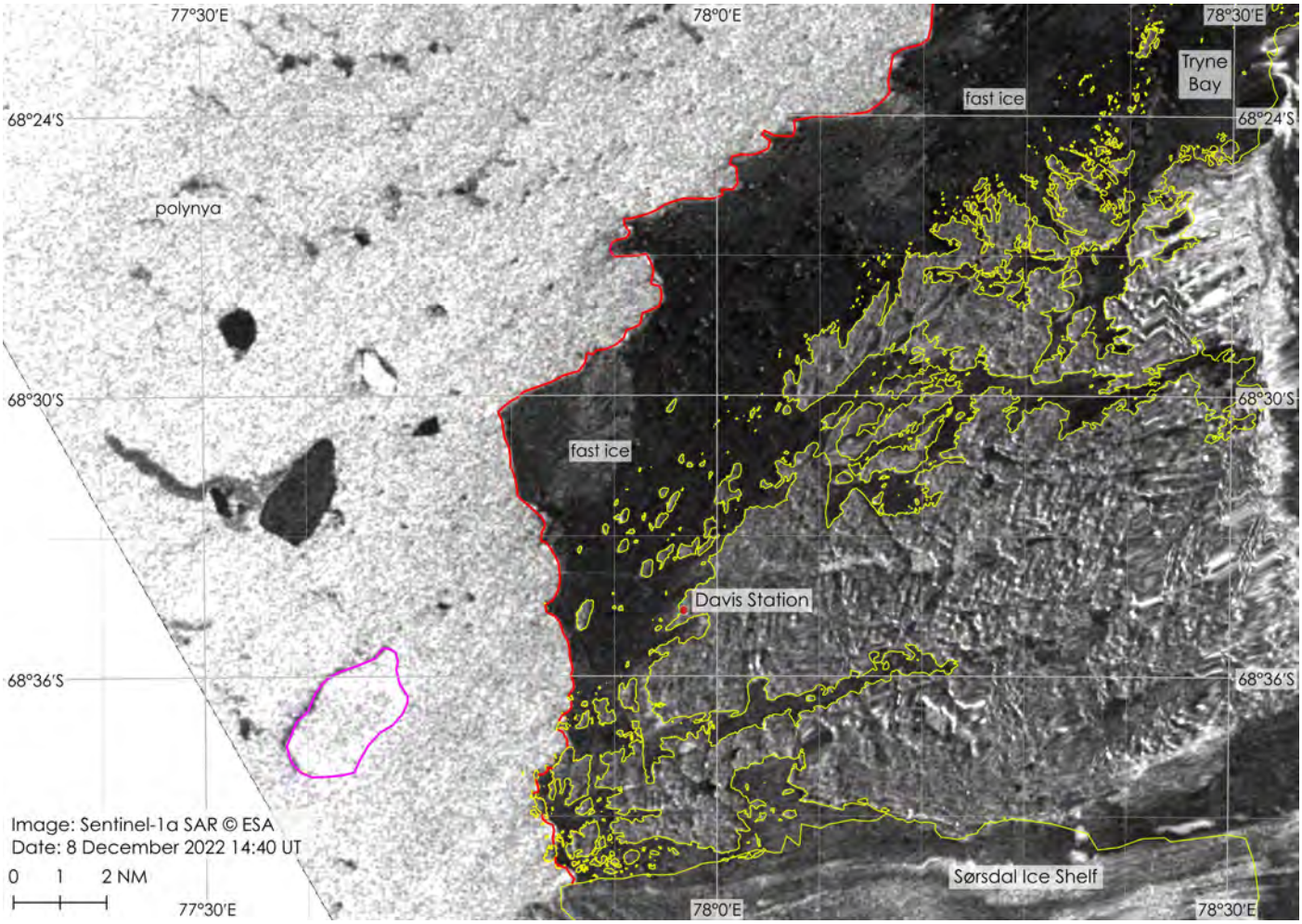


Figure 1: *Sentinel-1a SAR EW data acquired 8 December 2022 at 14:40 UT and provided by PolarView.*

The fast-ice edge has remained largely stable since 20 November 2022 and is roughly 3 nautical miles offshore.

A large iceberg is still west of the station (marked by a pink outline).

North of the station, the sea-ice edge (not shown in the figure) is close to the December median sea-ice extent.

Ice Bulletin: Casey Station

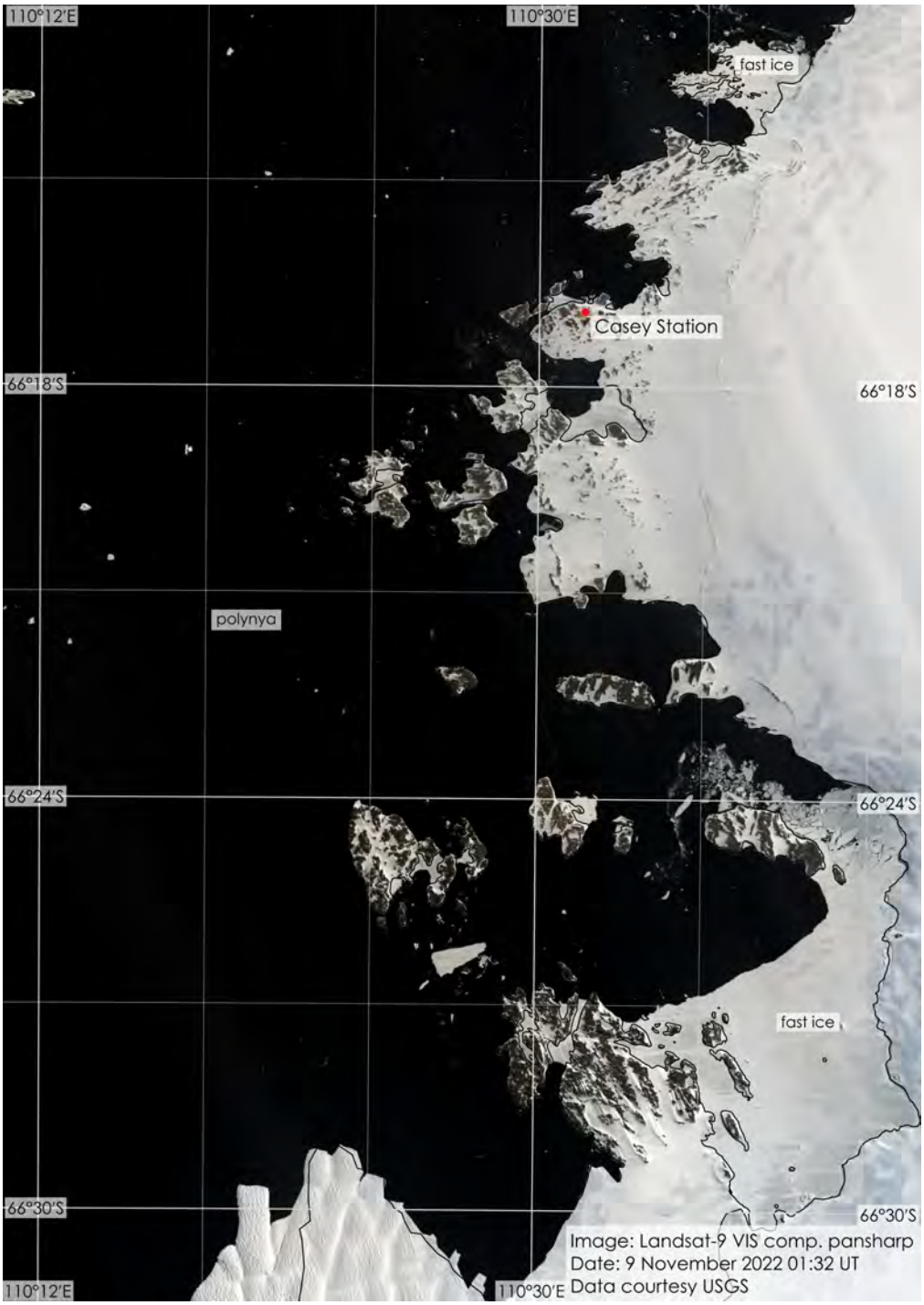
Issued: Friday 9th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of the Casey Station region.



North and south of the station, fast ice continues to break up and pieces of ex-fast ice and isolated icebergs are floating in the polynya.

Figure 1: *Landsat-9 visible composite pansharpened data acquired 9 December 2022 at 01:32 UT and provided by USGS.*

Ice Bulletin: Wilkins Aerodrome

Issued: Friday 9th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of Wilkins Aerodrome. Some cloud shadows are visible in the lower left corner.

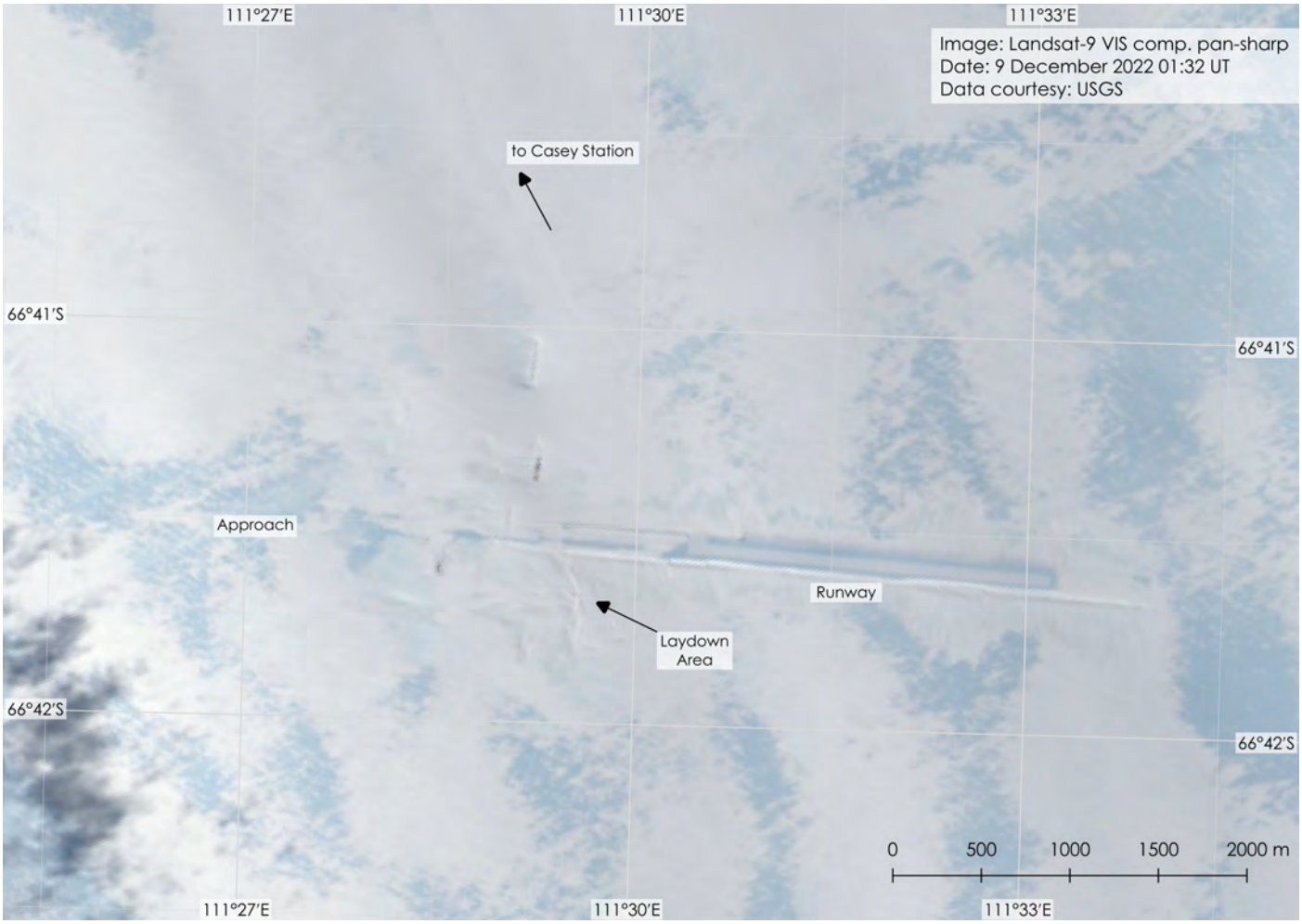


Figure 1: *Landsat-9 visible composite pansharpened data acquired 9 December 2022 at 01:32 UT and provided by USGS.*

The ice runway is partly covered by snow. North and south of the runway, snow dunes are left from previous clearing the runway.

Snow dunes have also accumulated in the lee of the camp and other structures.

Ice Bulletin: D'Urville Sea

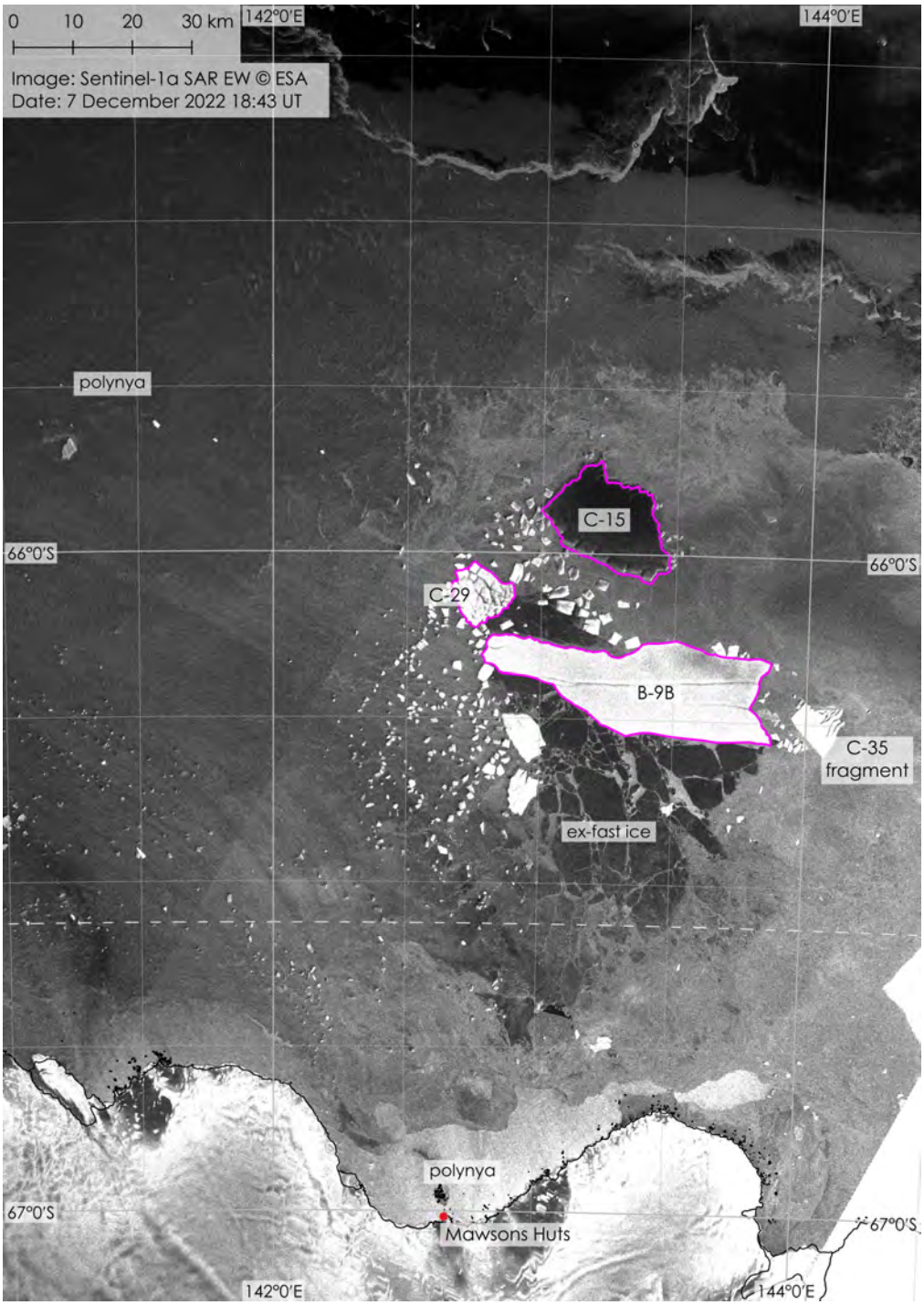
Issued: Friday 9th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data north of Commonwealth Bay in the southern D'Urville Sea.



In early-December 2022, the fast ice connecting Commonwealth Bay/Mawsons Huts with the grounded icebergs further north has shatterd and the bay off the huts is now a polynya.

East of iceberg B-9B, a fragment of iceberg C-35, which calved off the Ninnis Ice Shelf in July 2018, has drifted across from the Ninnis Ice Shelf.

East of the icebergs and the ex-fast ice, some pack ice remains local and is decaying. West of the icebergs, only very little sea ice is off Dumont D'Urville Station (outside of the frame of Figure 1) and only strips and patches of decaying sea ice are drifting freely further north.

Figure 1: *Sentinel-1a SAR EW data acquired 7 December 2022 at 18:43 UT and provided by PolarView.*

Ice Bulletin: Antarctica

Issued: Monday 12th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows the pan-Antarctic sea-ice concentration anomaly based on passive microwave remote sensing data.

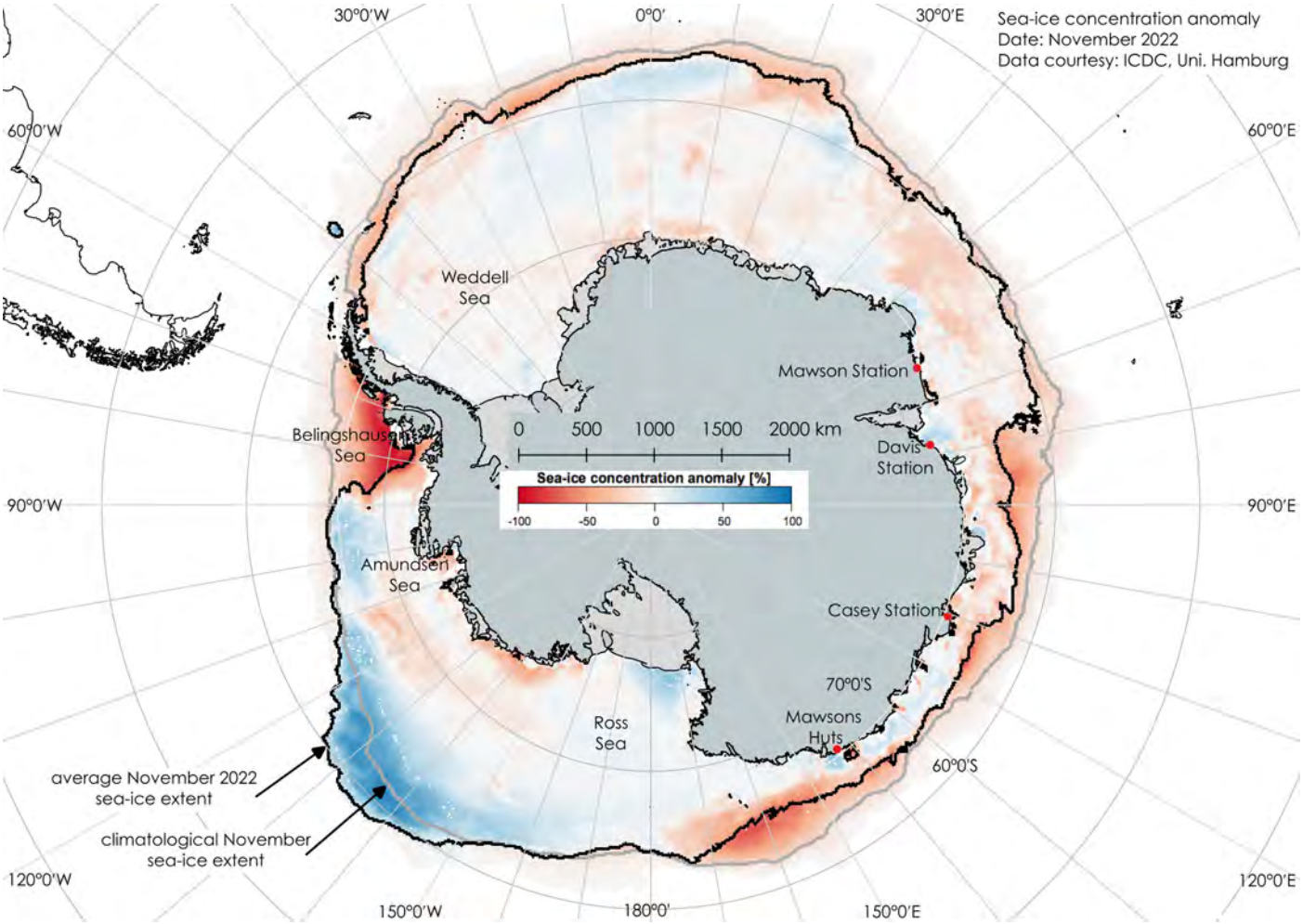


***Figure 1**: Sea-ice concentration anomaly for November 2022 provided by ICDC (Universität Hamburg).*

Pan-Antarctic sea-ice conditions continue to be overall low but not record-breaking (5th lowest) during November.

Only in the eastern Ross Sea, sea-ice extent continued to reach and partly exceed climatological values. The rest of the sea-ice zone around the continent exhibited below average sea-ice extent and associated concentration.

In the Bellingshausen Sea, the most pronounced negative anomaly has grown, and negative extent anomalies stretch the entire Weddell Sea and are continuing throughout East Antarctica.

Northeast of the northern tip of the Antarctic Peninsula, an isolated apparent positive anomaly is caused by the drift of large iceberg A-76A, which is north (outside) of the sea-ice zone and drifting further northward into the southern South Atlantic.

Ice Bulletin: Davis Station

Issued: Monday 12th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Davis Station. The fast-ice edge is marked by a red line (dashed red for 8 December 2022).

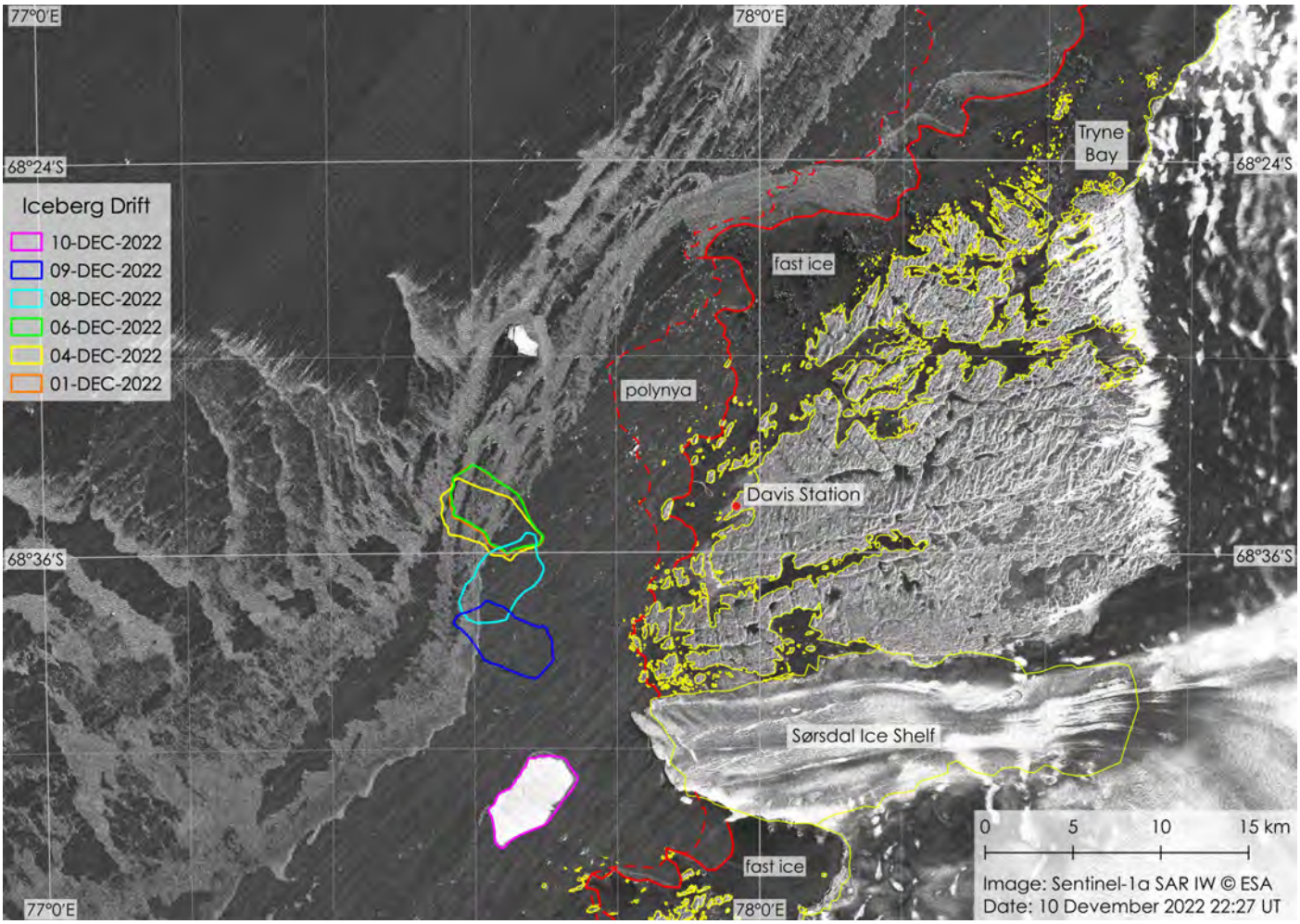


Figure 1: *Sentinel-1a SAR IW data acquired 10 December 2022 at 22:27 UT and provided by PolarView.*

During the weekend, fast ice broke away and off station the fast-ice edge is now roughly 1.5 nautical miles offshore.

A large iceberg is drifting to the south of the station (marked by a colour-coded outlines).

North of the station, the sea-ice edge (not shown in the figure) is up to 40 nautical miles below (south of) the December median sea-ice extent but north of the Amery Ice Shelf still roughly 70 nautical miles above (north of) the December median.

Ice Bulletin: D'Urville Sea

Issued: Monday 12th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows visible data north of the southern D'Urville Sea.

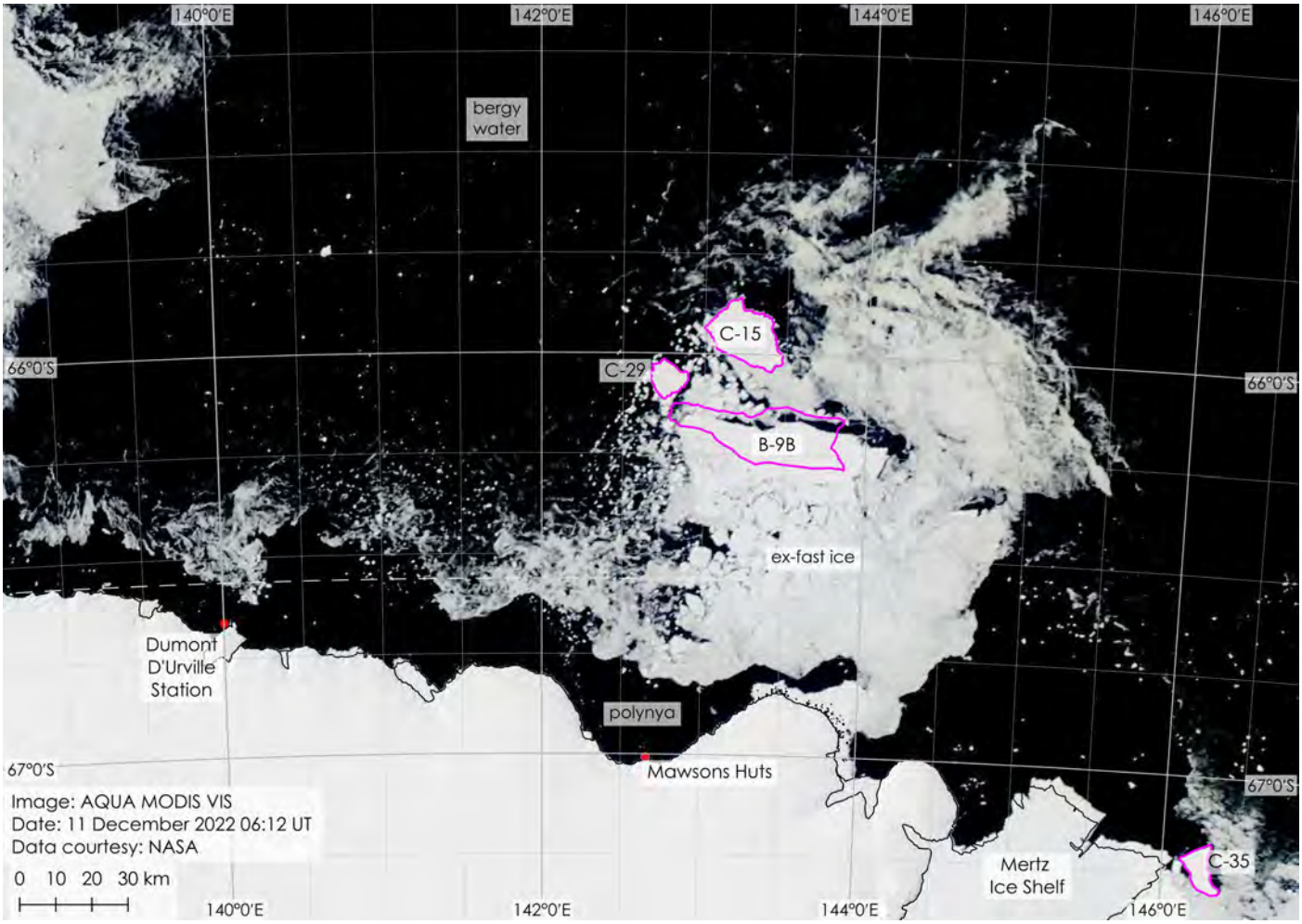


Figure 1: *AQUA MODIS VIS data acquired 11 December 2022 at 06:12 UT and provided by NASA.*

During the weekend, iceberg B-9B moved south-eastward (pink shapes indicate positions prior to the weekend), which indicates that the berg is not grounded but trapped between smaller icebergs and fast ice up until recently.

East of iceberg B-9B, a fragment of iceberg C-35 remains close to iceberg B-9B. Iceberg C-35 calved off the Ninnis Ice Shelf in July 2018 and is currently at the eastern edge of the Mertz Ice Shelf.

East of the icebergs and the ex-fast ice, some pack ice remains local and is decaying. West of the icebergs troika north of Mawsons Huts, only very little sea ice is off Dumont D'Urville Station and only strips and patches of decaying sea ice are drifting freely further north.

Ice Bulletin: Casey Station

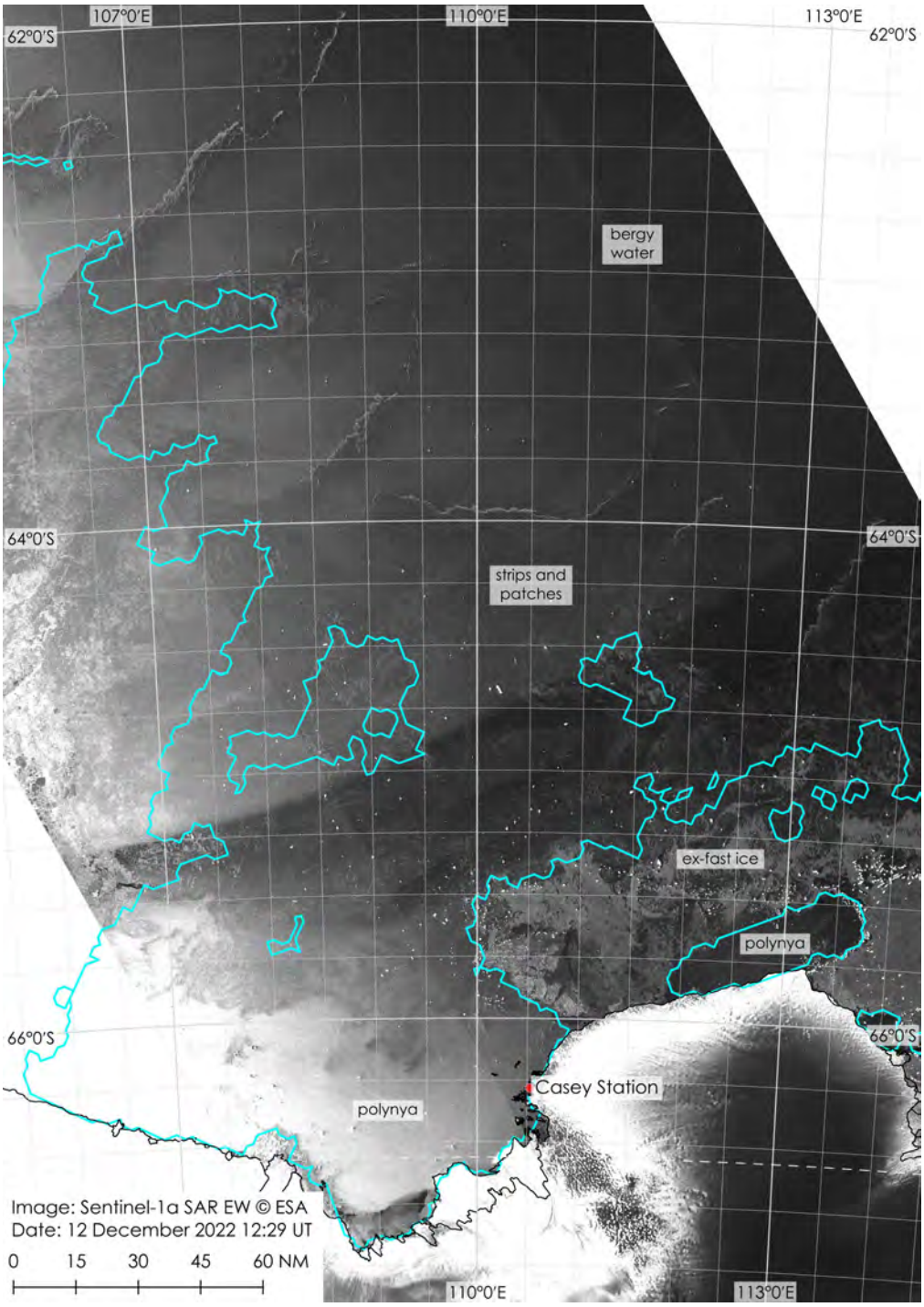
Issued: Tuesday 13th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data of the Casey Station region. The sea-ice edge based on passive microwave data is included as a cyan line.



North of Casey Station, some fast ice remains attached to the western flank of Law Dome but it is breaking up and releasing ex-fast ice floes northward.

West of 110º0'E, only very little sea ice remains but many small to medium-sized icebergs are present.

Figure 1: *Sentinel-1a SAR EW data acquired 12 December 2022 at 12:29 UT and provided by PolarView.*

Ice Bulletin: Mawson Station

Issued: Tuesday 13th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows visible data off Mawson Station.

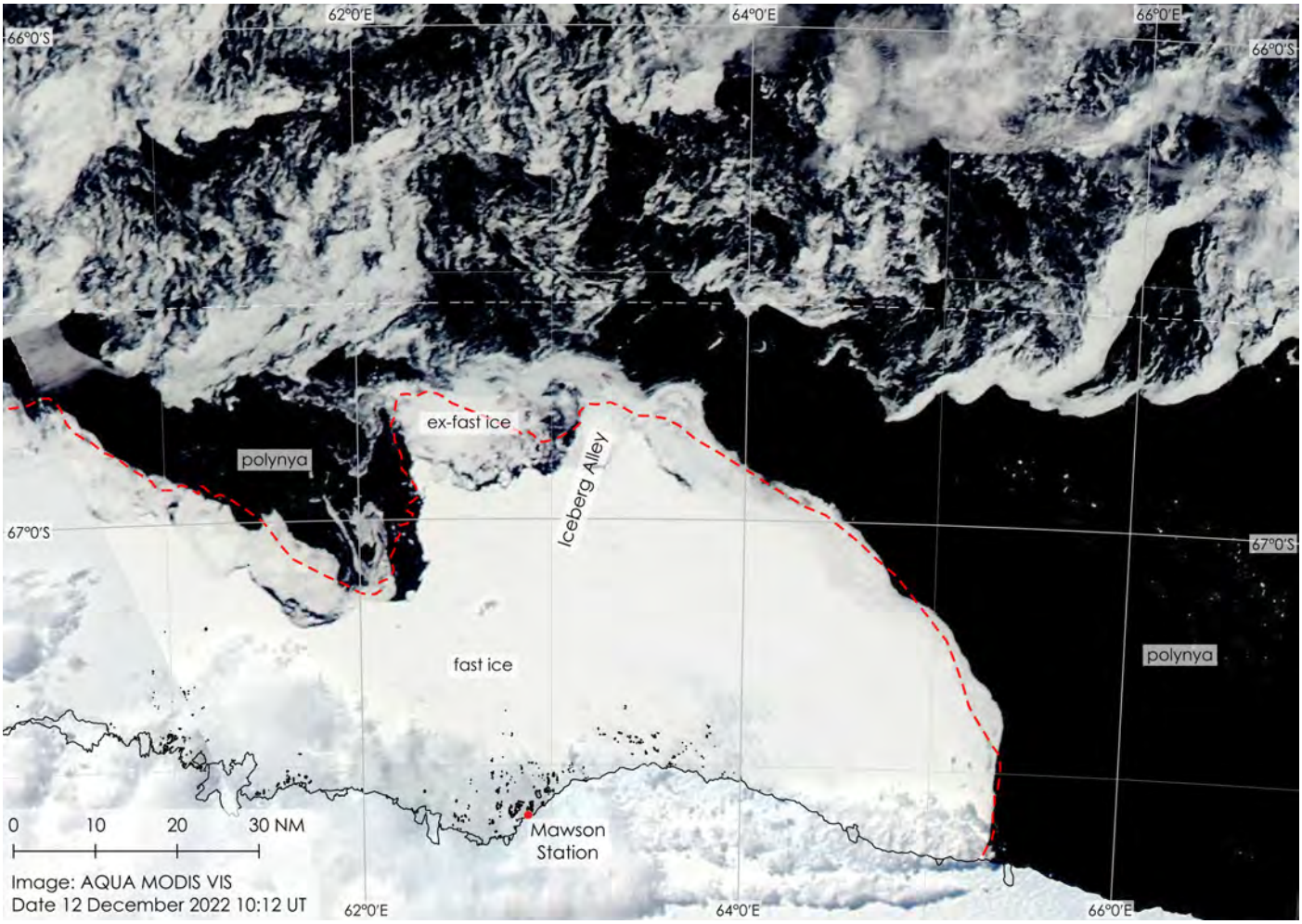


Figure 1: *AQUA MODIS visible composite data acquired 12 December 2022 at 10:12 UT and provided by NASA.*

North of the station, the fast-ice edge is starting to break up and the is moving southward. North of the fast ice, first-year sea ice and ex-fast ice are drifting freely. Some icebergs are also present.

Further north, the northern sea-ice edge (not shown in the figure) is currently within a couple of nautical miles of the median sea-ice extent for December.

Ice Bulletin: D'Urville Sea

Issued: Wednesday 14th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows visible composite data north of Mawson's Huts in the southern D'Urville Sea.

Iceberg B-9B continues to wiggle within the confiments of grounded smaller icebergs (dotted and dashed pink shape indicates position on 7 and 11 December 2022, respectively). The berg is not grounded anymore but was trapped between smaller icebergs and fast ice up until recently.

East of iceberg B-9B, a fragment of iceberg C-35 remains close to iceberg B-9B.

East and south of the troika of icebergs north of Mawsons Huts, ex-fast ice and some pack ice remains local and is decaying. West of the icebergs, only very little sea ice is off Dumont D'Urville Station (not included in the figure) and only strips and patches of decaying sea ice are drifting freely further north.

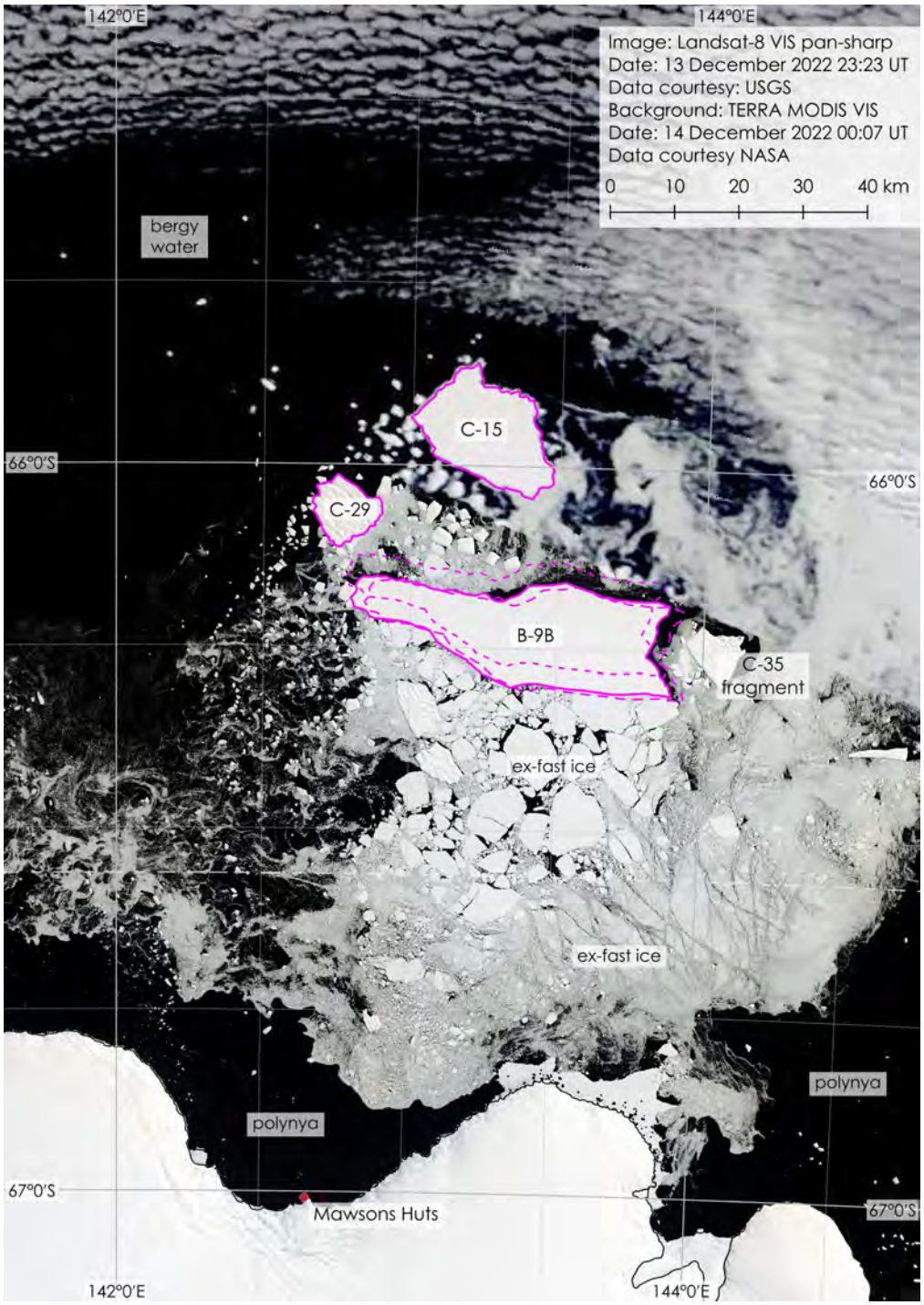


Figure 1: *Landsat-8 visible composite pan-sharpened data acquired 13 December 2022 at 23:23 UT and provided by USGS; background TERRA MODIS VIS data acquired 13 December 2022 at 00:07 UT and provided by NASA.*

Ice Bulletin: Davis Station

Issued: Wednesday 14th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Davis Station. The fast-ice edge is marked by a red line (dashed and dotted red for 8 December 2022 and 10 December 2022, respectively).

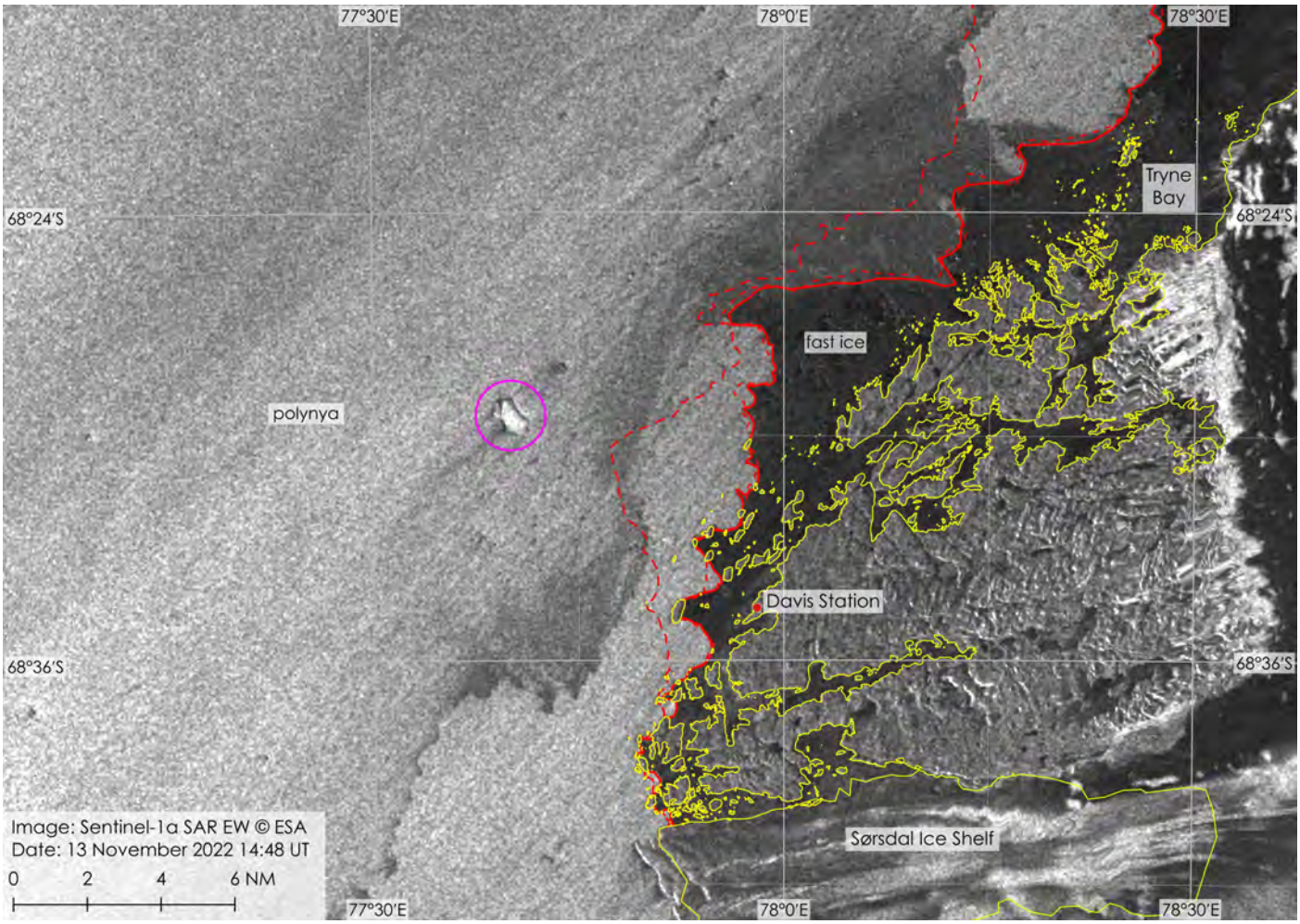


Figure 1: *Sentinel-1a SAR IW data acquired 10 December 2022 at 22:27 UT and provided by PolarView.*

Fast ice continues to brake away off station and the fast-ice edge is now only a little more than 1 nautical mile offshore.

A large iceberg that was off the Vestfold Hills has drift to the south of the Sørsdal Ice Shelf and is expected to continue its way south-westward.

Two icebergs (marked with a pink circle) remain grounded offshore.

Ice Bulletin: Cape Darnley

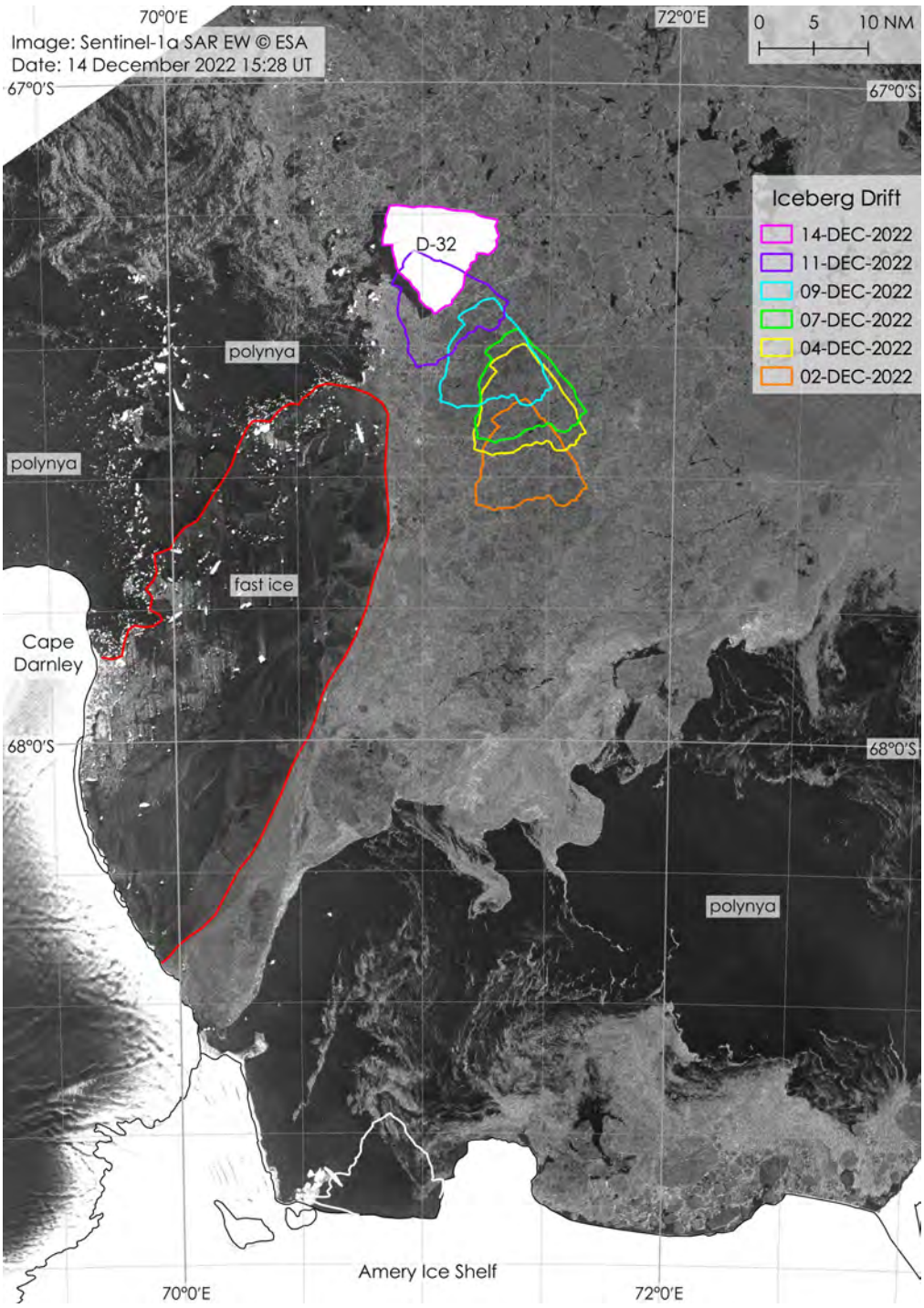
Issued: Thursday 15th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data northwest of the Amery Ice Shelf. The fast-ice edge is marked by a red line.



East of Cape Darnley, fast ice continues to shrink. Large iceberg D-32 calved off the Amery Ice Shelf in early-October (its initial position is marked by the white line off the western shelf-ice edge) and the iceberg's drift during December (so far) is indicated by colour-coded shapes. The iceberg is about the clear the northernmost grounded icebergs northeast of Cape Darnley and expected to turn west then and drift along the continental shelf break.

Further north, the sea-ice edge is within a couple of nautical miles of the median sea-ice extent for December.

Figure 1: *Sentinel-1a SAR EW data acquired 14 December 2022 at 15:28 UT and provided by PolarView.*

Ice Bulletin: Casey Station

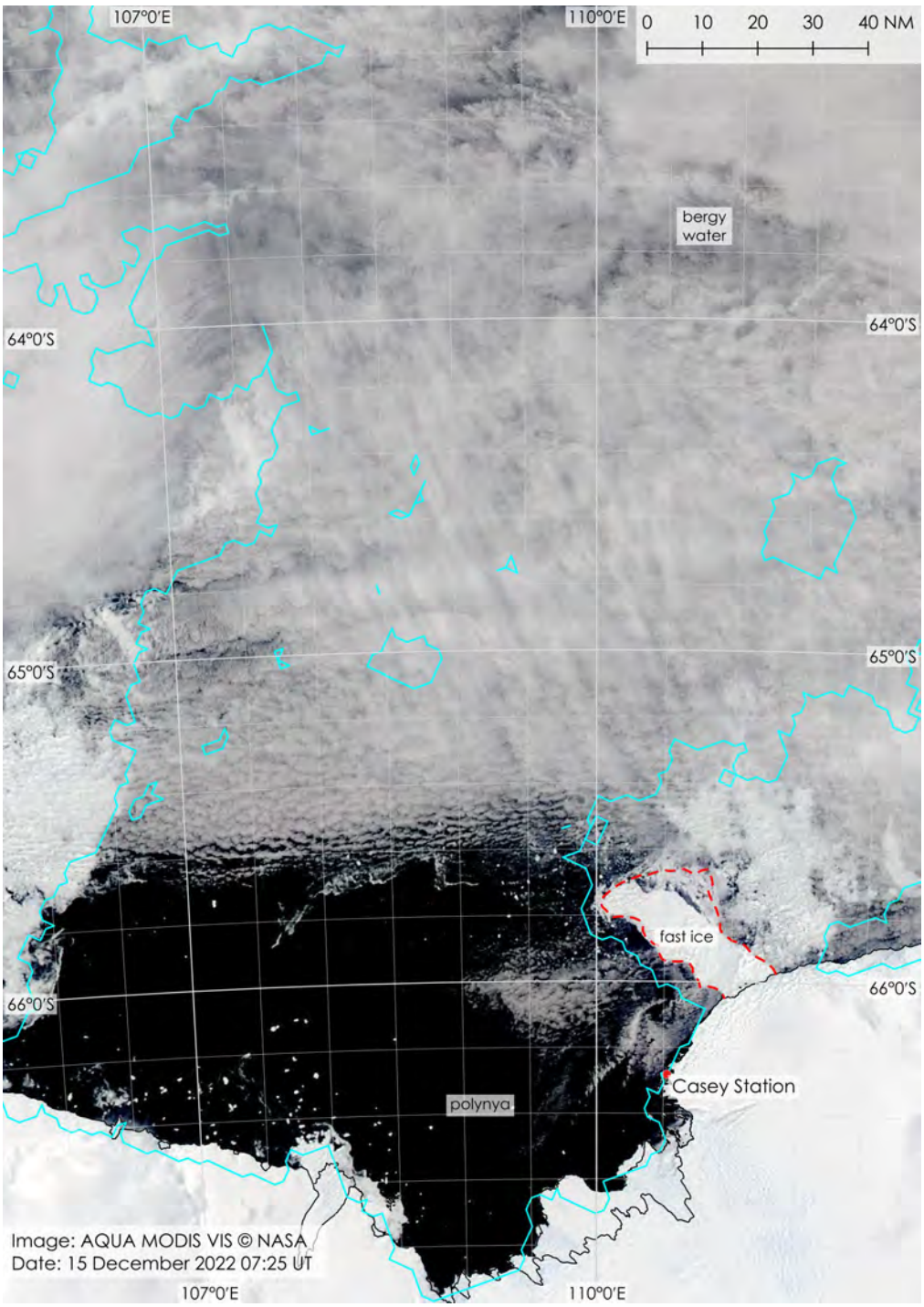
Issued: Friday 16th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows visible data of the Casey Station region. The sea-ice edge based on passive microwave data is included as a cyan line.



North of Casey Station, some fast ice remains attached to the western flank of Law Dome but it is breaking up and releasing ex-fast ice floes northward. The fast-ice edge on 14 December 2022 is indicated by a dashed red line.

Between 107º0'E and 110º0'E, only very little sea ice remains in strips and patches but many small to medium-sized icebergs are present.

Figure 1: *AQUA MODIS VIS data acquired 15 December 2022 at 07:25 UT and provided by NASA.*

Ice Bulletin: Mawson Station

Issued: Friday 16th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows visible data off Mawson Station. The fast-ice edge is marked by a red line (dashed red for 4 December 2022).

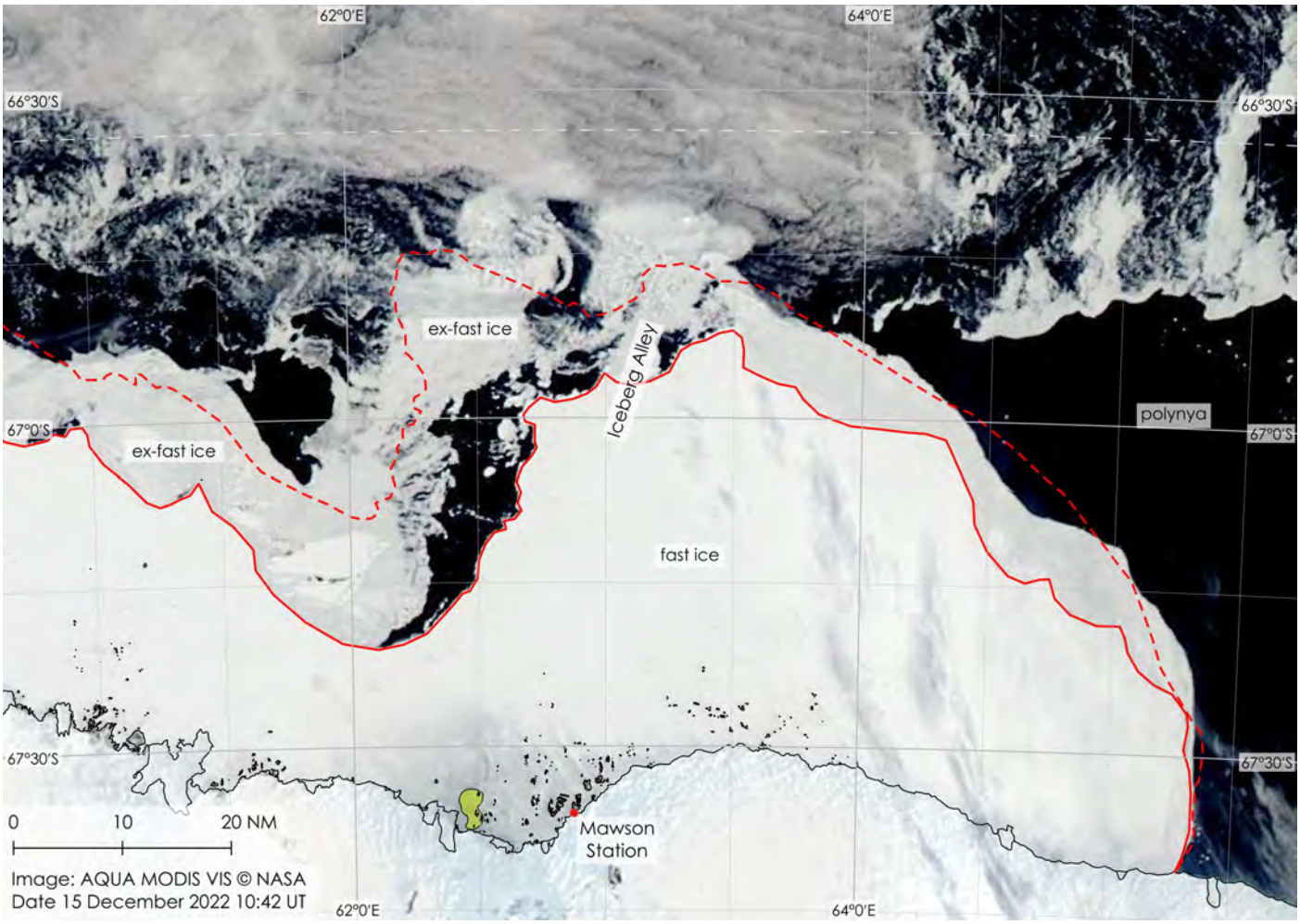


Figure 1: *AQUA MODIS visible composite data acquired 15 December 2022 at 10:42 UT and provided by NASA.*

North of the station, the fast-ice edge continues moving southward. North of the fast ice, first-year sea ice and ex-fast ice are drifting freely. Some icebergs are also present.

West of Mawson Station, fast ice is deteriorating nearshore and open-water holes start to appear nearshore (marked by a green-shaded shape).

Further north, the northern sea-ice edge (see Figure 2) is currently within a couple of nautical miles of the median sea-ice extent for December (marked by a black line) but the sea-ice concentration within the extent is below average conditions.

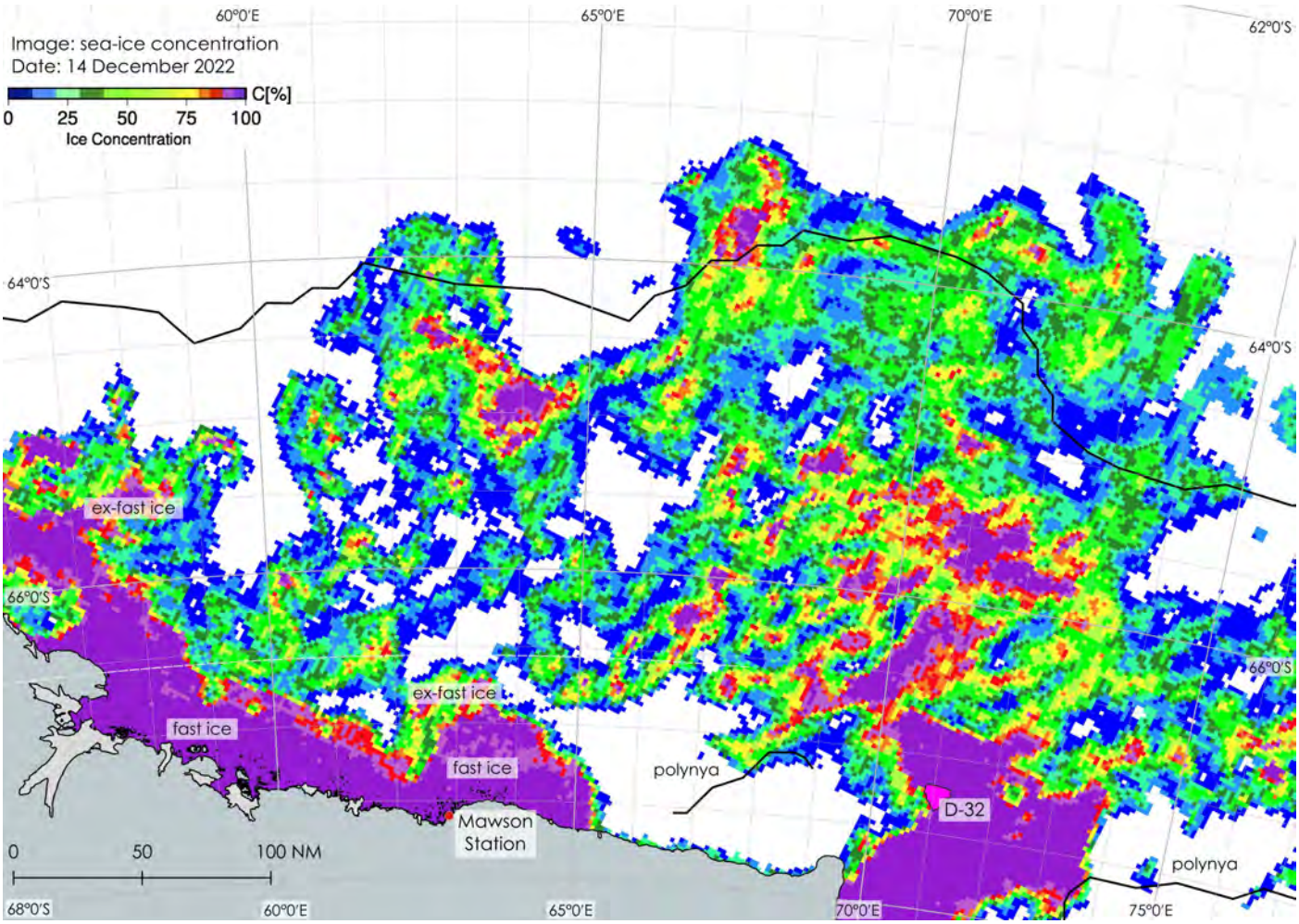


Figure 2: *Sea-ice concentration data acquired 14 December 2022 and provided by ICDC.*

Ice Bulletin: Iceberg A-76A

Issued: Friday 16th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data northeast of the Antarctic Peninsula in the north-western Weddell Sea. The drift of iceberg A-76A since November 2022 is indicated by colour-coded shapes.

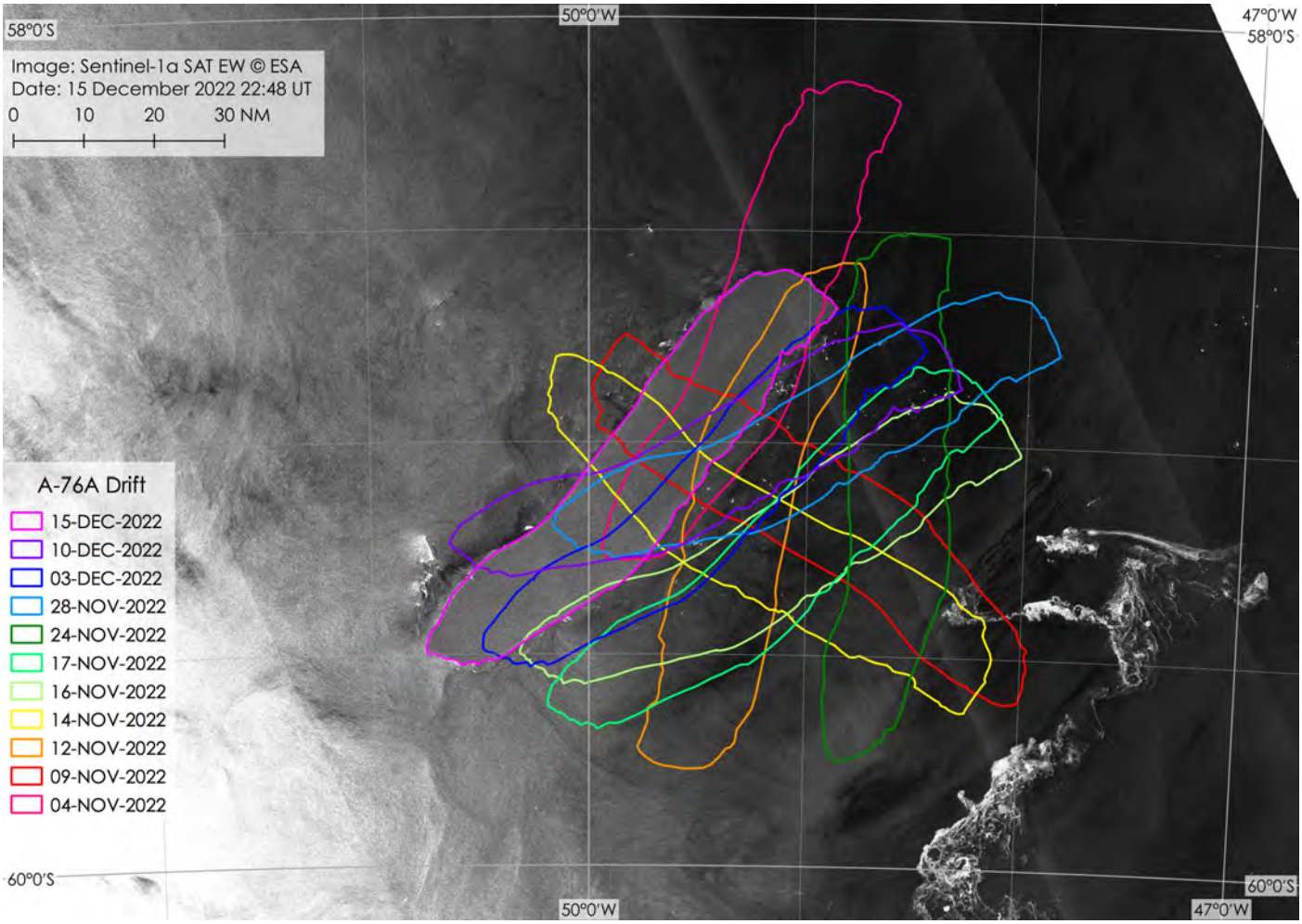


***Figure 1**: Sentinel-1a SAR EW data acquired 15 December 2022 at 22:48 UT and provided by PolarView.*

The iceberg is 250 nautical miles north of the sea-ice edge based on passive microwave data (not shown in the figure) and drifting in the Scotia Sea into the southern South Atlantic Ocean however, there are some strips and patches of sea ice north of the sea-ice edge that are below the detection limit of the passive microwave instrument and algorithm. Some of those patches can be seen as bright filaments southeast of the iceberg.

Between 4 November 2022 and 17 November 2022, the iceberg turned 360 degrees anti-clockwise and continued for another 45 degrees before turning back clockwise again since 24 November 2022 and drifting south-westward a bit.

The iceberg continues showing signs of breaking up and smaller icebergs and glacial debris are surrounding the iceberg and are drifting farther afield.

Ice Bulletin: Mawson Station

Issued: Monday 19th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows visible data off Mawson Station. The fast-ice edge on 15 December 2022 is marked by a dashed red line.

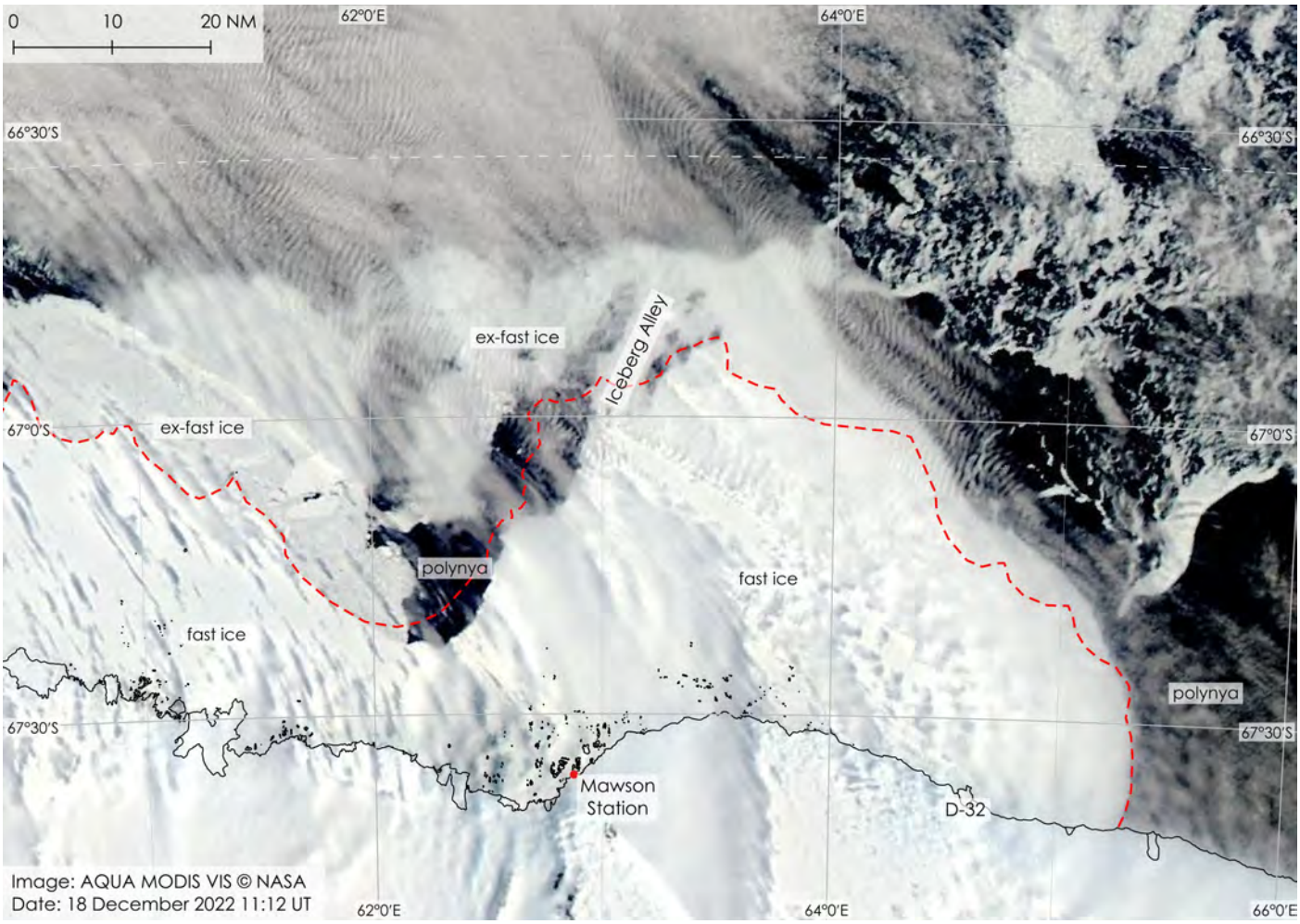


Figure 1: *AQUA MODIS visible composite data acquired 18 December 2022 at 11:12 UT and provided by NASA.*

North of the station, the fast-ice edge continues moving southward during the weekend. North of the fast ice, first-year sea ice and ex-fast ice are drifting freely. Some icebergs are also present.

Further north, the northern sea-ice edge (not shown in the figure) remains largely unchanged within a couple of nautical miles of the median sea-ice extent for December and the sea-ice concentration within the extent is below average conditions.

Ice Bulletin: Mawson Station

Issued: Tuesday 20th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data off Mawson Station. The fast-ice edge is marked by a red line.

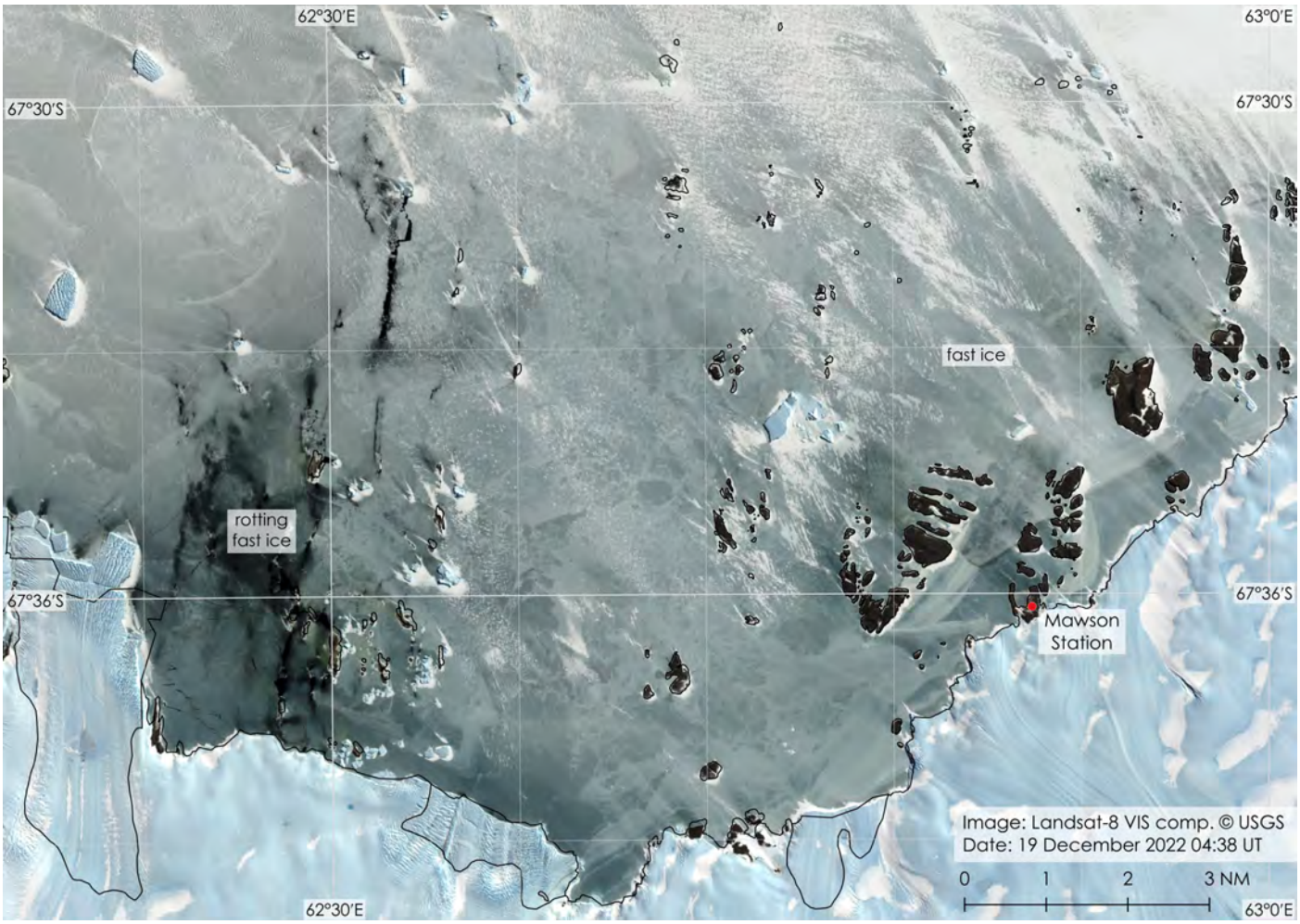


Figure 1: *Landsat-8 visible composite pan-sharpened data acquired 19 December 2022 at 04:38 UT and provided by USGS.*

West of Mawson Station, fast ice has started to deteriorate nearshore. North of the station, only the southern part of Iceberg Alley (marked by green outlines) remains covered by fast ice (see Figure 2).

The northern fast-ice edge moved southward during the weekend. North of the fast ice, first-year sea ice and ex-fast ice are drifting freely (see Figure 3; also showing the sea-ice edge based on passive microwave data in light blue). Some icebergs are also present.

The northern sea-ice edge (not shown in the figures) remains largely unchanged within a couple of nautical miles of the median sea-ice extent for December however, the sea-ice concentration within the extent is below average conditions.

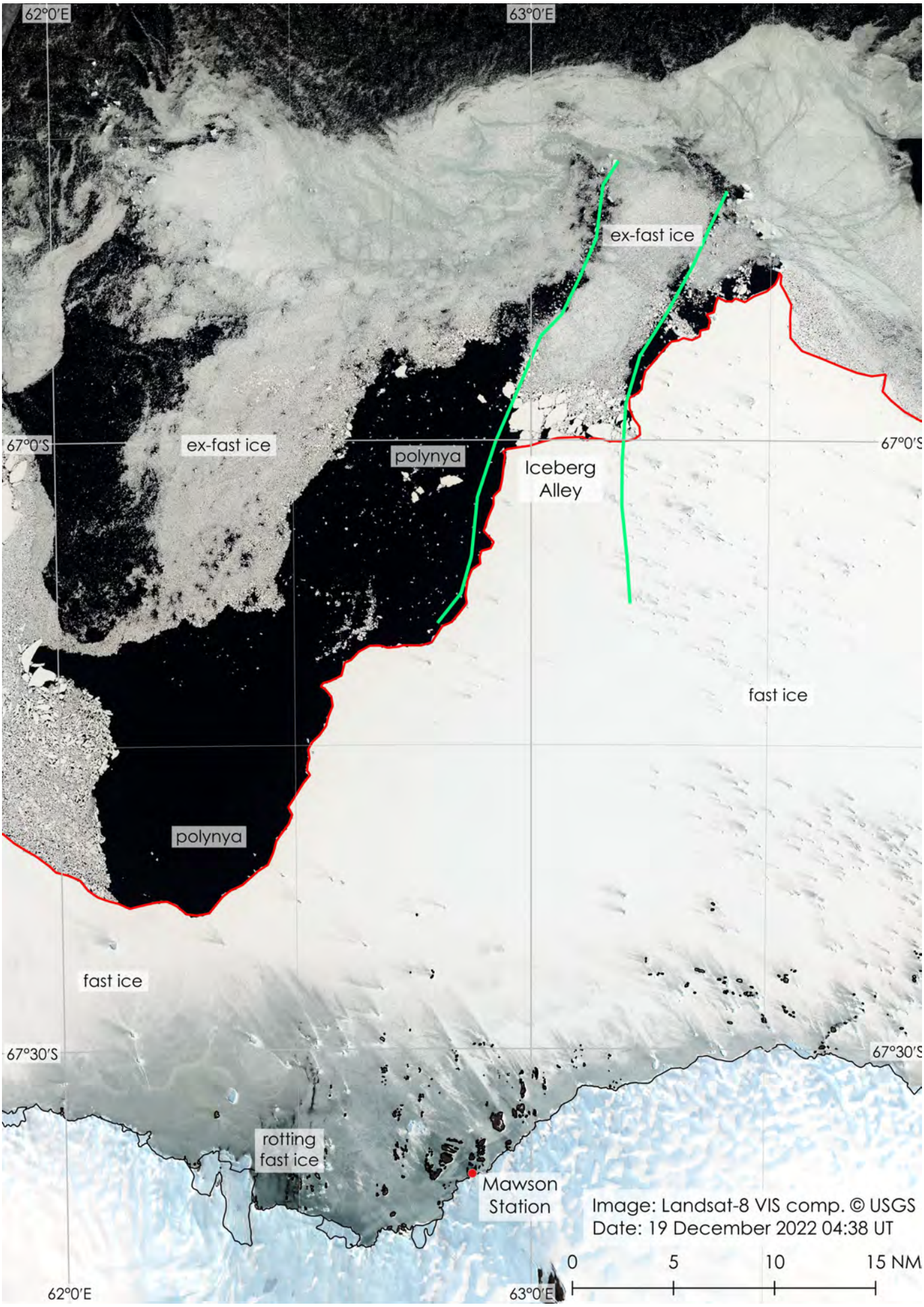


Figure 2: *Landsat-8 visible composite pan-sharpened data acquired 19 December 2022 at 04:38 UT and provided by USGS.*

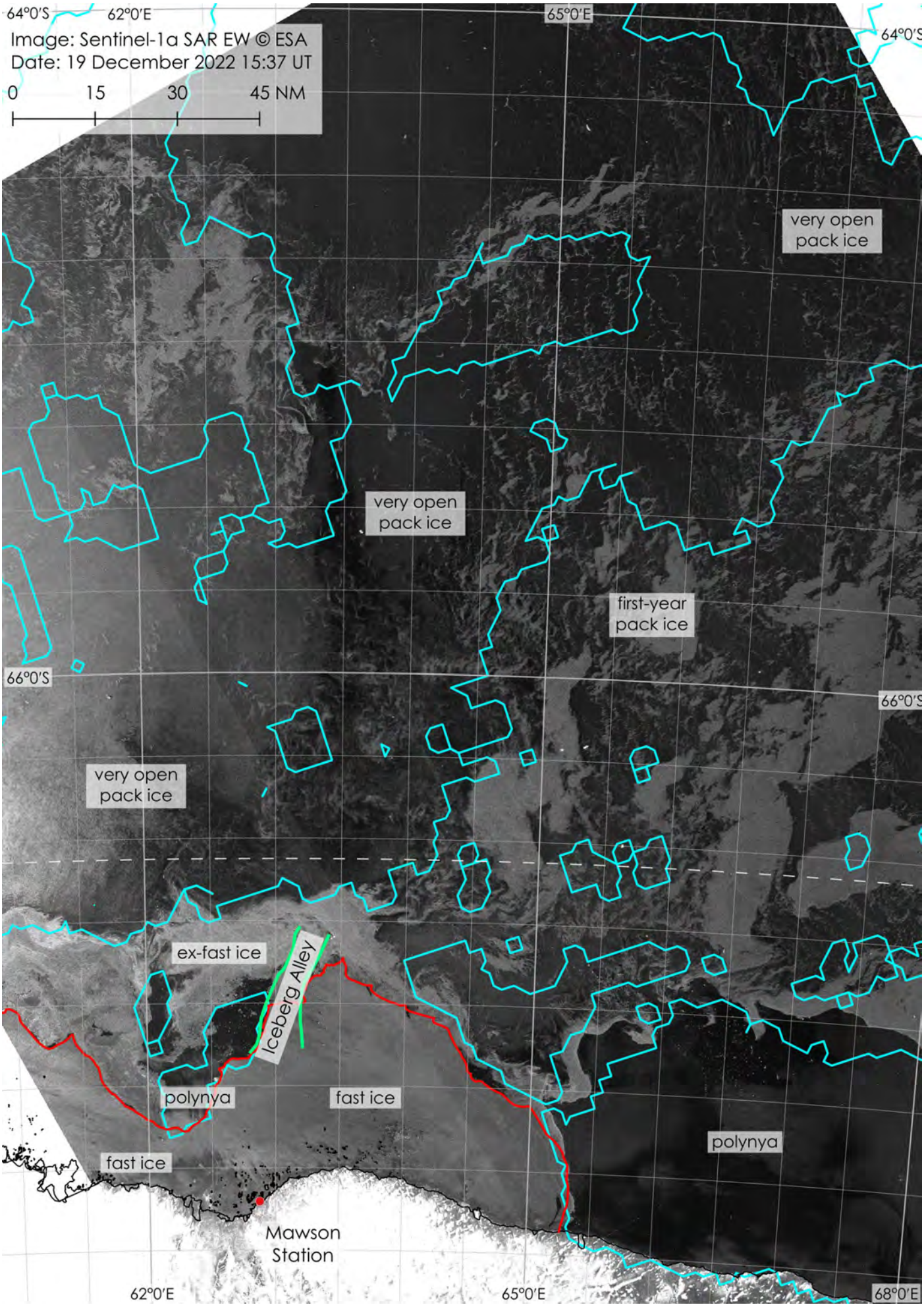


Figure 3: *Sentinel-1a SAR EW data acquired 19 December 2022 at 15:37 UT and provided by PolarView.*

Ice Bulletin: Casey Station

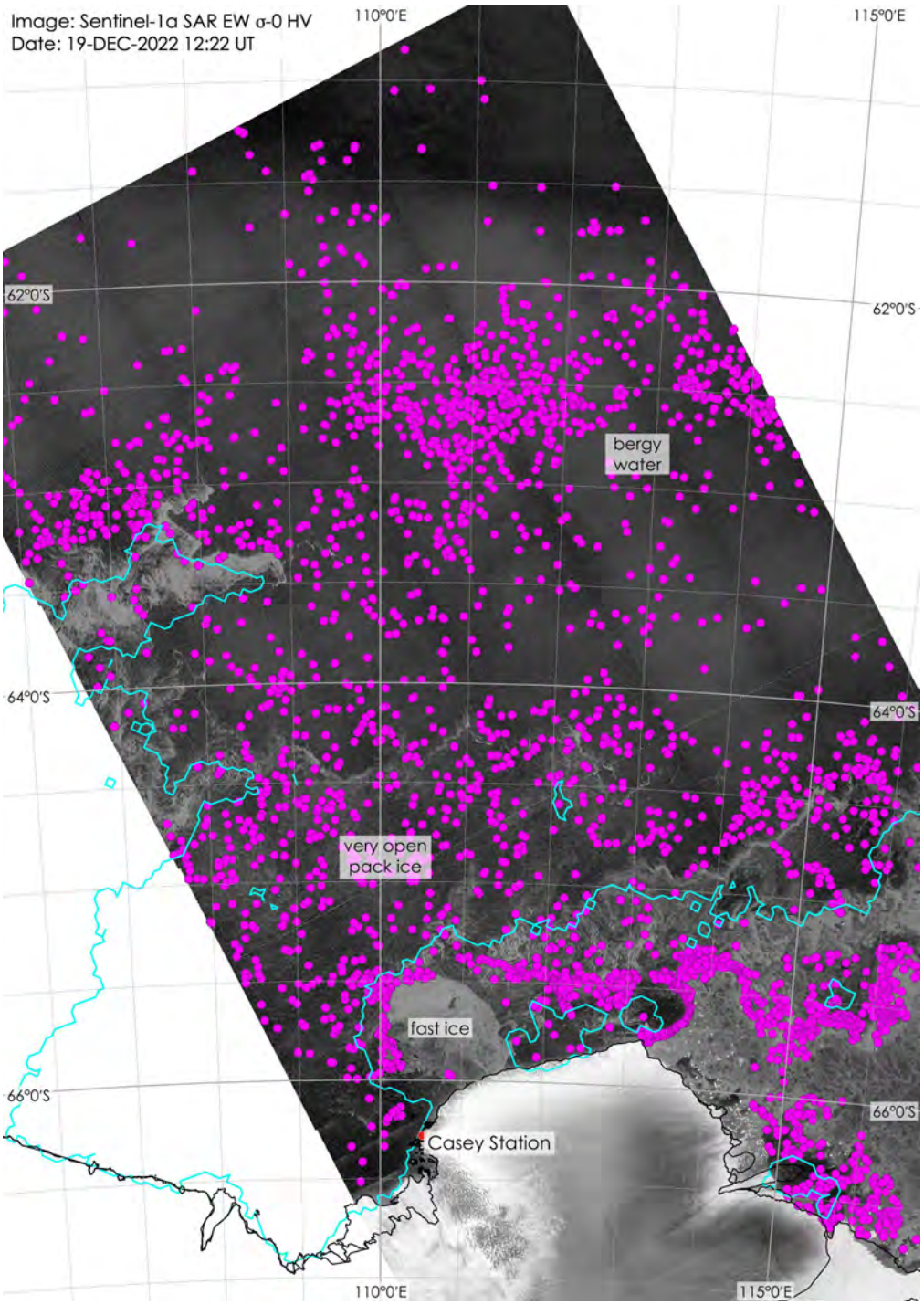
Issued: Tuesday 20th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data of the Casey Station region. The sea-ice edge based on passive microwave data is included as a cyan line. The data has been analysed for iceberg presence and more than 1500 features have been marked by pink dots. A diagonal hairline is a stitching artefact where two consecutive scenes join.



North of Casey Station, some fast ice remains attached to the western flank of Law Dome but it is breaking up and releasing ex-fast ice floes northward.

Between 108º0'E and 110º0'E, only very little sea ice remains in strips and patches but many small to medium-sized icebergs are present.

Figure 1: *Sentinel-1a SAR EW data acquired 19 December 2022 at 12:22 UT and provided by ESA.*

Ice Bulletin: Davis Station

Issued: Wednesday 21st December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Davis Station.

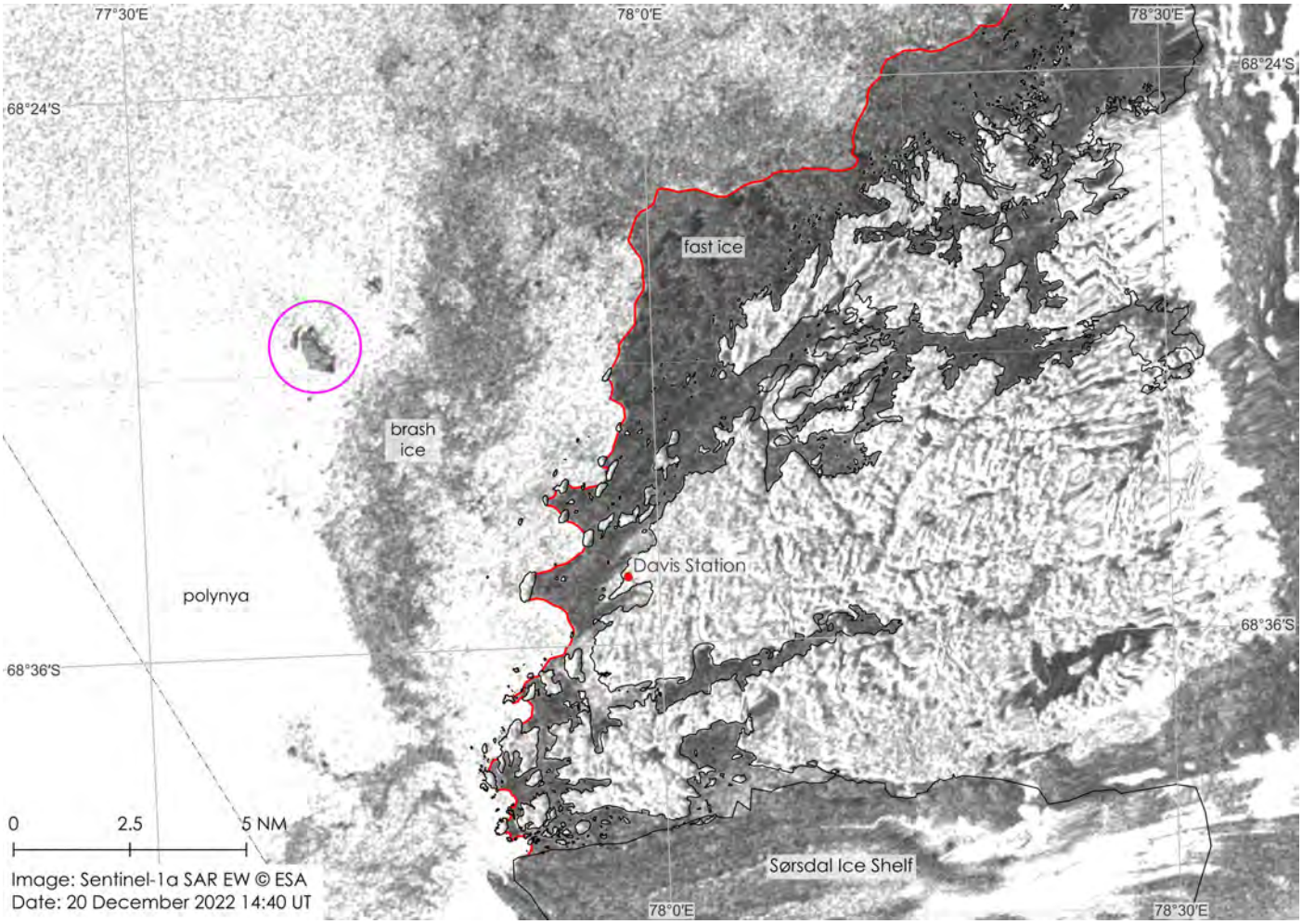


Figure 1: *Sentinel-1a SAR EW data acquired 20 December 2022 at 14:40 UT and provided by PolarView.*

Fast-ice edge is currently stable and only a little more than 1 nautical mile offshore. Some melting ex-fast ice is drifting as brash ice southward offshore.

Two icebergs (marked with a pink circle) remain grounded offshore.

Ice Bulletin: Mill Island

Issued: Wednesday 21st December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Mill Island west of Casey Station. Fast-ice areas are outlined in red and the sea-ice edge based on passive microwave data is shown in light-blue.

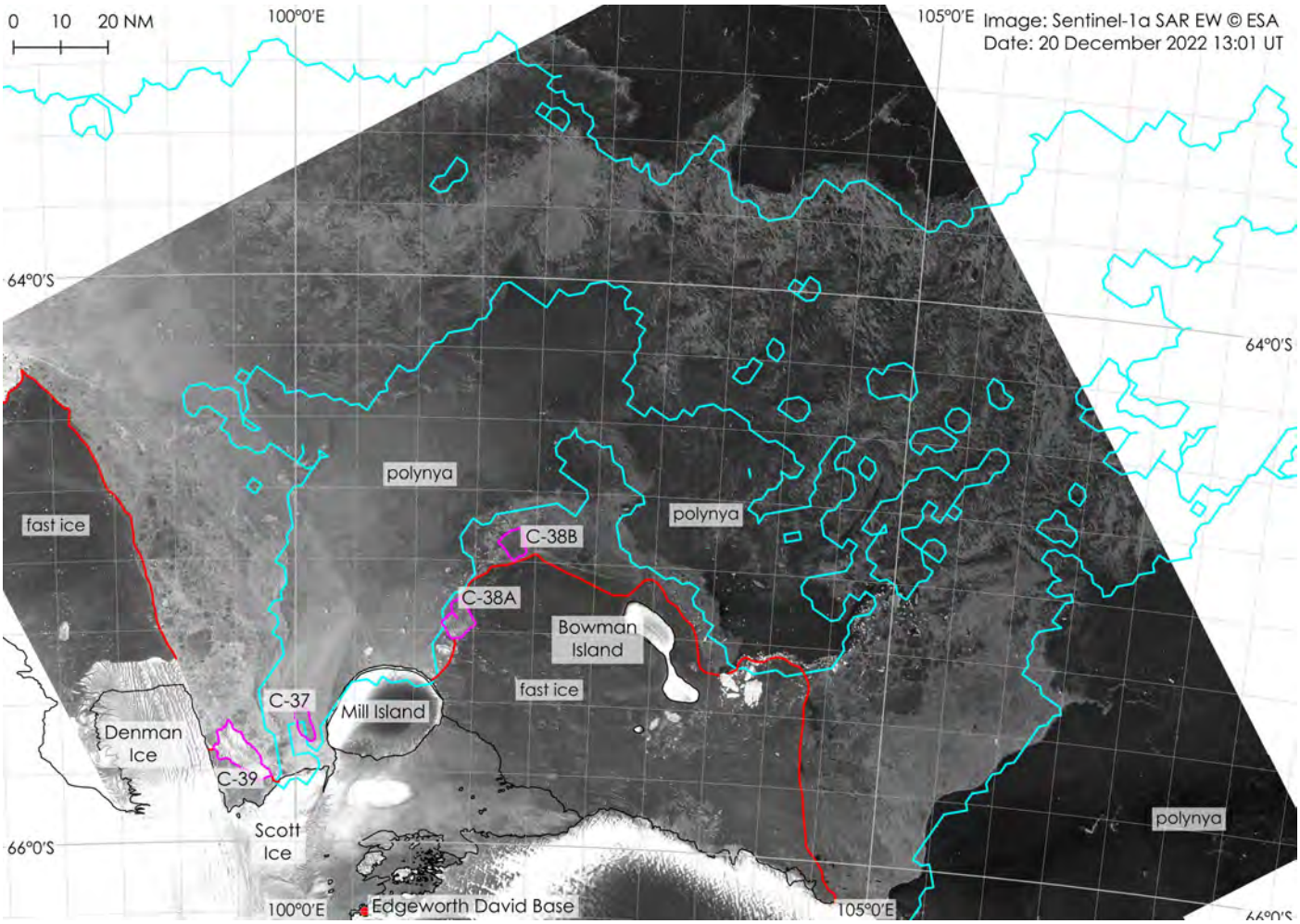


Figure 1: *Sentinel-1a SAR EW data acquired 20 December 2022 at 13:01 UT and provided by PolarView.*

A polynya is present north and west of the island and a bit further northeast.

Iceberg C-37 continues drifting freely in this polynya close to iceberg C-39, which is still locked in by fast ice as well as iceberg C-38A. However, iceberg C-38B is not enclosed by fast ice anymore and moving slightly north-eastward.

Further north, the northern sea-ice edge is roughly 30 nautical miles below (south of) the median sea-ice extent for December (not shown in the figure) and the sea-ice concentration within this extent is below average conditions.

Ice Bulletin: Casey Station

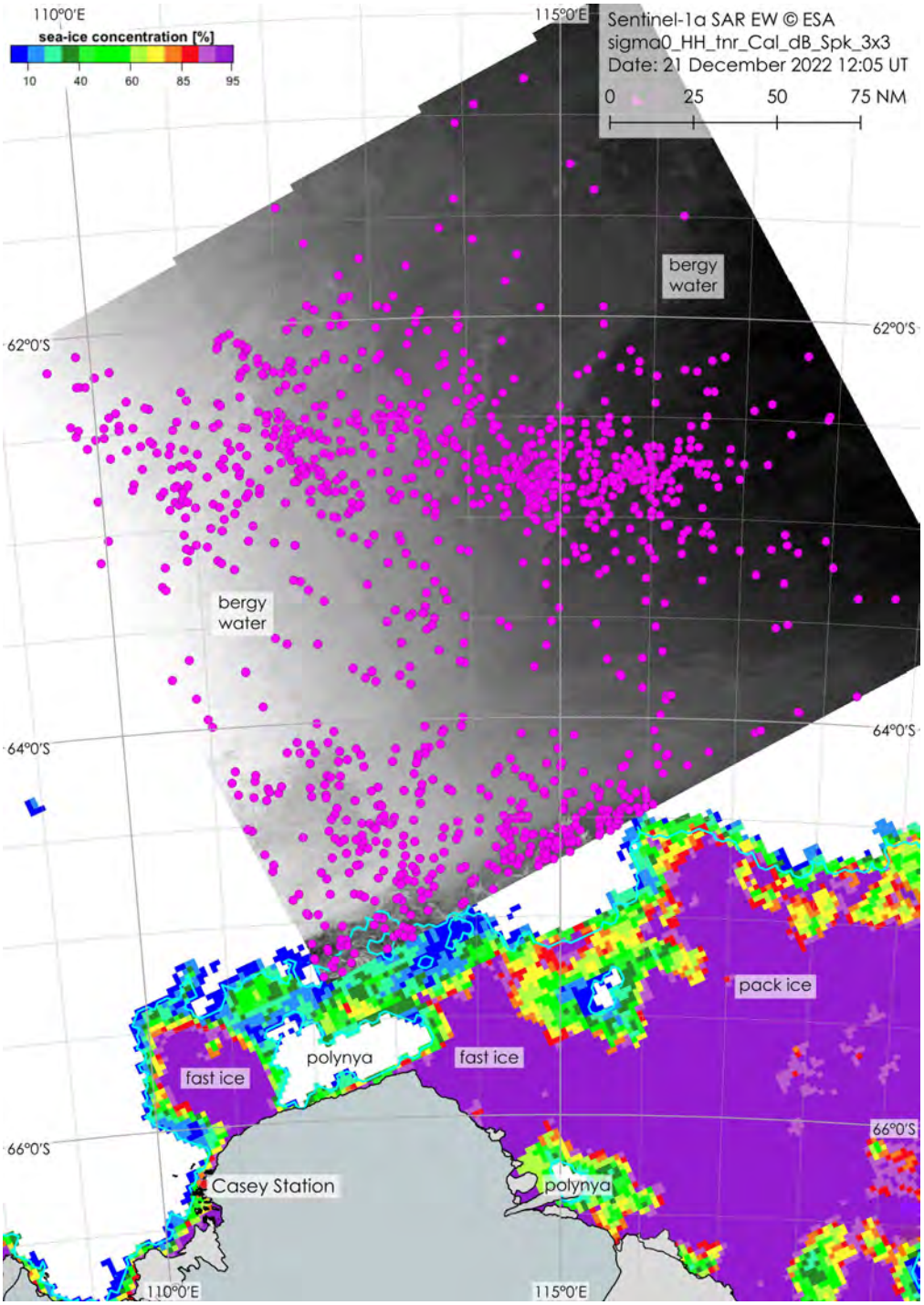
Issued: Thursday 22nd December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows a composite of data north of the Casey Station region. The sea-ice edge based on passive microwave data is included as a cyan line. The SAR data has been analysed for iceberg presence and 1200 features have been marked by pink dots.



North of Casey Station, some fast ice remains attached to the western flank of Law Dome but it is breaking up and releasing ex-fast ice floes northward.

Between 108º0'E and 110º0'E, only very little sea ice remains in strips and patches but many small to medium-sized icebergs are present.

Figure 2 provides a close-up view of the southwestern part of the SAR data.

Around 112º0'E and south of 64º0'S, very open sea ice is present that is below the detection limit of the passive microwave instrument and algorithm.

Figure 1: *Sentinel-1a SAR EW data acquired 21 December 2022 at 12:05 UT and provided by ESA; sea-ice concentration data acquired 20 December 2022 and provided by ICDC.*

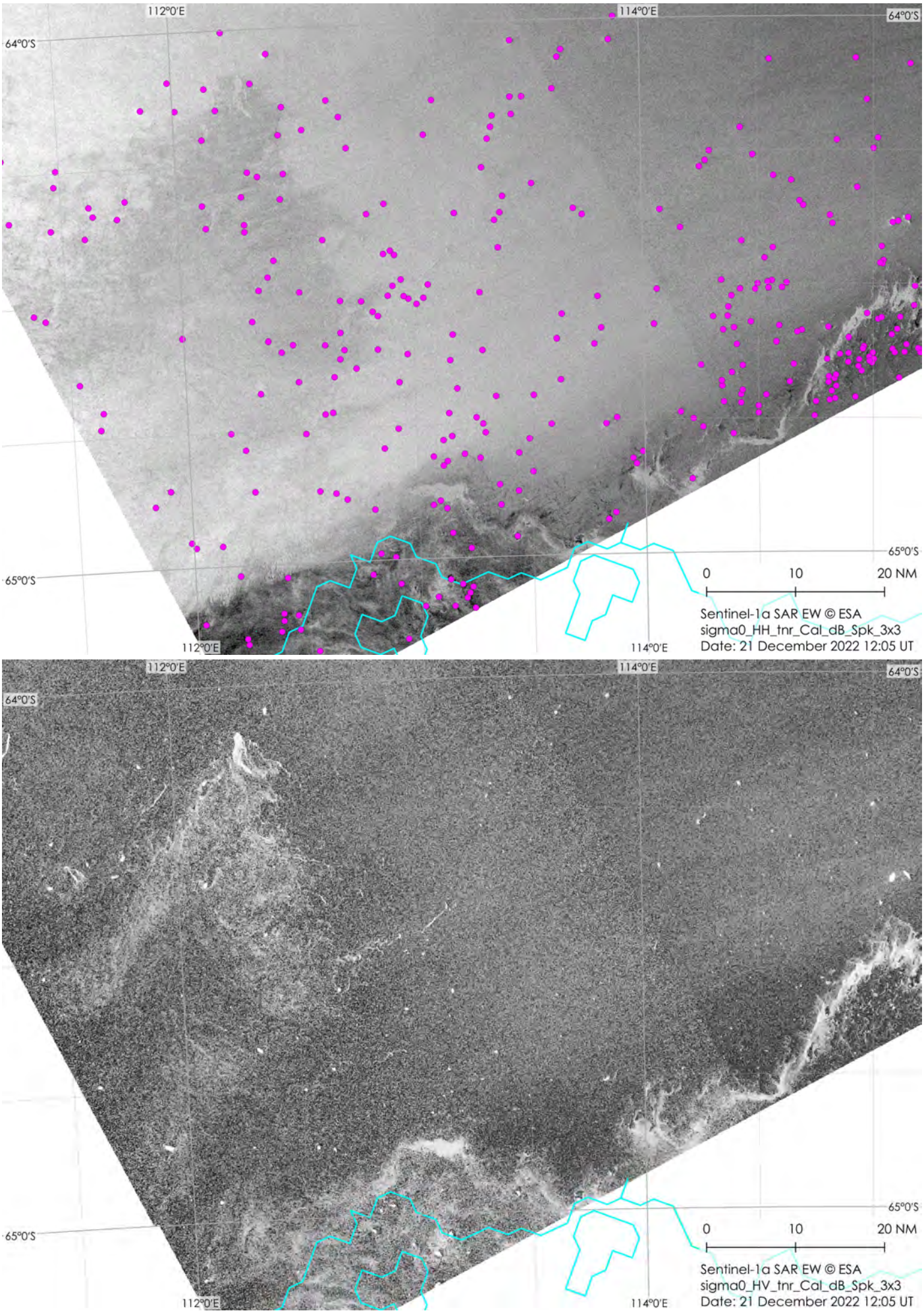


Figure 2 both panels: *Sentinel-1a SAR EW data acquired 21 December 2022 at 12:05 UT and provided by ESA*

Ice Bulletin: Davis Station

Issued: Friday 23rd December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) SAR data off Davis Station.

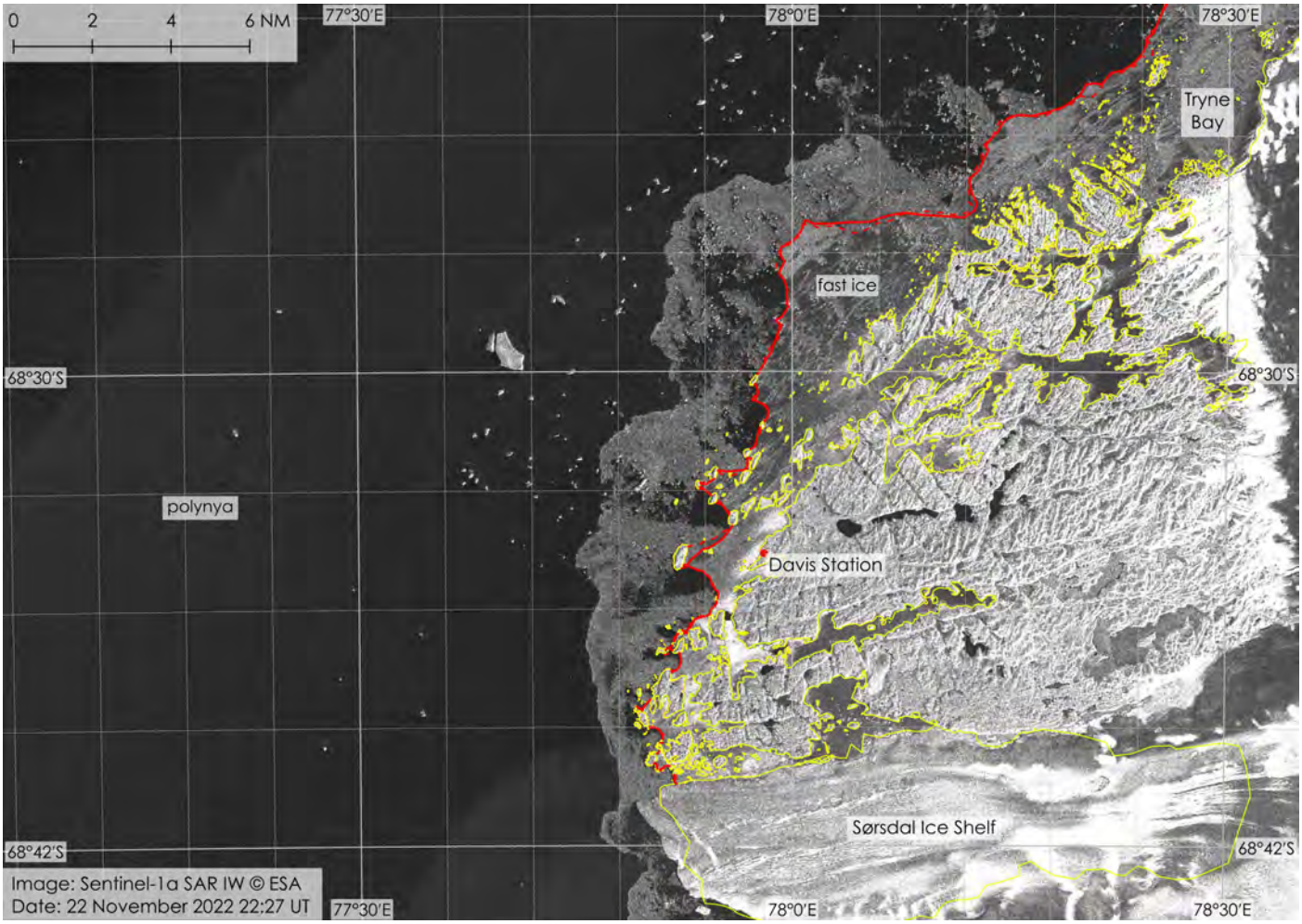


Figure 1: *Sentinel-1a SAR IW data acquired 22 December 2022 at 22:27 UT and provided by PolarView.*

Fast-ice edge remains currently largely stable and only a little more than 1 nautical mile offshore. Some melting ex-fast ice is drifting as brash ice southward offshore.

The majority of icebergs offshore is grounded but some are drifting generally south-westward.

Ice Bulletin: Mawson Station

Issued: Friday 23rd December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Mawson Station. The fast-ice edge is marked by a red line (dashed red for 19 December 2022).

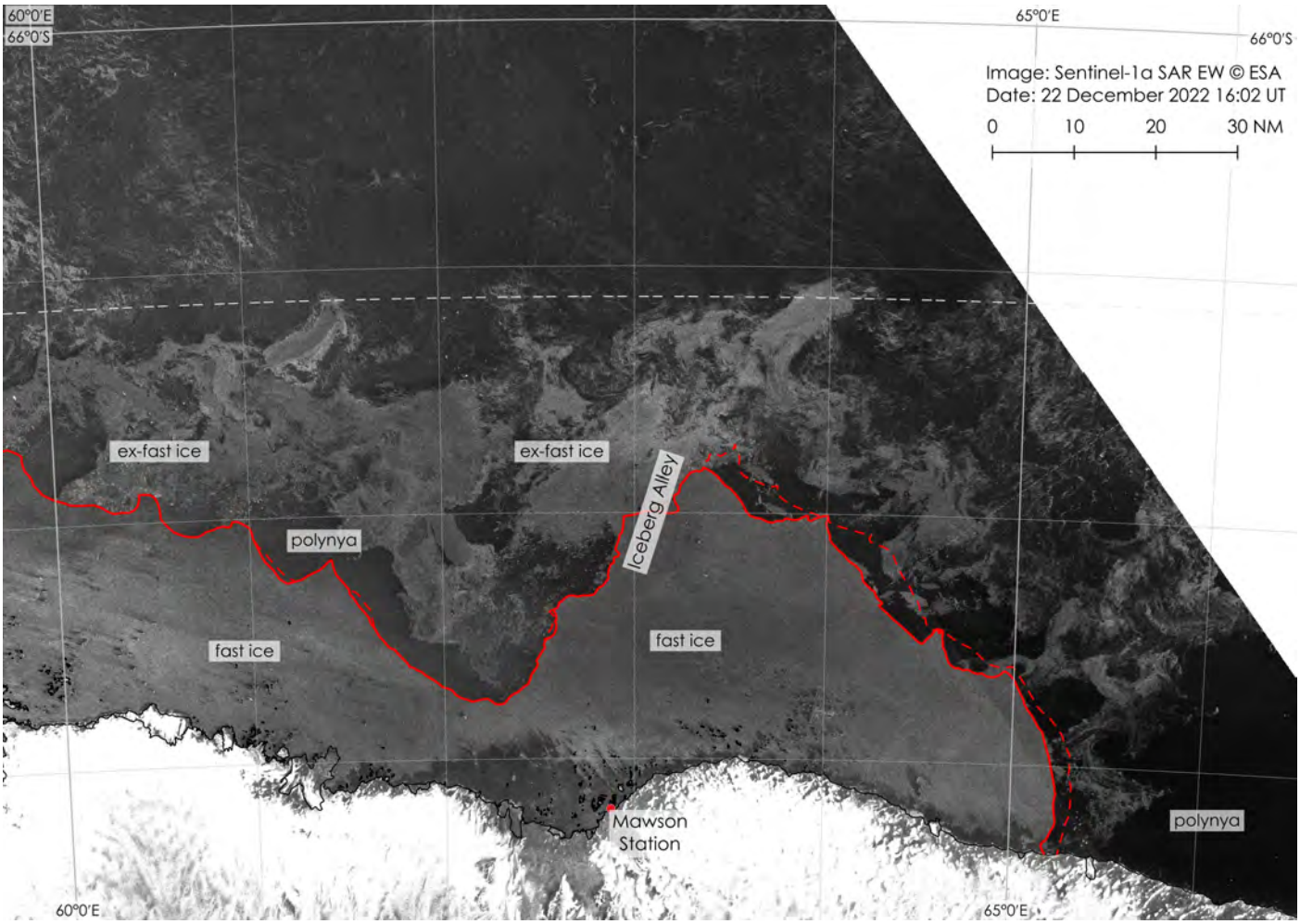


Figure 1: *Sentinel-1a SAR EW data acquired 22 December 2022 at 16:02 UT and provided by PolarView.*

North of the station, only the southern part of Iceberg Alley remains covered by fast ice.

Further east, the fast-ice edge moved slightly southward during the week. North of the fast ice, first-year sea ice and ex-fast ice is drifting freely. Some icebergs are also present.

The northern sea-ice edge (see Figure 2) has now largely collapsed and is generally 140 nautical miles below (south of) the median sea-ice extent for December, which is marked by a dashed black-white line in Figure 2. However, isolated patches of deteriorating sea ice remain within the climatological December median extent.

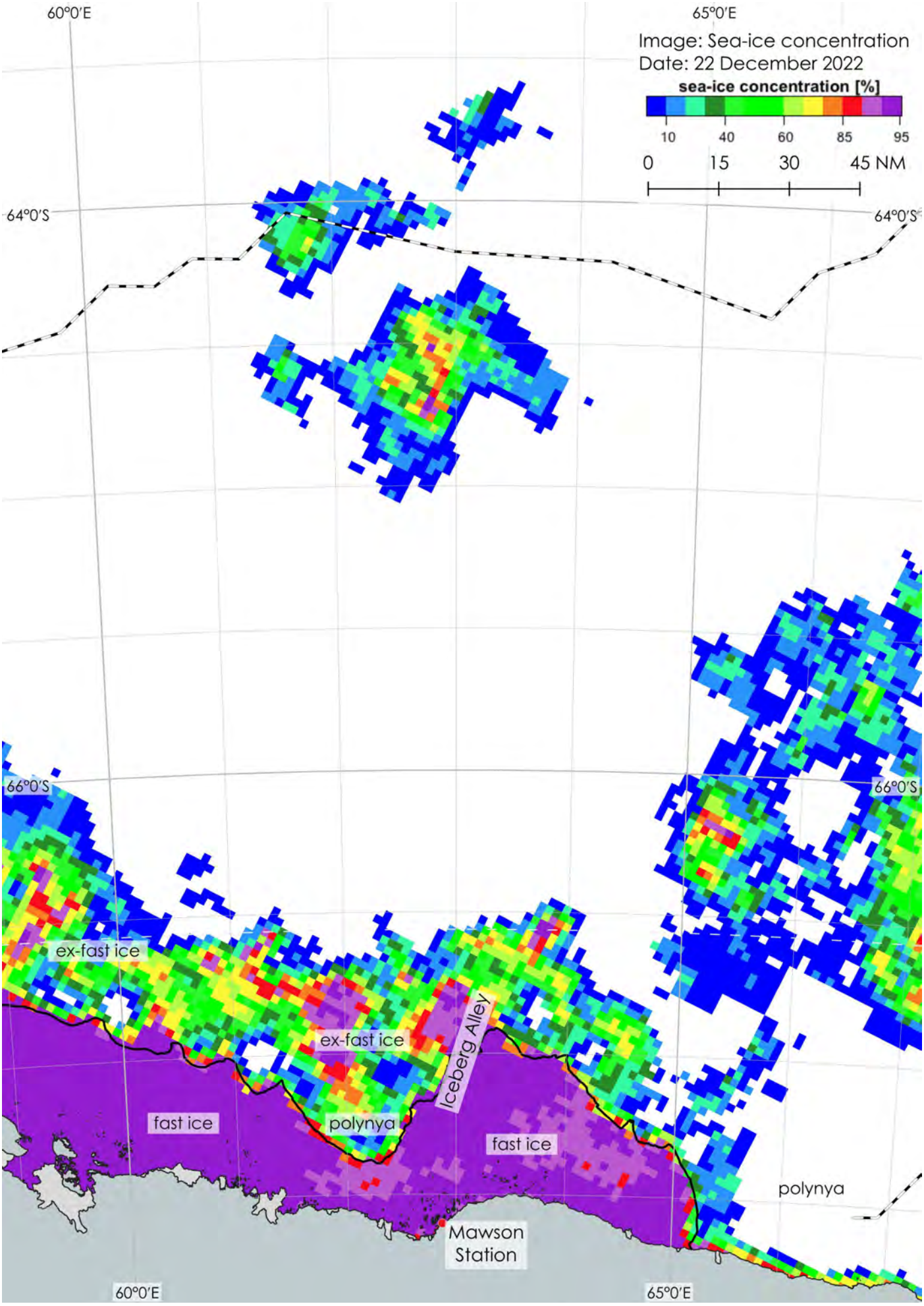


Figure 2: *Sea-ice concentration data acquired 22 December 2022 and provided by ICDC.*

Ice Bulletin: Casey Station

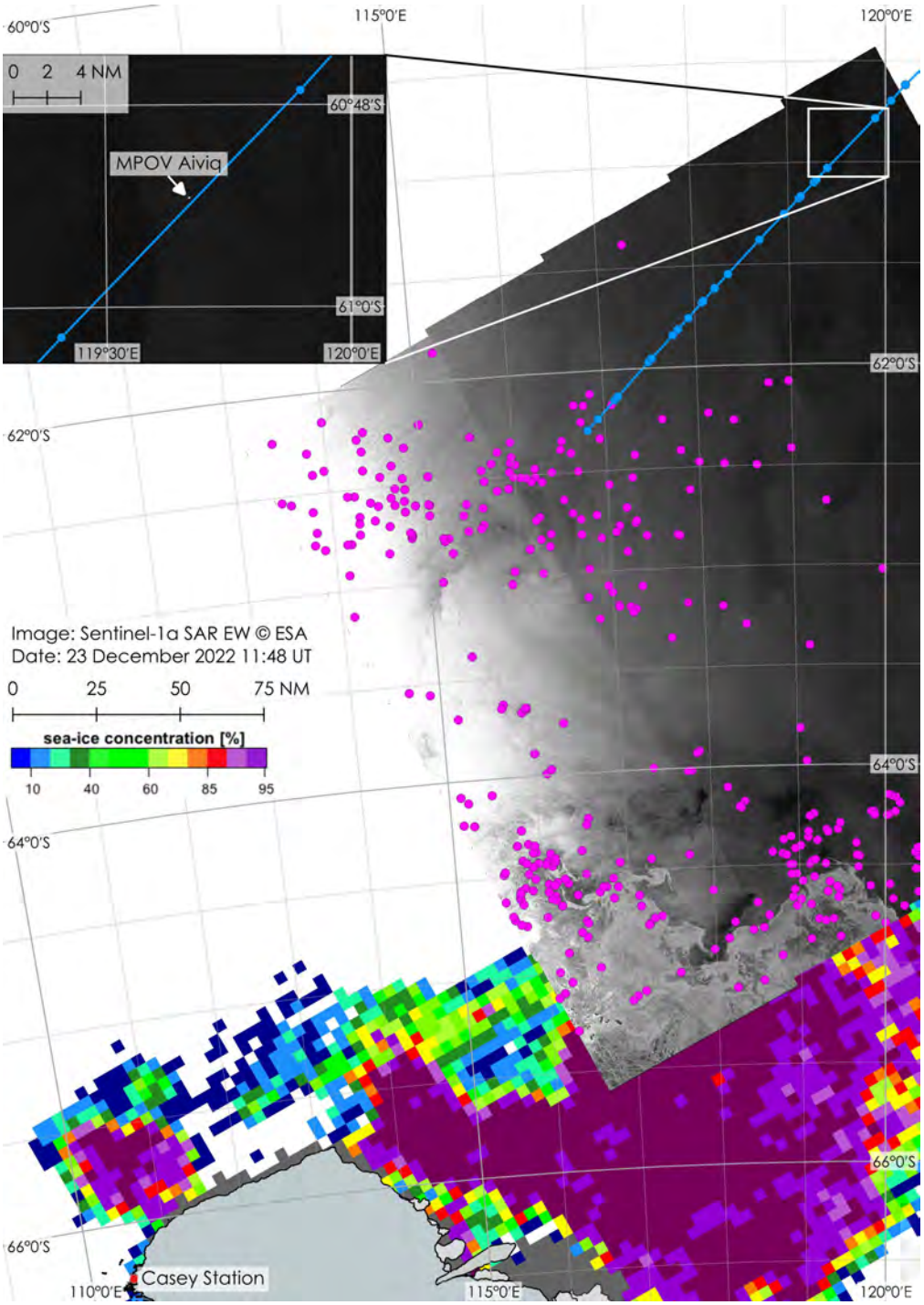
Issued: Saturday 24th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows a composite of data northeast of the Casey Station region. The cruise track of MPOV *Aiviq* is included as a blue line (up until 23 December 2022 23:33 UT). The inset shows the vessel at the time of the SAR data acquisition as a bright spot. The SAR data has been analysed for iceberg presence and more than 350 features have been marked by pink dots.



North of Casey Station, some fast ice remains attached to the western flank of Law Dome but it is breaking up and releasing ex-fast ice floes northward.

Between 108º0'E and 110º0'E, only very little sea ice remains in strips and patches but many small to medium-sized icebergs are present.

Figure 1: *Sentinel-1a SAR EW data acquired 23 December 2022 at 11:48 UT; sea-ice concentration data acquired 23 December 2022; both data sets provided by PolarView.*

Ice Bulletin: Wilkins Aerodrome

Issued: Saturday 24th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data of Wilkins Aerodrome. The scene is obscured by cloud in the western part.

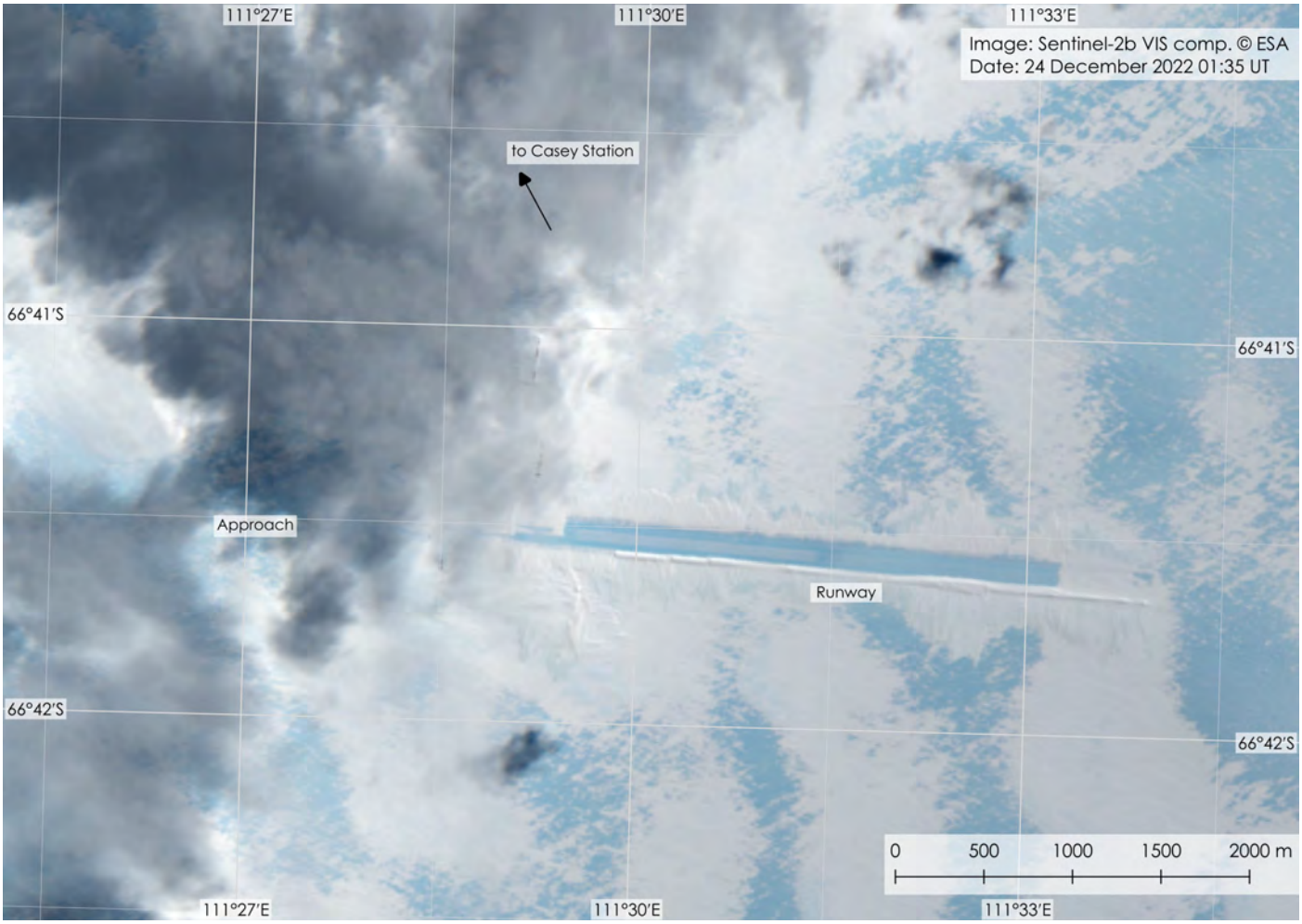


Figure 1: *Sentinel-2b visible composite data acquired 24 December 2022 at 01:35 UT and provided by ESA.*

The ice runway is partly covered by snow. North and south of the runway, snow dunes are left from previous clearing the runway.

Ice Bulletin: Casey Station

Issued: Wednesday 28th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off the Casey Station region. The cruise track of MPOV *Aiviq* is included as a blue line (up until 27 December 2022 22:41 UT). At the time of the SAR data acquisition, the vessel can be seen as a bright spot off station.

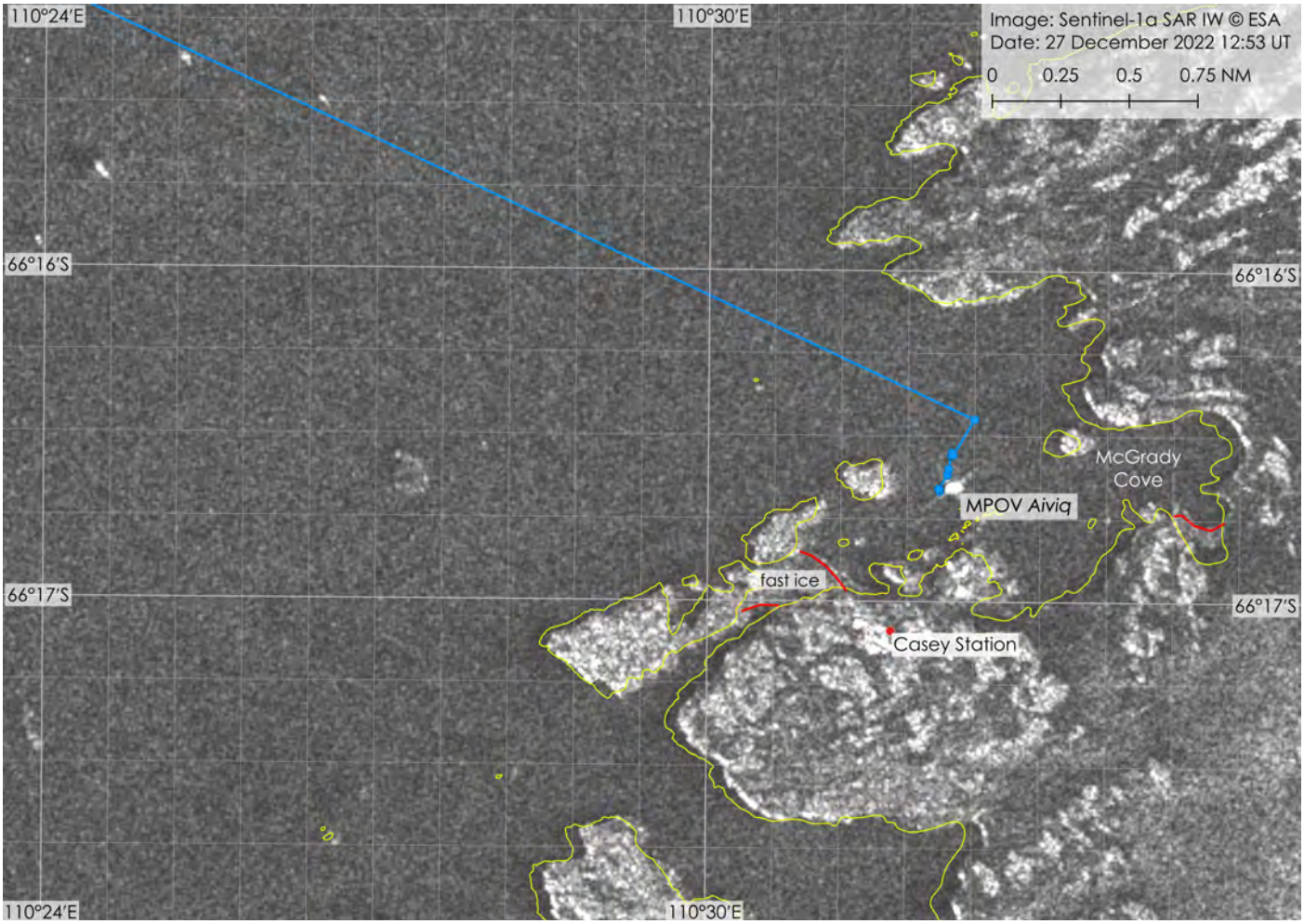


Figure 1: *Sentinel-1a SAR IW data acquired 27 December 2022 at 12:53 UT and provided by ESA.*

Off station, little fast ice remains nearshore and some icebergs are drifting in the polynya offshore.

North of Casey Station (outside of Figure 1), some fast ice remains attached to the western flank of Law Dome but it is breaking up and releasing ex-fast ice floes northward.

Further north and west of 107º30'E, the sea-ice edge is within a few nautical miles of the December median sea-ice extent, while east of 110º0'E the sea-ice edge is roughly 50 nautical miles below (south of) the media extent. Between 107º30'E and 110º0'E, the coast is exposed to the ocean but many small to medium-sized icebergs are present.

Ice Bulletin: Mawson Station

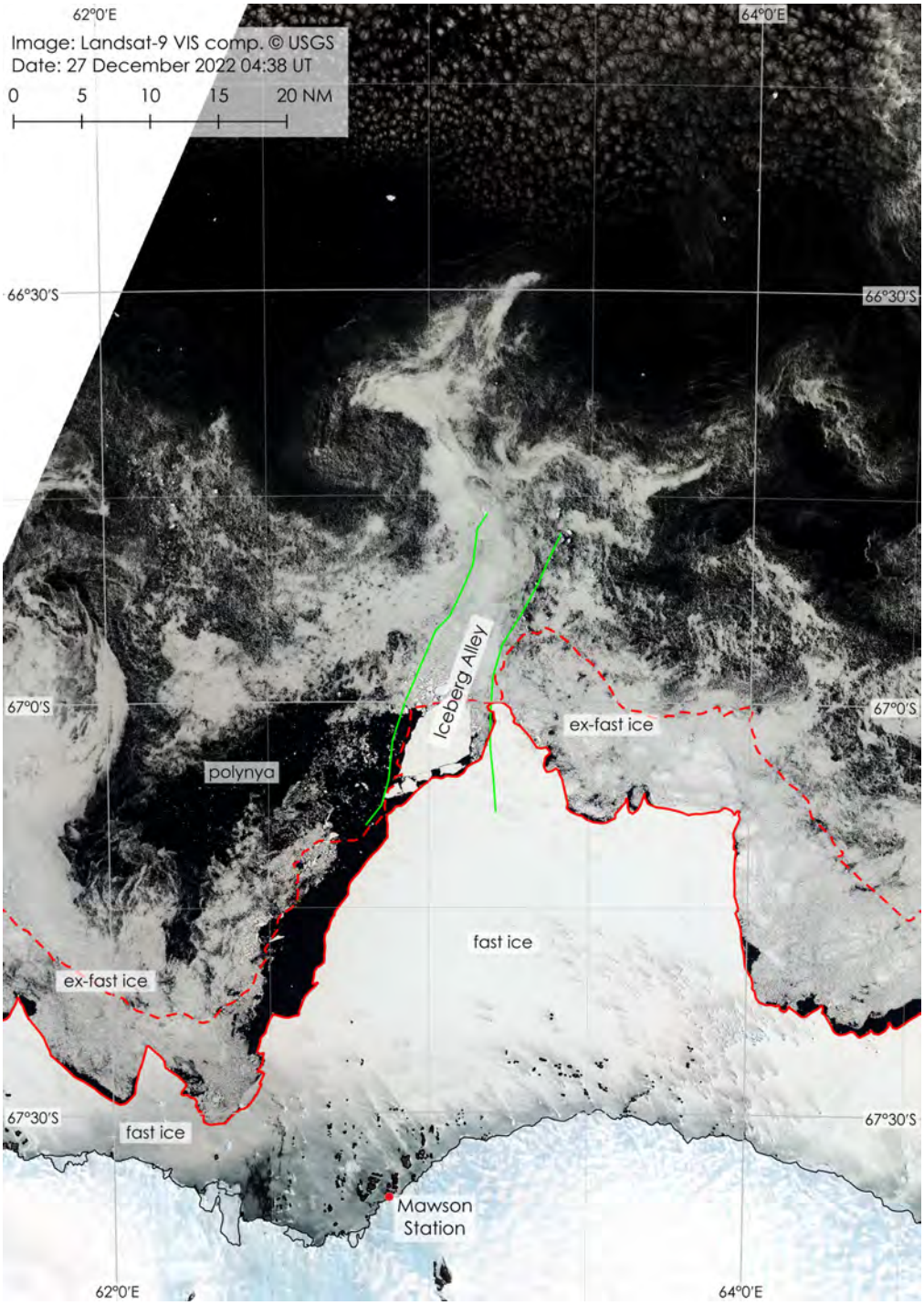
Issued: Wednesday 28th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (30 m horizontal) visible data off Mawson Station. The fast-ice edge is marked by a red line (dashed red for 22 December 2022).



North of the station, fast ice is now also breaking in the southern part of Iceberg Alley (marked by green outlines).

West of the station, rotting fast ice nearshore is expanding northward and starting to connect with the polynya northwest of the station.

Further east, the fast-ice edge moved southward since 22 December 2022. North of the fast ice, first-year sea ice and ex-fast ice is drifting freely. Some icebergs are also present.

The northern sea-ice edge (not shown in the figure) has largely collapsed and is generally 150 nautical miles below (south of) the median sea-ice extent for December. However, isolated patches of deteriorating sea ice and freely drifting icebergs remain within the climatological December median extent.

Figure 1: *Landsat-9 VIS composite data acquired 27 December 2022 at 04:38 UT and provided by USGS.*

Ice Bulletin: Mawson Station

Issued: Friday 30th December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows visible data off Mawson Station. The fast-ice edge is marked by a red line (dashed red for 27 December 2022).

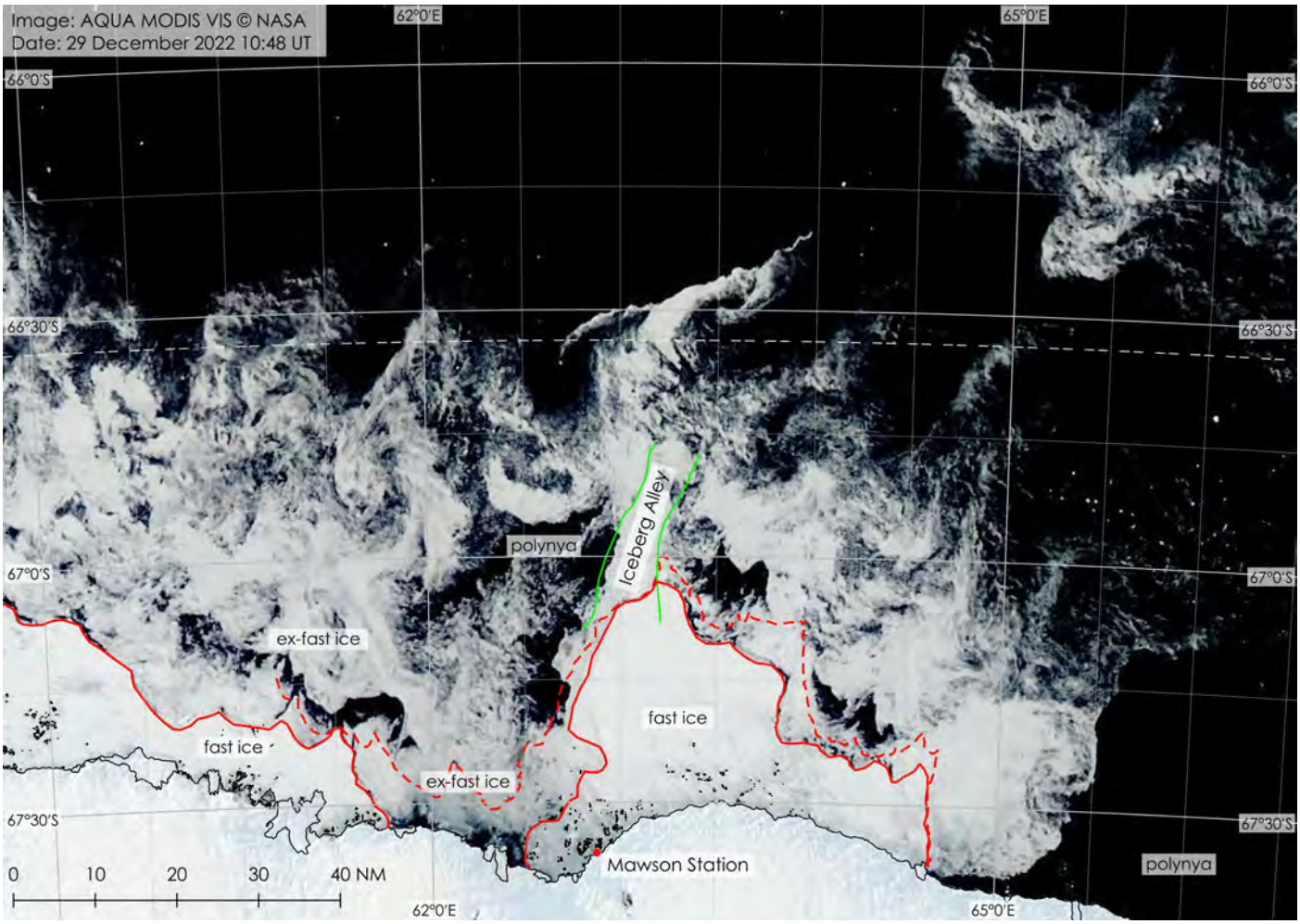


Figure 1: *AQUA MODIS VIS composite data acquired 29 December 2022 at 10:48 UT and provided by NASA.*

West of the station, fast ice has now broken off along roughly 20 nautical miles nearshore, and the polynya northwest of the station has expanded southward.

North of the station, Iceberg Alley (marked by green outlines) is almost clear of fastened sea ice but remains filled with decaying ex-fast ice.

Further east, the fast-ice edge moved further southward since 27 December 2022. North of the fast ice, deteriorating first-year sea ice and ex-fast ice is drifting freely. Some icebergs are also present.

The northern sea-ice edge (roughly along 66º30'S east of 65º0'E) has largely collapsed and is generally 150 nautical miles below (south of) the median sea-ice extent for December (not shown in the figure). However, isolated patches of melting sea ice and freely drifting icebergs remain within the climatological December median extent.

Ice Bulletin: Davis Station

Issued: Saturday 31st December 2022

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data off Davis Station. The fast-ice edge on 20 December 2022 is included as a dashed red line.

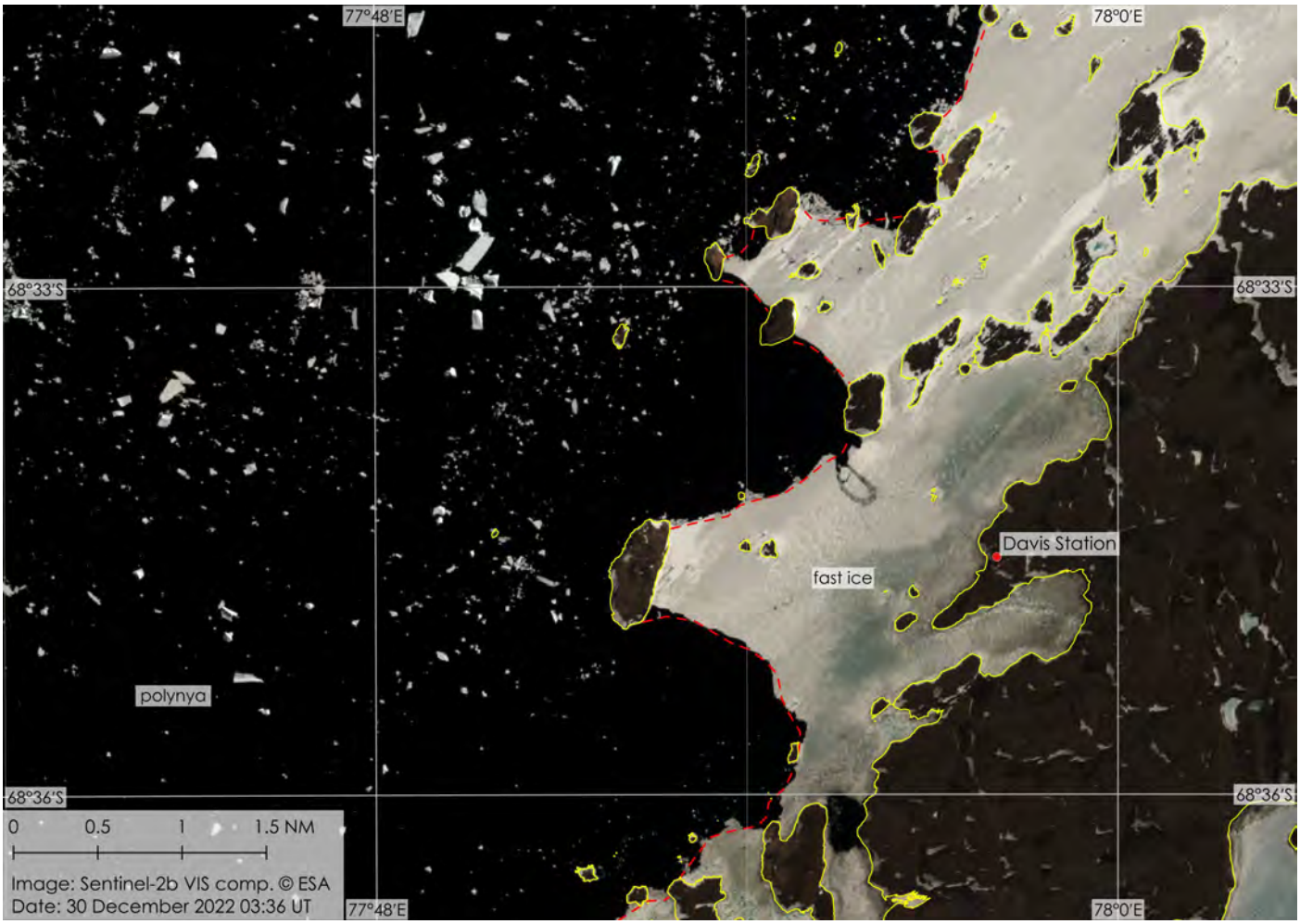


Figure 1: *Sentinel-2b visible composite data acquired 30 December 2022 at 03:36 UT and provided by ESA.*

Fast-ice edge remains currently largely stable and only a little more than 1 nautical mile offshore. Off station, the teardrop created in the fast ice by MPOV *Aiviq* leaving earlier is still visible.

Most icebergs offshore are grounded but some are drifting with decaying ex-fast ice floes generally south-westward.

Figure 2 provides a larger-scale overview of the Vestfold Hills offshore.

South of the station, areas where nearshore fast ice is melting through are marked by light blue dots. Some melting is also observed in Long Fjord.

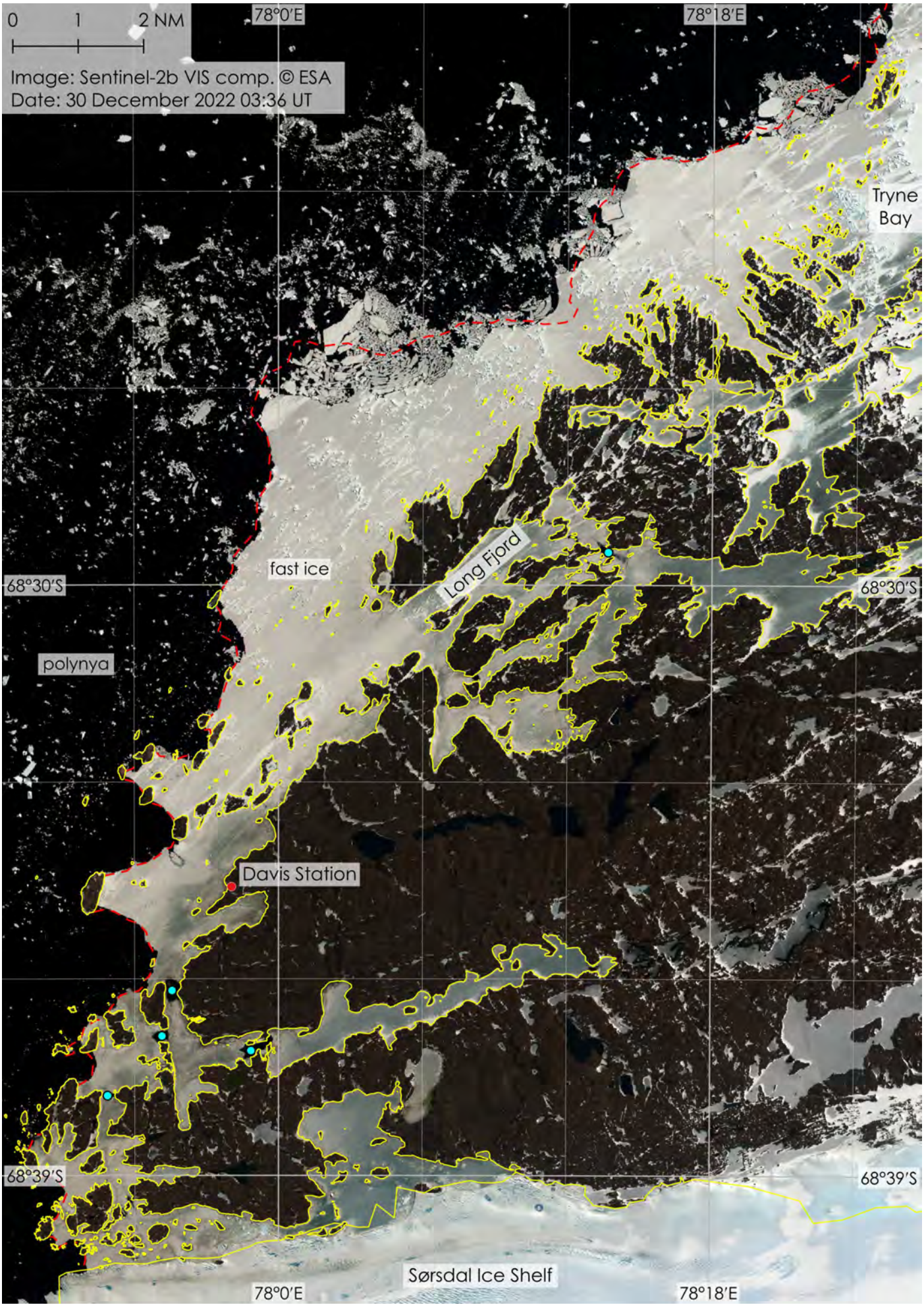


Figure 2: *Sentinel-2b visible composite data acquired 30 December 2022 at 03:36 UT and provided by ESA.*

Ice Bulletin: Casey Station

Issued: Sunday 1st January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off the Casey Station region. The fast-ice edge is marked with a red line (dashed red line for 14 December 2022).

North of Casey Station, some fast ice remains attached to the western flank of Law Dome but it is breaking up and releasing ex-fast ice floes northward.

Further north and west, pack ice consisting of decaying first-year sea ice and breaking up ex-fast ice is drifting between 108º0'E and 110º0'E.

Many small to medium-sized icebergs are also present.

Figure 2 provides the same geographical frame as Figure 1 but a composite of visible data.

The high-resolution Landsat-8 data are processed to show ice on the ocean with a light-blue tint and clouds with a pink tint.

Between 109º0'E and 110º0'E, the pack-ice zone is obscured by clouds but some of the open pack ice can be identified.

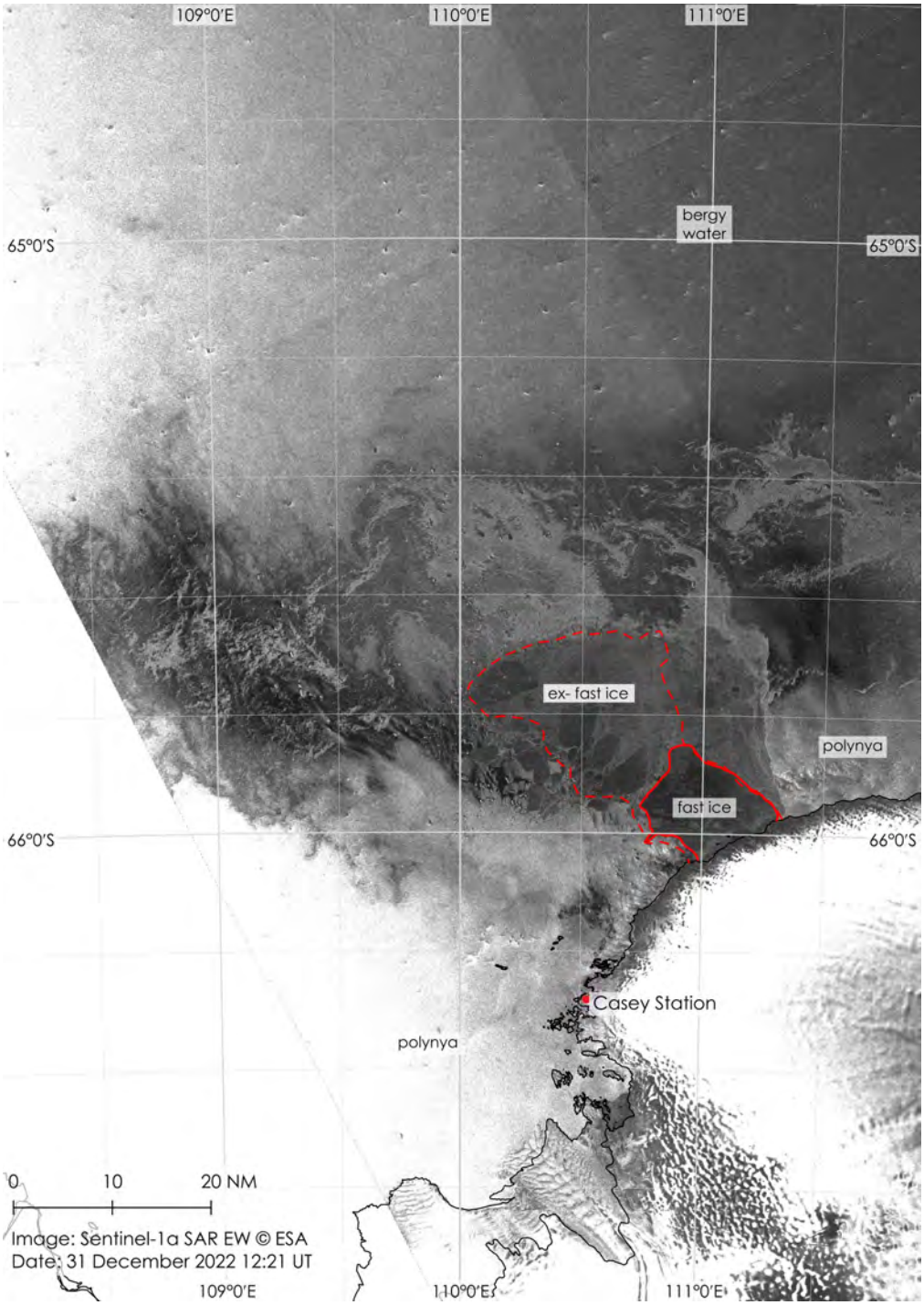


Figure 1: *Sentinel-1a SAR EW data acquired 31 December 2022 at 12:21 UT and provided by PolarView.*

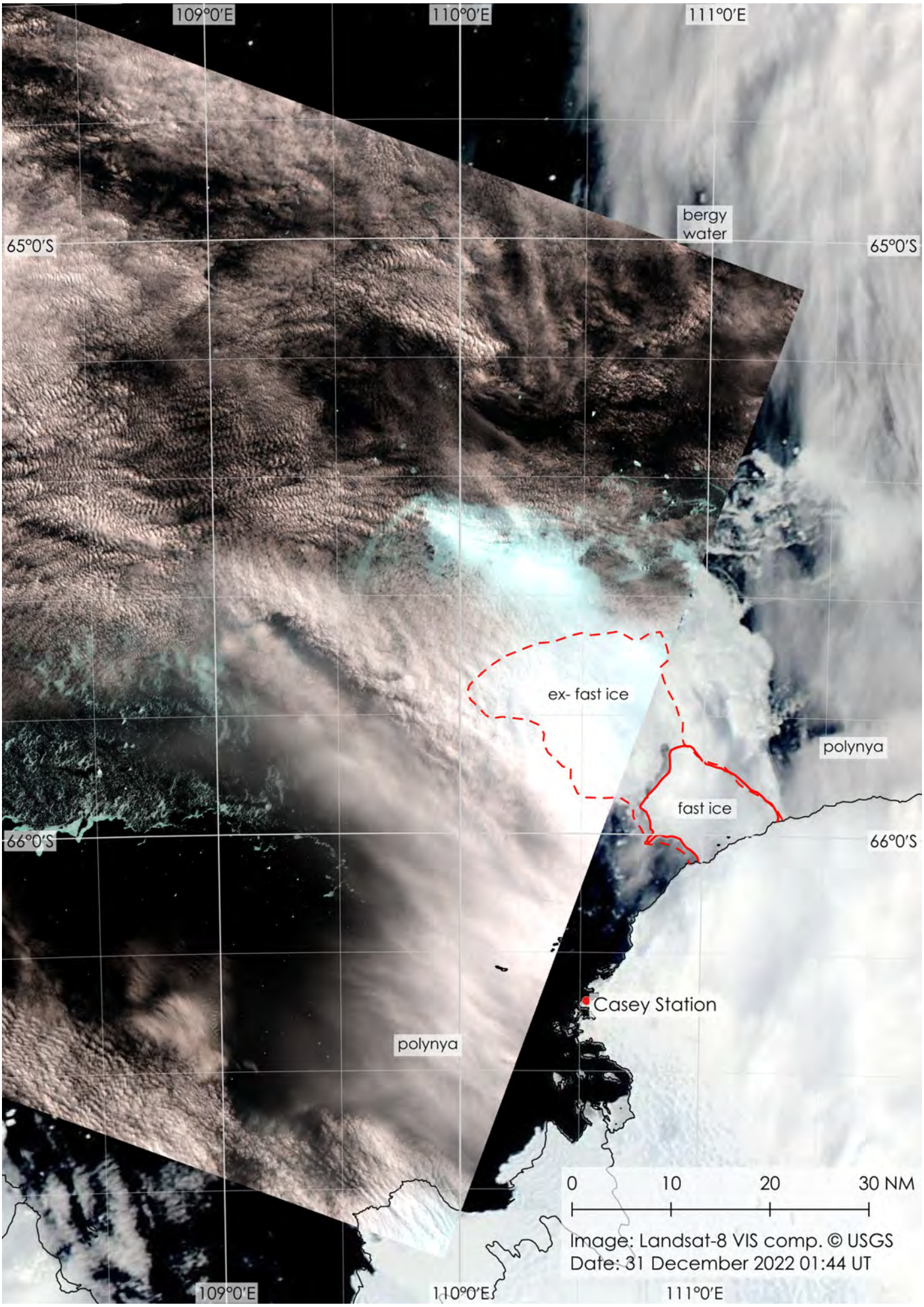


Figure 2: *AQUA MODIS VIS data acquired 31 December 2022 at 07:18 UT and provided by NASA; overlay of Landsat-8 VIS composite data acquired 31 December 2022 at 01:44 UT and provided by USGS.*

Ice Bulletin: Casey Station

Issued: Sunday 1st January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible of Casey Station. The positon of MPOV *Aiviq* on 1 January 2023 at 03:04 UT is marked by a blue dot.

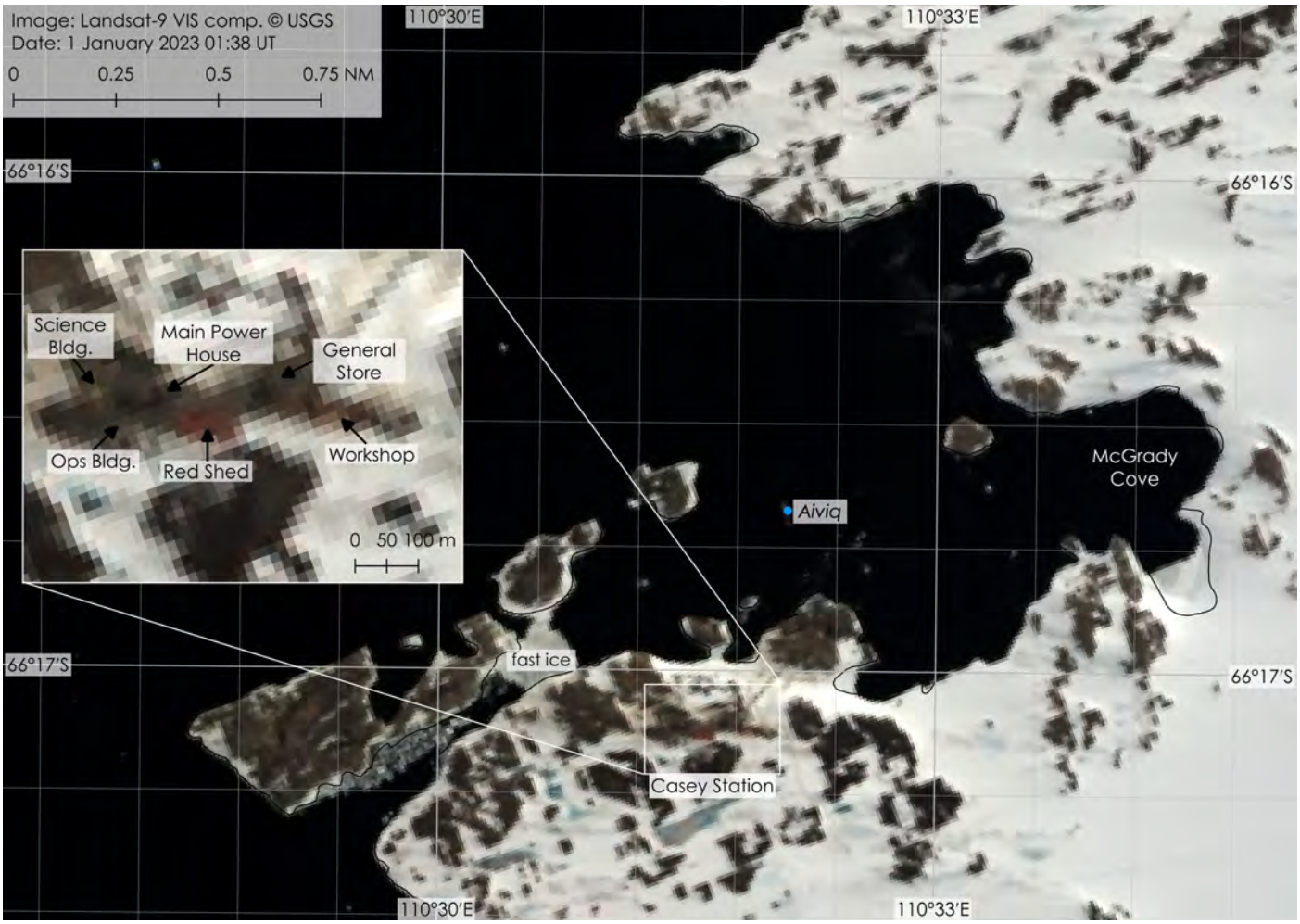


Figure 1: *Landsat-9 visible composite pan-sharpened data acquired 1 January 2023 at 01:38 UT and provided by USGS.*

Only very little fast ice remains in sheltered bays around the station.

Figure 2 provides the same data as Figure 1 but a larger overview northwest of Law Dome.

Pack ice consisting of decaying first-year sea ice and breaking up ex-fast ice is drifting between 108º0'E and 110º0'E.

Many small to medium-sized icebergs are also present.

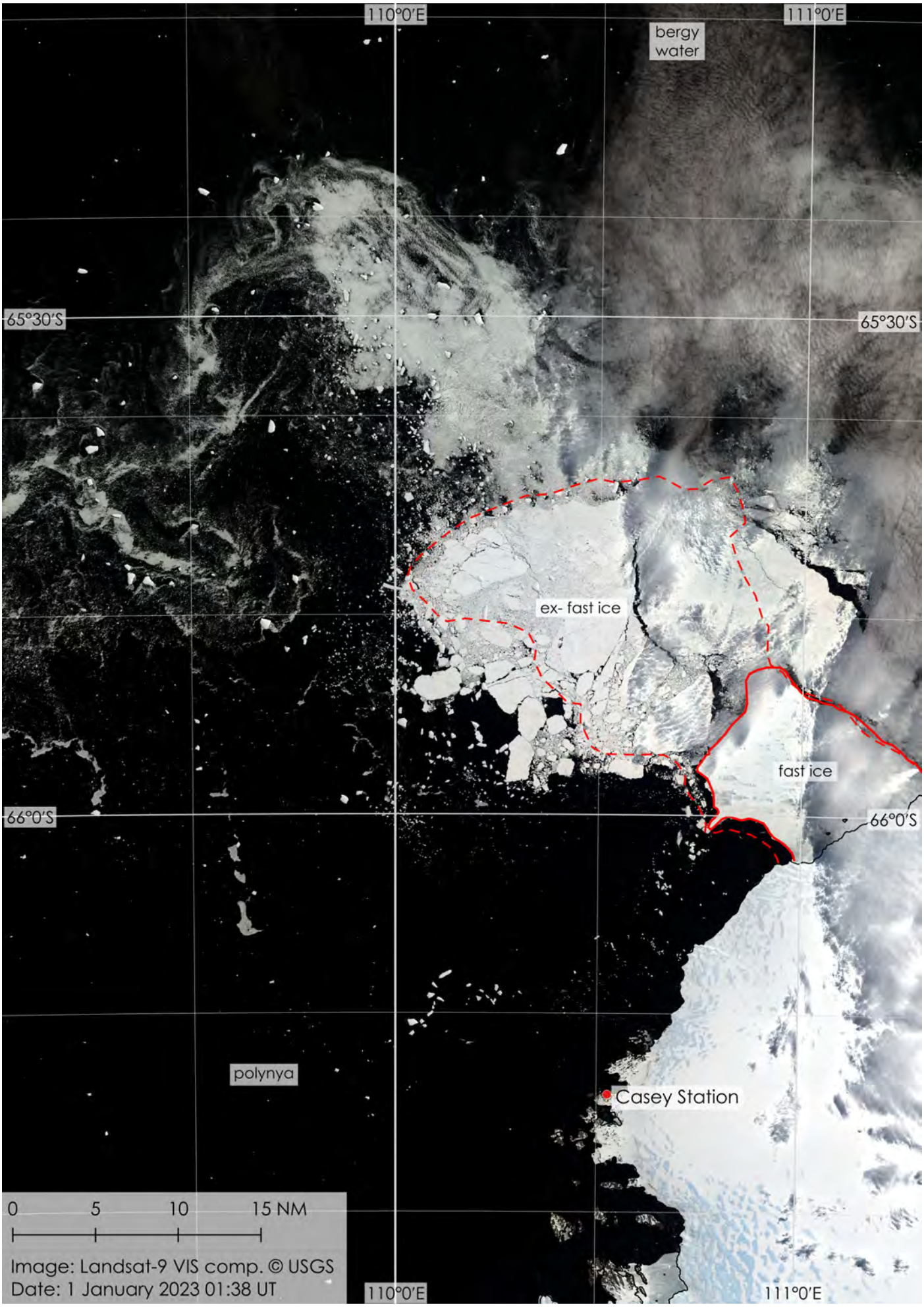


Figure 2: *Landsat-9 visible composite data acquired 1 January 2023 at 01:38 UT and provided by USGS.*

Ice Bulletin: Cape Darnley

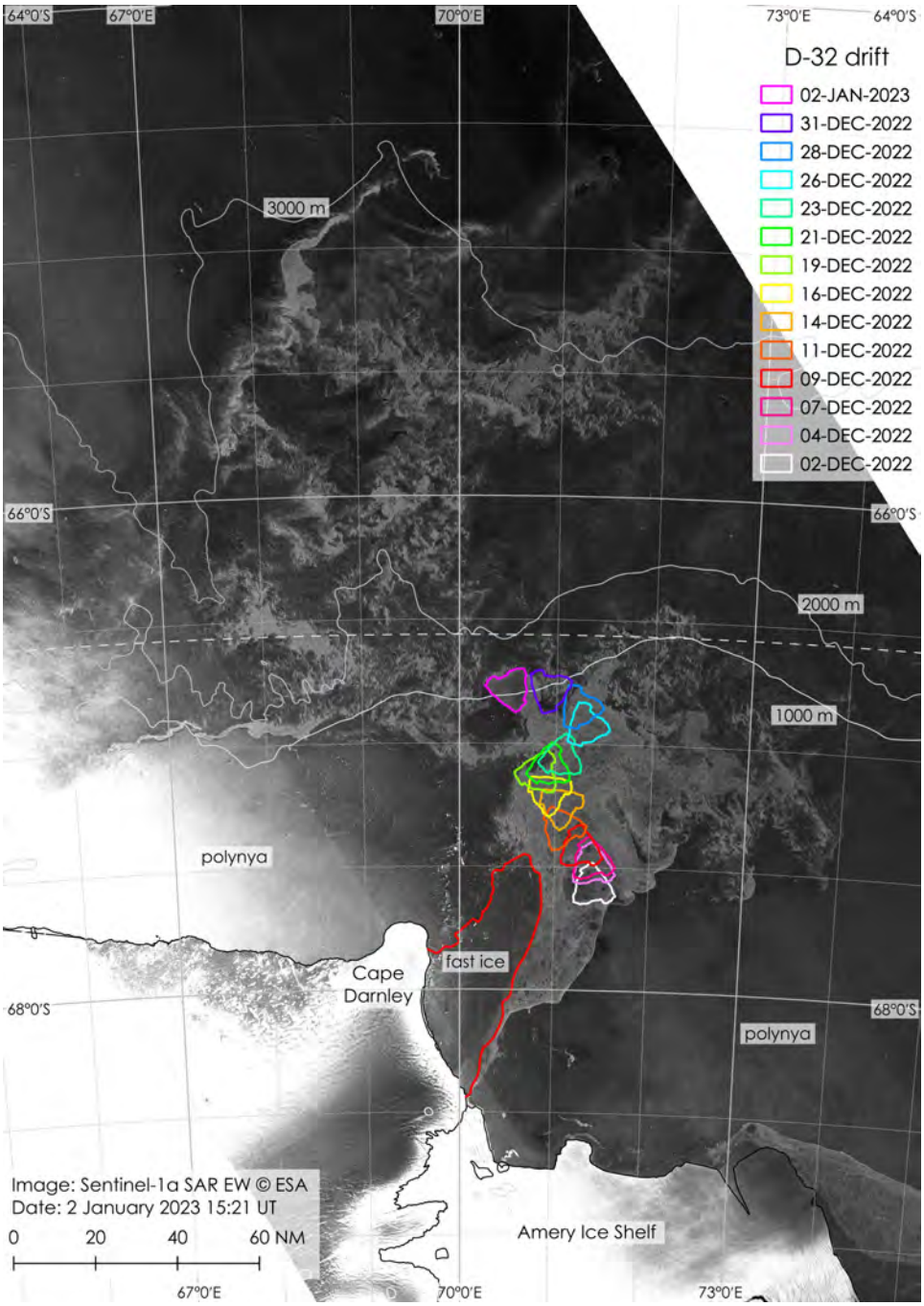
Issued: Tuesday 3rd January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Cape Darnley. The fast-ice edge is marked as a red outline. The drift of iceberg D-32 during December 2022 is indicated by colour-coded shapes. Seafloor bathymetry is included as grey lines.



The iceberg has drifted beyond (north of) the continental shelf and has turned westward. It is expected it will continue its drift roughly along the shelf break.

Off Cape Darnley, fast ice continues to break up. Sea ice is present as far north as 64º30'S but it is generally decaying and roughly 50 nautical miles below (south of) the median sea-ice extent for December along 70º0'E and up to 150 nautical miles below (south of) the median further west (including north of Mawson Station, which is outside of the figure).

Figure 1: *Sentinel-1a SAR EW data acquired 2 January 2023 at 15:21 UT and provided by PolarView.*

Ice Bulletin: Casey Region

Issued: Tuesday 3rd January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data northeast if the Casey Station region. Seafloor bathymetry corresponding to the background has been included as grey lines. The position of MPOV *Aiviq* on 3 January 2023 at 02:01 UT is marked by a blue dot.

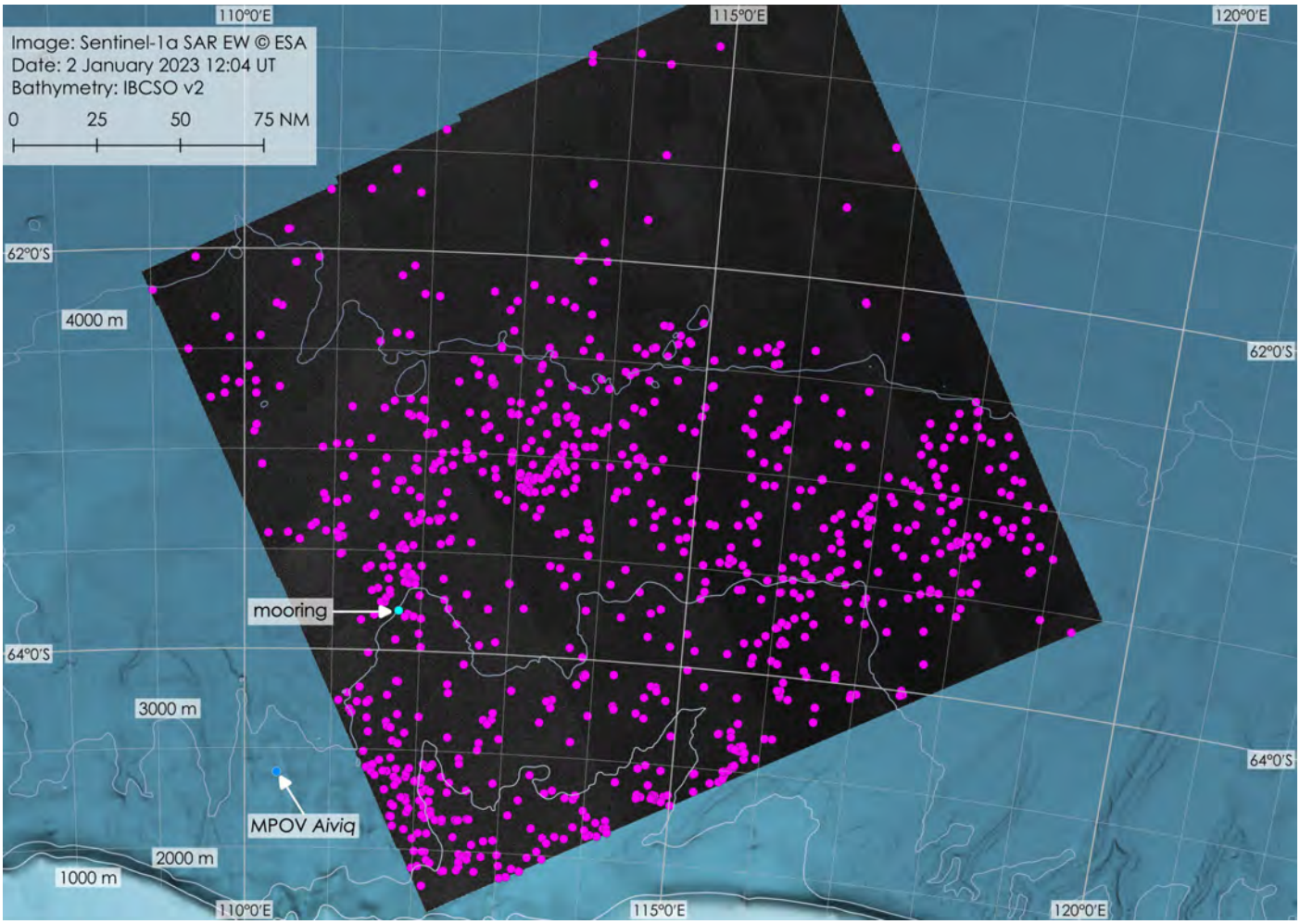


Figure 1: *Sentinel-1a SAR EW data acquired 2 January 2023 at 12:04 UT and provided by ESA.*

The SAR data have been analysed for iceberg presence and more than 840 features have been marked by pink dots. Drifting icebergs are present as far north as 61º0'S and in the vicinity of an oceanographic mooring (marked by a light blue dot).

Ice Bulletin: D'Urville Sea

Issued: Tuesday 3rd January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data north of Mawson's Huts in the southern D'Urville Sea.

Iceberg B-9B is still restless within the confiments of grounded smaller icebergs.

Ex-fast ice is deteriorating around the iceberg and generally drifting westward through small to medium-sized grounded icebergs.

East of iceberg B-9B, a fragment of iceberg C-35 remains close to iceberg B-9B.

Off Mawson's Huts, Cape Denison is ice free.

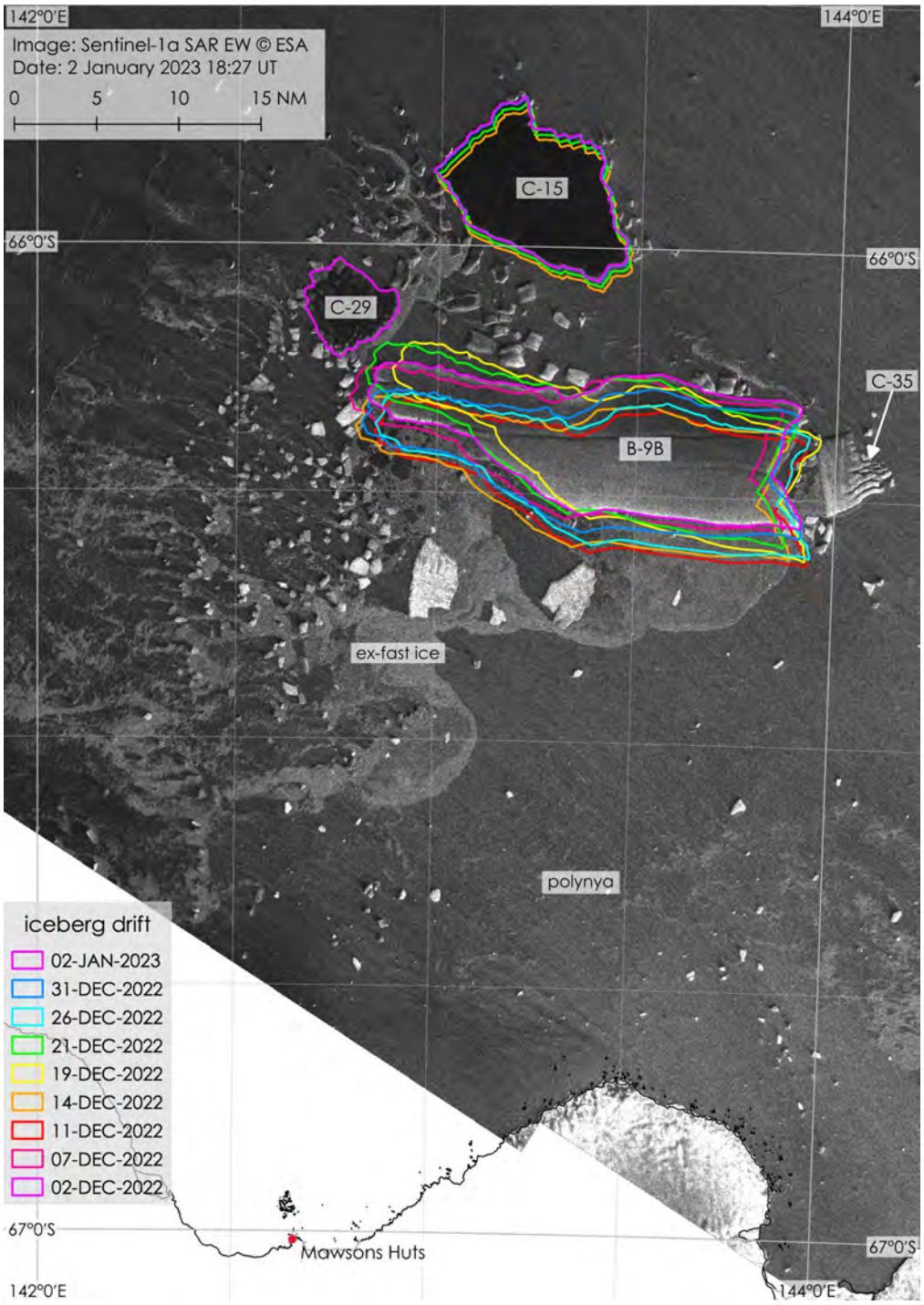


Figure 1: *Sentinel-1a SAR EW data acquired 2 January 2023 at 18:27 UT and provided by PolarView.*

Ice Bulletin: Casey Station

Issued: Wednesday 4th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data of the Casey Station region. The fast-ice edge is included as a red line.

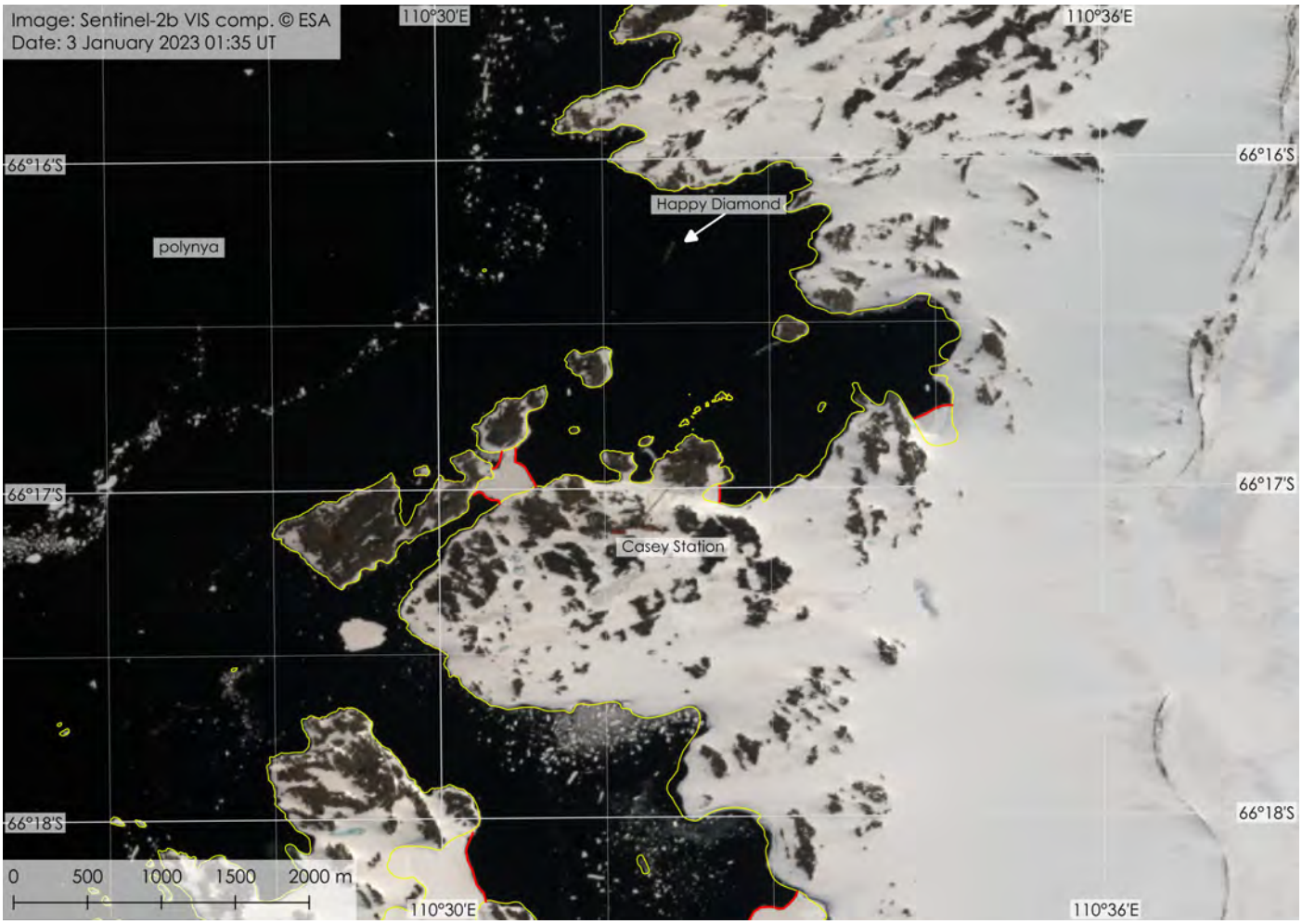


Figure 1: *Sentinel-2b visible composite data acquired 3 January 2023 at 01:35 UT and provided by ESA.*

Around Casey Station, very little fast ice remains in sheltered bays and it is breaking up and releasing ex-fast ice floes.

Figure 2 shows a larger scale overview of the same data as Figure 1.

Only isolated sea-ice floes and icebergs are present in the polynya offshore.

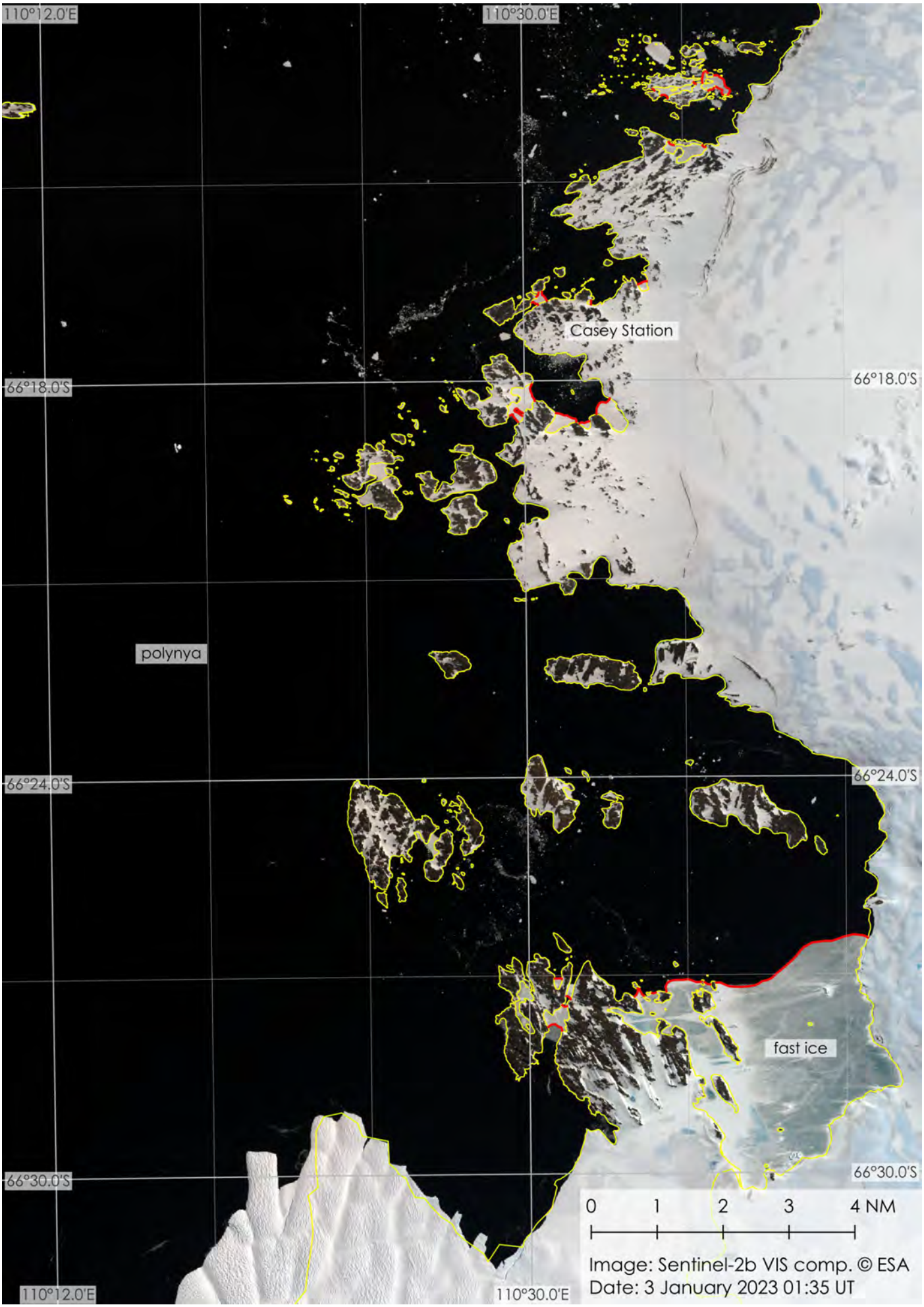


Figure 2: *Sentinel-2b visible composite data acquired 3 January 2023 at 01:35 UT and provided by ESA.*

Ice Bulletin: Wilkins Aerodrome

Issued: Wednesday 4th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data of Wilkins Aerodrome. Some cloud shadows are visible in the lower left corner.

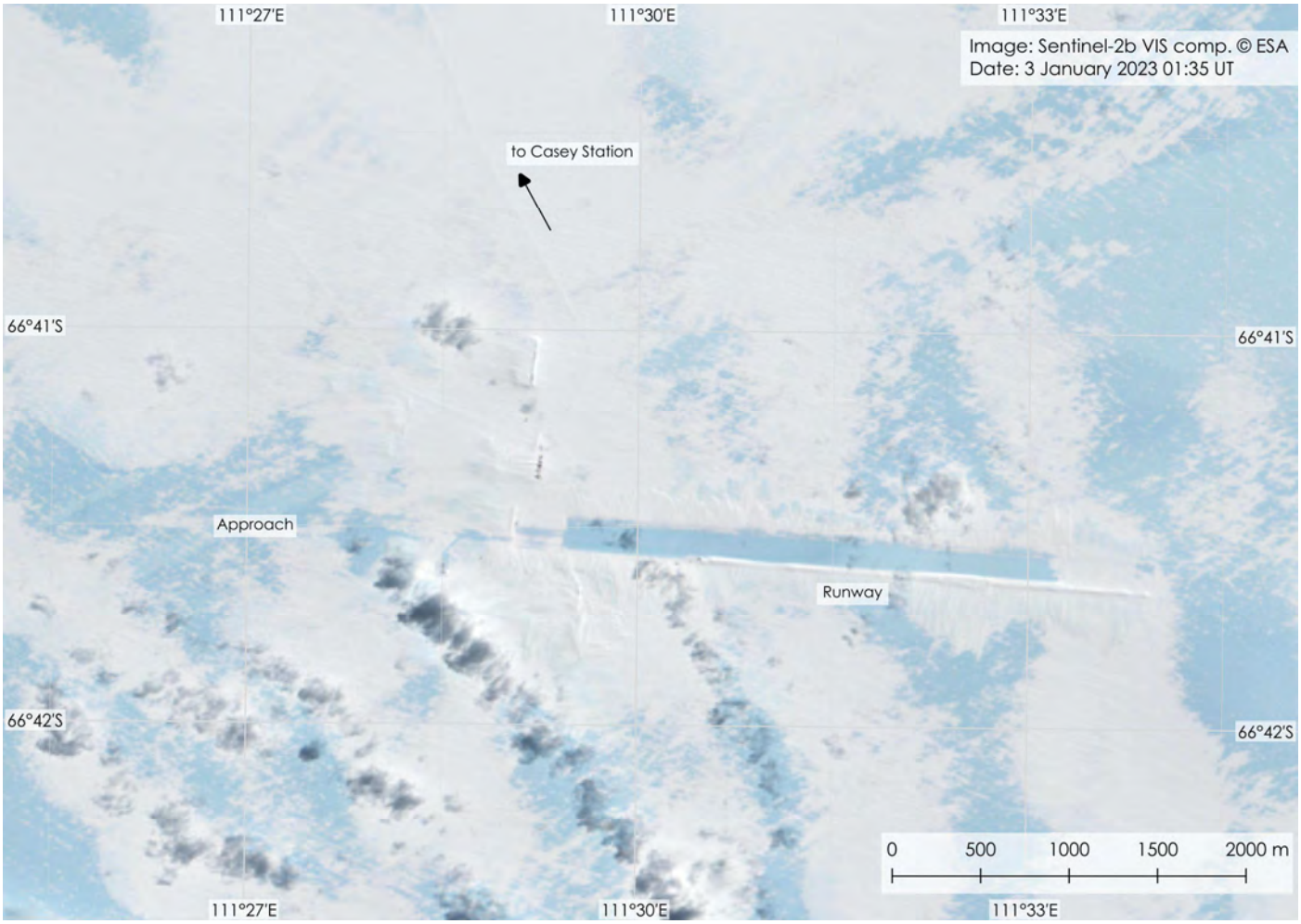


Figure 1: *Sentinel-2b visible composite data acquired 3 January 2023 at 01:35 UT and provided by ESA.*

The ice runway is partly covered by snow. North and south of the runway, snow dunes are left from previous clearing the runway.

Snow dunes have also accumulated in the lee of the camp and other structures.

Ice Bulletin: Davis Station

Issued: Wednesday 4th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution SAR data off Davis Station. The fast-ice edge on 22 December 2022 is included as a dashed red line.

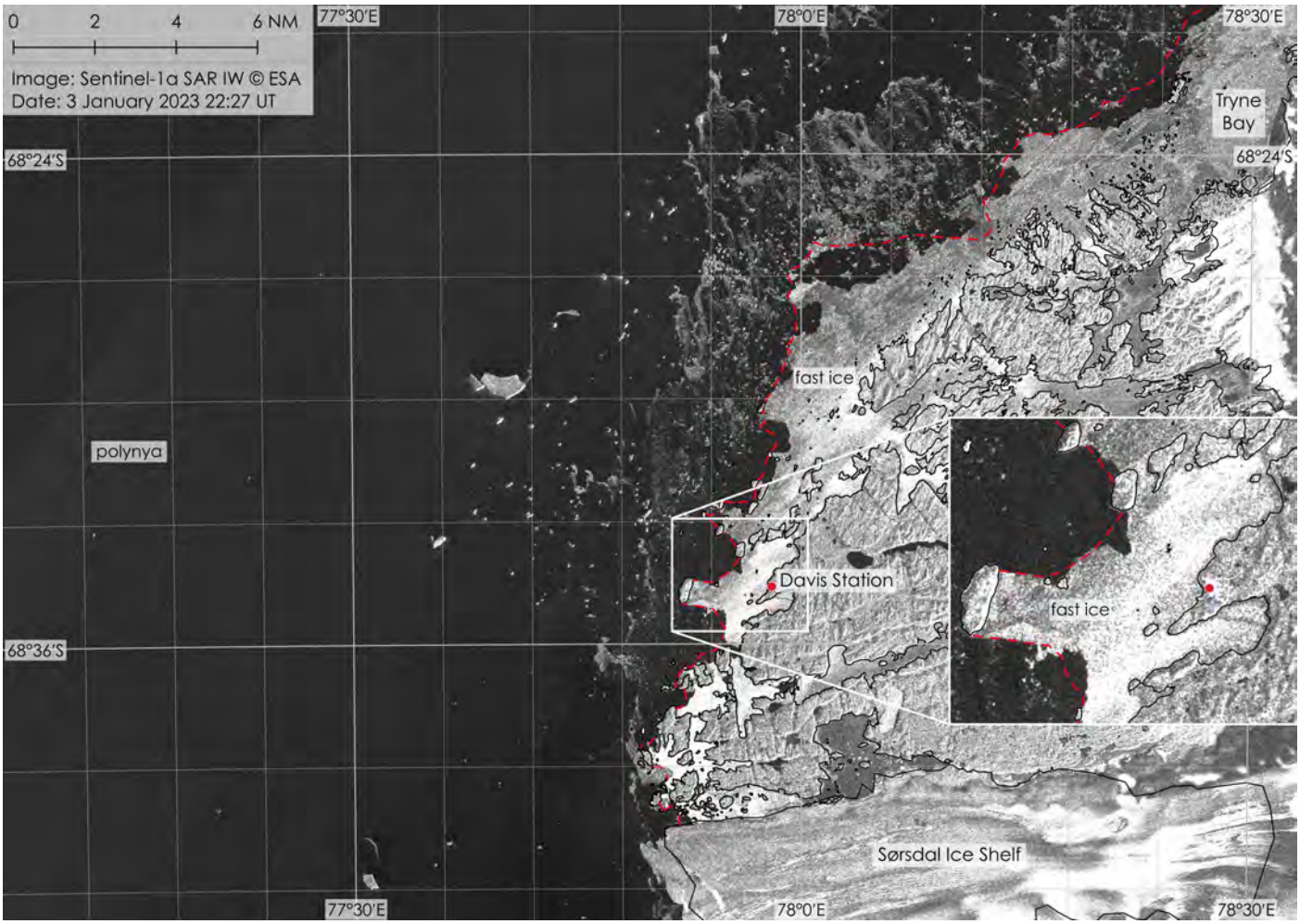


Figure 1: *Sentinel-1a SAR IW data acquired 3 January 2023 at 22:27 UT and provided by PolarView.*

Fast-ice edge remains currently largely stable and roughly 1 nautical mile offshore. Off station, the teardrop created in the fast ice by MPOV *Aiviq* leaving earlier has now broken out.

Most icebergs offshore are grounded but some are drifting with decaying ex-fast ice floes.

South of the station, areas previously identified where nearshore fast ice is melting through (see Ice Bulletin from 31 December 2022) are growing in extent.

Ice Bulletin: Mawson Station

Issued: Wednesday 4th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Mawson Station. The fast-ice edge on 31 December 2022 is marked by a dashed red line.

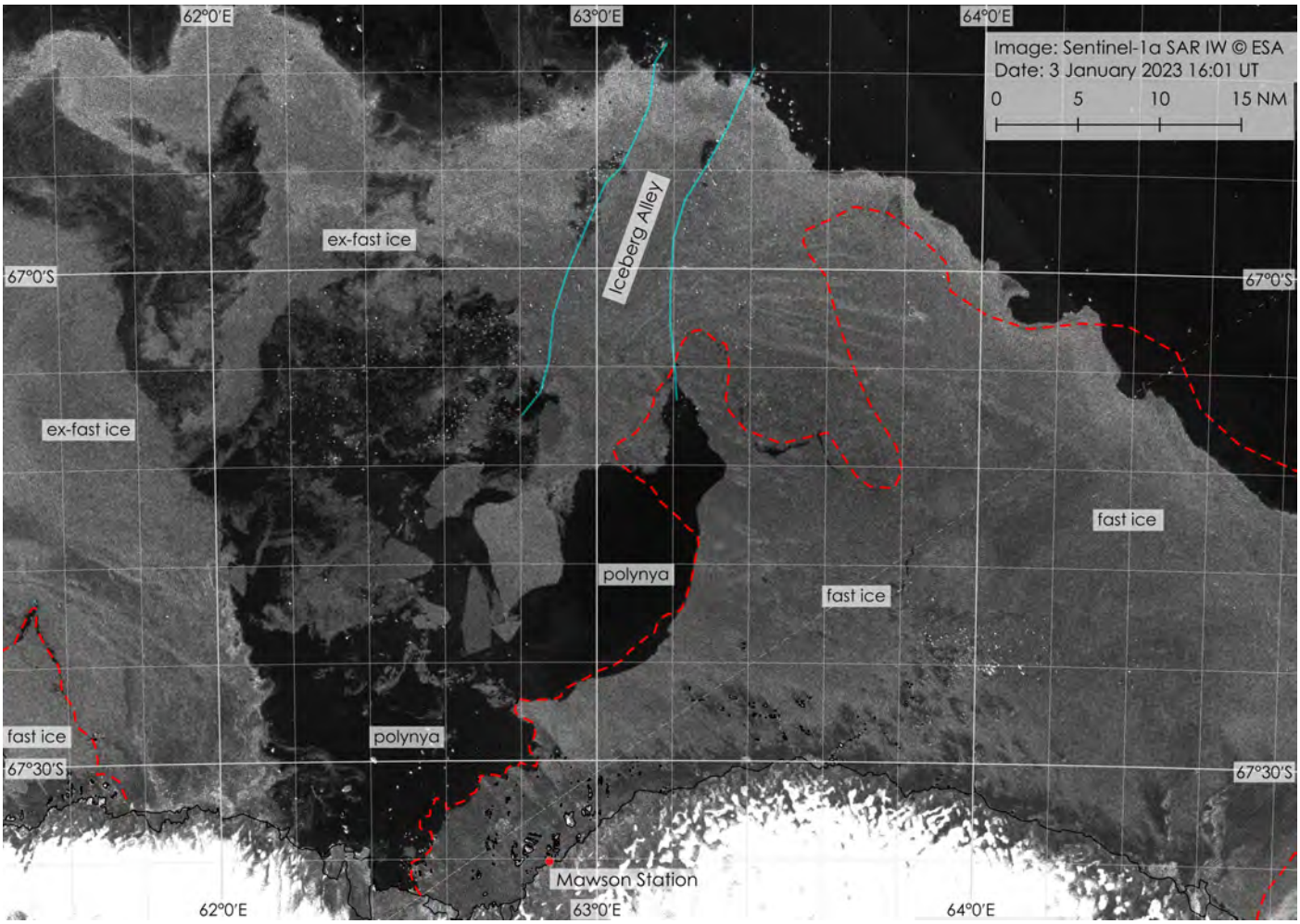


Figure 1: *Sentinel-1a SAR EW data acquired 3 January 2023 at 16:01 UT and provided by PolarView.*

West of the station, fast ice has broken off along roughly 20 nautical miles nearshore, and the polynya northwest of the station has expanded southward.

North of the station, Iceberg Alley (marked by blue outlines) is clear of fastened sea ice but remains filled with decaying ex-fast ice.

Further east, the fast-ice edge moved further southward since 31 December 2022. North of the fast ice, deteriorating first-year sea ice and ex-fast ice is close to the fast-ice edge. Some icebergs are also present.

The northern sea-ice edge remains generally 150 nautical miles below (south of) the median sea-ice extent for December (not shown in the figure).

Ice Bulletin: Mawson Station

Issued: Wednesday 4th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data off Mawson Station.

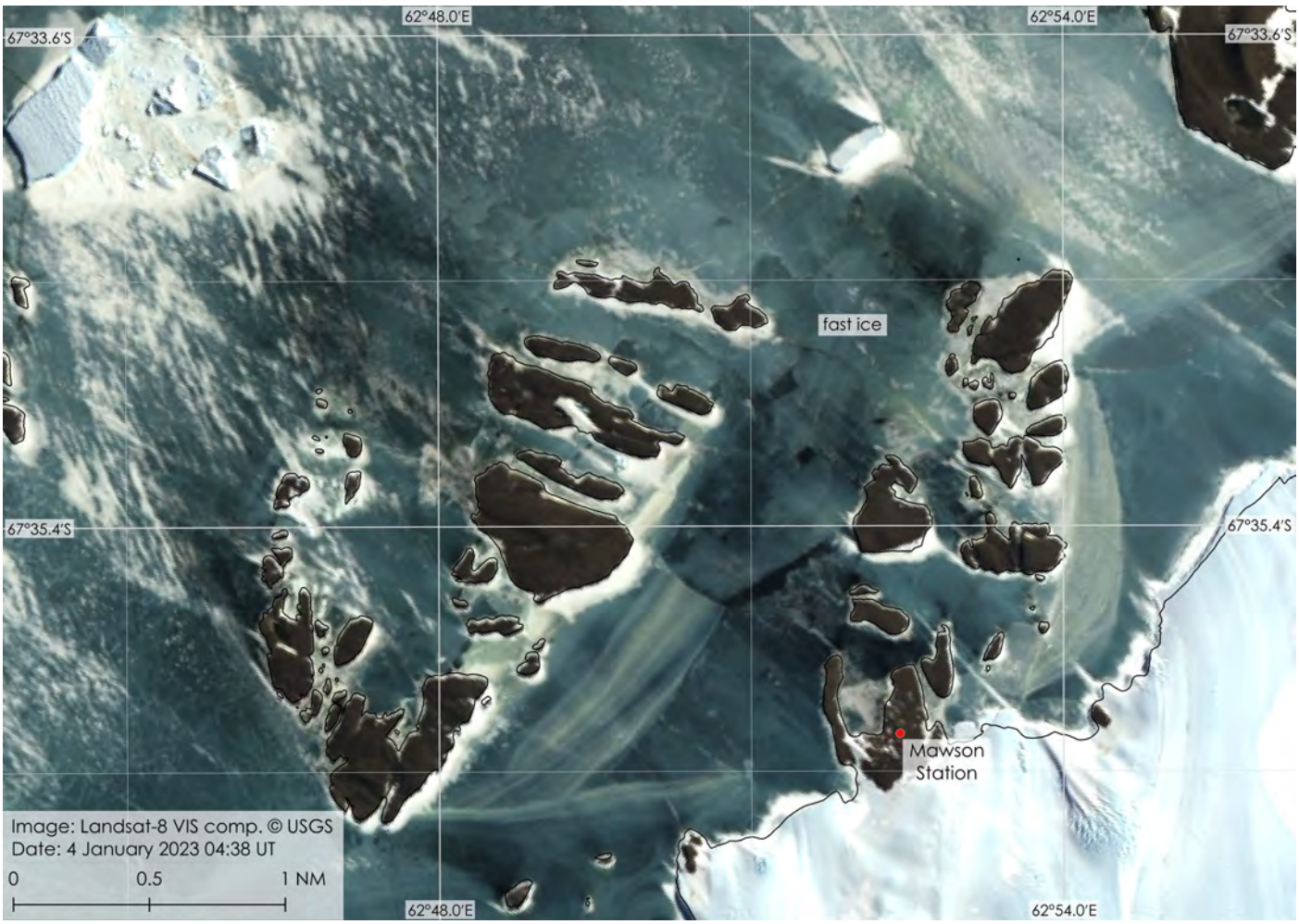


Figure 1: *Landsat-8 visible composite pan-sharpened data acquired 4 January 2023 at 04:38 UT and provided by USGS.*

Off station, the surface of the fast ice reveals different freezing stage when the ice was formed last autumn. Some patches offshore start to show signs of thawing through now.

Figure 2 shows a larger-scale overview north of the station. The general ice conditions have not changed significantly since our last Mawson Station Ice Bulletin.

The fast-ice edge is marked by a red line (dashed red for 31 December 2022).

West of the station, fast ice has broken off along roughly 20 nautical miles nearshore, and the polynya northwest of the station has expanded towards the shoreline.

North of the station, Iceberg Alley (marked by blue outlines) is clear of fastened sea ice but remains filled with decaying ex-fast ice.

Further east, the fast-ice edge moved further southward since 31 December 2022. North of the fast ice, deteriorating first-year sea ice and ex-fast ice is drifting close to the fast-ice edge. Some icebergs are also present.

The northern sea-ice edge remains generally 150 nautical miles below (south of) the median sea-ice extent for December (not shown in the figure).

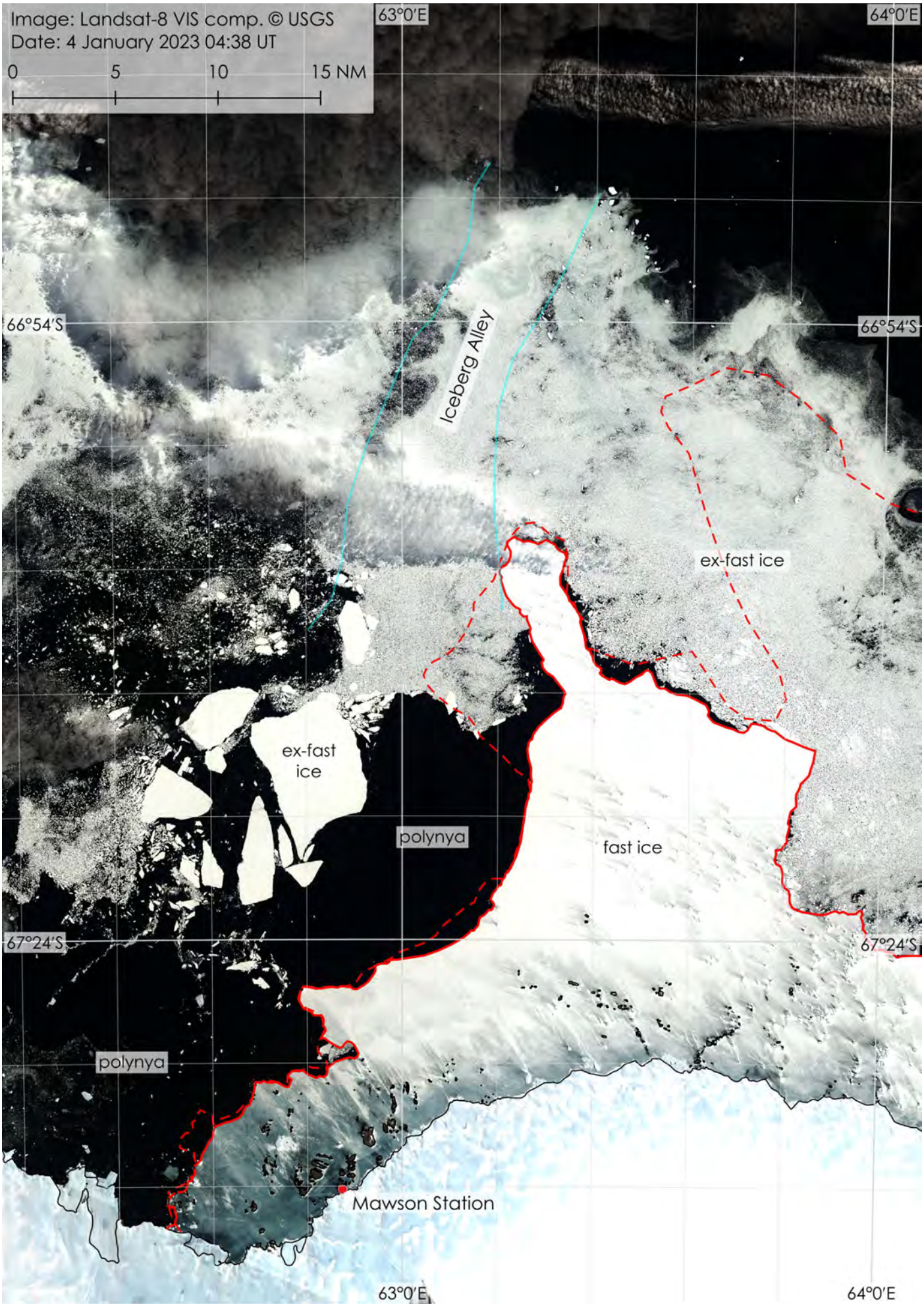


Figure 2: *Landsat-8 visible composite pan-sharpened data acquired 4 January 2023 at 04:38 UT and provided by USGS.*

Ice Bulletin: Casey Station

Issued: Friday 6th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data of the Casey Station region. The fast-ice edge is included as a red line. The cruise track of MV *Happy Diamond* is shown as a yellow line (up to 6 January 2023 01:20 UT).

In the vicinity of Casey Station, only minimal fast ice remains in sheltered bays. Further north, some fast ice remains off the western flank of Law Dome. It is breaking up and releasing ex-fast ice floes north- and westward.

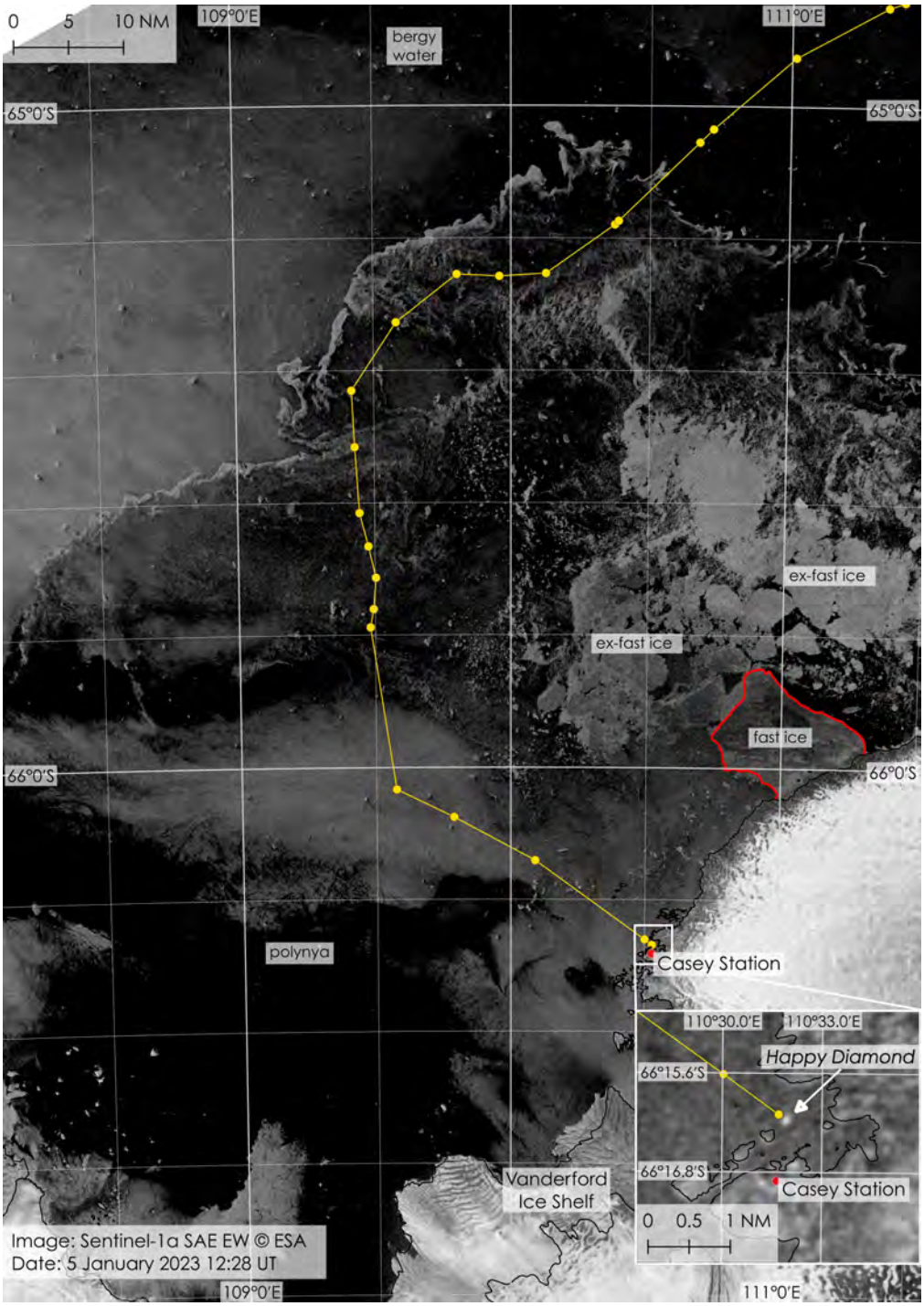


Figure 1: *Sentinel-1a SAR EW data acquired 5 January 2023 at 12:28 UT and provided by ESA.*

Ice Bulletin: Casey Station

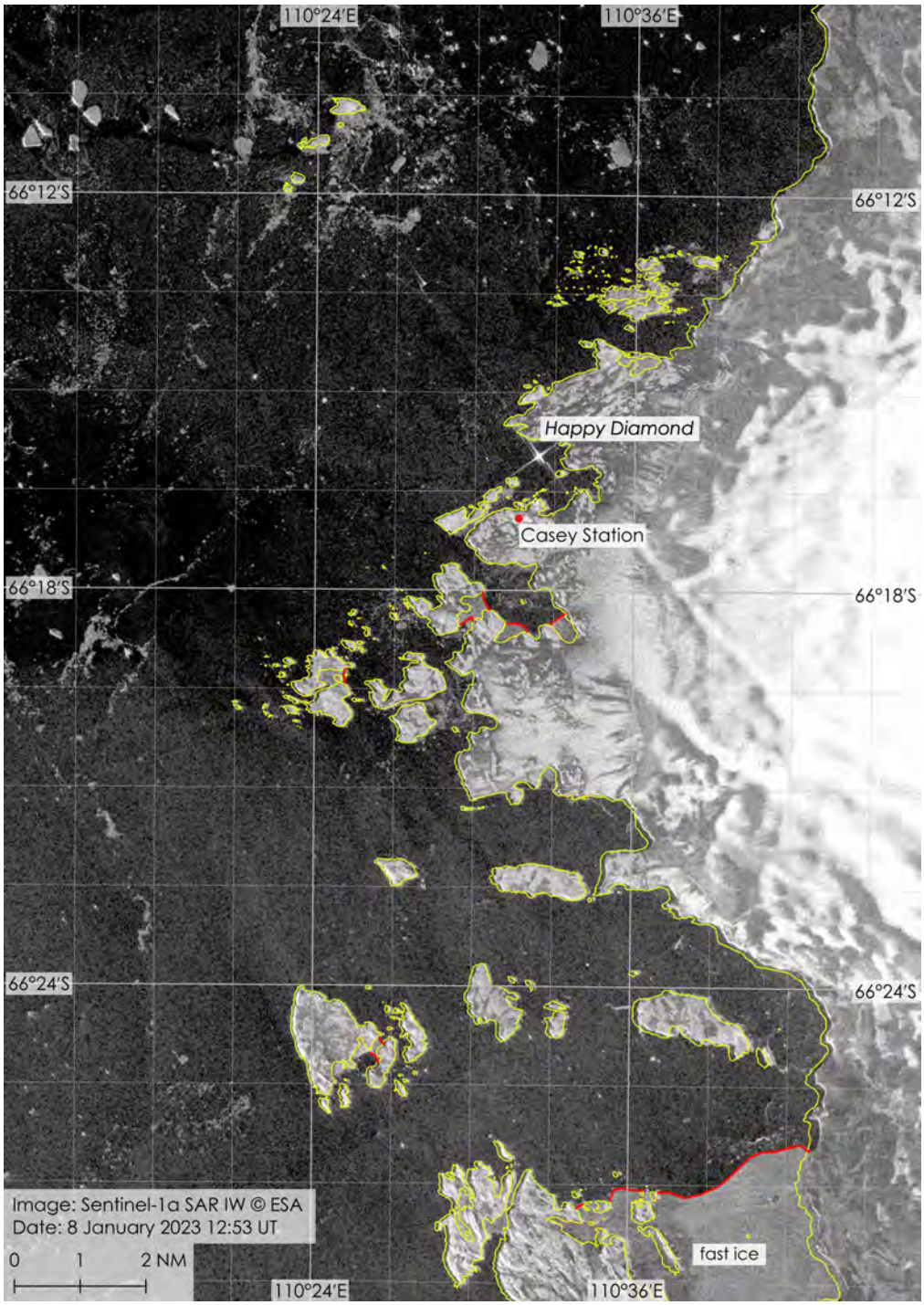
Issued: Monday 9th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data of the Casey Station region. The fast-ice edge is included as a red line. The position of MV *Happy Diamond* at the time of data acquisition is seen as bright star northeast of the station.



In the vicinity of Casey Station, minimal fast ice remains in sheltered bays.

Further north (outside of Figure 1), some fast ice remains off the western flank of Law Dome. It is breaking up and releasing ex-fast ice floes north- and westward.

Figure 1: *Sentinel-1a SAR IW data acquired 8 January 2023 at 12:53 UT and provided by ESA.*

Ice Bulletin: Mawson Station

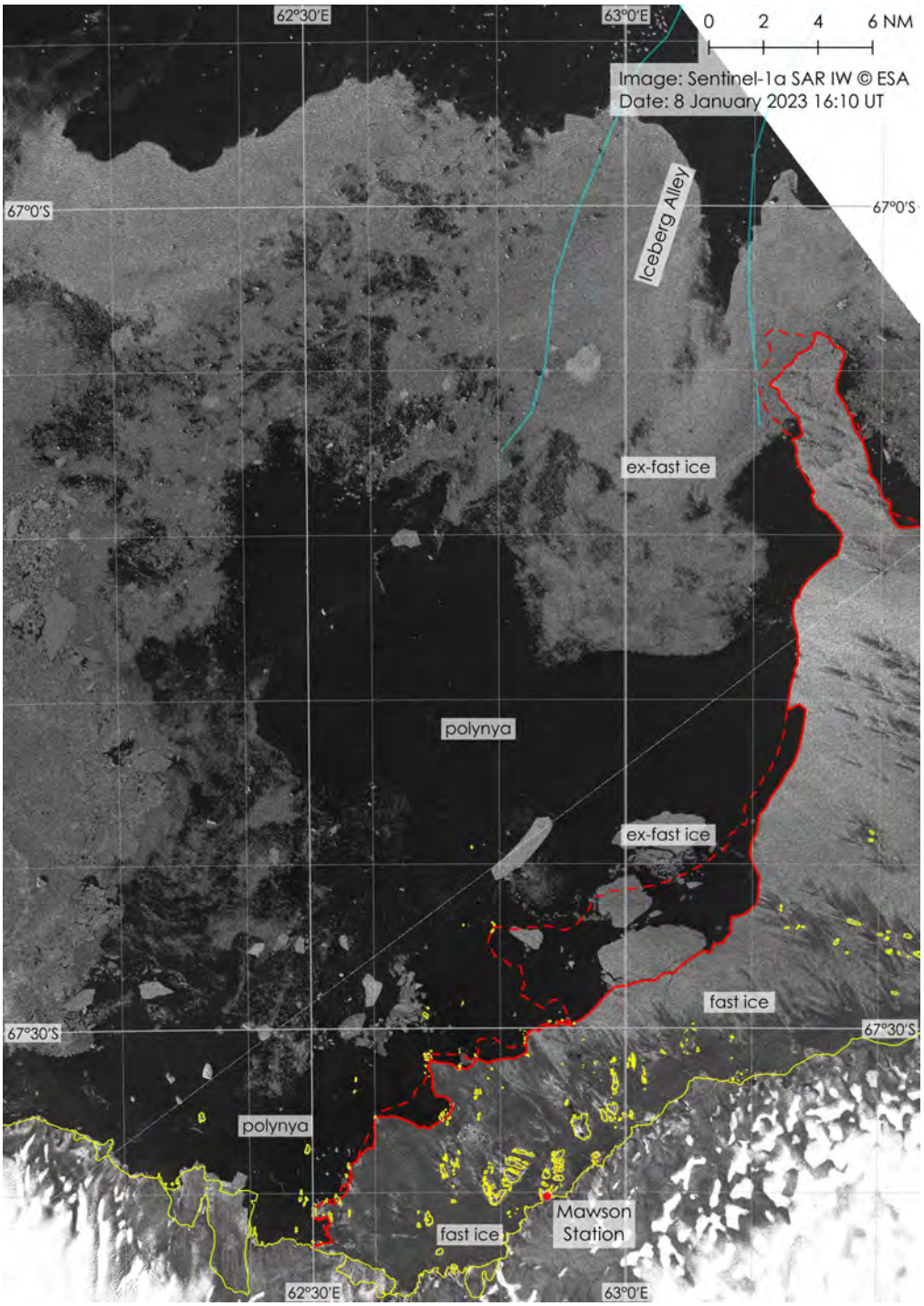
Issued: Monday 9th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution SAR data off Mawson Station. The fast-ice edge is marked with a red line (dashed red line for 4 January 2023). A thin white diagonal line is a stitching artefact where two consecutive scenes join.



North of the station, Iceberg Alley (marked by blue outlines) is clear of fastened sea ice but remains filled with decaying ex-fast ice.

Between the alley and the station, fast ice continues to break up.

The northern sea-ice edge remains generally a couple of nautical miles below (south of) the median sea-ice extent for January (not shown in the figure).

Figure 1: *Sentinel-1a SAR IW data acquired 8 January 2023 at 16:10 UT and provided by PolarView.*

Ice Bulletin: Ross Sea

Issued: Monday 9th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows a composite of visible and SAR data of the north-western Ross Sea. RV *Tangaroa* cruise TAN2302 mooring locations are marked by coloured dots.

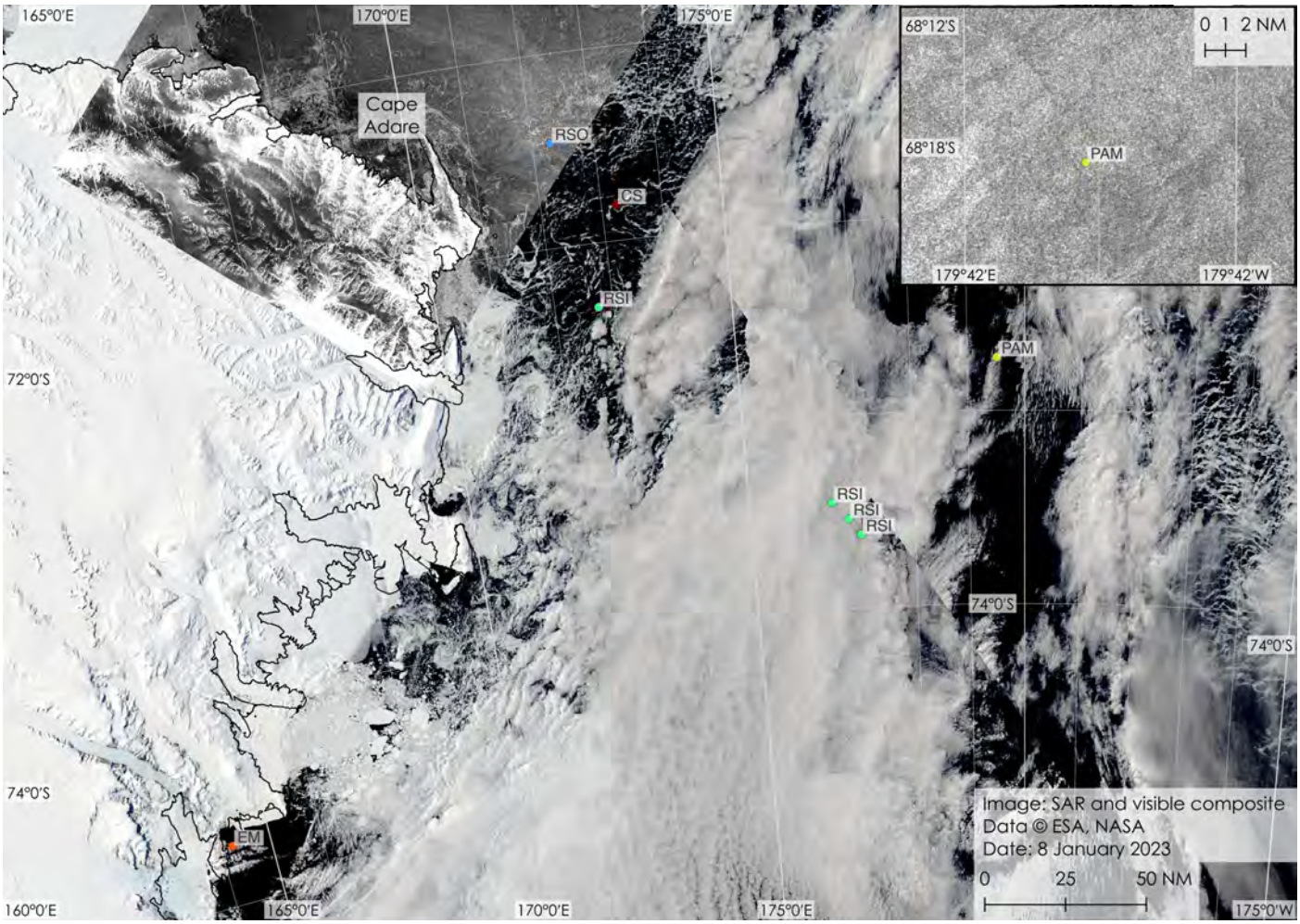


Figure 1: *AQUA MODIS VIS data acquired 8 January 2023 at 04:44 UT and provided by NASA;*
north-western overlay: Sentinel-1a SAR IW data acquired 8 January 2023 at 16:01 UT and provided by PolarView.
upper right inset: Sentinel-1a SAR EW data acquired 8 January 2023 at 07:56 UT and provided by PolarView.

The inset shows that the 'PAM' mooring at 68º20'S is covered by drifting sea ice, but this pack ice is melting, drifting freely and dispersing. Similar conditions are present at all other mooring locations except for the southernmost ('EM' in Terra Nova Bay), which is free of sea ice. While the bay is free of sea ice, it is still surrounded high concentration of first-year pack ice (see Figure 2).

Figure 2 shows sea-ice concentration data of the western Ross Sea. The climatological sea-ice extent for January is included as a black/white line.

While all but one ('RSO' off Cape Adare) mooring locations appear to be 'ice free', the low concentration of sea ice that is obvious in the SAR data is below the detection limit of the passive microwave instrument (and processing algorithm) that is the source of the concentration chart.

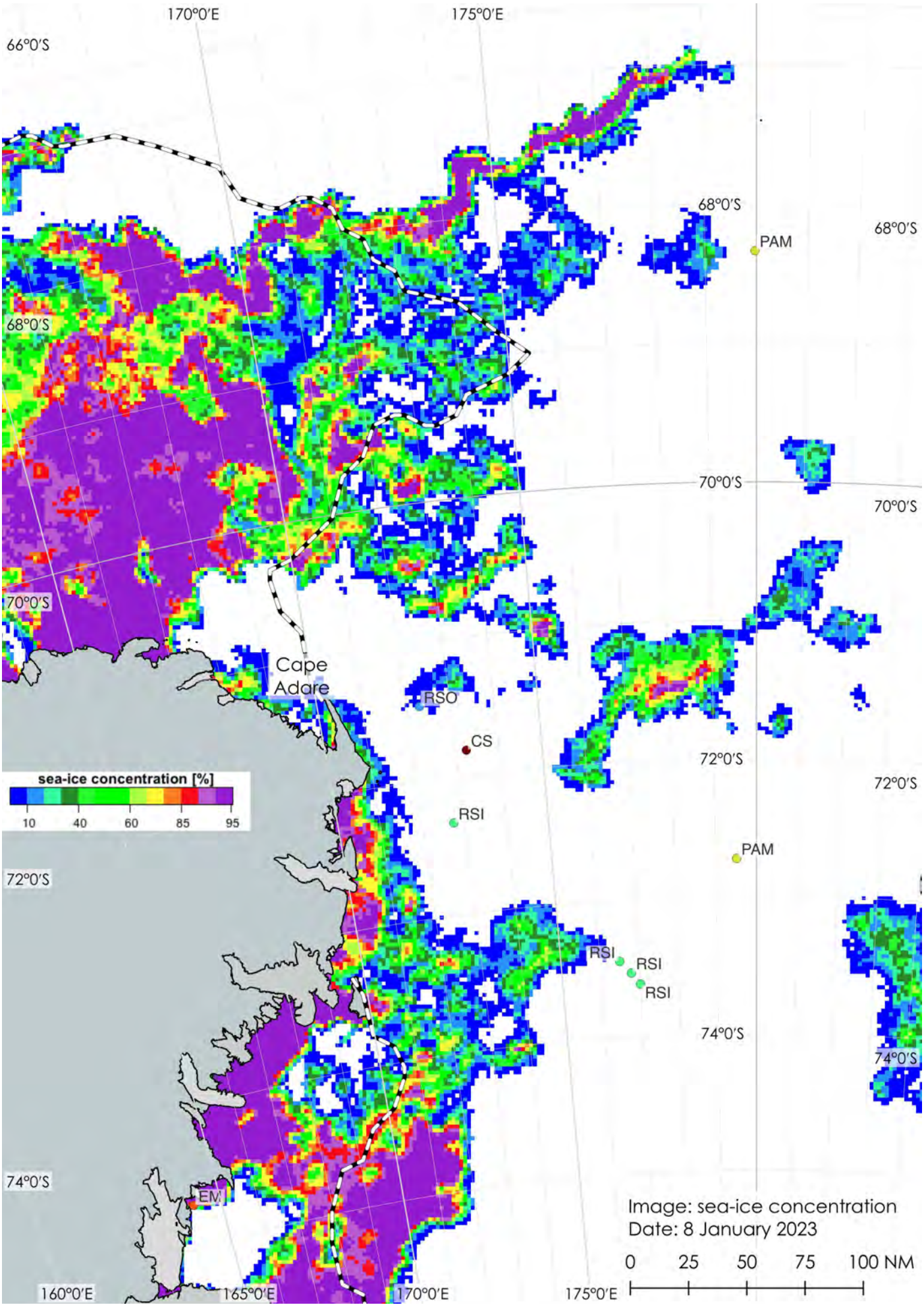


Figure 2: *Sea-ice concentration data acquired 8 January 2023 and provided by ICDC, Uni. Hamburg.*

Ice Bulletin: Mill Island

Issued: Tuesday 10th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows a composite of visible data around Mill Island west of Casey Station. Fast-ice edge and large iceberg positions are marked by a dashed red line and dashed pink shapes, respectively, for 20 December 2022.

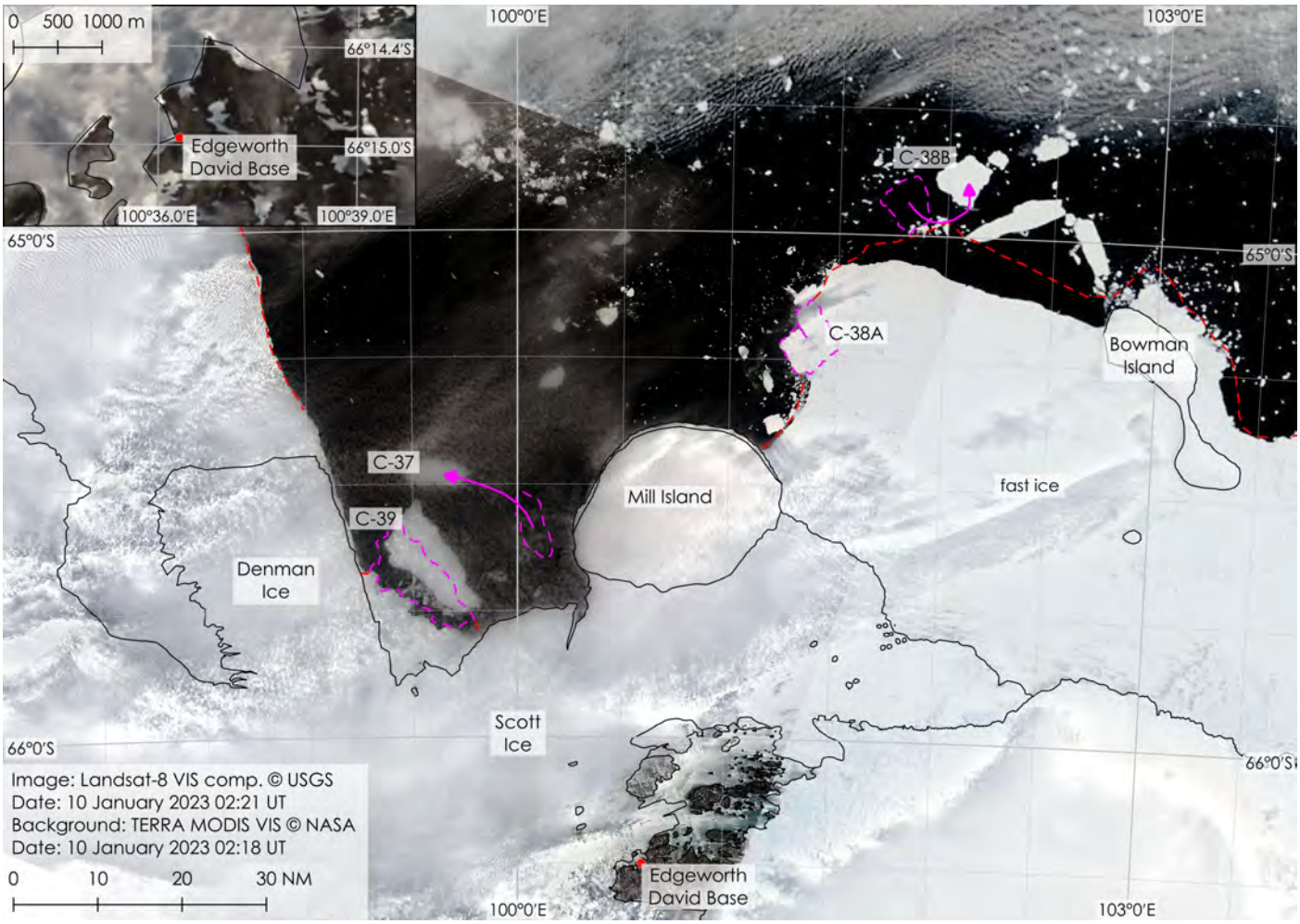


Figure 1: *TERRA MODIS VIS data acquired 10 January 2023 at 02:18 UT and provided by NASA; overlay of Landsat-8 visible composite pan-sharpened data acquired 10 January 2023 at 02:21 UT and provided by USGS.*

A polynya remains present north and west of the island and a bit further northeast.

Since 20 December 2022, iceberg C-37 continued drifting freely in this polynya, but iceberg C-39 is now also free from fast ice and drifting north-eastward. Iceberg C-38A remains locked in by fast ice but iceberg C-38B continues its north-eastward drift and is rotating.

Further north, sea ice is melting the sea-ice concentration is below January average conditions.

The inset in the figure shows a close-up around Edgeworth-David Base in the south-western part of the Bunger Hills, which is slightly affected by clouds.

Ice Bulletin: Antarctica

Issued: Wednesday 11th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows the pan-Antarctic sea-ice concentration anomaly based on passive microwave remote sensing data.

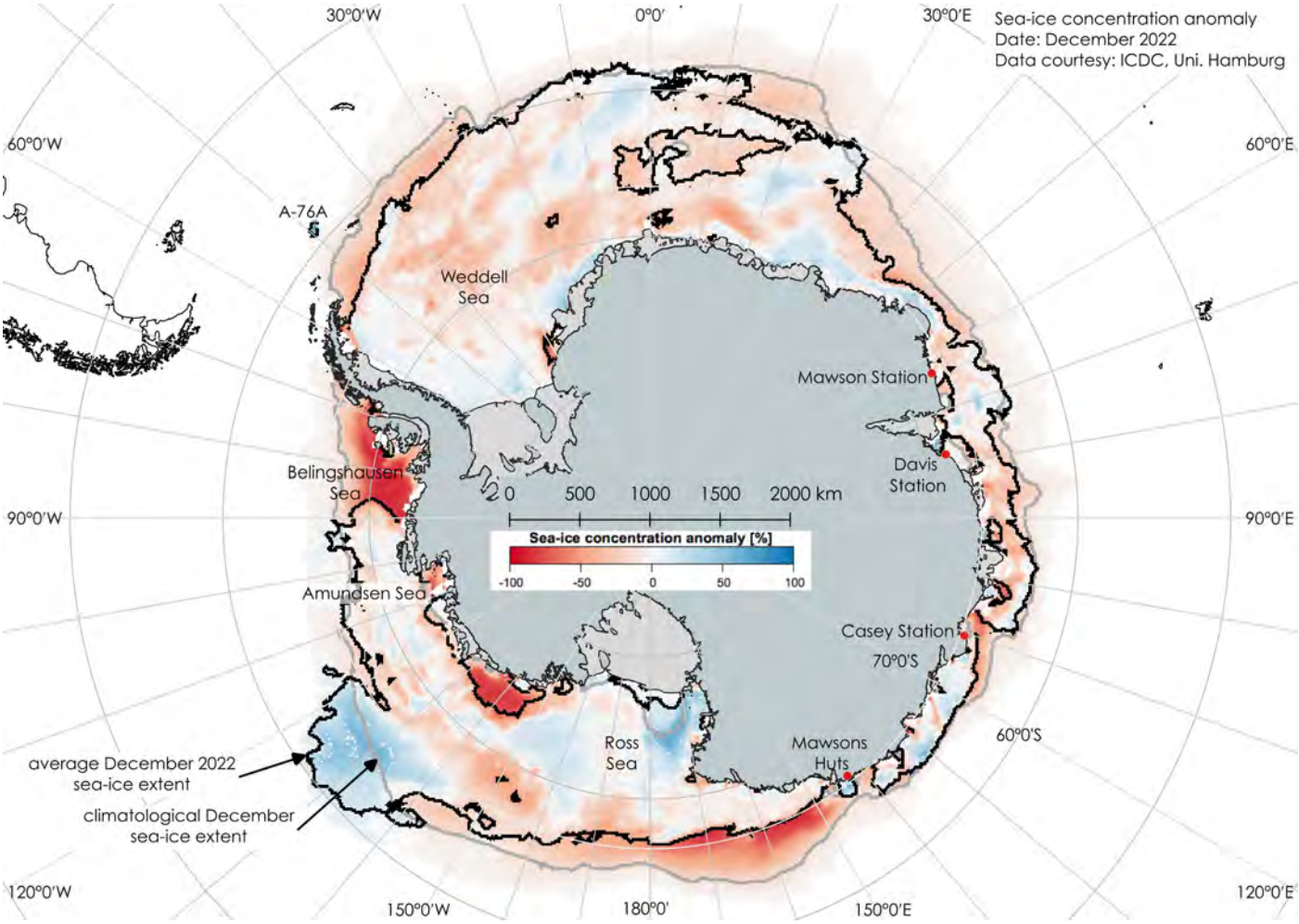


***Figure 1**: Sea-ice concentration anomaly for December 2022 provided by ICDC (Universität Hamburg).*

Pan-Antarctic sea-ice conditions continue to be overall low with trends from November 2022 accelerated.

Only in the eastern and south-western Ross Sea, sea-ice extent partly exceeded climatological values. The rest of the sea-ice zone around the continent exhibited below average sea-ice extent and associated concentration.

In the Bellingshausen Sea, the most pronounced negative anomaly has grown, and negative extent and concentration anomalies stretch almost the entire Weddell Sea and are continuing throughout East Antarctica. In the eastern Weddell Sea, the Maud Rise Polynya (east of Greenwich Meridian) has grown substantially during December.

Northeast of the northern tip of the Antarctic Peninsula, an isolated apparent positive anomaly is caused by the drift of large iceberg A-76A, which is north (outside) of the sea-ice zone and drifting further northward into the southern South Atlantic.

Ice Bulletin: Mawson Station

Issued: Thursday 12th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution visible data off Mawson Station. The fast-ice edge is marked with a red line (dashed red line for 8 January 2023).

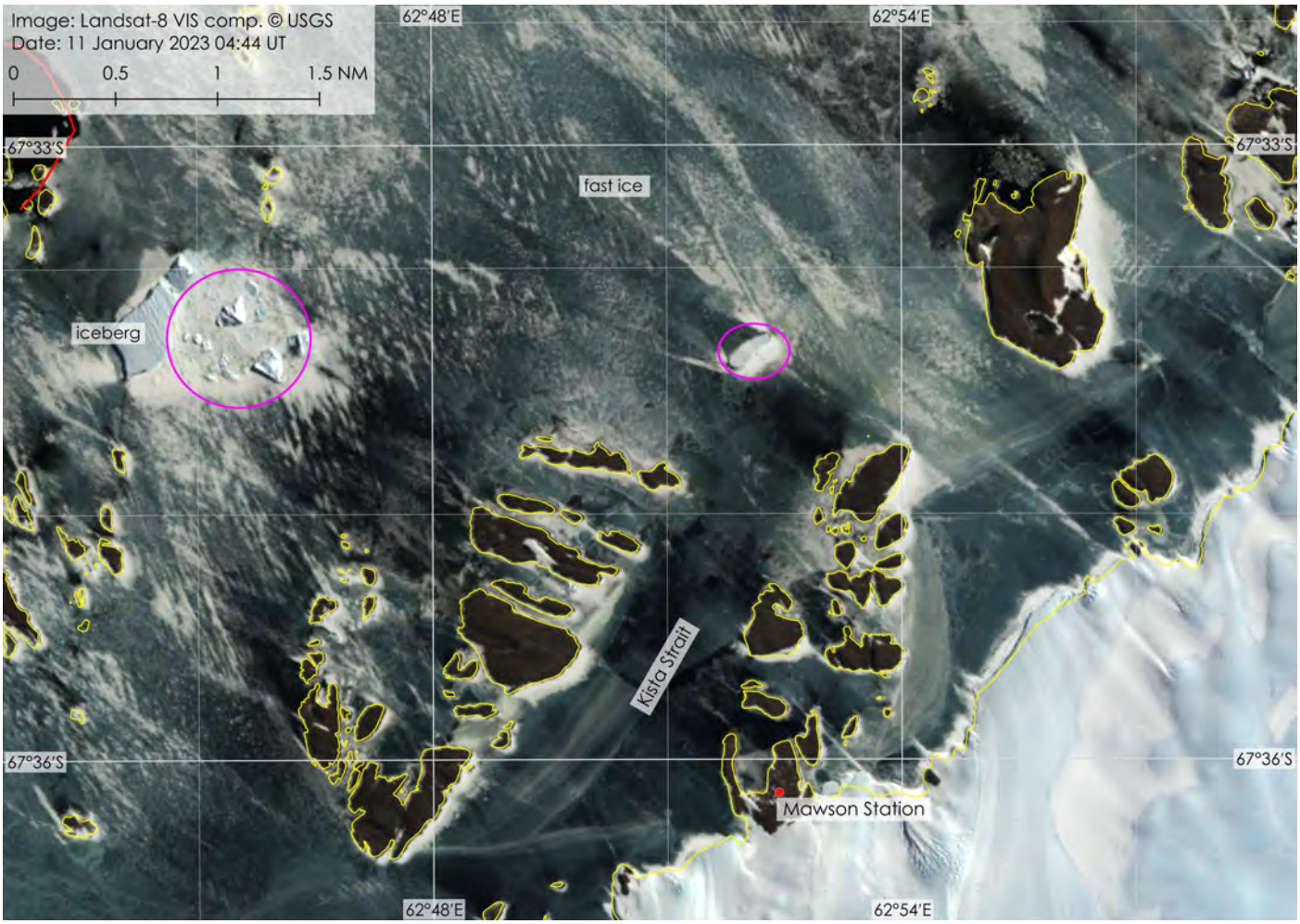


Figure 1: *Landsat-8 visible composite pan-sharpened data acquired 11 January 2023 at 04:44 UT and provided by USGS.*

Off station, the fast ice is thinning. Northwest of the station, a large tabular iceberg has been crumbling during winter and a field of glacial debris is marked with a pink circle. North of the station, a singular iceberg is enclosed by fast ice north of Kista Strait (also marked by a pink circle).

Figure 2 shows a larger scale overview of the same data as Figure 1.

North of the station, Iceberg Alley (marked by blue outlines) is clear of fastened sea ice and the northern part of the alley is now clear of ex-fast ice too, but the southern part of the alley remains filled with decaying ex-fast ice.

Between the alley and the station, fast ice continues to break up, partly in vast sheets.

The northern sea-ice edge remains generally a couple of nautical miles below (south of) the median sea-ice extent for January (not shown in the figure).

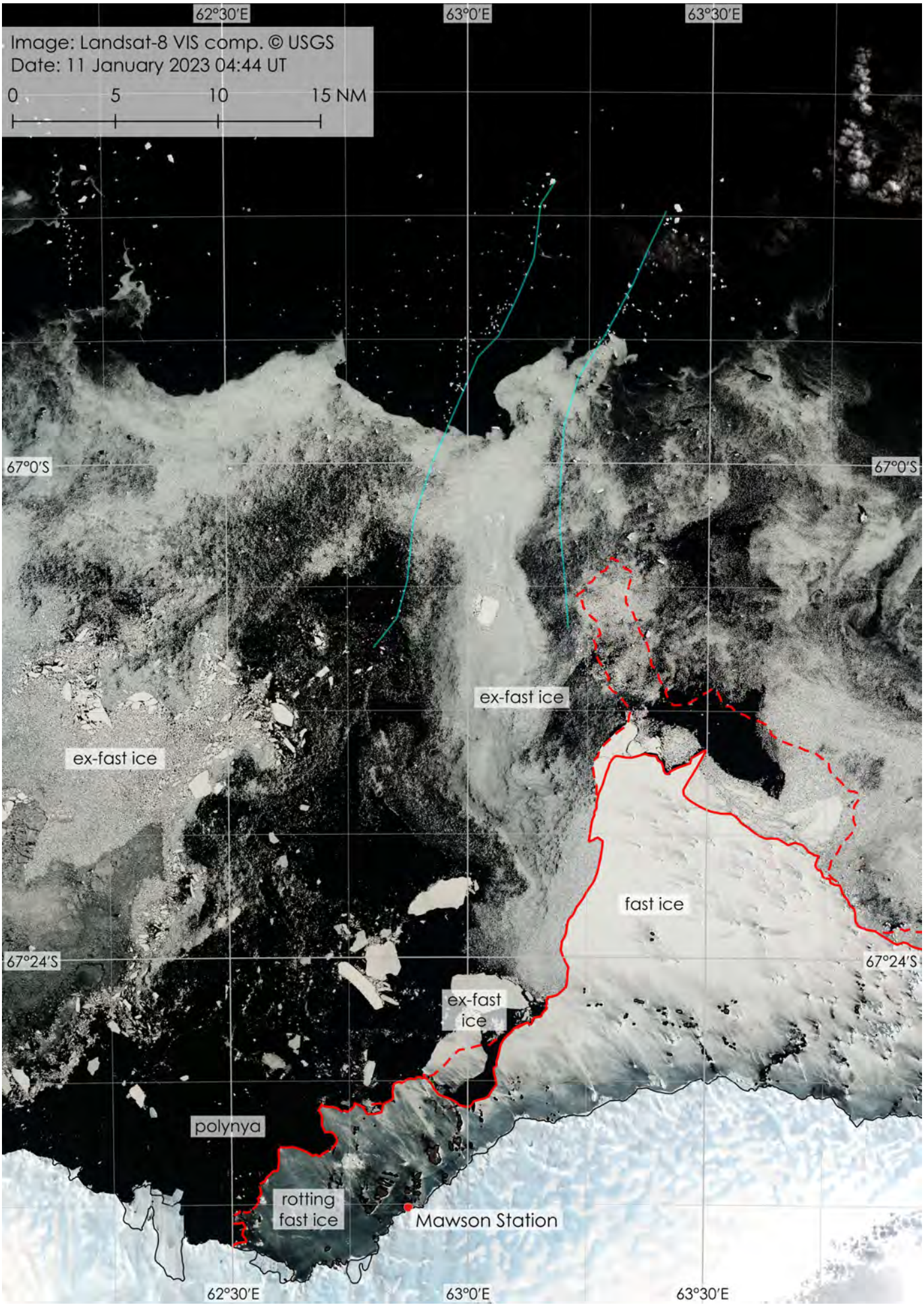


Figure 2: *Landsat-8 visible composite pan-sharpened data acquired 11 January 2023 at 04:44 UT and provided by USGS.*

Ice Bulletin: Wilkins Aerodrome

Issued: Friday 13th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of Wilkins Aerodrome. Some cloud shadows are visible in the left part of the figure.

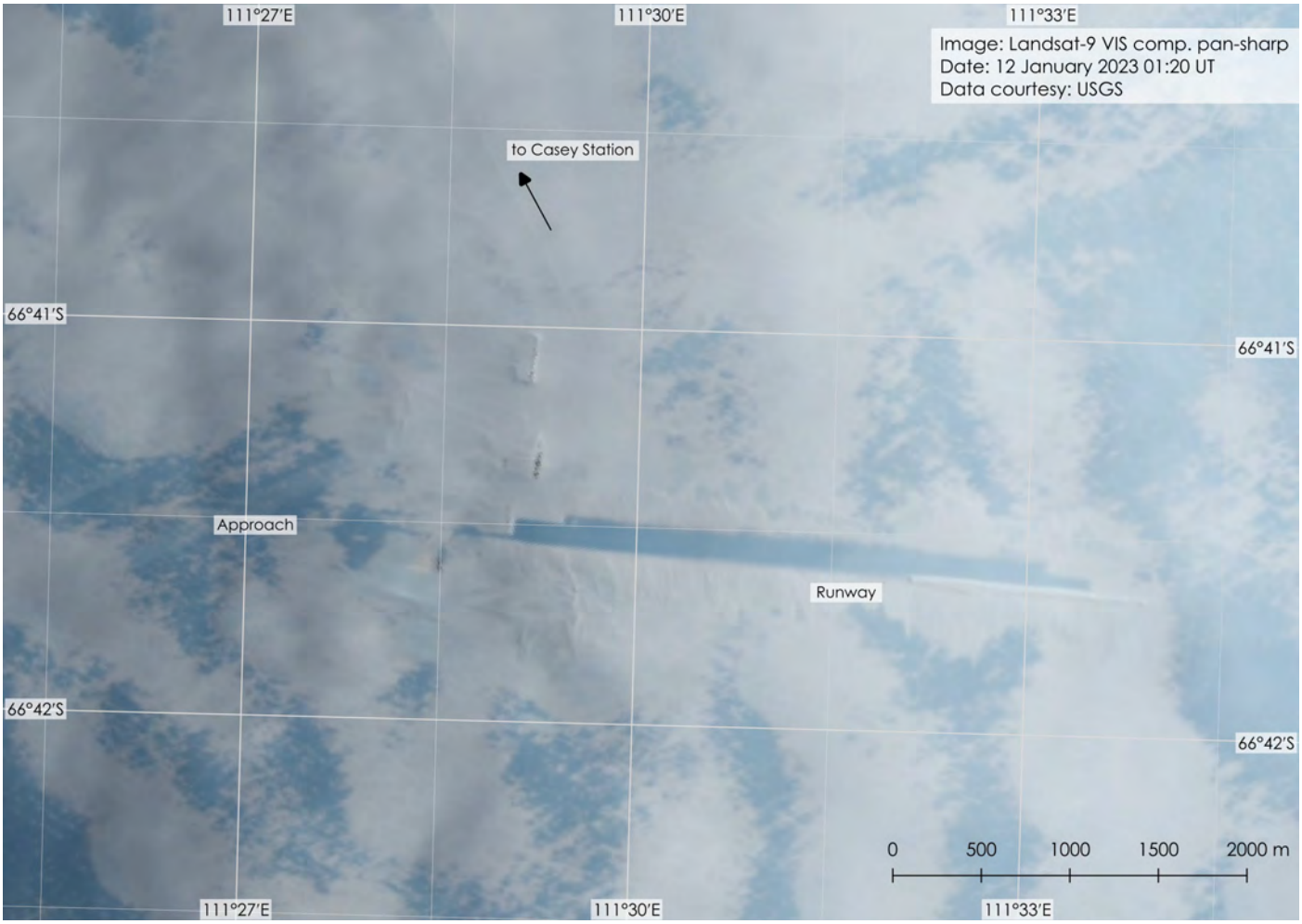


Figure 1: *Landsat-9 visible composite pan-sharpened data acquired 12 January 2023 at 01:20 UT and provided by USGS.*

The ice runway is partly covered by snow. North and south of the runway, snow dunes are left from previous clearing the runway.

Snow dunes have also accumulated in the lee of the camp and other structures.

Ice Bulletin: Mill Island

Issued: Friday 13th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows visible data around Mill Island west of Casey Station. Fast-ice edge and large iceberg positions are marked by a dashed red line and dashed pink shapes, respectively, for 11 January 2023.

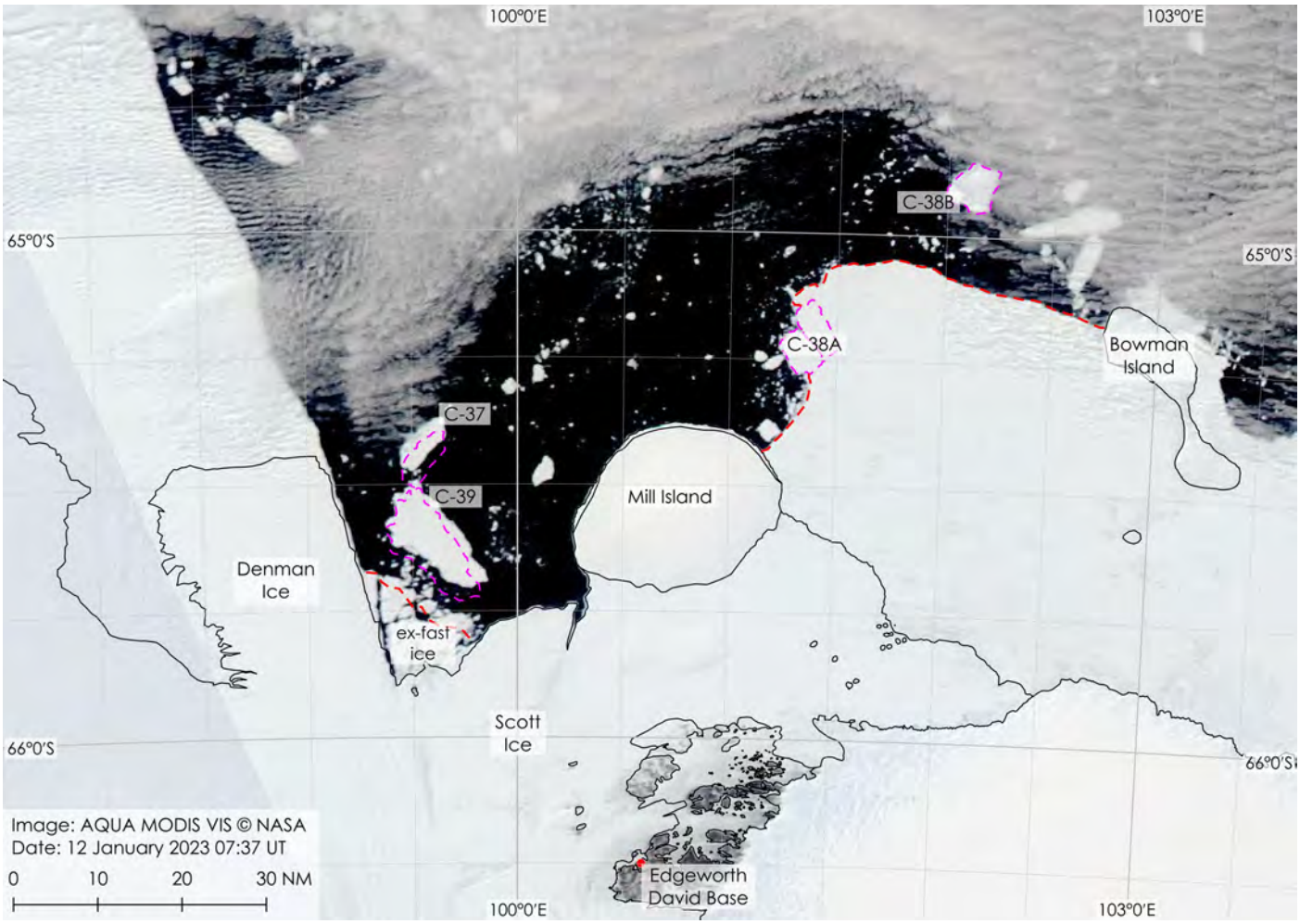


Figure 1: *AQUA MODIS VIS data acquired 12 January 2023 at 07:37 UT and provided by NASA.*

A polynya remains present north and west of the island and a bit further northeast.

Icebergs C-37 and C-39 are drifting northward freely in this polynya. Iceberg C-38A remains locked in by fast ice but iceberg C-38B continues its north-eastward drift and is rotating.

Since iceberg C-39 was released from fast ice earlier this week, the remaining fast ice is now shattered.

Further north, sea ice is melting the sea-ice concentration remains below January average conditions.

Figure 2 shows high-resolution (15 m horizontal) visible data around Edgeworth-David Base in the south-western part of the Bunger Hills.

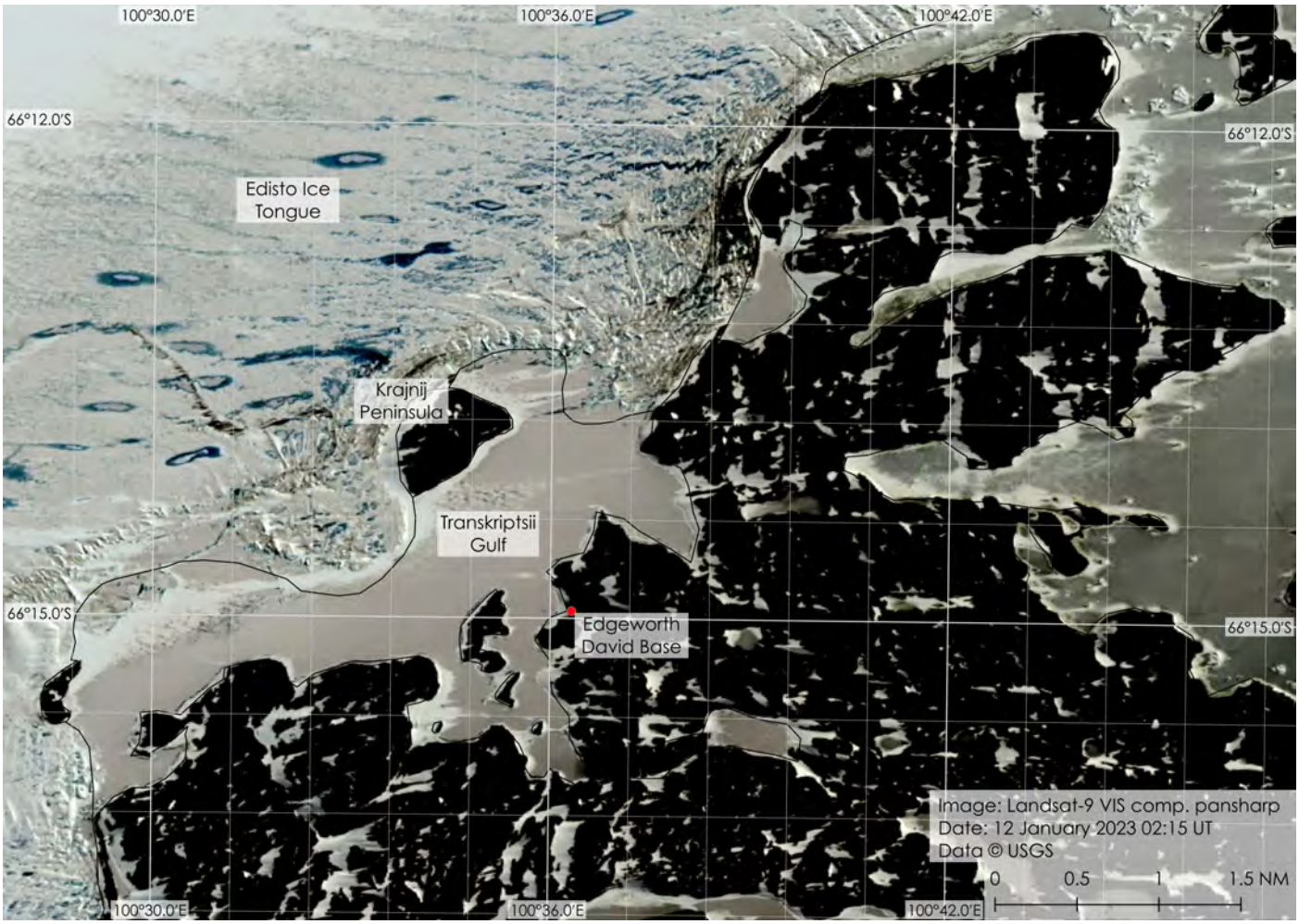


Figure 2: *Landsat-9 visible composite pan-sharpened data acquired 12 January 2023 at 02:15 UT and provided by USGS.*

Ice Bulletin: Mawson Station

Issued: Friday 13th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data off Mawson Station. The fast-ice edge is marked with a dashed red line for 11 January 2023.

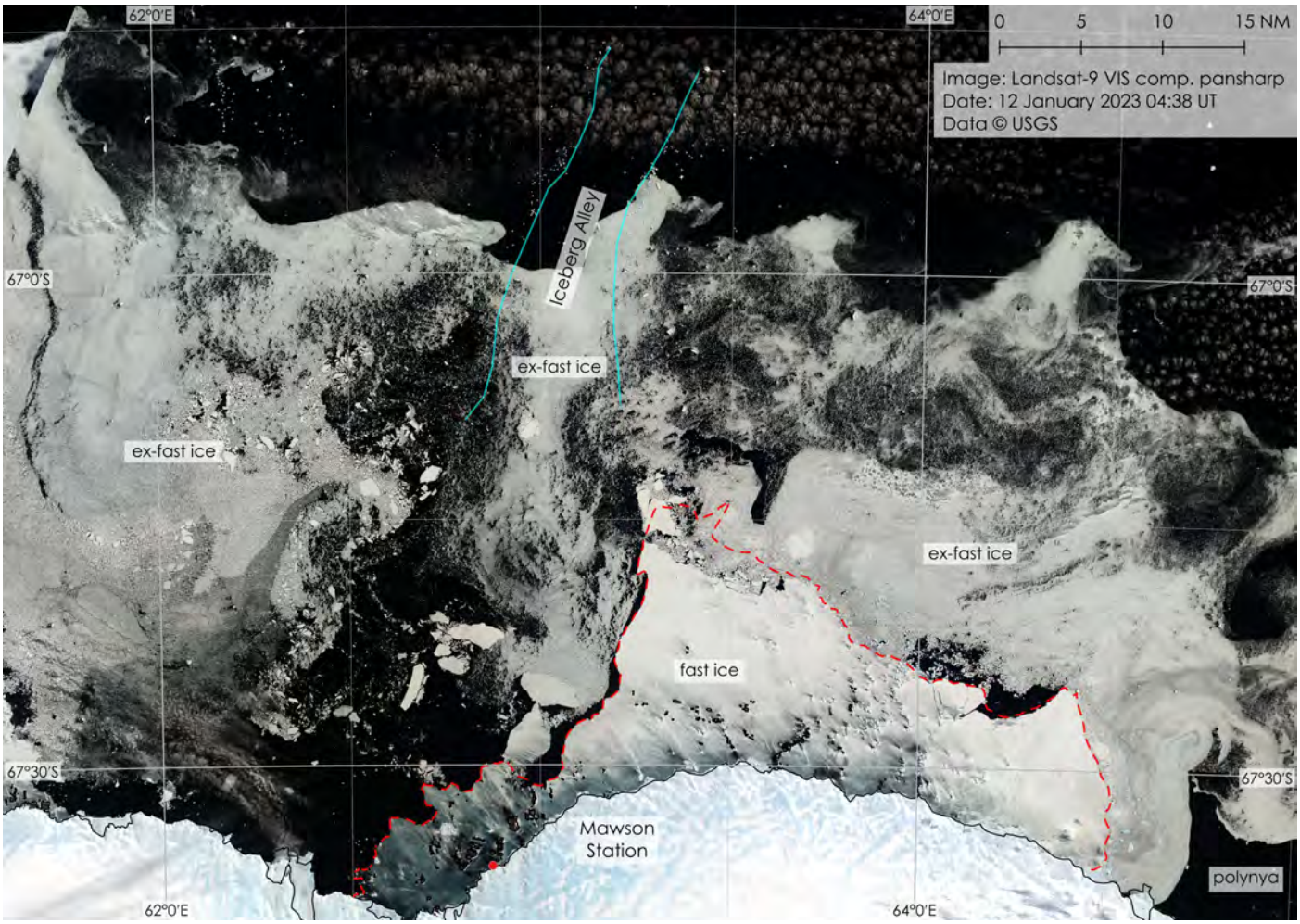


Figure 1: *Landsat-9 visible composite pan-sharpened data acquired 12 January 2023 at 04:38 UT and provided by USGS.*

North of the station, Iceberg Alley (marked by blue outlines) is clear of fastened sea ice and the northern part of the alley is now largely clear of ex-fast ice too, but the southern part of the alley remains filled with decaying ex-fast ice.

Between the alley and the station, fast ice continues to break up, partly in vast sheets.

The northern sea-ice edge remains generally a couple of nautical miles below (south of) the median sea-ice extent for January (not shown in the figure).

Ice Bulletin: Ross Sea

Issued: Friday 13th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Mooring locations of RV *Tangaroa* cruise TAN2302 are marked by coloured dots in all figures of this Bulletin.

Figure 1 shows visible data of the north-western Ross Sea.

The 'PAM' mooring south of Scott Island (67°22′S and 179°54′W) is currently not affected by sea ice however, a spit-like pack ice feature originating from first-year sea ice further west is stretching eastward and reaching across 180º north of that mooring location.

Figure 2 shows a composite of visible and SAR data of the north-western Ross Sea. All mooring locations are affected by minimal sea ice that is drifting freely, melting and dispersing. Nearshore, higher concentration of sea ice remains present, but it is decaying as well and drifting in strips and patches.

Figures 3 and 4 show high-resolution (15 m horizontal) visible data of the western Ross Sea coast.

The nearshore sea ice is drifting with the surface currents and had a generally southward direction on 12 January 2023 (between the two acquisitions from AQUA and Landsat spacecraft).

While Terra Nova Bay is largely free of drifting sea ice it is however, surrounded by a ring of first-year pack ice from the tip of the Drygalksi Ice Tongue northward. This pack ice is also decaying but consists still of partly large floes.

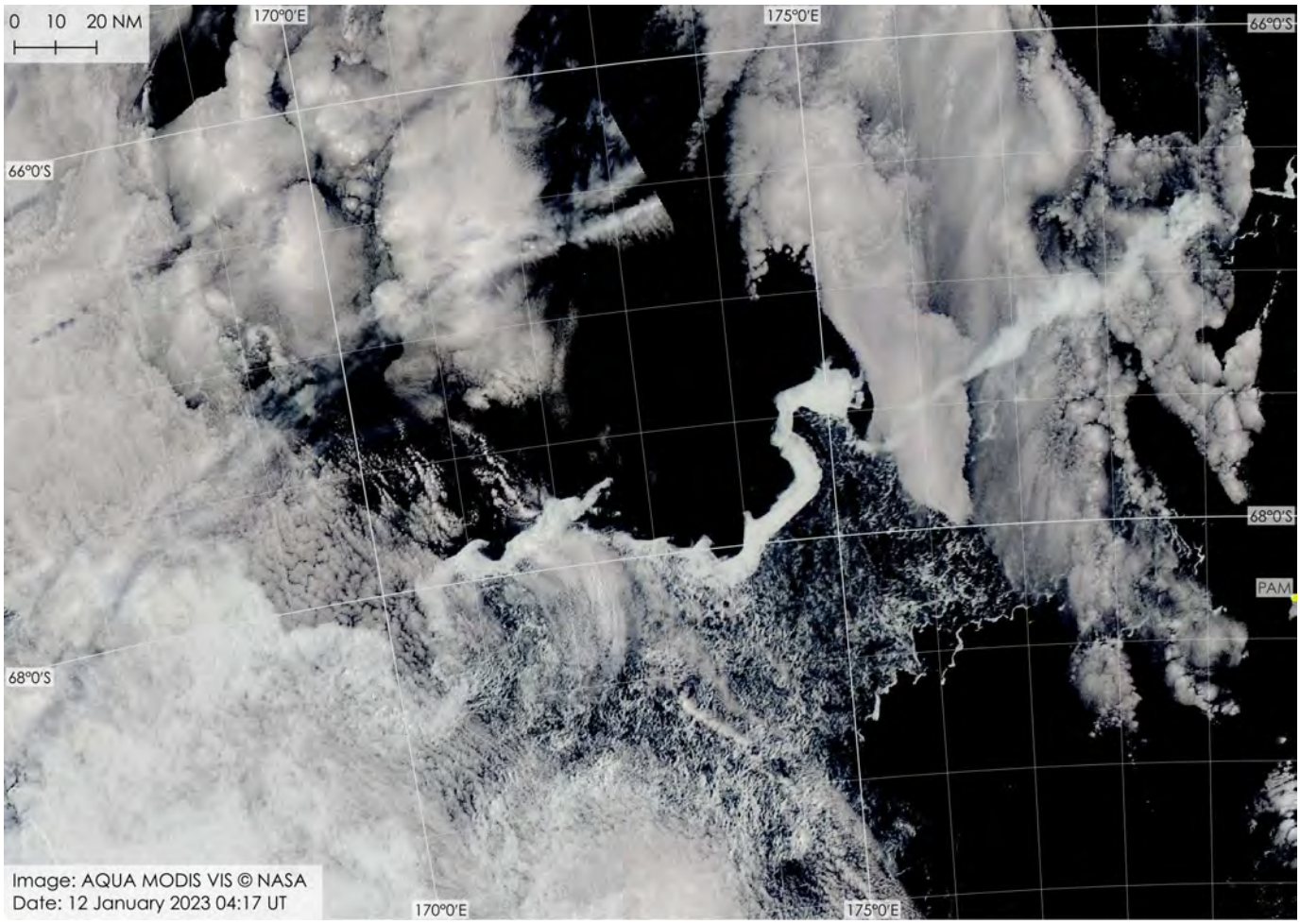


Figure 1: *AQUA MODIS VIS data acquired 12 January 2023 at 04:17 UT and provided by NASA.*

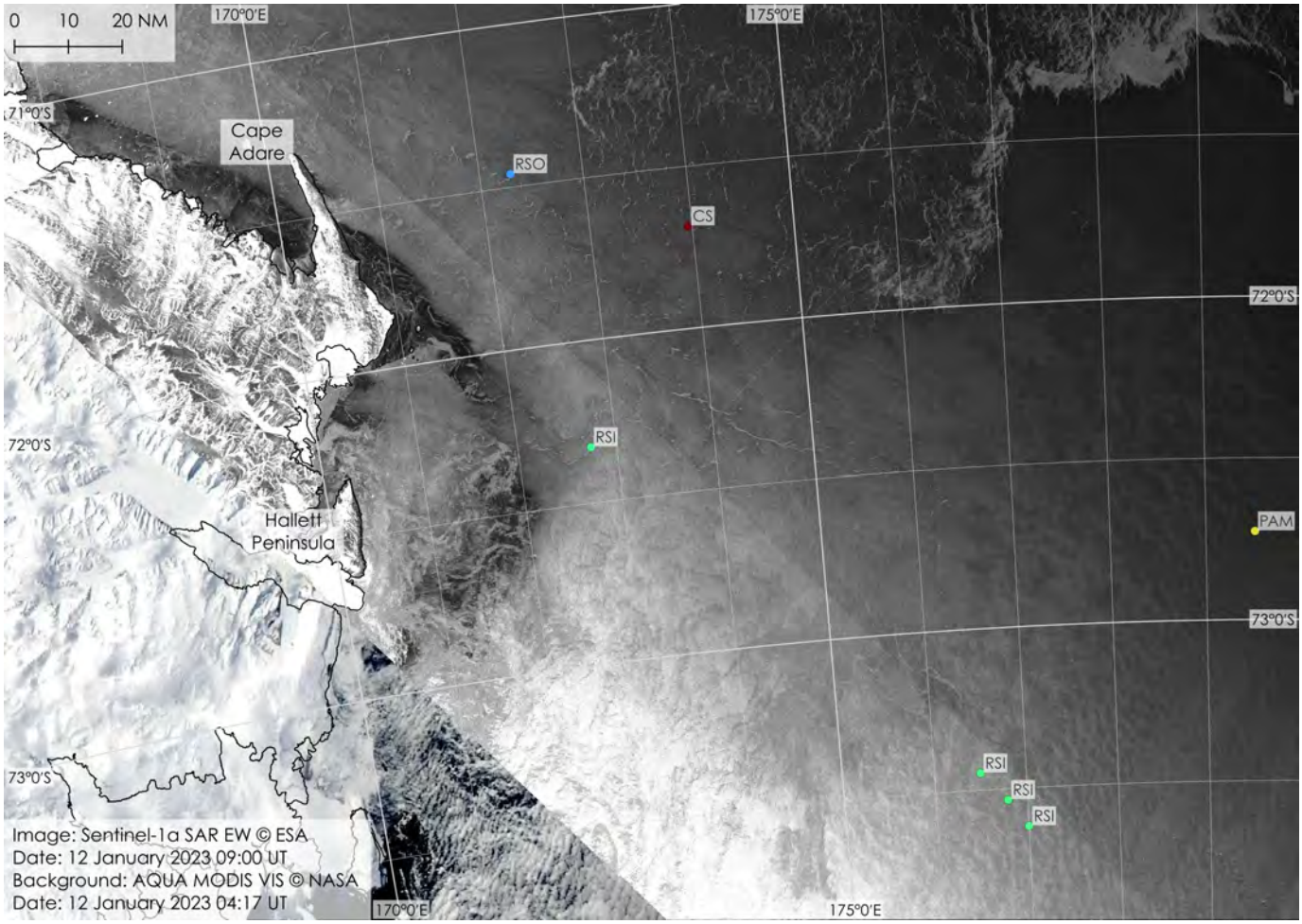


Figure 2: *Sentinel-1a SAR EW data acquired 12 January 2023 at 09:00 UT and provided by PolarView; background: AQUA MODIS VIS data acquired 12 January 2023 at 04:17 UT and provided by NASA.*

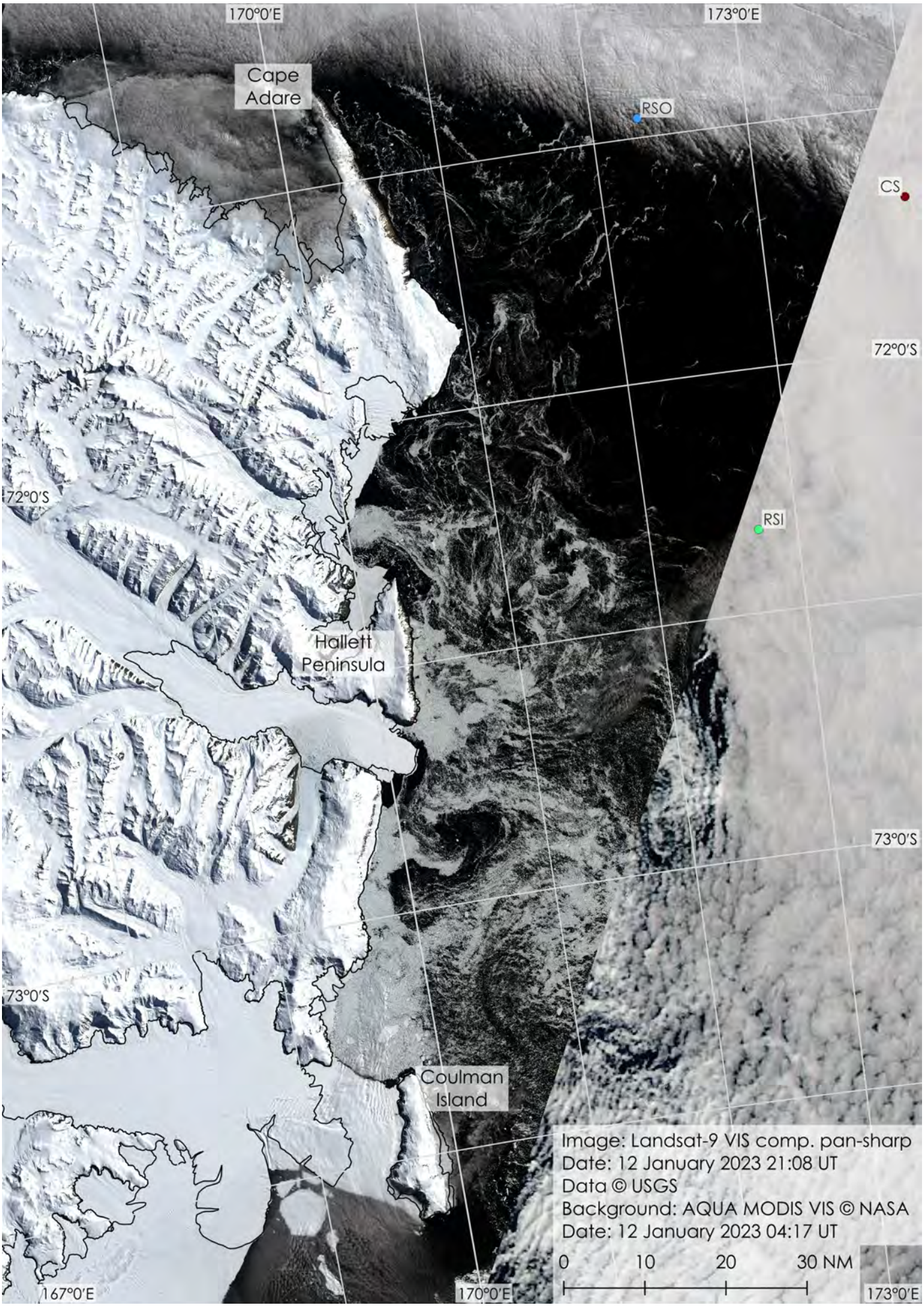


Figure 3: *Landsat-9 visible composite pan-sharpened data acquired 12 January 2023 at 21:08 UT and provided by USGS; background: AQUA MODIS VIS data acquired 12 January 2023 at 04:17 UT and provided by NASA.*

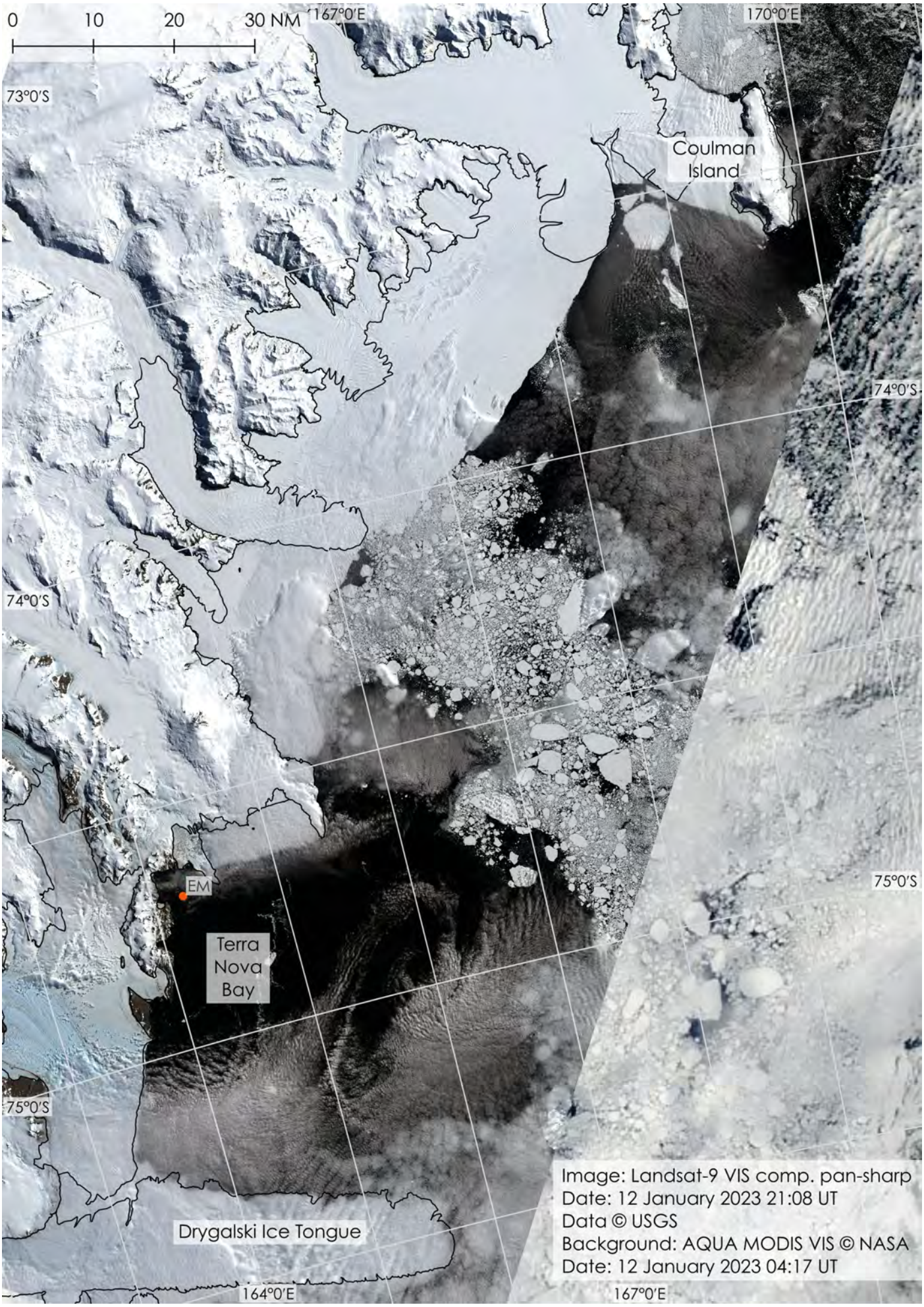


Figure 4: *Landsat-9 visible composite pan-sharpened data acquired 12 January 2023 at 21:08 UT and provided by USGS; background: AQUA MODIS VIS data acquired 12 January 2023 at 04:17 UT and provided by NASA.*

Ice Bulletin: Davis Station

Issued: Monday 16th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data off Davis Station. The fast-ice edge is marked by a red line (dashed red line for on 22 December 2022).

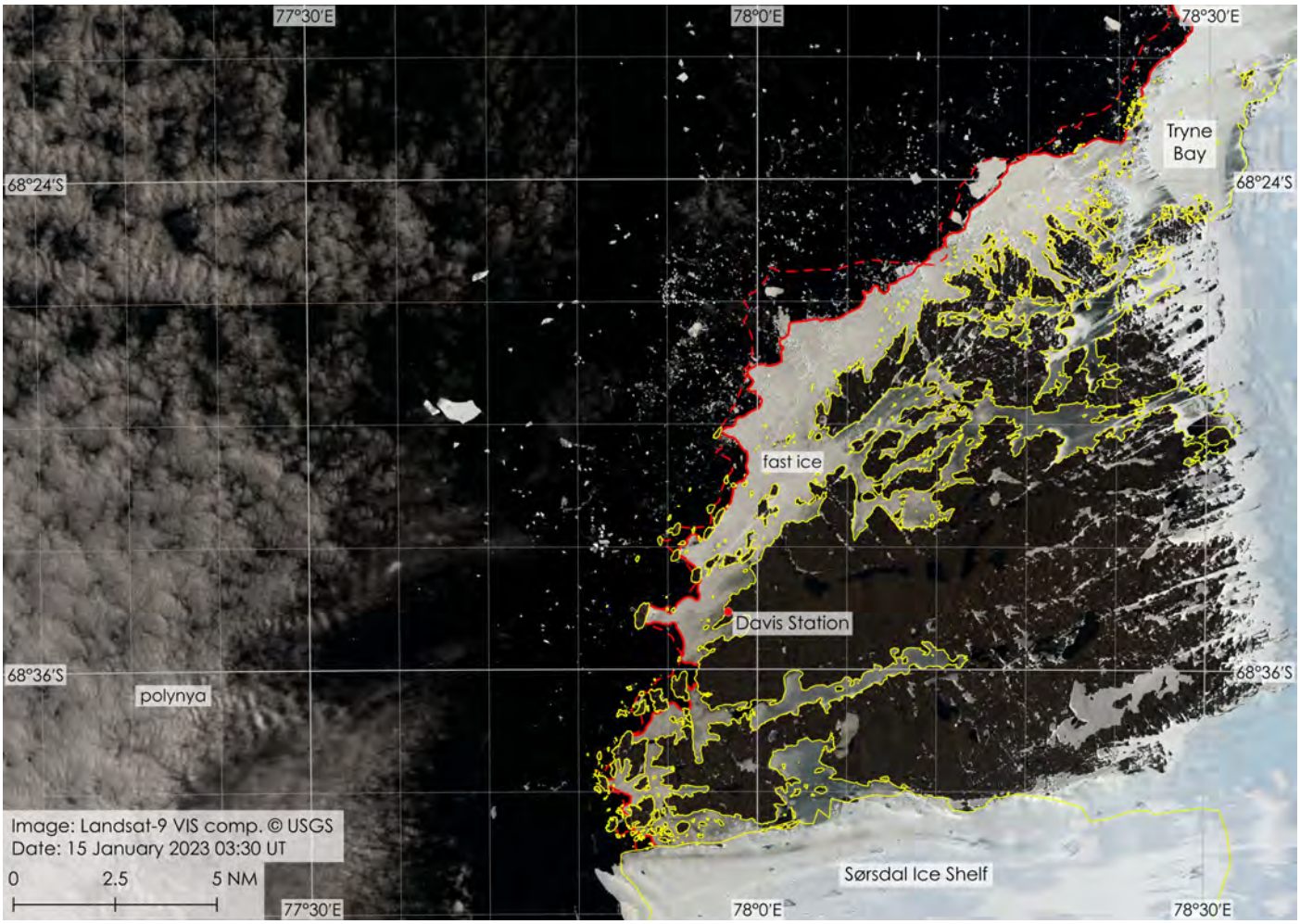


Figure 1: *Landsat-9 visible composite pan-sharpened data acquired 15 January 2023 at 03:30 UT and provided by USGS.*

Off station, fast ice remains currently largely stable and roughly 1 nautical mile offshore. Further along the off the hills, fast ice continues to retreat towards the shore.

Most icebergs offshore are grounded but some are drifting with decaying ex-fast ice floes.

Figure 2 shows large-scale sea-ice concentration along the coast between the Amery Ice Shelf and Law Dome. The median sea-ice extent for January is included as a black/white line.

Sea ice is below average conditions in the region for the time of year. Some fast-ice areas remain east (upstream) of ice shelfs. Further offshore, first-year sea ice and ex-fast ice is melting.

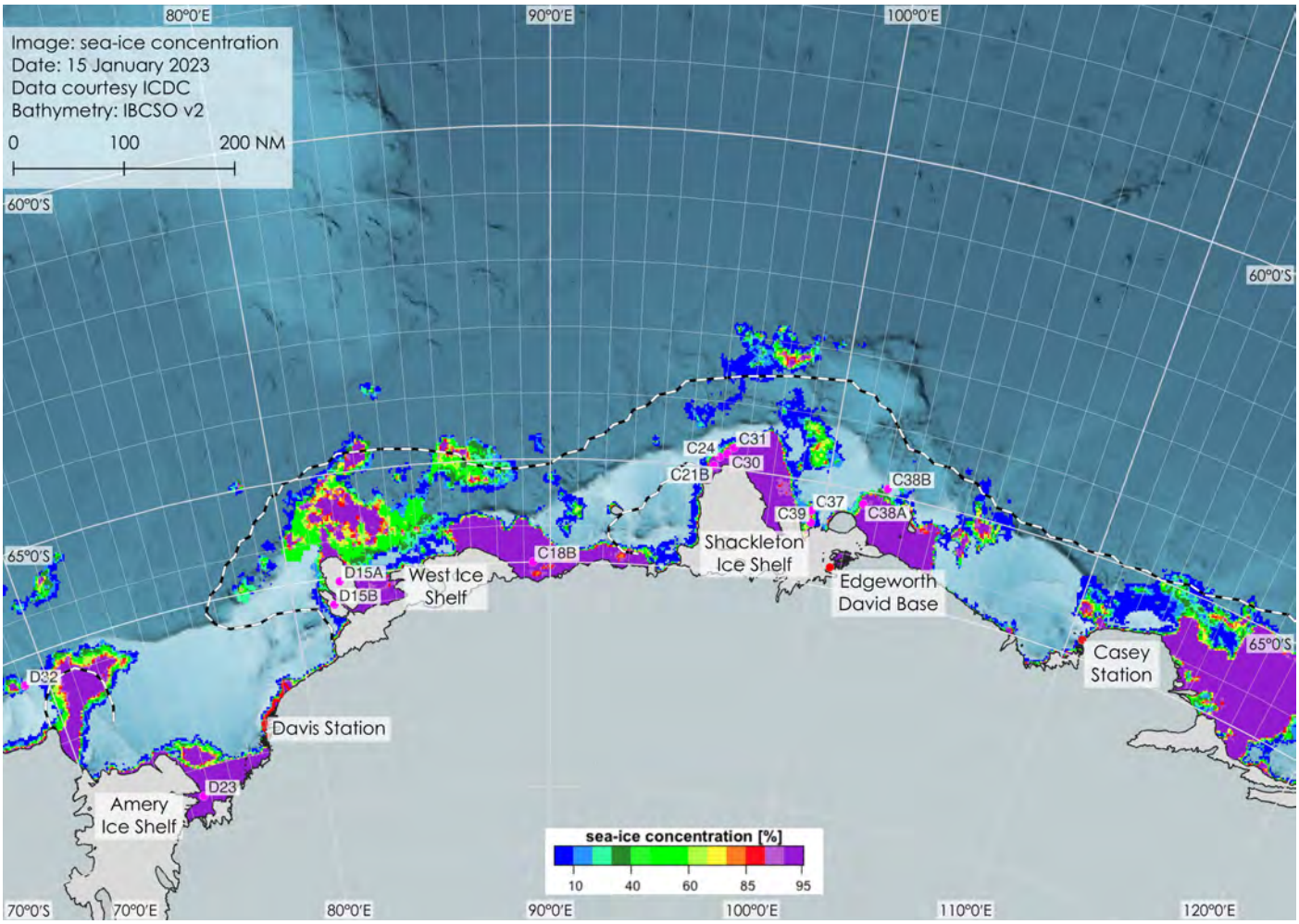


Figure 2: *Sea-ice concentration data acquired 15 January 2023 and provided by ICDC, University of Hamburg.*

Ice Bulletin: Shackleton Ice Shelf

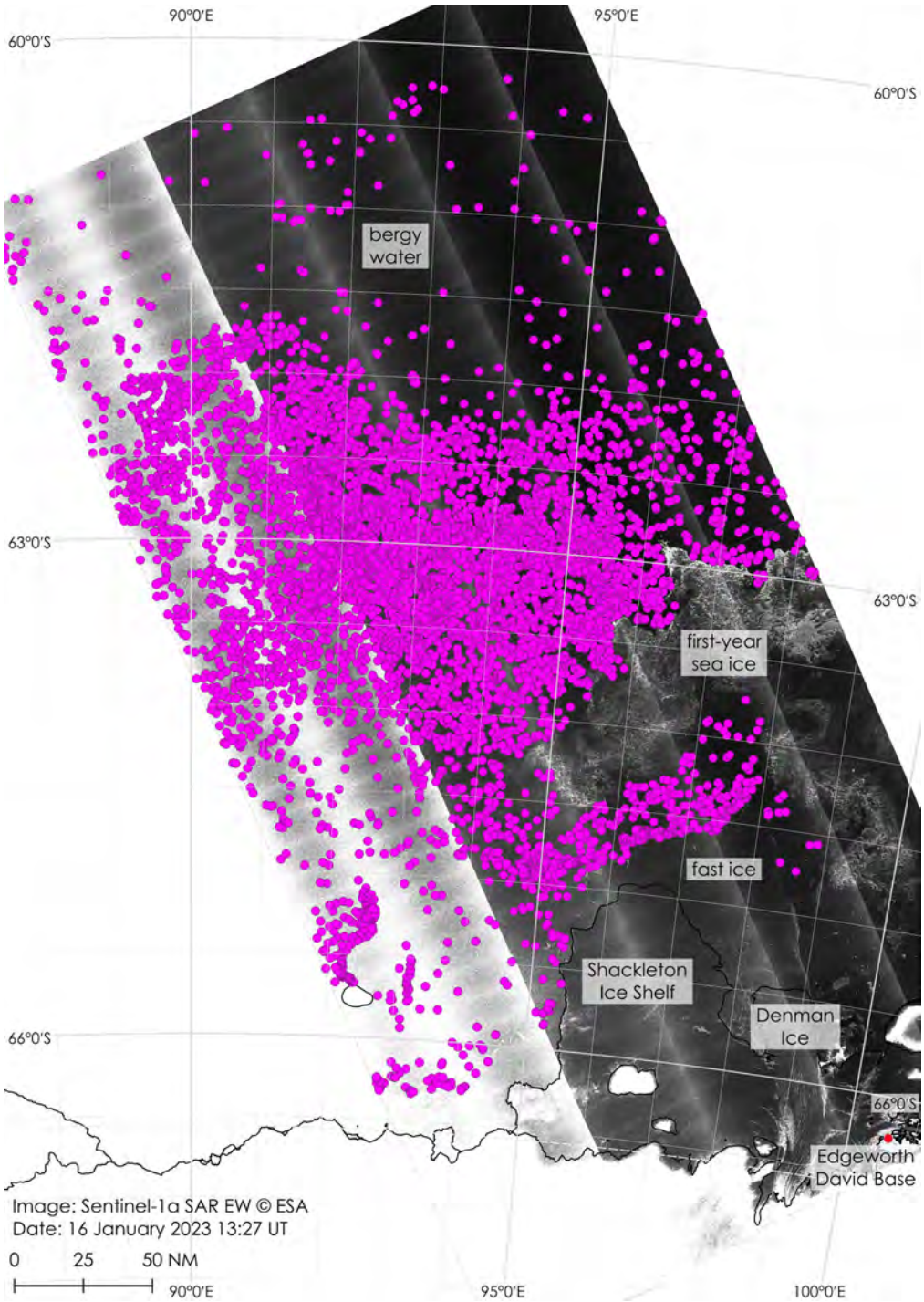
Issued: Tuesday 17th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data northwest of the Shackleton Ice Shelf.



The scene has been analysed for iceberg presence and more than 5500 features have been marked by pink dots outside of the sea-ice zone of the region.

The first-year sea ice north and northeast of the Shackleton Ice Shelf consists of a melange of decaying pack ice and decaying ex-fast ice.

East of the ice shelf, multi-year fast ice remains attached north of the Denman Ice.

Figure 1: *Sentinel-1a SAR EW data (cross-polarised Intensity) acquired 16 January 2023 at 13:27 UT and provided by ESA.*

Ice Bulletin: Wilkins Aerodrome

Issued: Wednesday 18th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of Wilkins Aerodrome. The scene is slightly obscured by clouds.

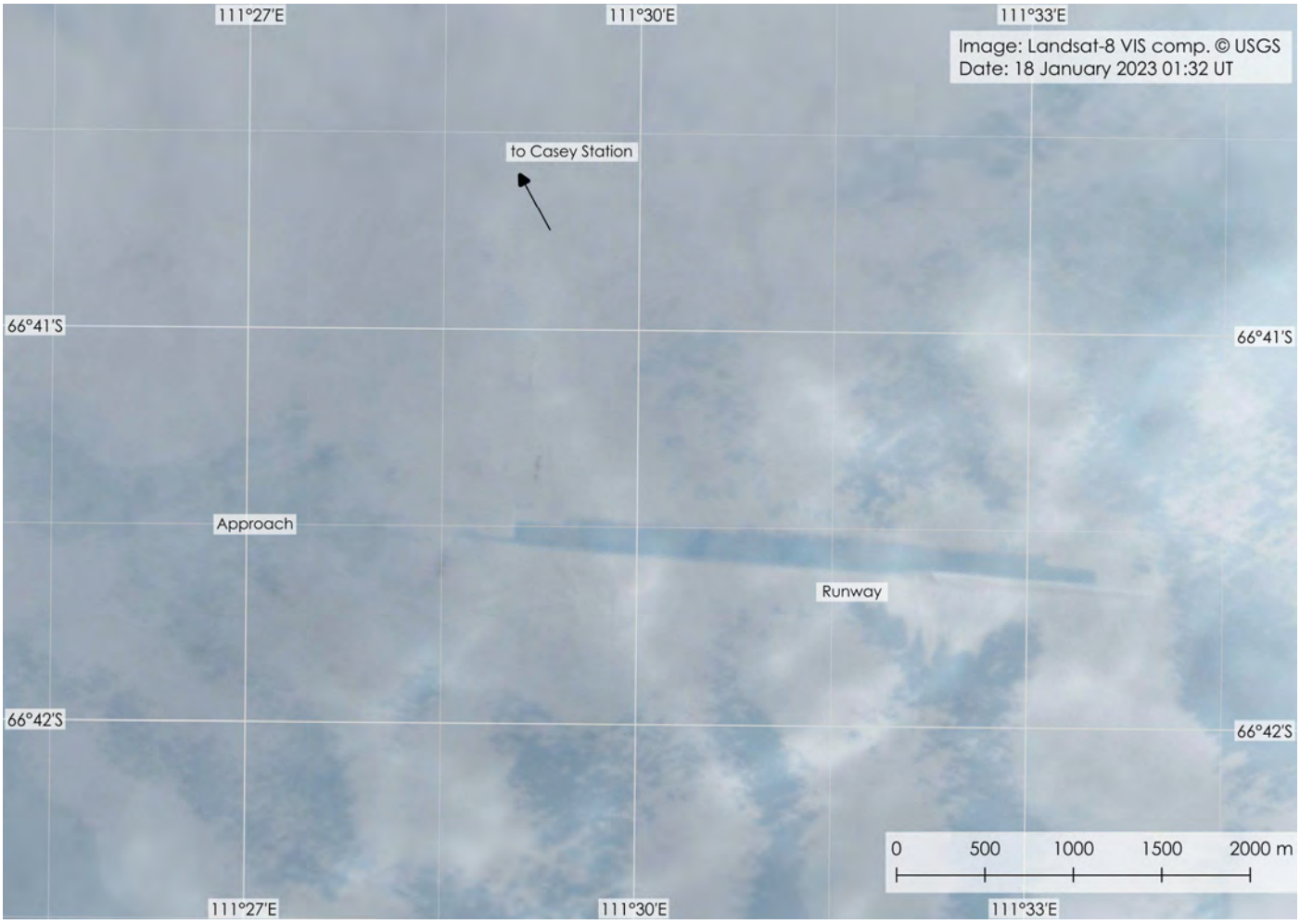


Figure 1: *Landsat-8 visible composite pan-sharpened data acquired 18 January 2023 at 01:32 UT and provided by USGS.*

The ice runway is partly covered by snow. North and south of the runway, snow dunes are left from previous clearing the runway.

Snow dunes have also accumulated in the lee of the camp and other structures.

Ice Bulletin: Shackleton Ice Shelf

Issued: Thursday 19th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data north of the Shackleton Ice Shelf. The fast-ice edge is included as a red line. The sea-ice edge based on passive microwave data is shown by the light-blue line.

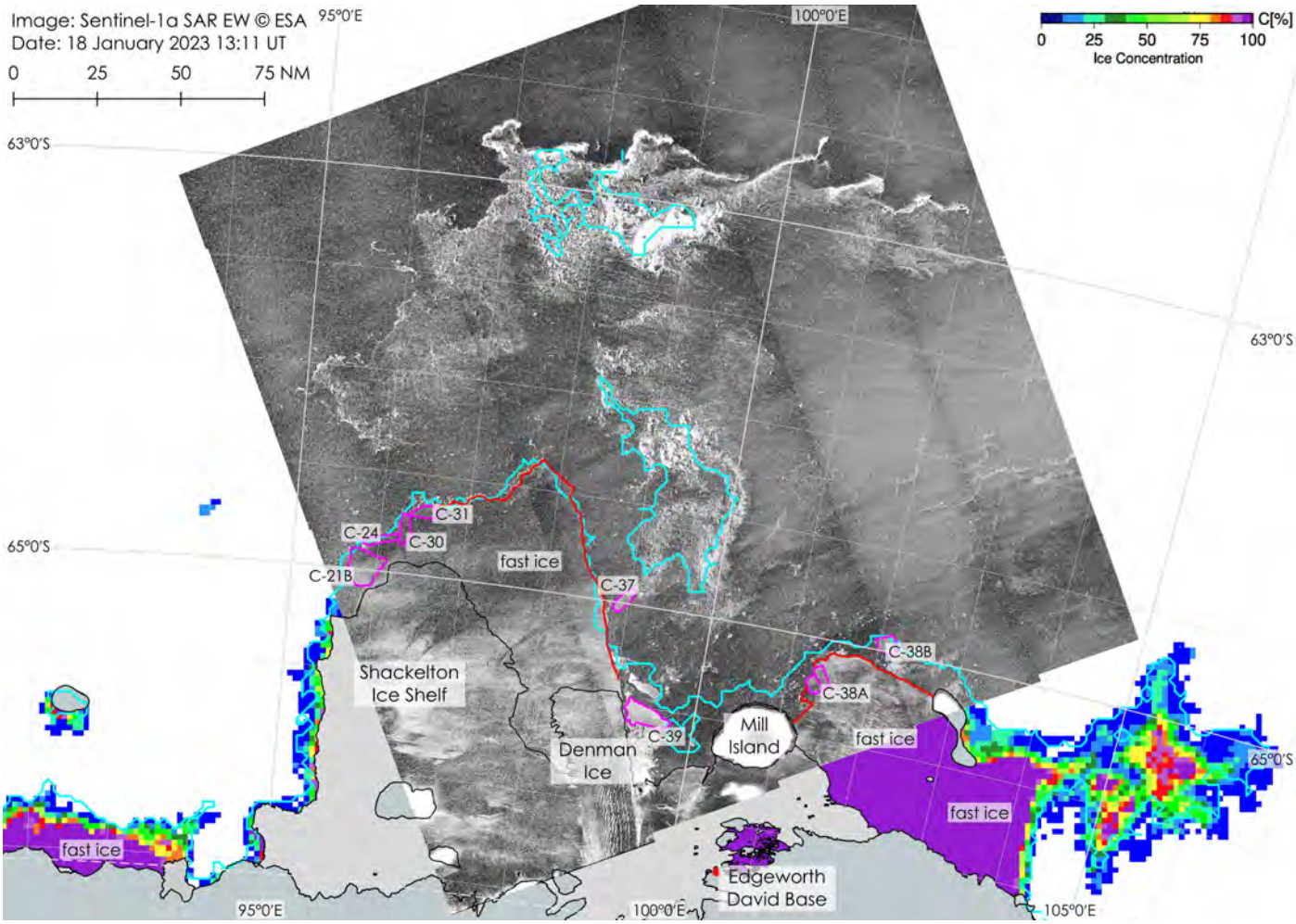


Figure 1: *Sentinel-1a SAR EW data (cross-polarised Intensity) acquired 18 January 2023 at 13:11 UT and provided by ESA; background of sea-ice concentration data acquired 18 January 2023 and provided by ICDC, University Hamburg.*

The passive microwave sea-ice edge (and concentration) is underestimating the extent of sea ice in the region. Most of the sea ice is decaying first-year sea ice but some ex-fast ice is present as well.

East of the Shackleton Ice Shelf, multi-year fast ice remains attached north of the Denman Ice. East of Mill Island, first-year fast ice is present.

Figure 2 also shows SAR data but additionally iceberg presence and more than 4300 features have been marked by pink dots. Iceberg data from 16 January 2023 (two days earlier) is also included as orange dots.

Icebergs are present as far north as 58º45'S east of 95º0'E.

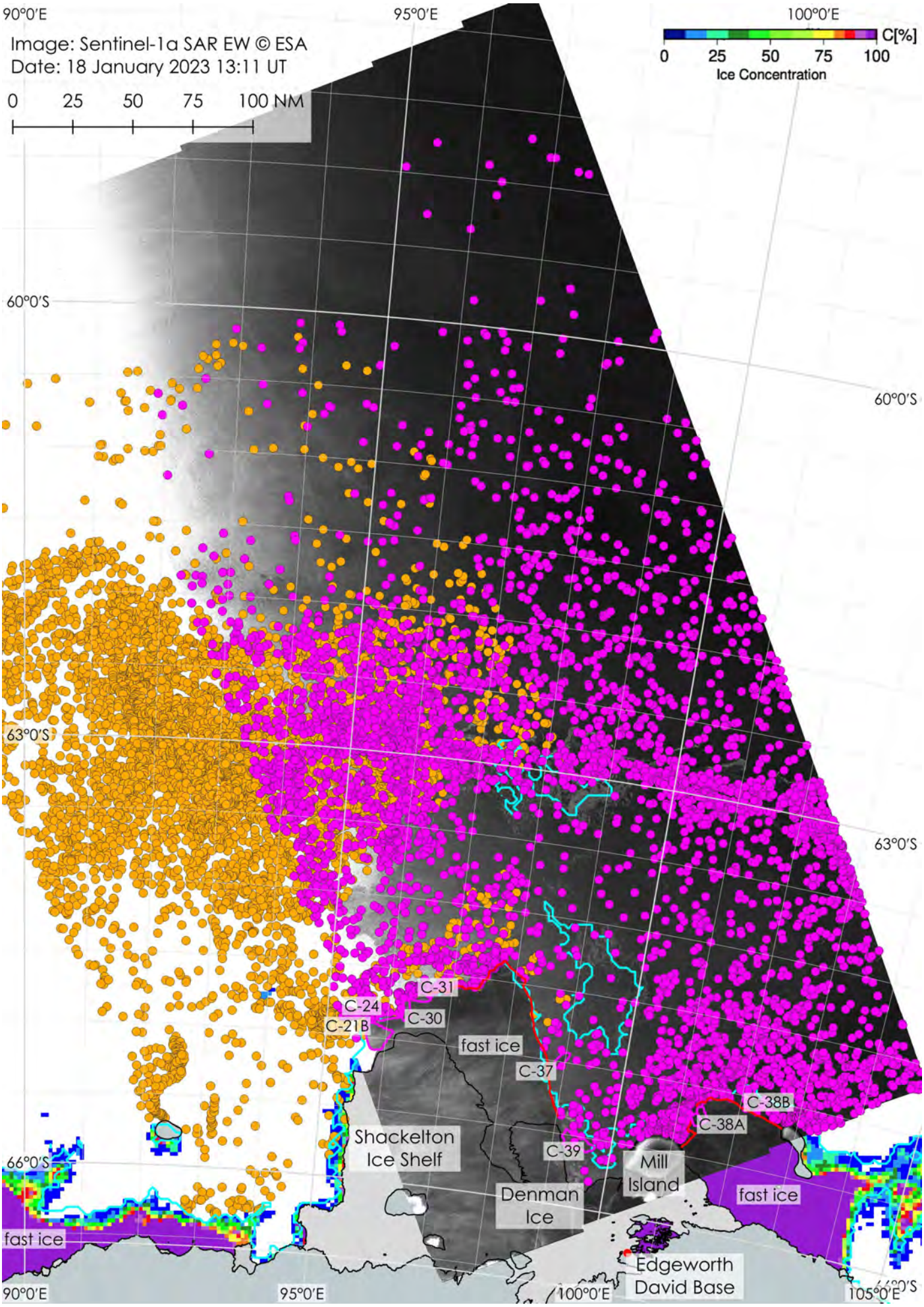


Figure 2: *Sentinel-1a SAR EW data acquired 18 January 2023 at 13:11 UT and provided by PolarView; background of sea-ice concentration data acquired 18 January 2023 and provided by ICDC, University Hamburg.*

Ice Bulletin: Ross Sea

Issued: Friday 20th January 2023

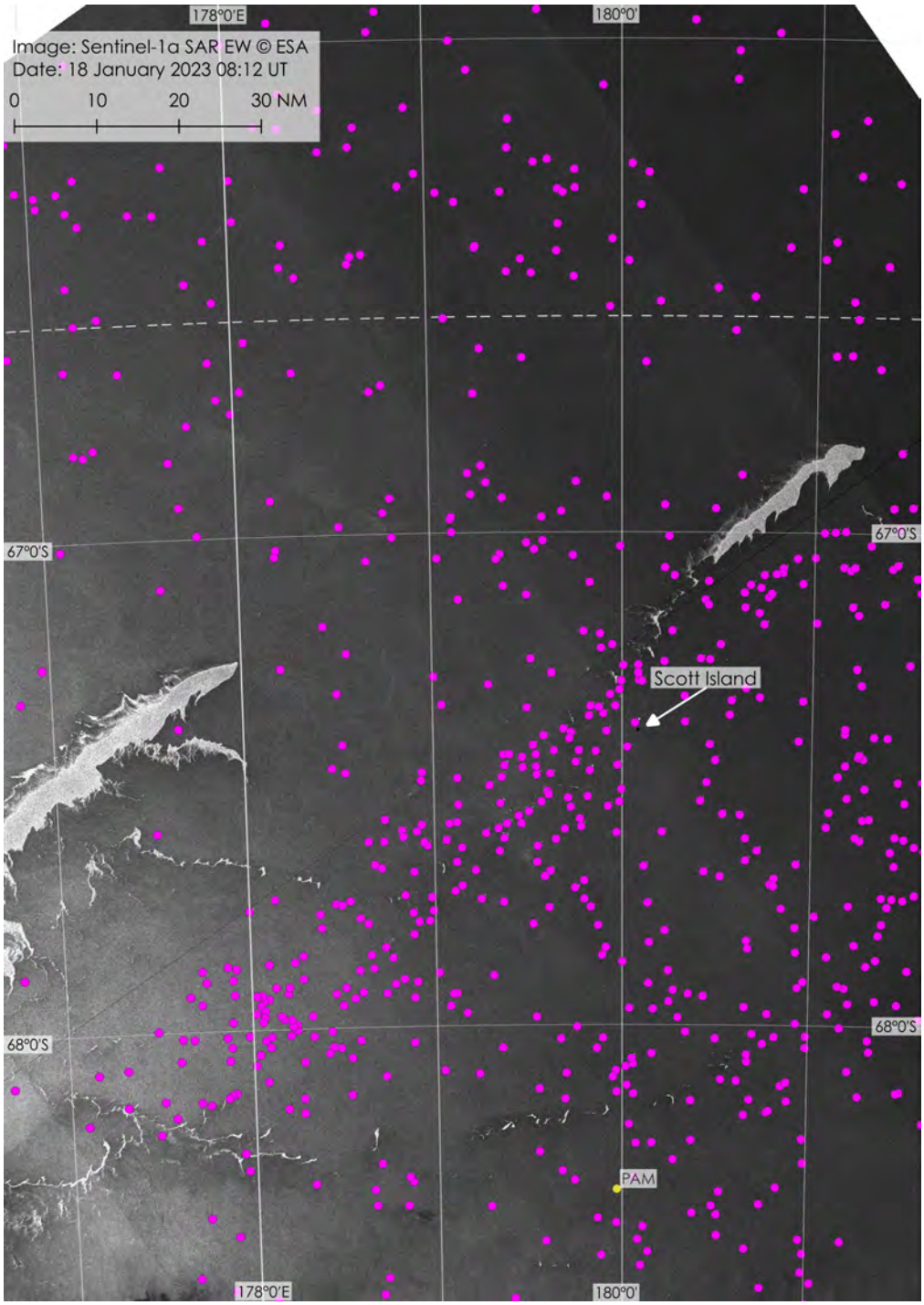
Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Mooring locations of RV *Tangaroa* cruise TAN2302 are marked by coloured dots in all figures of this Bulletin.

Figure 1 shows SAR data of the north-western Ross Sea. The SAR data haven been analysed for iceberg presence, icebergs are marked by pink dots.



The 'PAM' mooring south of Scott Island (67°22′S and 179°54′W) is currently not affected by sea ice however, a spit-like pack ice feature originating from first-year sea ice further west is stretching eastward and reaching across 180º north of that mooring location.

Figure 2 shows a composite of sea-ice concentration and SAR data of the north-western Ross Sea. Additionally, the sea-ice edge based on passive microwave data is included as a light-blue line.

All marked mooring locations are affected only by minimal sea ice that is drifting freely, melting and dispersing. However, higher concentration of sea ice remains present nearshore, but it is decaying as well and drifting in strips and patches.

Figure 1: *Sentinel-1a SAR EW data acquired 18 January 2023 at 08:12 UT and provided by PolarView.*

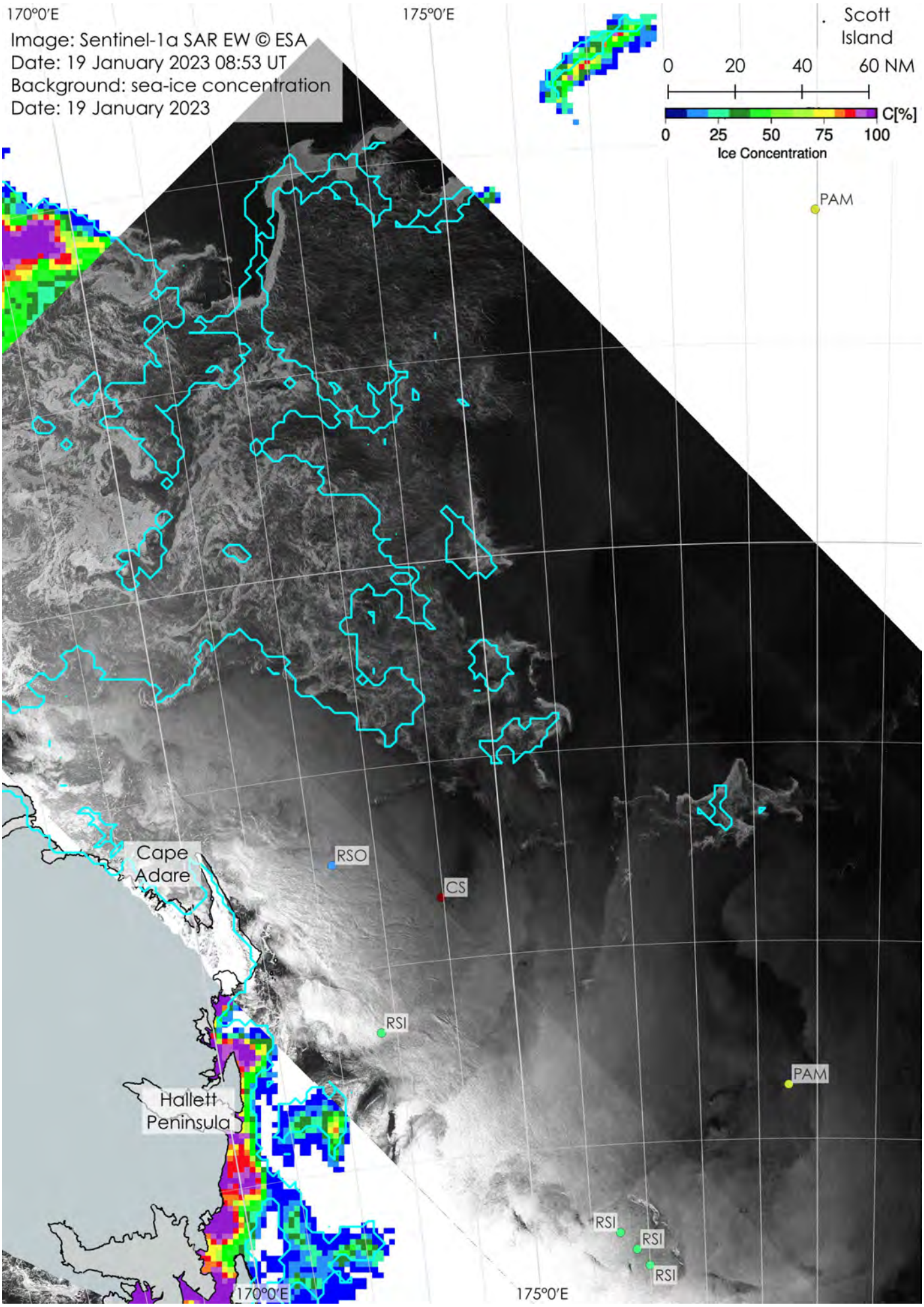


Figure 2: *Sentinel-1a SAR EW data acquired 19 January 2023 at 08:53 UT and provided by PolarView; background of sea-ice concentration data acquired 19 January 2023 and provided by ICDC, University Hamburg.*

Ice Bulletin: Cape Darnley

Issued: Friday 20th January 2023

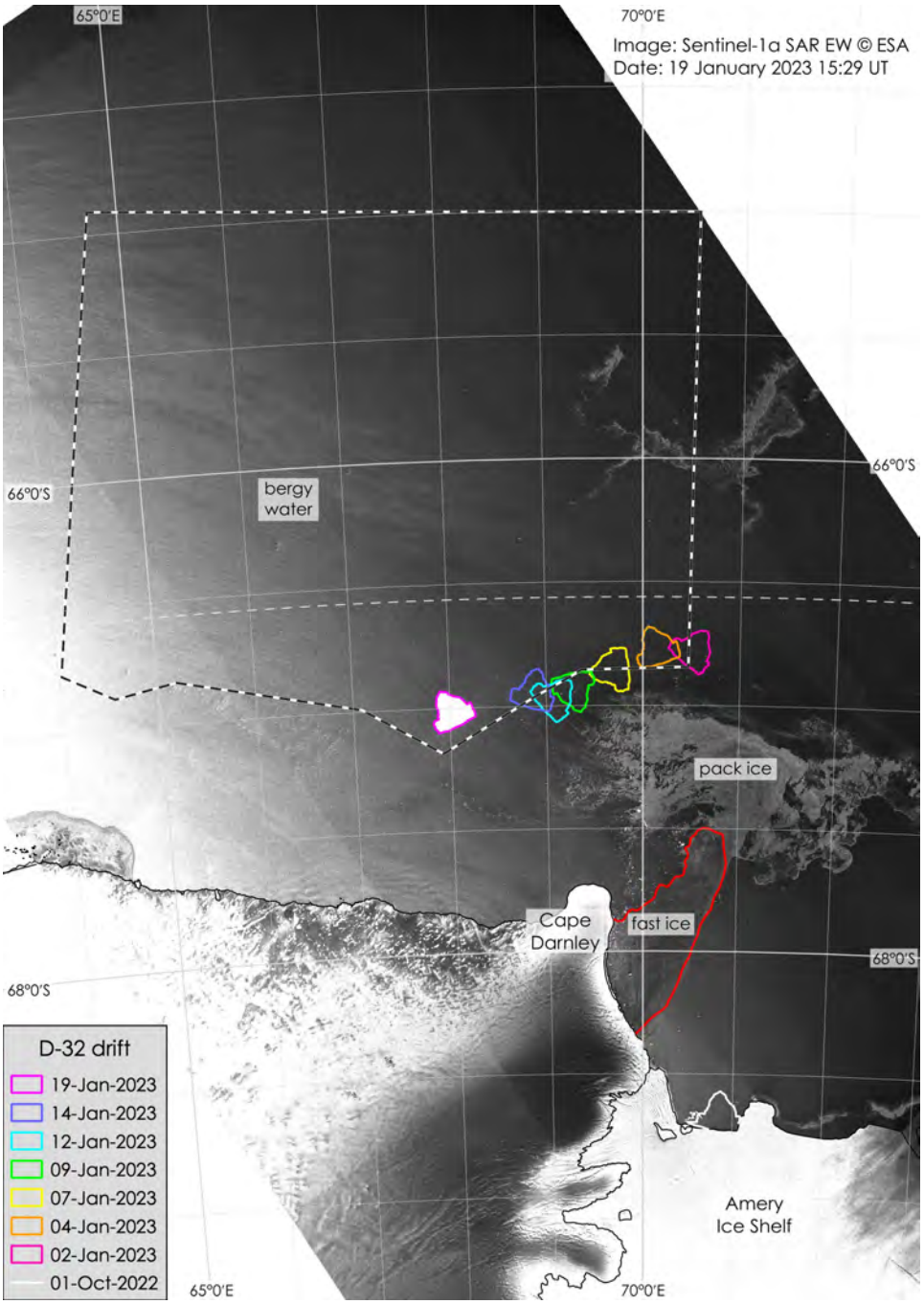
Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Cape Darnley. The black/white outline marks the proposed survey area of RV *Investigator* voyage IN2023-V01.

The fast-ice edge is marked by a red outline. The drift of iceberg D-32 during January 2023 is indicated by colour-coded shapes.



Since calving off the Amery Ice Shelf in October 2022 (the white outline at the western edge of the shelf front), the iceberg has drifted northward and off the continental shelf. Since late-December 2022, it has turned westward and is expected to continue its drift westward roughly along the shelf break.

Off Cape Darnley, fast ice continues to break up. Pack ice is present as far north as 65º30'S but it is generally decaying.

Figure 1: *Sentinel-1a SAR EW data acquired 19 January 2023 at 15:29 UT and provided by PolarView.*

Ice Bulletin: Casey Station

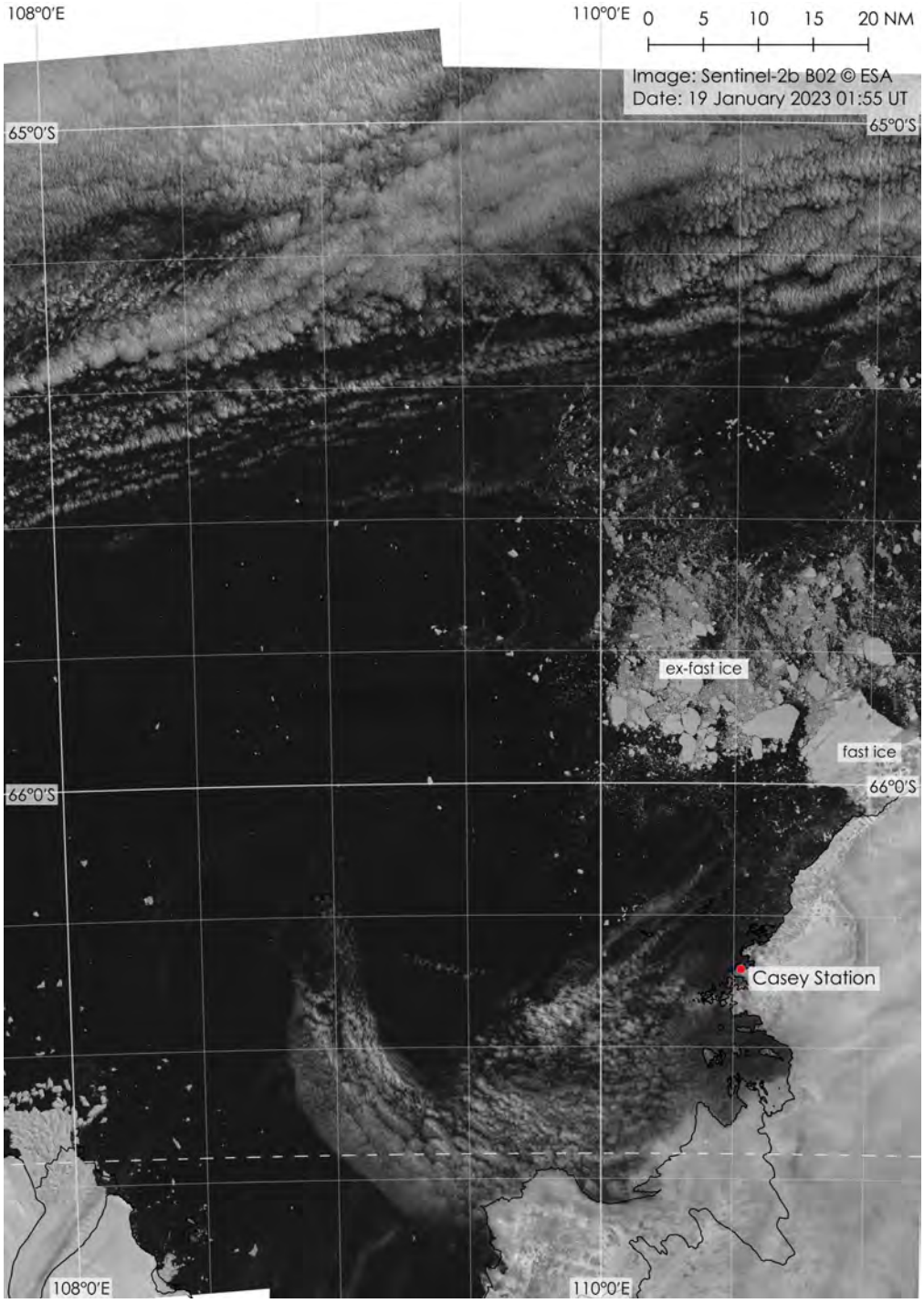
Issued: Friday 20th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) data of the Casey Station region.



In the vicinity of Casey Station, minimal fast ice remains in sheltered bays.

Further north, some fast ice remains off the western flank of Law Dome. It is breaking up and releasing ex-fast ice floes north- and westward.

Figure 1: *Sentinel-2b Band-2 data acquired 19 January 2023 at 01:55 UT and provided by ESA.*

Ice Bulletin: Wilkins Aerodrome

Issued: Saturday 21st January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of Wilkins Aerodrome.

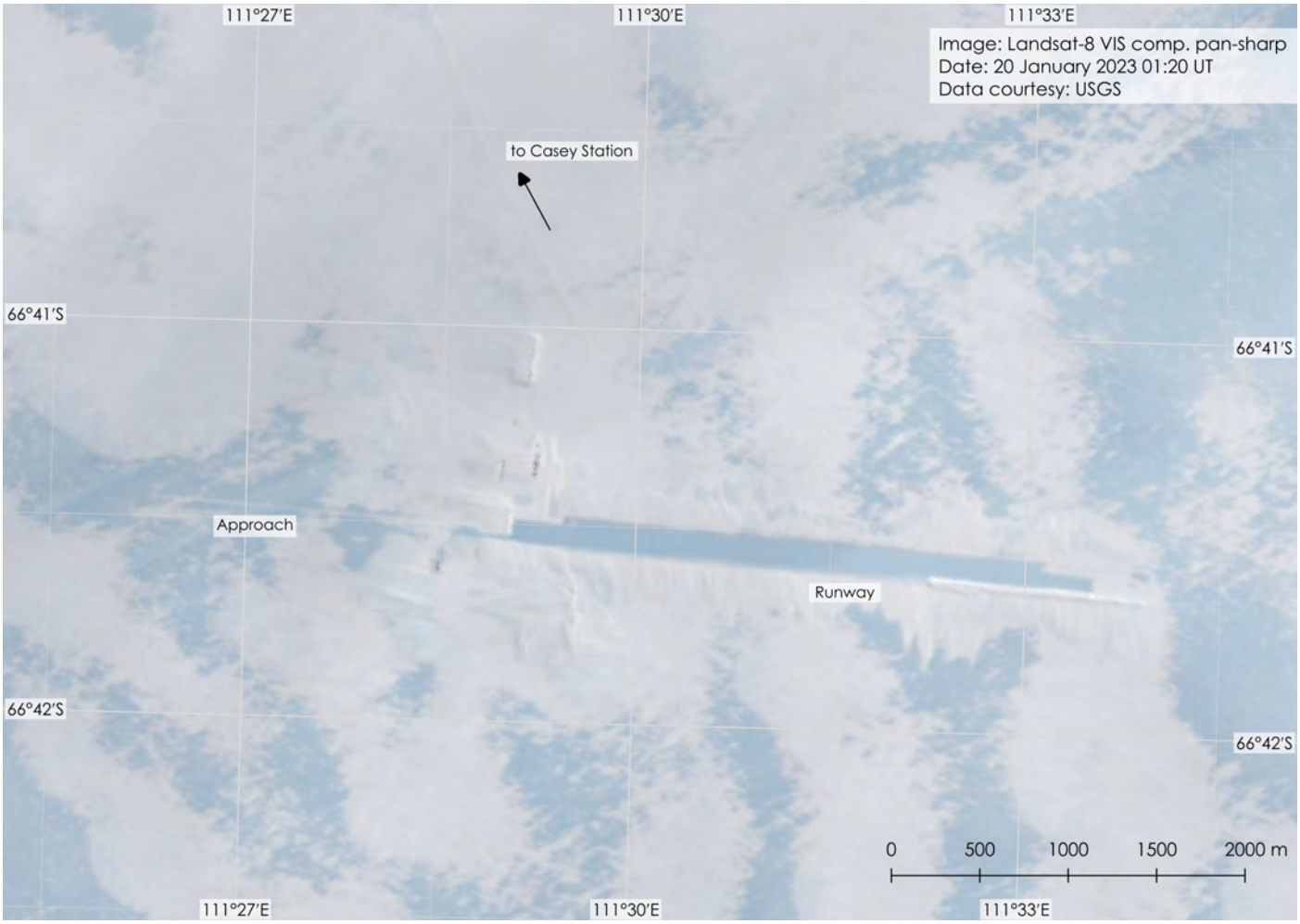


Figure 1: *Landsat-8 visible composite pan-sharpened data acquired 20 January 2023 at 01:20 UT and provided by USGS.*

The ice runway is partly covered by snow. North and south of the runway, snow dunes are left from previous clearing the runway.

Snow dunes have also accumulated around the camp and other structures.

Ice Bulletin: Mawson Station

Issued: Saturday 21st January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data off Mawson Station. The fast-ice edge is marked with a red line (dashed red line for 11 January 2023).

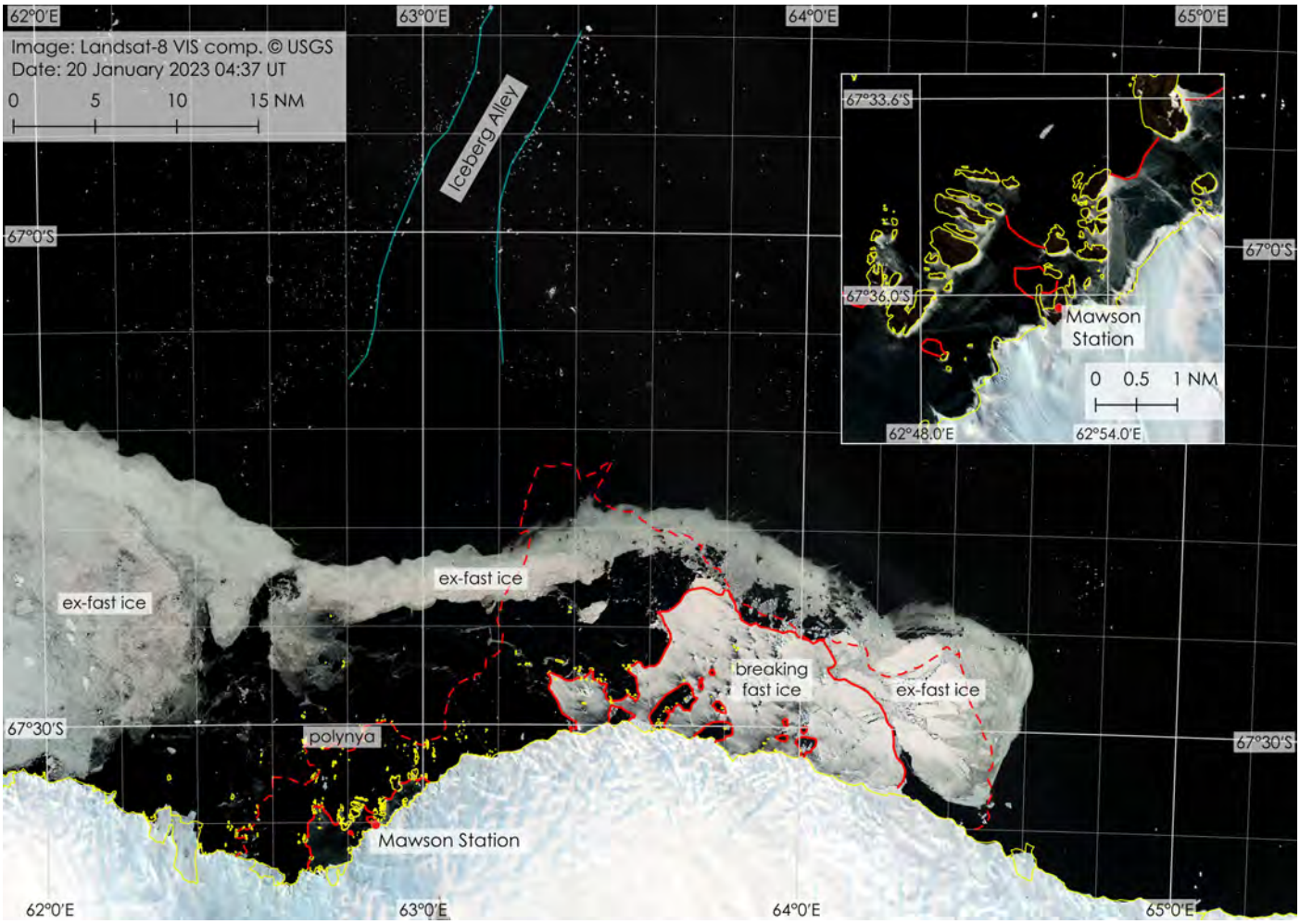


Figure 1: *Landsat-8 visible composite pan-sharpened data acquired 20 January 2023 at 04:37 UT and provided by USGS.*

North of the station, Iceberg Alley (marked by blue outlines) is now clear of any sea ice.

Off station, fast ice continues to break up, east of the station partly in vast sheets. A band of decaying ex-fast ice is separating the polynya off station with the open ocean to the north. This band originates from the rapidly breaking up fast ice east of Mawson Station.

Ice Bulletin: Davis Station

Issued: Saturday 21st January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data off Davis Station. The fast-ice edge is marked by a dashed red line for on 15 January 2023.

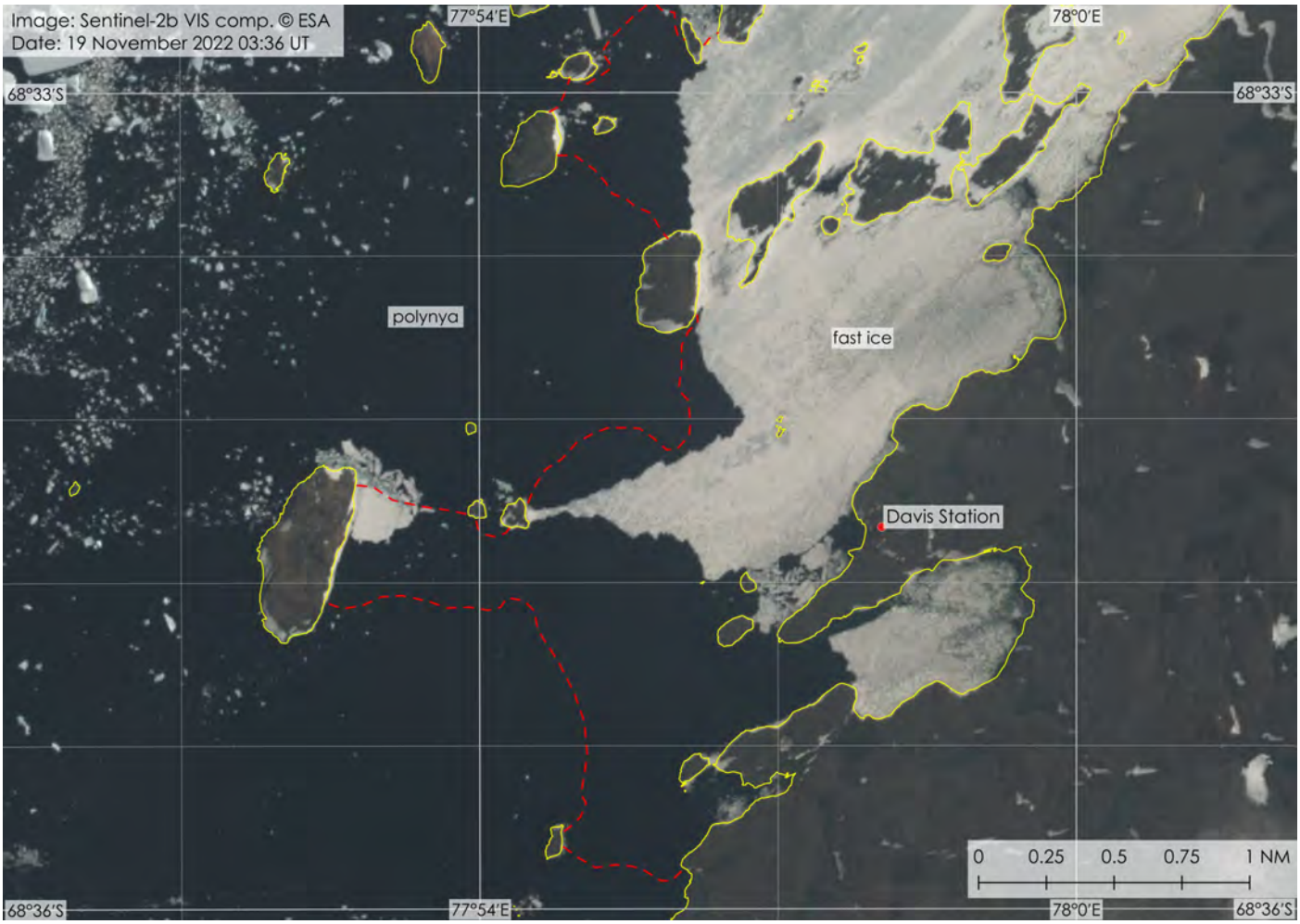


Figure 1: *Sentinel-2b visible composite data acquired 19 January 2023 at 03:36 UT and provided by ESA.*

Off station, fast ice is breaking up but some fast ice remains between pin-points (islands offshore). Further along the off the hills, fast ice continues to retreat towards the shore (see Figure 2).

Most icebergs offshore are grounded but some are drifting with decaying ex-fast ice floes.

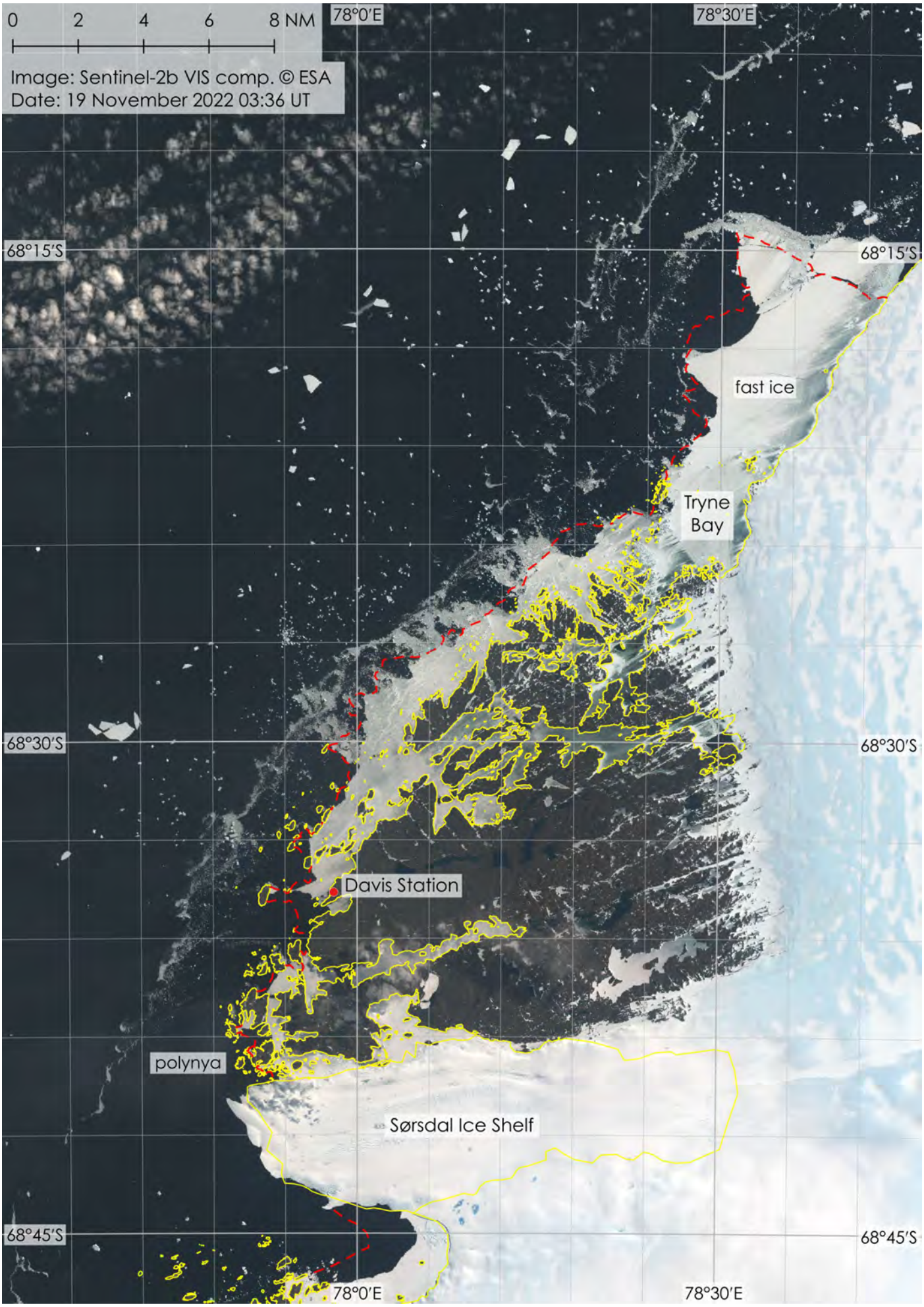


Figure 2: *Sentinel-2b visible composite data acquired 19 January 2023 at 03:36 UT and provided by ESA.*

Ice Bulletin: Davis Station

Issued: Sunday 22nd January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Davis Station. The fast-ice edge is marked by a dashed red line for on 15 January 2023 and with a solid red line for 19 January 2023.

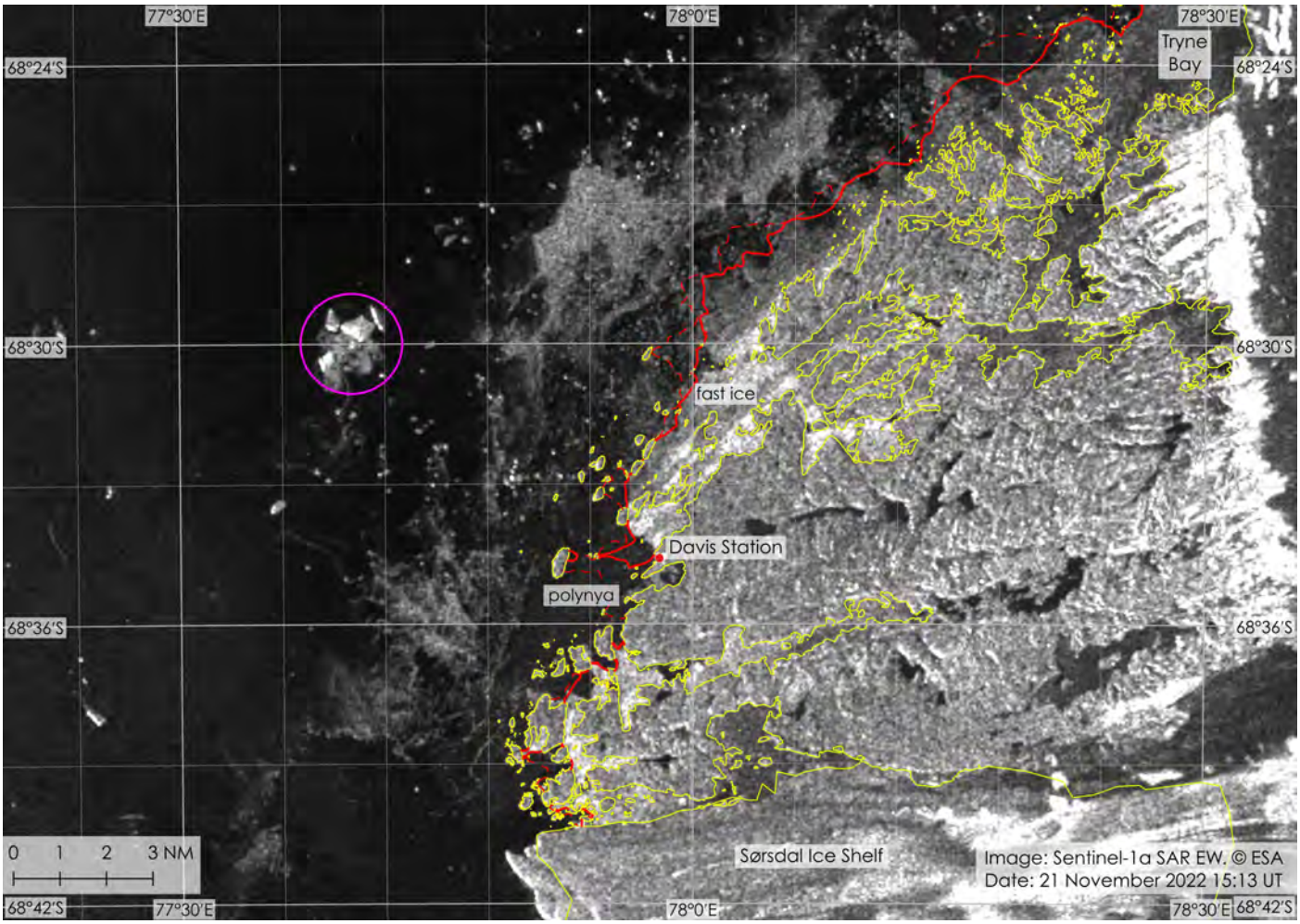


Figure 1: *Sentinel-1a SAR EW data acquired 21 January 2023 at 15:13 UT and provided by PolarView.*

Off station, fast ice continues breaking up, but some fast ice remains between pinpoints (islands offshore). Further along off the hills, fast ice continues to retreat towards the shore and ex-fast ice is generally drifting south-westward.

Most icebergs offshore are grounded but some are drifting with decaying ex-fast ice floes. An area of glacial debris is marked by a pink circle where a group of grounded icebergs is breaking up.

Ice Bulletin: Ross Sea

Issued: Sunday 22nd January 2023

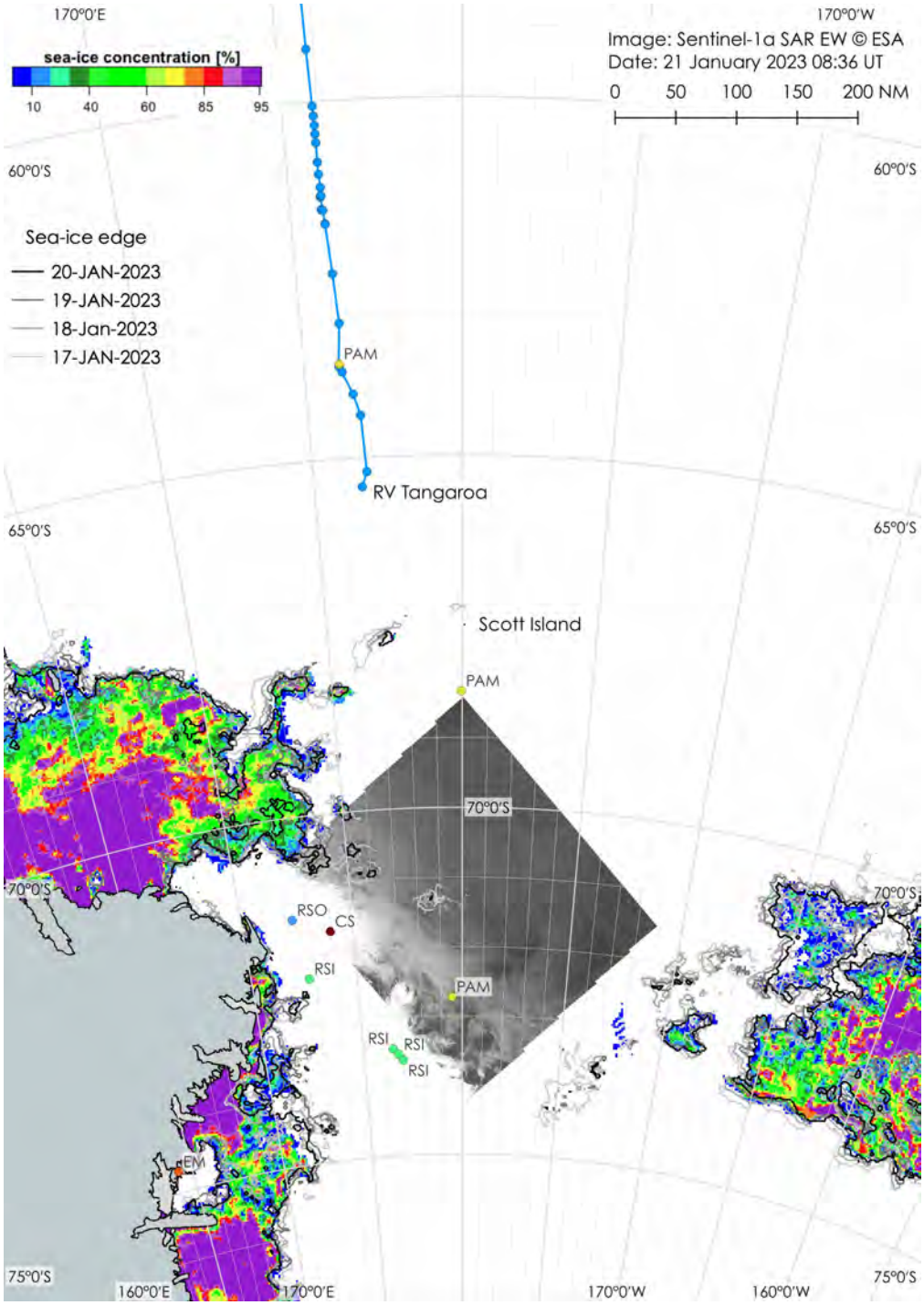
Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Mooring locations of RV *Tangaroa* cruise TAN2302 are marked by coloured dots in the figure of this Bulletin. The cruise track of the vessel up until 22 January 2023 00:00 UT is marked by a blue line.

Figure 1 shows a composite of SAR and sea-ice concentration data of the north-western Ross Sea. The sea-ice edge of the four days prior of 21 January 2023 is marked by colour-coded lines.



The 'PAM' mooring south of Scott Island is currently not affected by sea ice however, a spit-like pack ice feature originating from first-year sea ice further west is stretching eastward and was reaching across 180° north of that mooring location. The sea ice of this feature is decaying and dispersing.

Nearshore, higher concentration of sea ice remains present, but it is decaying as well and drifting in strips and patches.

Freely drifting icebergs can be present throughout the entire region shown in the figure.

Figure 1: *Sentinel-1a SAR EW data acquired 21 January 2023 at 08:36 UT and provided by ESA; background: sea-ice concentration data acquired 21 January 2023 and provided by ICDC, University Hamburg.*

Ice Bulletin: Ross Sea

Issued: Monday 23rd January 2023

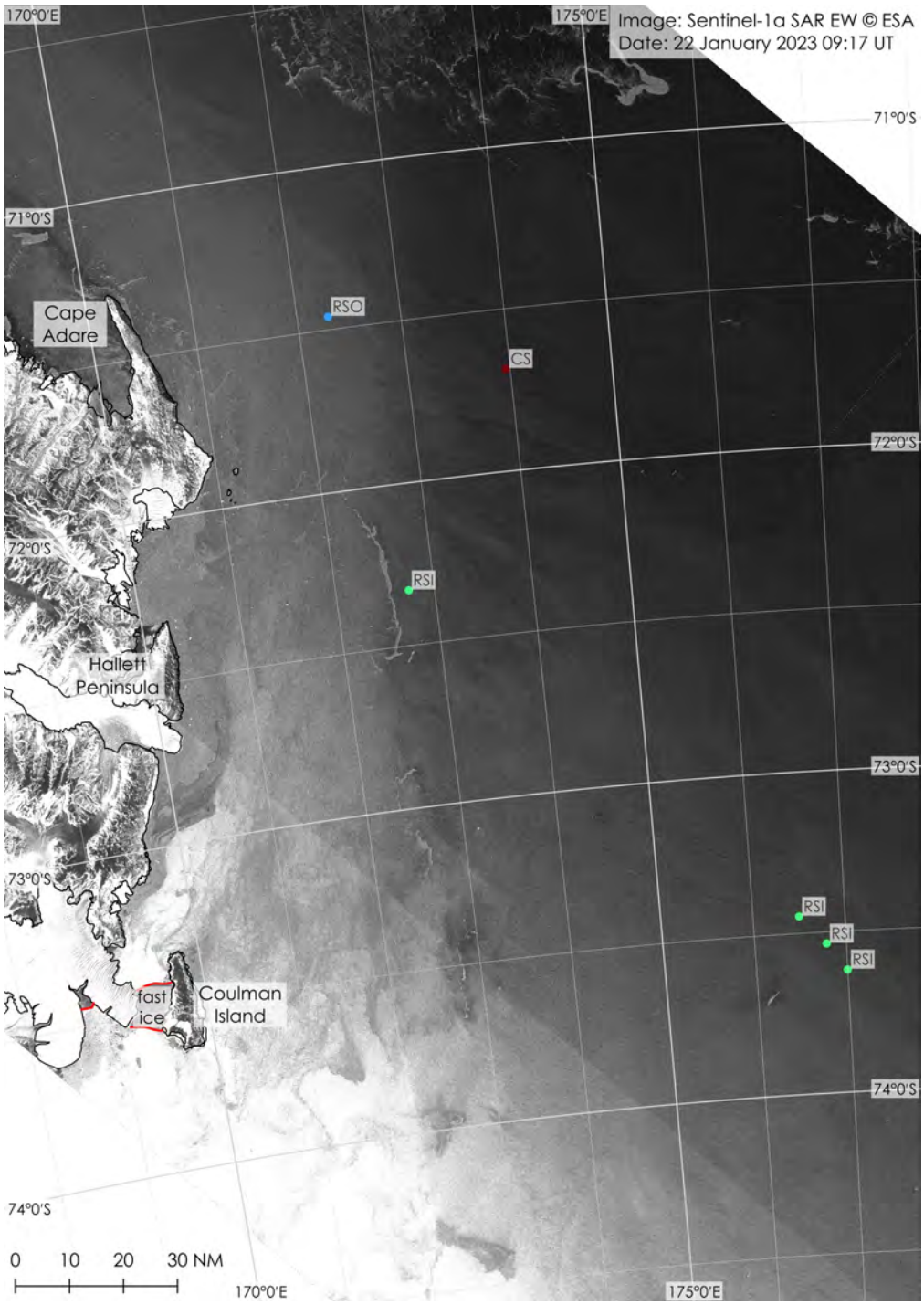
Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Mooring locations of RV *Tangaroa* cruise TAN2302 are marked by coloured dots in the figure of this Bulletin.

Figure 1 shows SAR data of the north-western Ross Sea.



Nearshore between Cape Adare and Coulman Island, sea ice appears to be flushed out and is decaying in strips and patches further offshore.

North and northeast of Cape Adare, decaying pack ice remains present between roughly 68º0'S and 71º0'S.

Only between Coulman Island and the Borchgrevink Glacier Tongue (west of the island), some fast ice is still between the shelf front and the island.

And band of higher concentration pack ice still connects Ross Island (outside of Figure 1) and the coast south of Coulman Island. This band is effectively cutting off Terra Nova Bay, which is otherwise largely free of drifting pack ice.

Freely drifting icebergs can be present throughout the entire region shown in the figure.

Figure 1: *Sentinel-1a SAR EW data acquired 22 January 2023 at 09:17 UT and provided by PolarView.*

Ice Bulletin: Davis Station

Issued: Monday 23rd January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data off Davis Station.

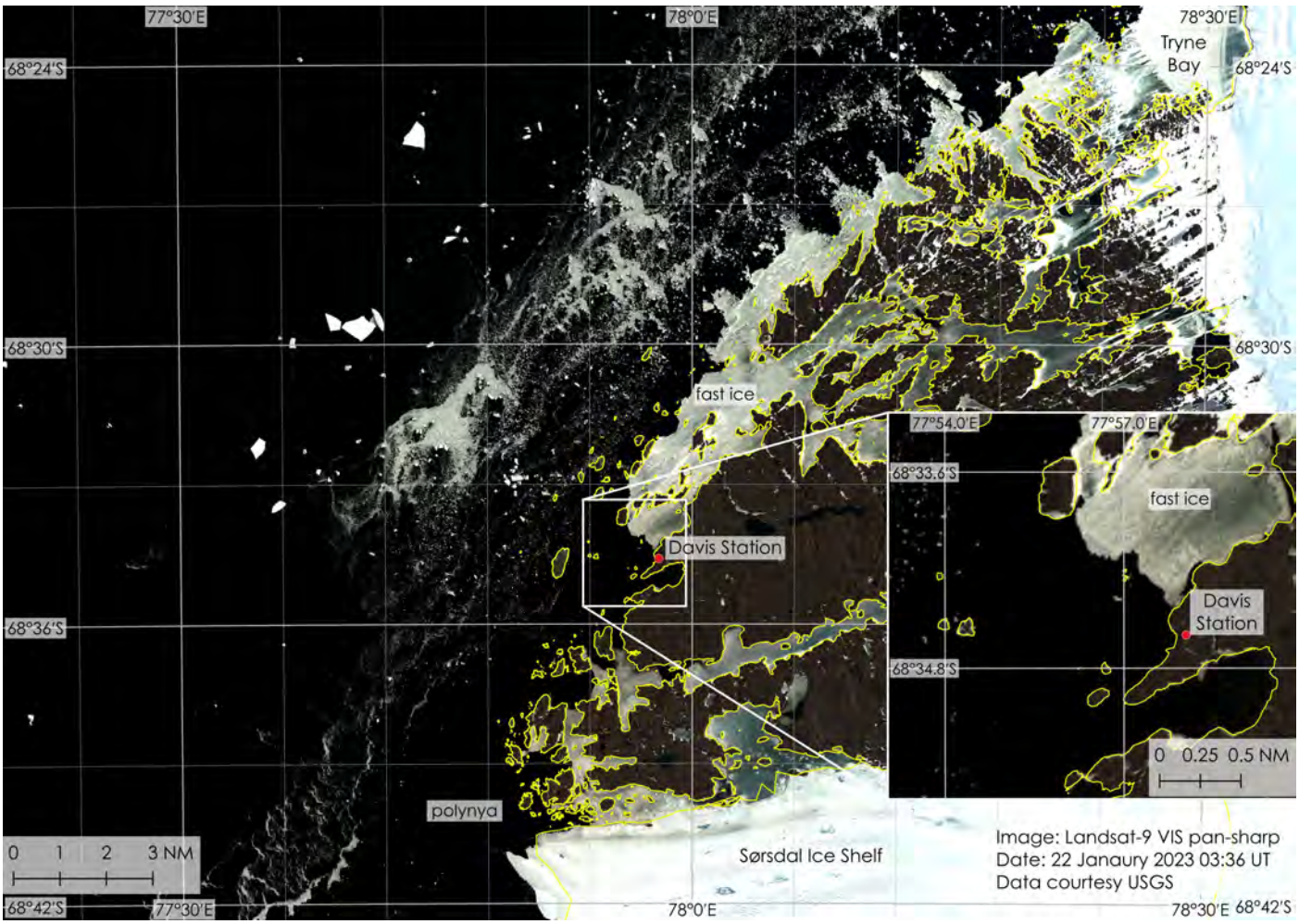


Figure 1: *Landsat-9 visible composite pan-sharpened data acquired 22 January 2023 at 03:36 UT and provided by USGS.*

Off station, fast ice continues breaking up, but some fast ice remains between pinpoints (islands offshore). Further along off the hills, fast ice continues to retreat towards the shore and ex-fast ice is generally drifting south-westward.

Most icebergs offshore are grounded but some are drifting with decaying ex-fast ice floes.

Ice Bulletin: Cape Darnley

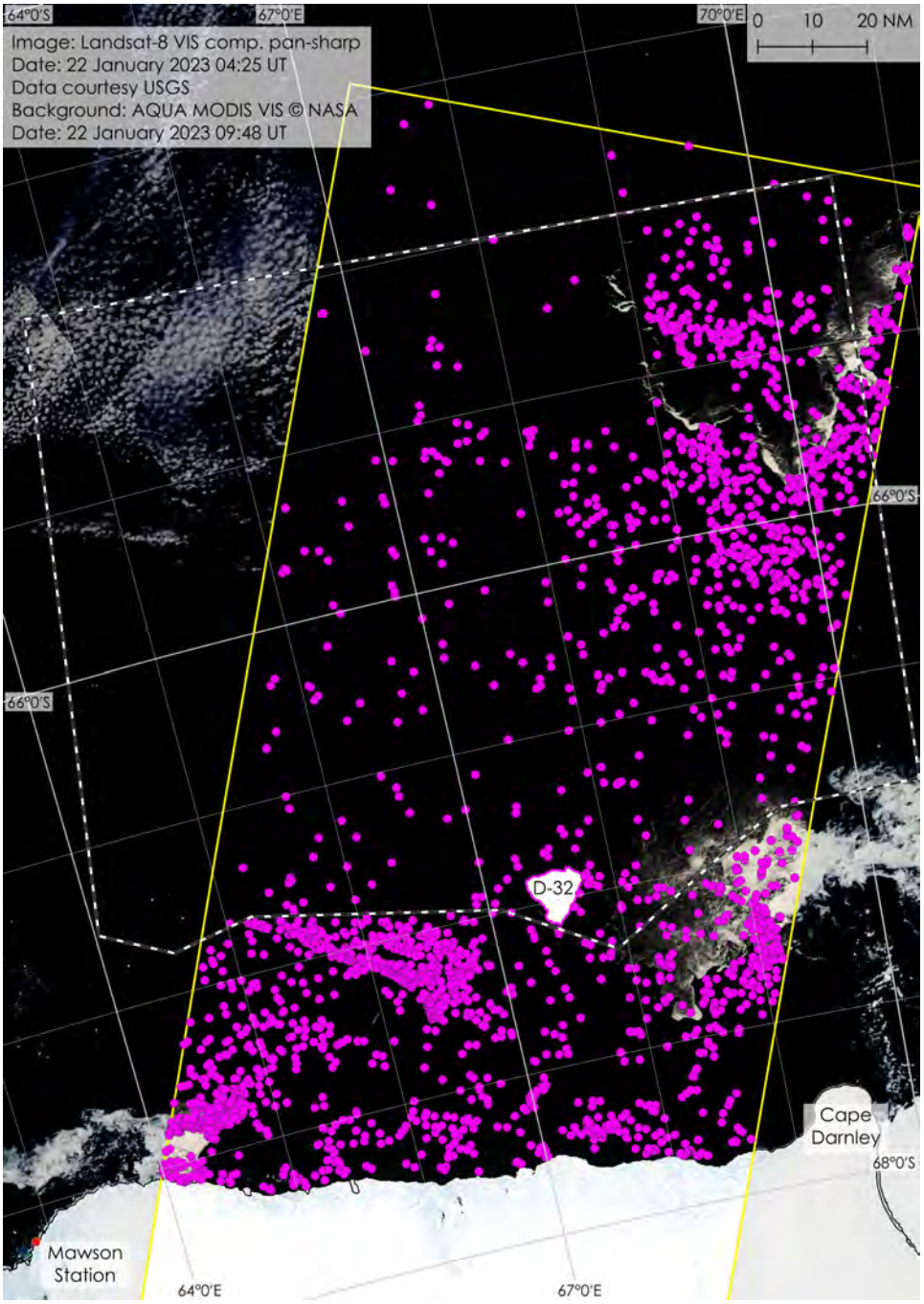
Issued: Monday 23rd January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows visible composite data off Cape Darnley. The black/white outline marks the proposed survey area of RV *Investigator* voyage IN2023-V01.



The high-resolution Landsat-8 data (within the yellow frame) have been analysed for iceberg presence and more than 2300 features have been marked by pink dots.

Large iceberg D-32 continues its westward drift parallel to the continental shelf break.

Pack ice is present in the north-eastern and southern part of the proposed survey area, but it is generally decaying and dispersing.

East off Cape Darnley, fast ice continues to break up and is releasing ex-fast ice floes northward, which are then carried by the predominant current westward.

Figure 1: *Landsat-8 visible composite pan-sharpened data acquired 22 January 2023 at 04:25 UT and provided by USGS; background: AQUA MODIS VIS data acquired 22 January 2023 at 09:48 and provided by NASA.*

Ice Bulletin: D'Urville Sea

Issued: Monday 23rd January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows visible data north of Mawson's Huts in the southern D'Urville Sea. The drift of iceberg C-35 is marked by colour-coded shapes.

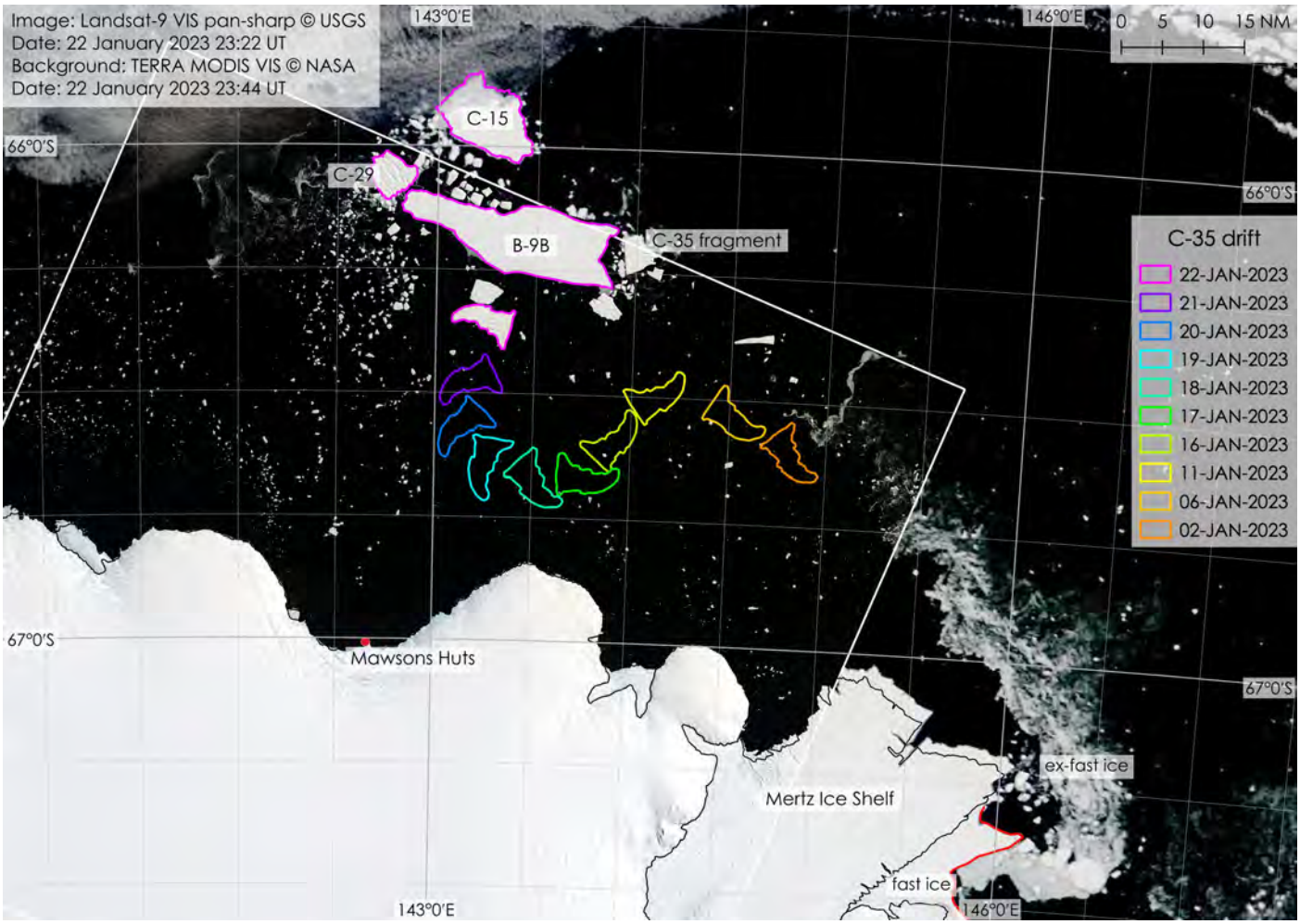


Figure 1: *Landsat-9 visible composite pan-sharpened data (marked by a white line) acquired 22 January 2023 at 23:22 UT and provided by USGS; background of TERRA MODIS VIS data acquired 22 January 2023 at 23:44 UT and provided by NASA.*

Since iceberg C-35 crossed in front of the Mertz Ice Shelf late last year, it drifted westward and appears to have been caught in an eddy current since 11 January 2023. The iceberg originally calved further southeast off the Ninnis Ice Shelf (outside Figure 1) in late-August 2018.

Iceberg B-9B is still restless within the confiments of grounded smaller icebergs. East of iceberg B-9B, a fragment of iceberg C-35 remains close to iceberg B-9B.

East of the Mertz Ice Shelf, fast ice is breaking up and deteriorating and generally drifting north-westward towards the group grounded and ungrounded icebergs north of Mawson's Huts/Commonwealth Bay.

Off Mawson's Huts, Cape Denison is ice free.

Ice Bulletin: Mawson Station

Issued: Wednesday 25th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data off Mawson Station. The fast-ice edge is marked with a red line.

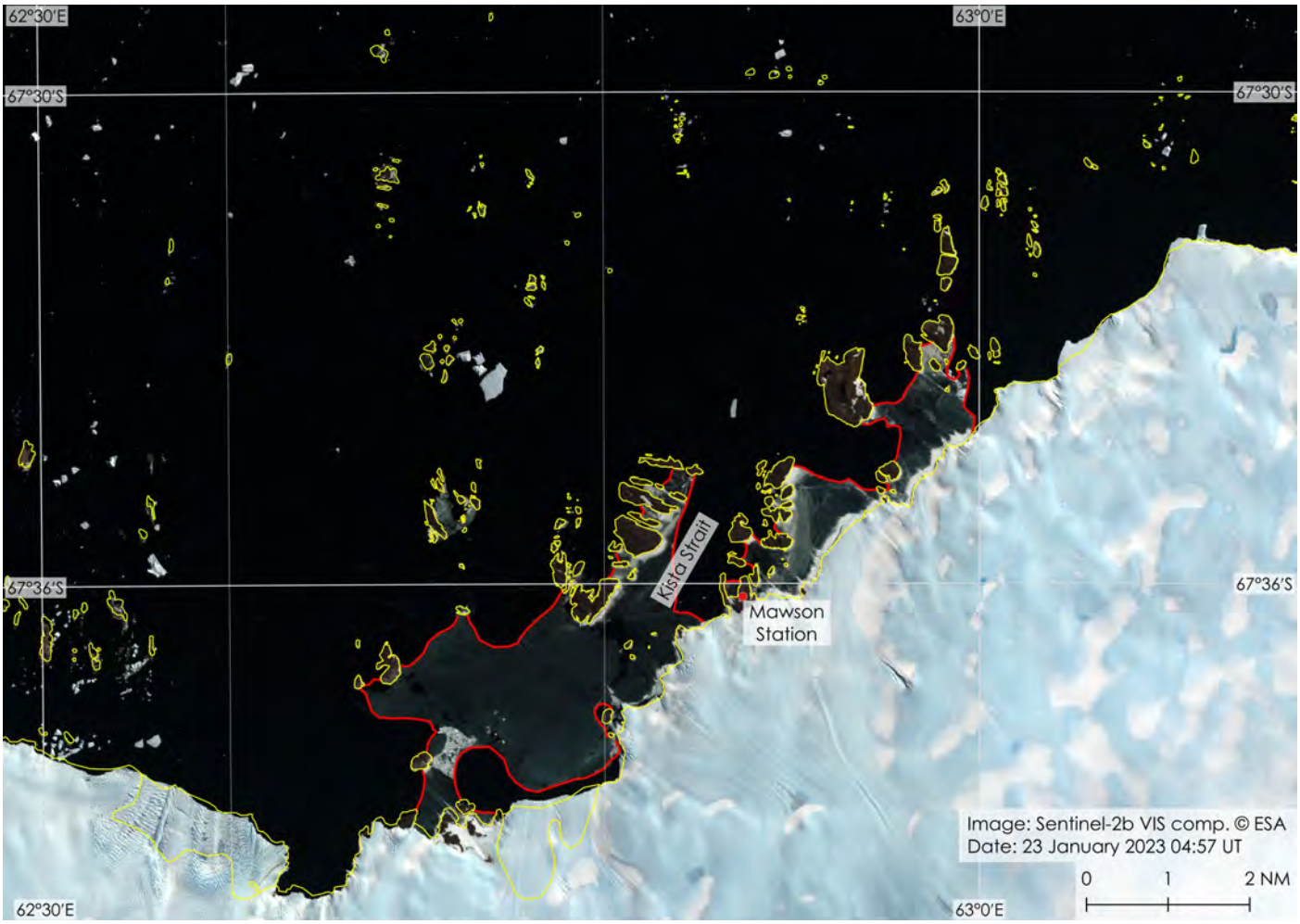


Figure 1: *Sentinel-2b visible composite data acquired 23 January 2023 at 04:57 UT and provided by ESA.*

Off station, fast ice continues to break up. The northern part of Kista Strait is free of fast ice and the remaining fast ice appears unstable.

Figure 2 shows a larger scale overview of the same data as Figure 1.

North of the station, Iceberg Alley (marked by blue outlines) is now clear of any sea ice. A band of decaying ex-fast ice is separating the polynya off station with the open ocean to the north. This band originates from the rapidly disintegrating fast ice east of Mawson Station.

Figure 3 shows the same geographical frame as Figure 2, but SAR data acquired roughly 34 hours after the visible data of figures 1 and 2. The fast ice edge from 23 January 2023 is included as a dashed red line.

The band of ex-fast ice north of the station has drifted roughly 2.5 nautical miles southward but continues to disperse. Off station, the remaining fast ice continues breaking up.

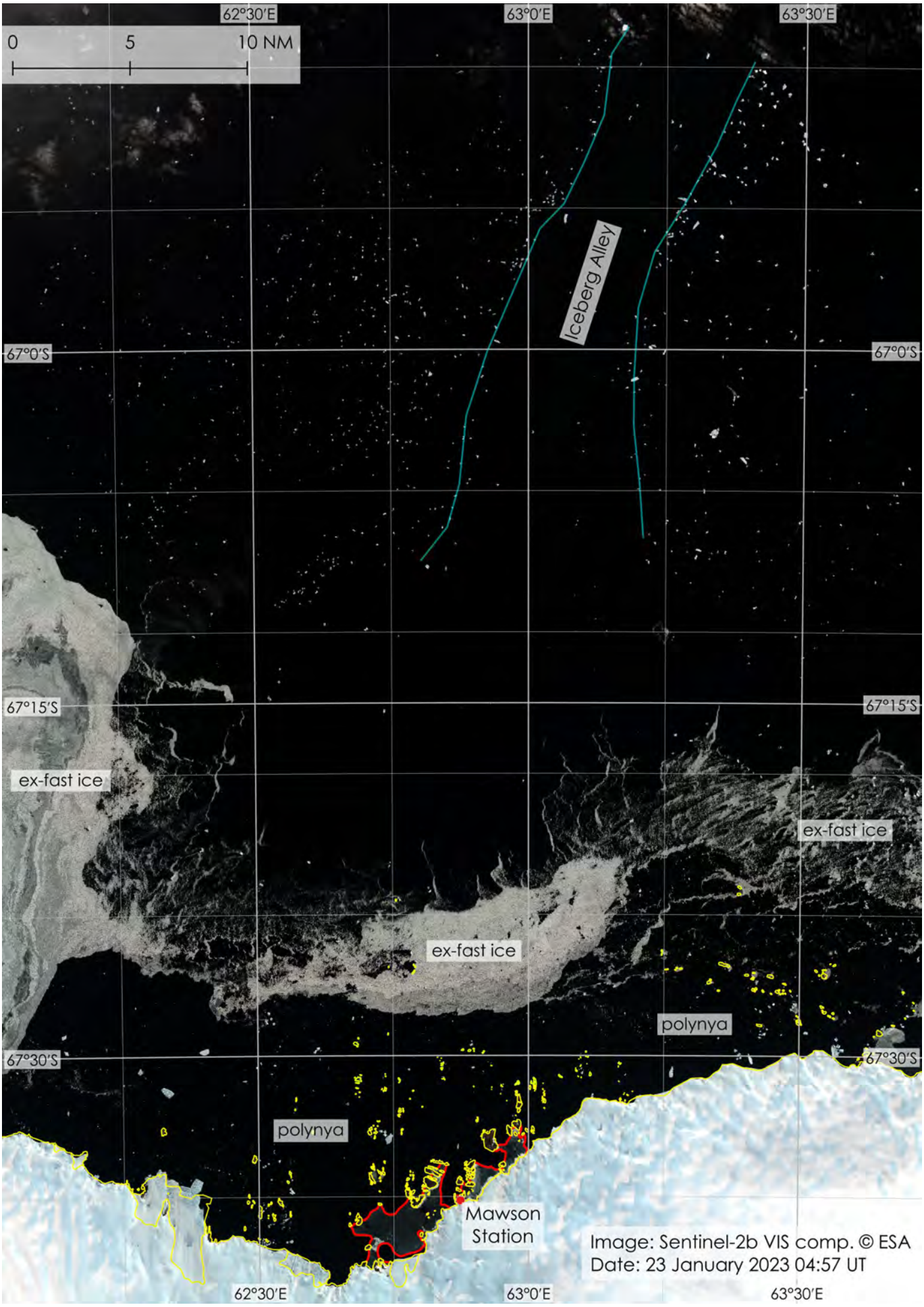


Figure 2: *Sentinel-2b visible composite data acquired 23 January 2023 at 04:57 UT and provided by ESA.*

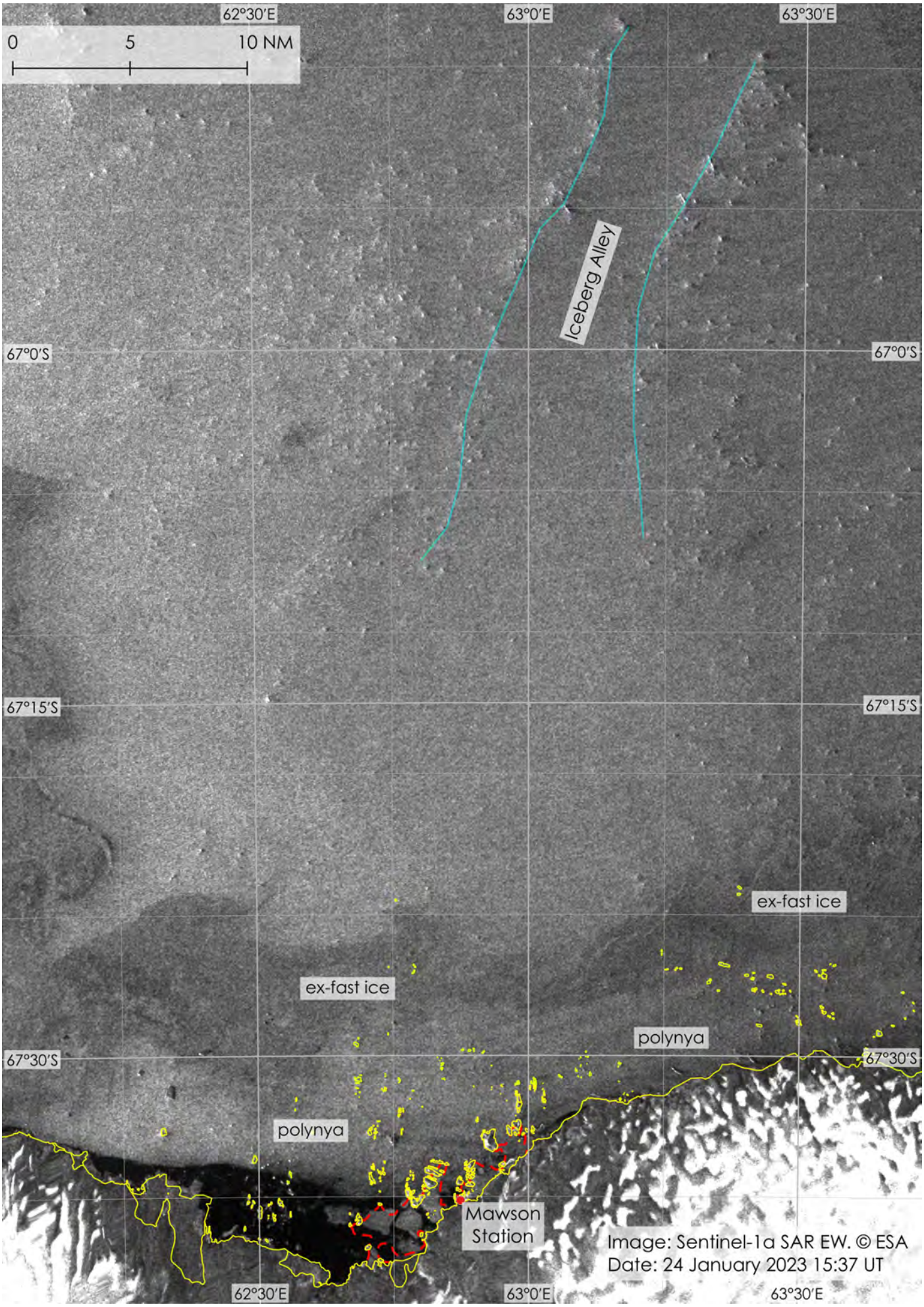


Figure 3: *Sentinel-1a SAR EW data acquired 24 January 2023 at 15:37 UT and provided by PolarView.*

Ice Bulletin: Cape Darnley

Issued: Wednesday 25th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Cape Darnley. The drift of large iceberg D-32 has been marked by colour-coded shapes. The black/white outline marks the proposed survey area of RV *Investigator* voyage IN2023-V01.

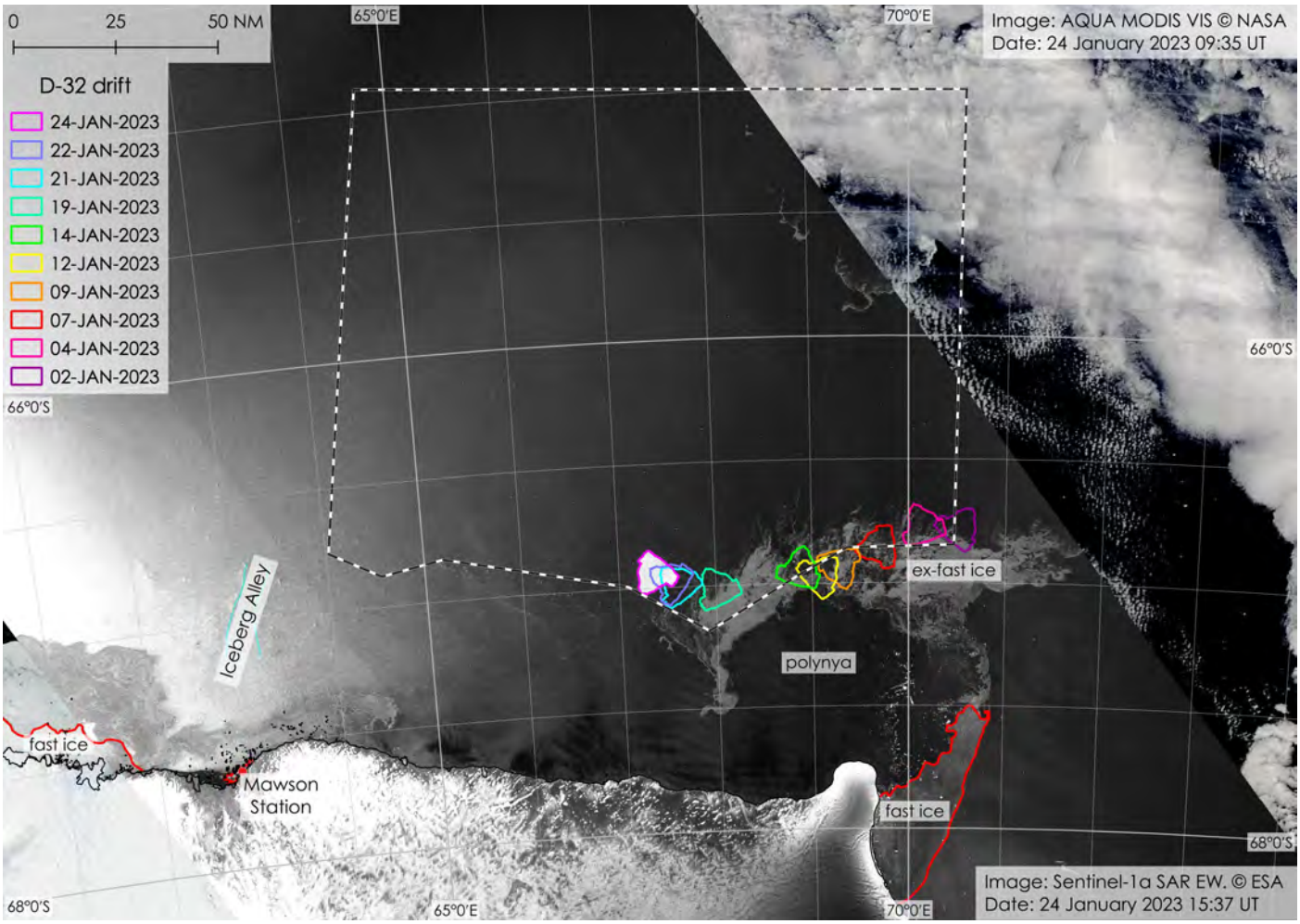


Figure 1: *Sentinel-1a SAR EW data acquired 24 January 2023 at 15:37 UT and provided by PolarView; background: AQUA MODIS VIS data acquired 24 January 2023 at 09:35 and provided by NASA.*

Large iceberg D-32 continues its westward drift parallel to the continental shelf break.

Pack ice remains present in the north-eastern and southern part of the proposed survey area, but it is generally decaying and dispersing.

East off Cape Darnley, fast ice continues to break up and is releasing ex-fast ice floes northward, which are then carried by the predominant current westward.

The largest part of the proposed survey area is free of drifting pack ice but icebergs are present throughout the region.

Ice Bulletin: Mill Island

Issued: Wednesday 25th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows visible data around Mill Island. Large icebergs are outlined by pink shapes (purple shapes for the respective icebergs on 18 January 2023).

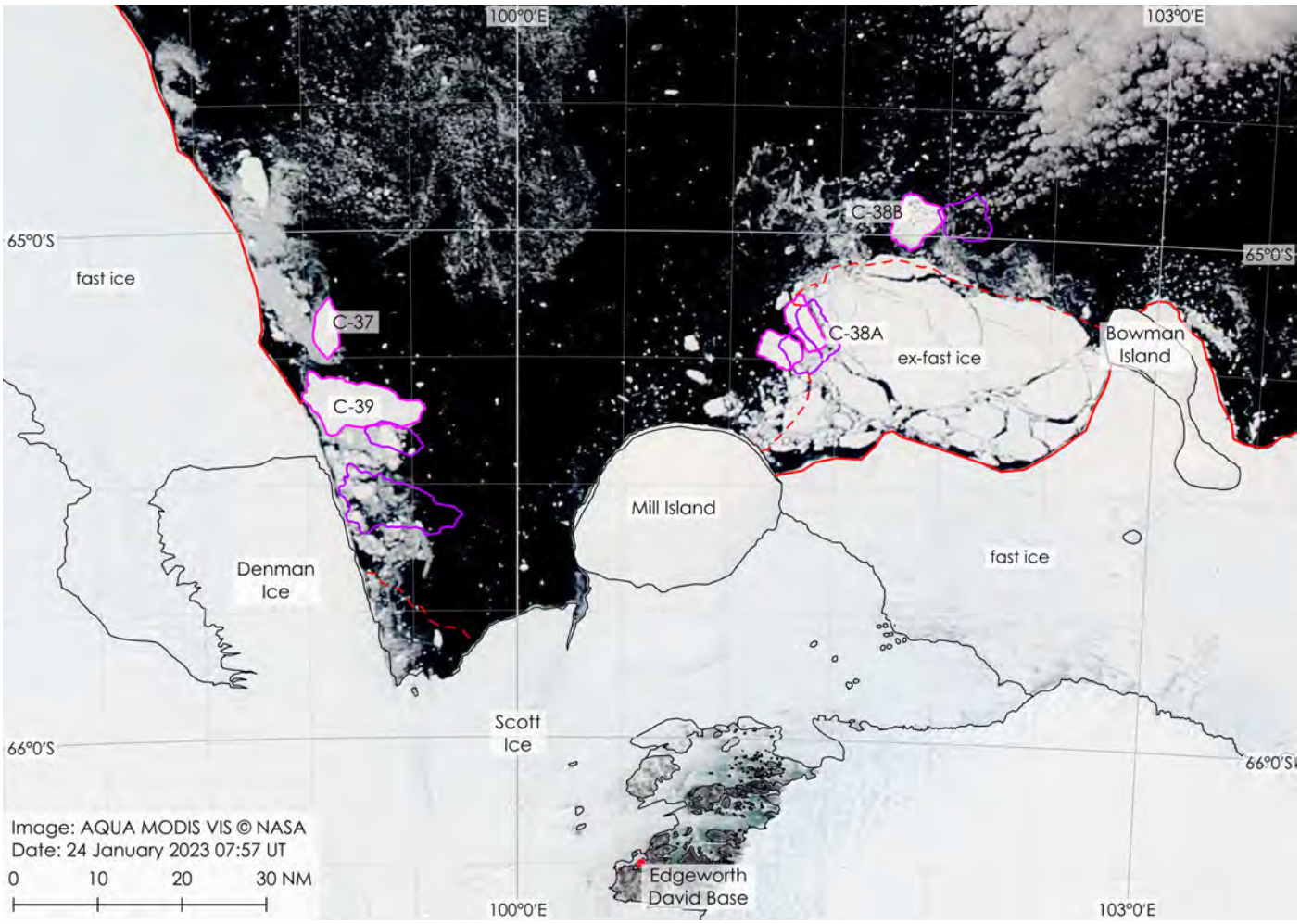


Figure 1: *AQUA MODIS VIS data acquired 24 January 2023 at 07:57 and provided by NASA.*

On 20 January 2023, roughly 2400 km^2 of fast ice have broken up northeast of Mill Island and released large iceberg C-38A, which has subsequently split in two icebergs that are not satisfying the criteria for large icebergs that are tracked specifically anymore.

All large icebergs are now drifting freely in the region. Pack ice and ex-fast ice is deteriorating and breaking up.

Ice Bulletin: New Iceberg A-81

Issued: Wednesday 25th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data of the Brunt Ice Shelf. The fast-ice edge is marked with a red line.

On 22 January 2023 during a spring tide, new iceberg A-81 with an area 1550 km² (almost the size of Greater Hobart) has broken off the 150 m thick Brunt Ice Shelf. The iceberg calved off the ice shelf when a fissure known as Chasm-1, which had been developing from the south northward towards the MacDonald Rumples, connected to smaller cracks that developed around the rumples southward.

Chasm-1 was dormant for 35 years before it restarted progressing northward in 2012. In the 2015-16 summer season, the British research station Halley VI, which was initially established closer to the shelf-ice edge, was relocated further upstream of Chasm-1 as a precaution.

During the calving process, at least seven additional large icebergs (marked by dashed pink shapes in the figure) have been formed ranging from 7 km^2 to almost 50 km^2. However, those icebergs do not satisfy the size limits to merit a separate designation (name).

Many more significant floes of multi-year ex-fast ice, which had formed within the crevasses of the breaking shelf, have been released and will join in the drift through the southern Weddell Sea along with the new icebergs. It is expected that iceberg A-81 will follow largely a similar drift track to iceberg A-74, which calved from the northern side of the Brunt Ice Shelf in February 2021 (the transparent grey shape in Figure 1) and is currently further southwest north of Berkner Island (not shown in the figure).

Also, during the calving, the fast ice that was still present at the southern edge of the ice shelf shattered.

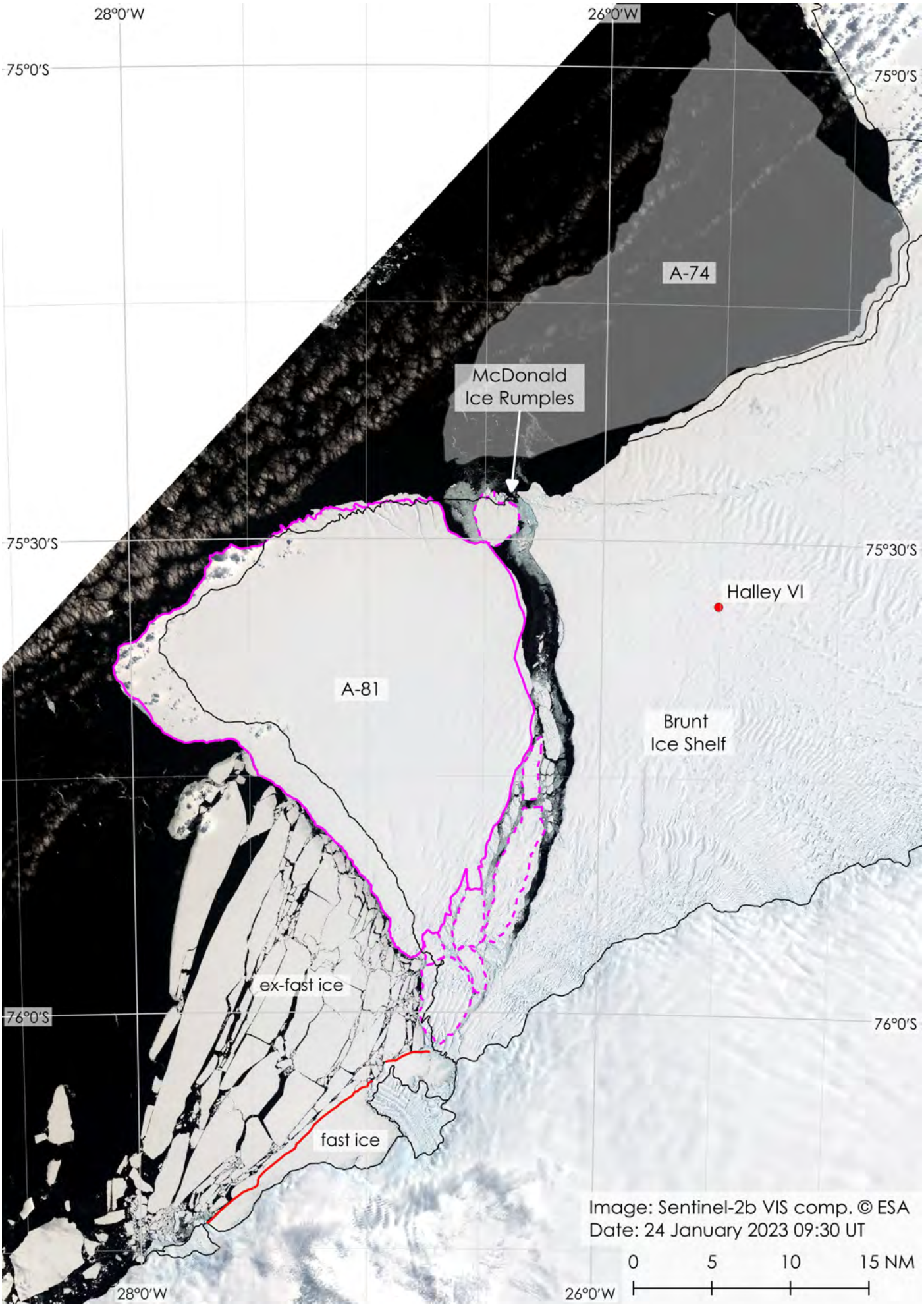


Figure 1: *Sentinel-2b visible composite data acquired 24 January 2023 at 09:30 UT and provided by ESA.*

Ice Bulletin: Ross Sea

Issued: Friday 27th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Mooring locations of RV *Tangaroa* cruise TAN2302 are marked by coloured dots in the figures of this Bulletin.

Figure 1 shows SAR data of the north-western Ross Sea. The cruise track of the vessel is indicated by the blue line (up until 26 January 2023 23:00 UT). Freely drifting icebergs are marked by pink dots.

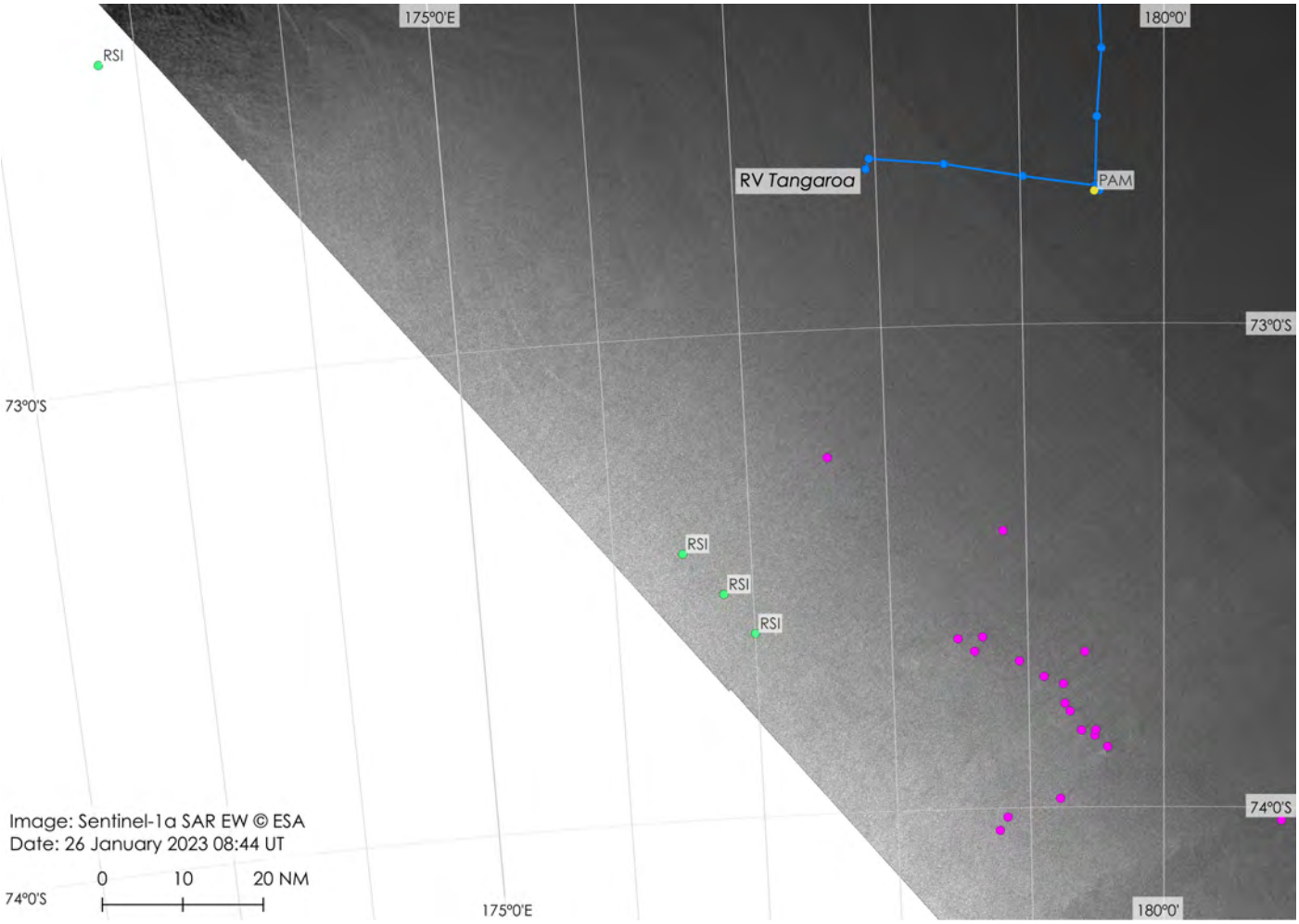


Figure 1: *Sentinel-1a SAR EW data acquired 26 January 2023 at 08:44 UT and provided by ESA.*

There is minimal drifting sea ice in the north-western part of the scene.

Figure 2 shows visible data of the western coast of the Ross Sea.

Nearshore between Cape Adare and Coulman Island, sea ice is decaying in strips and patches offshore.

Between Coulman Island and the Borchgrevink Glacier Tongue, fast ice has broken up between the shelf front and the island. Only south from there, some fast ice remains at the coast.

And band of higher concentration pack ice still connects Ross Island (outside of Figure 1) and the coast south of Coulman Island. This band is effectively cutting off Terra Nova Bay, which is otherwise largely free of drifting pack ice.

Freely drifting icebergs can be present throughout the entire region shown in the figures.

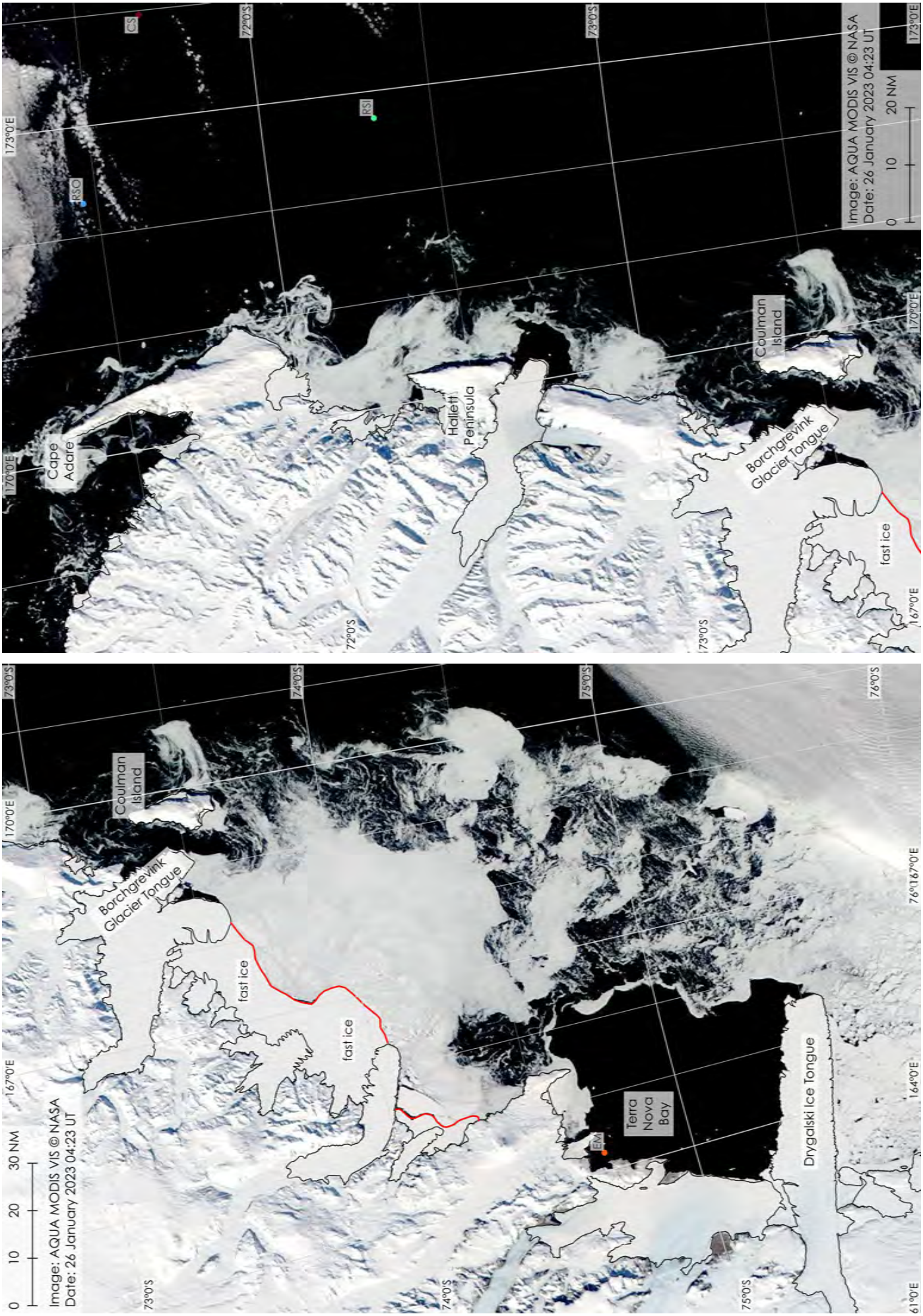


Figure 2: *AQUA MODIS VIS data acquired 26 January 2023 at 04:23 UT and provided by NASA.*

Ice Bulletin: Cape Darnley

Issued: Friday 27th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Cape Darnley. The drift of large iceberg D-32 has been marked by colour-coded shapes. The black/white outline marks the proposed survey area of RV *Investigator* voyage IN2023-V01.

Large iceberg D-32 continues its westward drift parallel to the continental shelf break.

Pack ice remains present in the north-eastern and southern part of the proposed survey area (outlined by yellow shapes), but it is generally decaying and dispersing.

East off Cape Darnley, fast ice continues to break up and is releasing ex-fast ice floes northward, which are then carried by the predominant current westward.

The largest part of the proposed survey area is free of drifting pack ice but icebergs are present throughout the region.

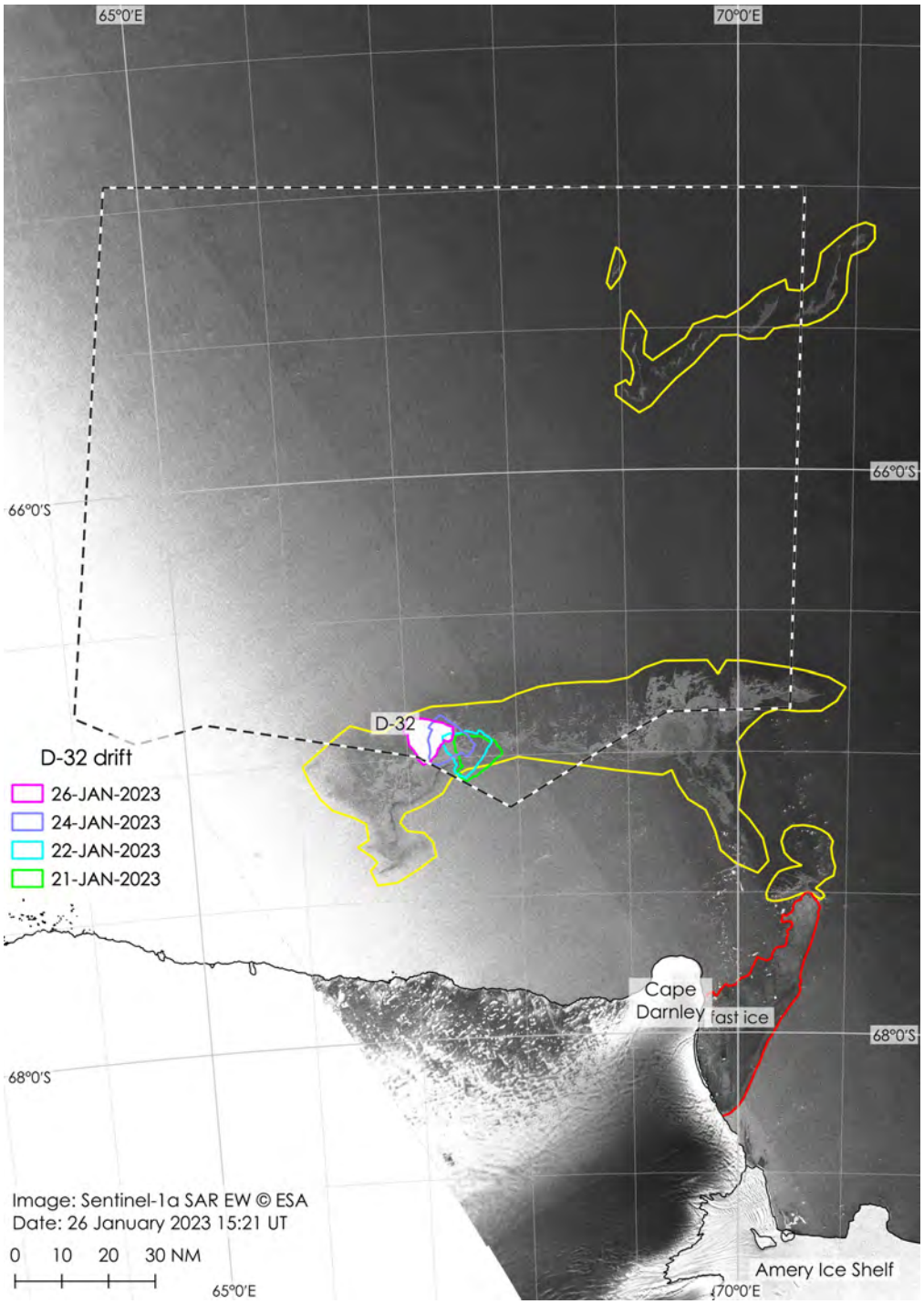


Figure 1: *Sentinel-1a SAR EW data acquired 26 January 2023 at 15:21 UT and provided by PolarView.*

Ice Bulletin: Ross Sea

Issued: Saturday 28th January 2023

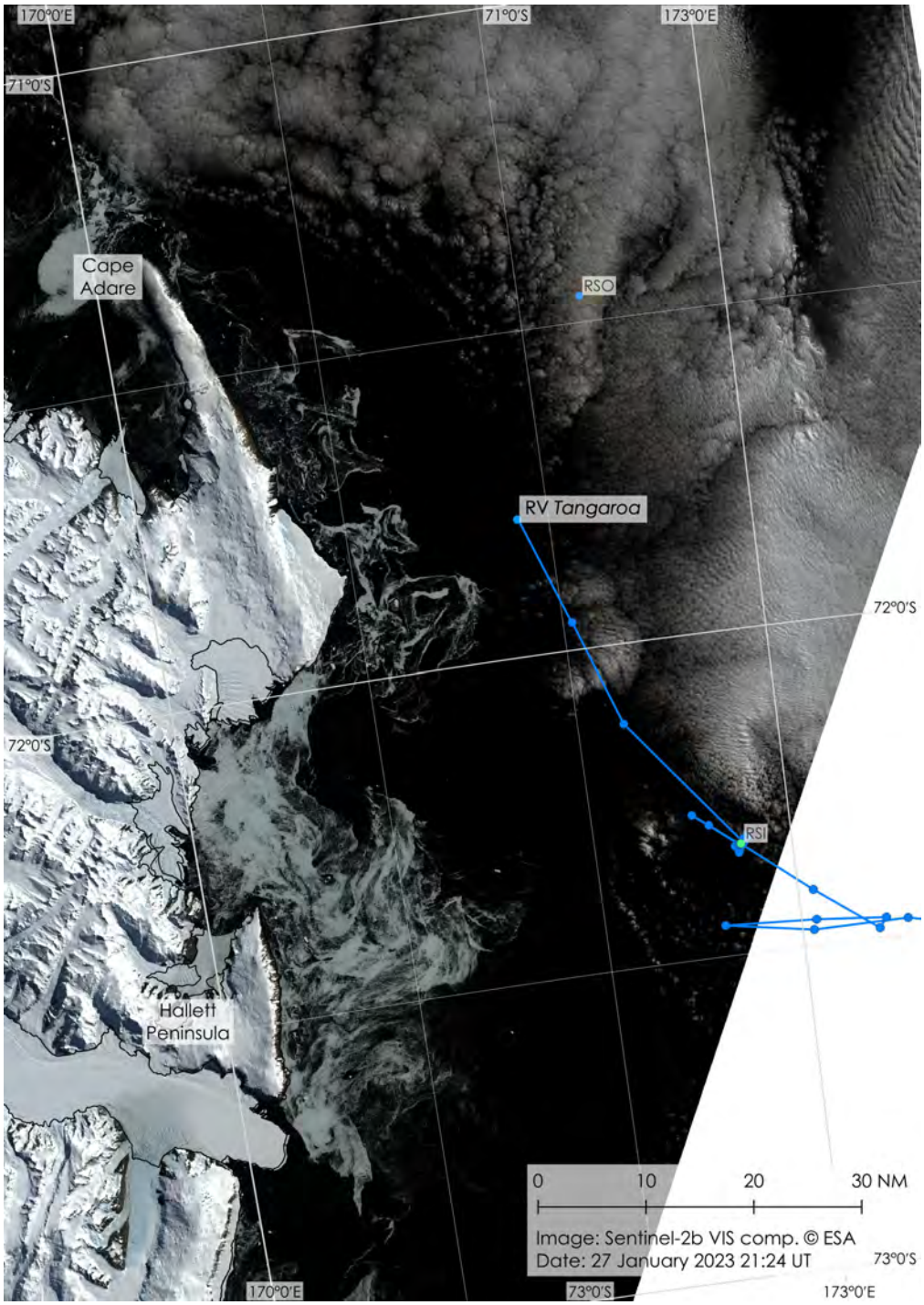
Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Mooring locations of RV *Tangaroa* cruise TAN2302 are marked by coloured dots in the figures of this Bulletin.

Figure 1 shows high-resolution (10 m horizontal) visible data of the north-western Ross Sea. The cruise track of the vessel is indicated by the blue line (up until 28 January 2023 06:00 UT).



Nearshore between Cape Adare and Hallet Peninsula, sea ice is decaying in strips and patches offshore and drifting generally eastward towards the open sea.

Freely drifting icebergs can be present throughout the entire region shown in the figure.

Figure 1: *Sentinel-2b VIS composite data acquired 27 January 2023 at 21:24 UT and provided by ESA.*

Ice Bulletin: Davis Station

Issued: Monday 30th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data off Davis Station.

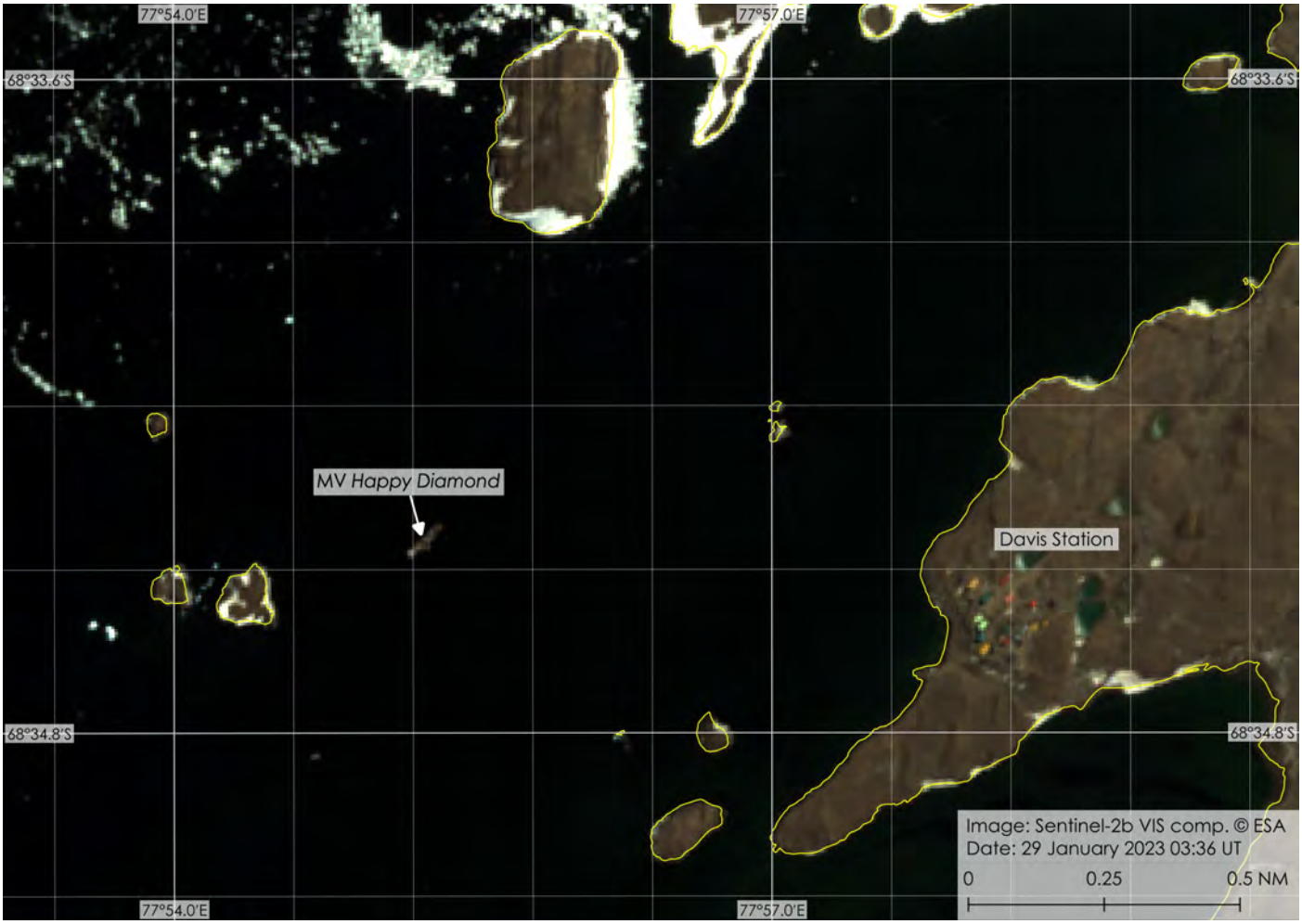


Figure 1: *Sentinel-2b visible composite data acquired 29 January 2023 at 03:36 UT and provided by ESA.*

Off station, fast ice continues breaking up.

Figure 2 shows a larger-scale overview of the Vestfold Hills.

Some fast ice remains between pinpoints (islands offshore). Further north, no more fast ice remains between the hills and the West Ice Shelf (not shown in the figure) but some ex-fast ice is generally drifting south-westward.

Most icebergs offshore are grounded but some are drifting with decaying ex-fast ice floes.

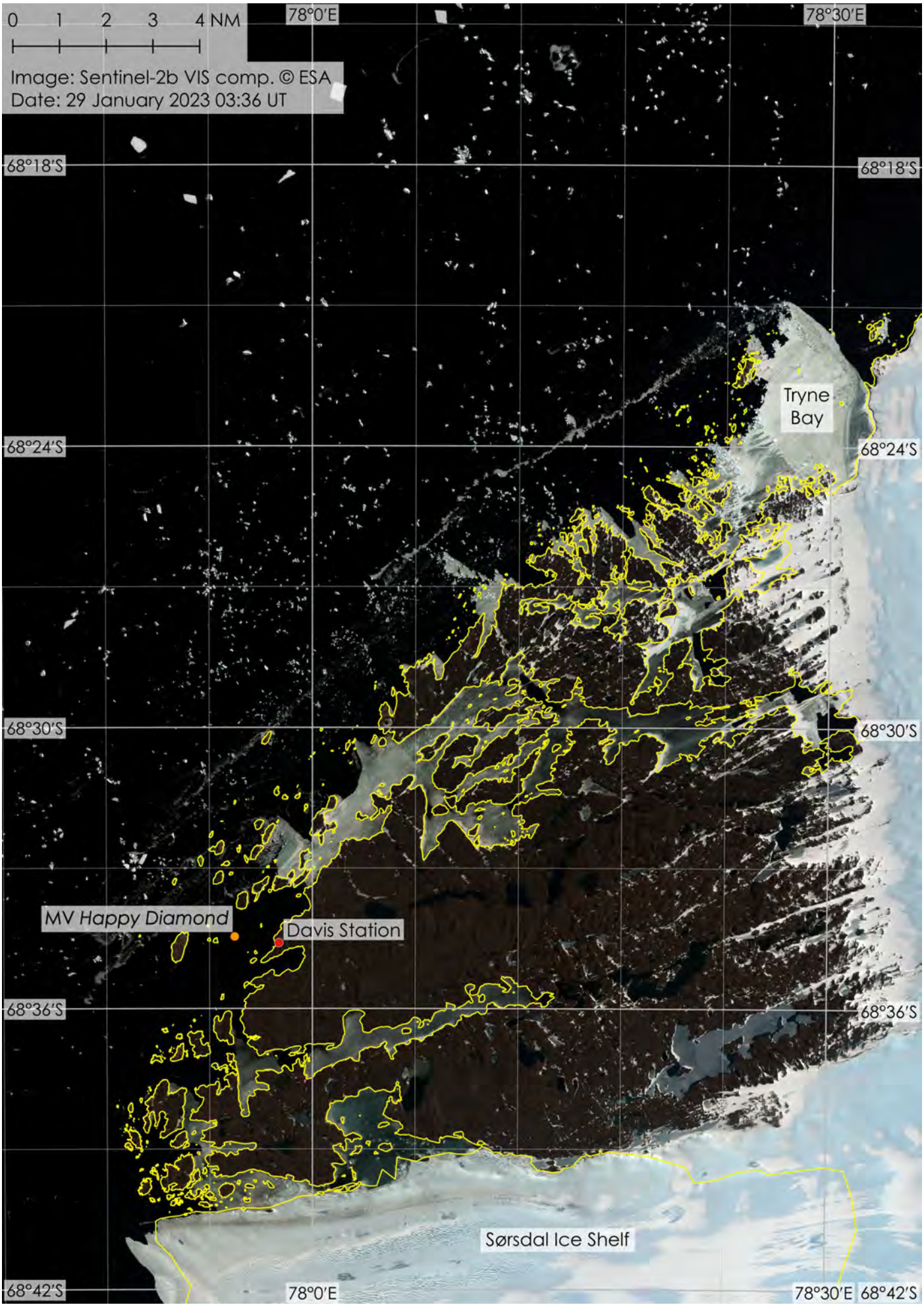


Figure 2: *Sentinel-2b visible composite data acquired 29 January 2023 at 03:36 UT and provided by ESA.*

Ice Bulletin: Ross Sea

Issued: Monday 30th January 2023

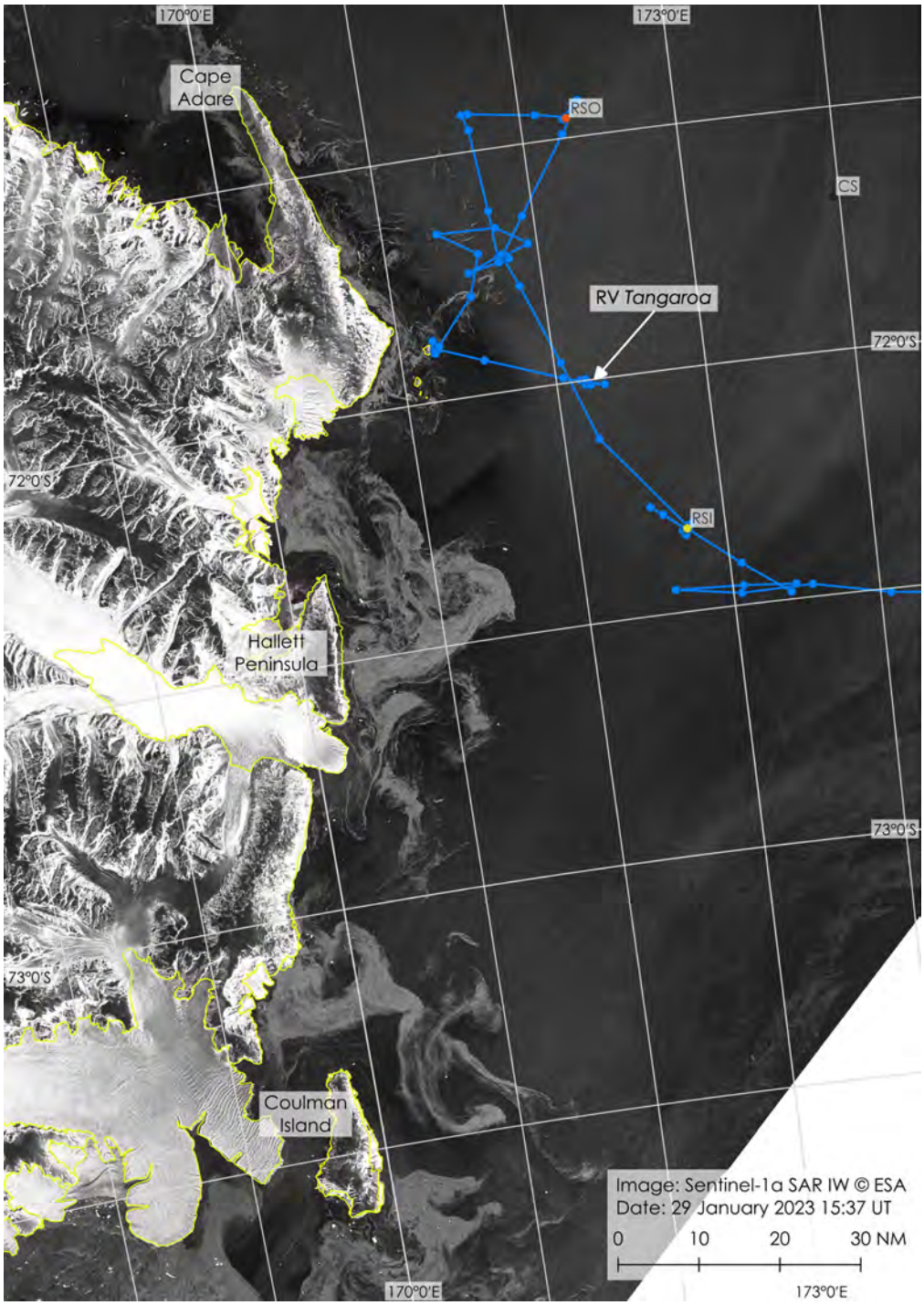
Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Mooring locations of RV *Tangaroa* cruise TAN2302 are marked by coloured dots in the figures of this Bulletin.

Figure 1 shows high-resolution (15 m horizontal) SAR data of the north-western Ross Sea. The cruise track of the vessel is indicated by the blue line (up until 30 January 2023 01:00 UT).



Nearshore between Cape Adare and Coulman Island, sea ice is decaying in strips and patches offshore and drifting generally eastward towards the open sea.

Freely drifting icebergs can be present throughout the entire region shown in the figure.

Figure 1: *Sentinel-1a SAR data acquired 29 January 2023 at 15:37 UT and provided by PolarView.*

Ice Bulletin: Cape Darnley

Issued: Monday 30th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution SAR data off Cape Darnley. The drift of large iceberg D-32 has been marked by colour-coded shapes. The black/white outline marks the proposed survey area of RV *Investigator* voyage IN2023-V01.

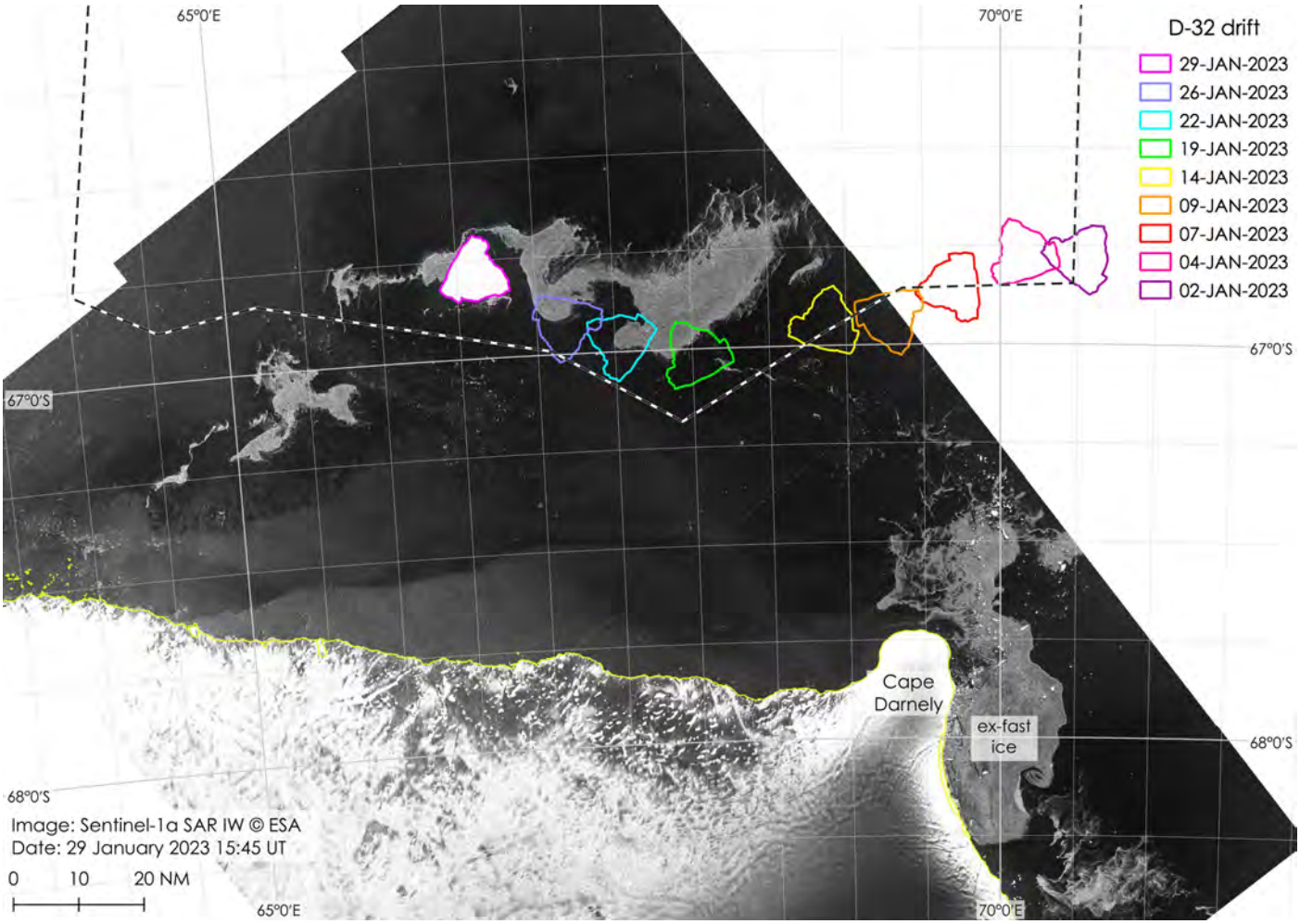


Figure 1: *Sentinel-1a SAR IW data acquired 29 January 2023 at 15:45 UT and provided by PolarView.*

Large iceberg D-32 continues its westward drift parallel to the continental shelf break.

Pack ice remains present in the southern part of the proposed survey area, but it is generally decaying and dispersing.

East off Cape Darnley, fast ice has shattered. Ex-fast ice floes are drifting northward and are then carried by the predominant current westward.

The largest part of the proposed survey area is free of drifting pack ice but icebergs are present throughout the region.

Ice Bulletin: Mawson Station

Issued: Monday 30th January 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data off Mawson Station.

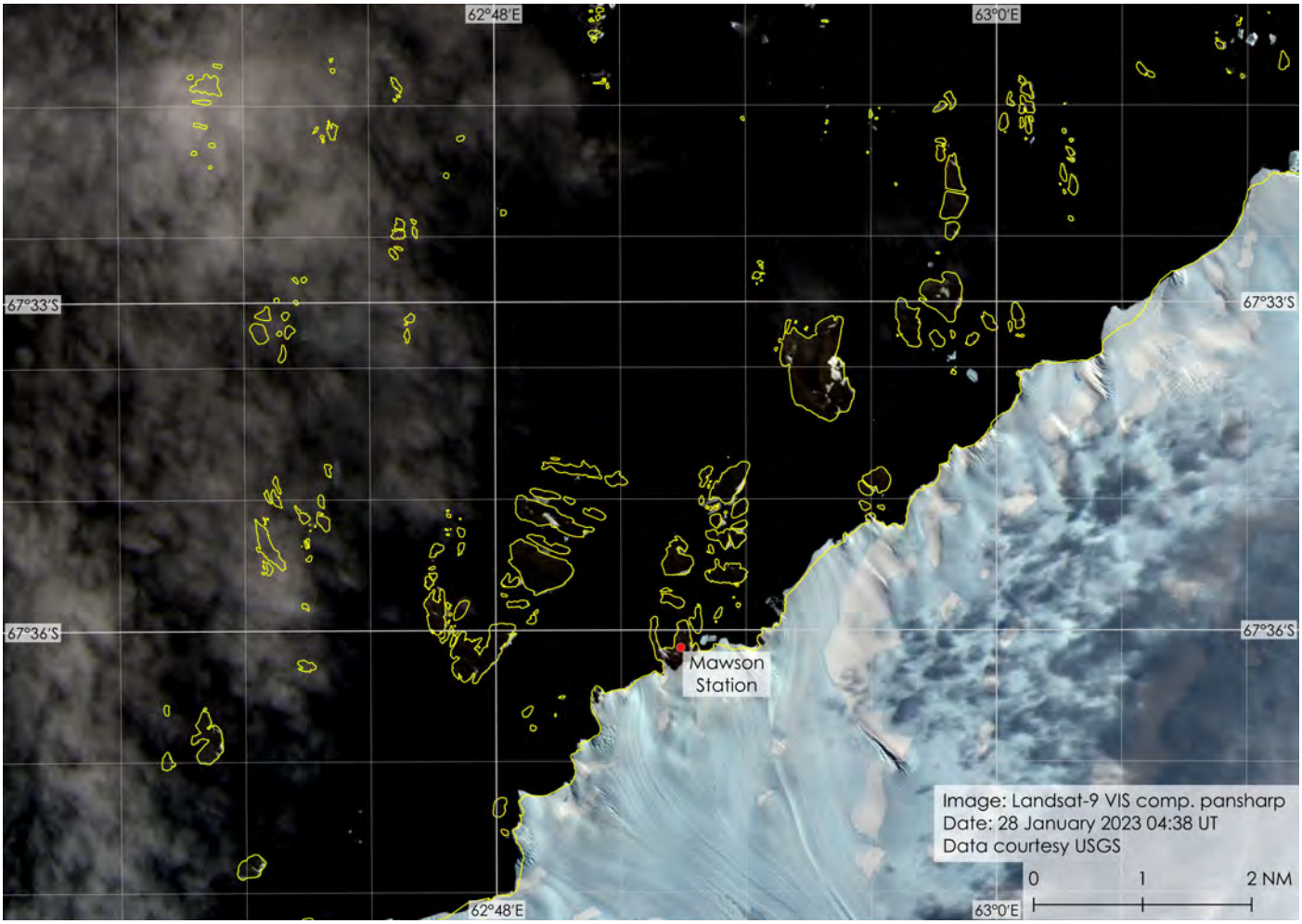


Figure 1: *Landsat-9 visible composite pan-sharpened data acquired 28 January 2023 at 04:38 UT and provided by USGS.*

Off station, the last remaining fast ice has broken out. Kista Strait is now free of fast ice.

Figure 2 shows a larger scale overview of SAR data. A diagonal black hairline is a stitching artefact where two consecutive scenes join. Three mooring locations are included in the figure. All these locations are free of pack ice but may be affected by freely drifting icebergs.

North of the station, Iceberg Alley is clear of any sea ice. Only remnants of a band of decaying ex-fast ice that was separating the former polynya off station with the open ocean to the north remain west 62º30'E. These remnants continue to rapidly disintegrate. East of Mawson Station, no more fast ice is along Mawson Coast.

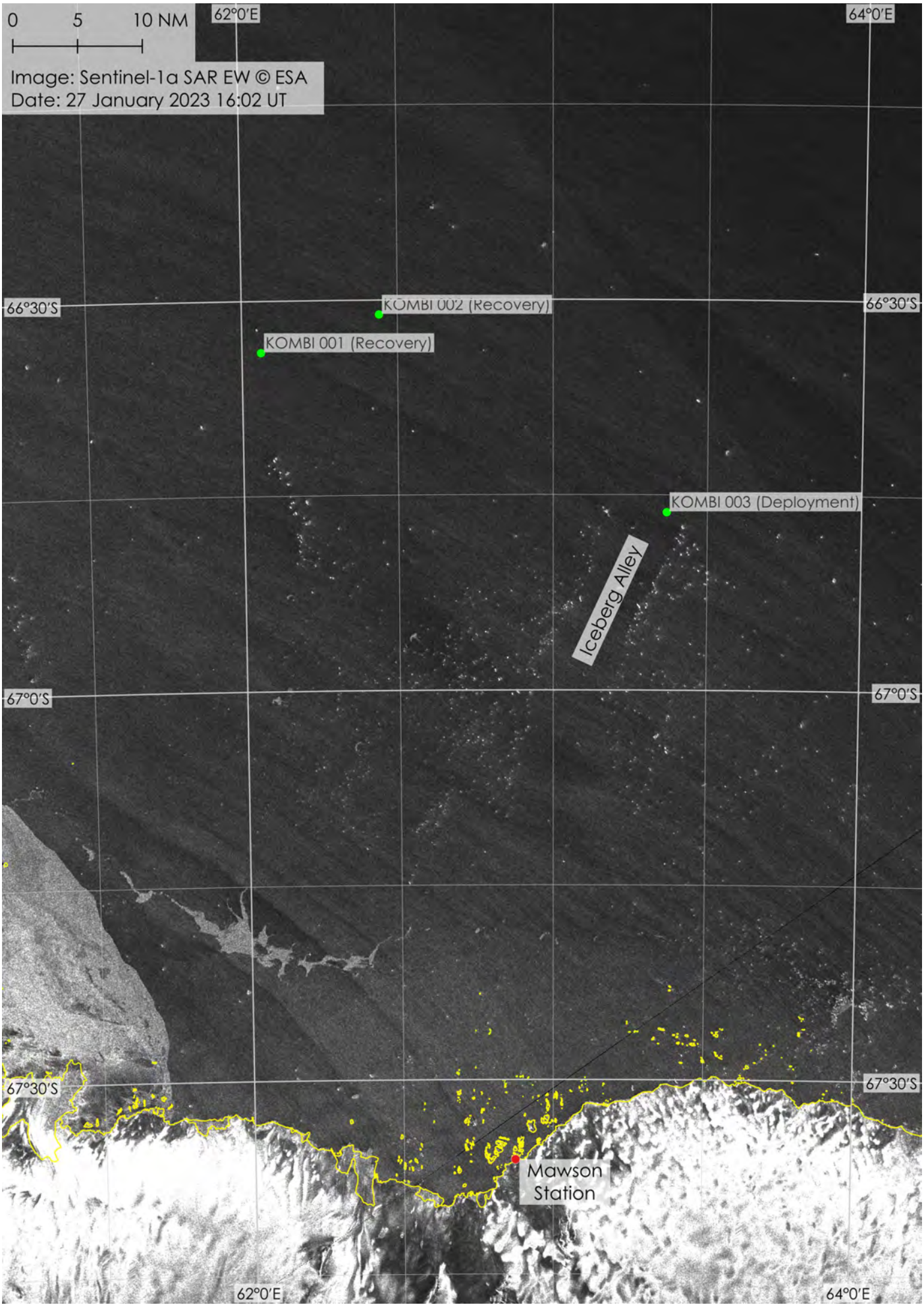


Figure 2: *Sentinel-1a SAR EW data acquired 27 January 2023 at 16:02 UT and provided by PolarView.*

Ice Bulletin: Ross Sea

Issued: Thursday 2nd February 2023

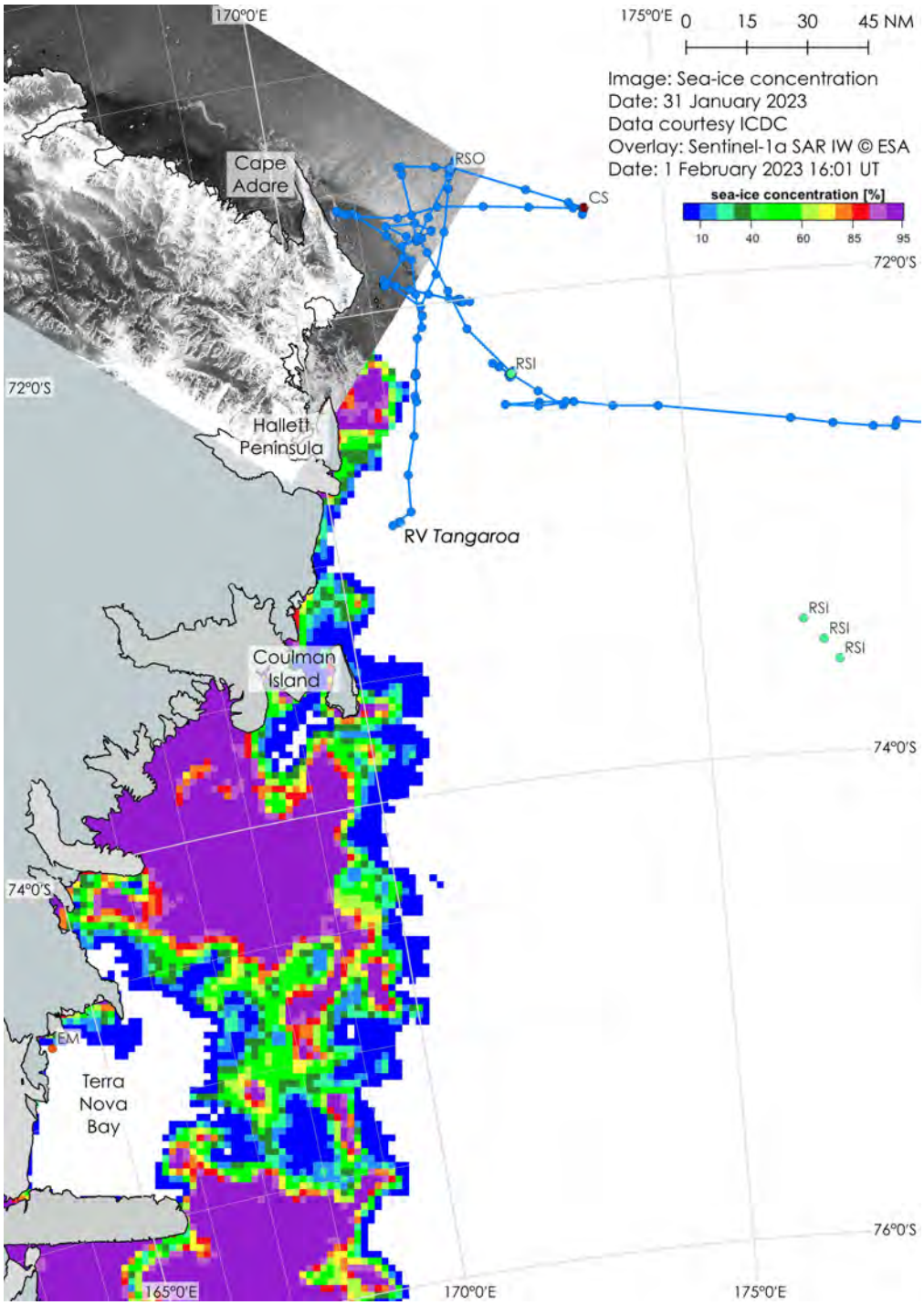
Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Mooring locations of RV *Tangaroa* cruise TAN2302 are marked by coloured dots in the figure of this Bulletin.

Figure 1 shows sea-ice concentration data of the north-western Ross Sea. The cruise track of the vessel is indicated by the blue line (up until 1 February 2023 22:00 UT).



Nearshore between Cape Adare and Coulman Island, sea ice continues decaying in strips and patches offshore and drifting generally towards the open sea.

Further south, Terra Nova Bay remains surrounded by a band of sea ice, which was recently drifting north-eastward into the Ross Sea.

Freely drifting icebergs can be present throughout the entire region shown in the figure.

Figure 1: *Sea-ice concentration data acquired 31 January 2023 and provided by ICDC, University Hamburg; Overlay: Sentinel-1a SAR IW data acquired 1 February 2023 at 16:01 UT and provided by PolarView.*

Ice Bulletin: Iceberg A-76A

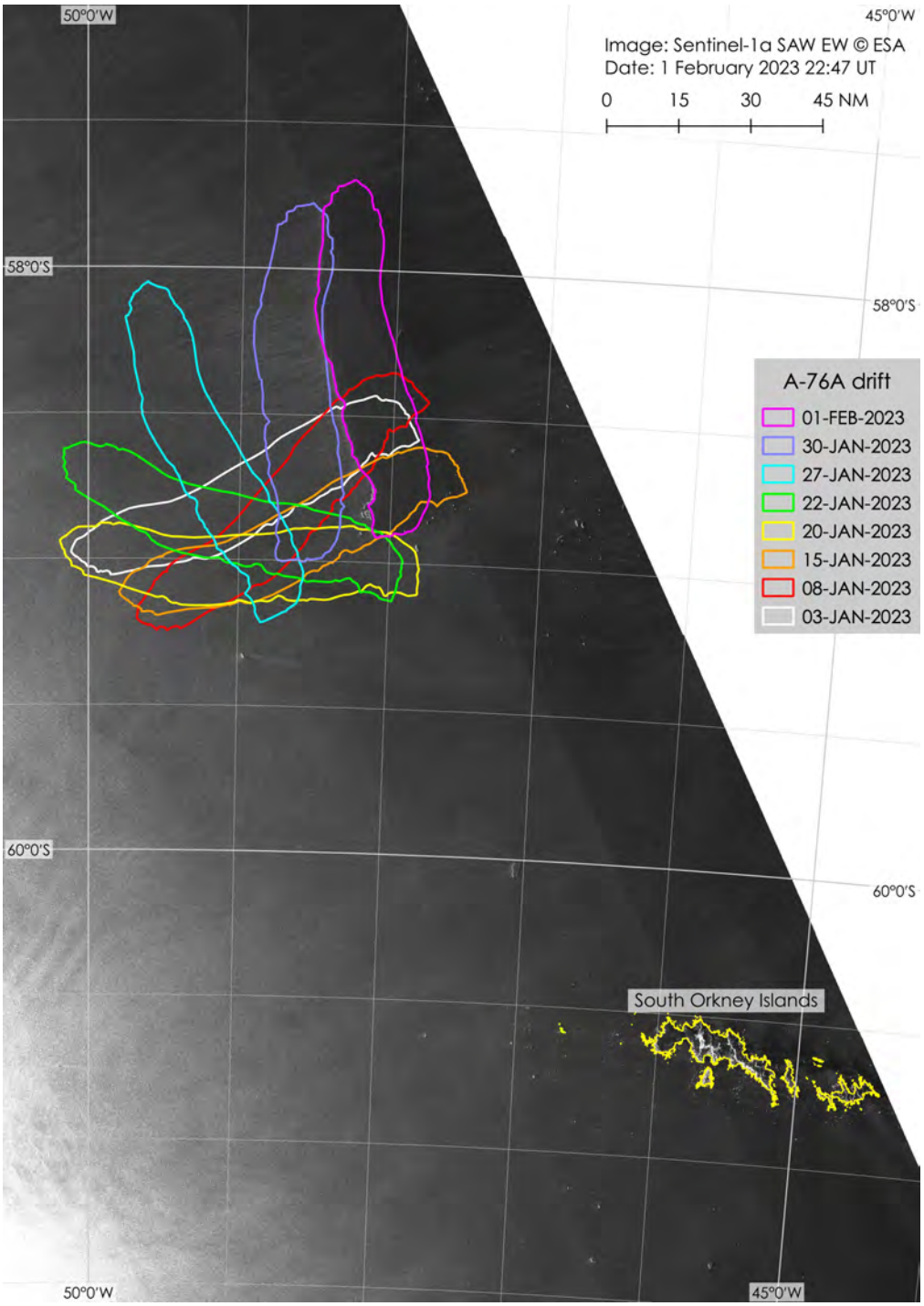
Issued: Thursday 2nd February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data northeast of the Antarctic Peninsula in the north-western Weddell Sea. The drift of iceberg A-76A during January 2023 is indicated by colour-coded shapes.



The iceberg is 320 nautical miles north of the sea-ice edge based on passive microwave data (not shown in the figure) and drifting north of the South Orkney Islands in the Scotia Sea into the southern South Atlantic Ocean.

During January 2023, the iceberg drifted initially a few miles southward before turning 100 degrees clockwise and drifting eastward again.

The iceberg continues showing signs of breaking up and smaller icebergs and glacial debris are surrounding the iceberg and are drifting farther afield.

***Figure 1**: Sentinel-1a SAR EW data acquired 1 February 2023 at 22:47 UT and provided by PolarView.*

Ice Bulletin: Mawson Station

Issued: Thursday 2nd February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data of Mawson Station.

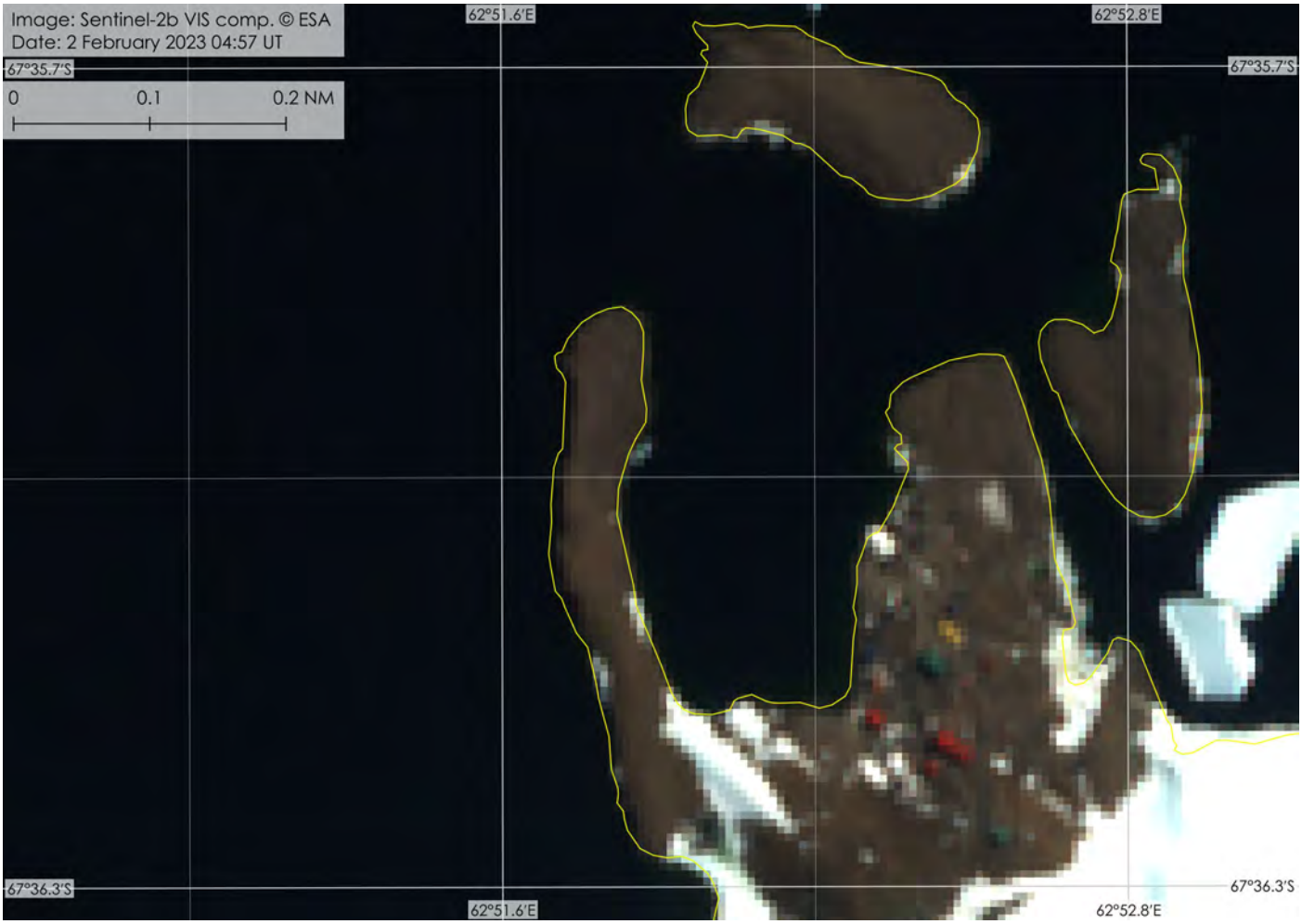


Figure 1: *Sentinel-2b visible composite data acquired 2 February 2023 at 04:57 UT and provided by ESA.*

Horseshoe Harbour off station is largely free of sea ice.

Figures 2 and 3 show larger scale overviews of the same data as Figure 1.

North of the station, Iceberg Alley (marked by blue outlines in Figure 3) is clear of any sea ice.

Remnants of decaying ex-fast ice remain east 63º30'E and south of 67º0'S but continue to rapidly disintegrate.

East of 61º0'E, no more fast ice is along Mawson Coast but freely drifting icebergs are present throughout the region.

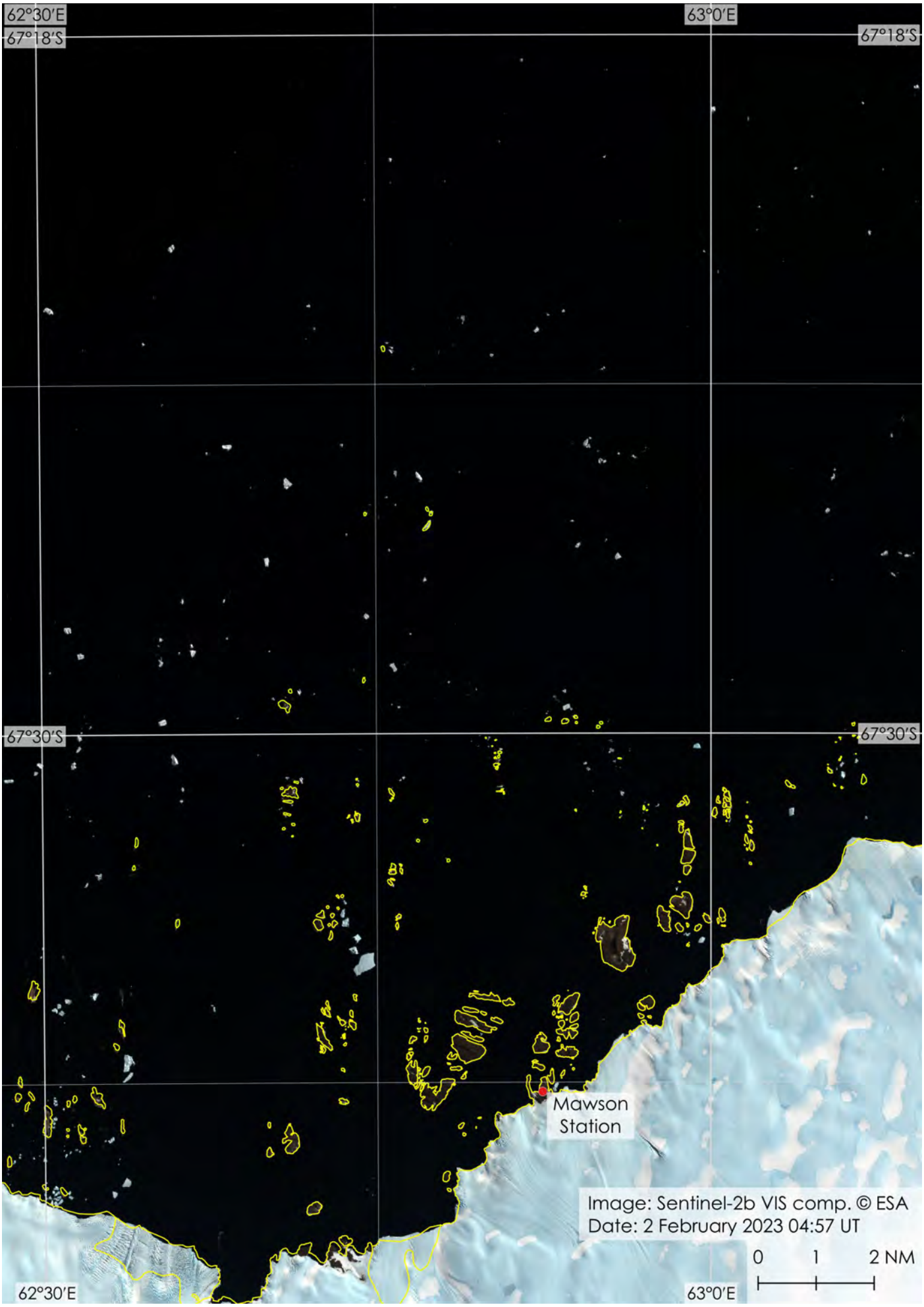


Figure 2: *Sentinel-2b visible composite data acquired 2 February 2023 at 04:57 UT and provided by ESA.*

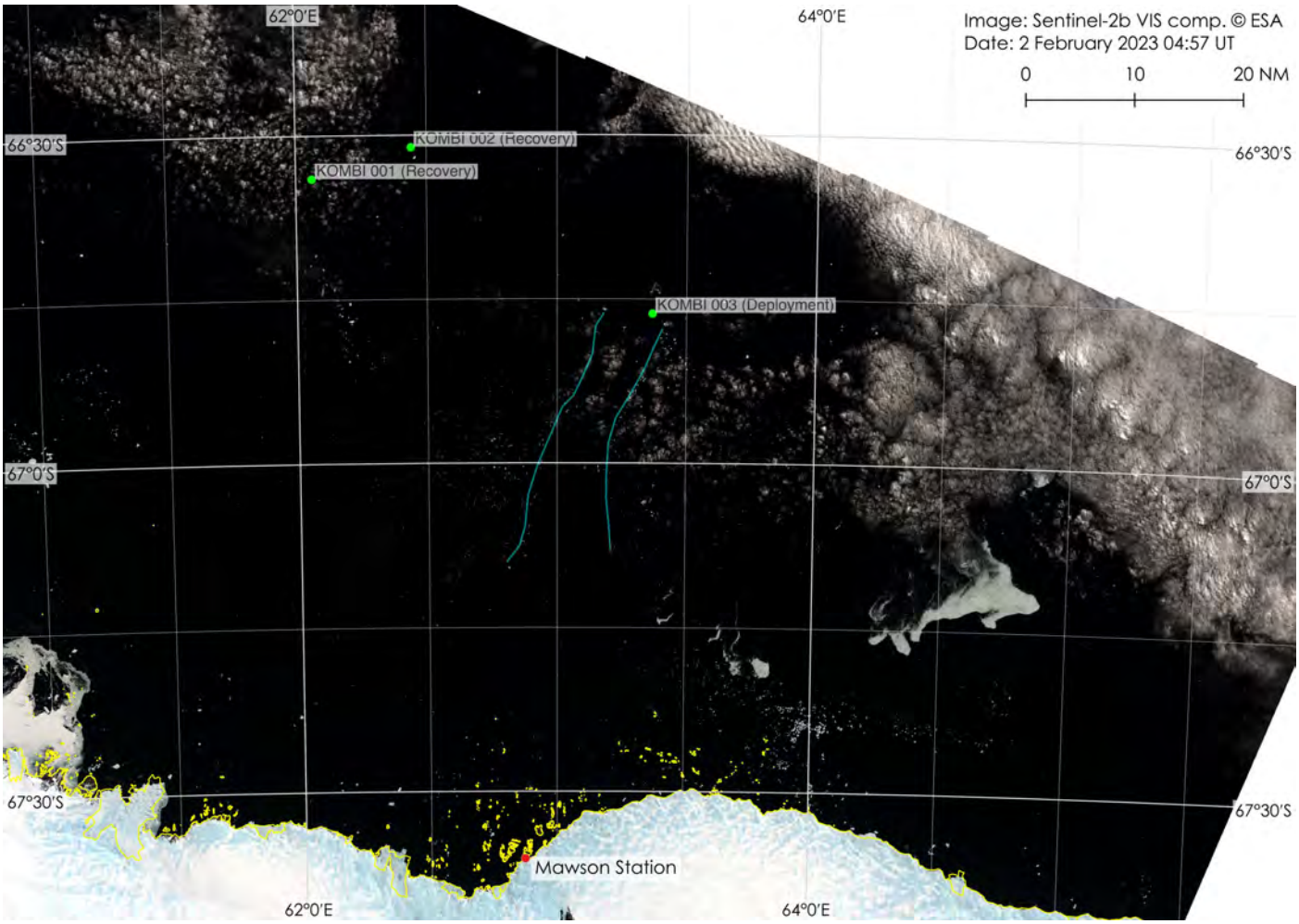


Figure 3: *Sentinel-2b visible composite data acquired 2 February 2023 at 04:57 UT and provided by ESA.*

Ice Bulletin: Ross Sea

Issued: Saturday 4th February 2023

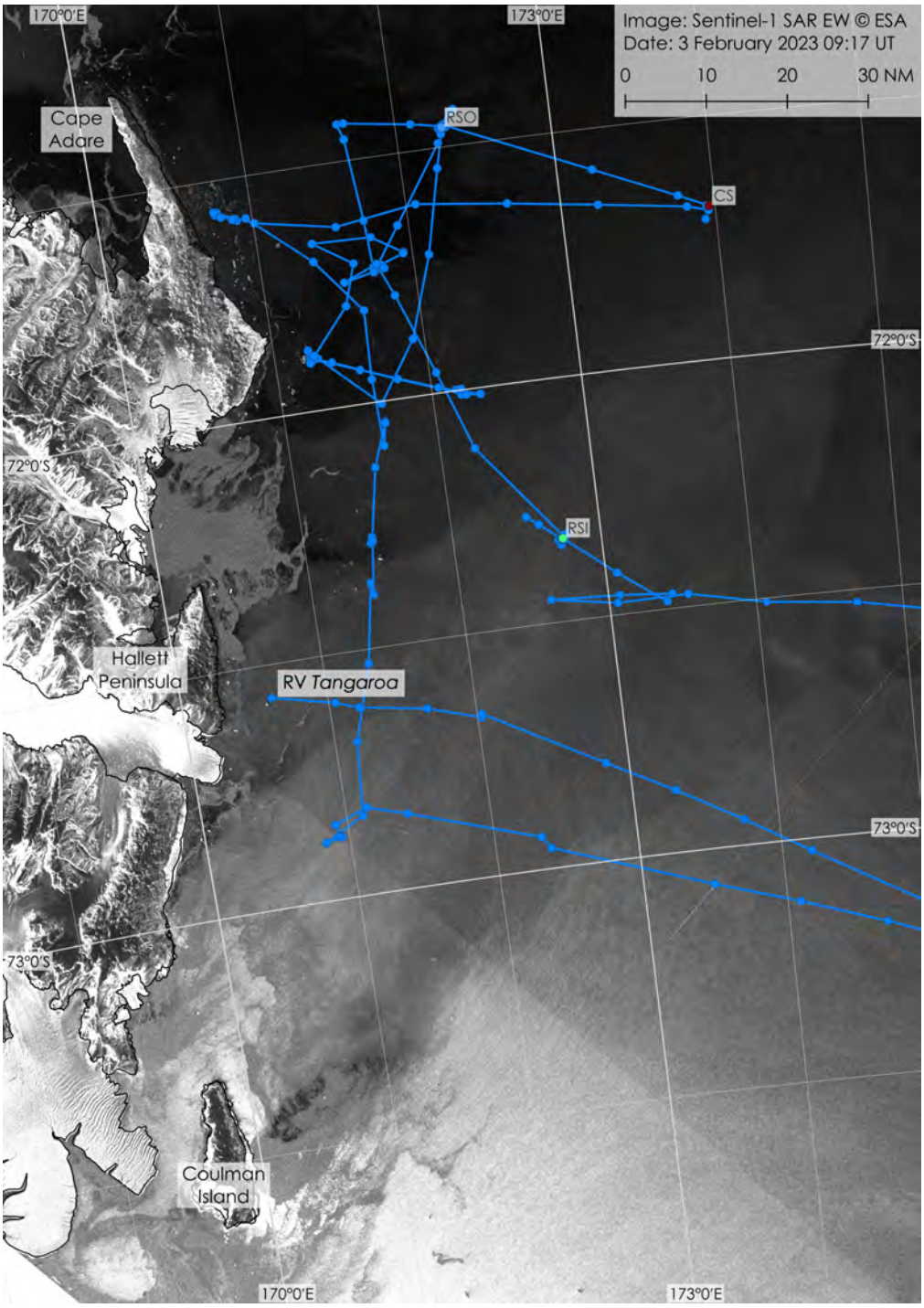
Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Mooring locations of RV *Tangaroa* cruise TAN2302 are marked by coloured dots in the figure of this Bulletin.

Figure 1 shows SAR data of the north-western Ross Sea. The cruise track of the vessel is indicated by the blue line (up until 3 February 2023 23:00 UT).



Nearshore between Cape Adare and Coulman Island, sea ice continues decaying in strips and patches offshore and is drifting generally north-eastward towards the open sea.

Further south, Terra Nova Bay (not shown in the figure) remains surrounded by a band of higher concentration sea ice.

Freely drifting icebergs can be present throughout the entire region shown in the figure.

Figure 1: *Sentinel-1 SAR EW data acquired 3 February 2023 at 09:17 UT and provided by PolarView.*

Ice Bulletin: Casey Station

Issued: Saturday 4th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of Casey Station and surrounds.

Minimal sea ice remains around the station and the islands offshore. Only north of Browning Peninsula in the south, some fast ice is still anchored to the shore.

Figure 2 shows a close-up of Casey Skiway (YCSK) with two aircraft currently north of the ice runway.

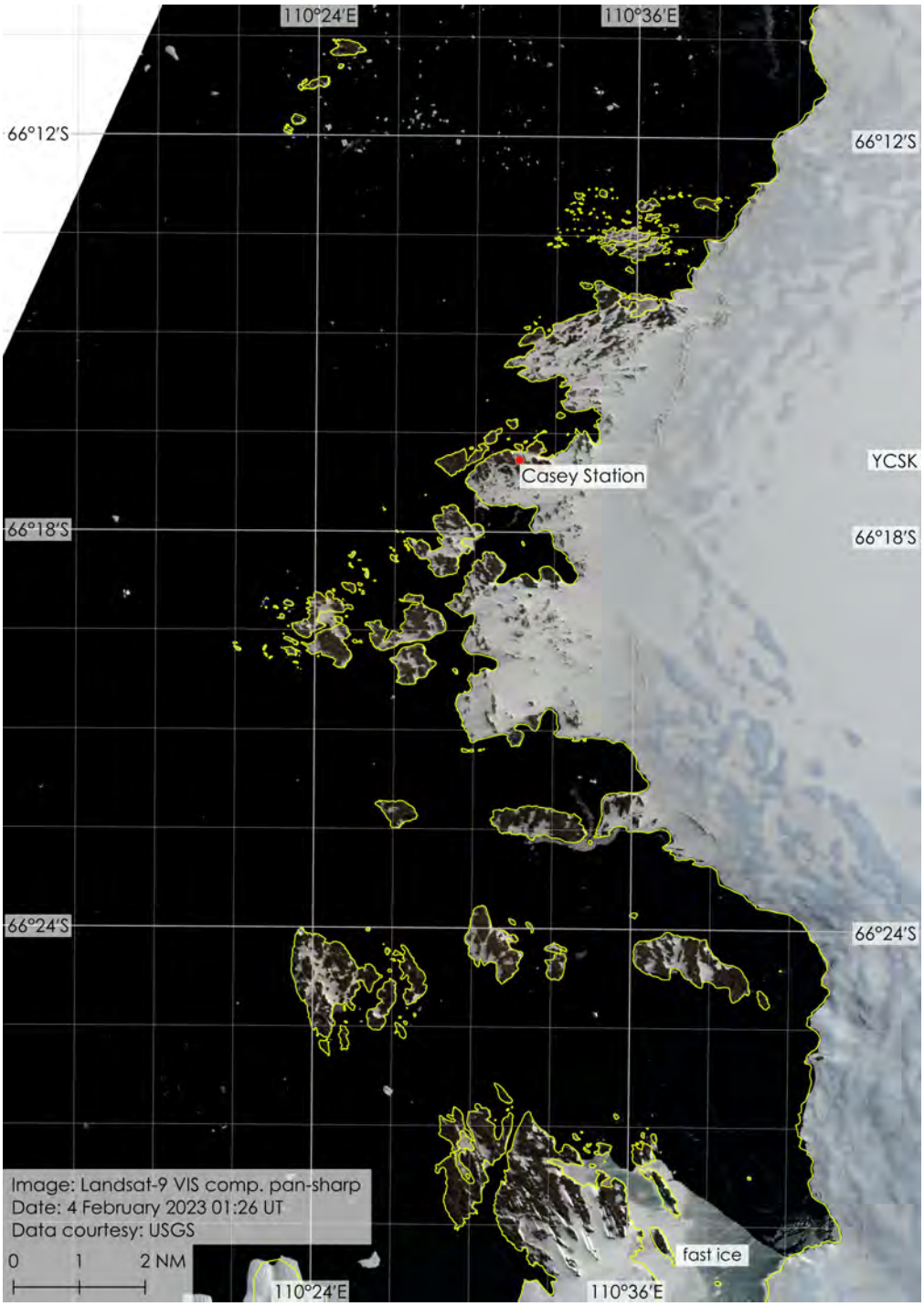


Figure 1: *Landsat-9 visible composite pan-sharpened data acquired 4 February 2023 at 01:26 UT and provided by USGS.*

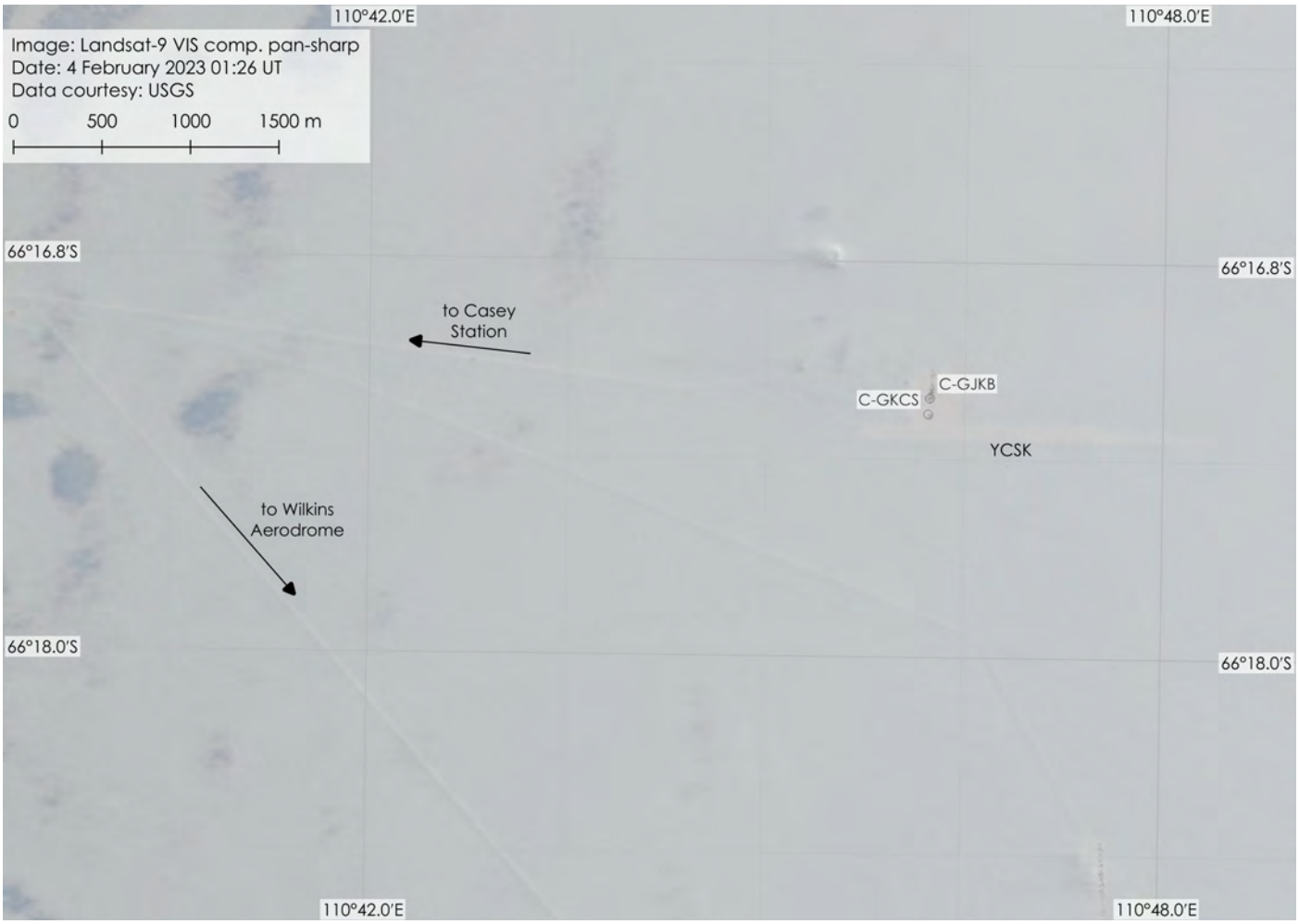


Figure 2: *Landsat-9 visible composite pan-sharpened data acquired 4 February 2023 at 01:26 UT and provided by USGS.*

Ice Bulletin: Wilkins Aerodrome

Issued: Saturday 4th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of Wilkins Aerodrome.

Figure 1: *Landsat-9 visible composite pan-sharpened data acquired 4 February 2023 at 01:26 UT and provided by USGS.*

The ice runway is partly covered by snow. North and south of the runway, snow dunes are left from previous clearing the runway.

Snow dunes have also accumulated around the camp and other structures.

Ice Bulletin: Cape Darnley

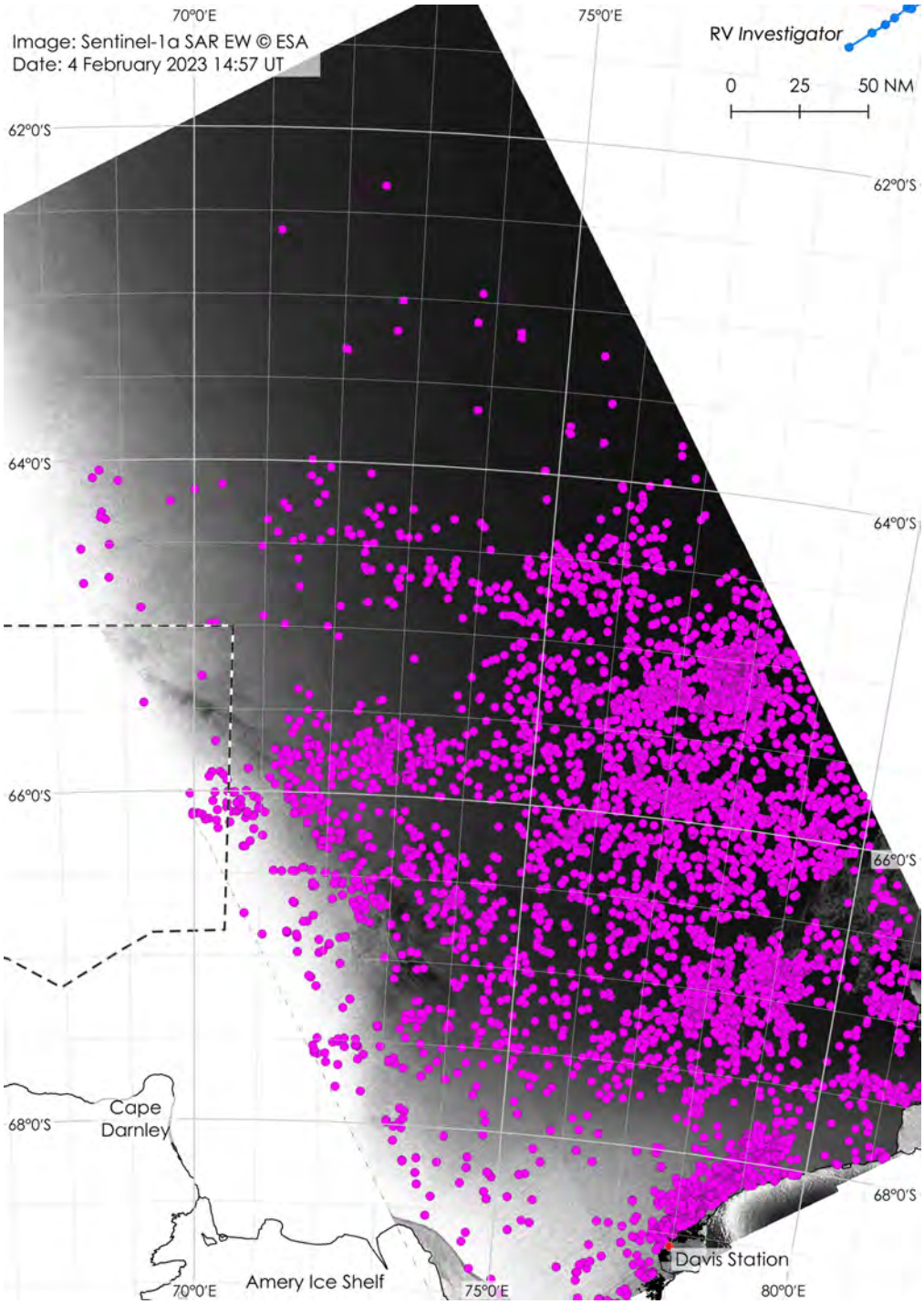
Issued: Sunday 5th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data northeast of Cape Darnley. The black/white outline marks the proposed survey area of RV *Investigator* voyage IN2023-V01. The cruise track of the vessel is marked by a blue line (up until 5 February 2023 01:00 UT).



The SAR data has been analysed for iceberg presence and more than 5000 features have been marked by pink dots.

The largest part of the proposed survey area is free of drifting pack ice, but icebergs are present throughout the region.

Figure 1: *Sentinel-1a SAR EW data acquired 4 February 2023 at 14:57 UT and provided by ESA.*

Ice Bulletin: Davis Station

Issued: Sunday 5th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off the Amery Ice Shelf.

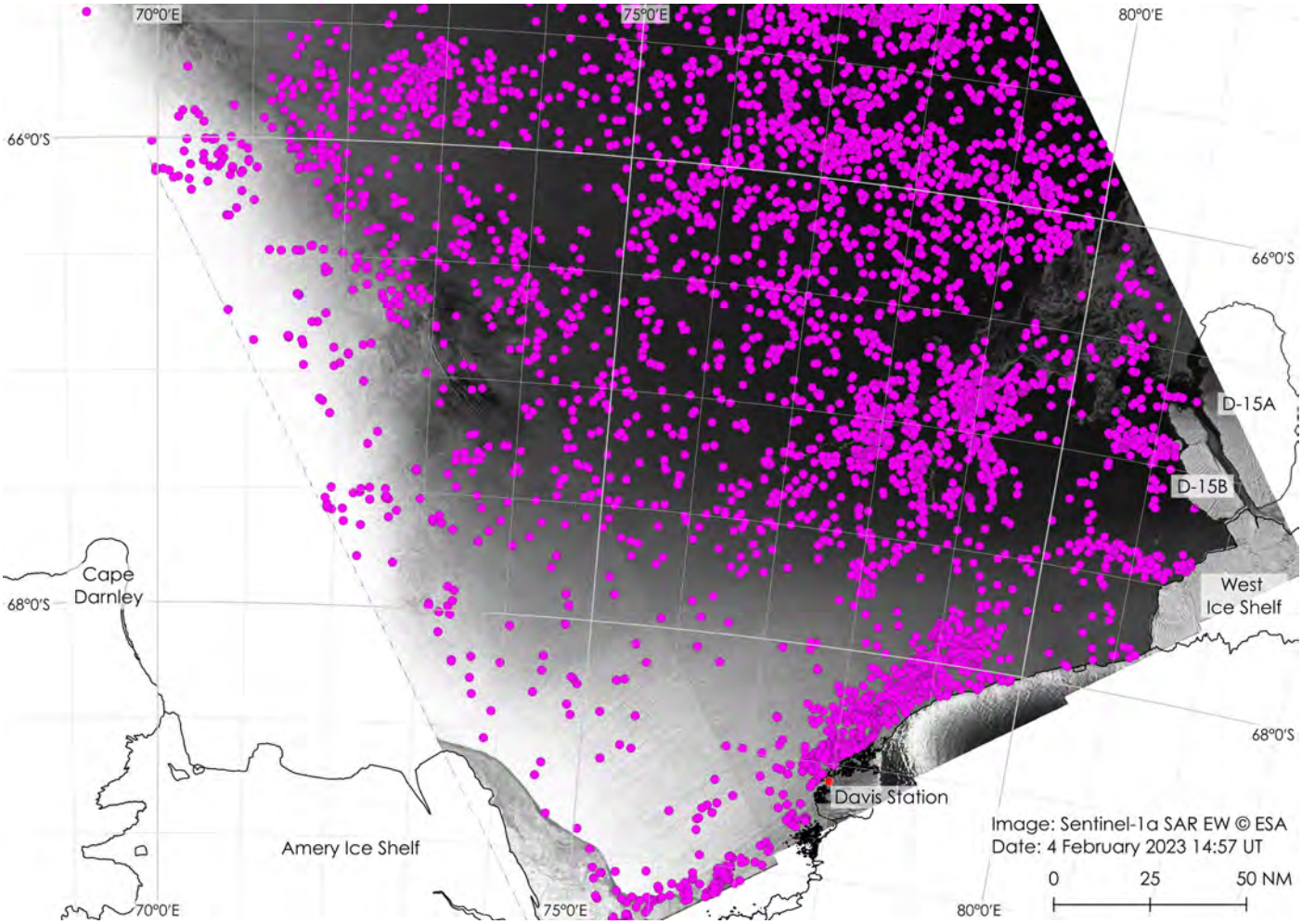


Figure 1: *Sentinel-1a SAR EW data acquired 4 February 2023 at 14:57 UT and provided by ESA.*

The SAR data has been analysed for iceberg presence and more than 4000 features have been marked by pink dots.

Ex-fast ice remains off the north-eastern edge of the Amery Ice Shelf. Around the D-15 icebergs, ex-fast ice is also entering the Amery Basin region (between Cape Darnley and the West Ice Shelf) from the east around the northern edge of the icebergs.

Ice Bulletin: Wilkins Aerodrome

Issued: Monday 6th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of Wilkins Aerodrome.

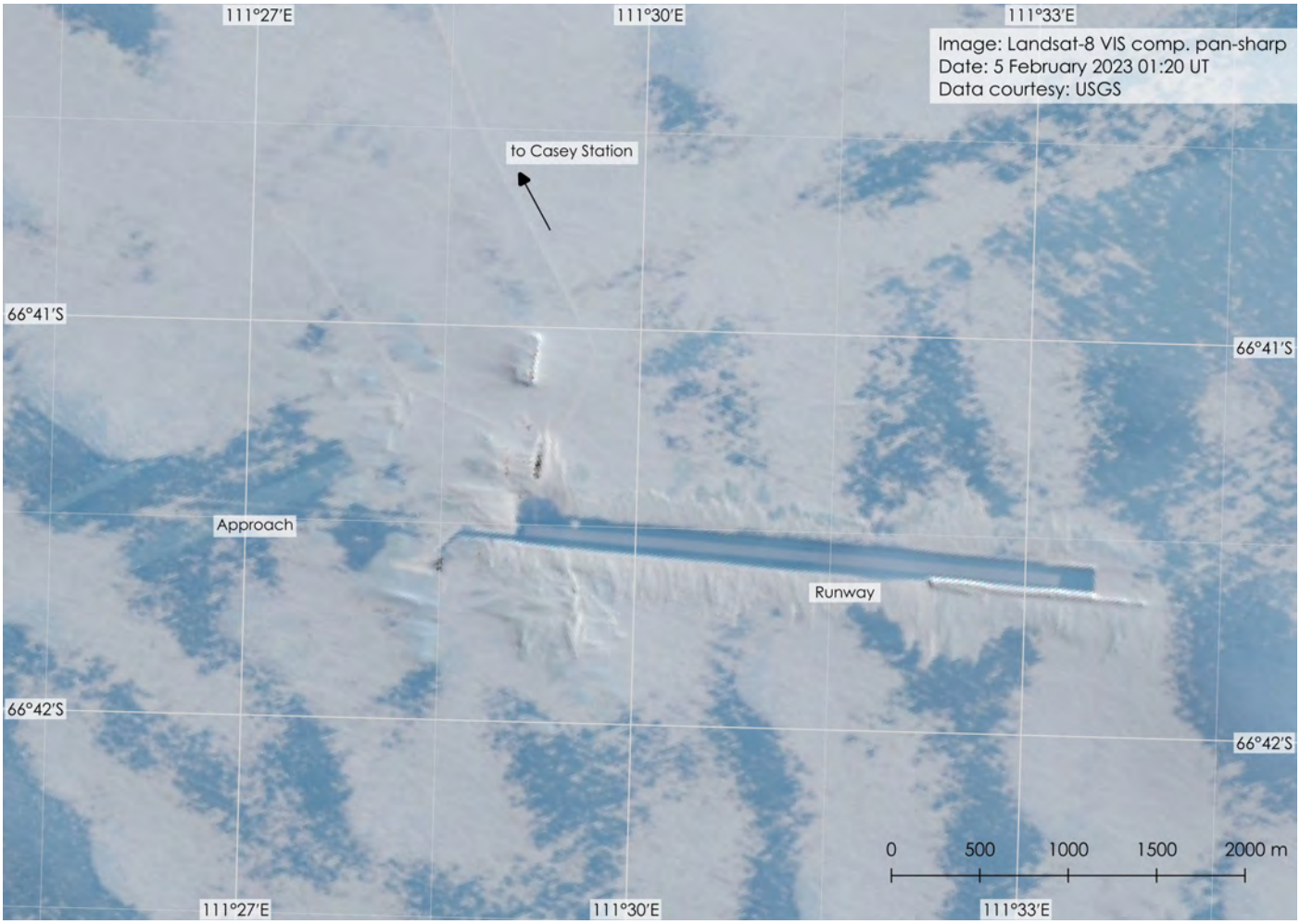


Figure 1: *Landsat-8 visible composite pan-sharpened data acquired 5 February 2023 at 01:20 UT and provided by USGS.*

The ice runway is partly covered by snow. North and south of the runway, snow dunes are left from previous clearing the runway.

Snow dunes have also accumulated around the camp and other structures.

Ice Bulletin: Iceberg A-81

Issued: Monday 6th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data of the Brunt Ice Shelf.

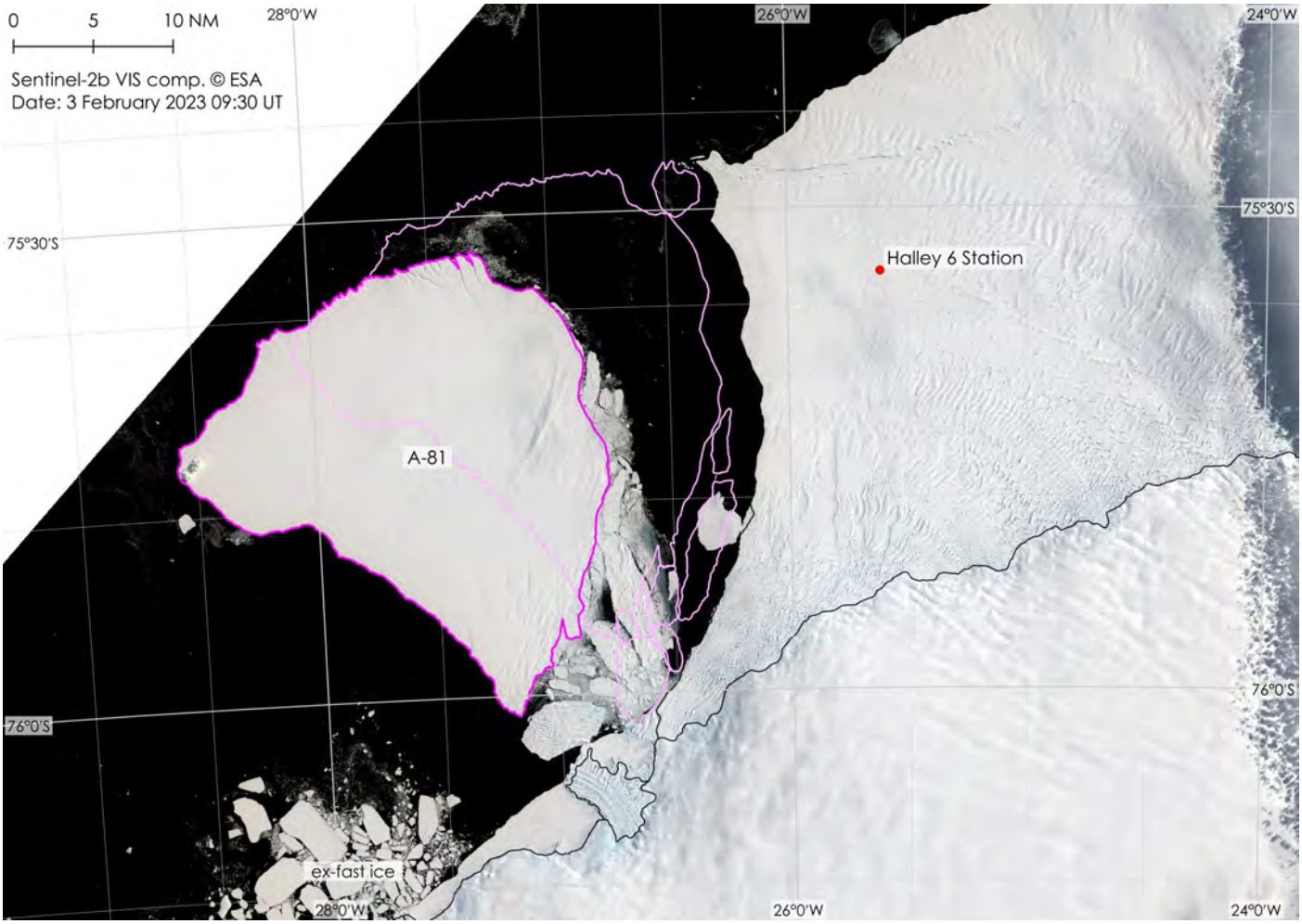


Figure 1: *Sentinel-2b visible composite data acquired 3 February 2023 at 09:30 UT and provided by ESA.*

Two weeks ago, iceberg A-81 calved off the Brunt Ice Shelf. The position on 24 January 2023 (two days after the break) is indicated by the light pink shape (including some of the surrounding new icebergs that were created at the same time).

During the past two weeks, the iceberg drifted roughly 10 nautical miles westward into the southern Weddell Sea. Ex-fast ice from the southern edge of the ice shelf is also drifting along the coast, partly as vast sheets.

Figure 2 shows a close-up view of the British Halley 6 Station. The blue modules of the station can be clearly seen with the largest, red module, the Robert Falcon Scott Living Module in the middle.

Figure 2: *Sentinel-2b visible composite data acquired 3 February 2023 at 09:30 UT and provided by ESA.*

Ice Bulletin: Mill Island

Issued: Monday 6th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data around Mill Island. The drift of large icebergs is outlined by colour-coded shapes.

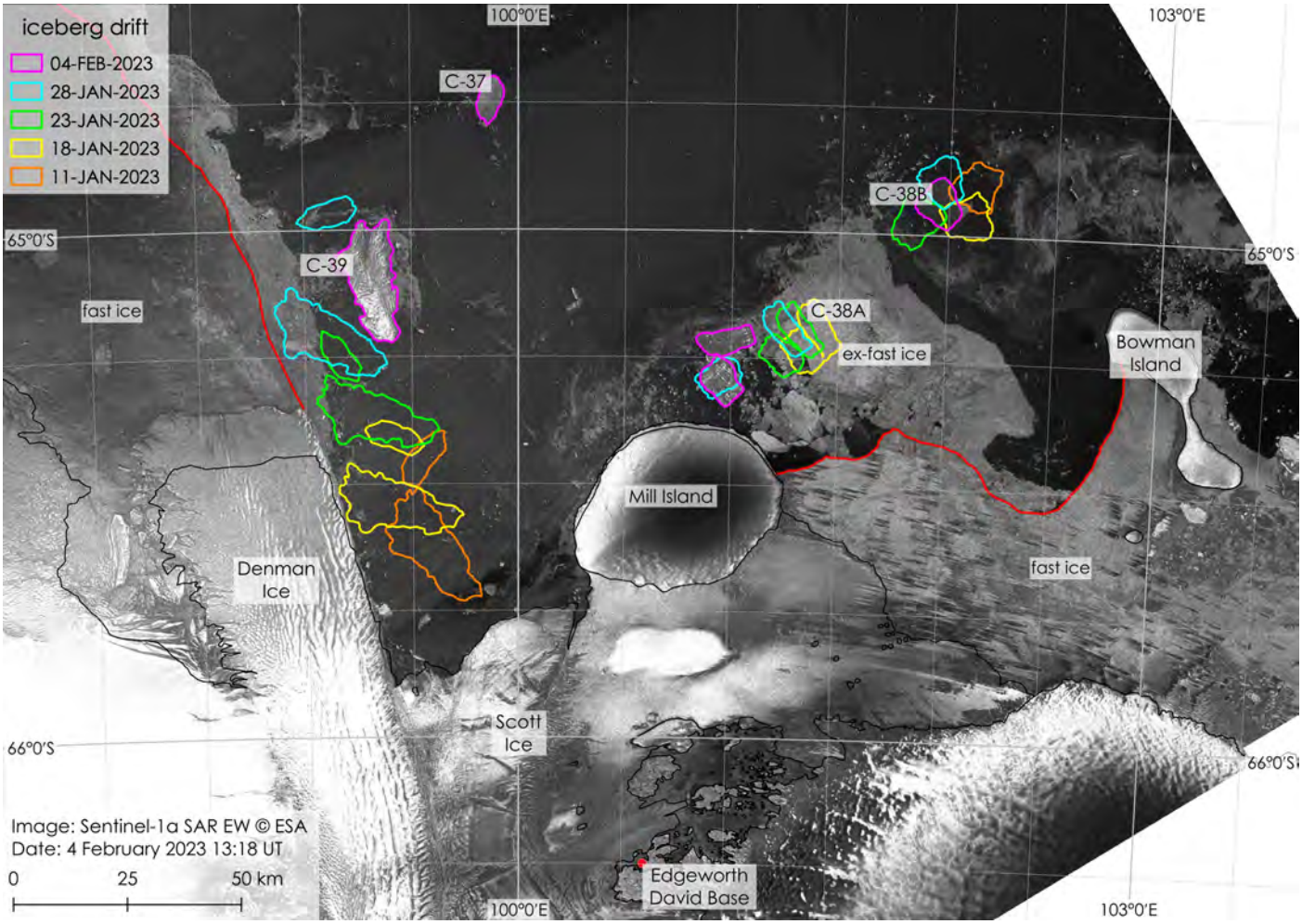


Figure 1: *Sentinel-1a SAR EW data acquired 4 February 2023 at 13:18 and provided by PolarView.*

All large icebergs are drifting freely in the region. On 20 January, iceberg C-38A split into two icebergs that are not satisfying the criteria for large icebergs that are tracked specifically anymore however, they are still clearly discernible. Likewise, iceberg C-37 has also shrunk to a size below the tracked-iceberg criterion.

The melange of pack ice and ex-fast ice continues deteriorating and more fast ice is breaking up in the region.

Ice Bulletin: Cape Darnley

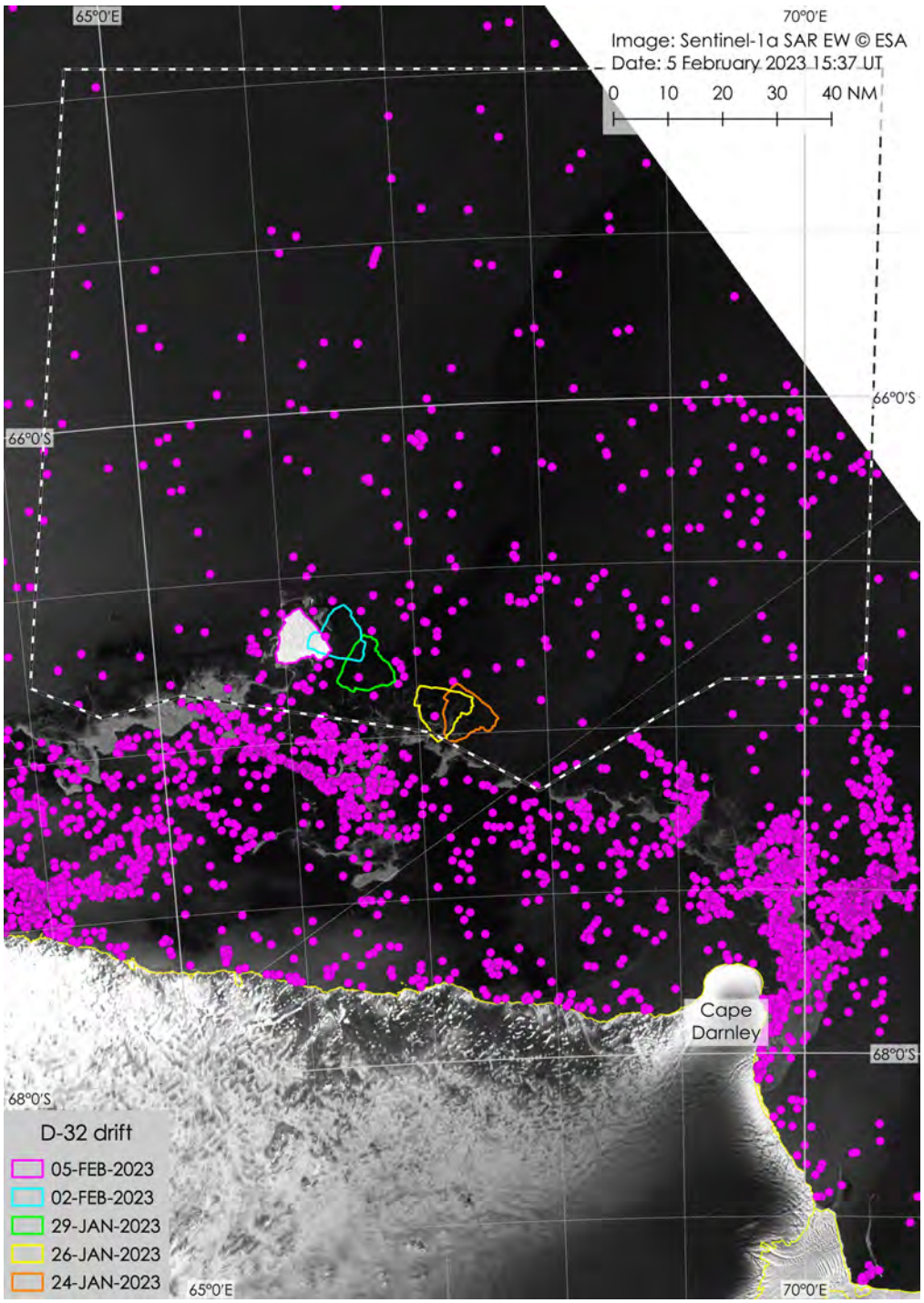
Issued: Monday 6th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data northeast of Cape Darnley. The black/white outline marks the proposed survey area of RV *Investigator* voyage IN2023-V01. A diagonal white hairline is a stitching artefact where two consecutive scenes join.



The SAR data has been analysed for iceberg presence and more than 2500 features have been marked by pink dots.

Iceberg D-32 continues its drift westward roughly along the continental shelf break.

The largest part of the proposed survey area is free of drifting pack ice, but icebergs are present throughout the region. The survey area is only affected by decaying ex-fast ice in the south-western part.

Figure 1: *Sentinel-1a SAR EW data acquired 5 February 2023 at 15:37 UT and provided by PolarView.*

Ice Bulletin: Ross Sea

Issued: Monday 6th February 2023

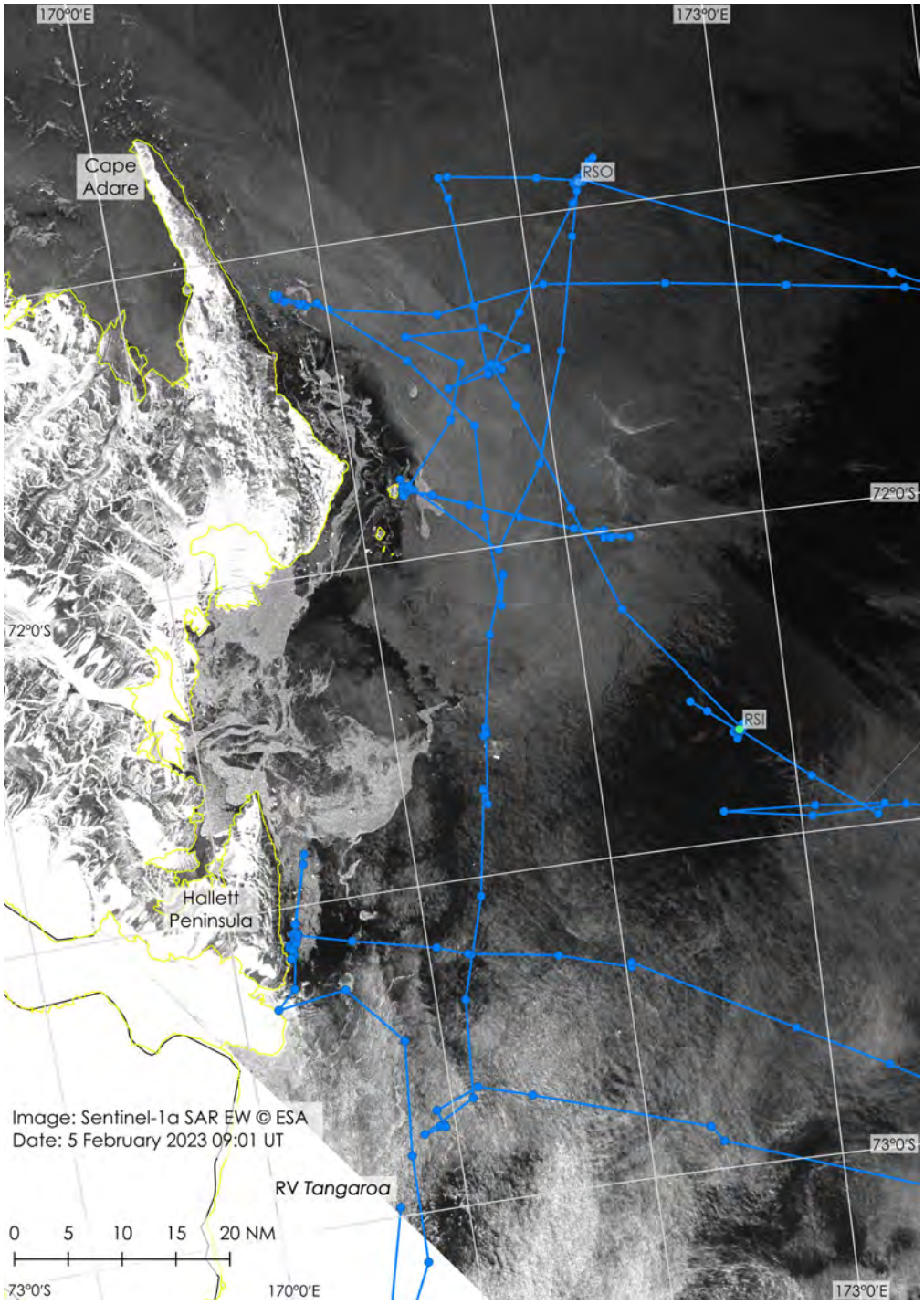
Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Mooring locations of RV *Tangaroa* cruise TAN2302 are marked by coloured dots in the figures of this Bulletin.

Figure 1 shows SAR data of the north-western Ross Sea. The cruise track of the vessel is indicated by the blue line (up until 6 February 2023 01:00 UT).



Nearshore between Cape Adare and Hallett Peninsula, sea ice continues decaying in strips and patches offshore and is drifting generally eastward towards the open sea.

Further south, Terra Nova Bay (see Figure 2) remains surrounded by a band of higher concentration sea ice, which is thinning.

Freely drifting icebergs can be present throughout the entire region shown in the figures.

Figure 3 shows high-resolution (3.125 km) sea-ice concentration data of the same area as shown in Figure 2. Additionally, the sea-ice edge since 1 February 2023 is also included in the figure.

The thinning of the above-mentioned band of pack ice, which is drifting northward around Drygalski Ice Tongue, is evident in the figure. The lowest ice concentration is found just north of 75º0'S.

Figure 1: *Sentinel-1 SAR EW data acquired 5 February 2023 at 09:01 UT and provided by PolarView.*

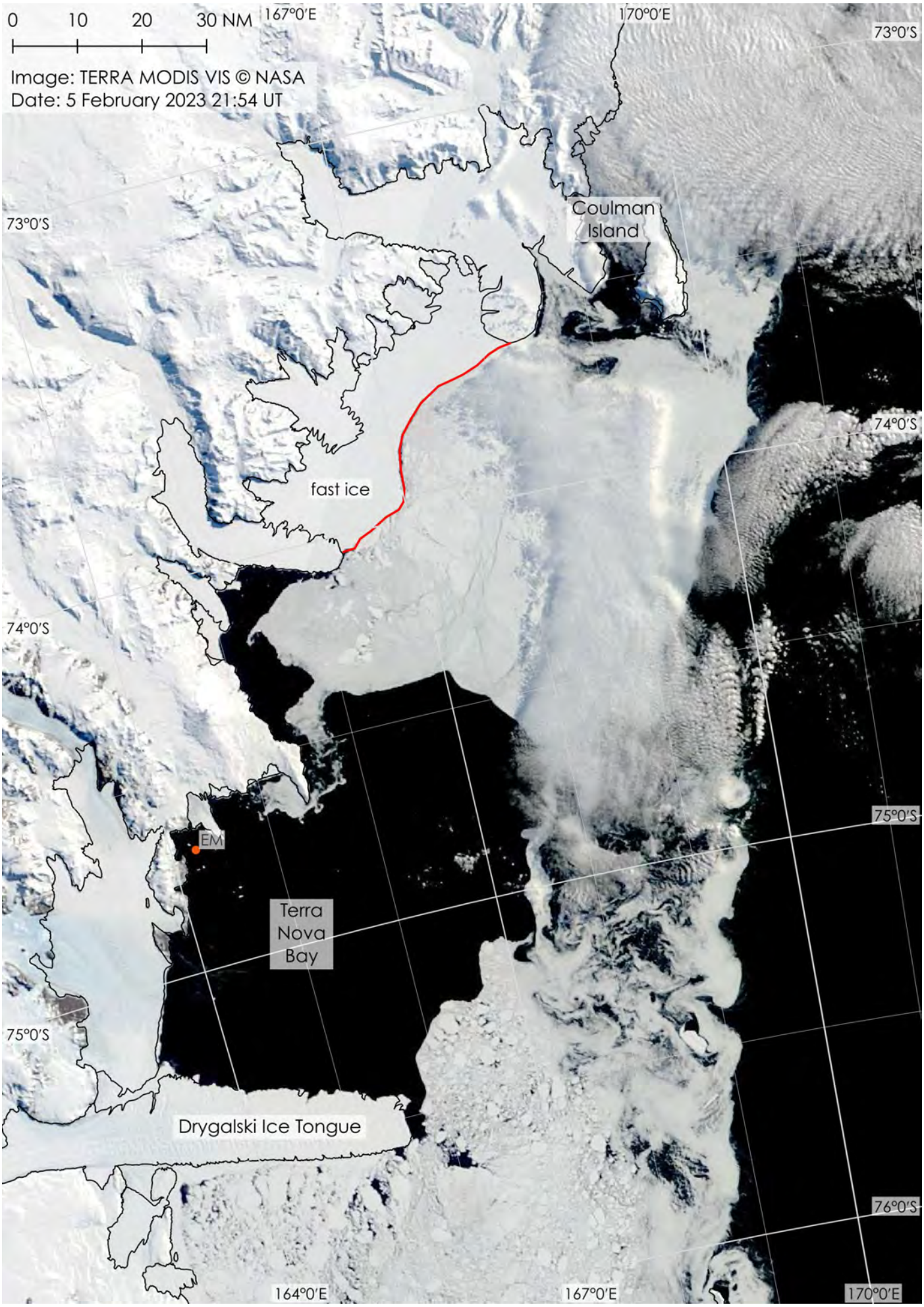


Figure 2: *TERRA MODIS VIS data acquired 5 February 2023 at 21:54 UT and provided by NASA.*

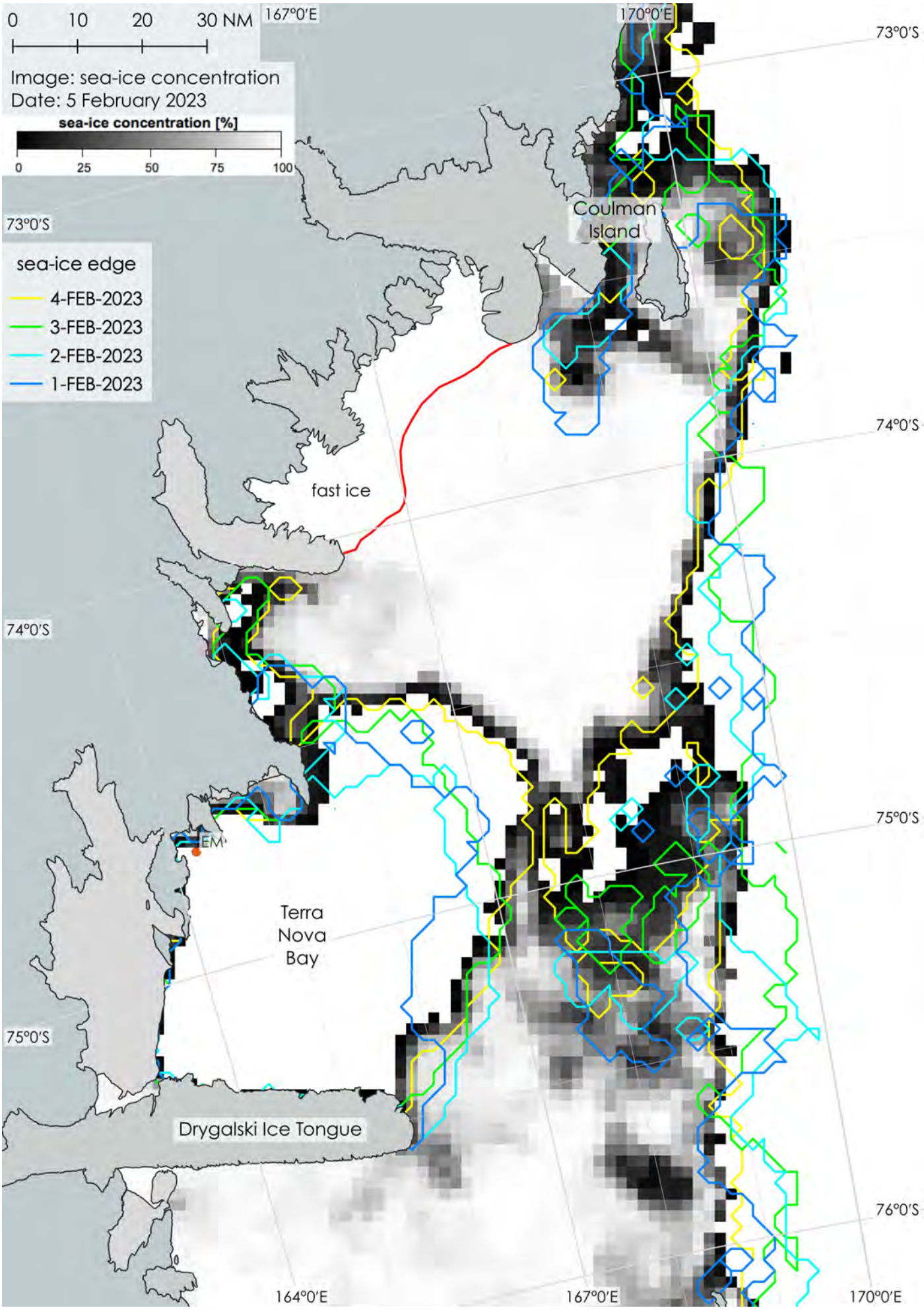


Figure 3: *Sea-ice concentration data acquired 5 February 2023 and provided by ICDC, University Hamburg.*

Ice Bulletin: Mawson Station

Issued: Monday 6th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of Mawson Station.

Horseshoe Harbour off station remains largely free of sea ice.

Figures 2 and 3 show larger scale overviews off the station.

North of the station, Iceberg Alley (marked by blue outlines in Figure 2) is mostly clear of any sea ice except for some strips and patches of decaying ex-fast ice in the northern part of the alley.

Iceberg D-32 and remnants of decaying ex-fast ice are further east along Mawson Coast, but the ex-fast ice continues to rapidly decay.

Figure 3 shows SAR data northwest of Cape Darnley. The recent drift of large iceberg D-32 is indicated by colour-coded shapes. Additionally, the SAR data have been analysed for iceberg presence and more than 4000 features have been marked by pink dots.

Decaying ex-fast ice originates from fast ice that was attached off the eastern side of Cape Darnley. This patch of fast ice shattered recently, and the pack-ice floes are drifting now westward.

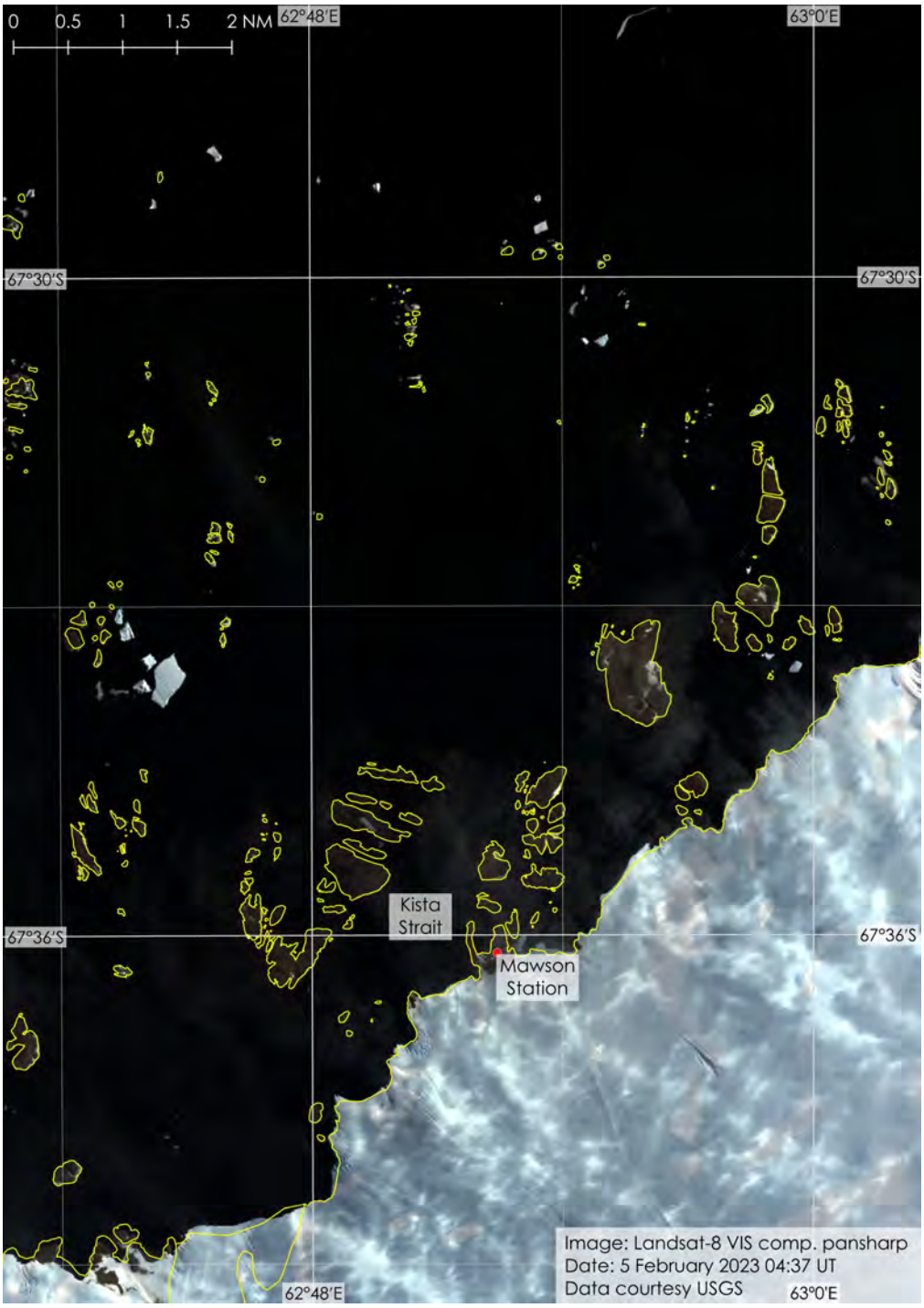


Figure 1: *Landsat-8 visible composite pan-sharpened data acquired 5 February 2023 at 04:37 UT and provided by USGS.*

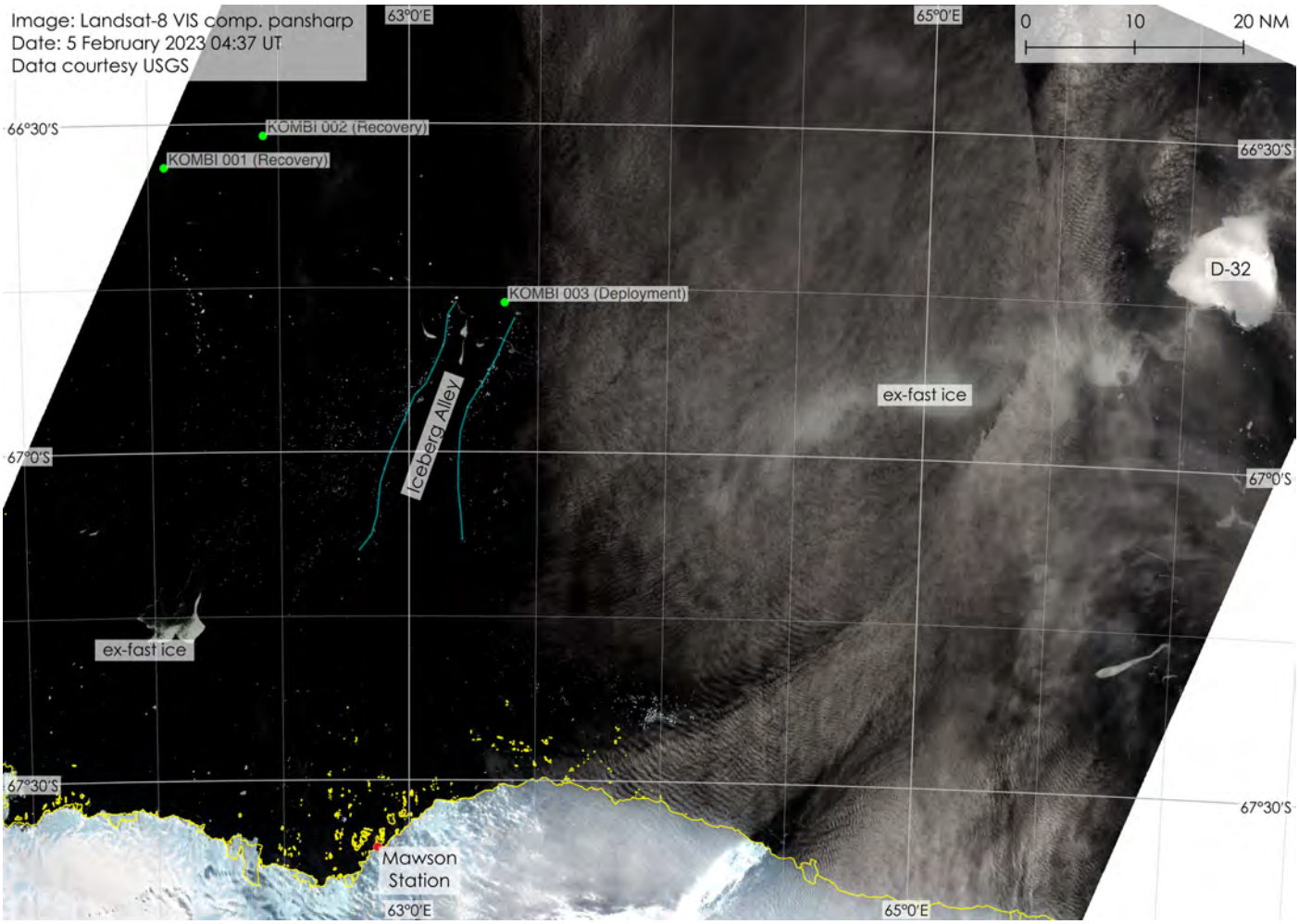


Figure 2: *Landsat-8 visible composite pan-sharpened data acquired 5 February 2023 at 04:37 UT and provided by USGS.*

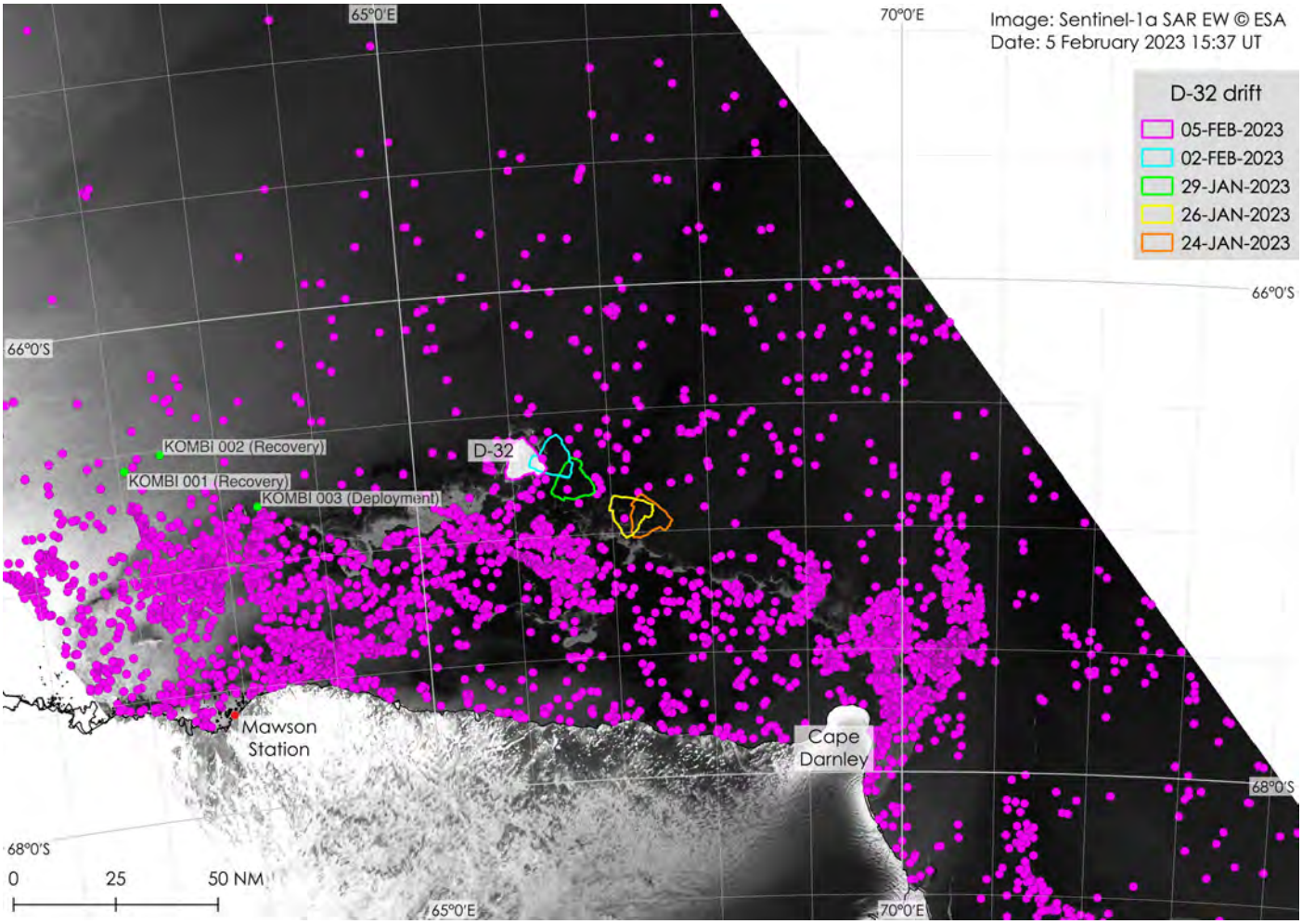


Figure 3: *Sentinel-1a SAR EW data acquired 5 February 2023 at 15:37 UT and provided by PolarView.*

Ice Bulletin: Casey Station

Issued: Monday 6th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows visible data of Casey Station and surrounds.

On 3 February 2023, the last remaining fast ice that was attached to the north-western flank of Law Dome has shattered.

North of Law Dome, ex-fast ice continues now breaking up and melting. Some icebergs remain grounded on Peterson Bank and some a drifting freely.

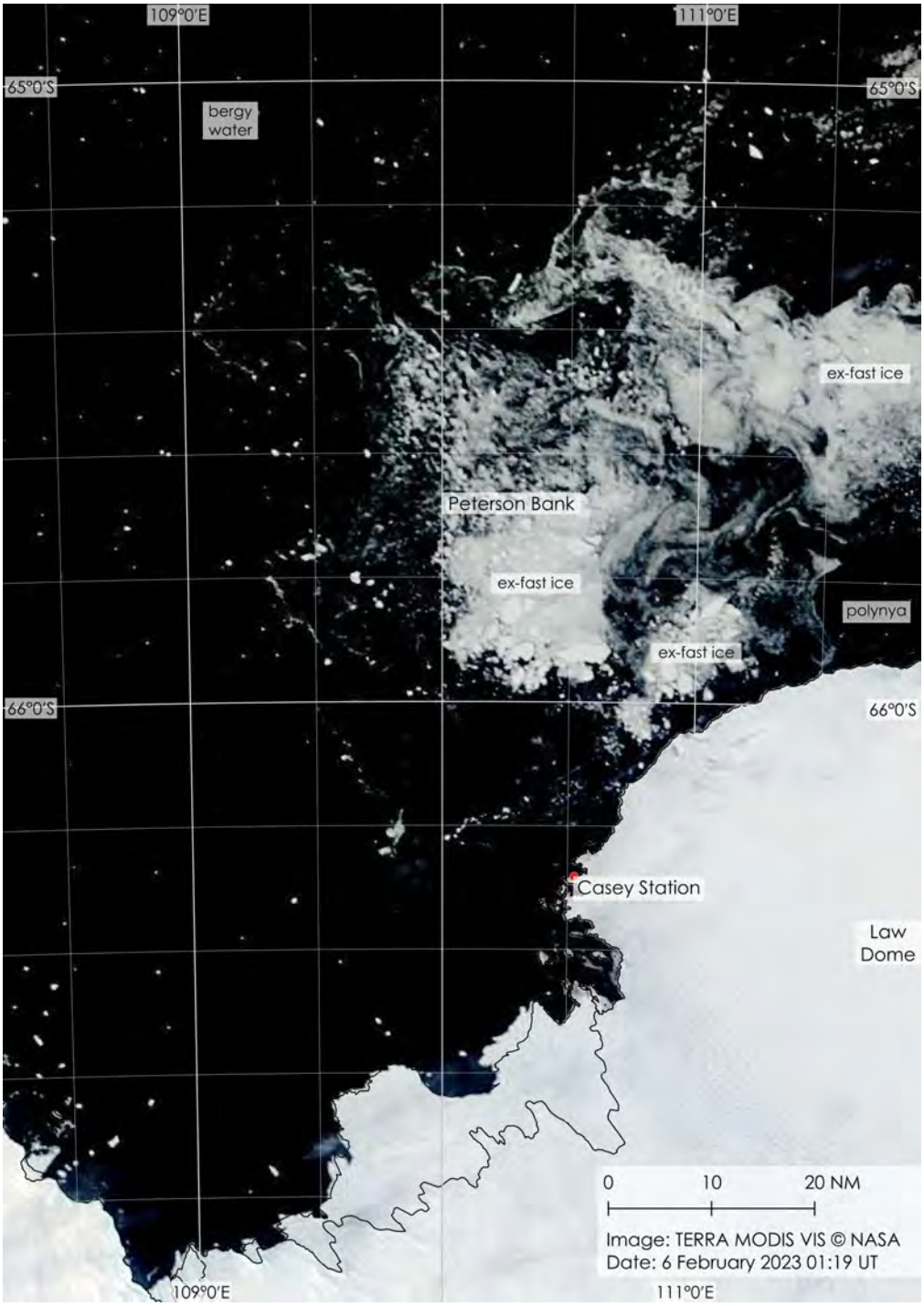


Figure 1: *TERRA MODIS visible composite data acquired 6 February 2023 at 01:19 UT and provided by NASA.*

Ice Bulletin: Ross Sea

Issued: Tuesday 7th February 2023

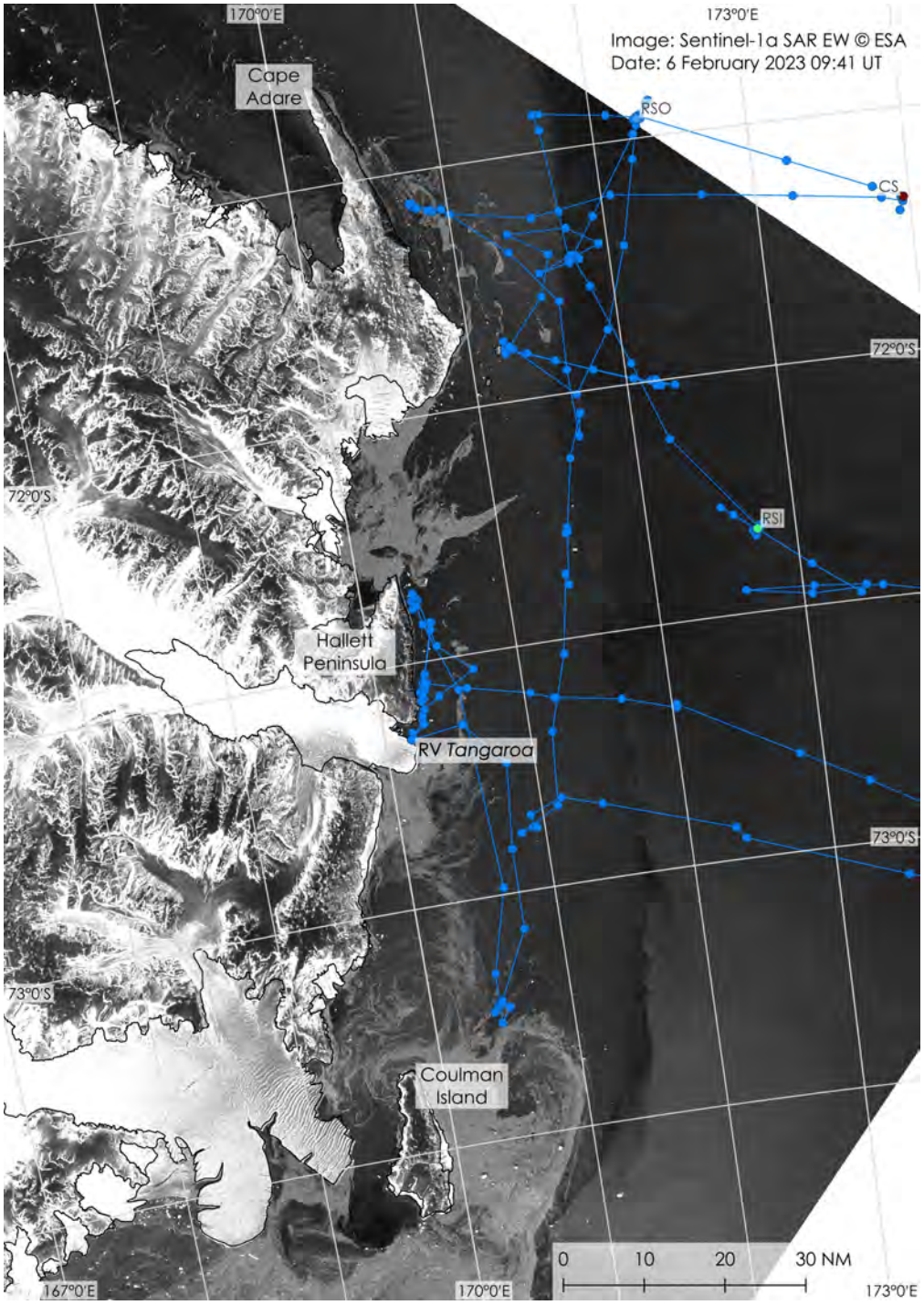
Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Mooring locations of RV *Tangaroa* cruise TAN2302 are marked by coloured dots in the figures of this Bulletin.

Figure 1 shows SAR data of the north-western Ross Sea. The cruise track of the vessel is indicated by the blue line (up until 6 February 2023 23:00 UT).



Nearshore between Cape Adare and Hallet Peninsula, sea ice continues decaying in strips and patches offshore and is drifting generally eastward towards the open sea.

Further south, Terra Nova Bay (see Figure 2) remains surrounded by a band of higher concentration sea ice, which is thinning. This band of pack ice is fed by pack ice drifting northward around the Drygalski Ice Tongue. The lowest ice concentration is found just north of 75º0'S.

Freely drifting icebergs can be present throughout the entire region shown in the figures.

Figure 1: *Sentinel-1 SAR EW data acquired 6 February 2023 at 09:41 UT and provided by PolarView.*

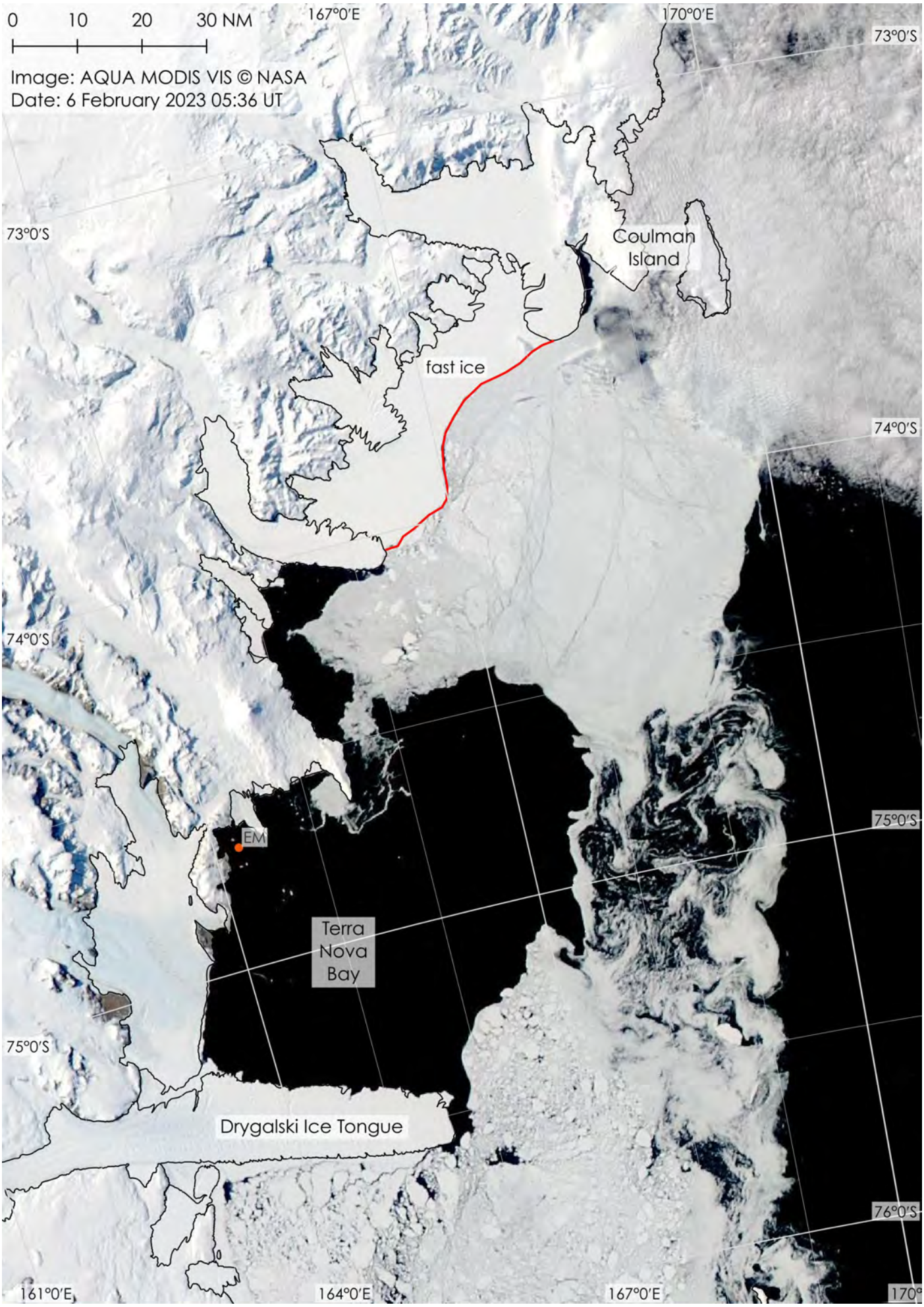


Figure 2: *AQUS MODIS VIS data acquired 6 February 2023 at 05:36 UT and provided by NASA.*

Ice Bulletin: Ross Sea

Issued: Wednesday 8th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of Terra Nova Bay in the western Ross Sea.

Terra Nova Bay remains largely free of sea ice but is still surrounded by first-year pack ice. The lowest concentration of this pack ice is just north and around of 75°0'S. Some icebergs are drifting freely in the bay.

Figure 2 shows close-up view of the part of lowest ice concentration off the bay.

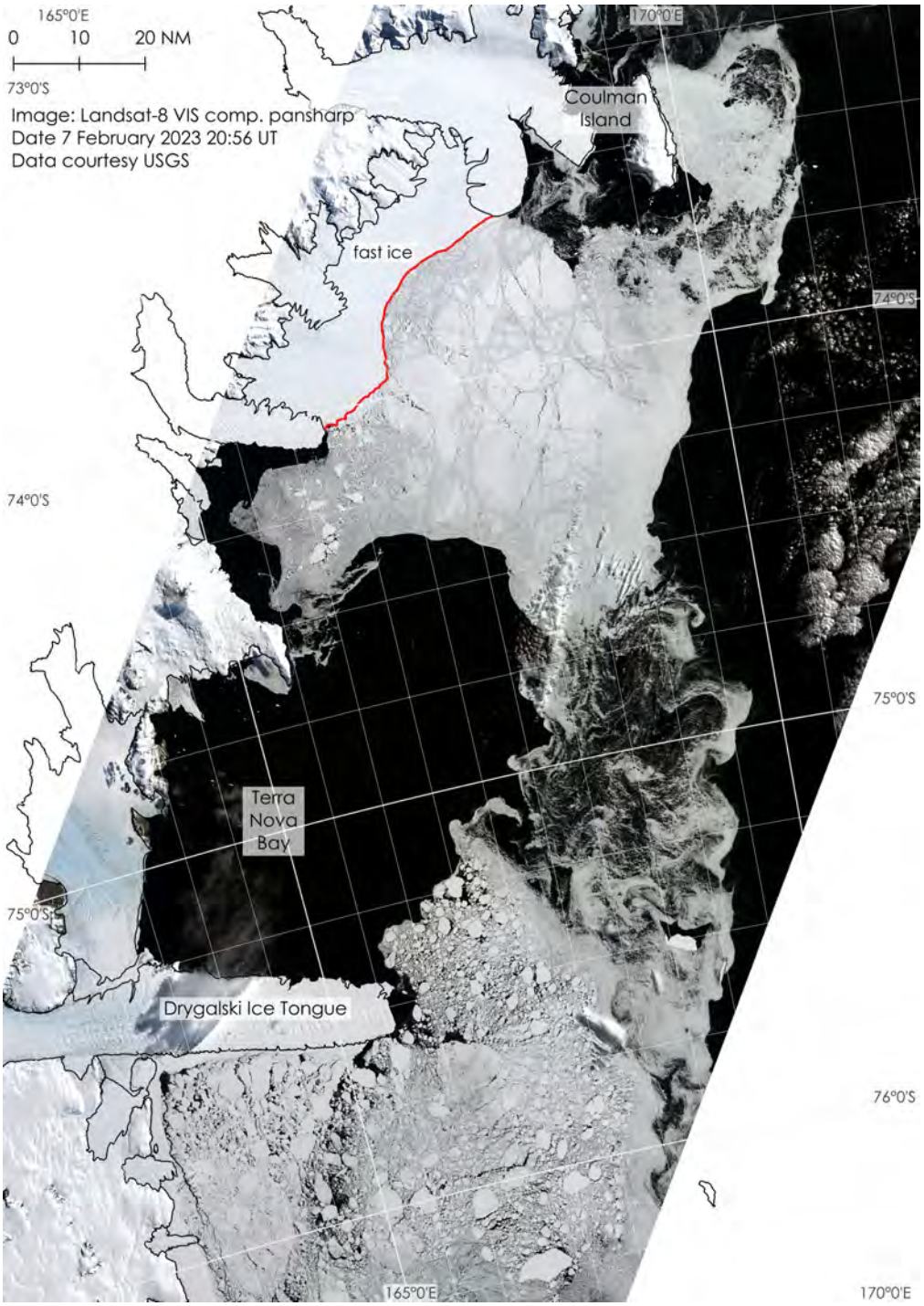


Figure 1: *Landsat-8 visible composite pan-sharpened data acquired 7 February 2023 at 20:56 UT and provided by USGS.*

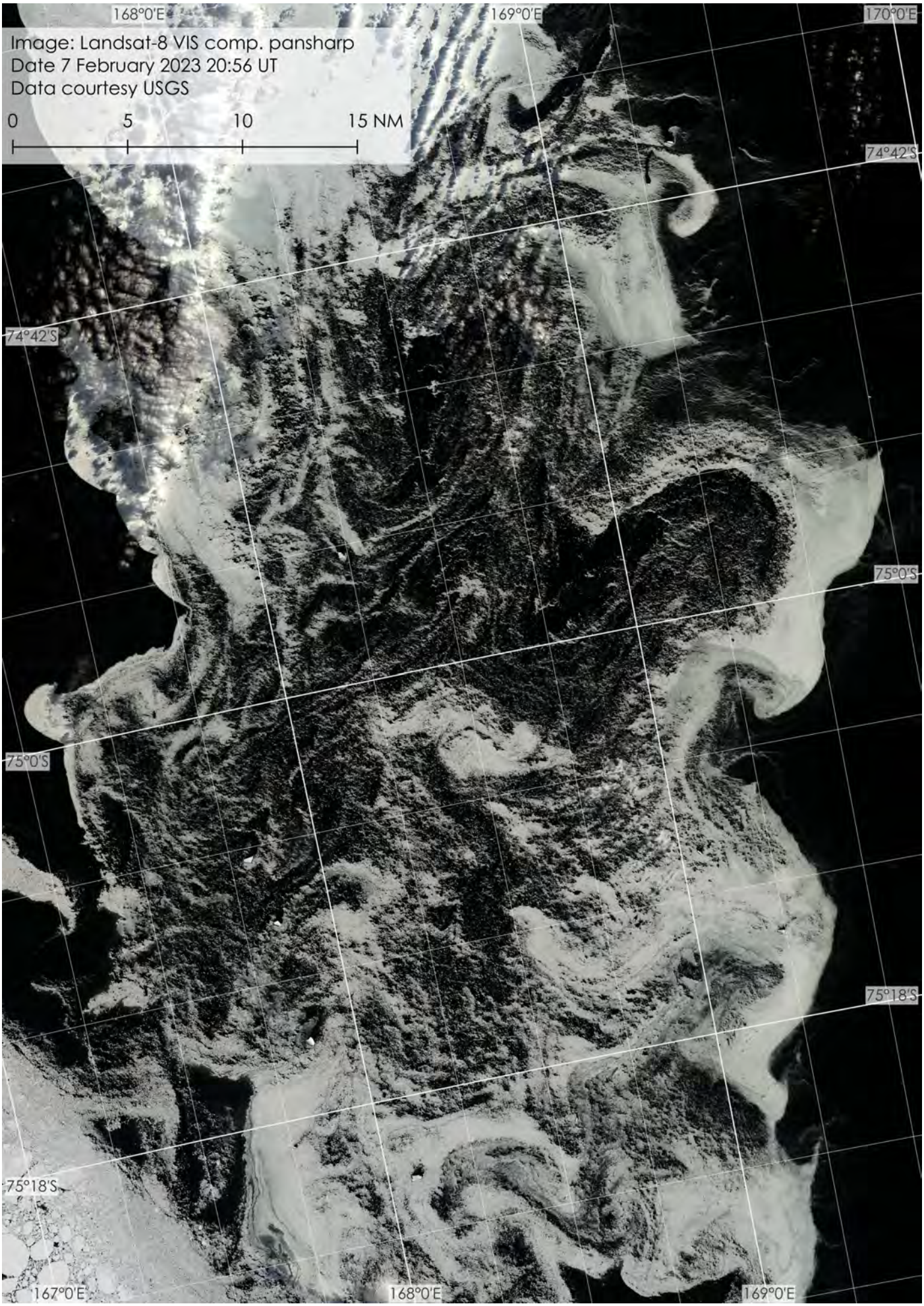


Figure 2: *Landsat-8 visible composite pan-sharpened data acquired 7 February 2023 at 20:56 UT and provided by USGS.*

Ice Bulletin: Cape Darnley

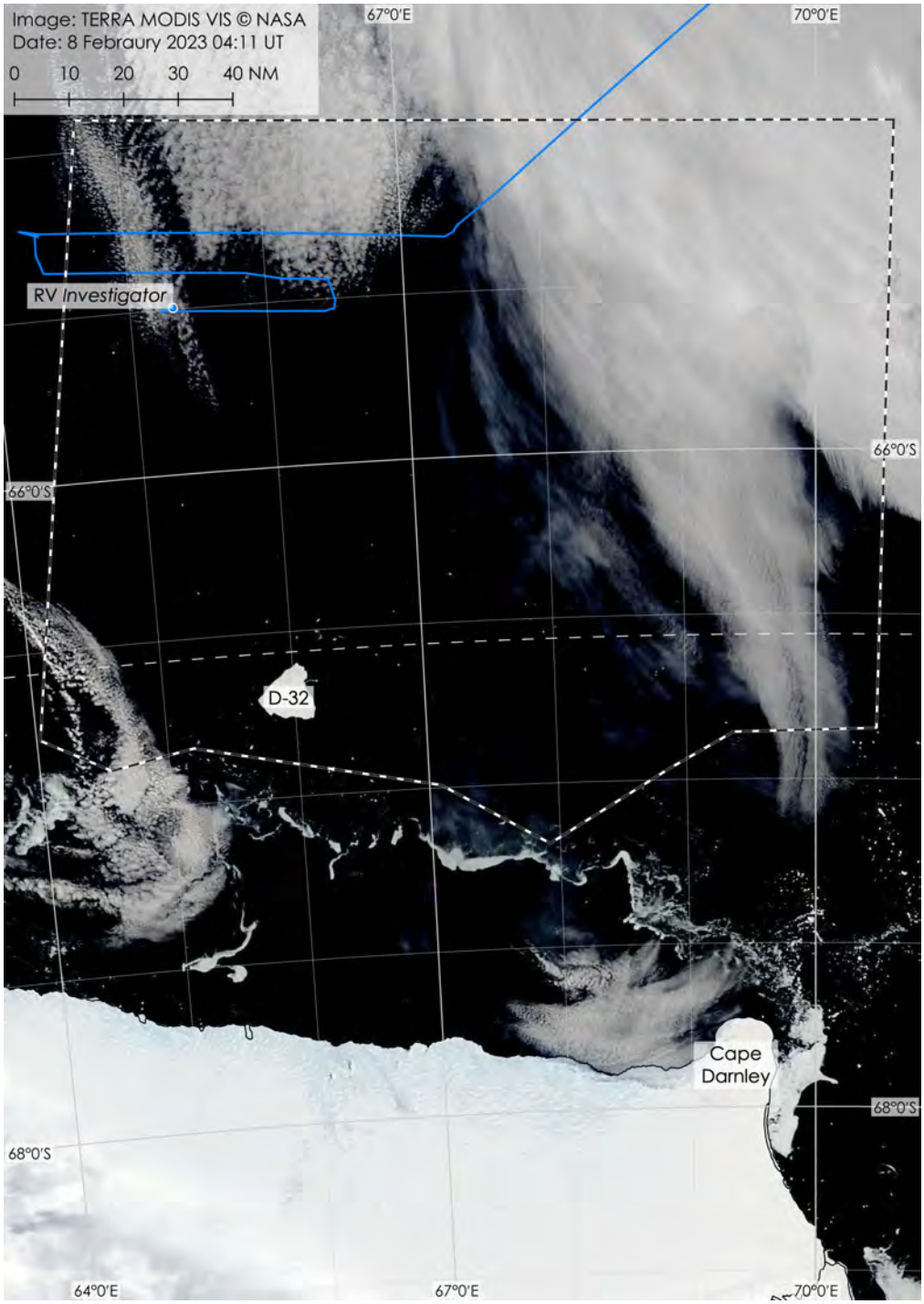
Issued: Wednesday 8th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows visible data northeast of Cape Darnley. The black/white outline marks the proposed survey area of RV *Investigator* voyage IN2023-V01. The cruise track of the vessel is given by the blue line (up until 8 February 2023 06:00 UT). The north-eastern part of the image is obscured by stratiform clouds and in the south-western corner some cumulus clouds are present.



Iceberg D-32 continues its drift westward roughly along the continental shelf break.

Almost the entire proposed survey area is free of drifting pack ice, but icebergs are present throughout the region. Only the southern part of the survey area may be affected by occasional decaying ex-fast ice floes.

Figure 1: *TERRA MODIS VIS data acquired 8 February 2023 at 04:11 UT and provided by NASA.*

Ice Bulletin: Ross Sea

Issued: Wednesday 8th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows visible data of Terra Nova Bay in the western Ross Sea.

Terra Nova Bay remains largely free of sea ice but is still surrounded by first-year pack ice. The lowest concentration of this pack ice is just north and around of 75°0'S. Some icebergs are drifting freely in the bay.

Figure 1: *AQUA MODIS visible composite data acquired 8 February 2023 at 03:45 UT and provided by NASA.*

Ice Bulletin: Mawson Station

Issued: Thursday 9th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Mawson Station. A white diagonal hairline is a stitching artefact where two consecutive scenes join. The cruise track of MV *Happy Diamond* is indicated by the orange line (up until 8 February 2023 22:00 UT).

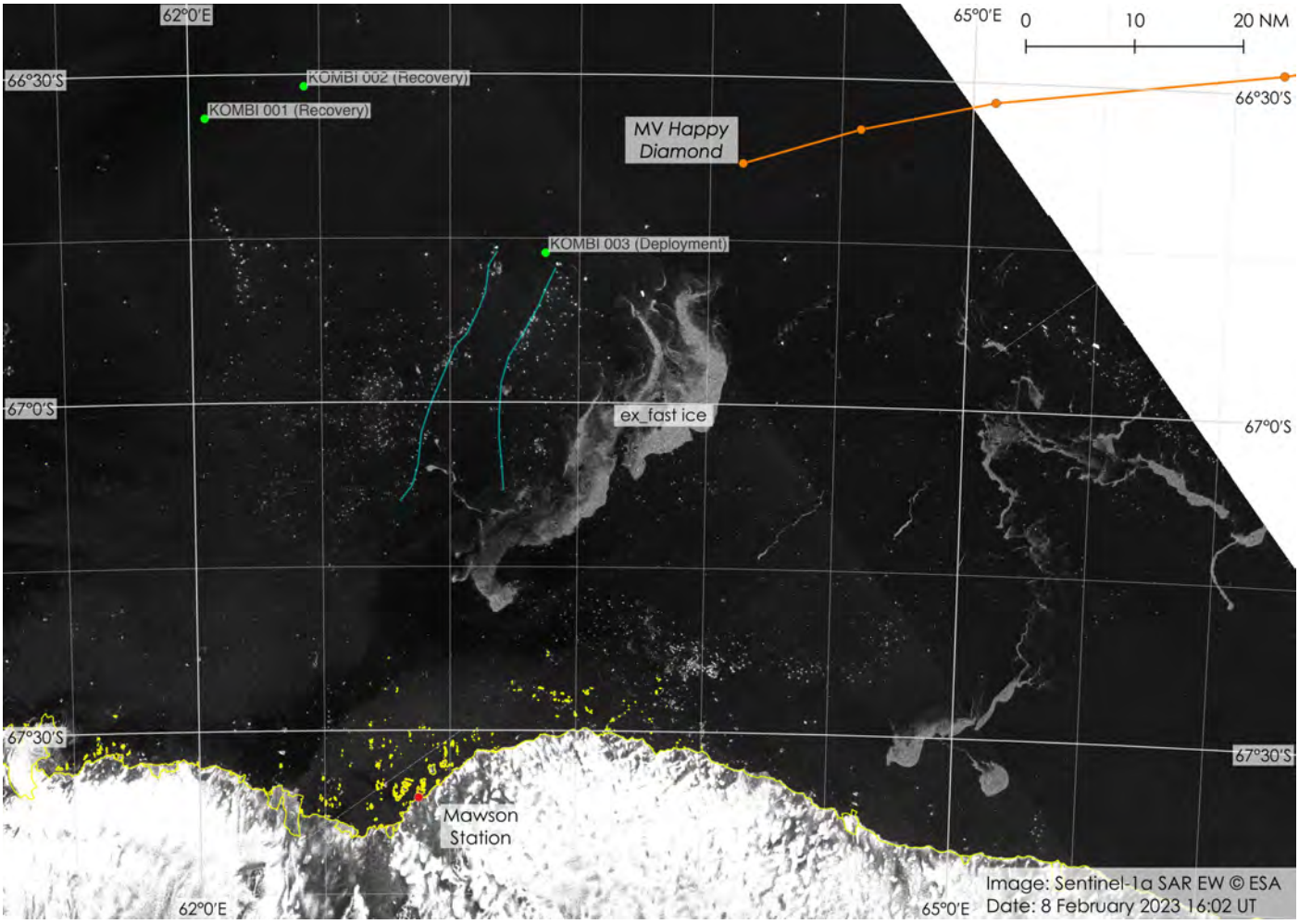


Figure 1: *Sentinel-1a SAR data acquired 8 February 2023 at 16:02 UT and provided by PolarView.*

North of the station, Iceberg Alley (marked by blue outlines) is largely clear of sea ice. Only in the southern part of the alley, strips and patches of decaying ex-fast ice are present.

Remnants of decaying ex-fast ice remain east of the alley south of 66º45'S but continue to disintegrate.

Ice Bulletin: Ross Sea

Issued: Thursday 9th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data of the north-western Ross Sea. The cruise track of RV *Tangaroa* is included as a blue line (up until 9 February 2023 00:00 UT).

Nearshore between Cape Adare and Hallett Peninsula, sea ice continues decaying and has been recently pushed back against the shore.

However, further south around Coulman Island, the pack ice has drifted eastward towards the open sea.

Figure 2 shows visible data of Terra Nova Bay and offshore and Figure 3 shows high-resolution (15 m horizontal) visible data of the band of pack ice off Terra Nova Bay.

The band of pack ice that is closing off the bay remains as the outer parts of the band (the western and eastern edges of the pack ice north of the Drygalksi Ice Tongue) appear to thicken slightly.

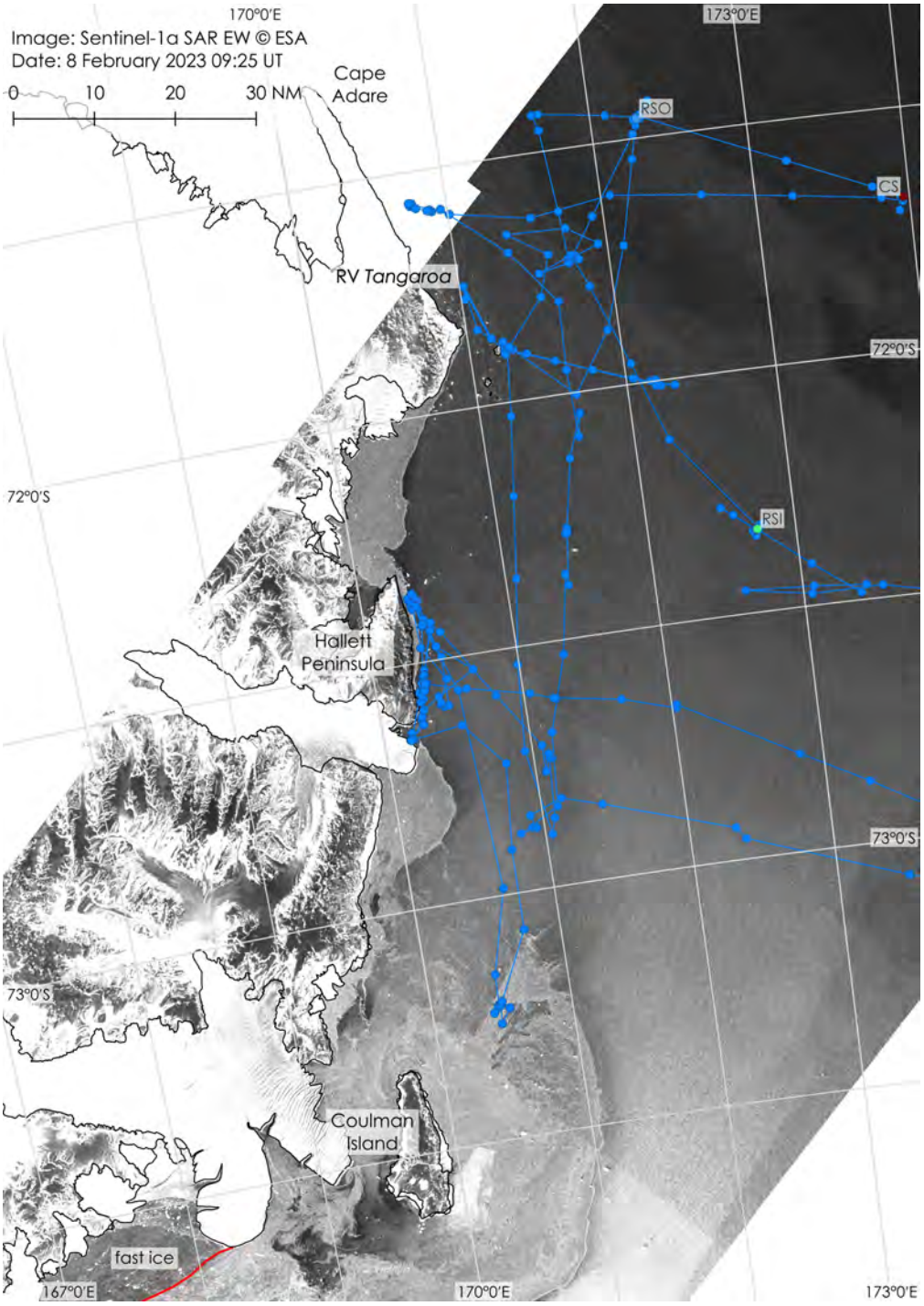


Figure 1: *Sentinel-1a SAR EW data acquired 8 February 2023 at 09:25 UT and provided by PolarView.*

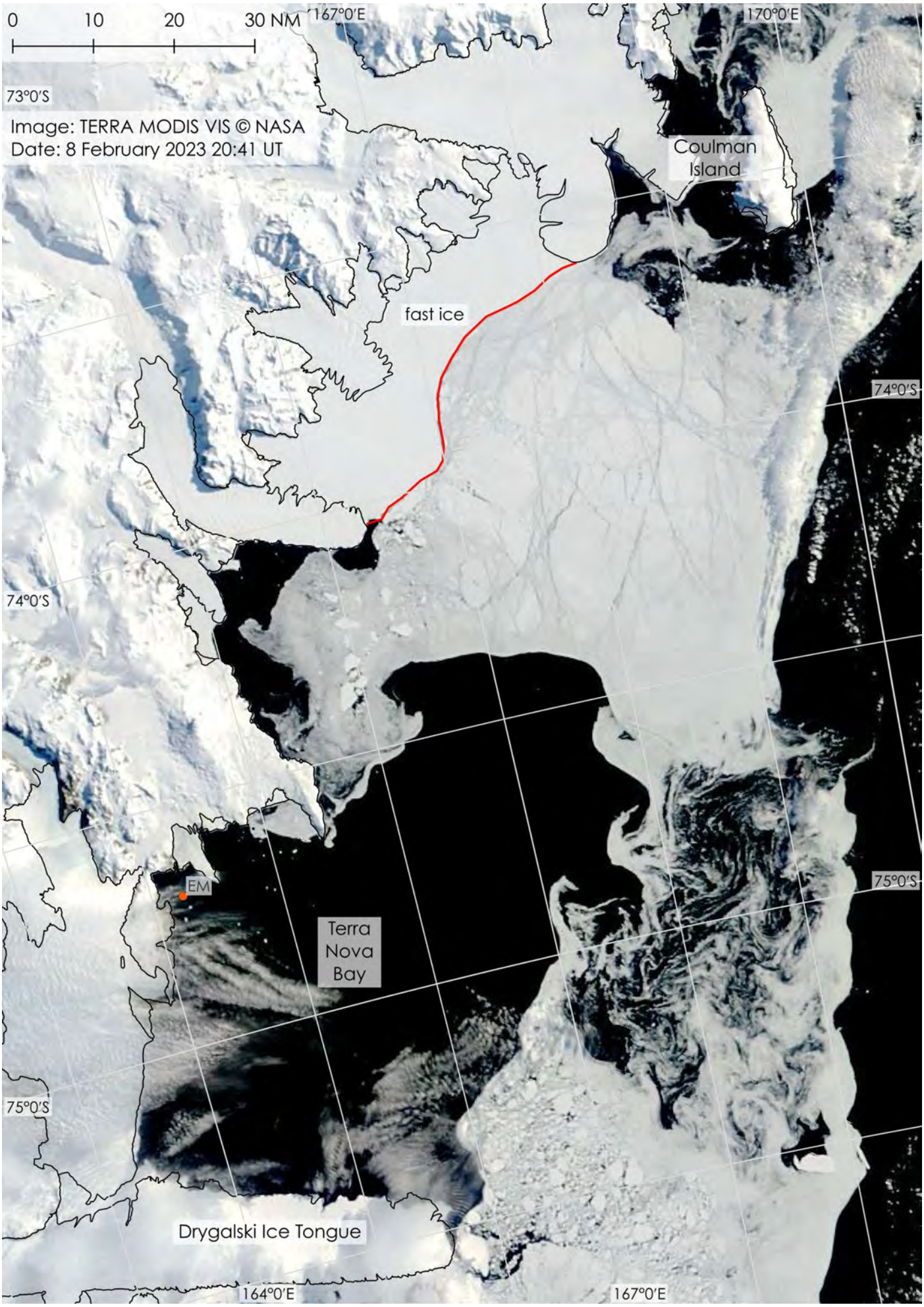


Figure 2: *TERRA MODIS visible composite data acquired 8 February 2023 at 20:41 UT and provided by NASA.*

Figure 3: *Landsat-9 visible composite pan-sharpened data acquired 8 February 2023 at 20:50 UT and provided by USGS.*

Ice Bulletin: Davis Station

Issued: Thursday 9th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) SAR data off Davis Station. The fast-ice edge is marked by a red line.

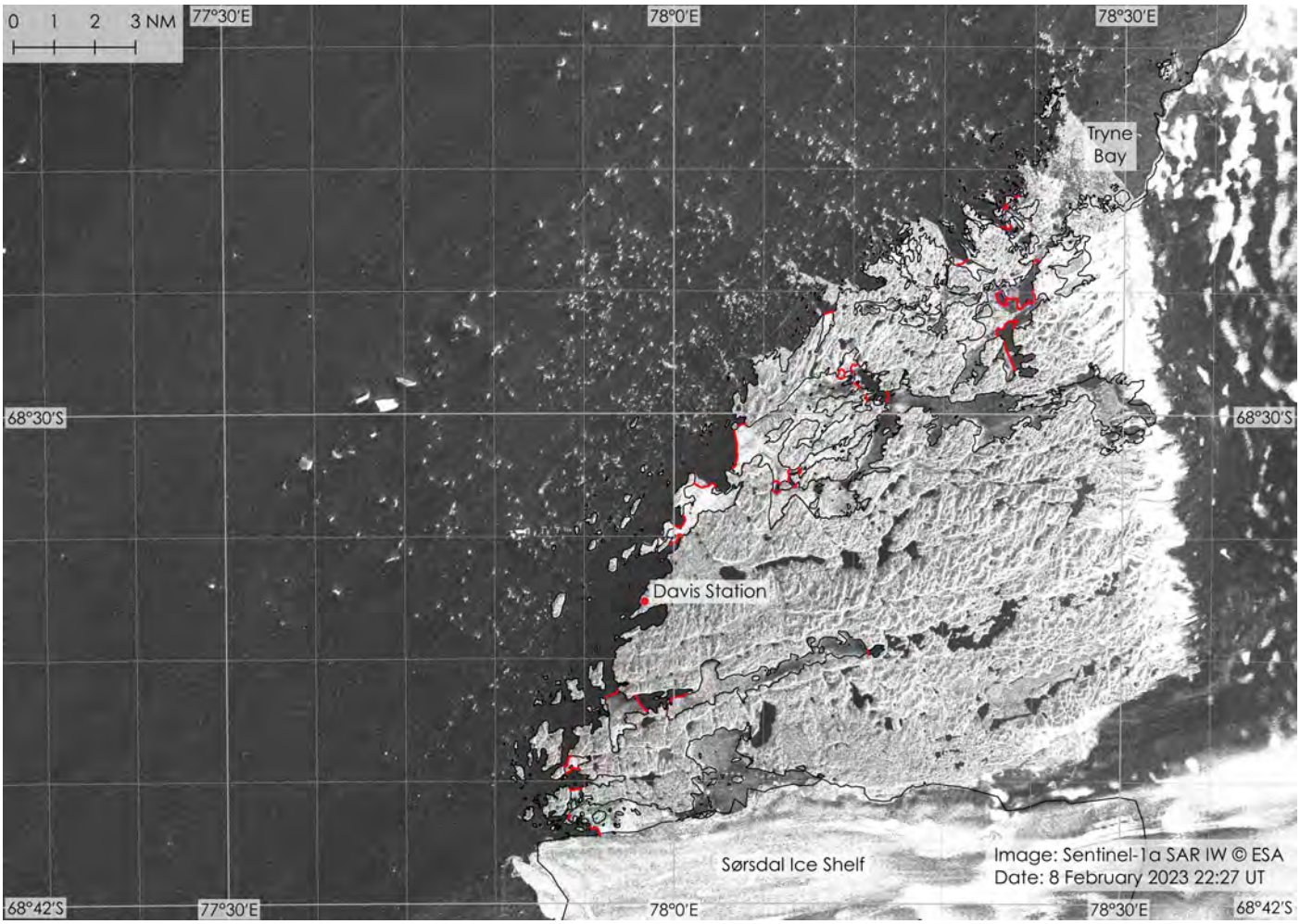


Figure 1: *Sentinel-1a SAR IW data acquired 8 February 2023 at 22:27 UT and provided by PolarView.*

Only minimal fast ice remains in sheltered bay off the hills. Offshore, most of the icebergs are grounded but some are still drifting.

Figure 2 shows high-resolution (10 m horizontal) visible data off Davis Station.

Some of the inshore fjords and channels remain partially frozen over.

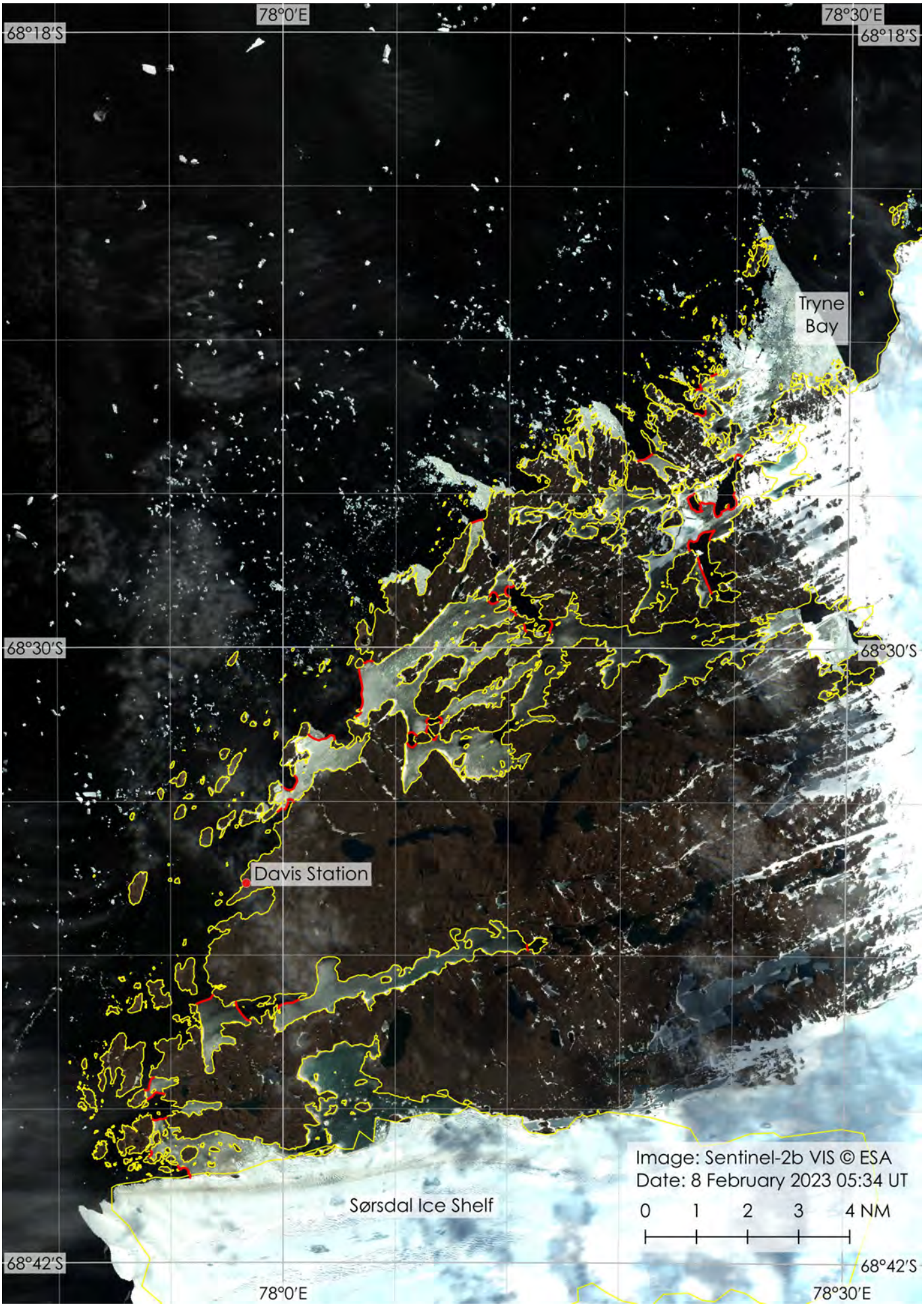


Figure 2: *Sentinel-2b visible composite data acquired 8 February 2023 at 05:34 UT and provided by ESA.*

Ice Bulletin: Ross Sea

Issued: Friday 10th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Mooring locations of RV *Tangaroa* cruise TAN2302 are marked by coloured dots in the figures of this Bulletin.

Figure 1 shows visible data of the north-western Ross Sea. The cruise track of RV *Tangaroa* is included as a blue line (up until 9 February 2023 22:00 UT).

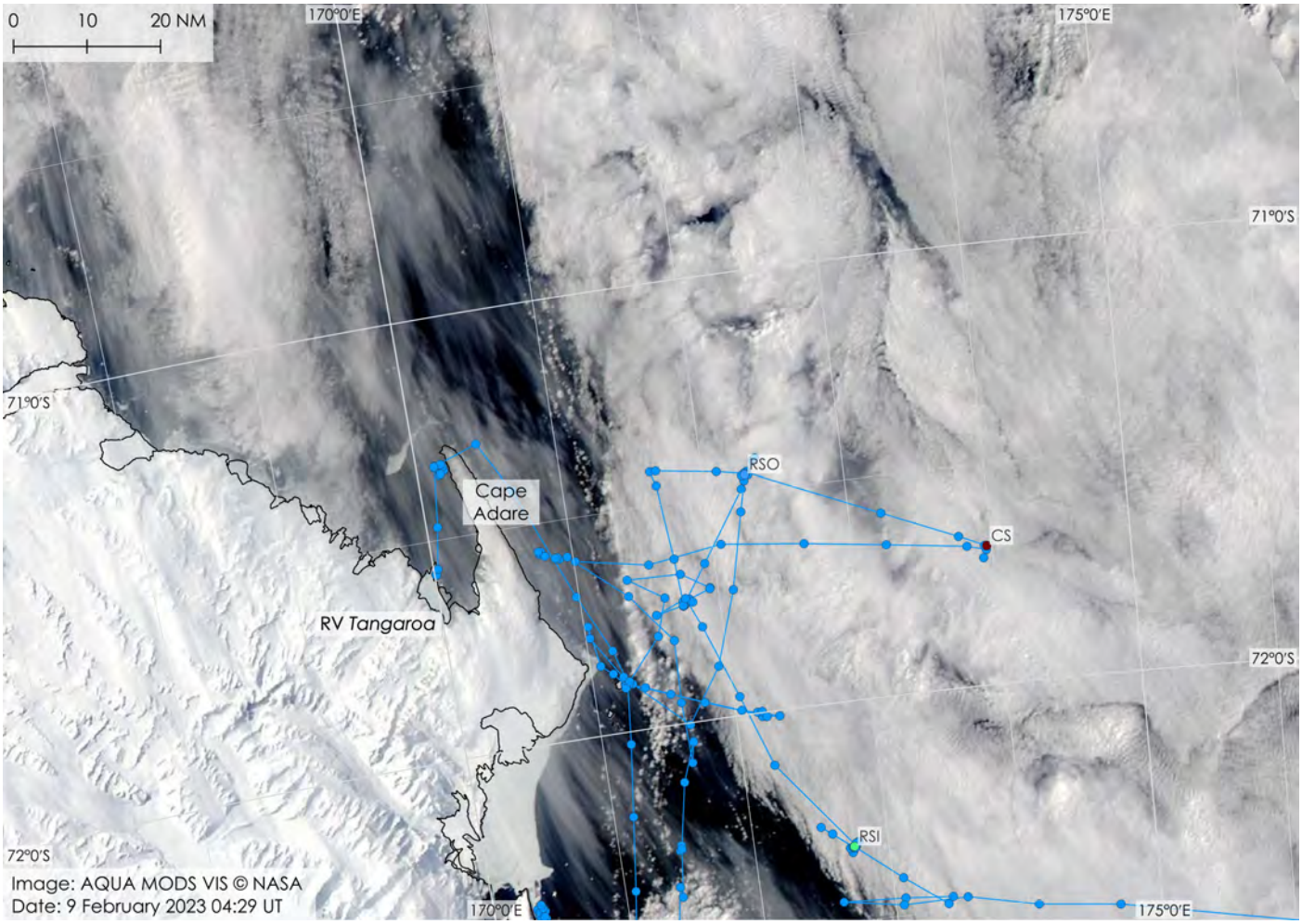


Figure 1: *AQUA MODIS visible composite data acquired 9 February 2023 at 04:29 UT and provided by NASA.*

Nearshore around Cape Adare, sea ice continues decaying and has been recently pushed back against the shore. A spit-like feature of sea ice can be seen around the northern tip of Cape Adare

Figure 2 shows SAR data north-east of Cape Adare. The data has been analysed for iceberg-presence and more than 650 features have been marked by a pink dot.

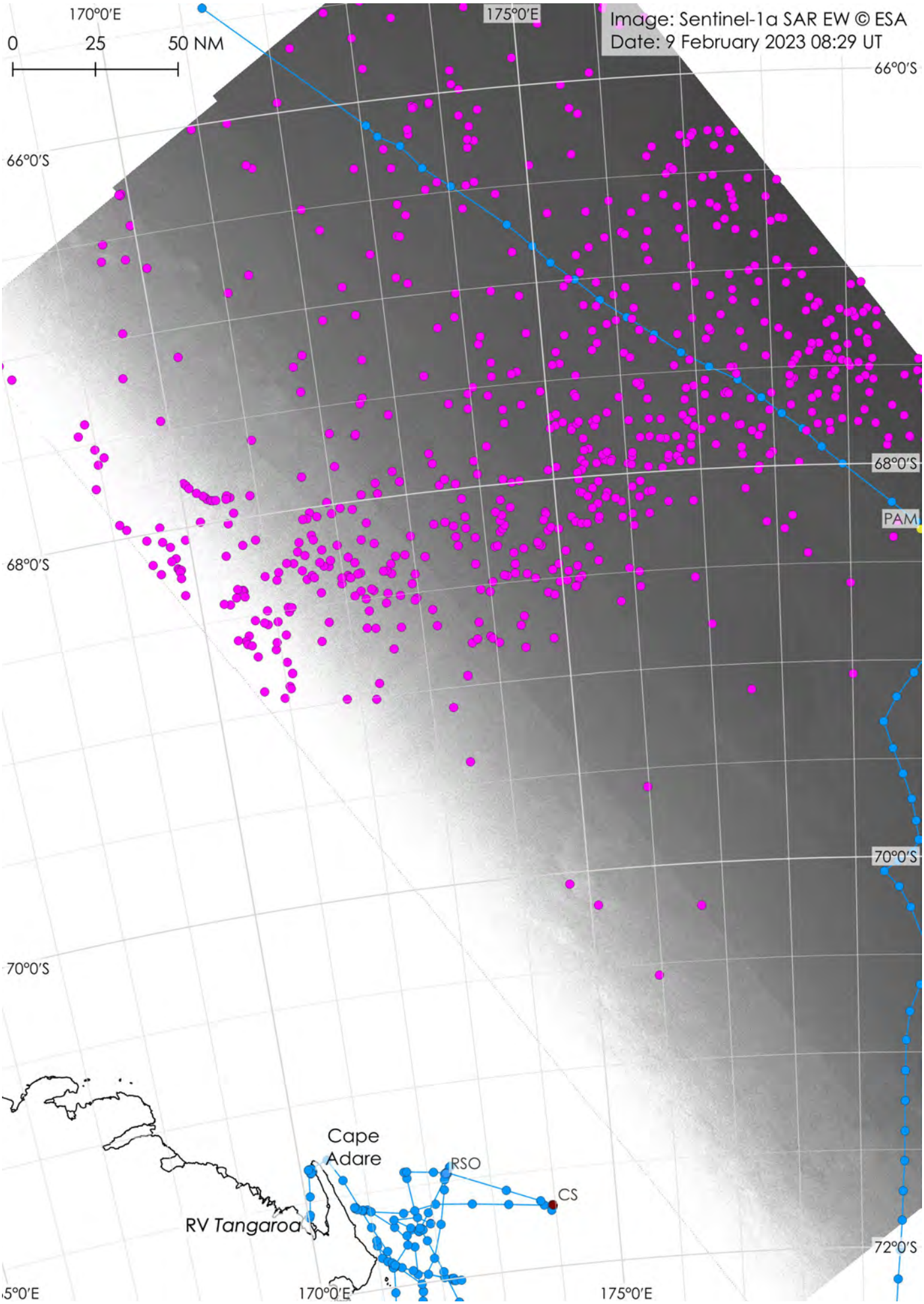


Figure 2: *Sentinel-1a SAR EW data acquired 9 February 2023 at 08:29 UT and provided by ESA.*

Ice Bulletin: Mawson Station

Issued: Friday 10th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows a composite of SAR visible data off Mawson Coast. A white diagonal hairline is a stitching artefact where two consecutive scenes join. The cruise track of MPOV *Aiviq* is indicated by the blue line (up until 10 February 2023 00:20 UT).

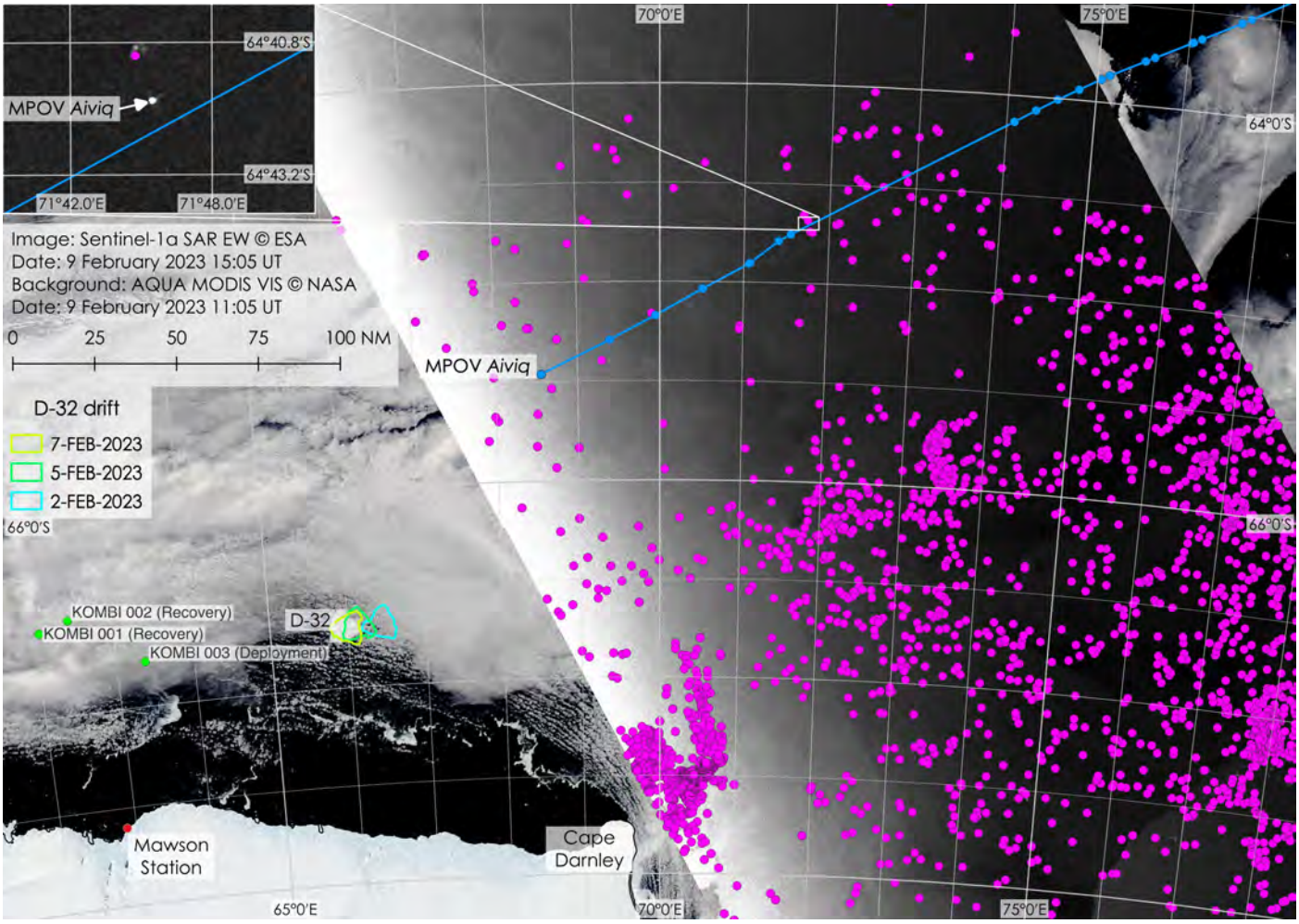


Figure 1: *Sentinel-1a SAR data acquired 9 February 2023 at 15:05 UT and provided by PolarView; background: AQUA MODIS VIS composite data acquired 9 February 2023 at 11:05 UT and provided by NASA.*

The inset in the figure shows MPOV *Aiviq* at the time of data acquisition as a bright reflection.

The SAR data have been analysed for iceberg presence and more than 3000 features have been marked by pink dots.

Iceberg D-32 continues its westward drift roughly along the continental shelf break.

Ice Bulletin: Cape Darnley

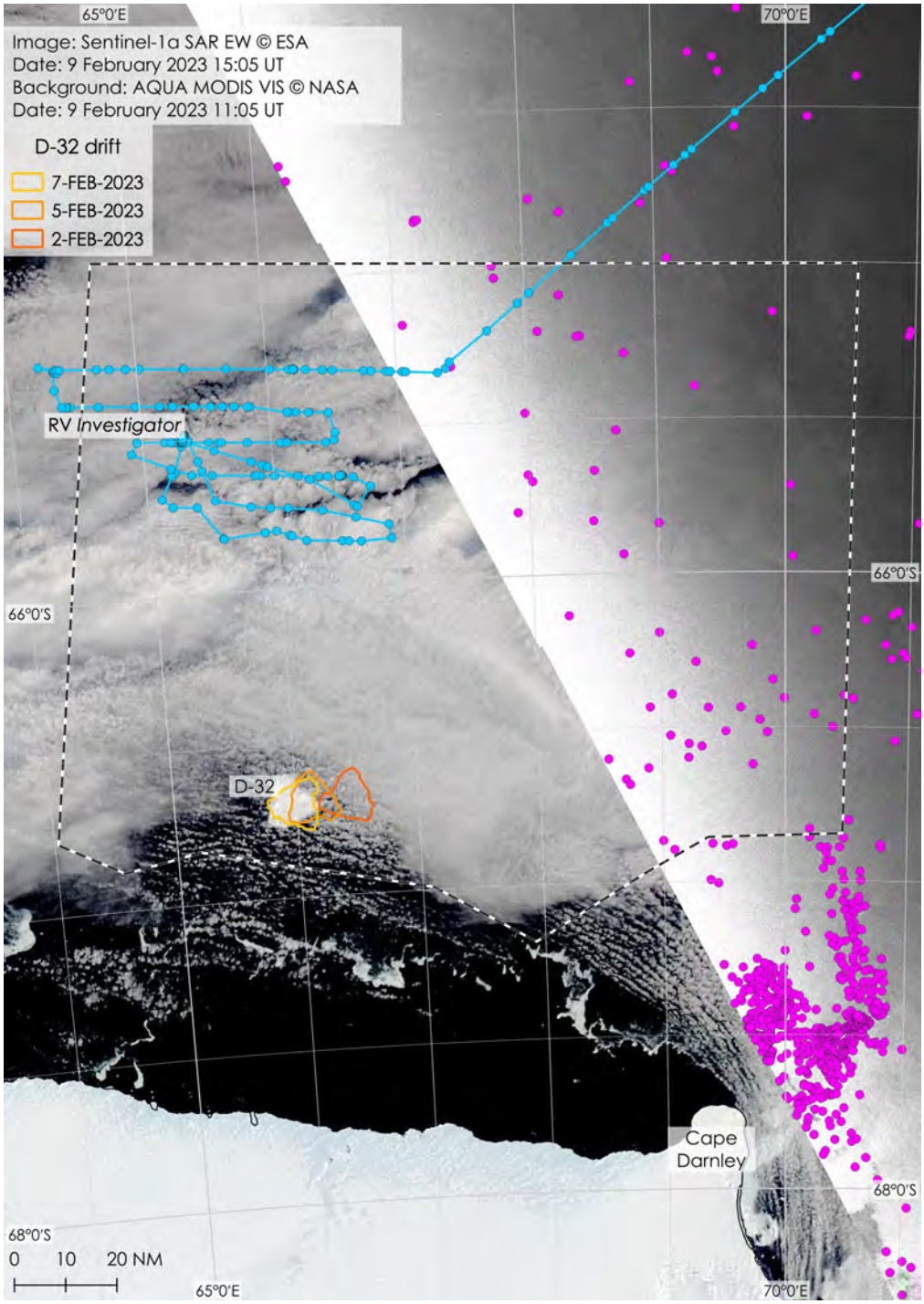
Issued: Friday 10th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows a composite of visible and SAR data north of Mawson Coast. The black/white outline marks the proposed survey area of RV *Investigator* voyage IN2023-V01. The cruise track of the vessel is given by the blue line (up until 10 February 2023 02:00 UT).



The SAR data have been analysed for iceberg presence and features have been marked by pink dots.

Iceberg D-32 continues its drift westward roughly along the continental shelf break.

The entire proposed survey area is largely free of drifting pack ice, but icebergs are present throughout the region. Only the southern part of the survey area may be affected by occasional decaying ex-fast ice floes originating from Cape Darnley.

Figure 1: *Sentinel-1a SAR data acquired 9 February 2023 at 15:05 UT and provided by PolarView;*

background: AQUA MODIS VIS composite data acquired 9 February 2023 at 11:05 UT and provided by NASA.

Ice Bulletin: Antarctica

Issued: Saturday 11th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows the pan-Antarctic sea-ice concentration anomaly based on passive microwave remote sensing data.

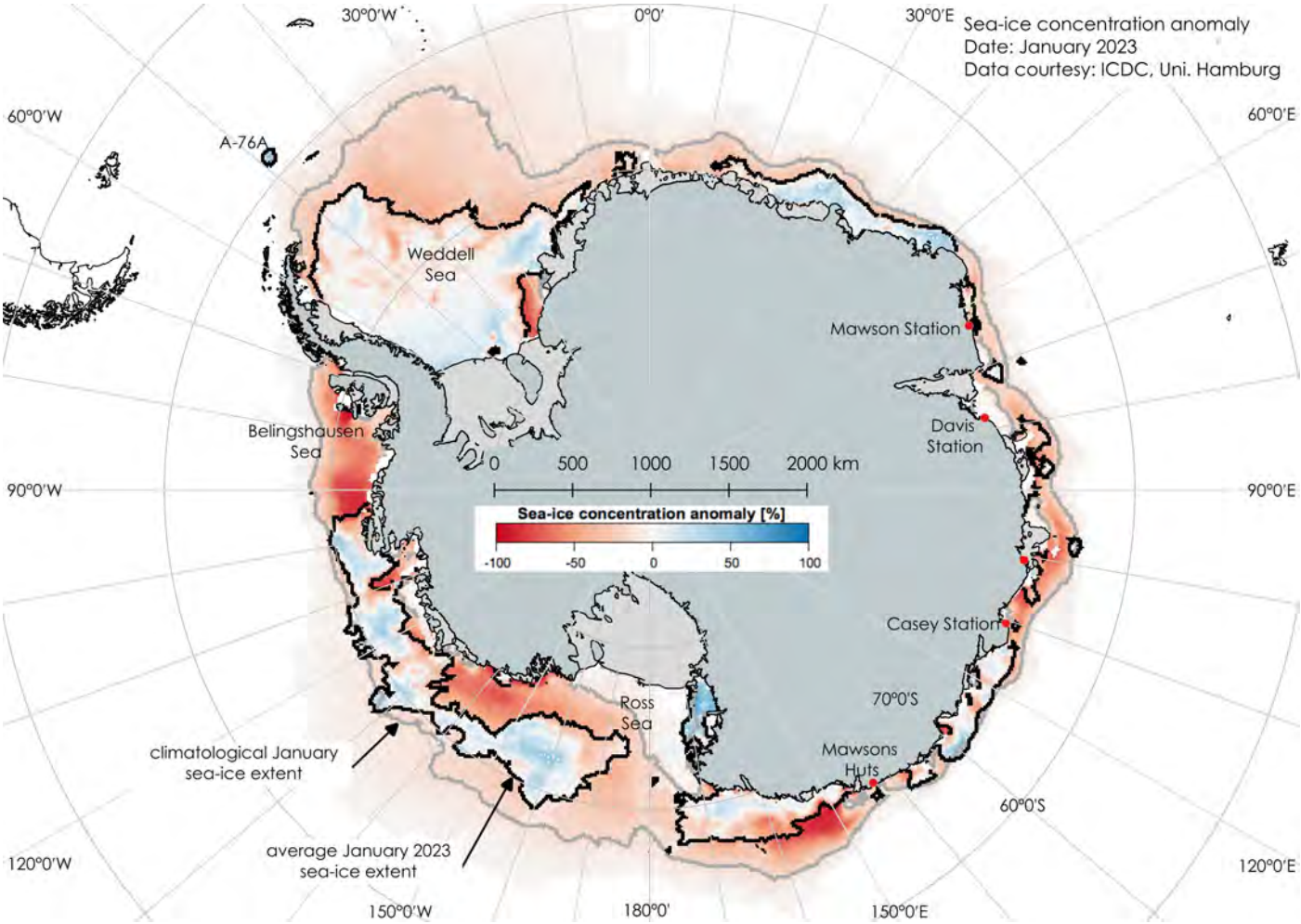


***Figure 1**: Sea-ice concentration anomaly for January 2023 provided by ICDC (Universität Hamburg).*

Pan-Antarctic sea-ice conditions continue to be overall low with trends from December 2022 accelerated.

In January 2023, sea-ice extent hit a new record low value for January since records began more than 40 years ago. Only a few pockets of above average sea-ice concentration within the record low extent remained scattered around the continent, most notably along the western Ross Sea coast.

Northeast of the northern tip of the Antarctic Peninsula, an isolated apparent positive anomaly is caused by the drift of large iceberg A-76A, which is north (outside) of the sea-ice zone and drifting further northward into the southern South Atlantic.

Ice Bulletin: Ross Sea

Issued: Saturday 11th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data of the north-western Ross Sea. Mooring locations of RV *Tangaroa* cruise TAN2302 are marked by coloured dots. The cruise track of the vessel is included as a blue line (up until 10 February 2023 22:00 UT).

Nearshore between Cape Adare and Hallett Peninsula, sea ice continues decaying and has been pushed back against the shore.

North and west of Cape Adare, no sea ice is present in the north-eastern Ross Sea however, icebergs are drifting freely in the region.

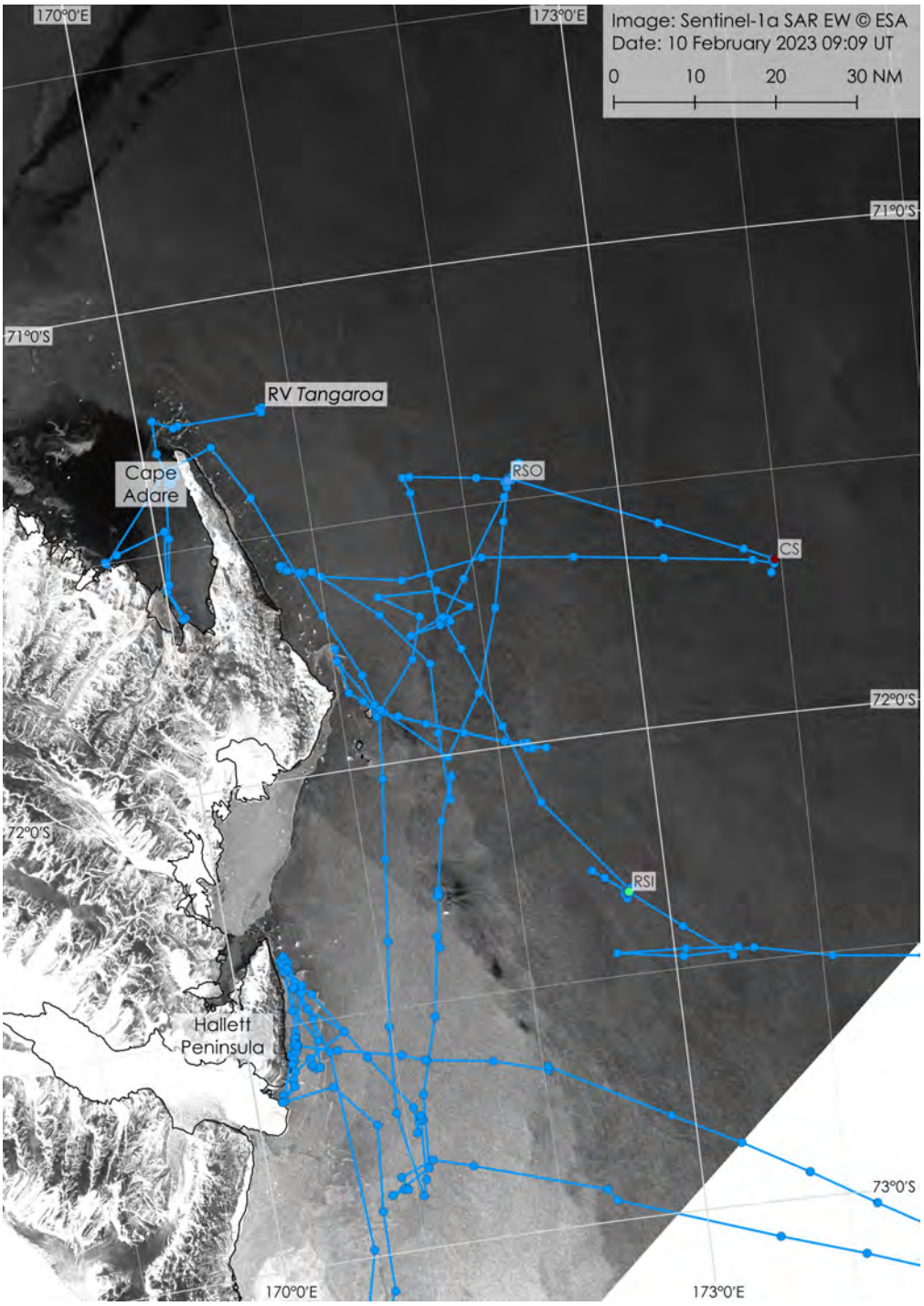


Figure 1: *Sentinel-1a SAR EW data acquired 10 February 2023 at 09:09 UT and provided by PolarView.*

Ice Bulletin: Mawson Station

Issued: Saturday 11th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows visible data north of Mawson Station. The cruise tracks of the MPOV *Aiviq* and MV *Happy Diamond* are given by the blue and orange lines, respectively (up until 11 February 2023 06:15 UT).

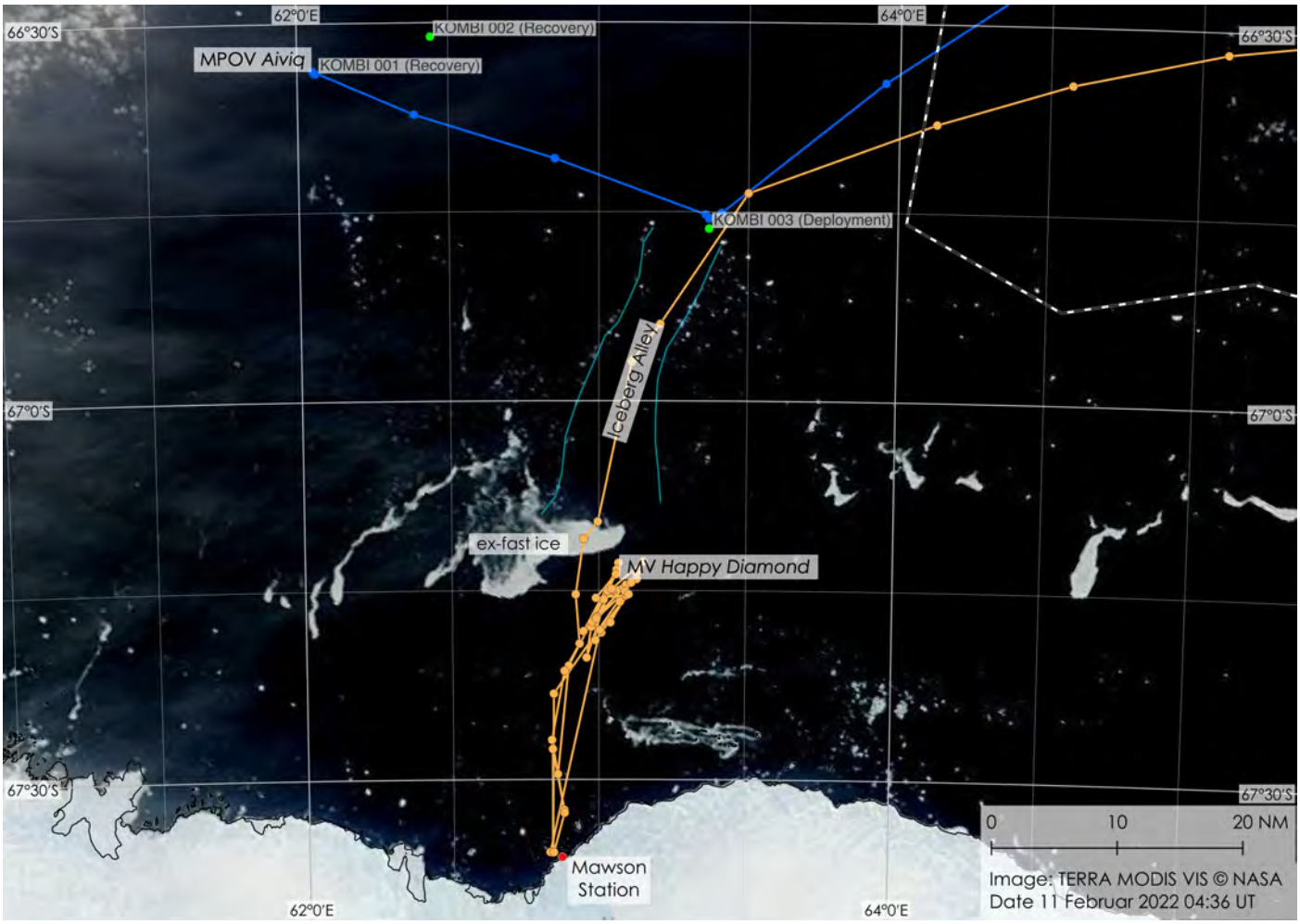


Figure 1: *TERRA MODIS VIS composite data acquired 11 February 2023 at 04:36 UT and provided by NASA.*

The southern end of Iceberg Alley (marked by blue outlines) is partly covered by drifting ex-fast ice, which originated from the eastern side of Cape Darnley (not shown in the figure).

Figure 2 shows a larger scale overview of the same data as Figure 1. The black/white outline marks the proposed survey area of RV *Investigator* voyage IN2023-V01. The cruise track of the vessel is marked in light blue (up until 11 February 2023 07:00 UT).

The entire proposed survey area is largely free of drifting pack ice, but icebergs are present throughout the region.

Iceberg D-32 continues its drift westward roughly along the continental shelf break.

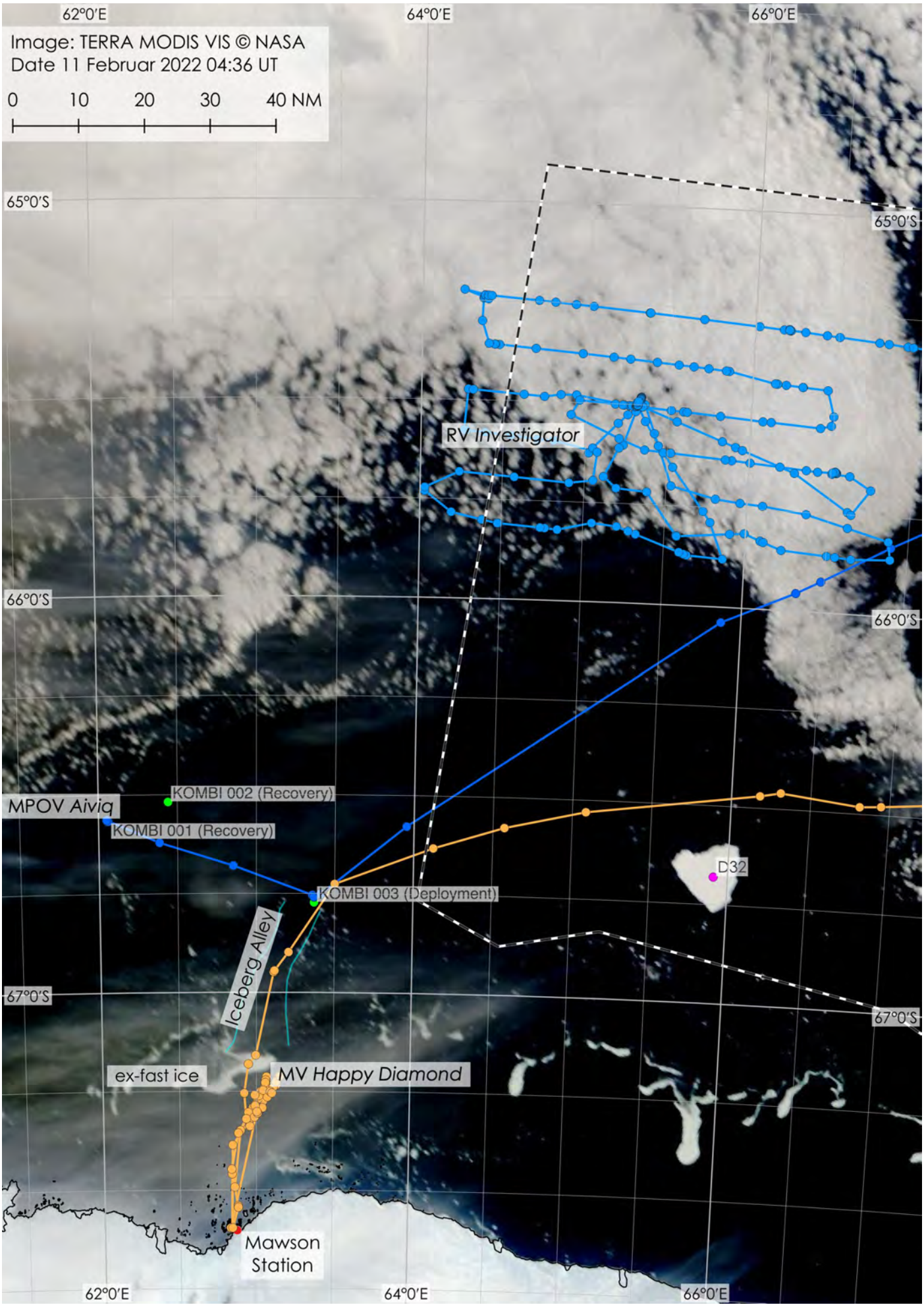


Figure 2: *TERRA MODIS VIS composite data acquired 11 February 2023 at 04:36 UT and provided by NASA.*

Ice Bulletin: Ross Sea

Issued: Monday 13th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data of the north-western Ross Sea. Mooring locations of RV *Tangaroa* cruise TAN2302 are marked by coloured dots. The vessel's cruise track is included as a blue line (up until 12 February 2023 23:00 UT).

Nearshore between Cape Adare and Hallett Peninsula, sea ice continues decaying and has been pushed northward and against the shore.

Figure 2 shows a larger scale overview north of Cape Adare. The data has been analysed for iceberg presence and more than 700 features have been marked by pink dots.

Northeast of Cape Adare, minimal sea ice is present in the north-western Ross Sea however, north of 70º0'S and west of 170º0'E, decaying sea ice and icebergs are drifting freely in the region.

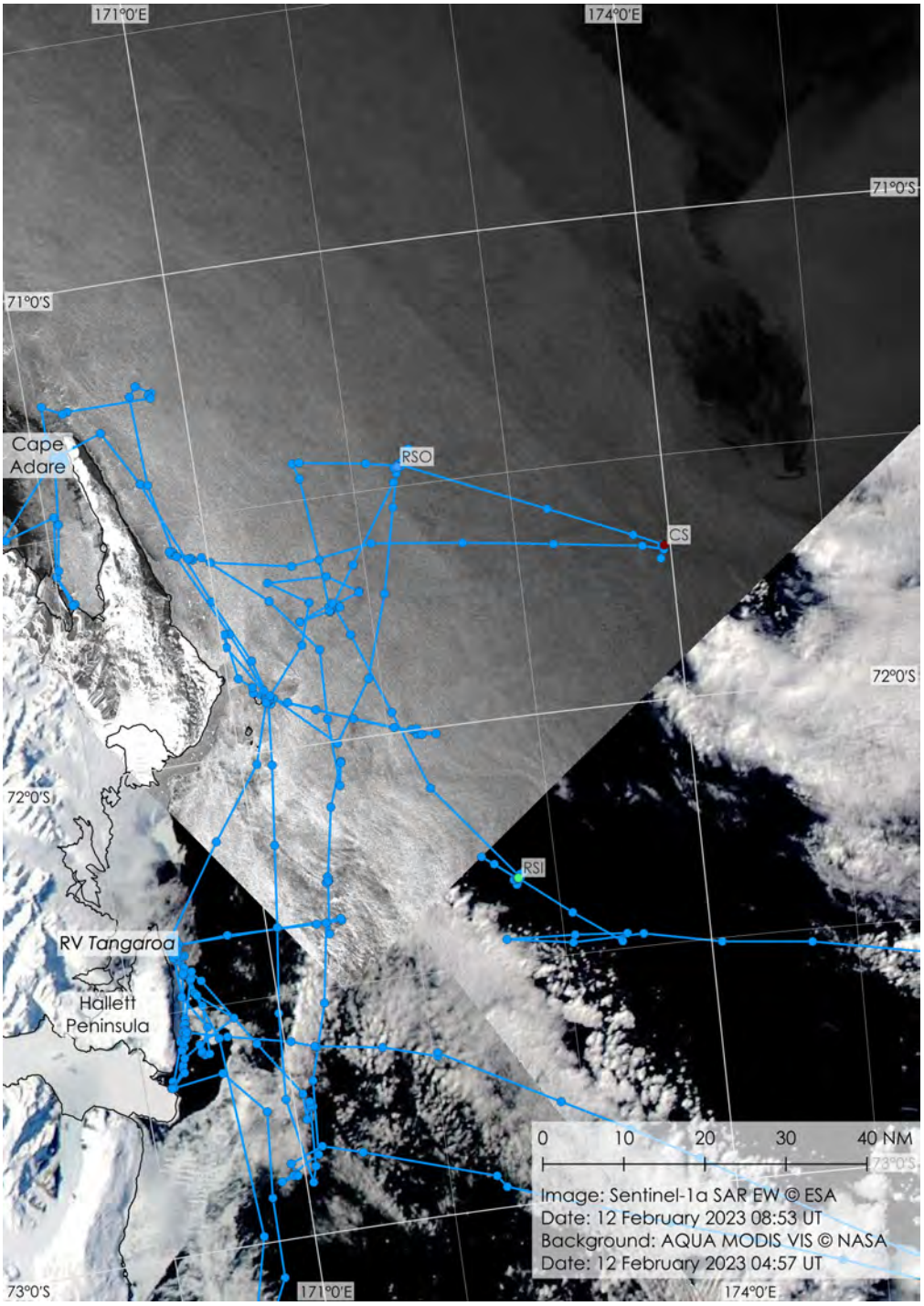


Figure 1: *Sentinel-1a SAR EW data acquired 12 February 2023 at 08:53 UT and provided by PolarView; background of AQUA MODIS VIS data acquired 12 February 2023 at 04:57 UT and provided by NASA.*

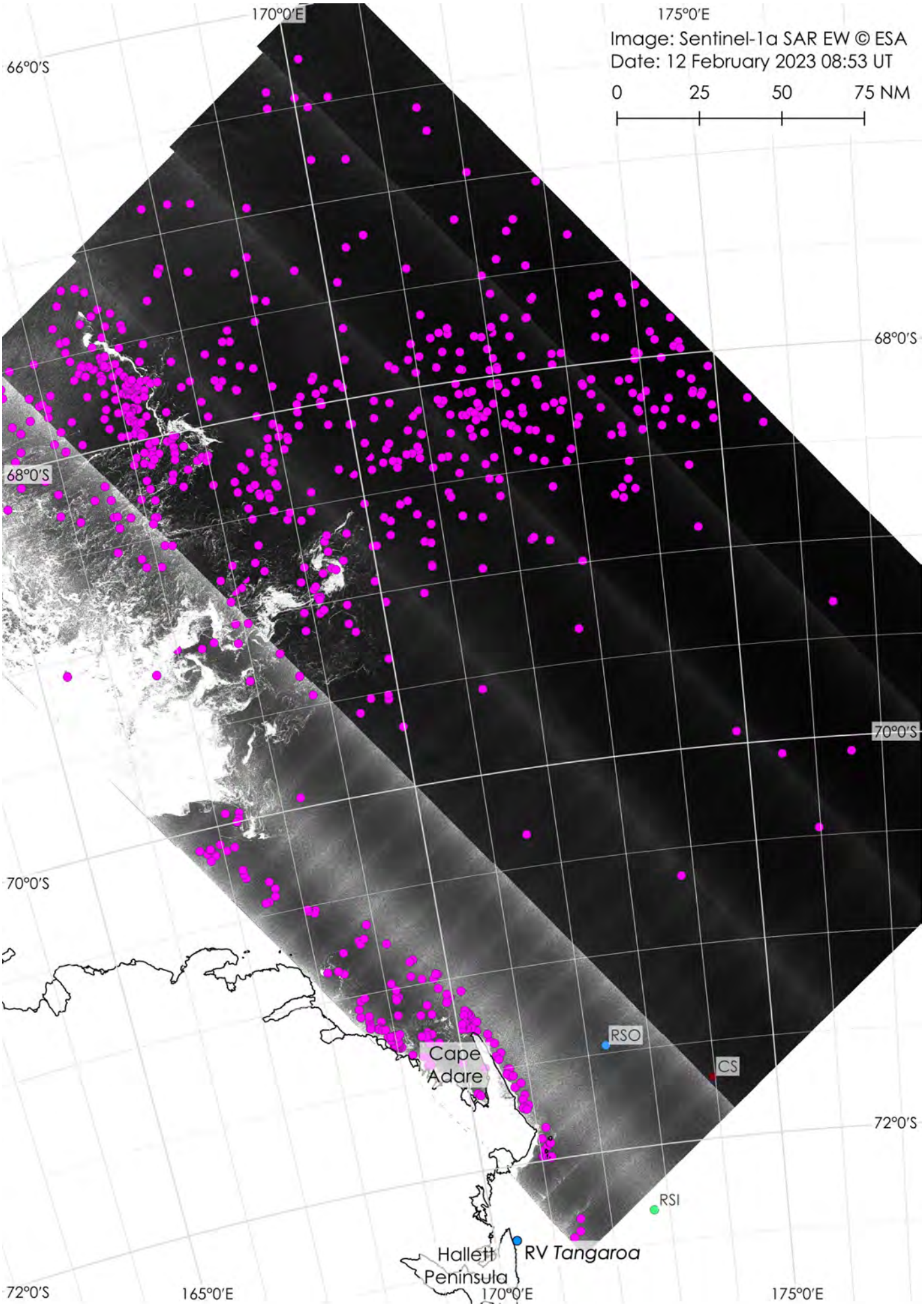


Figure 2: *Sentinel-1a SAR EW (cross-polarised intensity) data acquired 12 February 2023 at 08:53 UT and provided by ESA.*

Ice Bulletin: West Ice Shelf

Issued: Monday 13th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data north of West Ice Shelf. The cruise track of RV *Investigator* voyage IN2023-V01 is given by the blue line (up until 13 February 2023 04:00 UT).

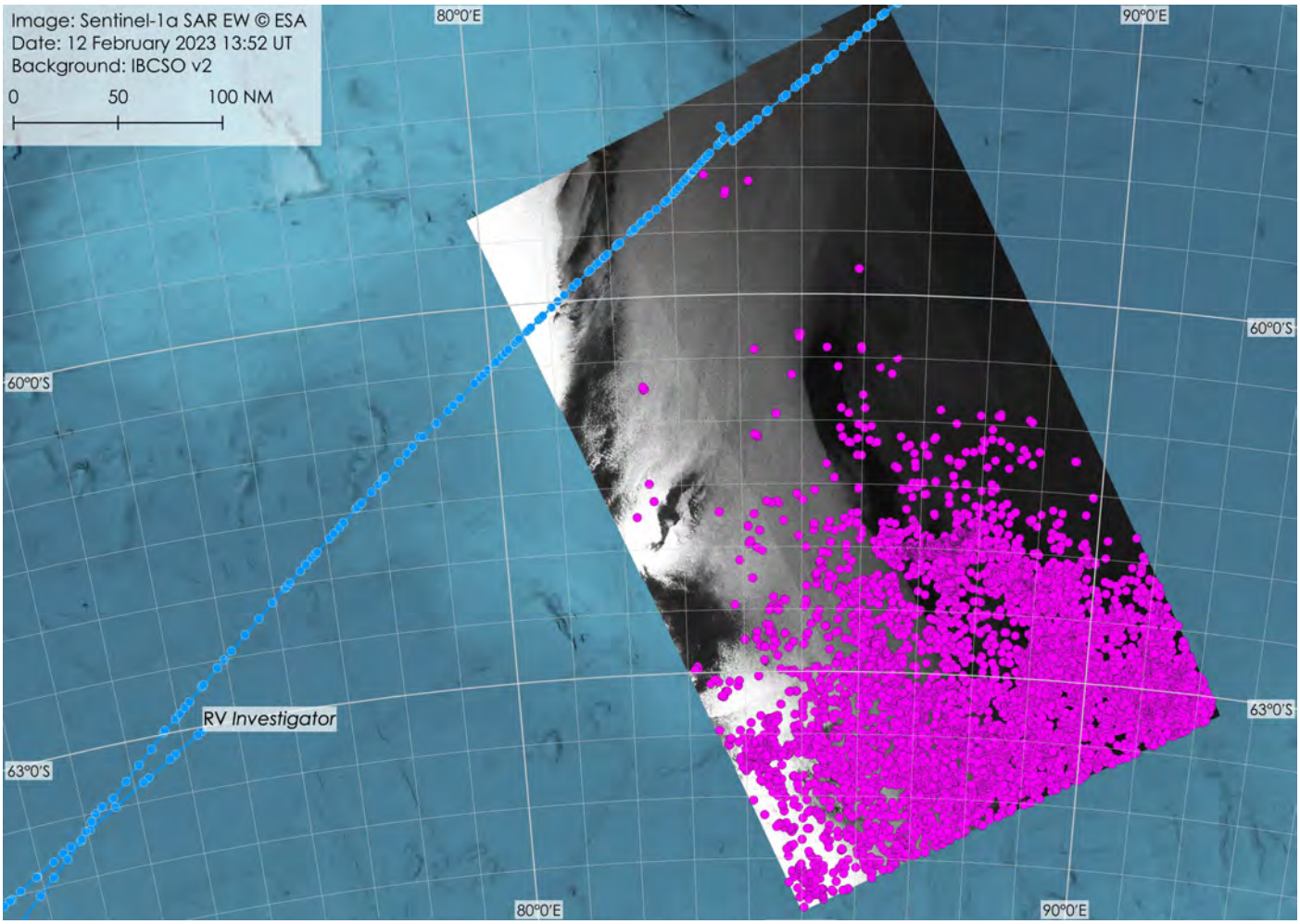


Figure 1: *Sentinel-1a SAR data acquired 12 February 2023 at 13:52 UT and provided by PolarView.*

The SAR data have been analysed for iceberg presence and more than 6600 features have been marked by pink dots. Isolated icebergs are as far north as 59º0'S.

Ice Bulletin: Ross Sea

Issued: Tuesday 14th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution SAR data of the north-western Ross Sea. The voyage track of RV *Tangaroa* TAN2302 cruise is included as a blue line (up until 13 February 2023 22:00 UT).

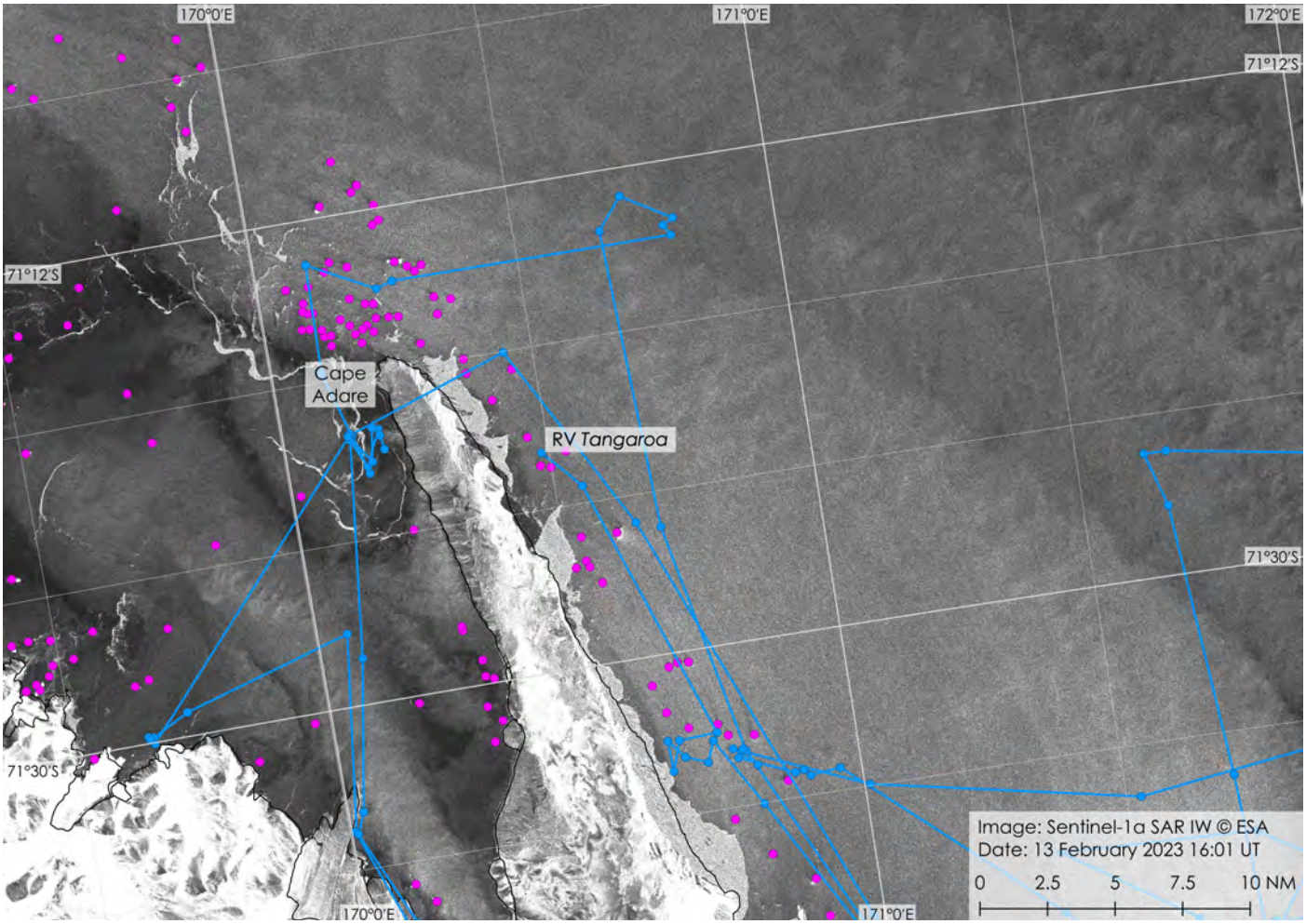


Figure 1: *Sentinel-1a SAR IW data acquired 13 February 2023 at 16:01 UT and provided by PolarView.*

Nearshore around Cape Adare, sea ice has been pushed northward and against the shore.

Figure 2 shows a larger scale overview north of Cape Adare. The data has been analysed for iceberg presence and features have been marked by pink dots.

The inset shows the vessel at the time of data acquisition as a bright spot.

North of Cape Adare, minimal sea ice is present in the north-western Ross Sea however, strips and patches of decaying sea ice are present of south of 69º0'S and west of 170º0'E and icebergs are drifting freely in the region.

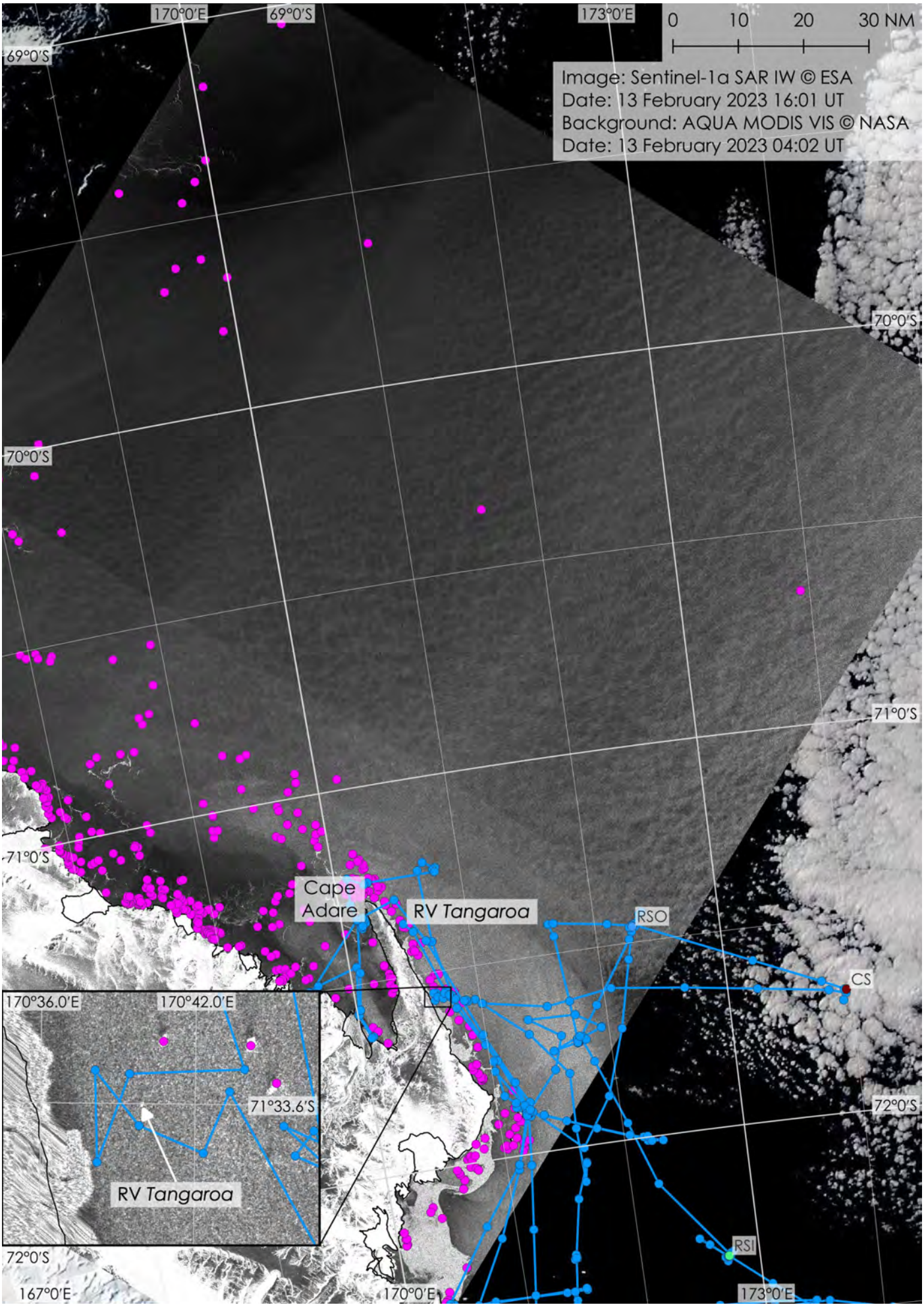


Figure 2: *Sentinel-1a SAR IW data acquired 13 February 2023 at 16:01 UT and provided by PolarView; background of AQUA MODIS VIS data acquired 13 February 2023 at 04:02 UT and provided by NASA.*

Ice Bulletin: Mawson Station

Issued: Tuesday 14th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data off Mawson Station. The insets show the positions of MPOV *Aiviq* and MV *Happy Diamond* at the time of data acquisition.

The region is largely free of sea ice, but occasional icebergs or small pieces of old ice are in the area.

Figure 2 shows a larger scale overview of the same data as Figure 1. The cruise tracks of the MPOV *Aiviq* and MV *Happy Diamond* are given by the blue and orange lines, respectively (up until 14 February 2023 00:30 UT).

Figure 3 shows high-resolution (15 m horizontal) SAR data north of Mawson Station. A diagonal hairline is a stitching artefact where two consecutive scenes join. The insets show MV *Happy Diamond* offshore and MPOV *Aiviq* off station as bright starshaped reflections.

Around 67°12'S, drifting ex-fast ice, which originated from the eastern side of Cape Darnley (not shown in the figure), is decreasing.

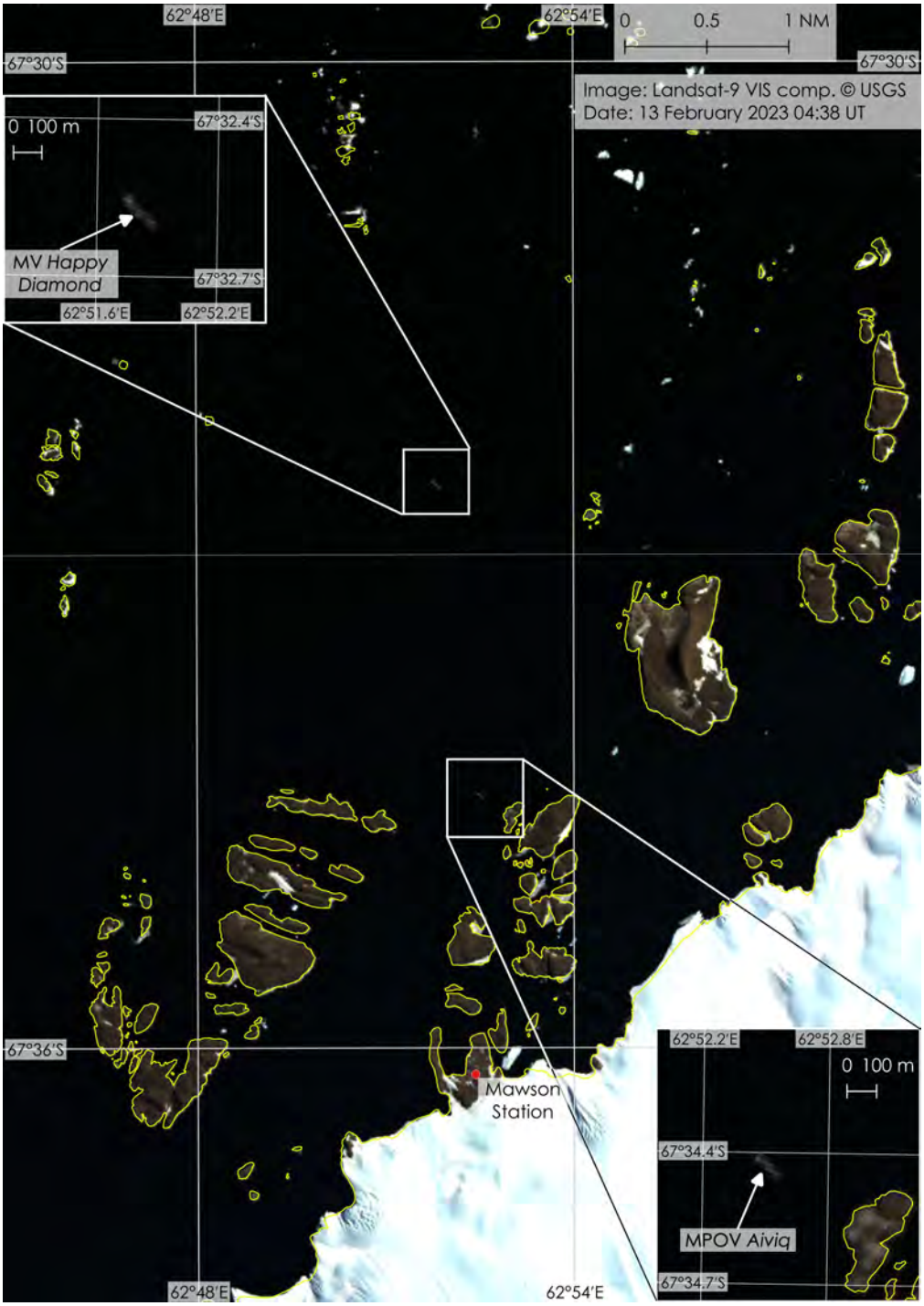


Figure 1: *Landsat-9 visible composite pan-sharpened data acquired 13 February 2023 at 04:38 UT and provided by USGS.*

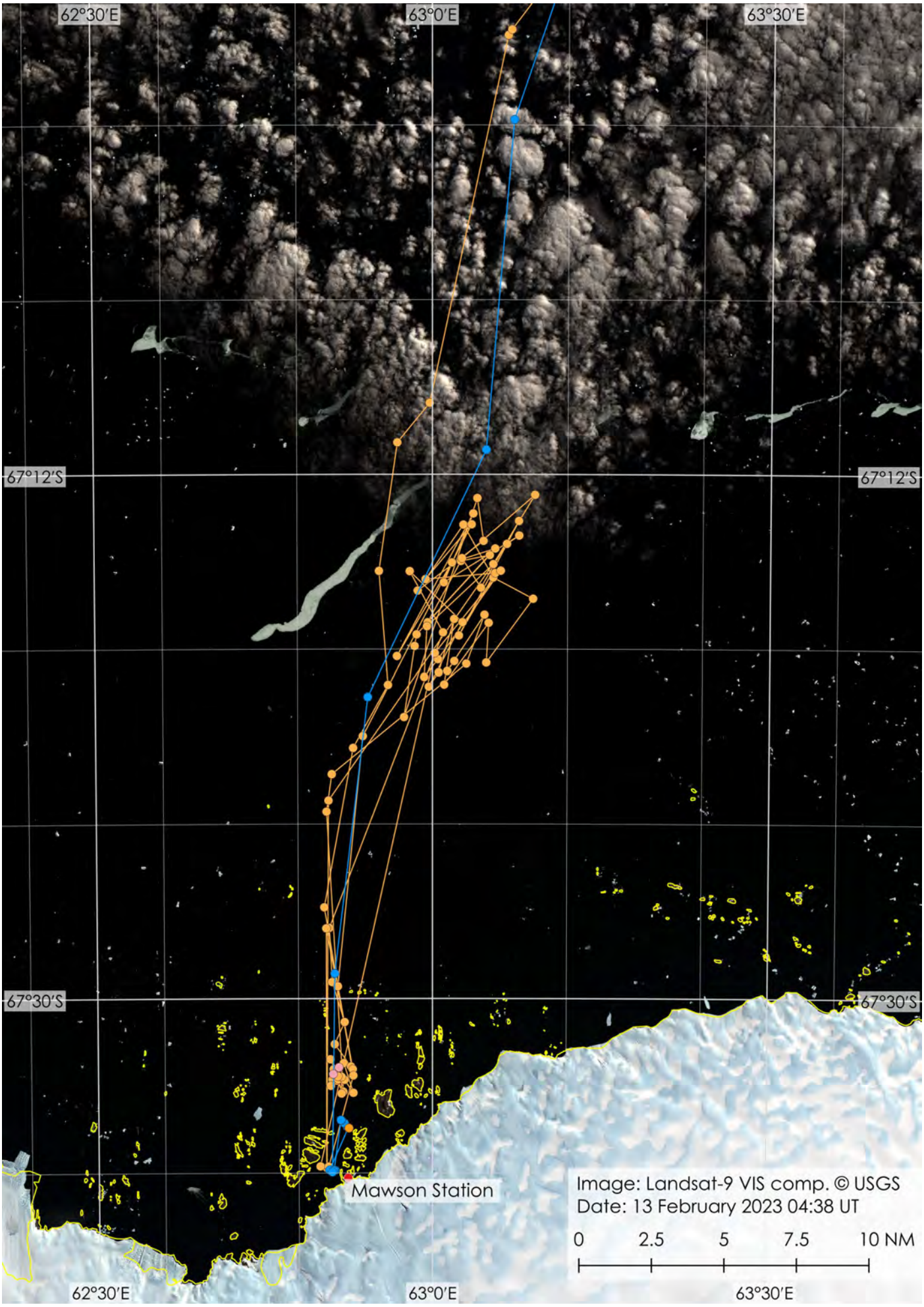


Figure 2: *Landsat-9 visible composite pan-sharpened data acquired 13 February 2023 at 04:38 UT and provided by USGS.*

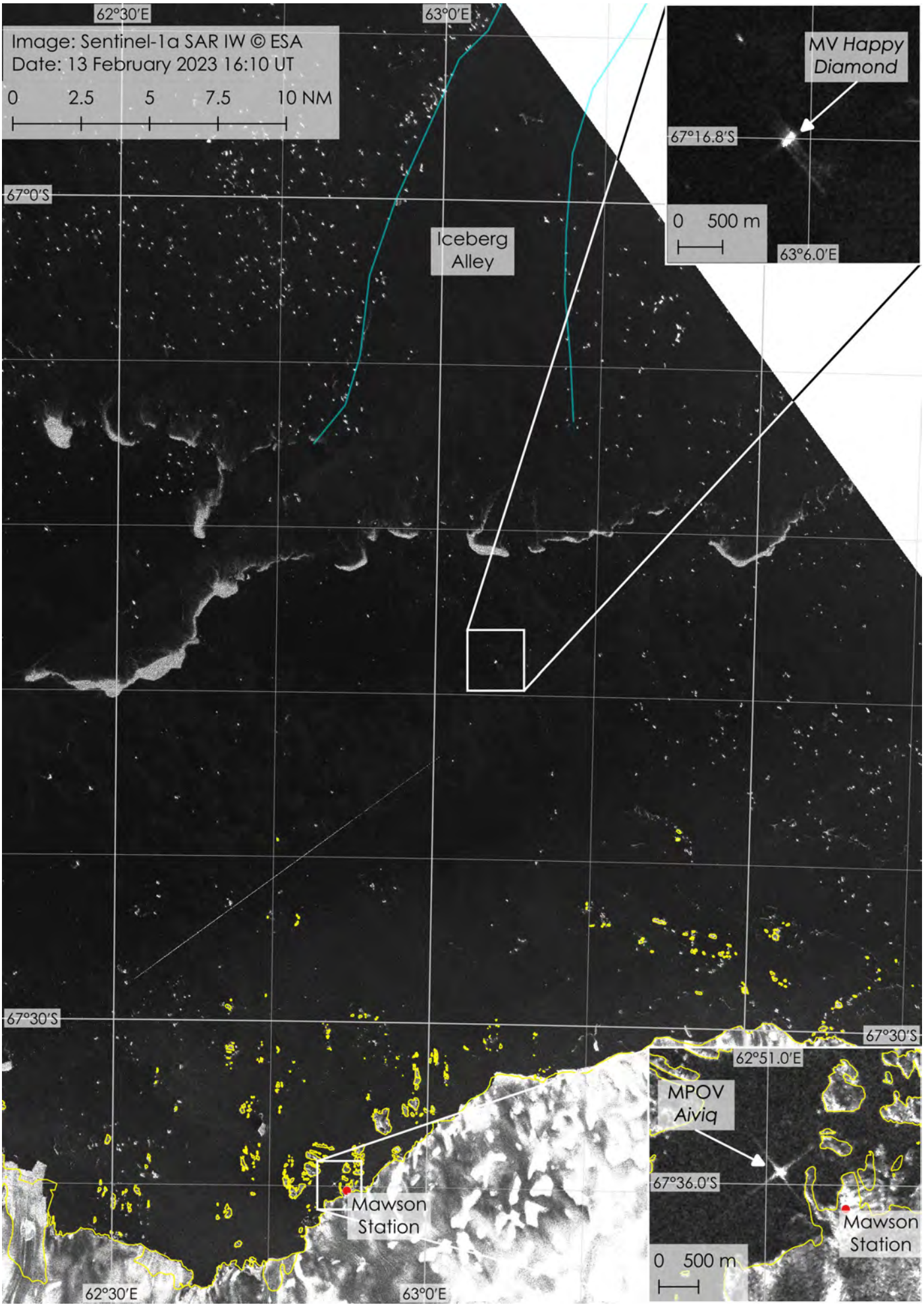


Figure 3: *Sentinel-1a SAR IW data acquired 13 February 2023 at 16:10 UT and provided by PolarView.*

Ice Bulletin: Mawson Station

Issued: Wednesday 15th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data off Mawson Station. The inset shows the position of MPOV *Aiviq* at the time of data acquisition.

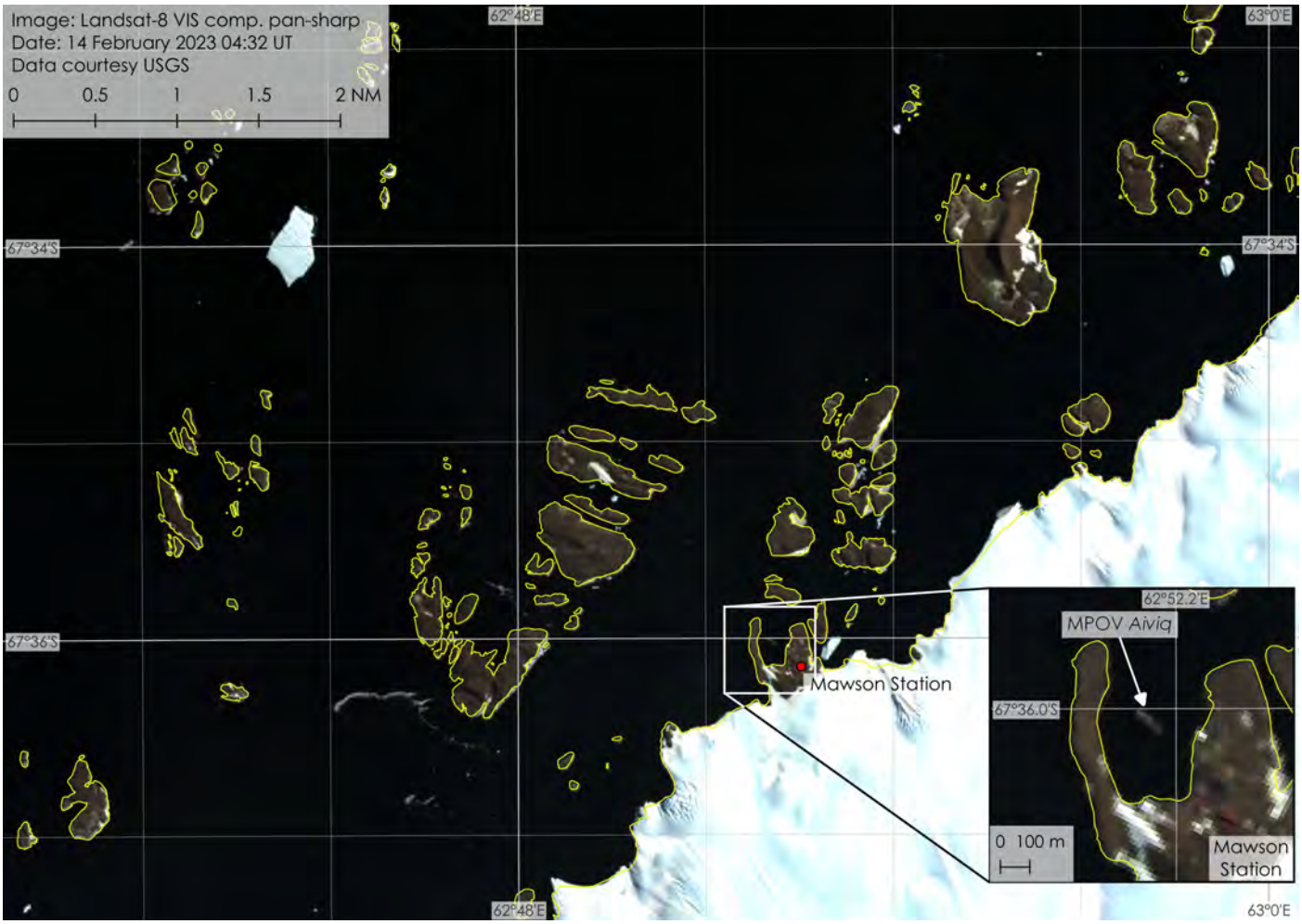


Figure 1: *Landsat-8 visible composite pan-sharpened data acquired 14 February 2023 at 04:32 UT and provided by USGS.*

Minimal sea ice remains in the vicinity of the station and the islands offshore. Some icebergs are in between the islands as well.

Further north, decaying ex-fast ice keeps drifting westward south of Iceberg Alley (see Figure 2).

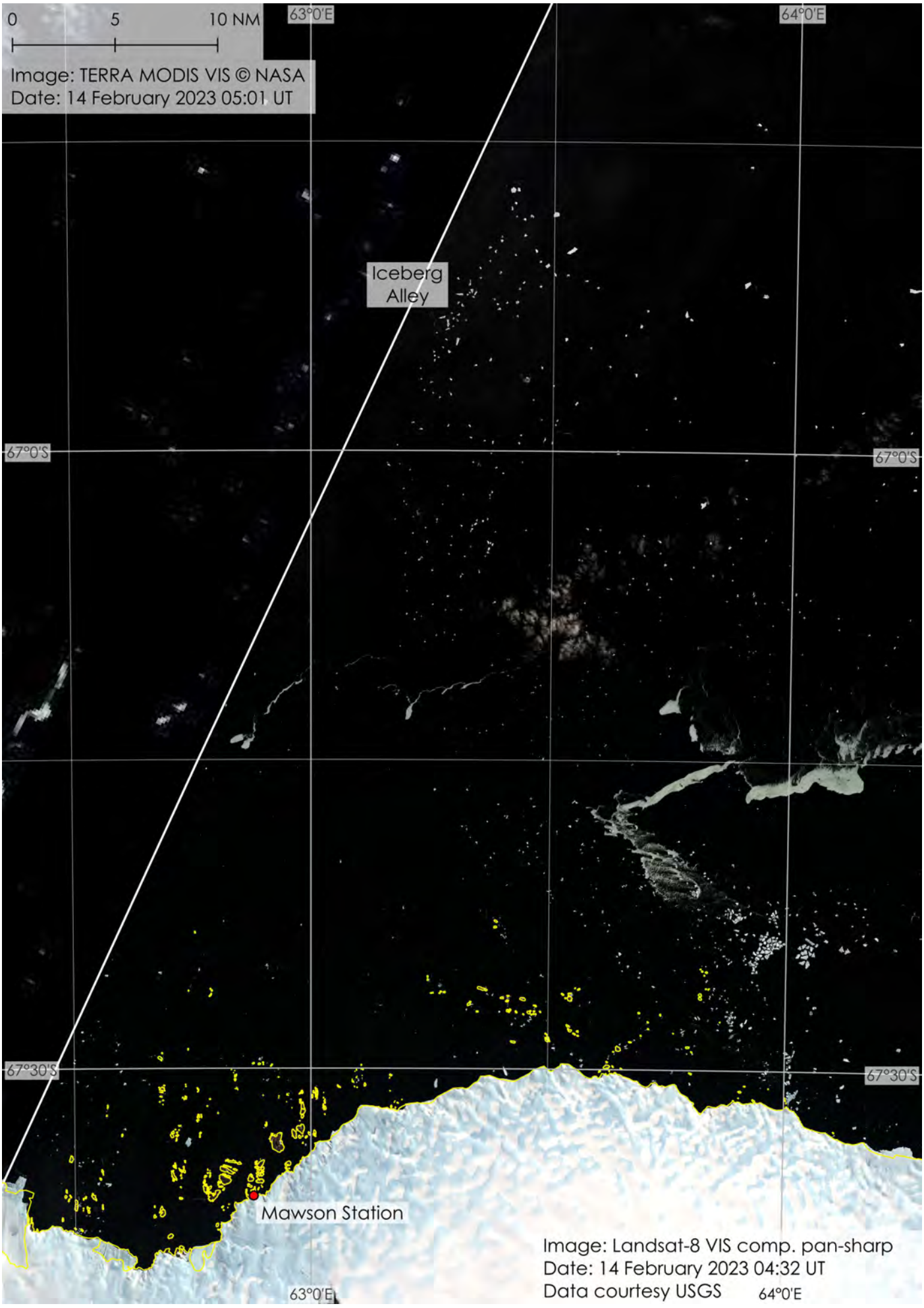


Figure 2: *Landsat-8 visible composite pan-sharpened data acquired 14 February 2023 at 04:32 UT and provided by USGS; complemented by TERRA MODIS VIS data acquired 14 February 2023 at 05:01 UT and provided by NASA.*

Ice Bulletin: Bunger Hills

Issued: Wednesday 15th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data of the Bunger Hills.

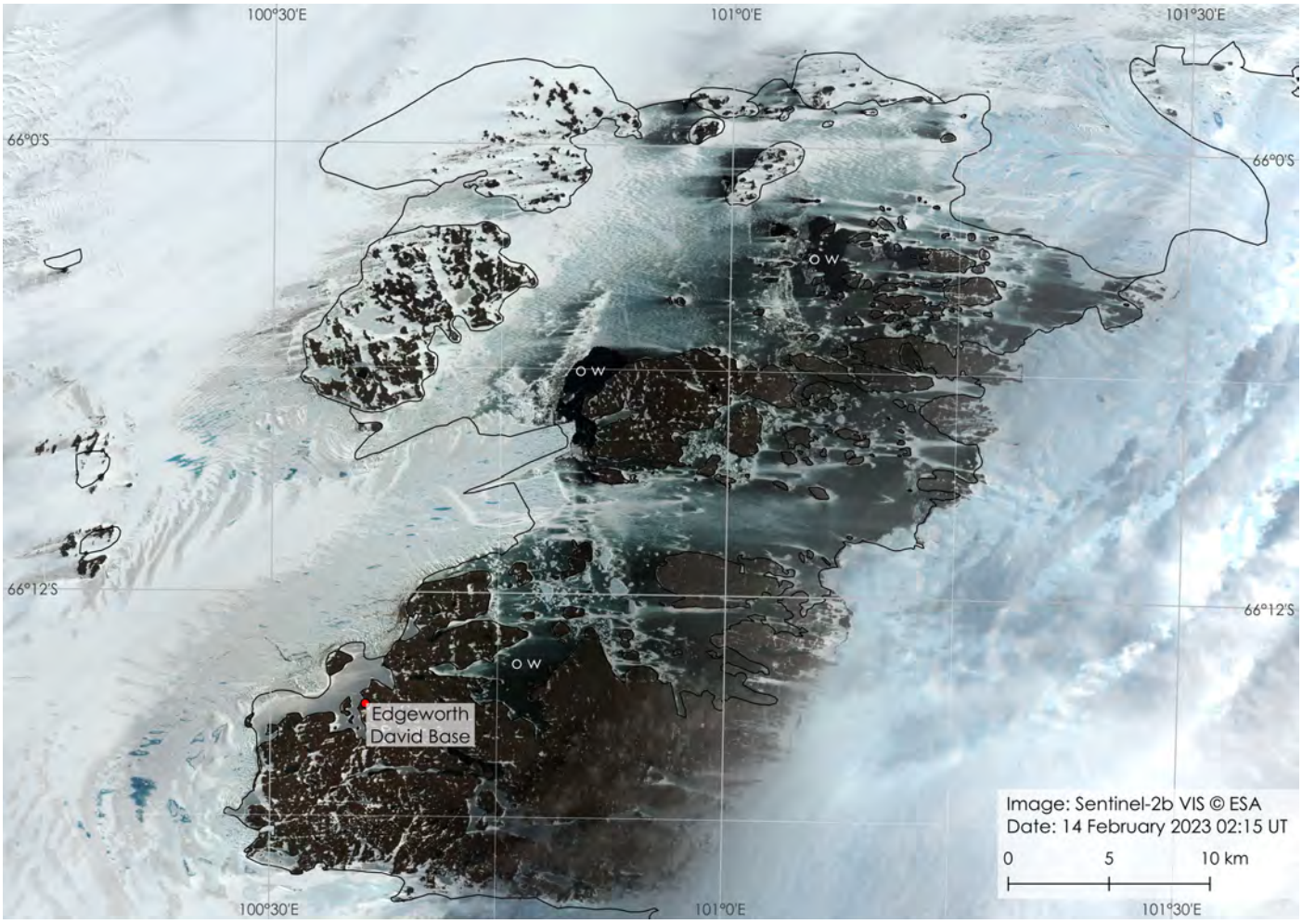


Figure 1: *Sentinel-2b visible composite data acquired 14 February 2023 at 02:15 UT and provided by ESA.*

The eastern part of the Bunger Hills is slightly obscured by clouds.

At the end of summer, some open water patches (marked 'o w') are present in some of the fjords of the hills.

Figure 2 shows a close-up zoom around the Edgeworth David Base.

Some of the smaller fjords are marked as open water and some of the lakes are ice free as well.

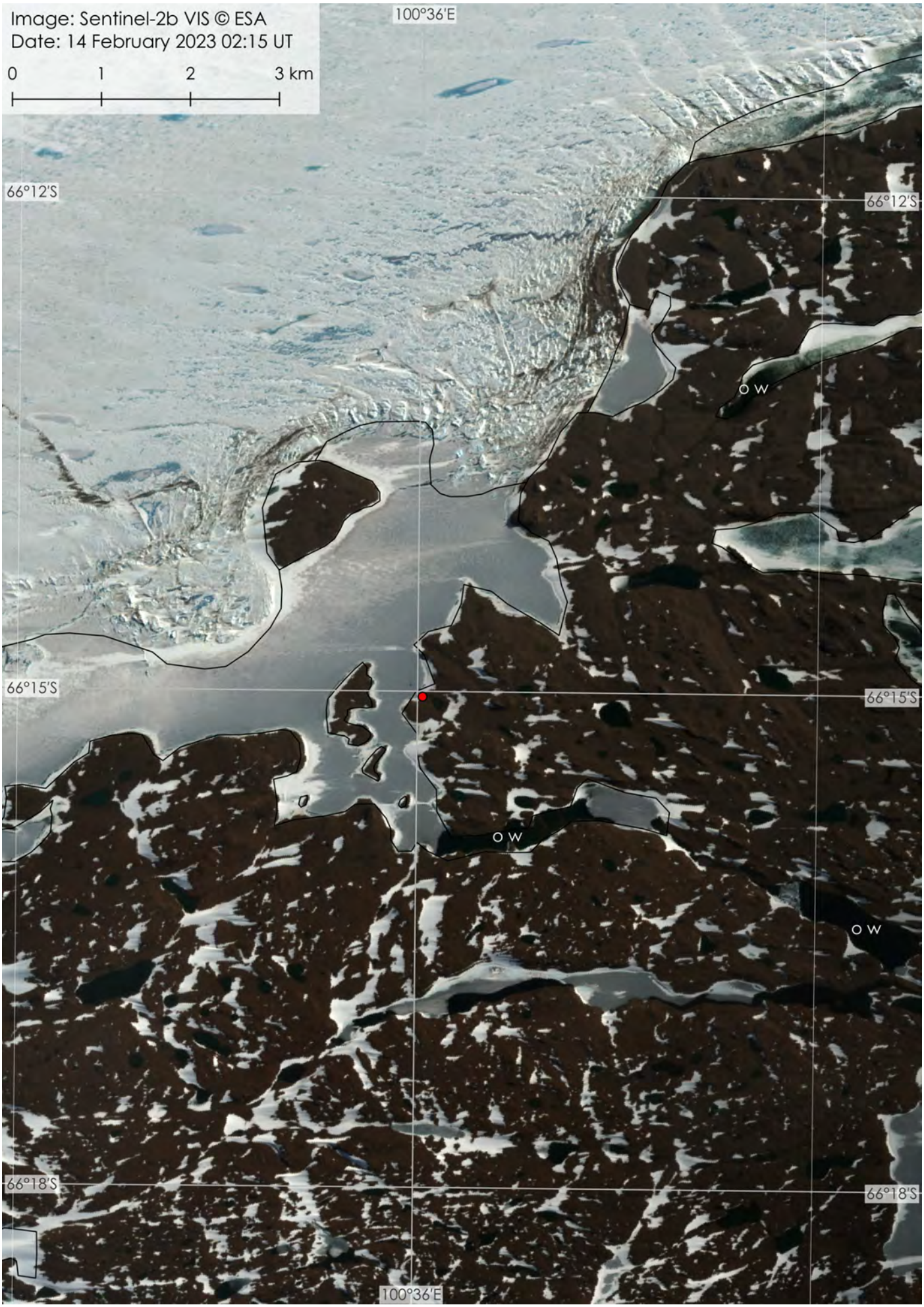


Figure 2: *Sentinel-2b visible composite data acquired 14 February 2023 at 02:15 UT and provided by ESA.*

Ice Bulletin: Casey Station

Issued: Thursday 16th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) SAR data of Casey Station and surrounds.

After the final collapse of any fast ice northwest of Law Dome on 3 February 2023, a melange of ex-fast ice and newly forming sea ice is now drifting north of Casey Station.

Only in the sheltered bay east of Browning Peninsula, some fast ice appears to have survived the summer.

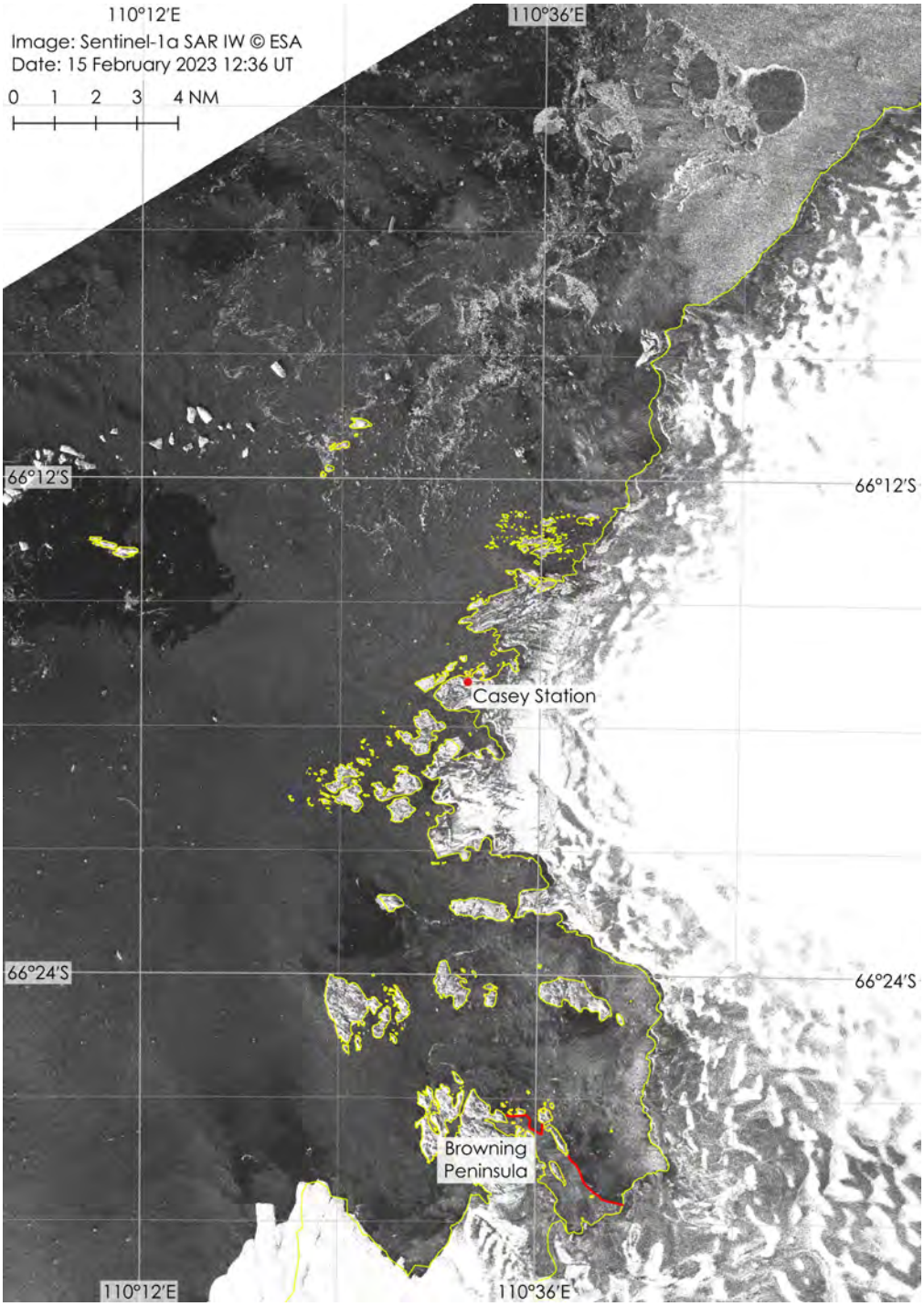


Figure 1: *Sentinel-1a SAR IW data acquired 15 February 2023 at 12:36 UT and provided by PolarView.*

Ice Bulletin: Cape Darnley

Issued: Monday 20th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data north of Cape Darnley. The cruise track of MPOV *Aiviq is* given by the blue line (up until 19 February 2023 21:00 UT). A white, diagonal hairline is a stitching artefact where two consecutive scenes join.

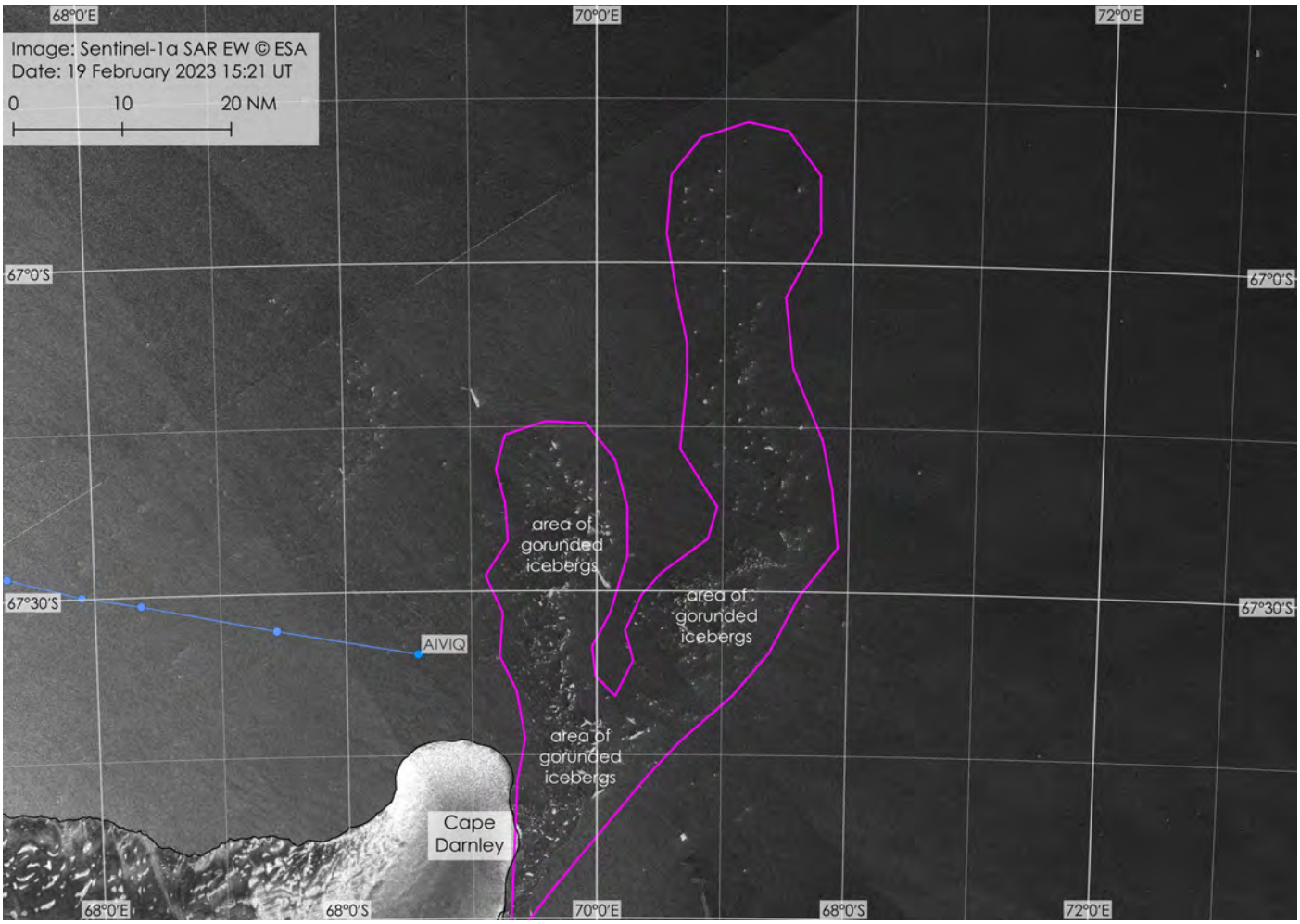


Figure 1: *Sentinel-1a SAR data acquired 19 February 2023 at 15:21 UT and provided by PolarView.*

The pink outline marks an area of mostly grounded icebergs northeast of Cape Darnley. Further afield, freely drifting icebergs are present throughout the region, but minimal sea ice remains.

Ice Bulletin: Wilkins Aerodrome

Issued: Monday 20th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of Wilkins Aerodrome.

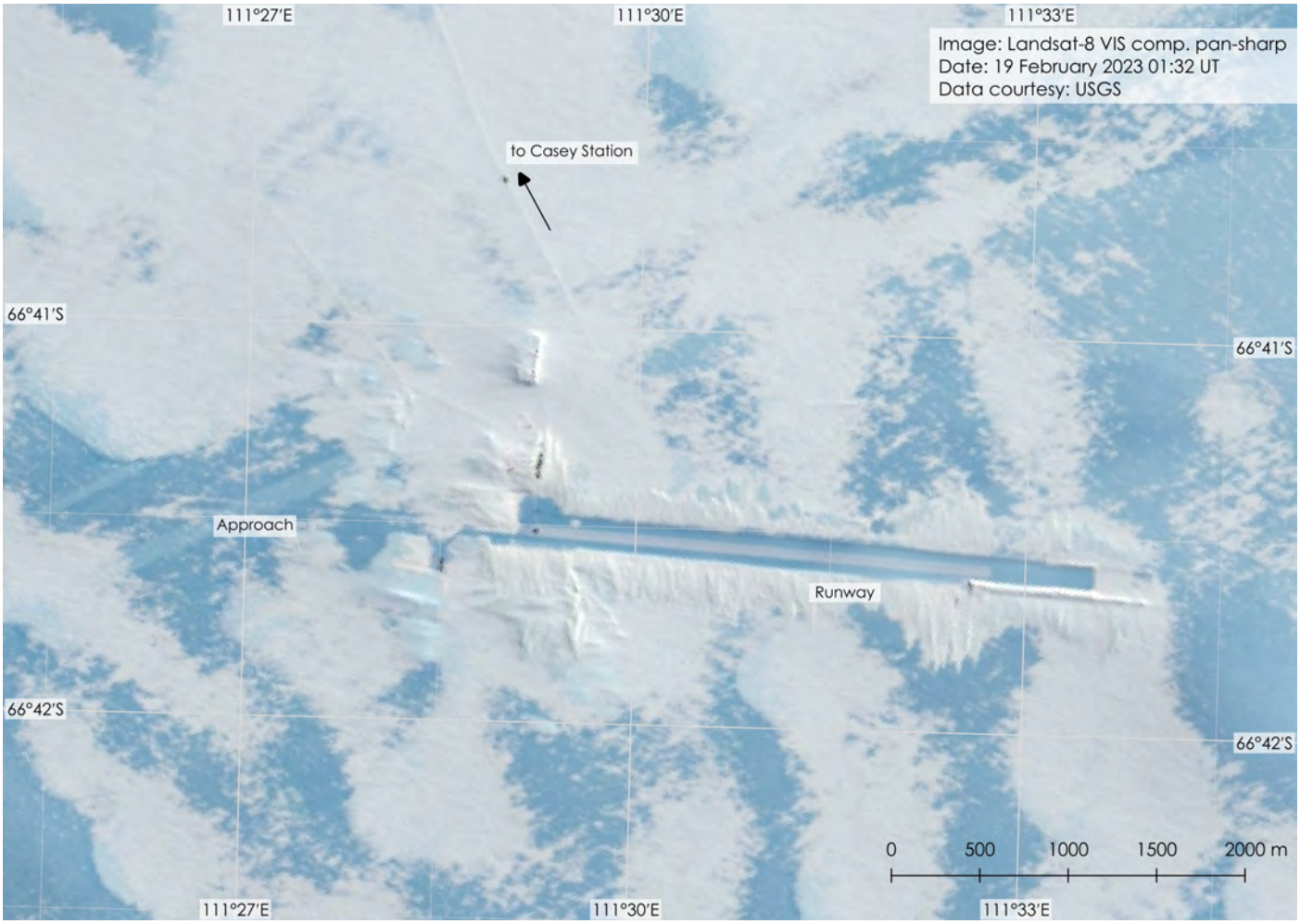


Figure 1: *Landsat-8 visible composite pan-sharpened data acquired 19 February 2023 at 01:32 UT and provided by USGS.*

North and south of the runway, snow dunes are left from previous clearing the runway. At the time of data acquisition, the Australian A-319 aircraft was on the ground.

Snow dunes have also accumulated around the camp and other structures.

Ice Bulletin: Casey Station

Issued: Monday 20th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of Casey Station and surrounds.

Only in the sheltered bay east of Browning Peninsula, some fast ice appears to have survived the summer.

Figure 2 shows a close-up of the region around the Casey Ski Landing Area (YCSK).

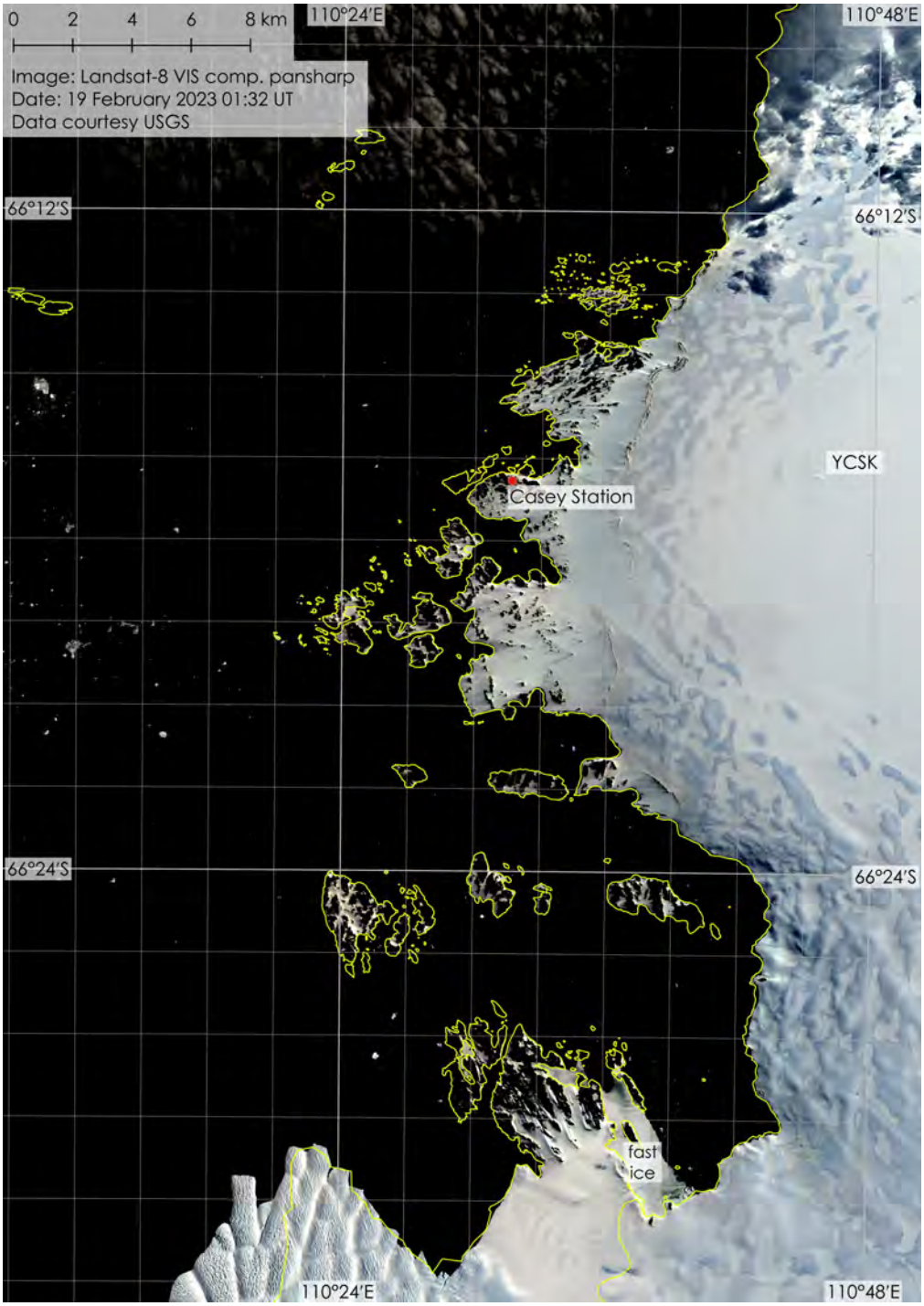


Figure 1: *Landsat-8 VIS composite pan-sharpened data acquired 19 February 2023 at 01:32 UT and provided by USGS.*

Figure 2: *Landsat-8 VIS composite pan-sharpened data acquired 19 February 2023 at 01:32 UT and provided by USGS.*

Ice Bulletin: Davis Station

Issued: Tuesday 21st February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) SAR data off Davis Station. The fast-ice edge is marked by a red line.

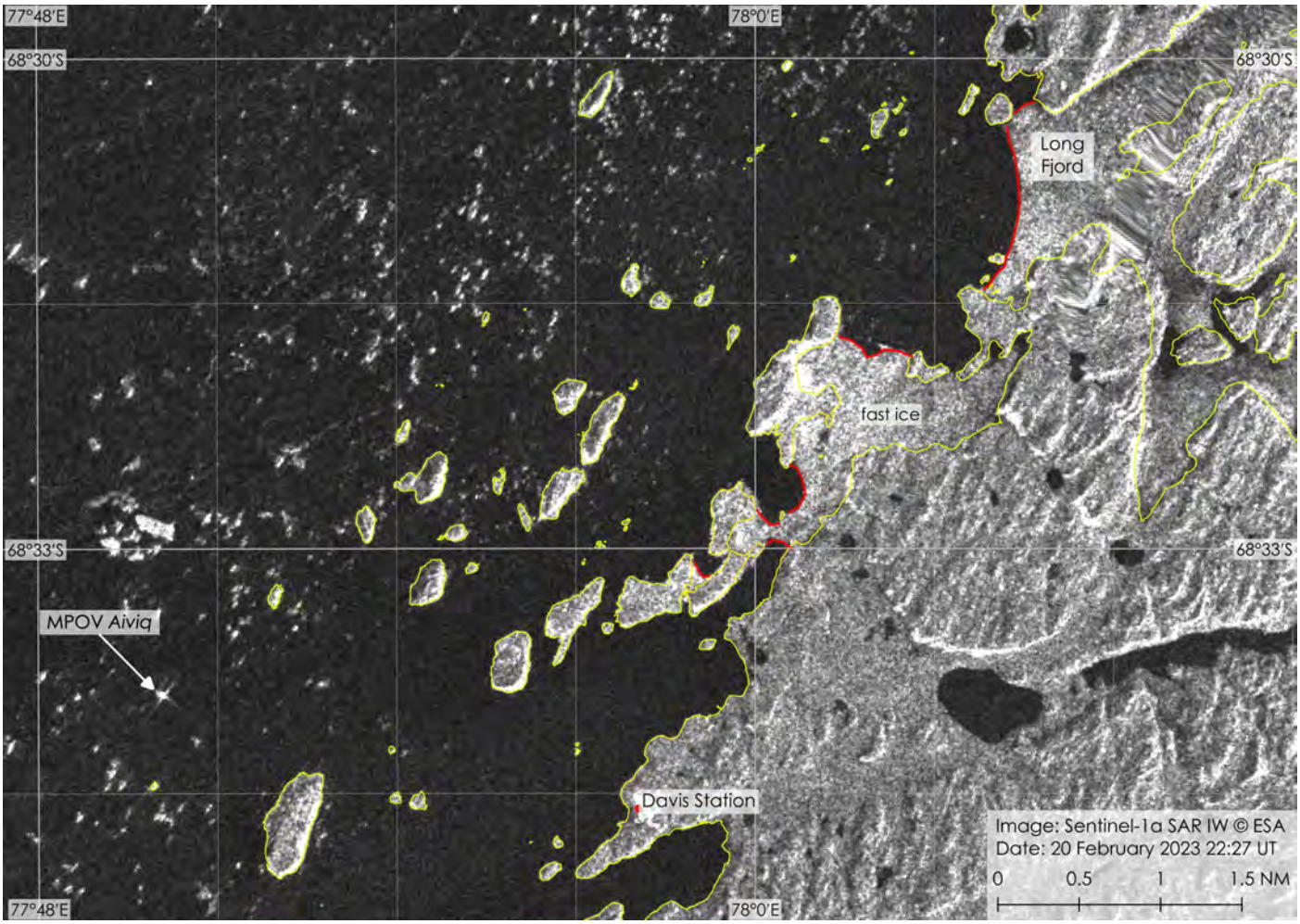


Figure 1: *Sentinel-1a SAR IW data acquired 20 February 2023 at 22:27 UT and provided by PolarView.*

Only minimal fast ice remains in sheltered bays off the hills. Offshore, most of the icebergs are grounded but some are still drifting. The location of MPOV *Aiviq* at the time of data acquisition is shown as a bright star.

Figure 2 shows a larger-scale overview of the entire Vestfold Hills. The recent track of MPOV *Aiviq* is given by the blue line.

Some of the inshore fjords and channels remain partially frozen over.

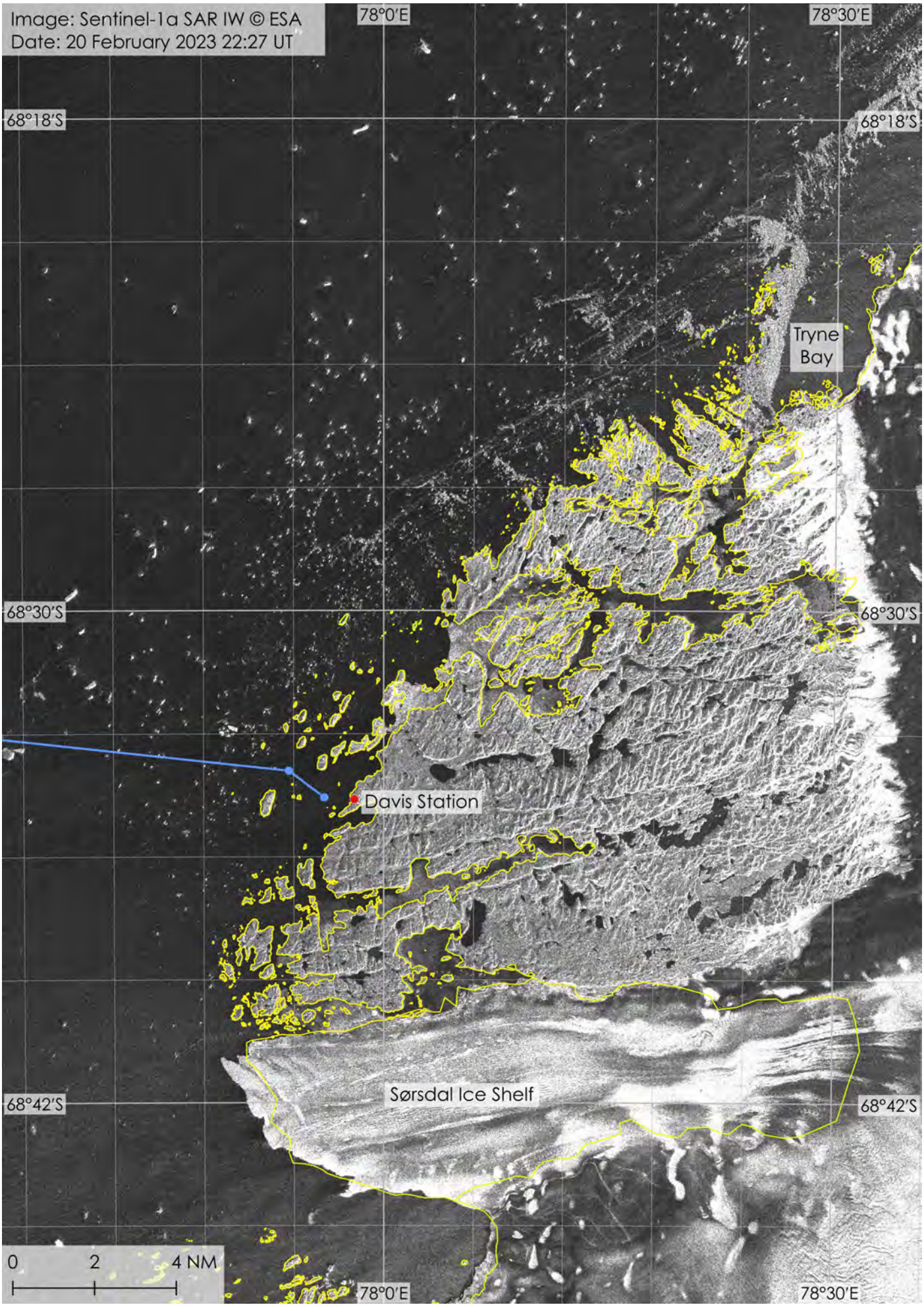


Figure 2: *Sentinel-1a SAR IW data acquired 20 February 2023 at 22:27 UT and provided by PolarView.*

Ice Bulletin: Mawson Station

Issued: Tuesday 21st February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Mawson Station. A diagonal white hairline is a stitching artefact where two consecutive scenes join.

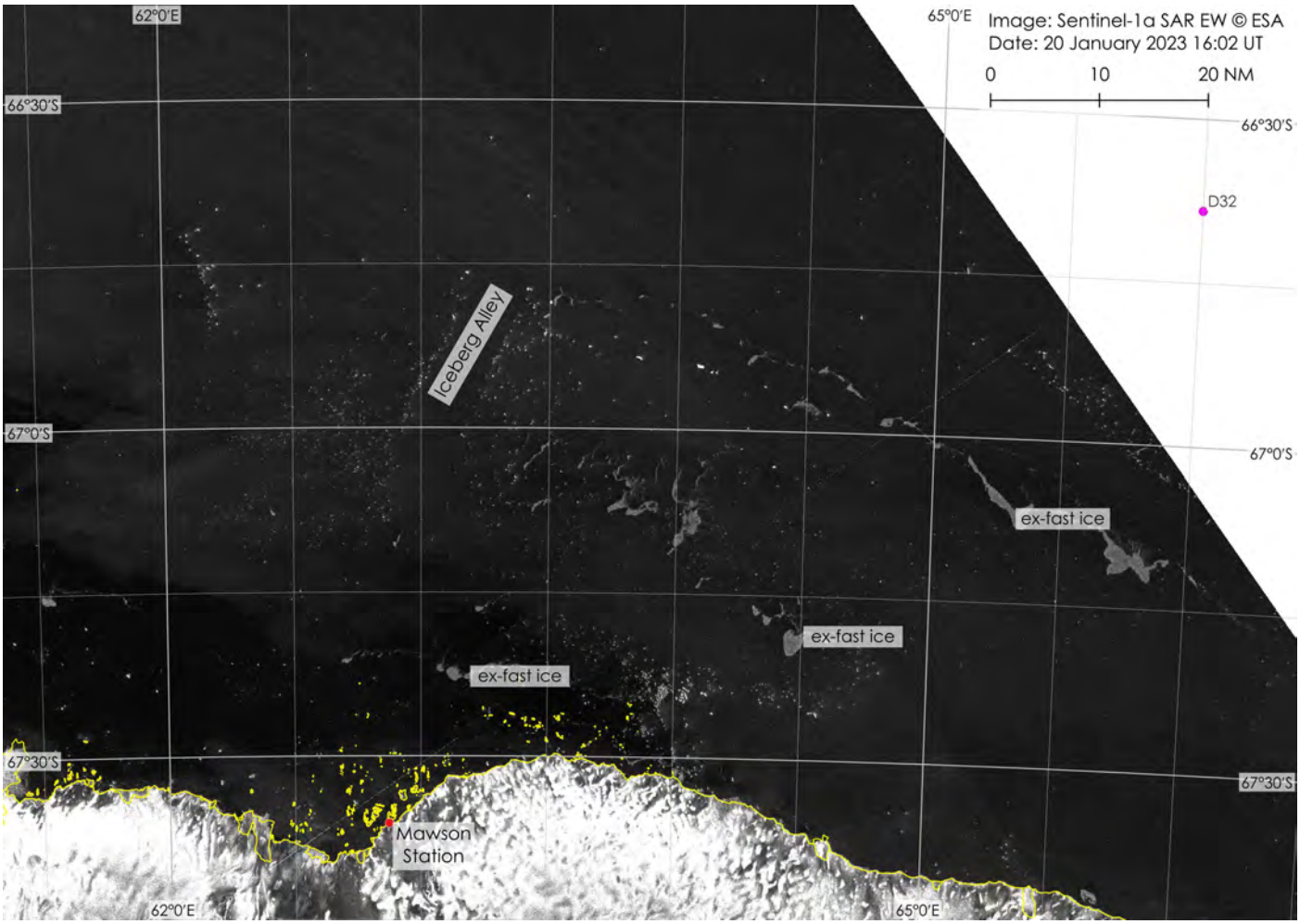


Figure 1: *Sentinel-1a SAR EW data acquired 20 February 2023 at 16:02 UT and provided by PolarView.*

There is no more fast ice nearshore. Some patches of decaying ex-fast ice are drifting westward offshore.

Ice Bulletin: Mawson Station

Issued: Tuesday 21st February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data off Mawson Station.

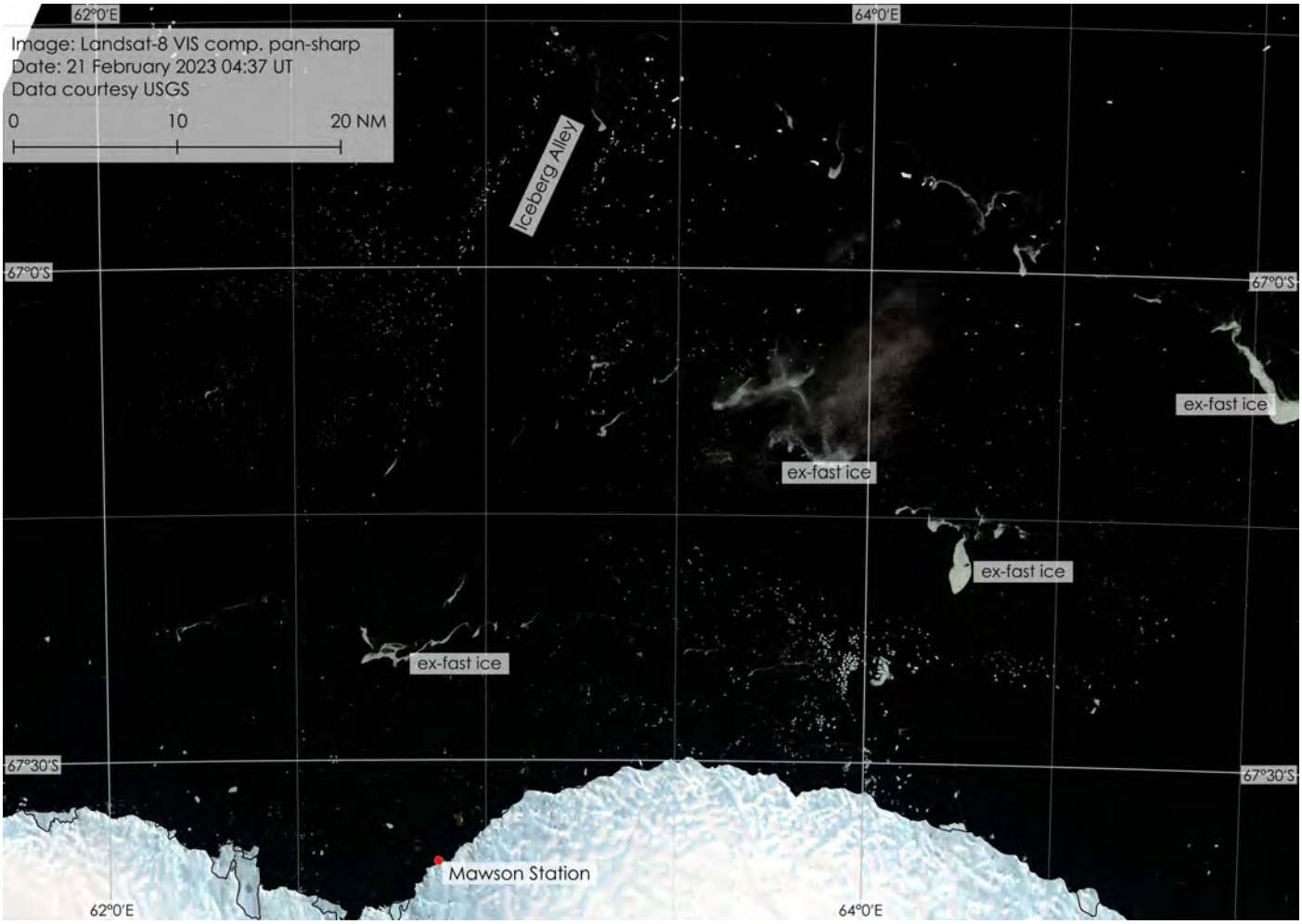


Figure 1: *Landsat-8 visible composite pan-sharpened data acquired 21 February 2023 at 04:37 UT and provided by USGS.*

There is no more fast ice nearshore. Some patches of decaying ex-fast ice are drifting westward offshore.

Figure 2 shows a close-up around the station. Between the northern offshore islands, some icebergs are present.

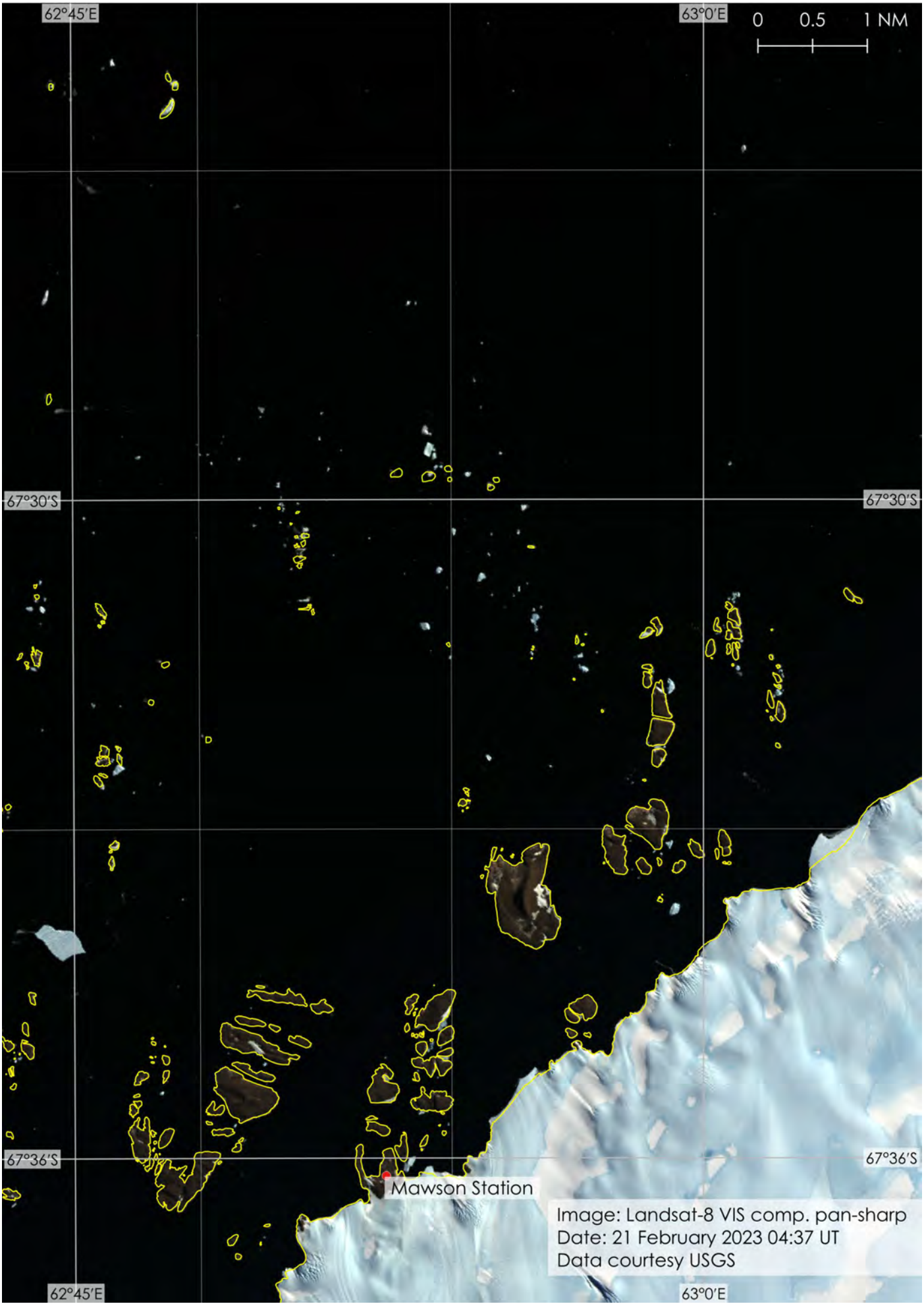


Figure 2: *Landsat-8 visible composite pan-sharpened data acquired 21 February 2023 at 04:37 UT and provided by USGS.*

Ice Bulletin: Davis Station

Issued: Wednesday 22nd February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data of Davis Station. The location of MPOV *Aiviq* at the time of data acquisition is marked by a white arrow.

Figure 1: *Sentinel-2b VIS composite data acquired 21 February 2023 at 03:46 UT and provided by ESA.*

Figure 2 shows a larger-scale overview of the entire Vestfold Hills. The recent track of MPOV *Aiviq* is given by the blue line. The fast-ice edge is marked by a red line.

Only minimal fast ice remains in sheltered bays off the hills. Offshore, most of the icebergs are grounded but some are still drifting. Some of the inshore fjords and channels remain partially frozen over.

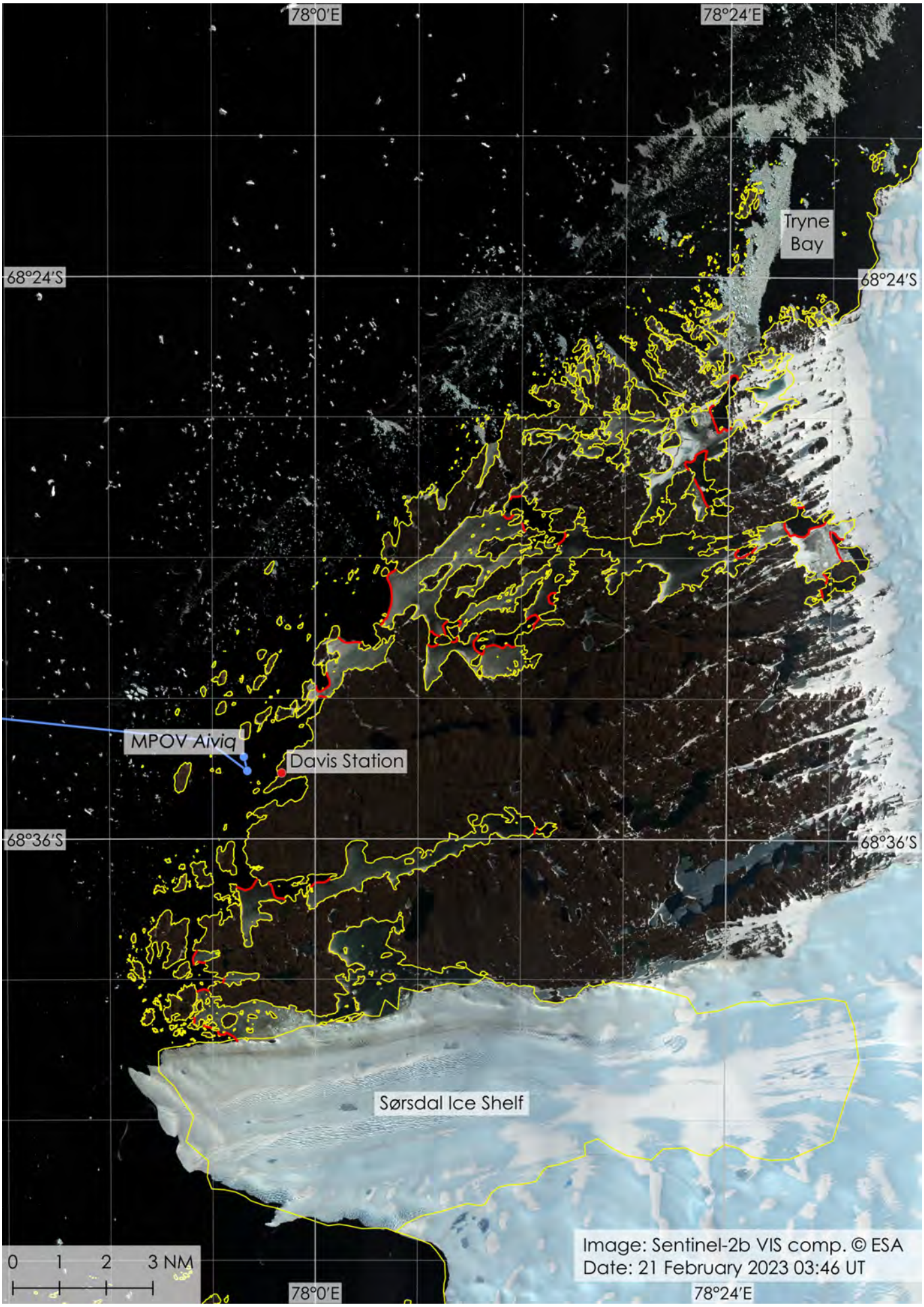


Figure 2: *Sentinel-2b VIS composite data acquired 21 February 2023 at 03:46 UT and provided by ESA.*

Ice Bulletin: Wilkins Aerodrome

Issued: Monday 27th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of Wilkins Aerodrome.

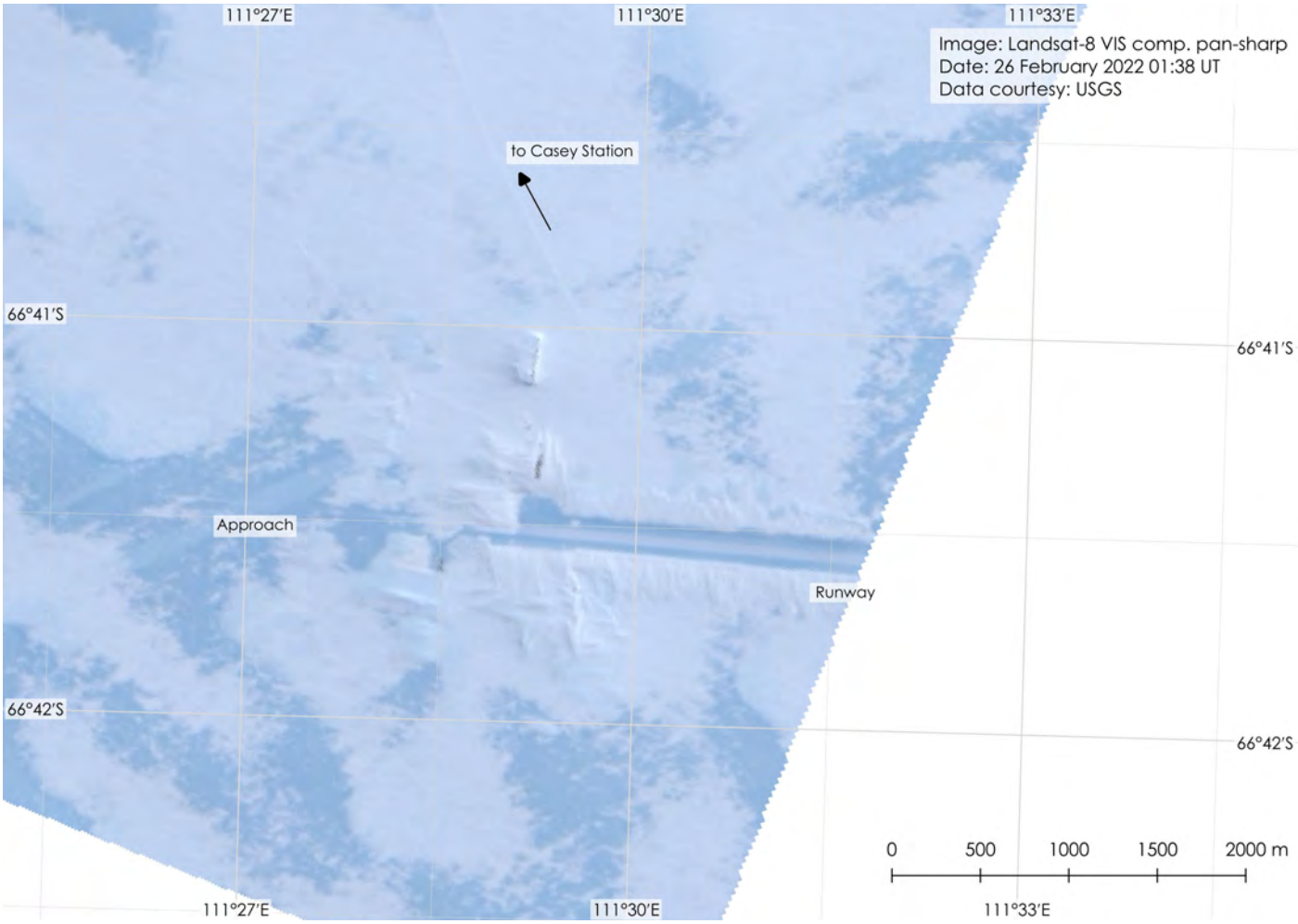


Figure 1: *Landsat-8 visible composite pan-sharpened data acquired 26 February 2023 at 01:38 UT and provided by USGS.*

North and south of the runway, snow dunes are left from previous clearing the runway. Snow dunes have also accumulated around the camp and other structures.

Ice Bulletin: Casey Station

Issued: Monday 27th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of Casey Station and surrounds.

Ex-fast ice is drifting southward along the north-western flank of Law Dome and is mixing with newly forming sea ice.

Only minimal fast ice remains in sheltered bays northeast of Browning Peninsula northeast of the Vanderford Ice Shelf.

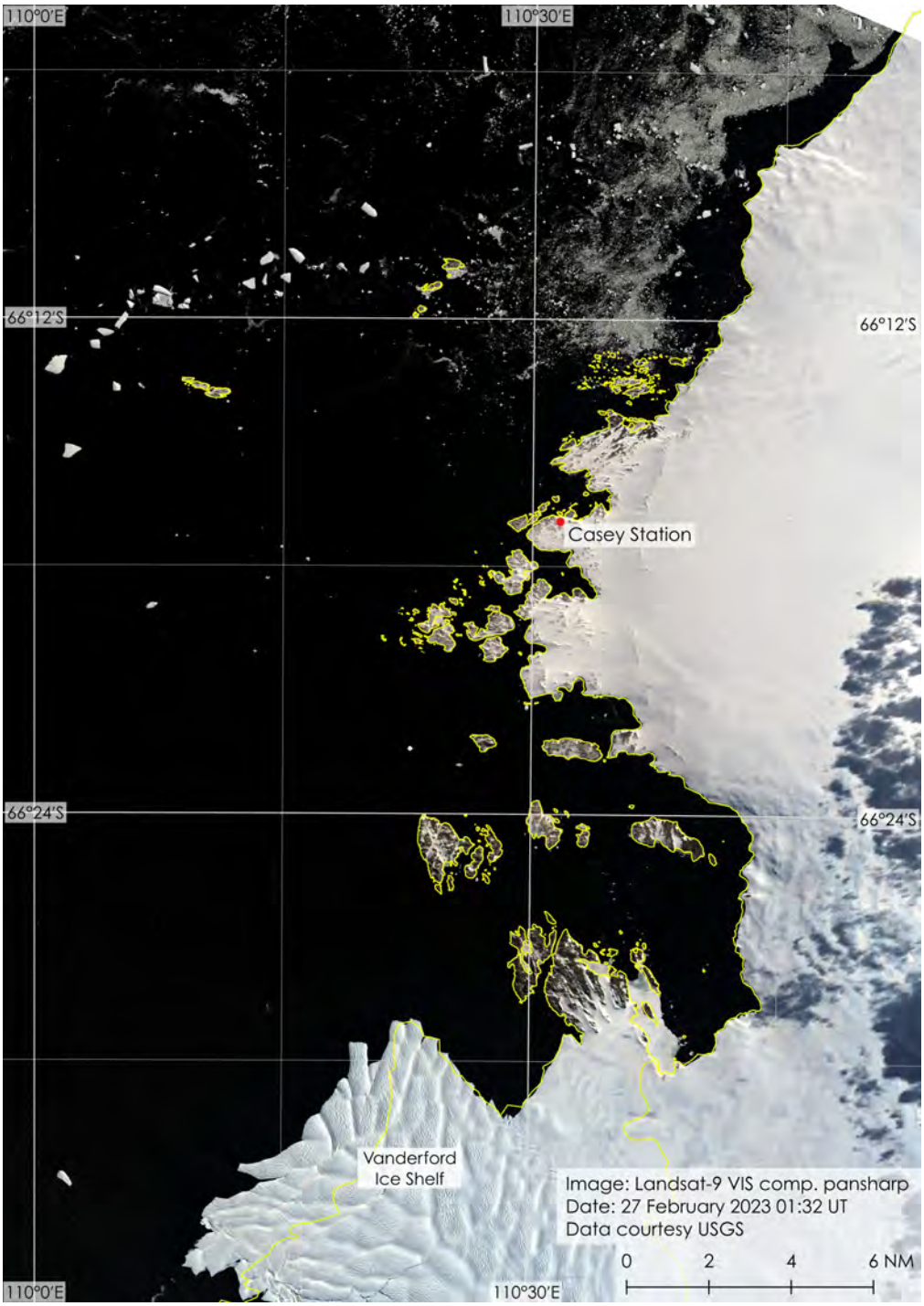


Figure 1: *Landsat-9 visible composite pan-sharpened data acquired 27 February 2023 at 01:32 UT and provided by USGS.*

Ice Bulletin: Wilkins Aerodrome

Issued: Monday 27th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of Wilkins Aerodrome.

Figure 1: *Landsat-9 visible composite pan-sharpened data acquired 27 February 2023 at 01:32 UT and provided by USGS.*

North and south of the runway, snow dunes are left from previous clearing the runway. Snow dunes have also accumulated around the camp and other structures.

Ice Bulletin: Mill Island

Issued: Tuesday 28th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data around Mill Island. The fast-ice edge on 9 February 2023 is indicated by a dashed red line.

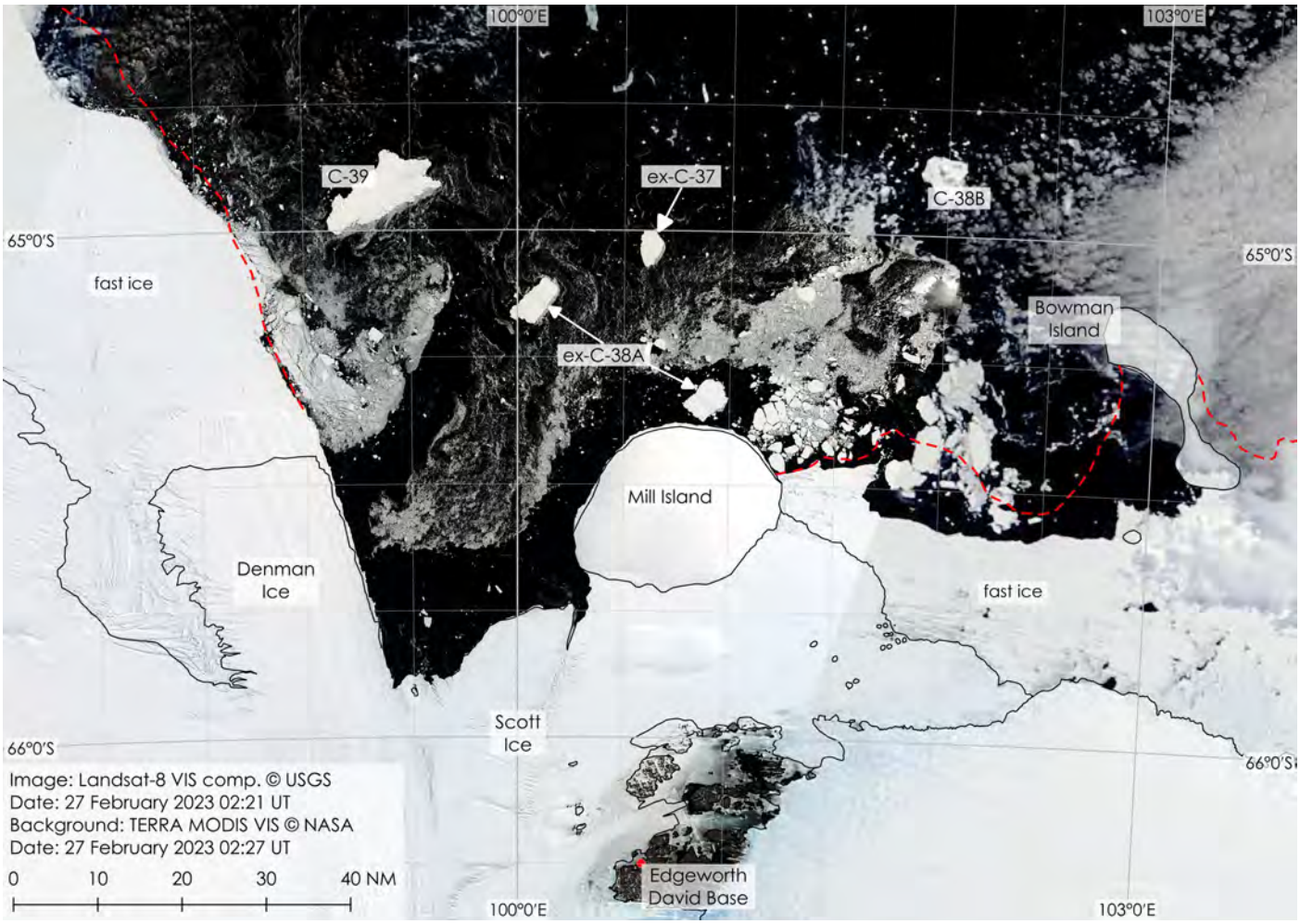


Figure 1: *Landsat-8 visible composite pan-sharpened data acquired 27 February 2023 at 02:21 and provided by USGS; background of TERRA MODIS VIS data acquired 27 February 2023 at 02:27 UT and provided by NASA.*

Icebergs C-37 and C-38A are not satisfying the criteria for large icebergs that are tracked specifically anymore however, they are still clearly discernible.

Between Mill Island and Bowman Island, the fast ice has continued breaking up during February. A melange of pack ice and ex-fast ice is now present north of the fast-ice edge where also new sea ice is starting to form.

Figure 2 shows a close-up view of the Bunger Hills. Areas of open water in between the hills are marked with 'OW'.

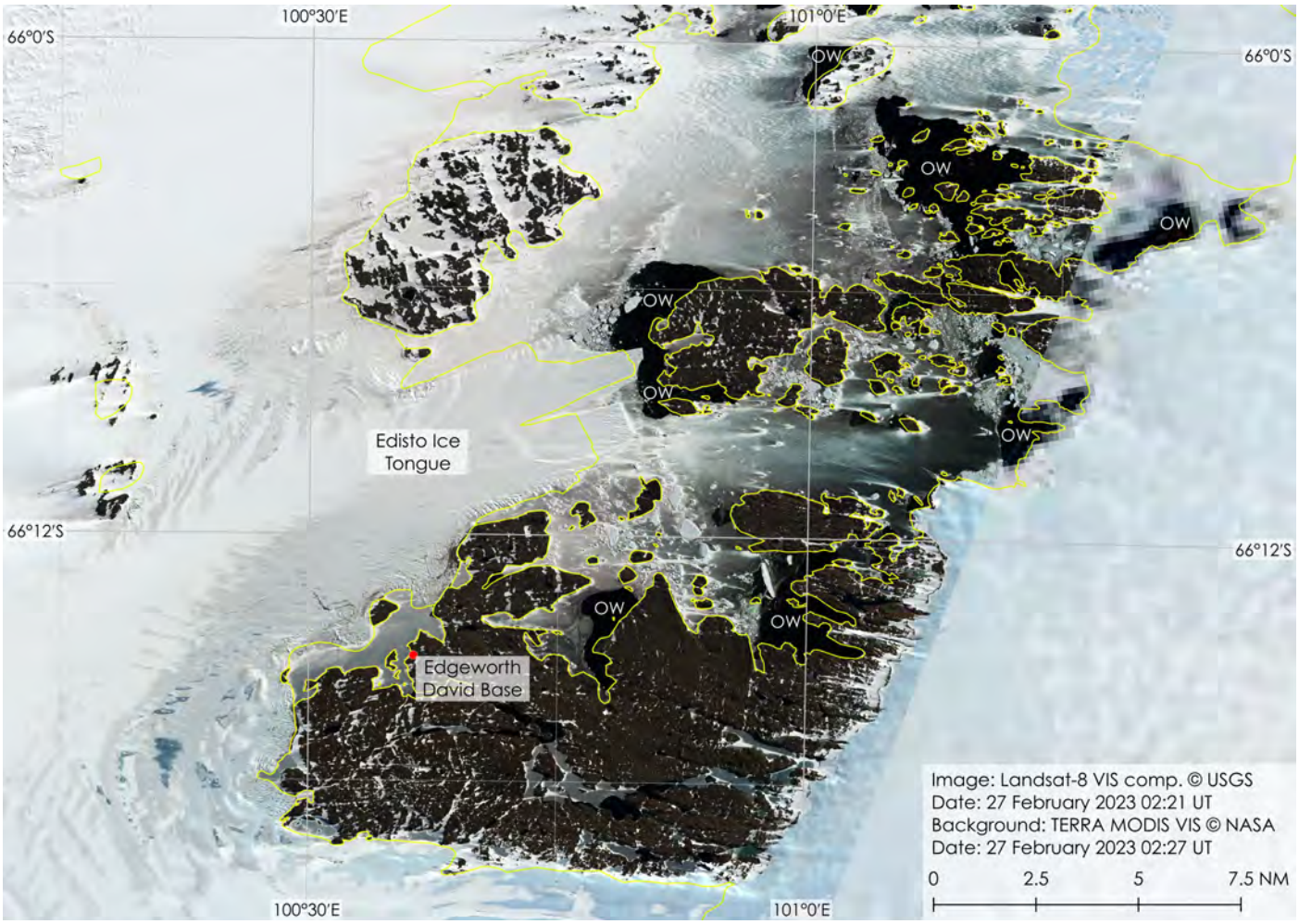


Figure 2: *Landsat-8 visible composite pan-sharpened data acquired 27 February 2023 at 02:21 and provided by USGS; background of TERRA MODIS VIS data acquired 27 February 2023 at 02:27 UT and provided by NASA.*

Ice Bulletin: Wilkins Aerodrome

Issued: Tuesday 28th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of Wilkins Aerodrome.

Figure 1: *Landsat-8 visible composite pan-sharpened data acquired 28 February 2023 at 01:26 UT and provided by USGS.*

North and south of the runway, snow dunes are left from previous clearing the runway. Snow dunes have also accumulated around the camp and other structures.

Ice Bulletin: Casey Station

Issued: Tuesday 28th February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data of Casey Station.

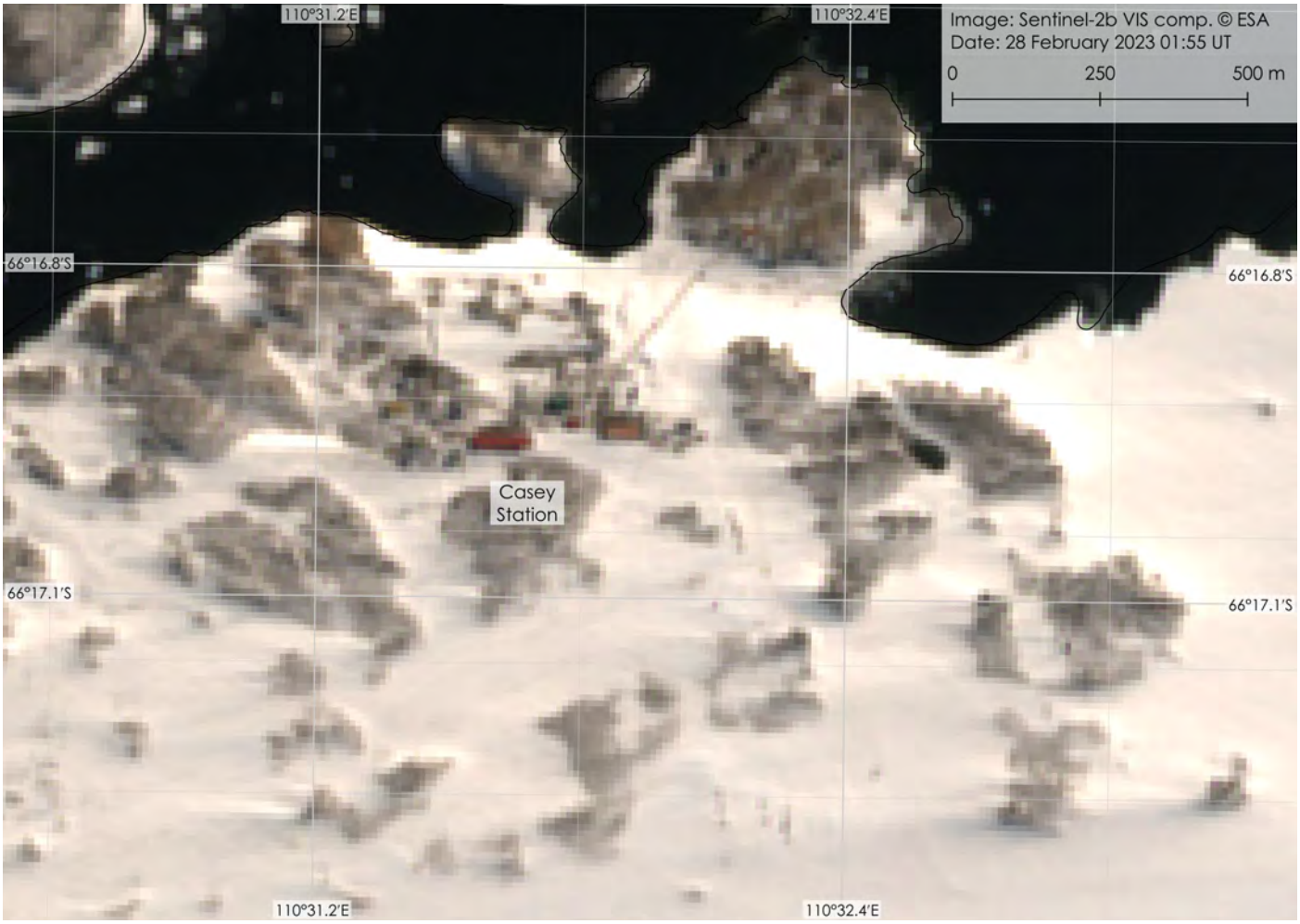


Figure 1: *Sentinel-2b visible composite data acquired 28 February 2023 at 01:55 UT and provided by ESA.*

Individual buildings of the station can be seen clearly in the figure.

Figure 2 provides a view of the Casey Skiway (YCSK) and surrounds. The staging area of the Million Year Ice Core (MYIC) traverse is also marked. A vehicle can be seen heading towards Wilkins Aerodrome.

Figure 3 shows the Wilkins Aerodrome.

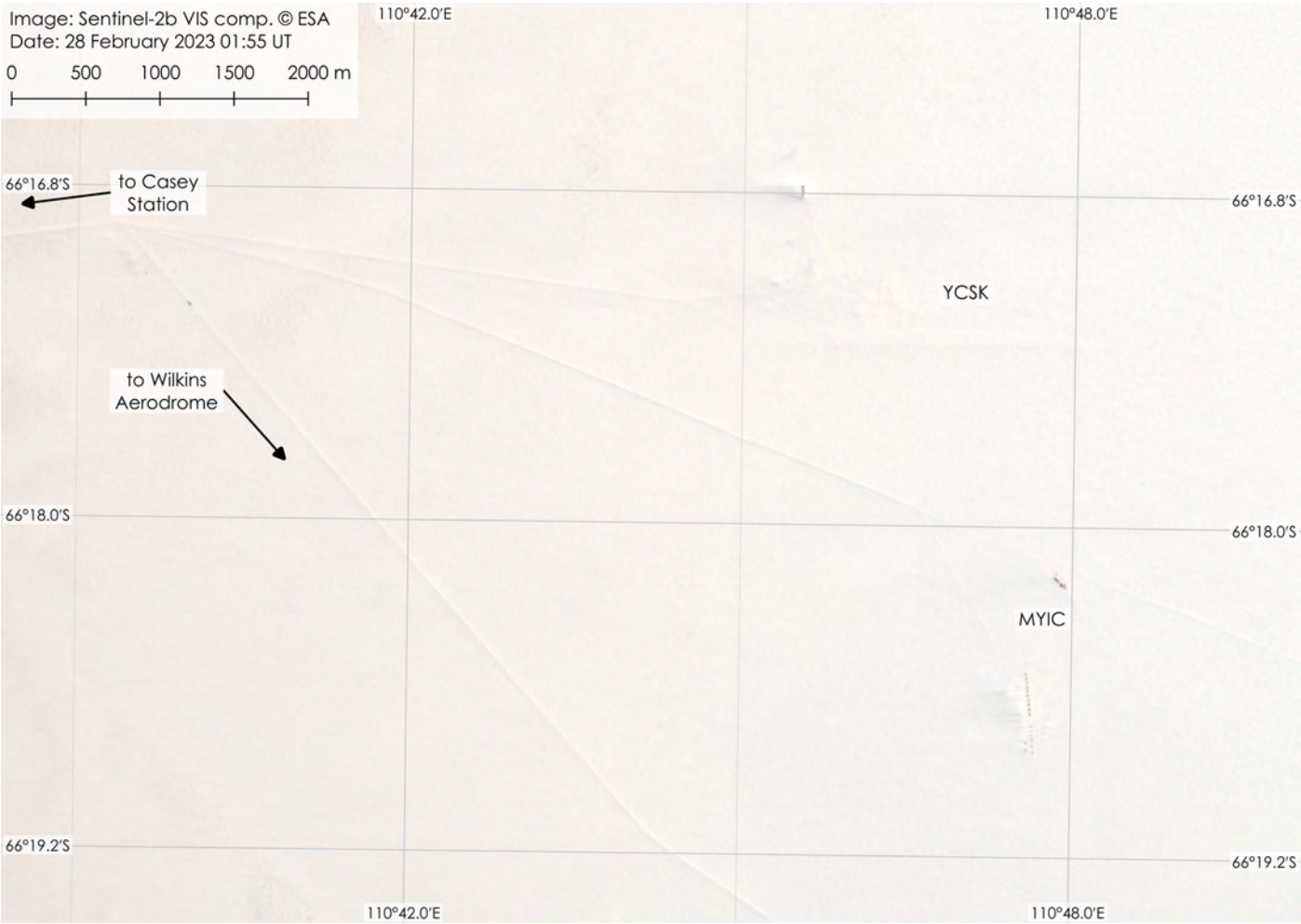


Figure 2: *Sentinel-2b visible composite data acquired 28 February 2023 at 01:55 UT and provided by ESA.*

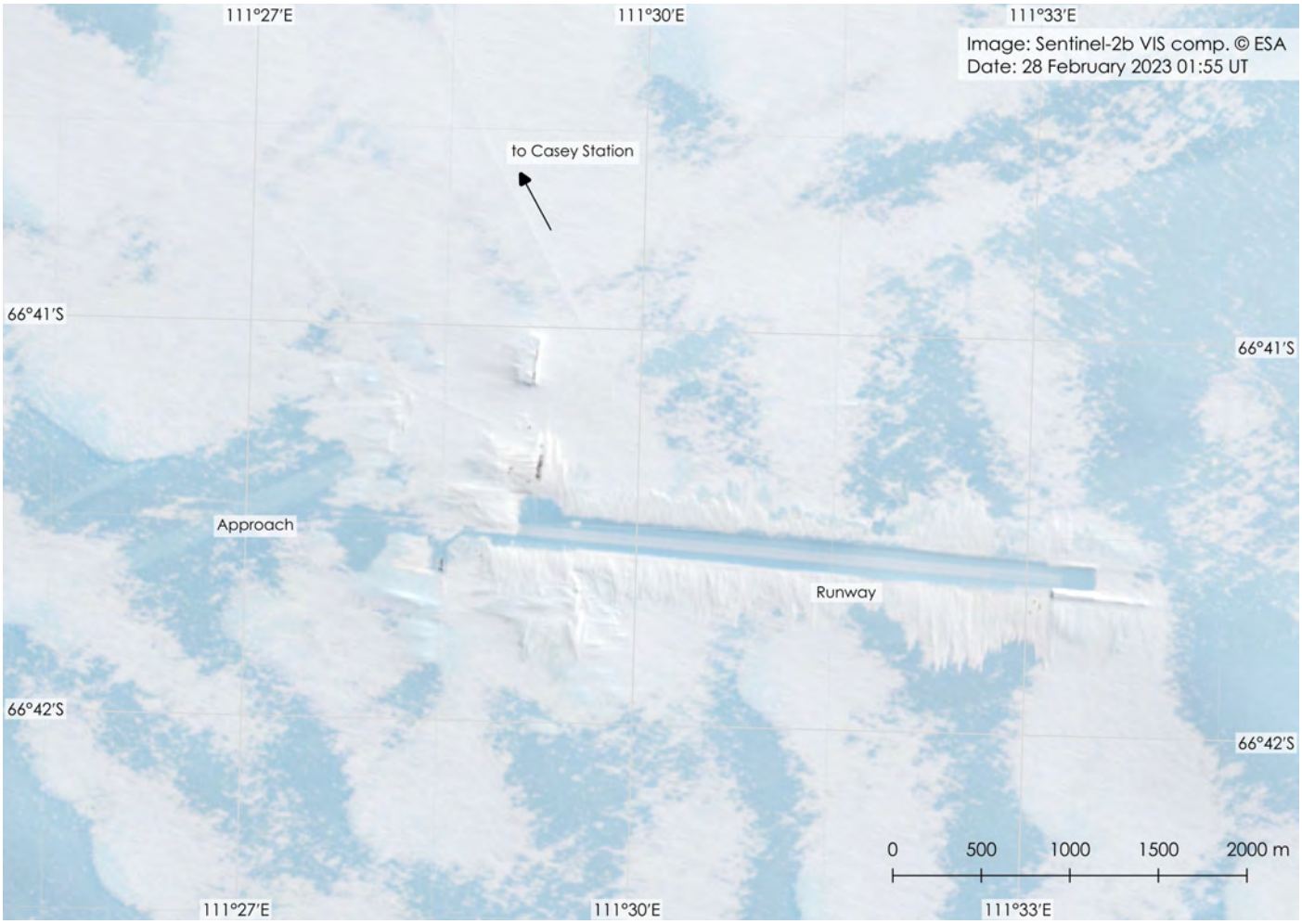


Figure 3: *Sentinel-2b visible composite data acquired 28 February 2023 at 01:55 UT and provided by ESA.*

Ice Bulletin: Mill Island

Issued: Wednesday 1st March 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows a composite of SAR and high-resolution (15 m horizontal) panchromatic data around Mill Island. The fast-ice edge is marked by a red line (a dashed red line for 27 February 2023).

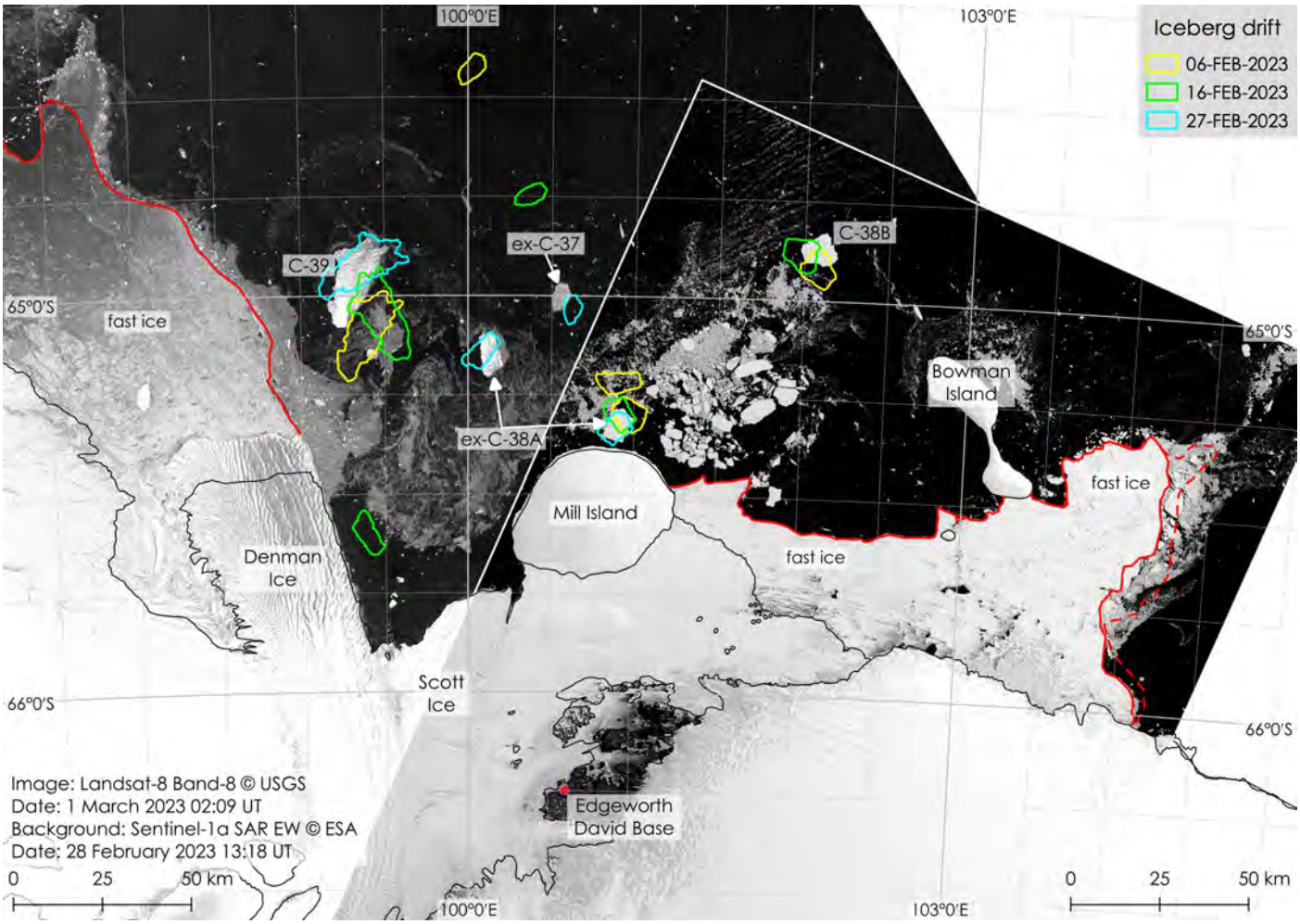


Figure 1: *Landsat-8 Band-8 (panchromatic) data acquired 1 March 2023 at 02:09 and provided by USGS; background of Sentinel-1 SAR EW data acquired 28 February 2023 at 13:18 UT and provided by PolarView.*

West of Mill Island, new sea ice is forming and circulating in the bay. East of Bowman Island, fast ice continues breaking up. A melange of pack ice and ex-fast ice is present north of the fast-ice edge where also new sea ice is forming.

While icebergs C-37 and C-38A are not satisfying the criteria for large icebergs that are tracked specifically anymore, they are still clearly discernible. Ex-iceberg C-37 drifted generally southward during February while the smaller part of ex-iceberg C-38A was north of Mill Island in the beginning of February before drifting across to the Denman Ice and back to northwest of Mill Island again. At the same time, iceberg C-39 drifted steadily northward and iceberg C-38B remained largely local.

All these different movement patterns indicate a highly dynamic surface ocean in the region during February 2023.

Ice Bulletin: Davis Station

Issued: Wednesday 1st March 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data of Davis Station and the Vestfold Hills.

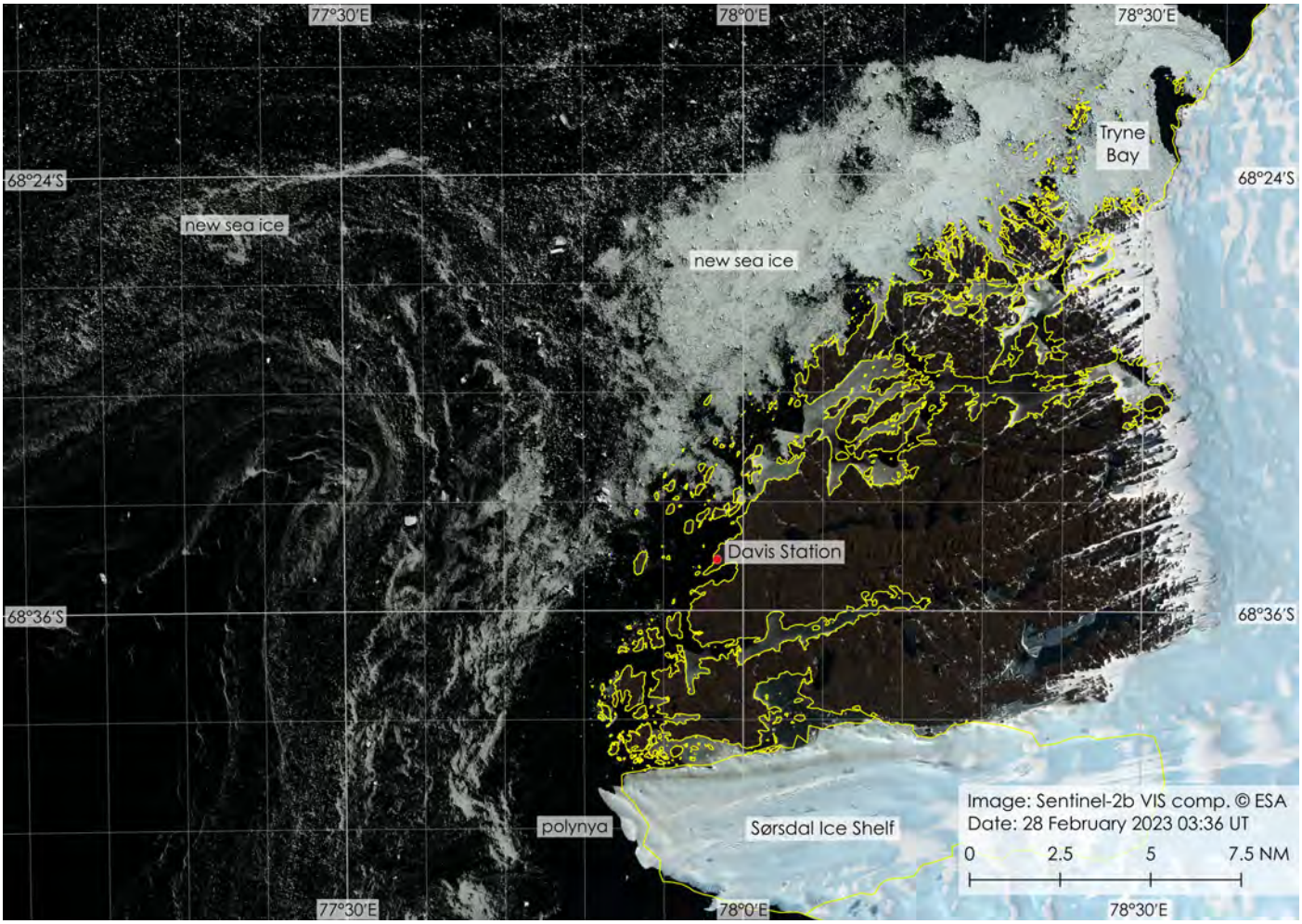


Figure 1: *Sentinel-2b visible composite data acquired 28 February 2023 at 03:36 and provided by ESA.*

New sea-ice formation has started off the Vestfold Hills. Minimal fast ice has survived in the fjords of the hills.

Figure 2 shows SAR data of the hills and northward including the West Ice Shelf.

West of the D-15 icebergs, ex-fast ice had drifted around the northern tip of iceberg D-15A and is now second-year sea ice as the new freezing season has started. It is expected to continue drifting south-westward along the coast.

During late-February, one large fragment of iceberg D-15B, which separated from the iceberg earlier, has now drifted westward away from its initial calving location (as indicated by the pink arrow). It remains currently north of a string of smaller icebergs that have also formed previously but will eventually enter a south-westward drift stream together with the second-year sea ice and newly forming sea ice.

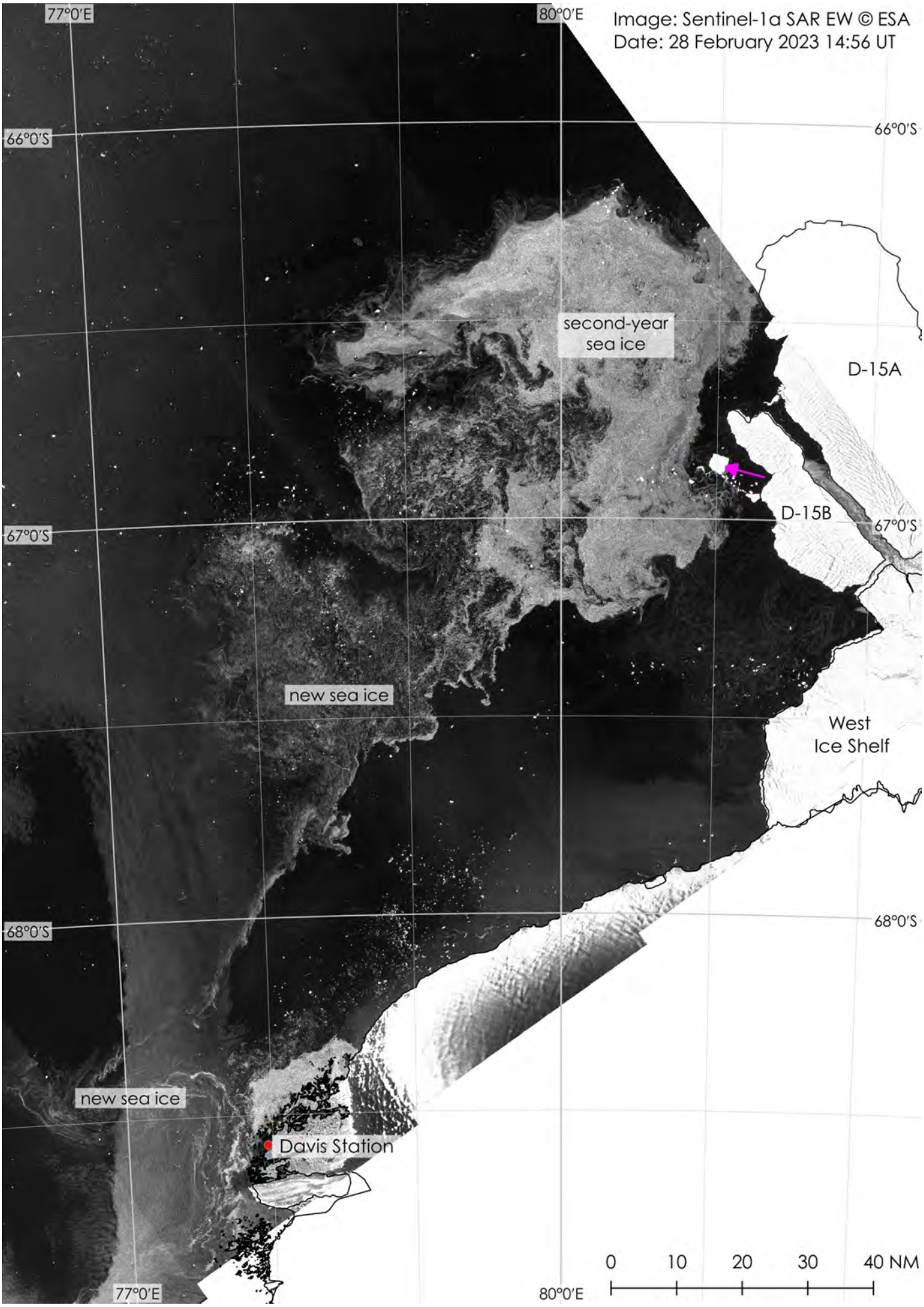


Figure 2: *Sentinel-1 SAR EW data acquired 28 February 2023 at 14:56 UT and provided by PolarView.*

Ice Bulletin: Iceberg A-76A

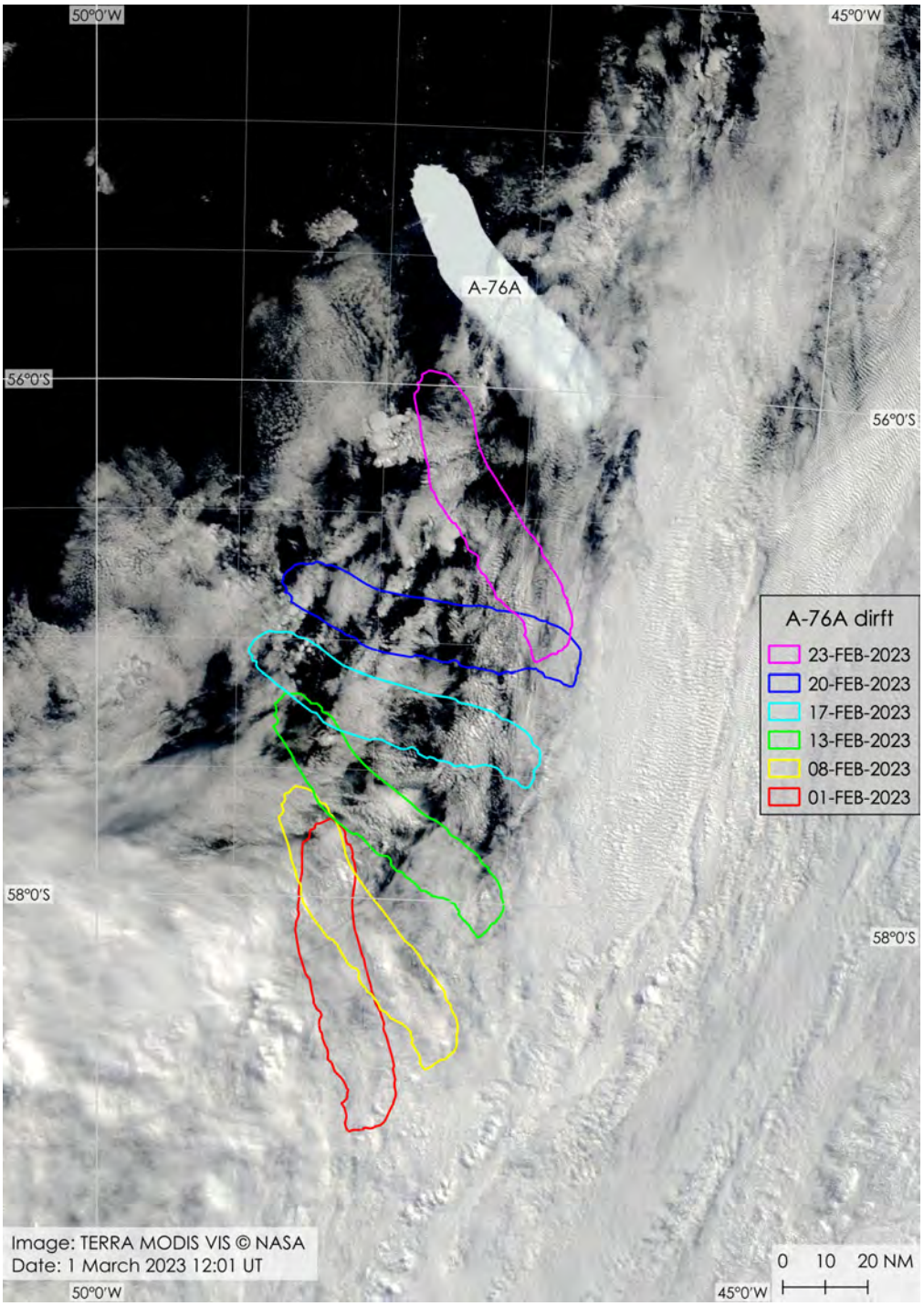
Issued: Thursday 2nd February 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows visible data northeast of the Antarctic Peninsula and northwest of the Weddell Sea. The drift of iceberg A-76A during February 2023 is indicated by colour-coded shapes.



During February, the iceberg drifted 160 nautical miles northward and is currently roughly 500 nautical miles north of the sea-ice edge based on passive microwave data (not shown in the figure). Due to the shape of the sea-ice edge, the iceberg is in fact more than 700 nautical miles north of the sea-ice edge when the longitude coordinate of the iceberg's centre is considered.

The iceberg is currently crossing the latitude of South Georgia Island in the Scotia Sea in the southern South Atlantic Ocean and therefore the latitude of the southern edge of South America. It has entered shipping routes that run across the southern South Atlantic.

The iceberg continues showing signs of breaking up and smaller icebergs and glacial debris are surrounding the iceberg and are drifting farther afield.

***Figure 1**: TERRA MODIS VIS data acquired 1 March 2023 at 12:01 UT and provided by NASA.*

Ice Bulletin: Mawson Station

Issued: Friday 3rd March 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows composite data off Mawson Station. The drift of iceberg D-32 is indicated by colour-coded shapes.

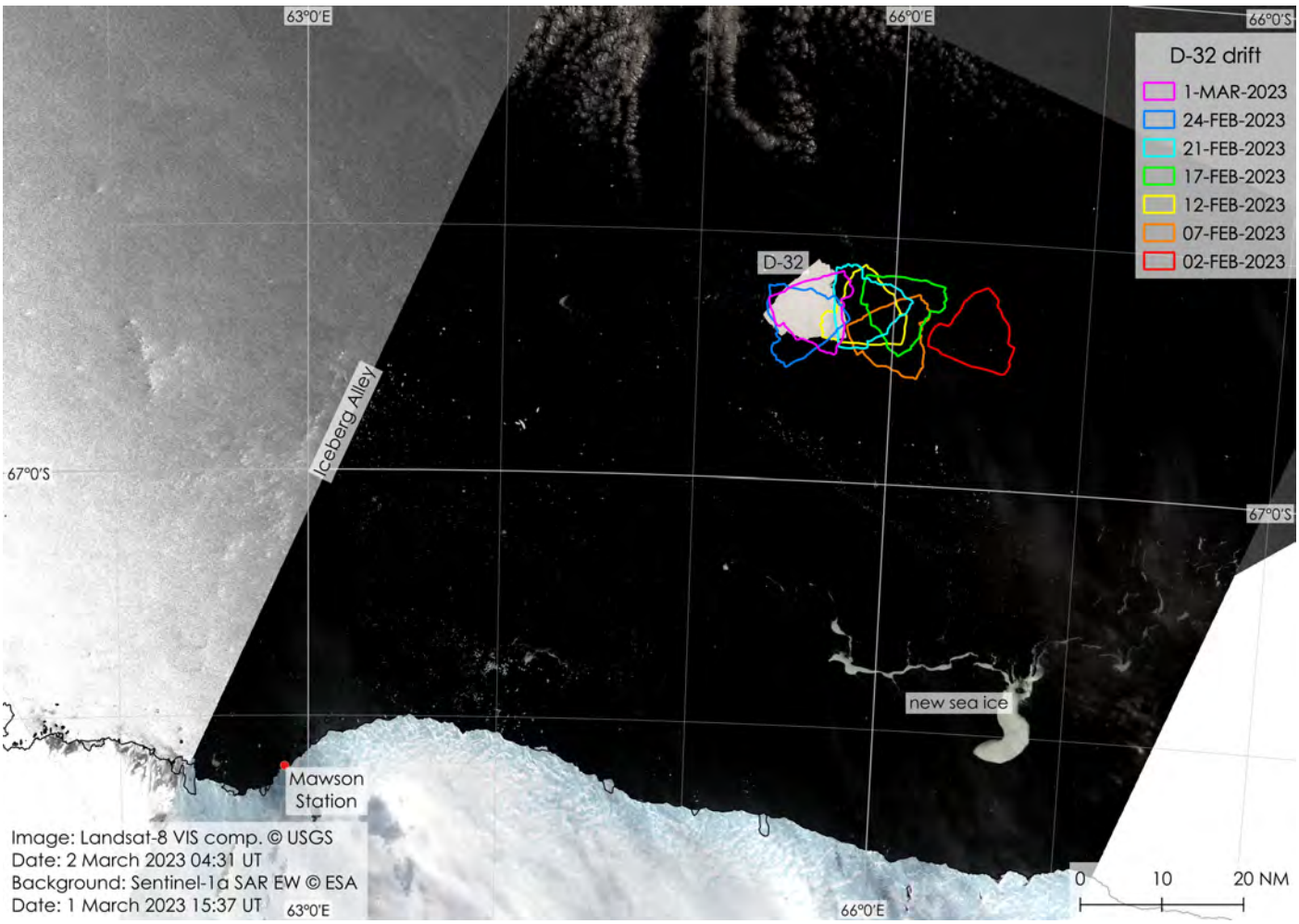


Figure 1: *Landsat-8 visible composite data acquired 2 March 2023 at 04:31 UT and provided by USGS; Background: Sentinel-1a SAR EW data acquired 1 March 2023 at 15:37 UT and provided by PolarView.*

There is no more fast ice nearshore. Some patches of new sea ice with incorporated ex-fast ice are drifting westward offshore. During February, iceberg D-32 rotated clockwise more than two complete rotations while drifting more than 22 nautical miles westward north of the continental shelf break.

Ice Bulletin: Mill Island

Issued: Monday 6th March 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows a composite of SAR and visible data around Mill Island. The fast-ice edge is marked by a dashed red line for 1 March 2023.

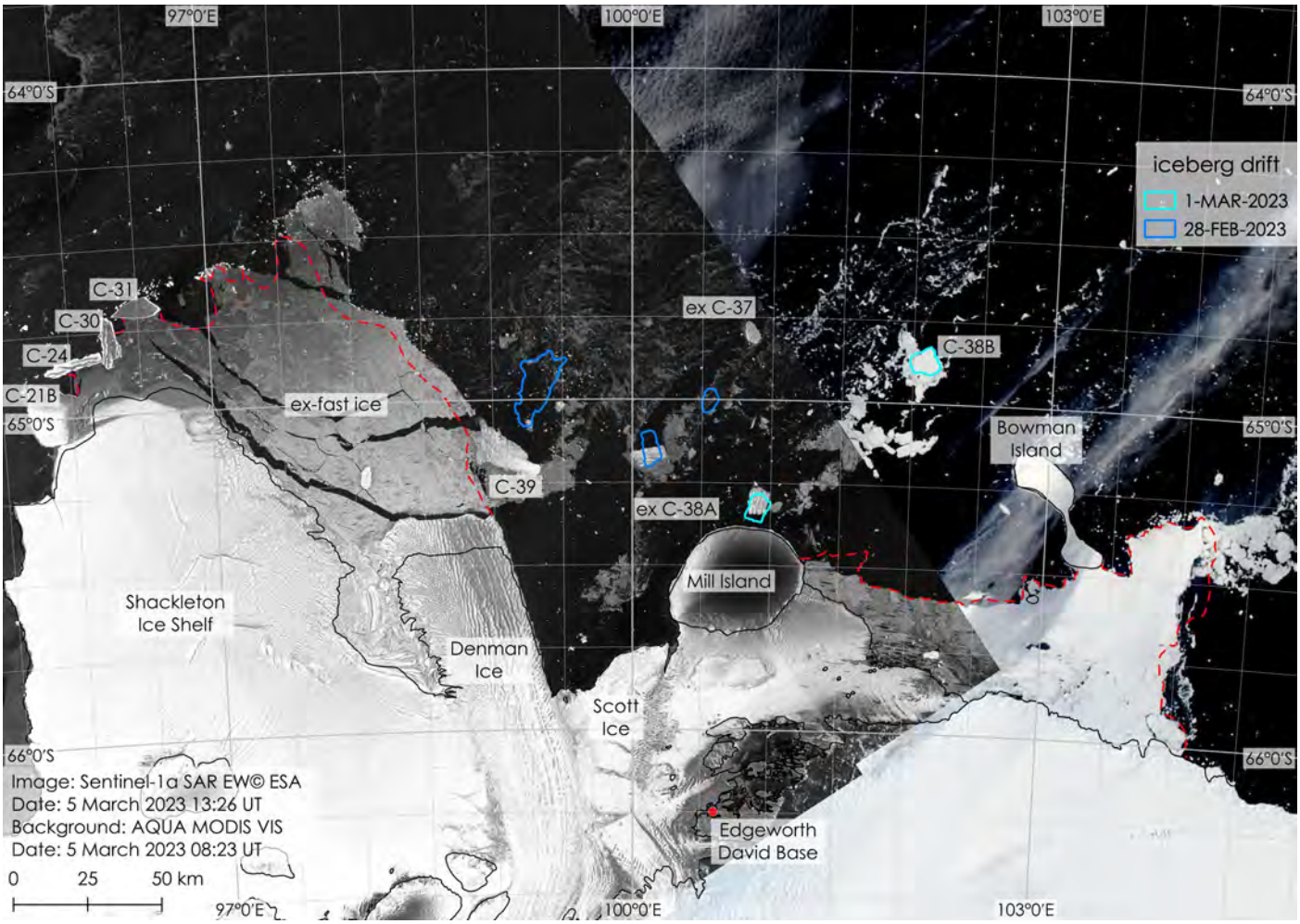


Figure 1: *Sentinel-1 SAR EW data acquired 5 March 2023 at 13:26 UT and provided by PolarView; Background: AQUA MODIS VIS data acquired 5 March 2023 at 08:23 UT and provided by NASA.*

Northeast of the Shackleton Ice Shelf, roughly 5400 km^2 (approximately 4 times the size of Flinders Island, Tasmania) of multi-year fast ice has broken off on 4 March 2023. This happened at a time when new sea ice is already forming west and north of Mill Island. East of Bowman Island, fast ice continues breaking up and a melange of pack ice and ex-fast ice is present off the fast-ice edge where also new sea ice is forming.

While icebergs C-37 and C-38A are not satisfying the criteria for large icebergs that are tracked specifically anymore, they are still clearly discernible. After generally drifting southward during February, ex-iceberg C-37 turned northward again in the first week of March. The ex-C-38A icebergs remained north of Mill Island in the beginning of March. Iceberg C-38B remained largely local. Iceberg C-39 has drifted southward again in early March after drifting steadily northward during February.

All these different movement patterns indicate a highly dynamic surface ocean in the region.

Ice Bulletin: West Ice Shelf

Issued: Monday 6th March 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows visible data of the eastern West Ice Shelf. The fast-ice edge is marked by a red line (dashed red line for 21 February 2023).

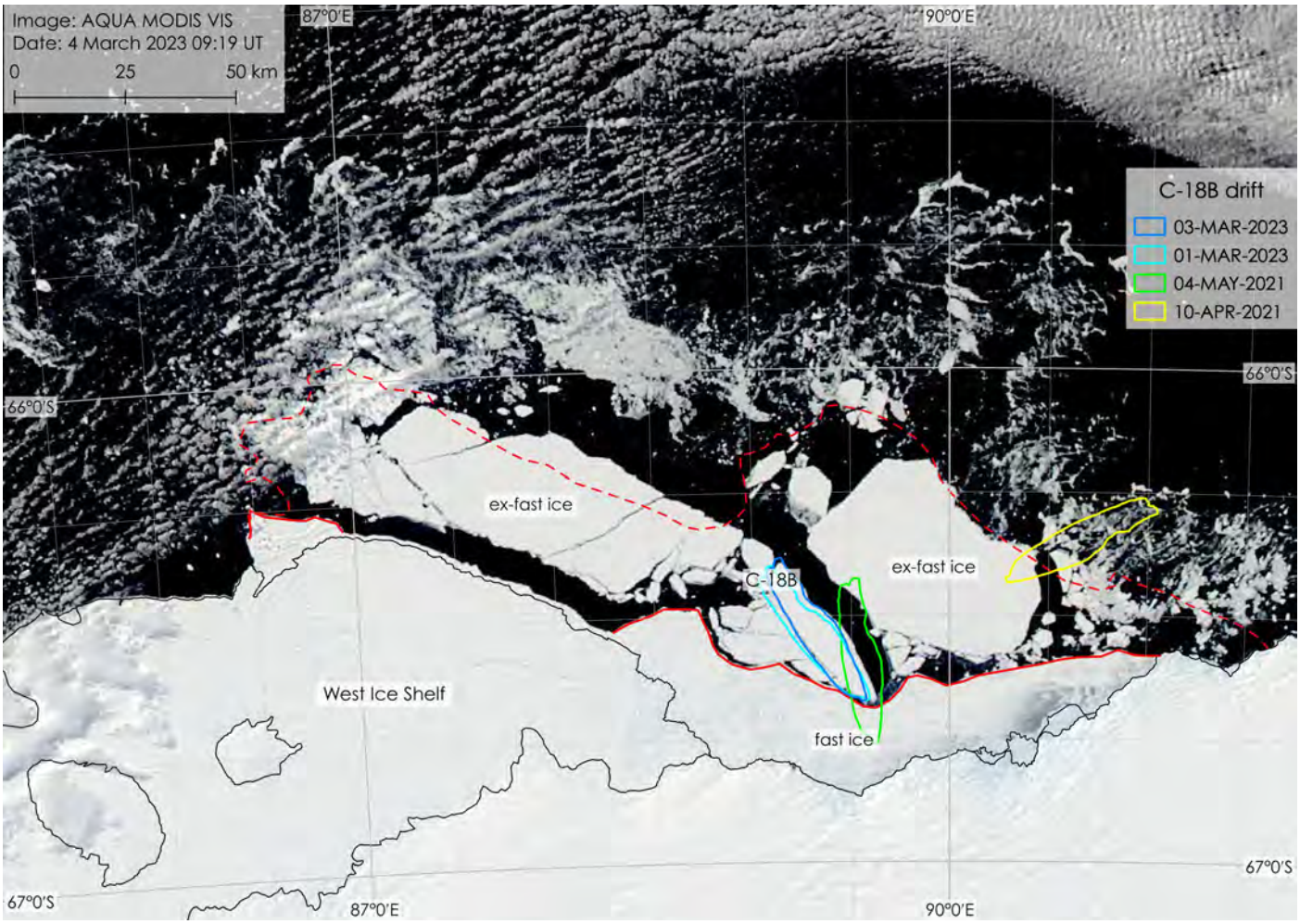


Figure 1: *AQUA MODIS VIS data acquired 4 March 2023 at 09:19 UT and provided by NASA.*

In early-March 2023, roughly 7200 km^2 (more than 5 times the size of Flinders Island, Tasmania) of second-year fast ice has broken off northeast of the West Ice Shelf. This happened at a time when new sea ice started forming.

This break-up has released iceberg C-18B again, which is now drifting north-eastward again. The iceberg arrived in the region roughly two years ago and was enclosed by fast ice since then.

Ice Bulletin: Wilkins Aerodrome

Issued: Wednesday 8th March 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (15 m horizontal) visible data of Wilkins Aerodrome.

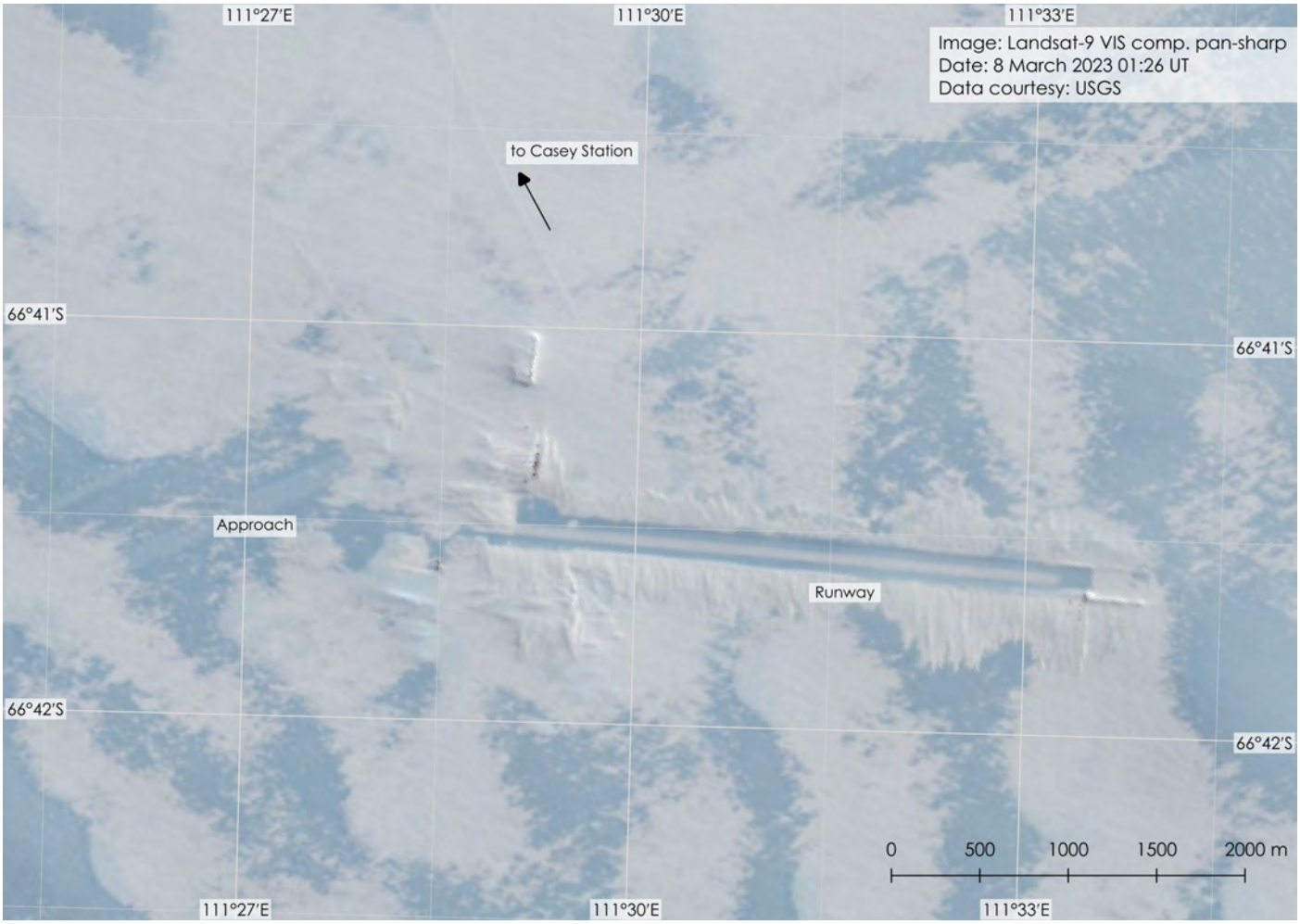


Figure 1: *Landsat-9 visible composite pan-sharpened data acquired 8 March 2023 at 01:26 UT and provided by USGS.*

North and south of the runway, snow dunes are left from previous clearing the runway. Snow dunes have also accumulated around the camp and other structures.

Ice Bulletin: Antarctica

Issued: Friday 10th March 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows the pan-Antarctic sea-ice concentration anomaly based on passive microwave remote sensing data.

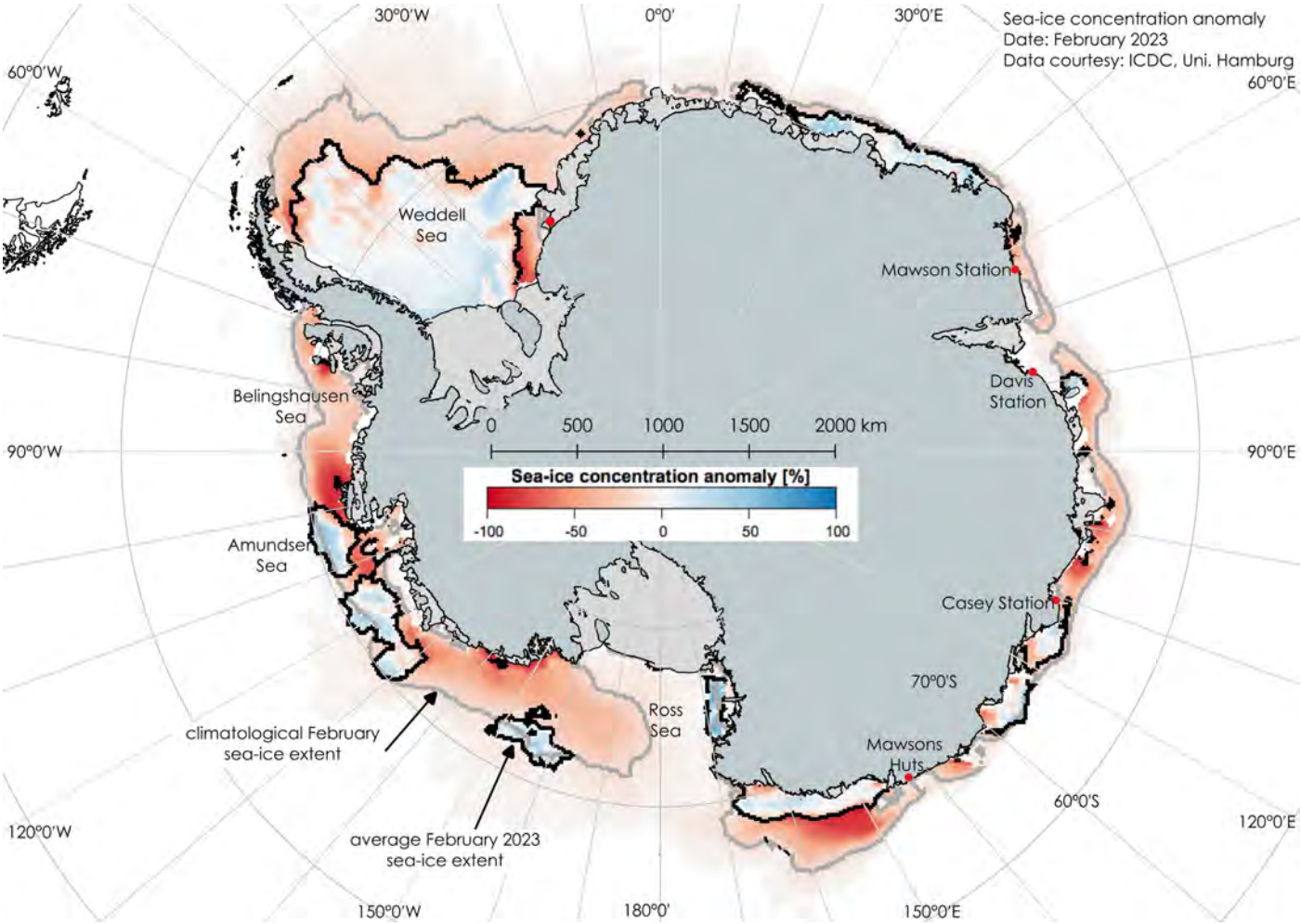


***Figure 1**: Sea-ice concentration anomaly for February 2023 provided by ICDC (Universität Hamburg).*

Pan-Antarctic sea-ice conditions reached a record minimal low and trends from December 2022 accelerated.

On 19 February 2023, sea-ice extent reached a new record low daily value since records began more than 40 years ago with 1.77 million km^2. It was only the second time below 2.0 million km^2 following the previous record set in 2022. This new record is 142 000 km^2 (more than 2 times the area of Tasmania) below last year's record.

On 22 February 2023, sea-ice area reached also a new record low daily value since records began more than 40 years ago with 1.05 million km^2, which is 15% lower than the previous record set in 2022.

Only a few pockets of above average sea-ice concentration within the record low extent remained scattered around the continent, most notably in the western Ross Sea.

Ice Bulletin: Casey Station

Issued: Thursday 16th March 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

The figures of this Ice Bulletin show high-resolution (10 m horizontal) visible data of Casey Station and surrounds.

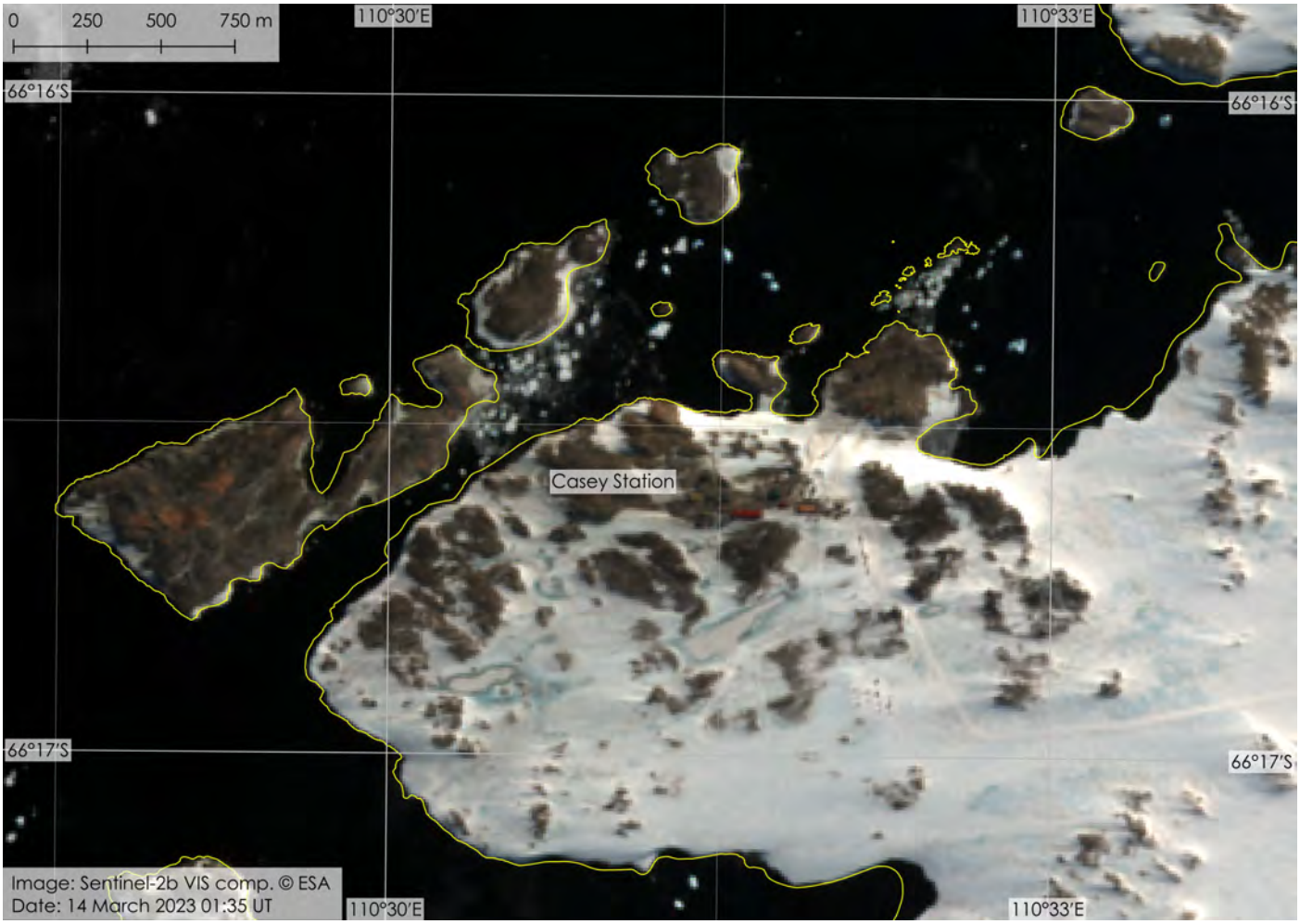


Figure 1: *Sentinel-2b visible composite data acquired 14 March 2023 at 01:35 UT and provided by ESA.*

Individual buildings of the station can be seen clearly in Figure 1.

Figure 2 provides a view of the Casey Skiway (YCSK) and surrounds. The staging area of the Million Year Ice Core (MYIC) traverse is also marked. Figure 3 shows the Wilkins Aerodrome.

Figure 4 shows a larger-scale overview of the entire region. Minimal fast ice has survived the summer sheltered in the south-western Penney Bay.

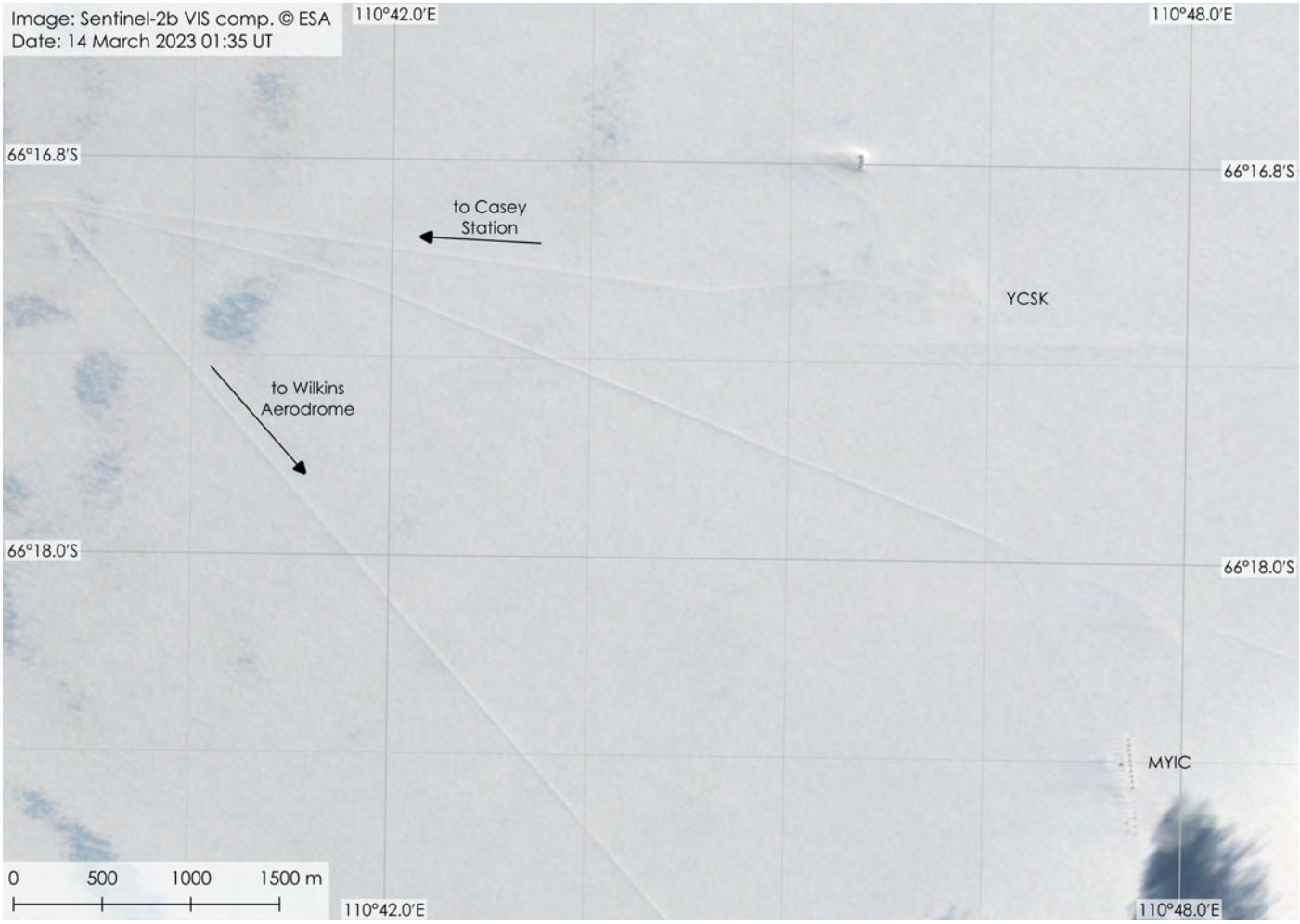


Figure 2: *Sentinel-2b visible composite data acquired 14 February 2023 at 01:35 UT and provided by ESA.*

Figure 3: *Sentinel-2b visible composite data acquired 14 February 2023 at 01:35 UT and provided by ESA.*

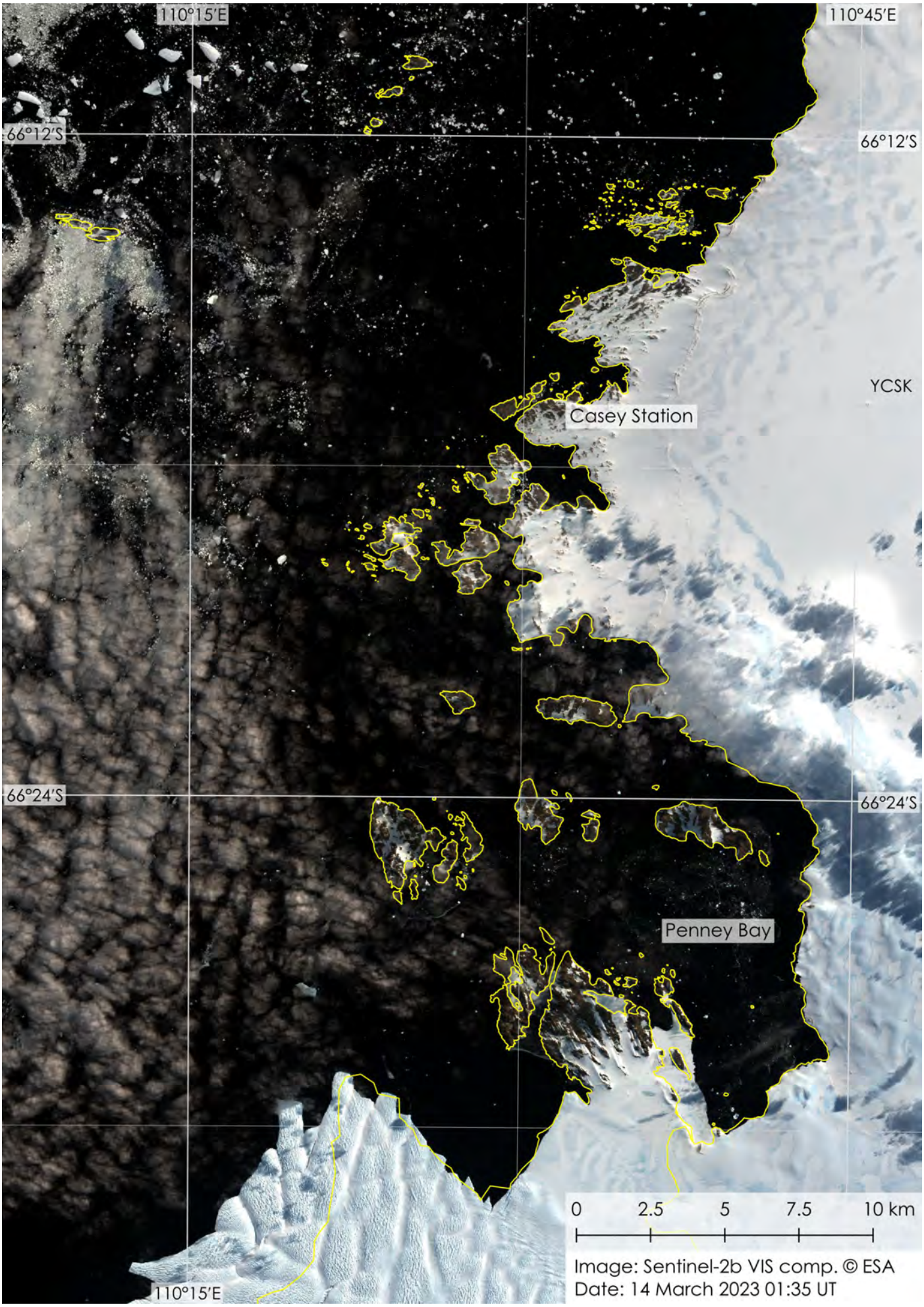


Figure 4: *Sentinel-2b visible composite data acquired 14 February 2023 at 01:35 UT and provided by ESA.*

Ice Bulletin: Weddell Sea

Issued: Thursday 16th March 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows visible data of the Weddell Sea.

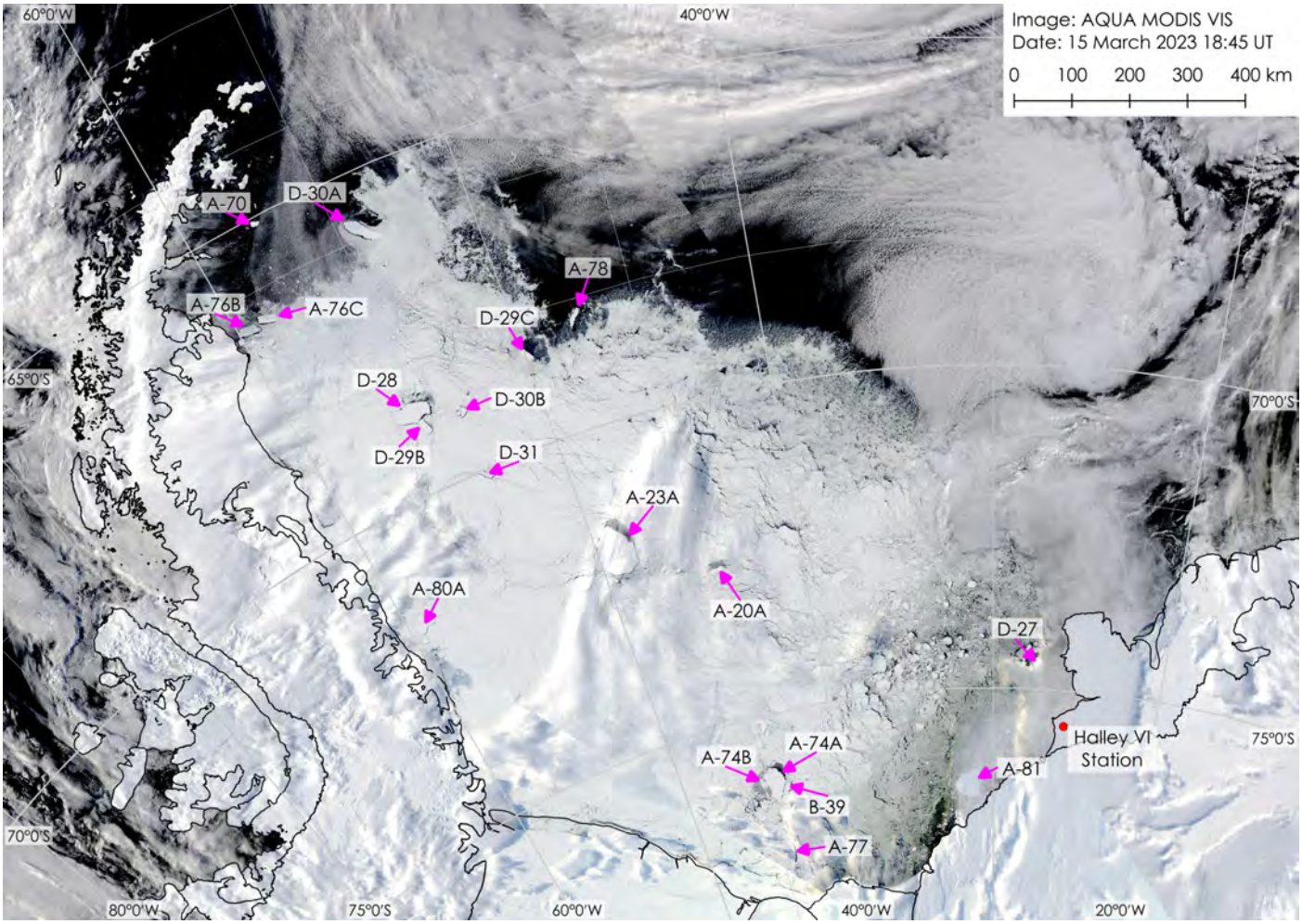


Figure 1: *AQUA MODIS visible composite data acquired 15 March 2023 at 18:45 and provided by NASA.*

Currently, 19 large (named) tabular icebergs are drifting in the southern and western Weddell Sea. Icebergs A-70 and A-78 are north of the sea-ice zone and additionally two more icebergs, namely D-29A and A-76A, are 630 km and 1350 km, respectively, north of the sea-ice edge and not shown in the figure. Furthermore, four icebergs are currently at the sea-ice edge.

Overall, this is a comparatively large number of large icebergs within the Weddell Sea.

Ice Bulletin: Davis Station

Issued: Friday 17th March 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows high-resolution (10 m horizontal) visible data of Davis Station and the Vestfold Hills.

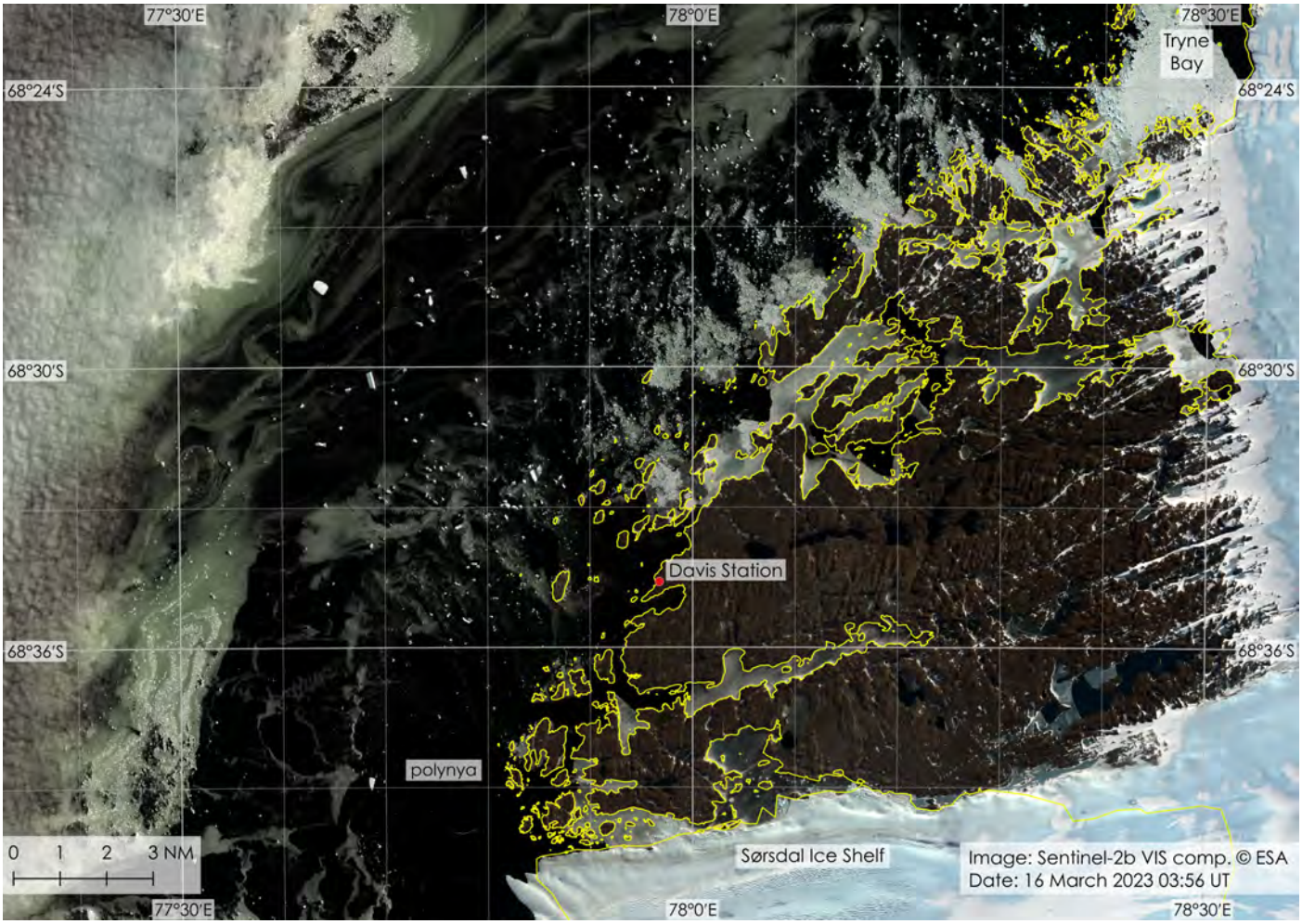


Figure 1: *Sentinel-2b visible composite data acquired 16 March 2023 at 03:56 and provided by ESA.*

New sea-ice formation has started off the Vestfold Hills. Minimal fast ice has survived in the fjords of the hills.

Some of the new ice appears discoloured due to late-blooming algae, which are using the new brash ice as vessels protecting from predation and a convenient lift to sunlight as the new ice floats on the ocean surface. This kind of discoloured sea ice is found in multiple places around the Antarctic this season, including off Cape Darnley, around the Commonwealth Bay region, in Terra Nova Bay and McMurdo Sound as well as the coastal Amundsen Sea.

Ice Bulletin: Mawson Station

Issued: Friday 17th March 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data of Mawson Coast and off Mawson Station.

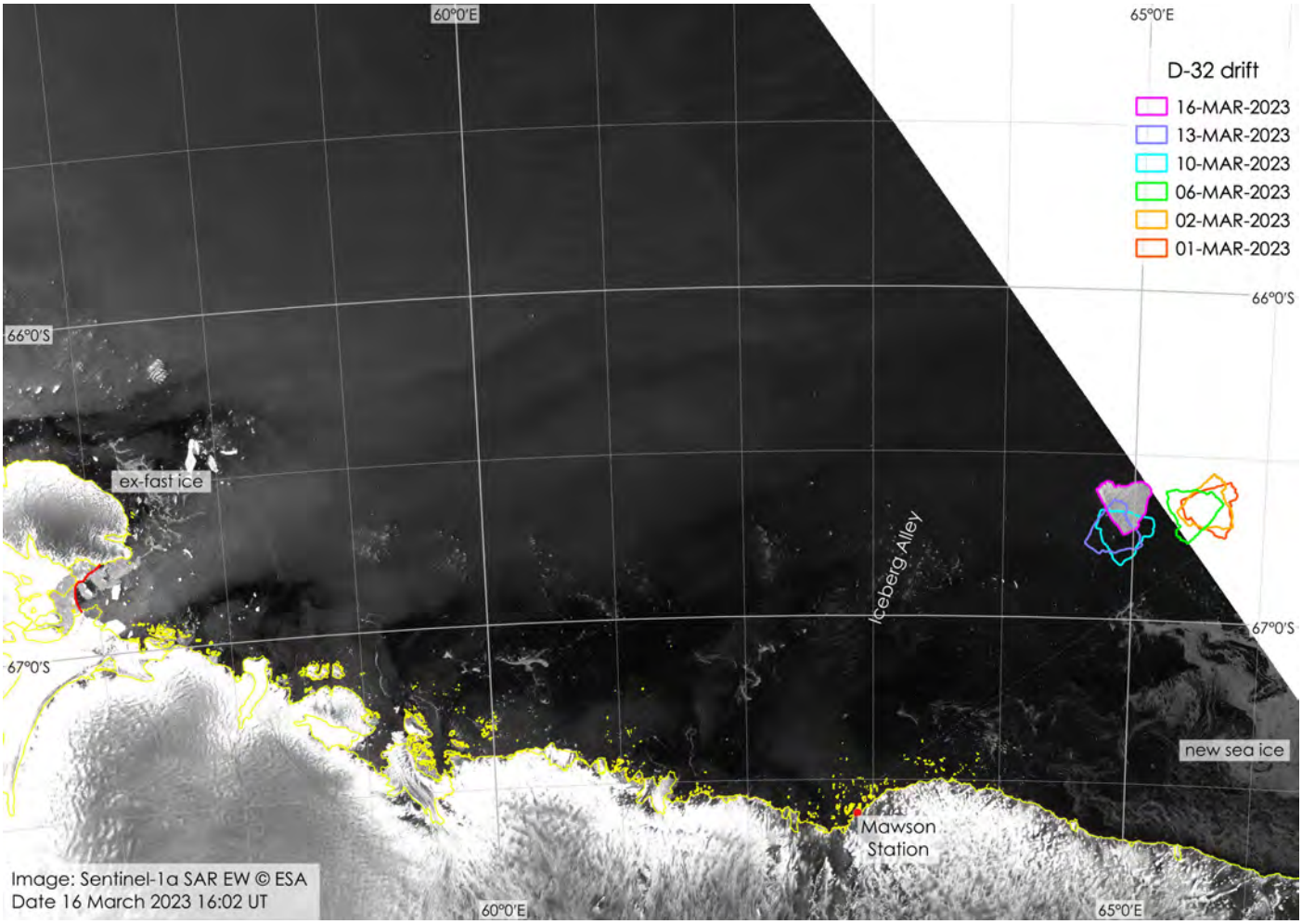


Figure 1: *Sentinel-1a SAR data acquired 16 March 2023 at 16:02 and provided by PolarView.*

Along Mawson Coast, only very minimal fast ice has survived the summer melt season in the far west (marked by a red line).

New sea ice is forming east of the Mawson Station and offshore in isolated patches.

Iceberg D-32 continues its generally westward drift off the continental shelf break.

Ice Bulletin: Brunt Ice Shelf

Issued: Wednesday 22nd March 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data of the Brunt Ice Shelf in the eastern Weddell Sea.

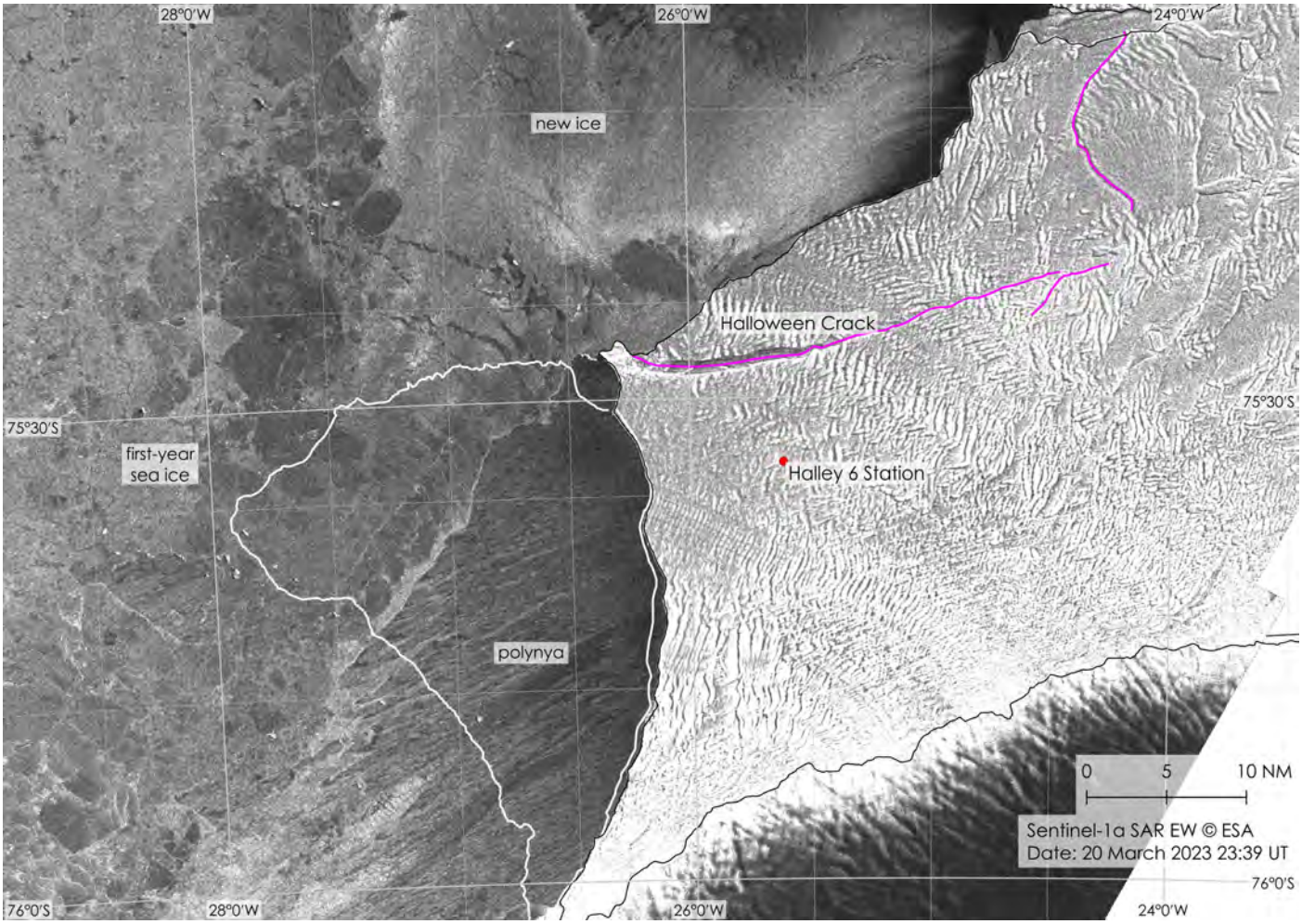


Figure 1: *Sentinel-1a SAR data acquired 20 March 2023 at 23:39 and provided by PolarView.*

West of Halley 6 Station, the white outline marks the extent of what is now iceberg B-81 and drifting southwest of the ice shelf (not shown in the figure). The area is currently largely occupied by a polynya (open ocean).

North of the station, the Halloween Crack was first spotted on 31 October 2016 and has since progressed eastward. Since the calving of iceberg A-81 in late-January 2023, the western part of the crack has significantly widened by an additional roughly 50 m in two months. Pre-calving, the Halloween Crack had widened to roughly 1300 m since 2016 (on average 17 m per month).

Ice Bulletin: Mill Island

Issued: Friday 24th March 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows visible data around Mill Island. The fast-ice edge on 1 March 2023 is marked by a dashed red line.

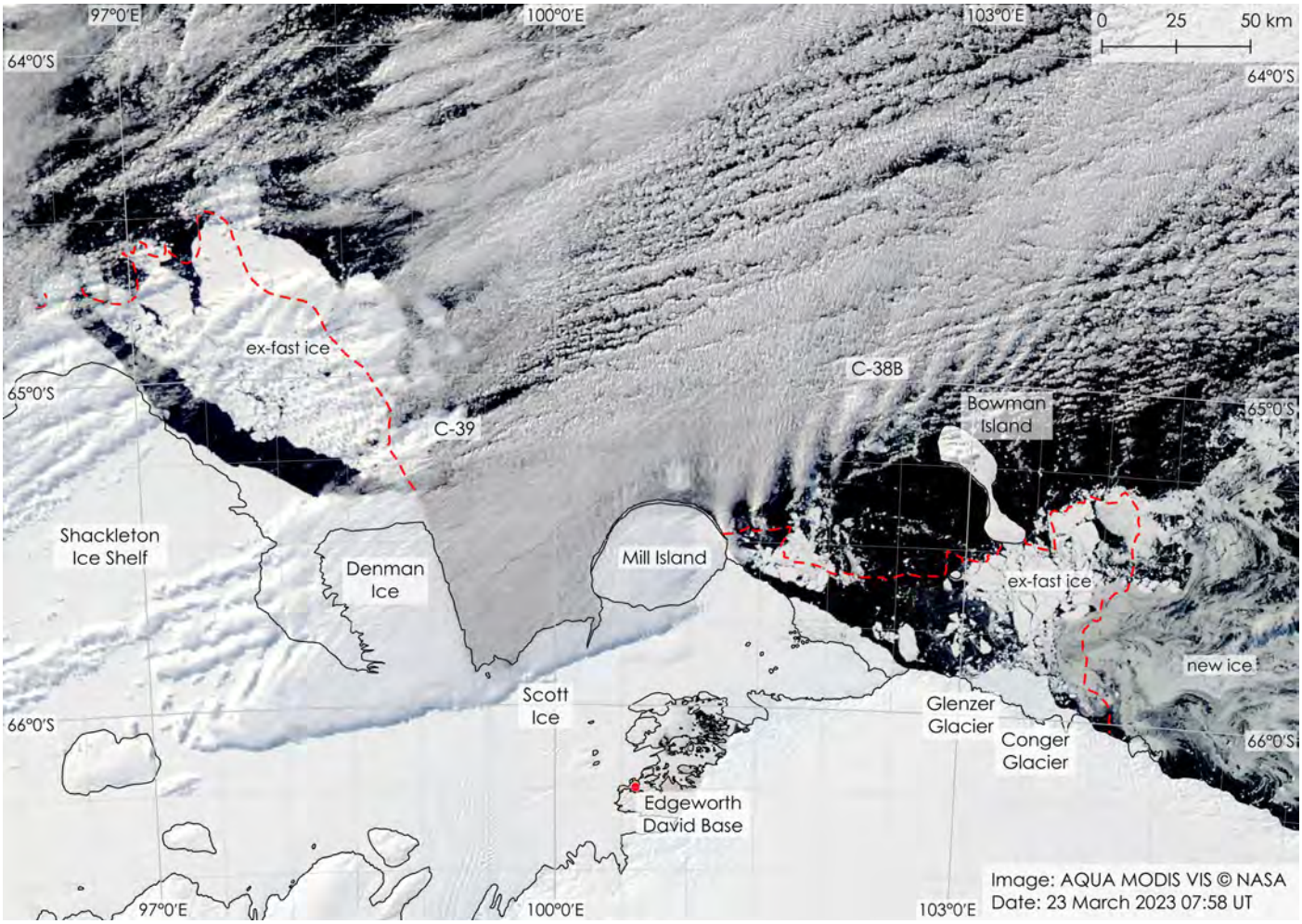


Figure 1: *AQUA MODIS VIS data acquired 23 March 2023 at 07:58 UT and provided by NASA.*

Late-season fast-ice break up continues in the region. Earlier this month, roughly 5400 km^2 (approximately 4 times the size of Flinders Island, Tasmania) of multi-year fast ice broke away from northeast of the Shackleton Ice Shelf. Also south of Bowman Island, fast ice has now completely disintegrated, and a melange of pack ice and ex-fast ice is present while additionally new sea ice is advected into the region from the east.

Icebergs C-37 and C-38A do not satisfy the criteria for large icebergs that are tracked specifically anymore but iceberg C-38B remained largely local and iceberg C-39 has drifted eastward since early March and remains at the south-eastern edge of the ex-fast ice north of the Denman Ice.

Northeast of Edgeworth David Base, some areas of open water can still be seen within the northern Bunger Hills.

Ice Bulletin: Davis Station

Issued: Monday 27th March 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows SAR data off Ingrid-Christensen Coast and Davis Station.

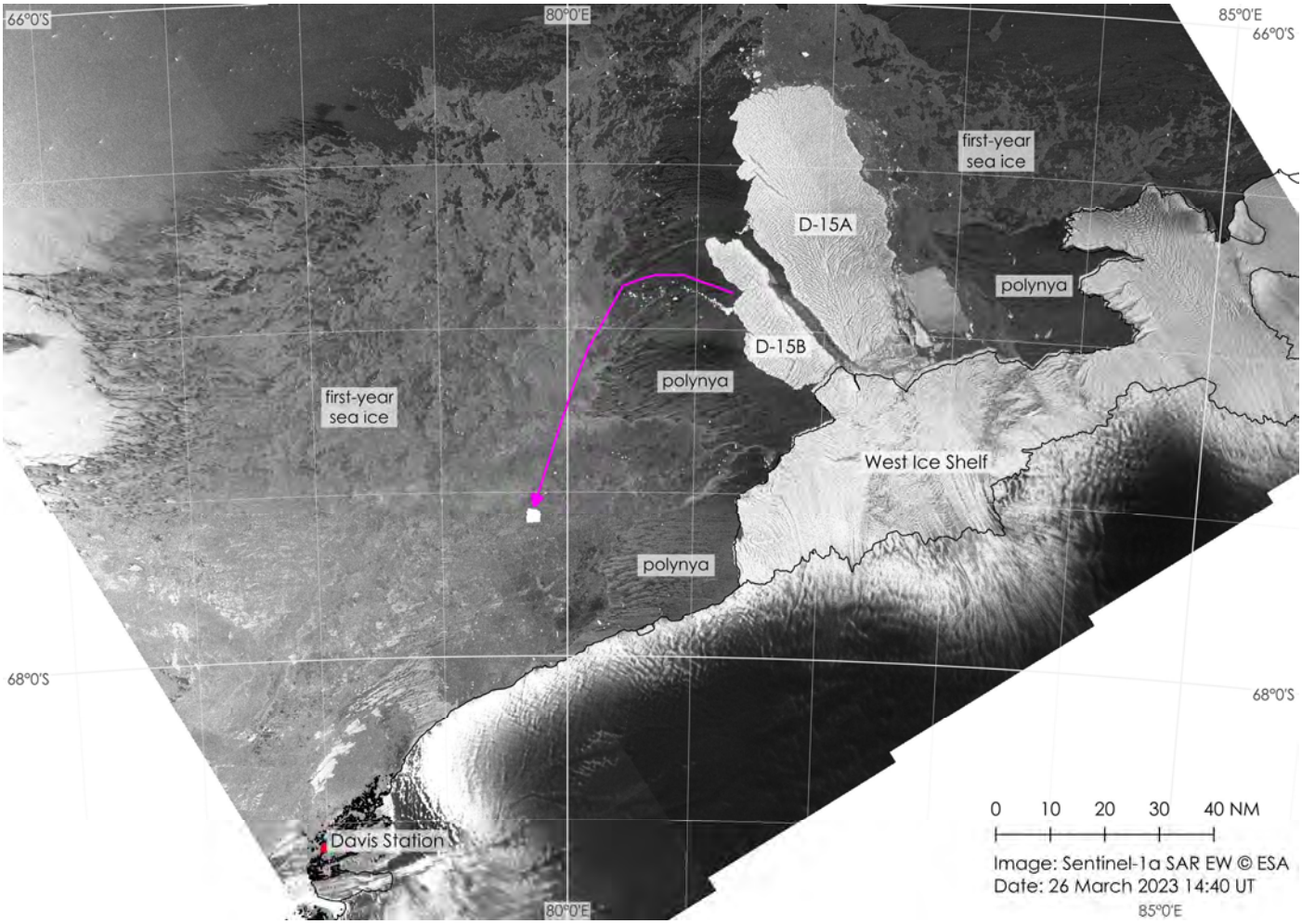


Figure 1: *Sentinel-1a SAR EW data acquired 26 March 2023 at 14:40 UT and provided by PolarView.*

Off Davis Station and further north towards the West Ice Shelf, fast ice is starting to consolidate but is yet to form an outer edge. Further offshore, new ice and first-year sea ice is forming and generally drifting westward.

One piece of iceberg D-15B that calved off in early spring 2022 has drifted around a line of smaller grounded icebergs and is currently drifting south-westward towards the coast.

Ice Bulletin: Mill Island

Issued: Friday 31st March 2023

Analyst: Jan L. Lieser

Australian Government
Bureau of Meteorology

Ice Situation:

Figure 1 shows visible data around Mill Island. The drift of large icebergs during March is indicated by colour-coded shapes.

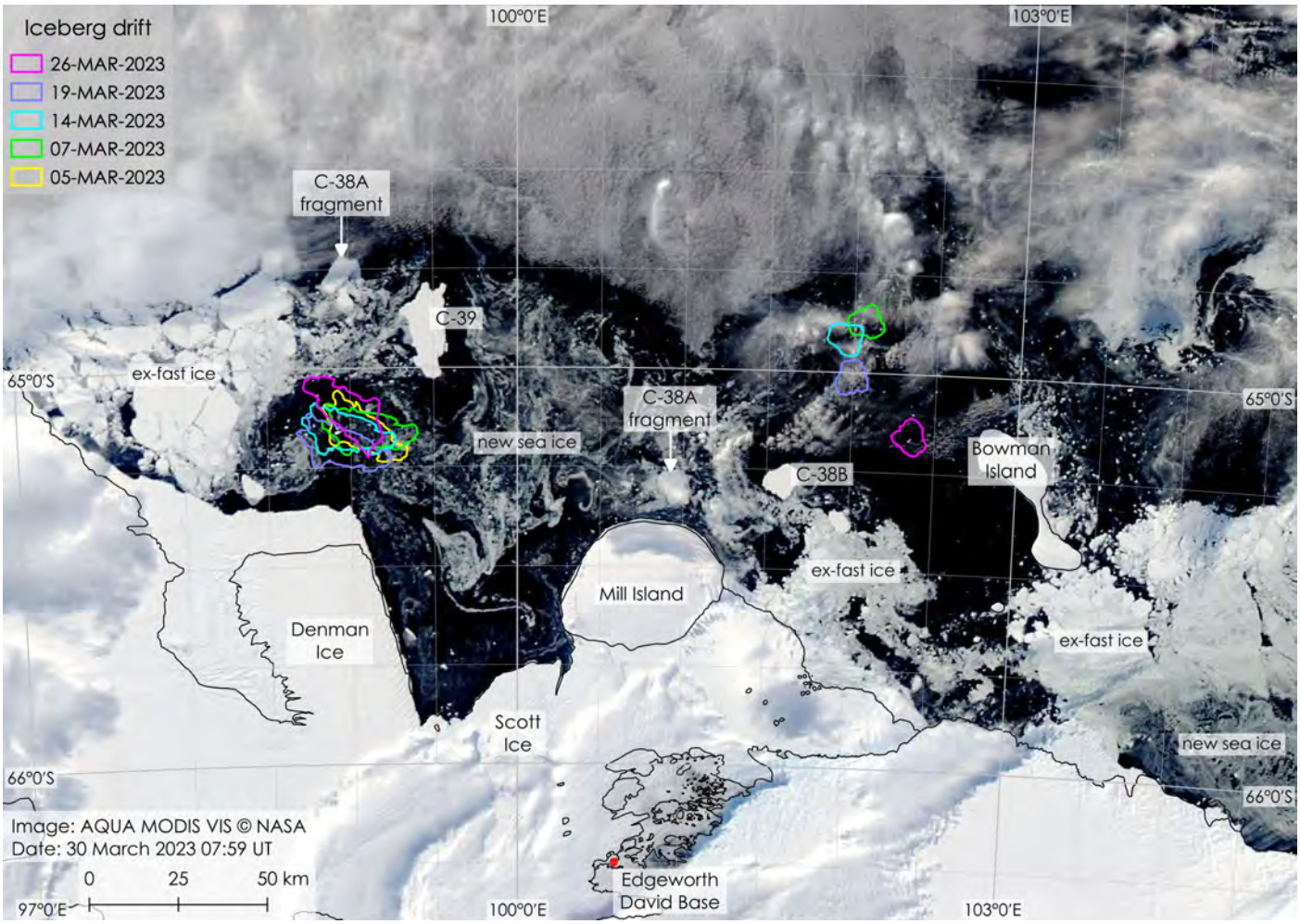


Figure 1: *AQUA MODIS VIS data acquired 30 March 2023 at 07:59 UT and provided by NASA.*

North of the Denman Glacier ice shelf (Denman Ice), the multi-year fast ice that broke away earlier this month continues to break up into smaller floes. Also south of Bowman Island, fast ice completely disintegrated, and a melange of pack ice and ex-fast ice is present while additionally new sea ice is advected into the region from the east.

Iceberg C-38A does not satisfy the criteria for large icebergs that are tracked specifically anymore but its largest fragments have been marked in the figure. During the last week, icebergs C-38B and C-39 have picked up speed (both directional and rotational) and are drifting freely currently.

Northeast of Edgeworth David Base, some areas of open water can still be seen within the northern Bunger Hills.

About the authors:

Jan L Lieser

Dr Jan L Lieser is a meteorologist and marine glaciologist with the Antarctic Meteorology Section at the Australian Bureau of Meteorology.

Jan is the leader of the Ice Service that is provided by the Bureau of Meteorology. Besides his operational duties he maintains a research interest in polar remote sensing. He has also collected on-site polar meteorological observations and sea-ice geophysical measurements, and has researched numerical modelling of Arctic sea ice and Antarctic subglacial Lake Vostok. He was a wintering scientist at the German Neumayer Station and has participated in several field research programs in both Antarctica and the Arctic Ocean, conducted by the Australian Antarctic Division and the German Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research. Jan has spent more than 450 days at sea, on-board icebreakers.

Damien Everett

Damien Everett is a meteorologist stationed in Hobart with the Australian Bureau of Meteorology (BoM), currently attached to the Antarctic Meteorology Section.

Damien performed forecasting duties for Defence based in the Northern Territory before relocating to Hobart and providing public weather and aviation forecast services for Tasmania. Prior to joining BoM, he served in the Royal Australian Navy navigating various ships before becoming a meteorologist and posted to the Fleet Weather and Oceanographic Centre. Damien has spent a summer at Davis Station providing forecasting services and has also wintered on the continent as a Weather Observer, completing over 500 days of continuous service.