



Environment and  
Climate Change Canada

Environnement et  
Changement climatique Canada

# 2023

# Annual Arctic Ice Atlas

## Winter 2022 – 2023



Canadian Ice Service  
Le service canadien des glaces



Canada 

## Foreword

The 2022-2023 Annual Arctic Ice Atlas is part of a continuing series, prepared each year by the Canadian Ice Service (CIS) since 1990. This collection of atlases documents Canadian Arctic winter sea-ice conditions to provide a comparison from year to year.

In this edition of the atlas, the Arctic is represented by five geographical areas: Canadian Arctic (full overview), Northwest Passage, Eastern Arctic (EA), Hudson Bay (HB), and Western Arctic (WA). Image mosaics are provided for each region while an analysis of the data is included for the latter three regions.

The mosaics are graphical depictions of ice conditions based on Synthetic Aperture Radar (SAR) data. The SAR data used in the compilation of the image mosaics in this year's atlas came from the RADARSAT Constellation Mission (RCM). The data were captured between the 28th and the 30th of January 2023.

The production of the mosaics in this year's atlas involved an automated algorithm developed by CIS staff that was utilized to: apply radiometric enhancements to the input images; stitch the overlapping images into a seamless mosaic; and then colourbalance the final output. The mosaicked images now display "dual-polarization" imagery consisting of horizontal transmit / horizontal receive ("HH") as well as horizontal transmit / vertical receive ("HV").

Generally speaking, and for discussion purposes here, varying polarizations in SAR data are akin to the spectral bands in an optical image. In order to display the dual-polarized imagery, the mosaicked imagery is presented in colour. The output consists primarily of yellow and purple hues by assigning the following polarization combinations to the RGB colour spectrum: Red = HH, Green = HV, and Blue = HV. During the winter months the horizontal transmit / vertical receive (HV) tends to highlight areas of second-year / multi-year ice as well as areas of roughness.

For all areas, the SAR data were captured at a resolution of 50 meters per pixel, the data were analyzed at approximately 100 meters per pixel and the published image mosaics were resampled to approximately 500 meters per pixel.

The regional ice analysis component of this year's Atlas consists of two Regional Ice Analysis Charts that depict sea ice conditions in two different World Meteorological Organization (WMO) colour-coding formats: Total Concentration and Stage of Development. Both of these charts are provided for the EA, HB, and WA regions.

The regional ice analysis charts are the product of Environment and Climate Change Canada's (ECCC) CIS personnel who used additional supporting information (including ice thickness reports, climatological data and optical imagery) in their preparation. An explanation of the nomenclature on the analysis charts can be found on the Sea Ice Symbols pages. A more detailed explanation of the nomenclature on the analysis charts can be found in the [Revised Ninth Edition of MANICE](#) (Manual of Standard Procedures for Observing and Reporting Ice Conditions), published by the CIS of ECCC.

All the RCM images contained in this atlas were processed by and are the property of the Government of Canada © 2023. RADARSAT is an official mark of the Canadian Space Agency.

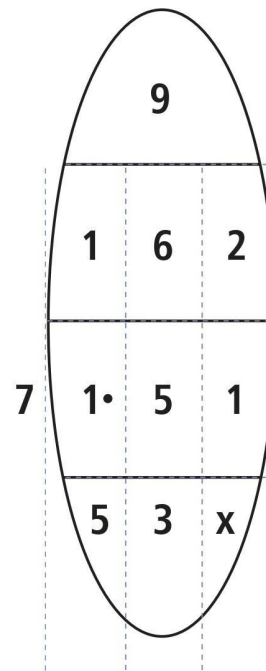
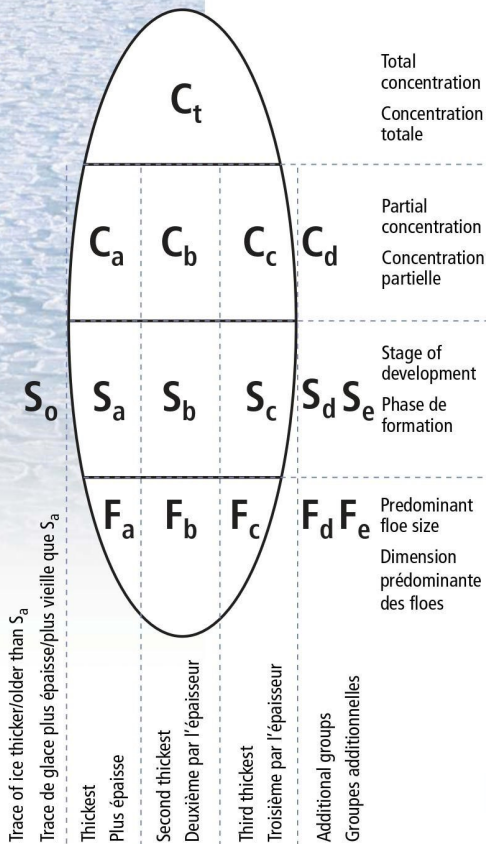
The successful completion of this project was made possible with the able assistance of CIS staff.

The following contributions should be noted:

- Project Manager: Todd Collings
- Mosaic production and algorithm: Yi Luo
- Image analysis: Daniel Beauchamp (EA), Todd Collings (HB), and Gilles Langis (WA)



# SEA ICE SYMBOLS / SYMBOLES DE LA GLACE DE MER



**Total concentration:** the ice coverage of an area determined by its concentration and expressed in tenths (in this example, 9/10).

**Concentration totale :** l'étendue de la couverture de glace, exprimée en dixièmes de la superficie du secteur (dans cet exemple, 9/10).

**Partial concentration:** the break-down of the total ice coverage expressed in tenths and graded by thickness. The thickest starting from the left and in this example, 1/10 is the thickest.

**Concentration partielle :** les concentrations respectives, exprimées en dixièmes, des glaces de différente épaisseur, par ordre décroissant. La plus épaisse commence à la gauche du diagramme, c'est-à-dire, 1/10 est le plus épais.

**Stage of development:** the type of ice in each of the grades, determined by its age, that is 1/10 is medium first-year ice (1\*), 6/10 is grey-white ice (5) and 2/10 is new ice (1). Trace of old ice is represented on the lefthand side (outside the egg) by the number 7.

**Stade de développement :** le type de glace de chacune des catégories déterminé par son âge, c'est-à-dire, 1/10 est de la glace moyenne de première année (1\*), 6/10 est de la glace blanchâtre (5), et 2/10 est de la nouvelle glace (1). Une trace de vieille glace est représentée à gauche (à l'extérieur de l'oeuf) par le chiffre 7.

**Floe size:** the form of the ice determined by its floe size for each section. In this example, big floes (5) for medium first-year ice (1\*); small floes (3) for grey-white ice (5); and undetermined, unknown or no form floes (x) for new ice (1).

**Taille des floes :** la forme de la glace, déterminée par la taille des floes dominants de chaque section. Dans cet exemple, grands floes (5) pour la glace moyenne de première année (1\*); petits floes (3) pour la glace blanchâtre (5) et floes indéterminée, inconnue ou sans forme (x) pour la nouvelle glace (1).

**Note:** When an ice type has a dot (\*) every other value to the left of it is also considered to have a dot.

**Remarque:** Lorsqu'un nombre est suivi d'un point (\*), toute autre valeur apparaissant à sa gauche est également pointée.

## SEA ICE SYMBOLS/SYMBOLS DE LA GLACE DE MER



Open Water  
Eau libre



Ice Free  
Libre de glace



Bergy Water



Fast Ice  
Banquise côtière

### Stage of Development/Stade de développement ( $S_o S_a S_b S_c S_d S_e$ )

Description/Élément	Thickness/Épaisseur	Code
New ice/Nouvelle glace	<10 cm	1
Nilas; ice rind/Nilas glace, vitrée	<10 cm	2
Young ice/Jeune glace	10-30 cm	3
Grey ice/Glace grise	10-15 cm	4
Grey-white ice/Glace blanchâtre	15-30 cm	5
First-year ice/Glace de première année	30 cm	6
Thin first-year ice/Glace mince de première année	30-70 cm	7
Medium first-year/ Glace moyenne de première année	70-120 cm	1*
Thick first-year ice/Glace épaisse de première année	>120 cm	4*
Old ice/Vieille glace		7*
Second-year/Glace de deuxième année		8*
Multi-year/Glace de plusieurs années		9*
Ice of land origin/Glace d'origine terrestre		▲*
Undetermined, unknown or no form/ Indéterminée, inconnue ou sans forme		X

### Floe Size/Grandeur des floes ( $F_a F_b F_c$ )

Description/Élément	Width/Extension	Code
Pancake ice/Glace en crêpes		0
Small ice cake, brash ice/Petit glaçons, sarrasins	<2 m	1
Ice cake/Glaçons	2-20 m	2
Small floe/Petits floes	20-100 m	3
Medium floe/Floes moyens	100-500 m	4
Big floe/Grands floes	500-2000 m	5
Vast floe/Floes immenses	2-10 km	6
Giant floe/Floes géants	>10 km	7
Fast ice/Banquise côtière		8
Icebergs		9
Undetermined, unknown or no form/ Indéterminée, inconnue ou sans forme		X
Strips (concentration = C)/ Glaces en cordons (concentration = C)		∞ C



Canadian Ice Service/Service canadien des glaces (CIS/SCG)

Client Services/Service à la clientèle











Email/Courriel: cisclients-scgclients@ec.gc.ca

Web site/Site web: <https://iceweb1.cis.ec.gc.ca>



# SEA ICE SYMBOLS / SYMBOLES DE LA GLACE DE MER

## WMO Concentration Colour Code – Sea Ice / Code de couleurs de l’OMM – Concentration – Glace de mer

	Ice Free / Libre de glace		7-8/10		
	< 1/10		9-10/10		
	1-3/10		Fast Ice / Banquise côtière		Optional/Facultatif / 7/10 New Ice / Nouvelle glace
	4-6/10		Undefined / Non-définie		9+-10/10 Nilas, Grey Ice / Glace grise**





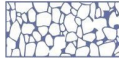
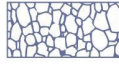

Colour is based on total ice concentration.

La couleur utilisée est établie en fonction de la concentration totale de la glace.

\*\* The optional colour indicating 9/10+-10/10 of nilas or grey ice indicates level ice, mainly on leads; it is not used for ice broken into brash or ice cakes or for concentrations less than 9/10+.

La couleur optionnelle désignant 9/10+-10/10 de nilas ou de glace grise indique de la glace uniforme se retrouvant surtout dans les chenaux; elle n'est pas utilisée pour désigner des sarrasins, des glaçons ou des concentrations de glace inférieures à 9/10+.

## Concentration of Ice / Concentrations de glace

	<1/10	Open water / Eau libre
	1-3/10	Very open drift / Banquise très lâche
	4-6/10	Open drift / Banquise lâche
	7-8/10	Close pack / Drift / Banquise serrée
	9/10	Very close pack / Banquise très serrée
	9+/10	Very close pack / Banquise très serrée
	10/10	Compact / Consolidated ice / Banquise compact/consolidée

## WMO Stage of Development Colour Code – Sea Ice / Code de couleurs de l’OMM – Stade de développement – Glace de mer

	Ice Free / Libre de glace		Grey-White Ice / Glace blanchâtre / 15-30 cm		Thick First-Year Ice / Glace épaisse de première année / 120 cm >		
	Open Water / Eau libre		First-Year Ice / Glace de première année / >= 30 cm		Old Ice / Vieille glace		Fast Ice / Banquise côtière
	New Ice / Nouvelle glace / < 10 cm		Thin First-Year Ice / Glace mince de première année / 30-70 cm		Second-Year Ice / Glace de deuxième année		Undefined Ice / Glace non-définie
	Grey Ice / Glace grise / 10-15 cm		Medium First-Year Ice / Glace moyenne de première année / 70-120 cm		Multi-Year Ice / Glace de plusieurs années		Icebergs

Colour is based on stage of development of predominant ice.

La couleur utilisée est établie en fonction du stade de développement de la glace prédominante.



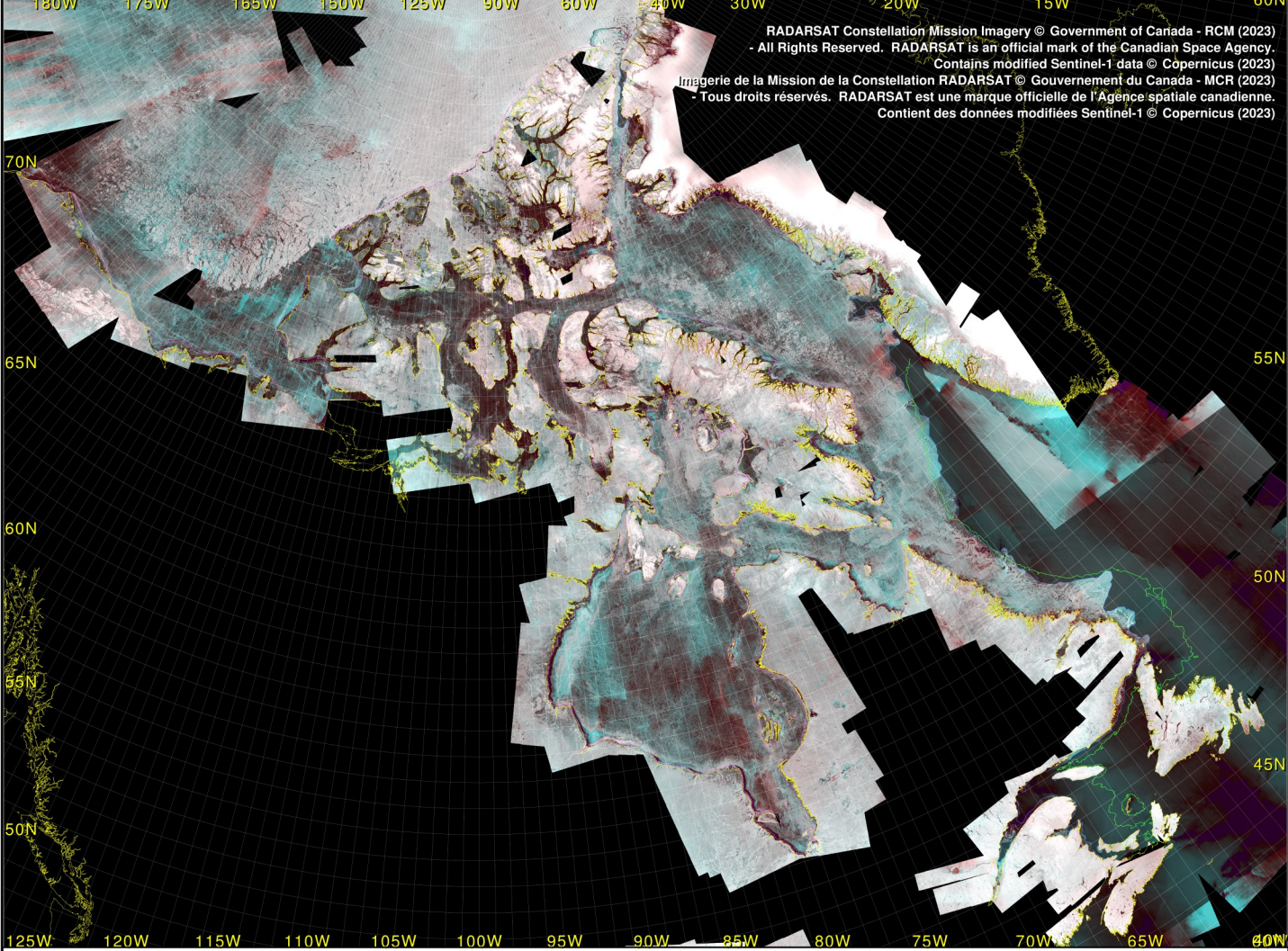
### Canadian Ice Service / Service canadien des glaces (CIS/SCG)

Client Services / Service à la clientèle


Email / Courriel: [cisclients-scgclients@ec.gc.ca](mailto:cisclients-scgclients@ec.gc.ca)




Web site / Site web: <https://icweb1.cis.ec.gc.ca>

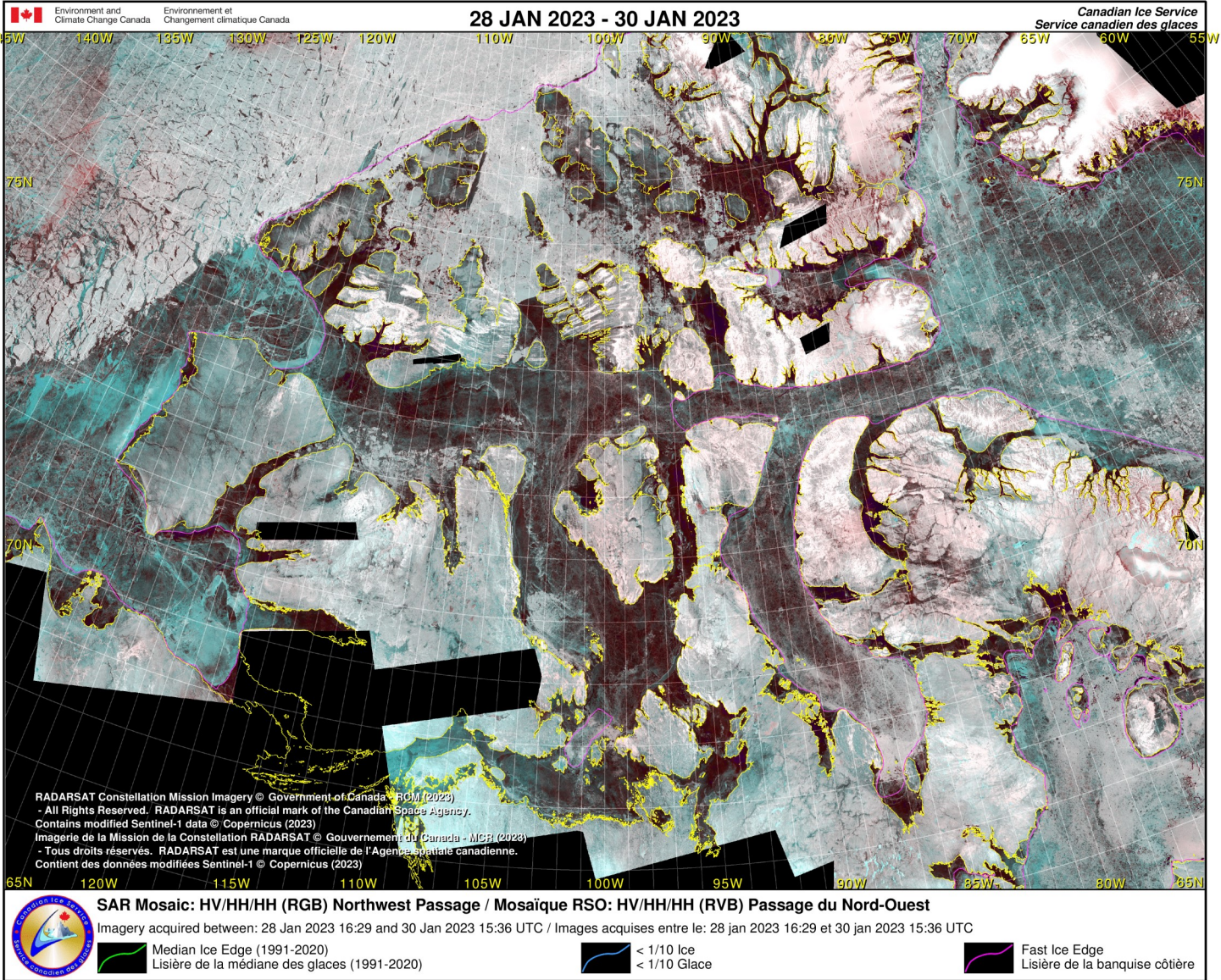




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**SAR Mosaic: HV/HH/HH (RGB) Canadian Arctic / Mosaïque RSO: HV/HH/HH (RVB) L'Arctique canadien**  
 Imagery acquired between: 28 Jan 2023 16:29 and 30 Jan 2023 15:36 UTC / Images acquises entre le: 28 jan 2023 16:29 et 30 jan 2023 15:36 UTC

 Median Ice Edge (1991-2020) Lisière de la médiane des glaces (1991-2020)	 < 1/10 Ice < 1/10 Glace	 Fast Ice Edge Lisière de la banquise côtière
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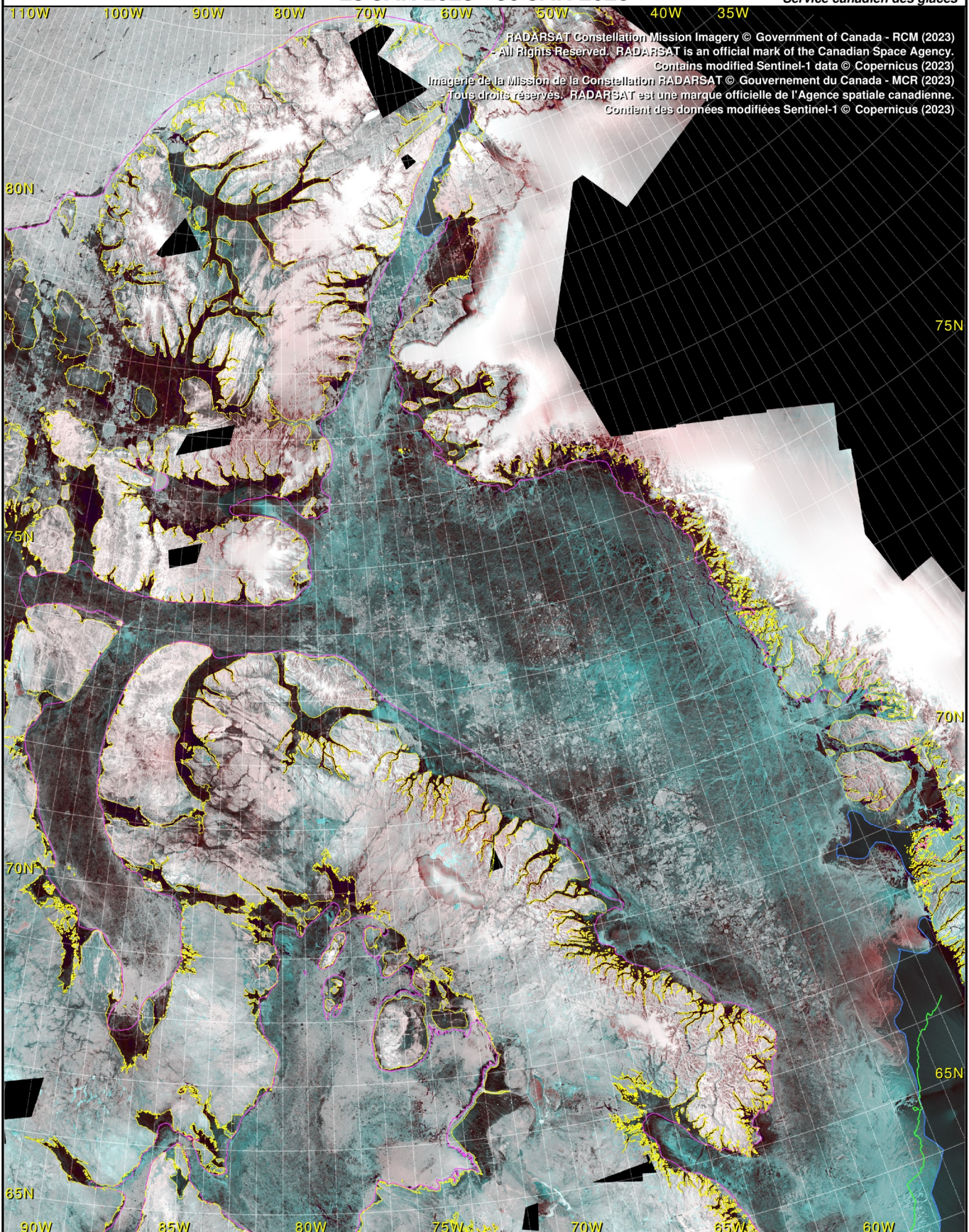


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28 JAN 2023 - 30 JAN 2023

Canadian Ice Service  
Service canadien des glaces



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SAR Mosaic: HV/HH/HH (RGB) Eastern Arctic / Mosaïque RSO: HV/HH/HH (RVB) Arctique de l'Est

Imagery acquired between: 28 Jan 2023 16:29 and 30 Jan 2023 15:36 UTC / Images acquises entre le: 28 jan 2023 16:29 et 30 jan 2023 15:36 UTC



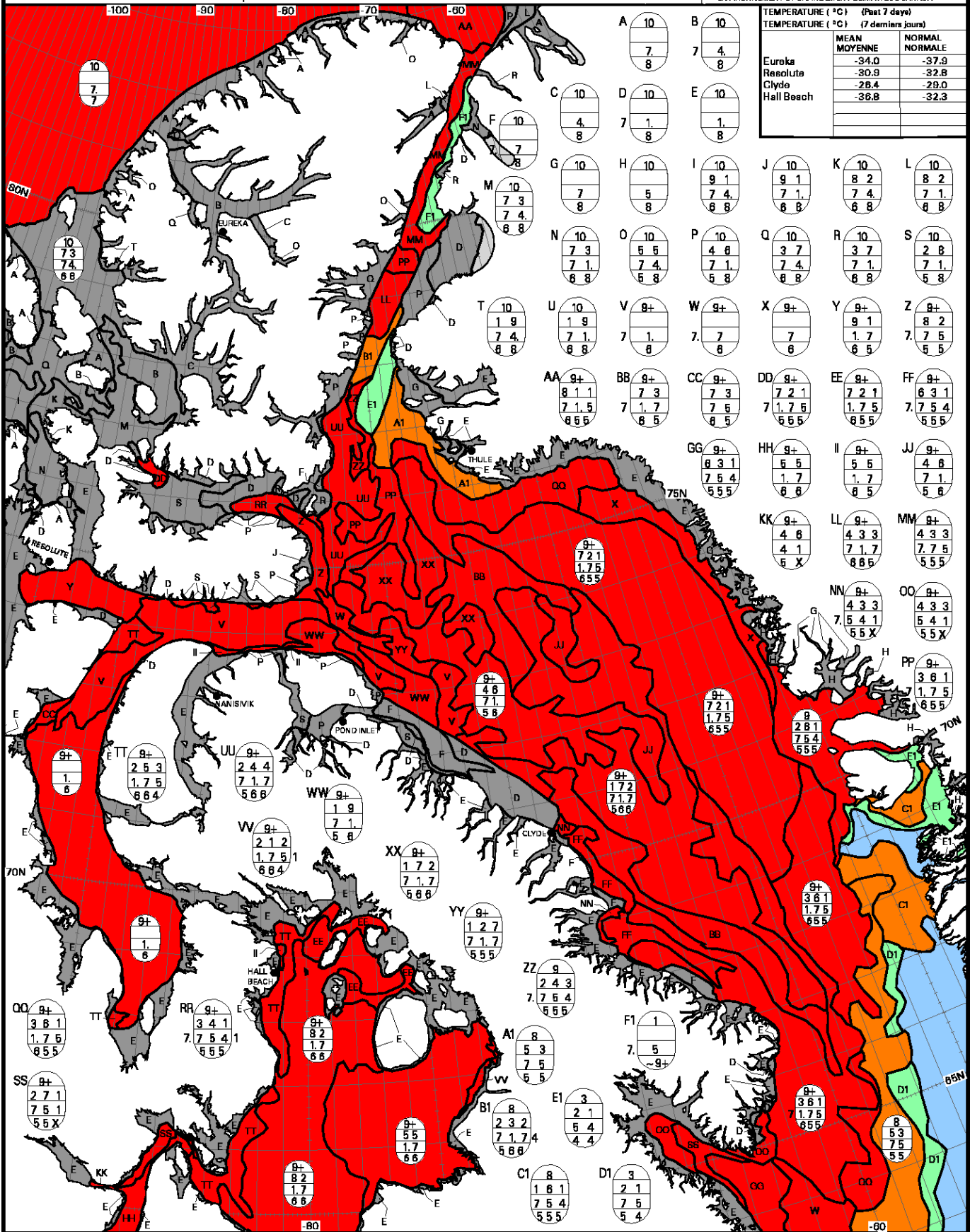
Median Ice Edge (1991-2020)  
Lisière de la médiane des glaces (1991-2020)



< 1/10 Ice  
< 1/10 Glace



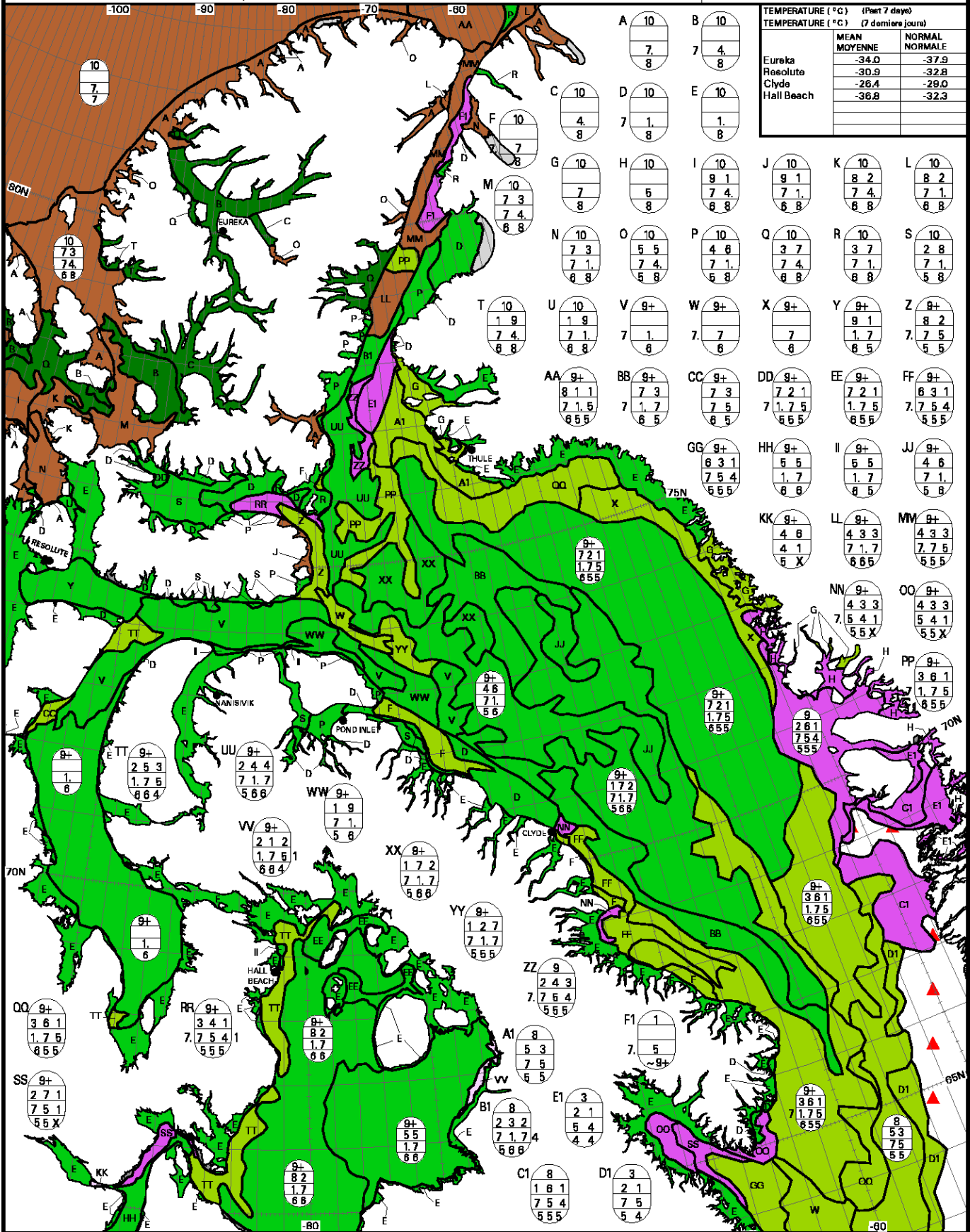
Fast Ice Edge  
Lisière de la banquise côtière



Legend for WMO Colour Code - Concentration and Code de couleurs de l'OMM - Concentration. Includes categories for Ice Free, < 1/10, 1-3/10, 4-6/10, 7-8/10, 9-10/10, New Ice, Nilas/Grey Ice, Fast Ice, Ice Shelf, and Undefined.



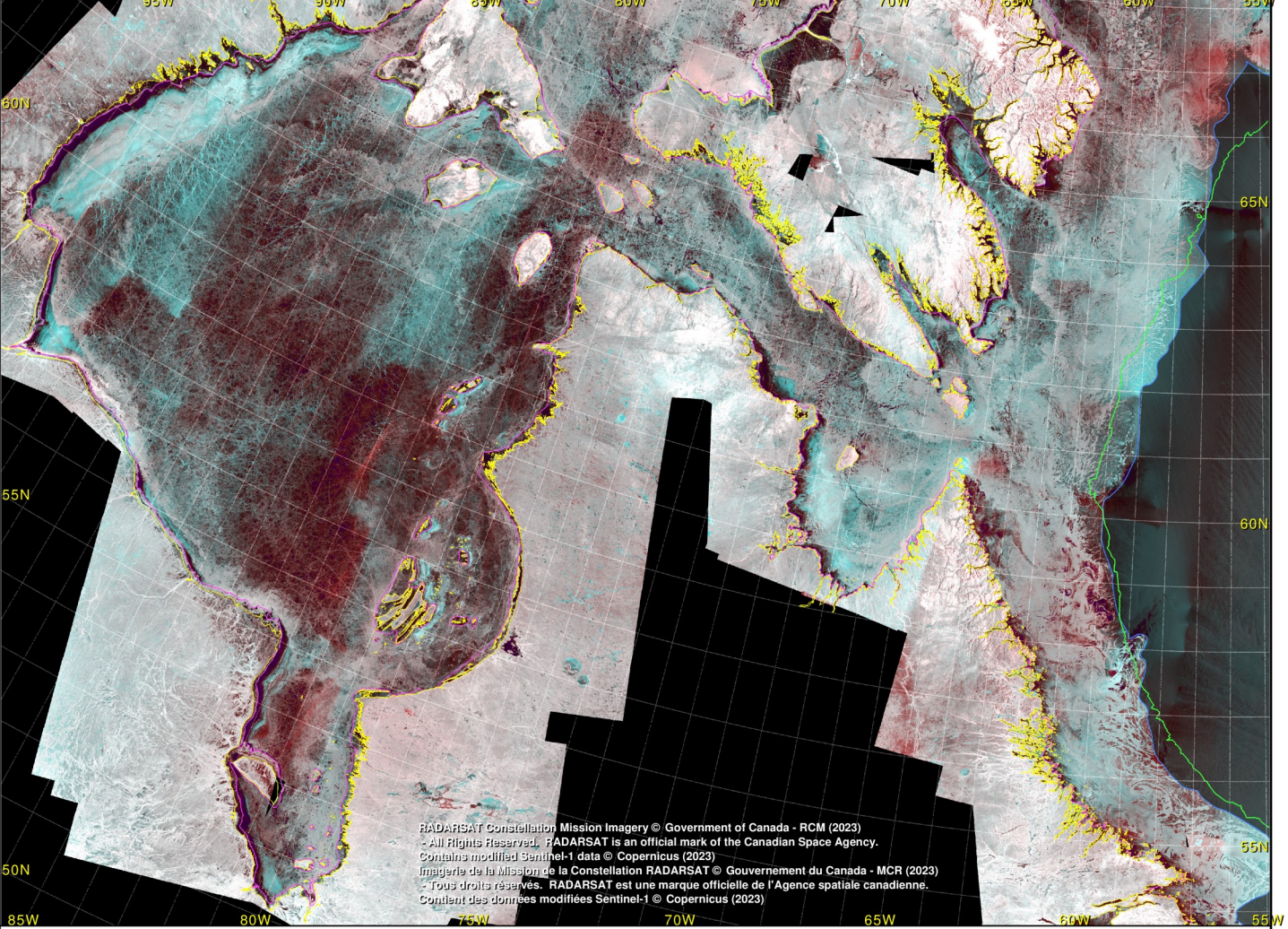
	TEMPERATURE (°C) (Past 7 days)	
	MEAN MOYENNE	NORMAL NORMALE
Eureka	-34.0	-37.9
Resolute	-30.9	-32.8
Clyde	-26.4	-29.0
Hall Beach	-36.8	-32.3



WMO Colour Code - Stage of Development




Code de couleurs de l'OMM - Stade de formation

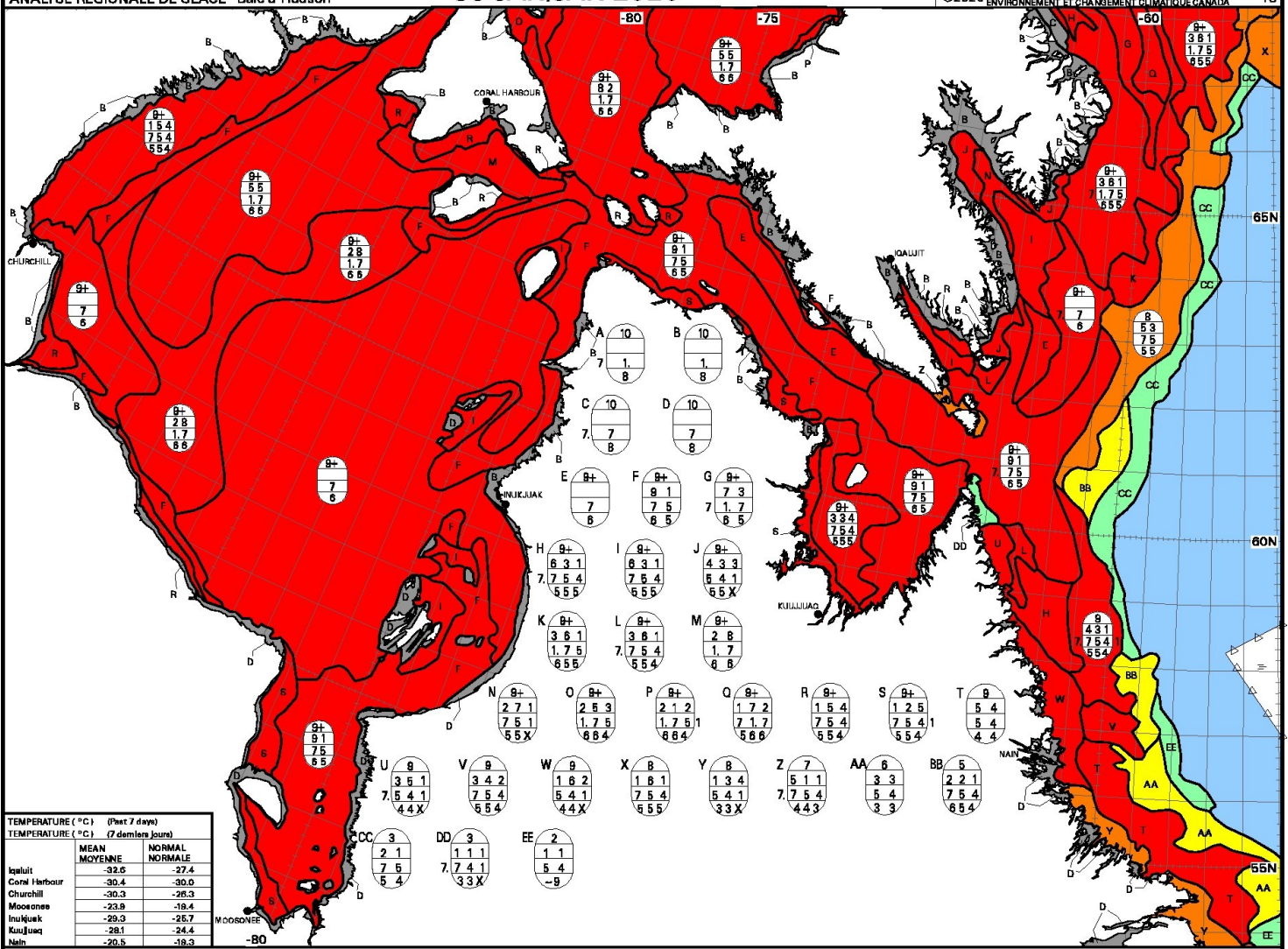
Ice Free Libre de glace	New Nouvelle	Grey-white Blanchâtre	Thin First-year Mince de premi ère année	Old ice Vieille glace	Undefined Fast Ice Indéfini Banquise à ôtrère
Open Water Eau Libre	Grey Grise	First-year Première année	Medium First-year Moyenne de premi ère année	Second-year Deuxième année	Ice Shelf Plateau de glace
Icebergs			Thick First-year Épaisse de premi ère année	Multi-year Plusieurs années	Undefined Indéterminée



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**SAR Mosaic: HV/HH/HH (RGB) Hudson Bay / Mosaïque RSO: HV/HH/HH (RVB) Baie d'Hudson**  
 Imagery acquired between: 28 Jan 2023 16:29 and 30 Jan 2023 15:36 UTC / Images acquises entre le: 28 jan 2023 16:29 et 30 jan 2023 15:36 UTC

 Median Ice Edge (1991-2020) Lisière de la médiane des glaces (1991-2020)	 < 1/10 Ice < 1/10 Glace	 Fast Ice Edge Lisière de la banquise côtière
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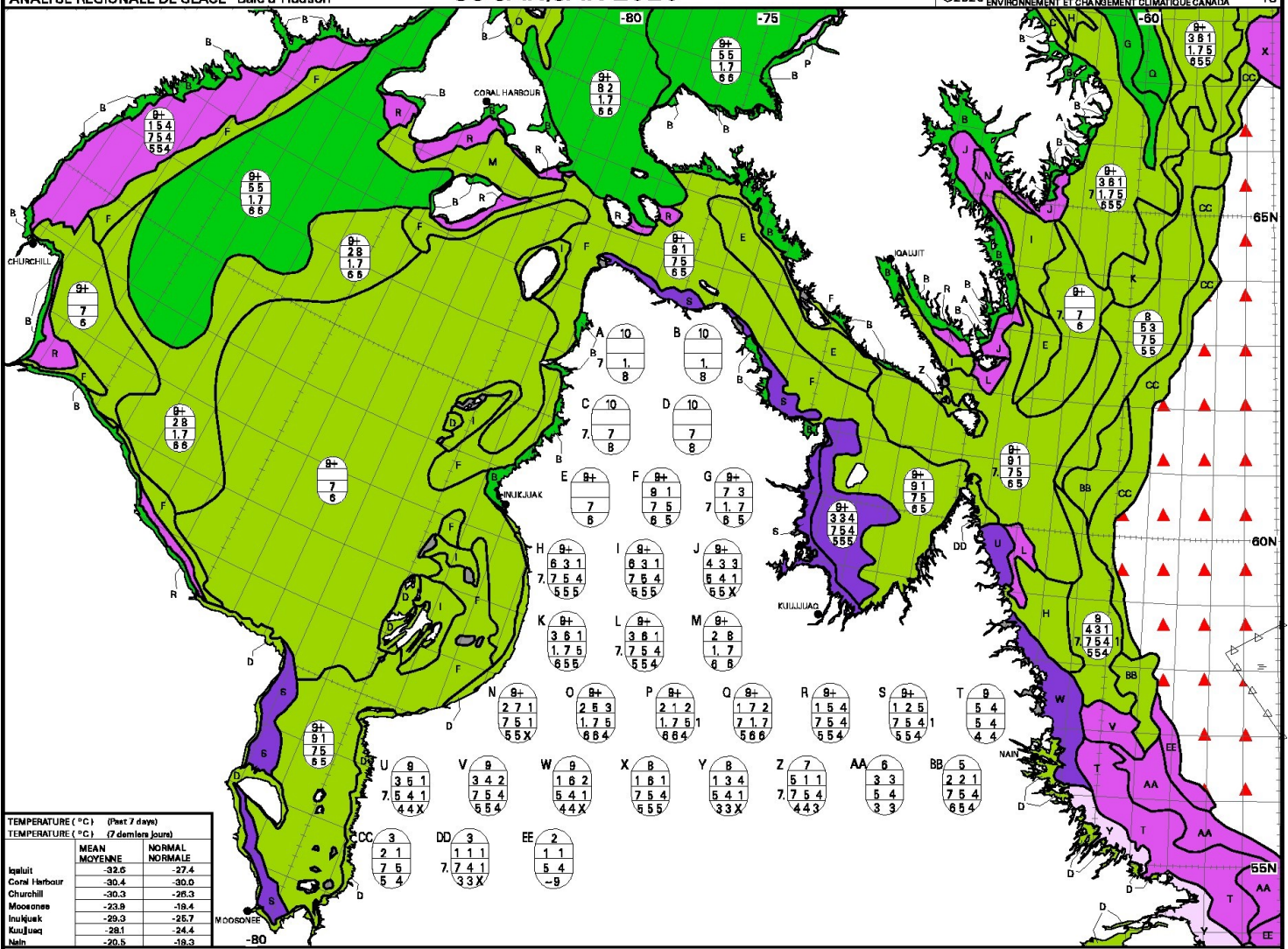
TEMPERATURE (°C) (Past 7 days)  
TEMPERATURE (°C) (7 derniers jours)

	MEAN MOYENNE	NORMAL NORMALE
Iqaluit	-32.6	-27.4
Coral Harbour	-30.4	-30.0
Churchill	-30.3	-28.3
Mooseonee	-23.9	-18.4
Inukjuak	-29.3	-26.7
Kuujuuaq	-28.1	-24.4
Nain	-20.5	-18.3

WMO Colour Code - Concentration

Code de couleurs de l'OMM - Concentration

- Ice Free  
Libre de glace
- 1-3/10
- 7-8/10
- Fast Ice  
Banquise côtière
- New Ice  
Nouvelle glace
- < 1/10
- 4-6/10
- 9-10/10
- Undefined  
Indéterminée
- Nilas/Grey Ice  
Nilas/glace grise



TEMPERATURE (°C) (Past 7 days)  
TEMPERATURE (°C) (7 derniers jours)

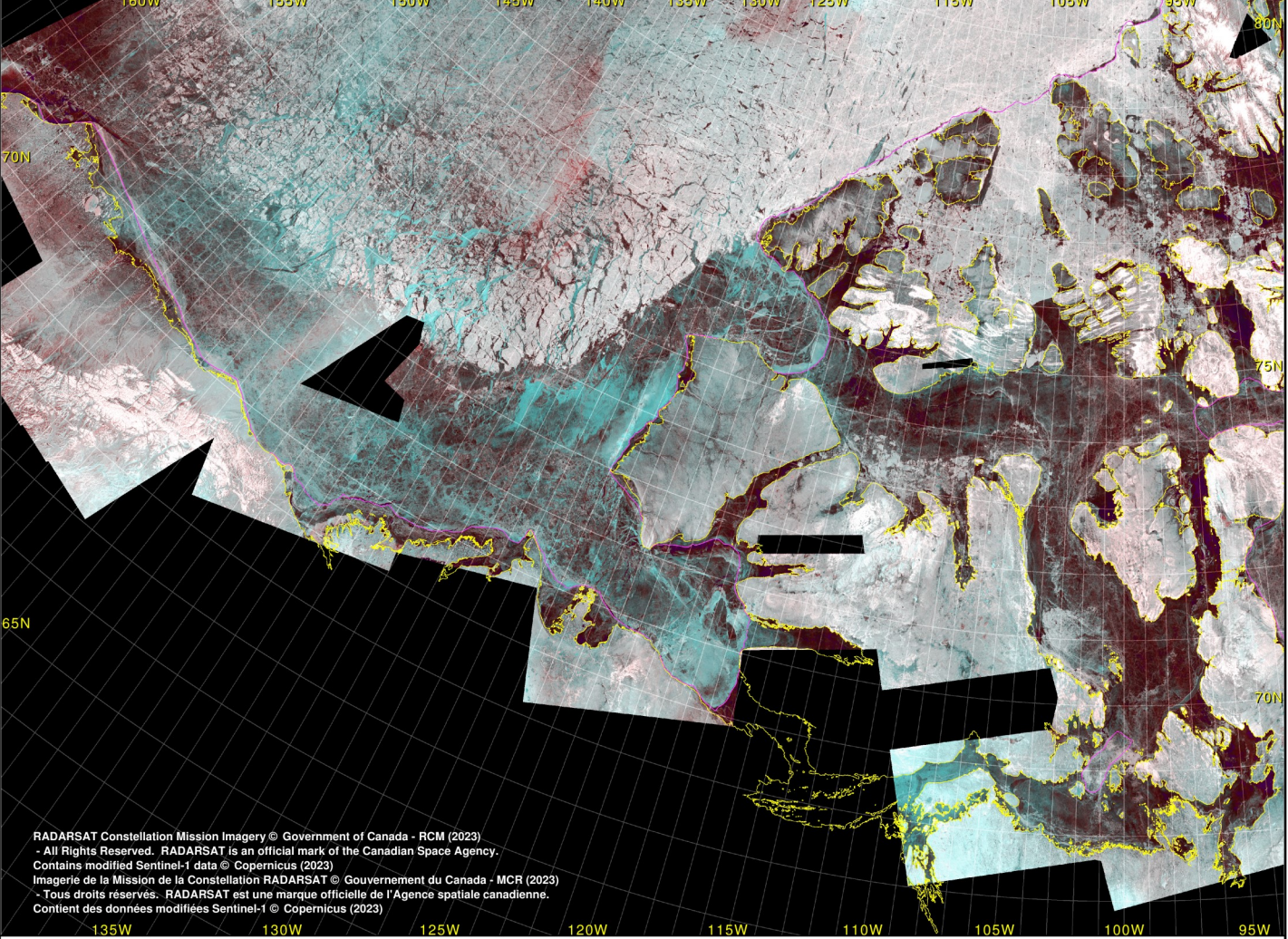
	MEAN MOYENNE	NORMAL NORMALE
Inukjuak	-32.6	-27.4
Coral Harbour	-30.4	-30.0
Churchill	-30.3	-28.3
Mooseonee	-23.9	-18.4
Inukjuak	-29.3	-26.7
Kuujuaq	-28.1	-24.4
Nain	-20.5	-18.3

WMO Colour Code - Stage of Development

	Ice Free Libre de glace		New Nouvelle		Grey-white Blanchâtre
	Open Water Eau Libre		Grey Gris		First-year Première année
	Iceberg				

Code de couleurs de l'OMM - Stade de formation

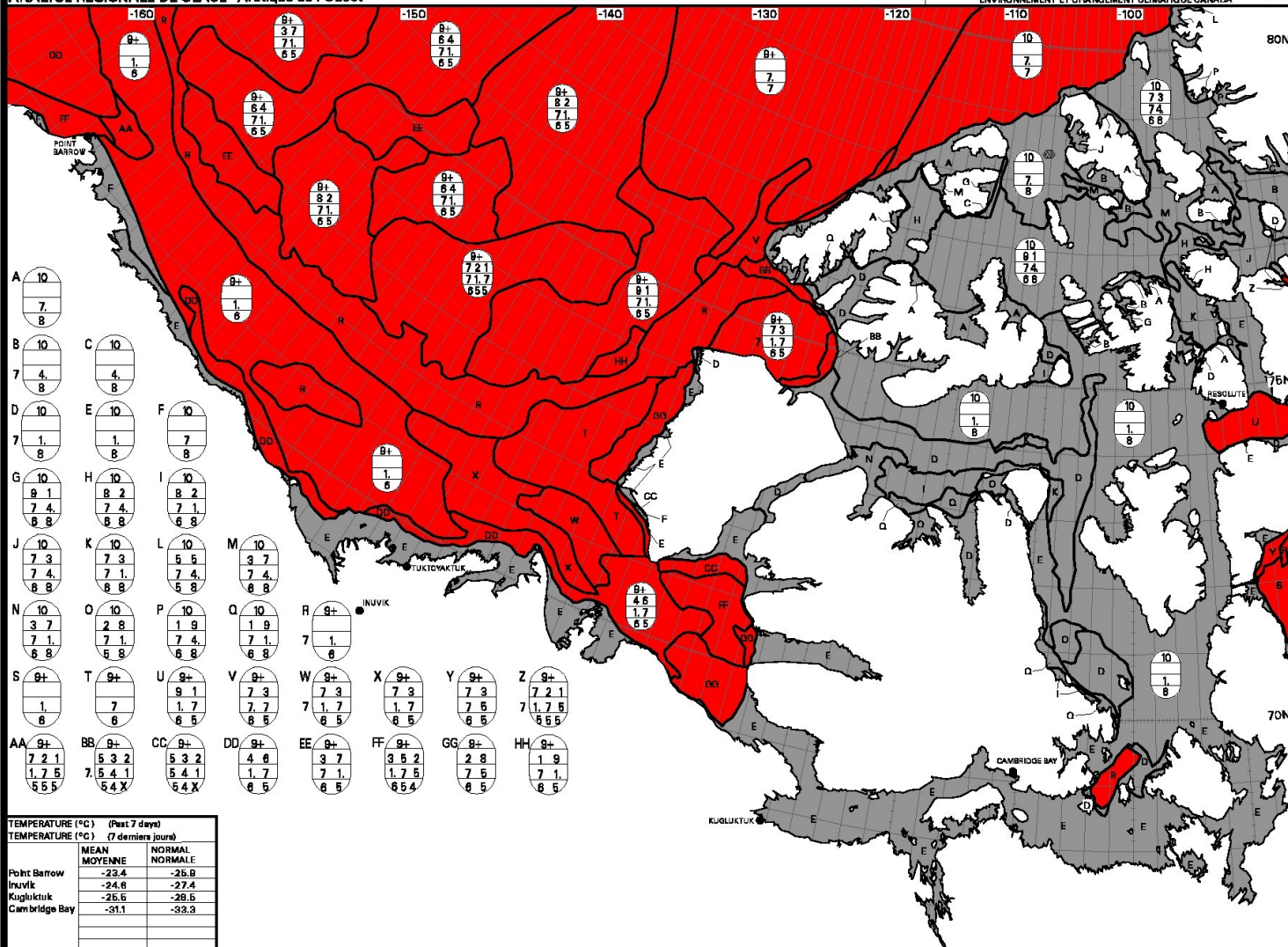
	Thin First-year Mince de première année		Old Ice Vieille glace		Undefined Fast Ice Indéfini Banquise c. 60 à 80
	Medium First-year Moyenne de première année		Second-year Deuxième année		Undefined Indéfini
	Thick First-year Épaisse de première année		Multi-year Plusieurs années		



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**SAR Mosaic: HV/HH/HH (RGB) Western Arctic / Mosaïque RSO: HV/HH/HH (RVB) Arctique de l'Ouest**  
 Imagery acquired between: 28 Jan 2023 16:29 and 30 Jan 2023 15:36 UTC / Images acquises entre le: 28 jan 2023 16:29 et 30 jan 2023 15:36 UTC

 Median Ice Edge (1991-2020) Lisière de la médiane des glaces (1991-2020)	 < 1/10 Ice < 1/10 Glace	 Fast Ice Edge Lisière de la banquise côtière
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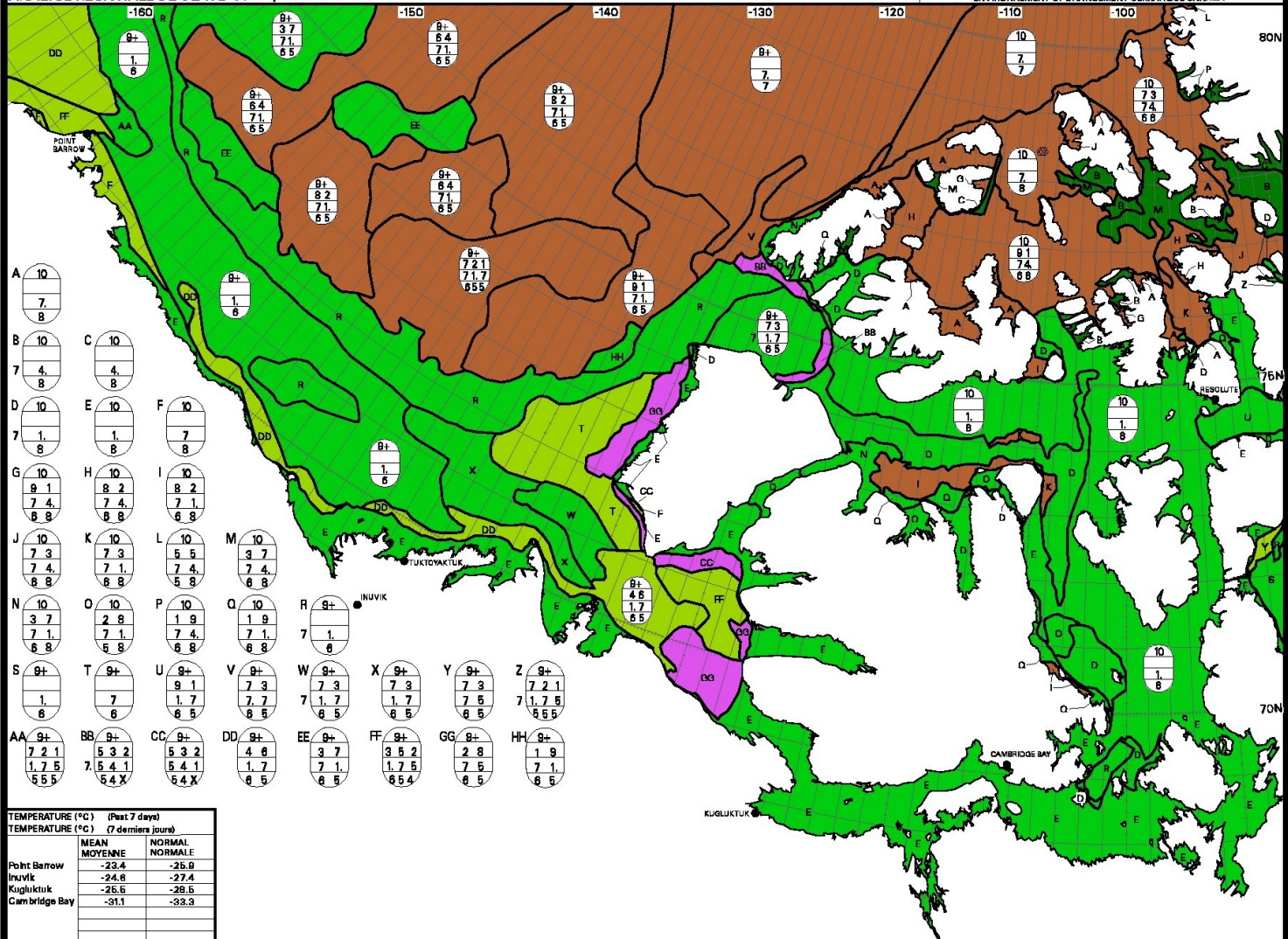


**WMO Colour Code - Concentration**

- Ice Free / Libre de glace
- < 1/10
- 1-3/10
- 4-6/10
- 7-8/10
- 9-10/10

**Code de couleurs de l'OMM - Concentration**

- New Ice / Nouvelle glace
- Nias/Grey Ice / Nias/glace grise
- Fast Ice / Banquise côtière
- Ice Shelf / Plateau de glace
- Undefined / Indéterminée



TEMPERATURE (°C) (Past 7 days)  
TEMPERATURE (°C) (7 derniers jours)

	MEAN MOYENNE	NORMAL NORMALE
Point Barrow	-23.4	-25.9
Inuvik	-24.6	-27.4
Kugluktuk	-25.6	-28.5
Cambridge Bay	-31.1	-32.3

WMO Colour Code - Stage of Development

Code de couleurs de l'OMM - Stade de formation

Ice Free Libre de glace	New Nouvelle	Grey-white Blanchâtre	Thin First-year Mince de première année	Old ice Vieille glace	Undefined First Ice Indéfini Banquise côtière
Open Water Eau Libre	Grey Grise	First-year Première année	Medium First-year Moyenne de première année	Second-year Deuxième année	Ice Shelf Plateau de glace
Icebergs			Thick First-year Épaisse de première année	Multi-year Plusieurs années	Undefined Indéfini