



Environment and
Climate Change Canada

Environnement et
Changement climatique Canada

2017

Annual Arctic

Ice Atlas

Winter 2016 – 2017



Canadian Ice Service
Le service canadien des glaces



Canada

Foreword

The 2016-2017 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 divided into three regions: Eastern Arctic (EA), Hudson Bay (HB) and Western Arctic (WA). A mosaic and a regional ice analysis are provided for each of these regions.

The mosaics are graphical depictions of ice conditions primarily 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-2 satellite. The data were captured between January 27th and January 30th, 2017.

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 which appear as areas of blue to purple in the mosaic. For all areas, the SAR data were captured at a resolution of 50 metres / pixel, the data were analyzed at approximately 100 metres / pixel and the published image mosaics were resampled to approximately 500 metres / 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: stage of development and total concentration. Both of these charts are provided for each of the above-mentioned three 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 page. 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), prepared by the CIS of ECCC.

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

The following contributions should be noted:

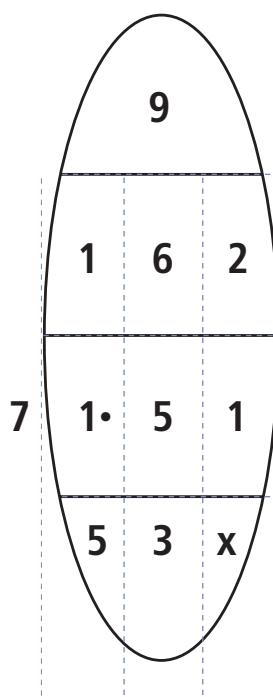
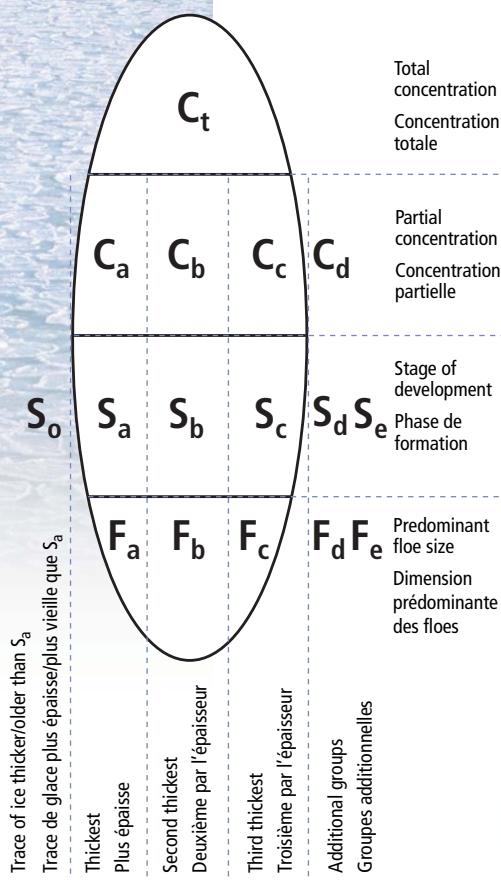
- Project Manager: Todd Collings
- RADARSAT data acquisition: Céline Fabi, Christine Generoux and Kathy Mateer
- Mosaic production and algorithm: Yi Luo
- Image analysis: Véronique Pinard (EA), Russell Hanright (HB), and Denis Dubé (WA)



SEA ICE SYMBOLS

SYMBOLES DE LA GLACE DE MER

2020



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 glace blanchâtre (5) et floes indéterminés, inconnus 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/SYMOLES DE LA GLACE DE MER



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)/ Glace en cordons (concentration = C)		CO C

X

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

Client Services/Service à la clientèle
Ottawa, Ontario
K1A 0H3



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

Web site/Site web: <https://www.canada.ca/en/environment-climate-change/services/ice-forecasts-observations.html>



SEA ICE SYMBOLS

SYMBOLS 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
	4-6/10		Undefined Non-définie
			Optional/Facultatif
			7/10 New Ice Nouvelle glace
			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
	Open Water Eau libre		First-Year Ice Glace de première année
			>= 30 cm
	New Ice Nouvelle glace		Thin First-Year Ice Glace mince de première année
	< 10 cm		30–70 cm
	Grey Ice Glace grise		Medium First-Year Ice Glace moyenne de première année
	10–15 cm		70–120 cm
			Second-Year Ice Glace de deuxième année
			Multi-Year Ice Glace de plusieurs années
			Icebergs

Colour is based on stage of development of predominant ice.

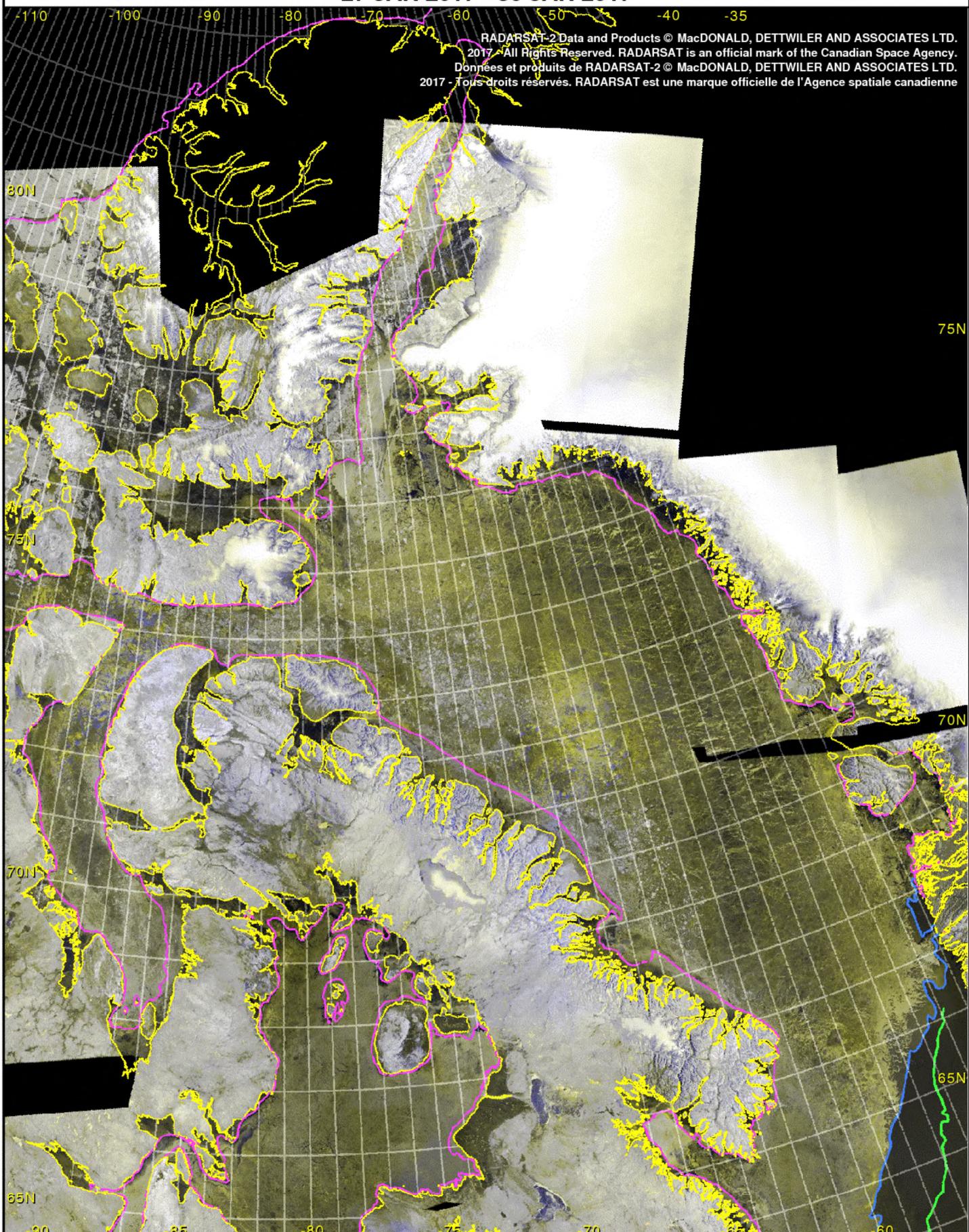
La couleur utilisée est établie en fonction du stade de développement de la glace prédominante.

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

Client Services/Service à la clientèle
Ottawa, Ontario
K1A 0H3

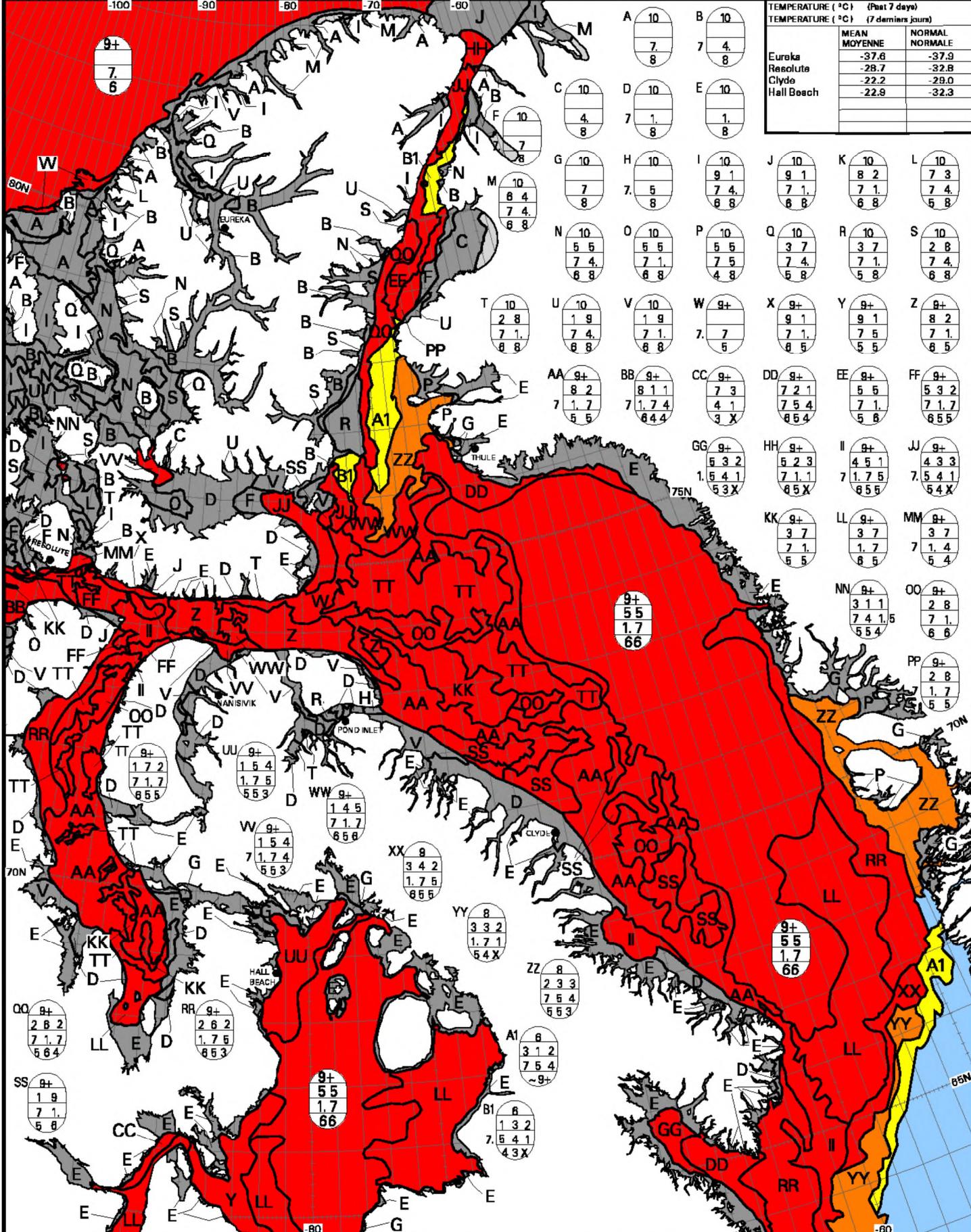
Email/Courriel: ec.cisclients-scgclients.ec@canada.ca
Web site/Site web: <https://www.canada.ca/en/environment-climate-change/services/ice-forecasts-observations.html>



27 JAN 2017 - 30 JAN 2017**RADARSAT HH-HV Mosaic: Eastern Arctic / Mosaïque de RADARSAT HH-HV: Arctique de l'Est**

Imagery acquired between: Jan 27, 2017 and Jan 30, 2017 / Images acquises entre le: 27 jan, 2017 et 30 jan, 2017

Median Ice Edge (1981-2010)
Limite médiane des glaces (1981-2010)<1/10 Ice
<1/10 GlaceFast Ice Edge
Lisière de la banquise côtière



WMO Colour Code - Concentration

 Ice Free
Libre de glace

1-3/10

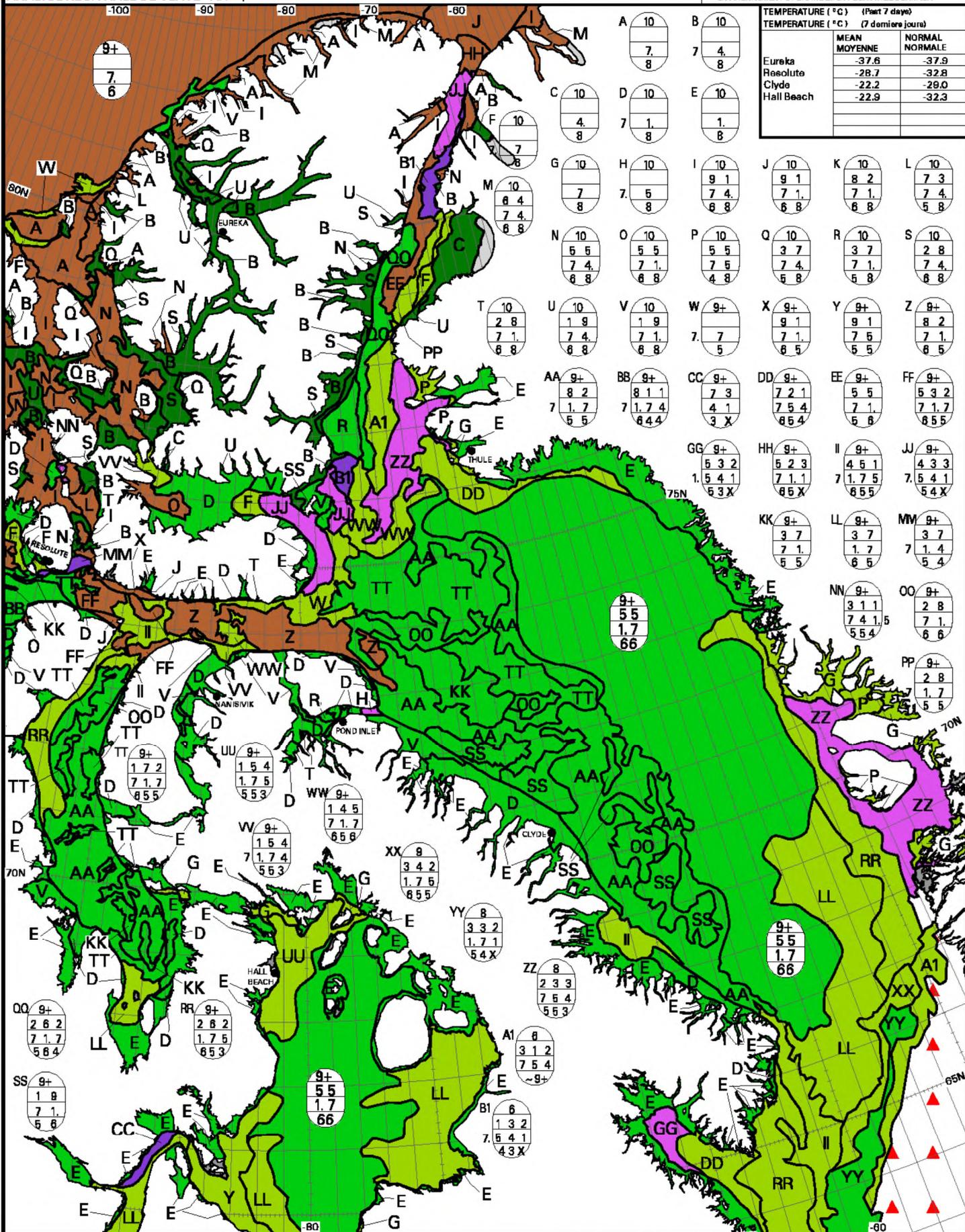
7-8/10

Code de couleurs de l'OMM - Concentration

 New Ice
Nouvelle glace

 Nilas/Gray Ice

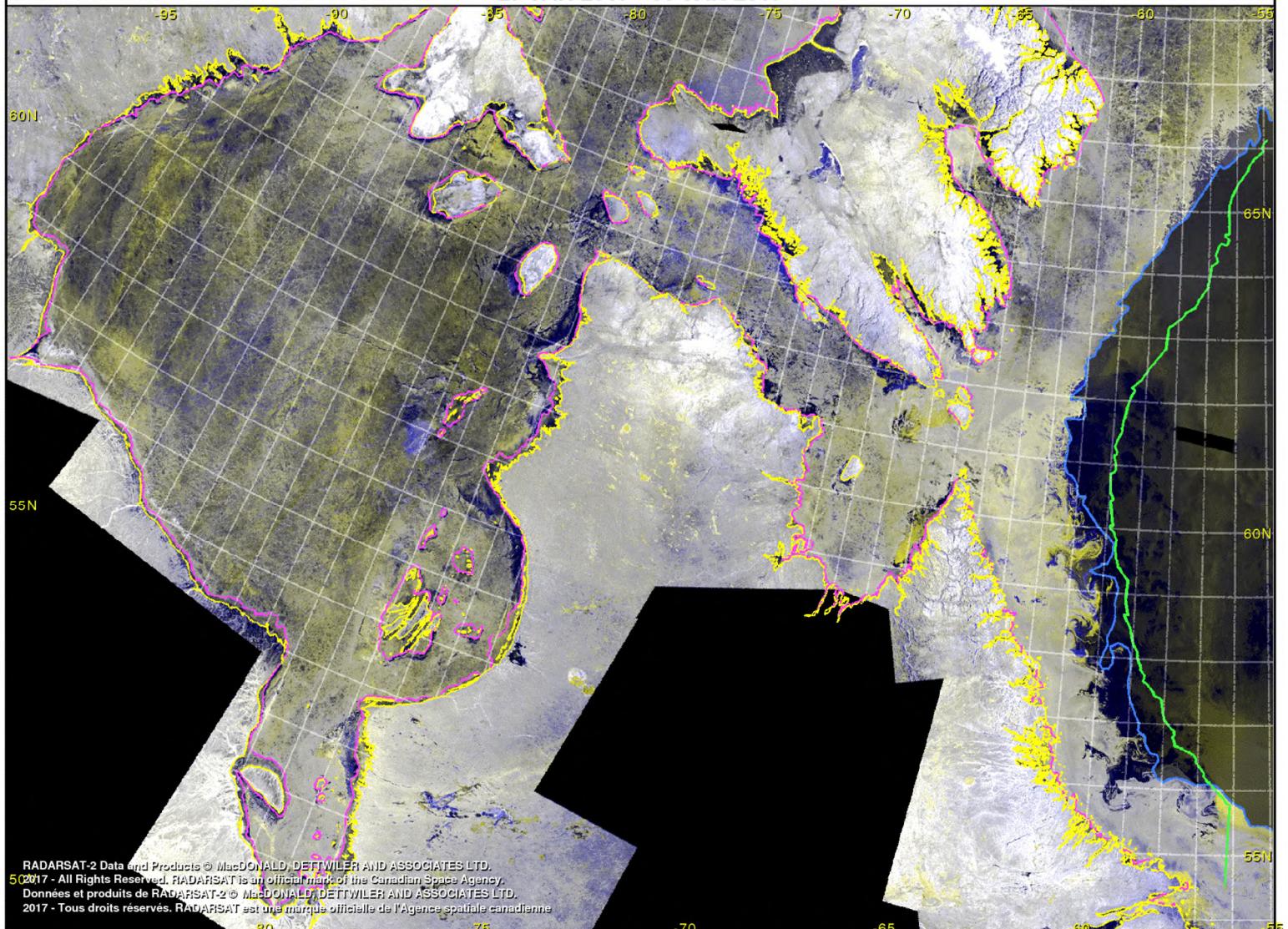
Façade glaciaire
Ice Shelf
Plateau de glace



WMO Colour Code - Stage of Development

Code de couleurs de l'OMM - Stade de formation

27 JAN 2017 - 30 JAN 2017



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RADARSAT HH-HV Mosaic: Hudson Bay / Mosaïque de RADARSAT HH-HV: Baie d'Hudson

Imagery acquired between: Jan 27, 2017 and Jan 30, 2017 / Images acquises entre le: 27 jan, 2017 et 30 jan, 2017

MDA

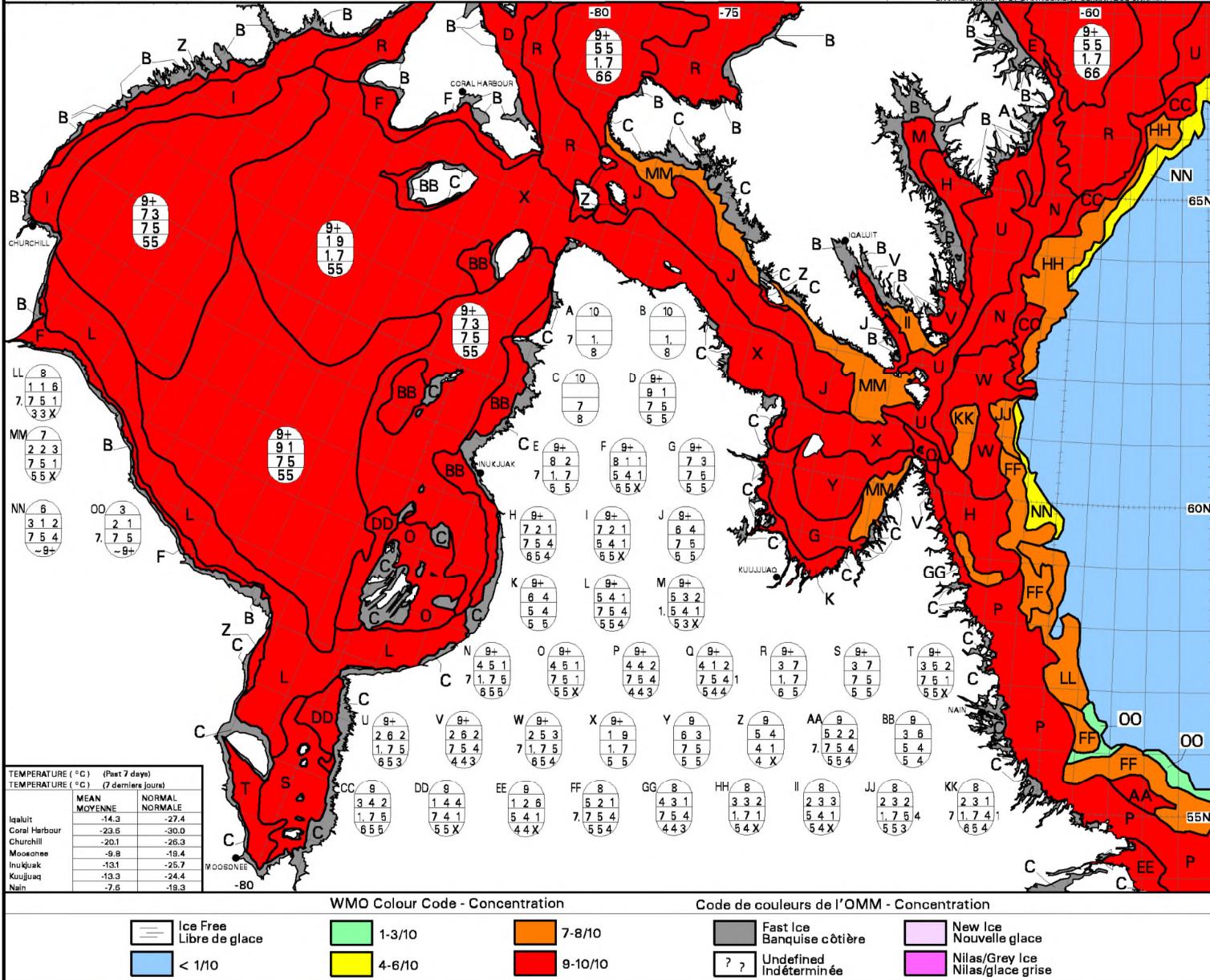


Median Ice Edge (1981-2010)
Limite médiane des glaces (1981-2010)

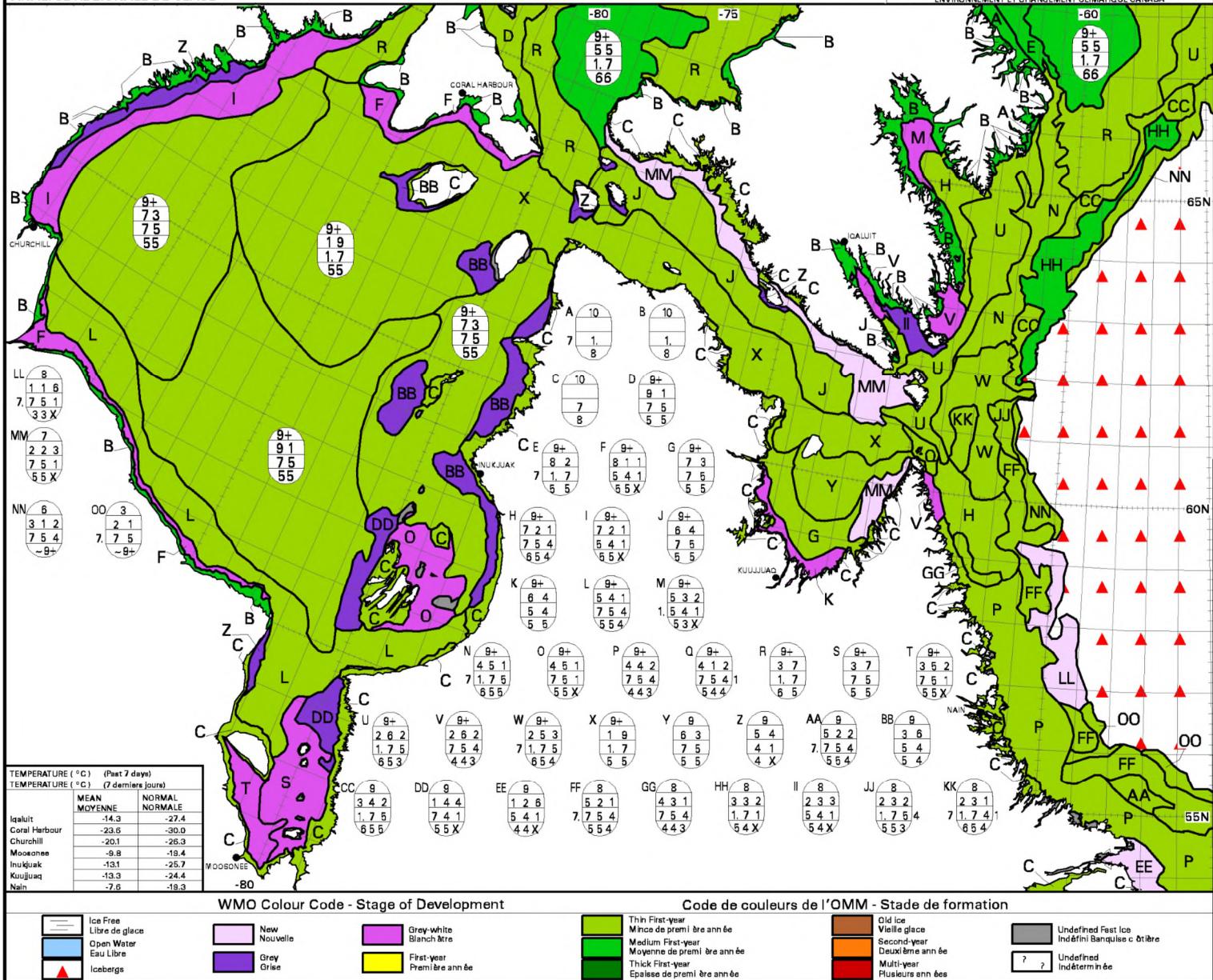
< 1/10 Ice
< 1/10 Glace

Fast Ice Edge
Lisière de la banquise côtière

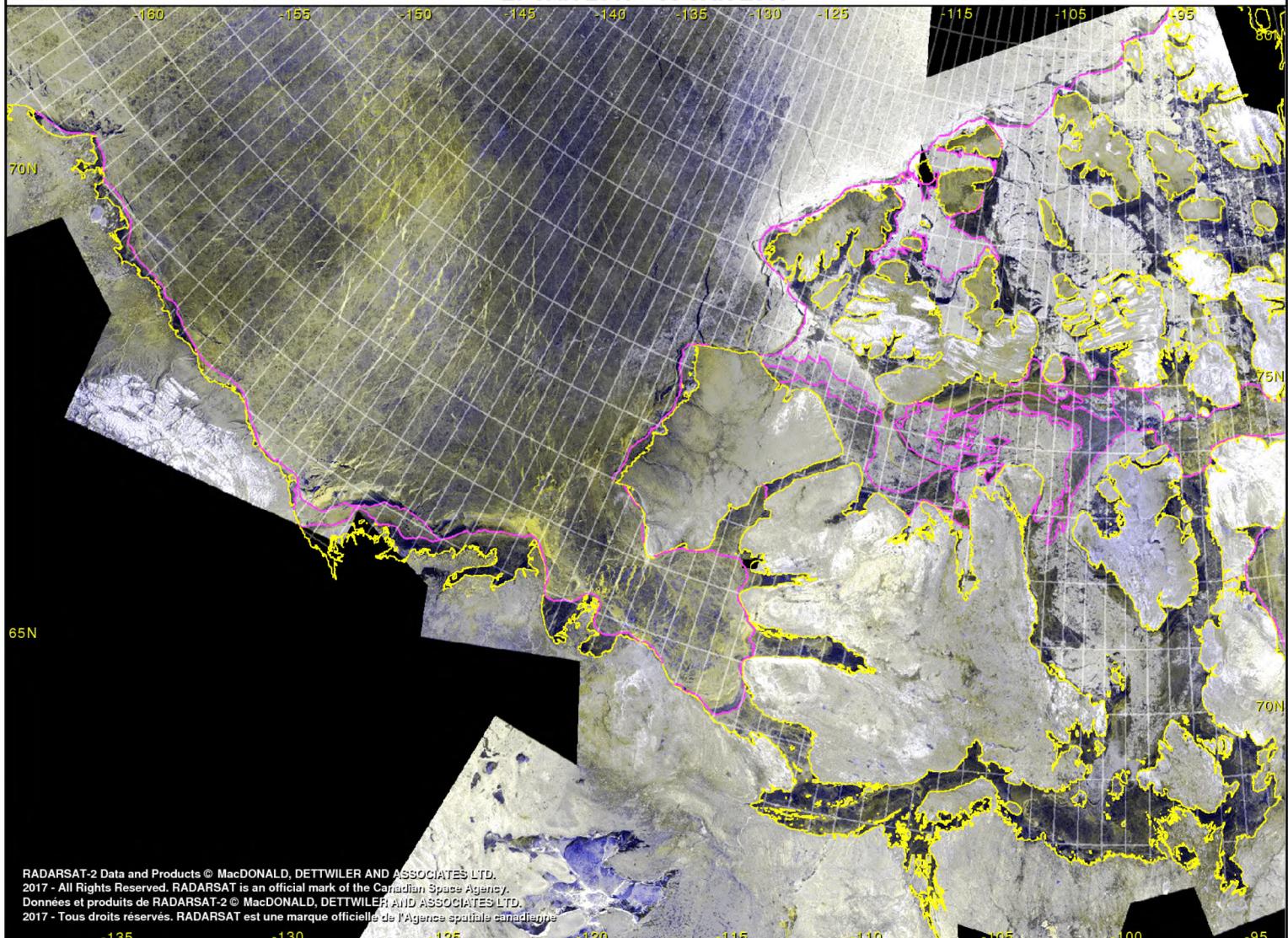
30 JAN/JAN 2017



30 JAN/JAN 2017



27 JAN 2017 - 30 JAN 2017



RADARSAT HH-HV Mosaic: Western Arctic / Mosaïque de RADARSAT HH-HV: Arctique de l'Ouest

Imagery acquired between: Jan 27, 2017 and Jan 30, 2017 / Images acquises entre le: 27 jan, 2017 et 30 jan, 2017

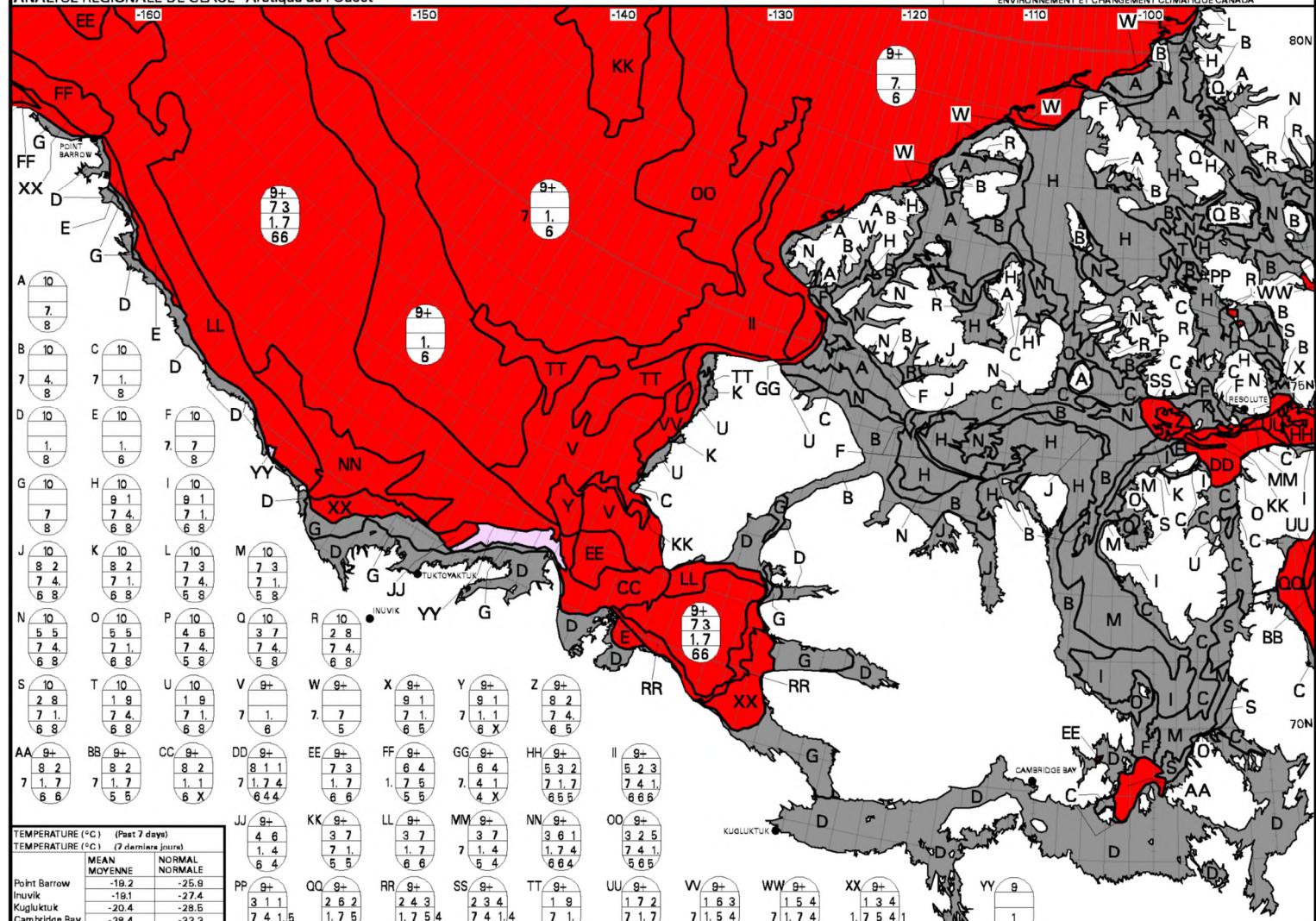


Median Ice Edge (1981-2010)
Limite médiane des glaces (1981-2010)

< 1/10 Ice
< 1/10 Glace

Fast Ice Edge
Lisière de la banquise côtière

30 JAN/JAN 2017



WMO Colour Code - Concentration



1-3/10	7-8/10
4-6/10	9-10/10

Code de couleurs de l'OMM - Concentration

New Ice Nouvelle glace	Fair Ice Bandeuse côtière
Nilas/Grey Ice Nilas/glace grise	Ice Shelf Plateau de glace

?	Undefindé Indéfinie
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