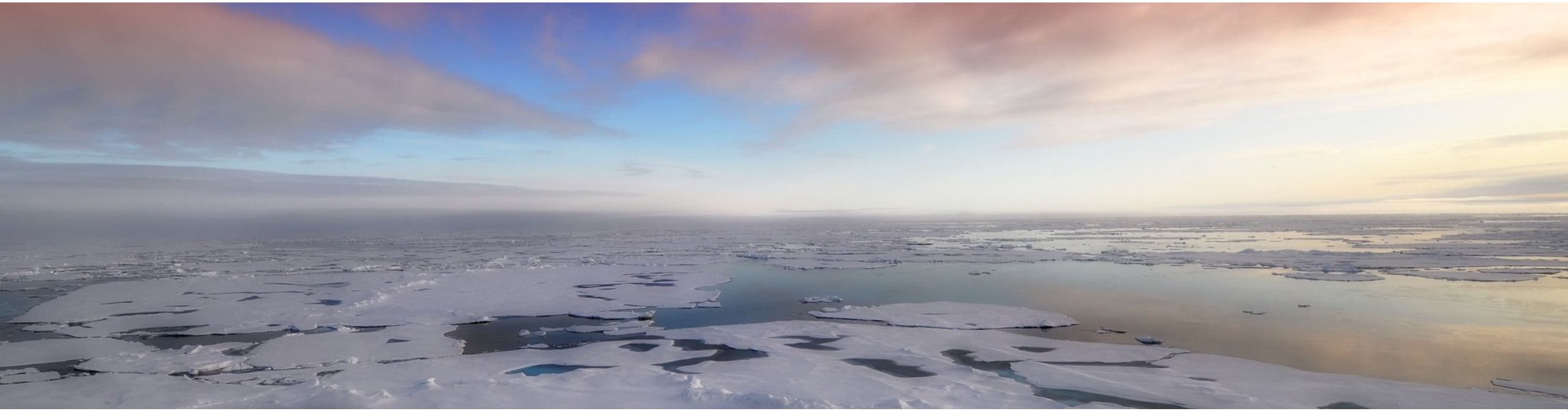
POOLPUZZEL WORKSHOP

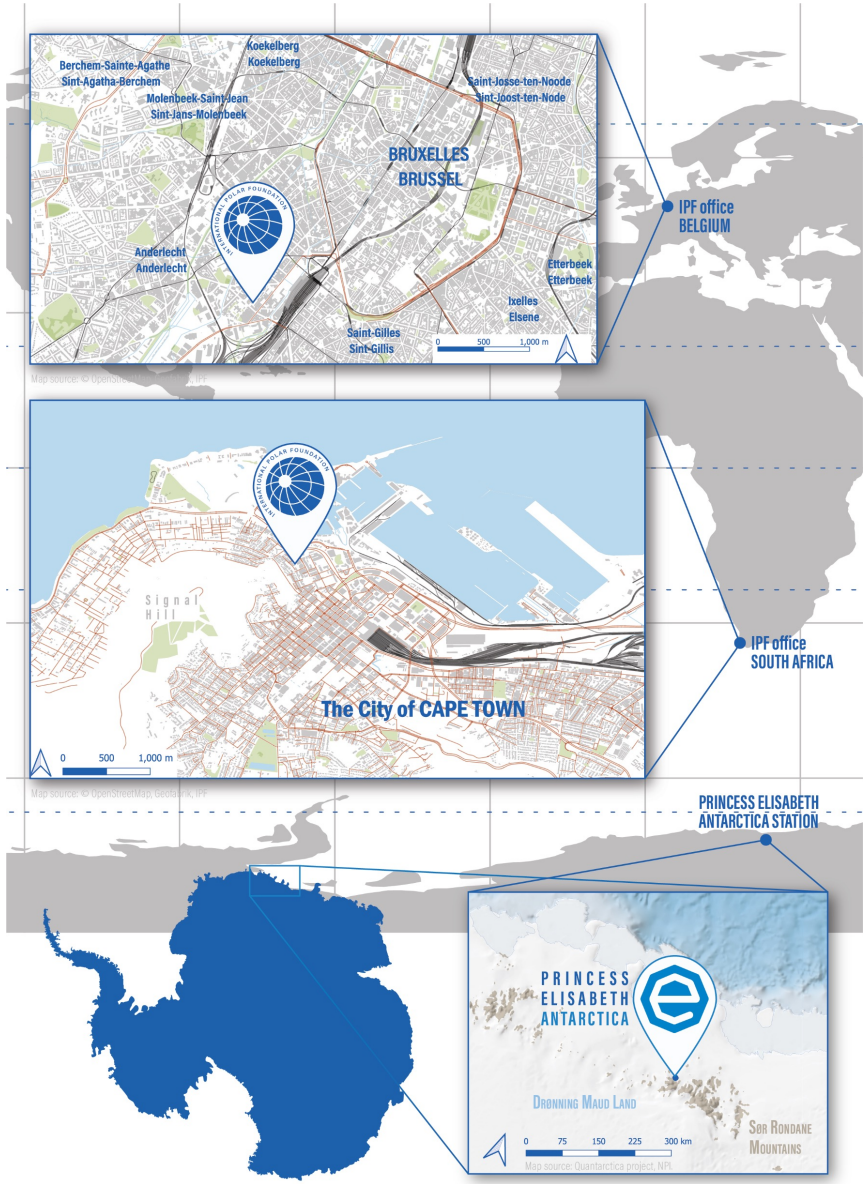
Mieke Sterken, International Polar Foundation



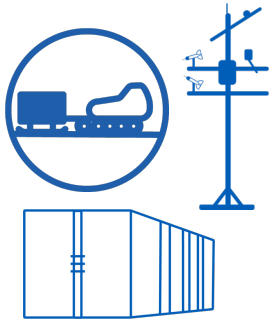
Zaterdag 25 maart, 2023

VLA-congres, AP Hogeschool Antwerpen

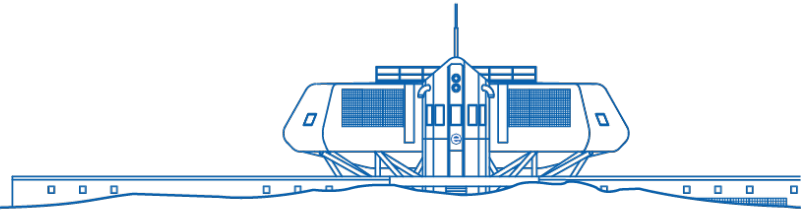
Wie zijn we?



- **ONDERSTEUNING van poolwetenschappen**

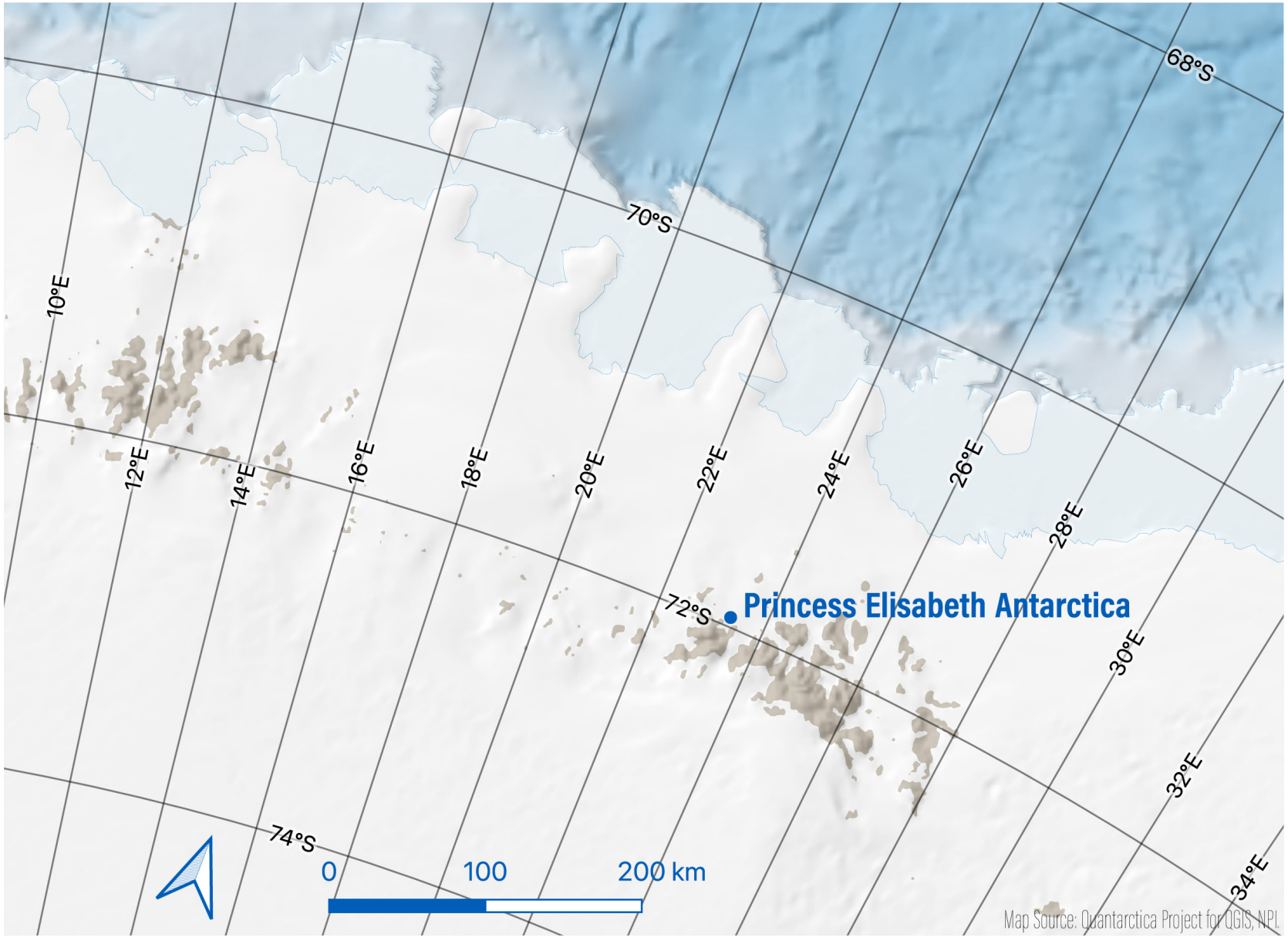


- **DEMONSTRATIE van duurzamer onderzoek**



- **EDUCATIE & outreach**

Wie zijn we?


68°S
70°S
72°S
74°S
10°E
12°E
14°E
16°E
18°E
20°E
22°E
24°E
26°E
28°E
30°E
32°E
34°E
Princess Elisabeth Antarctica
0
100
200 km
Map Source: Quantarctica Project for QGIS, NPI.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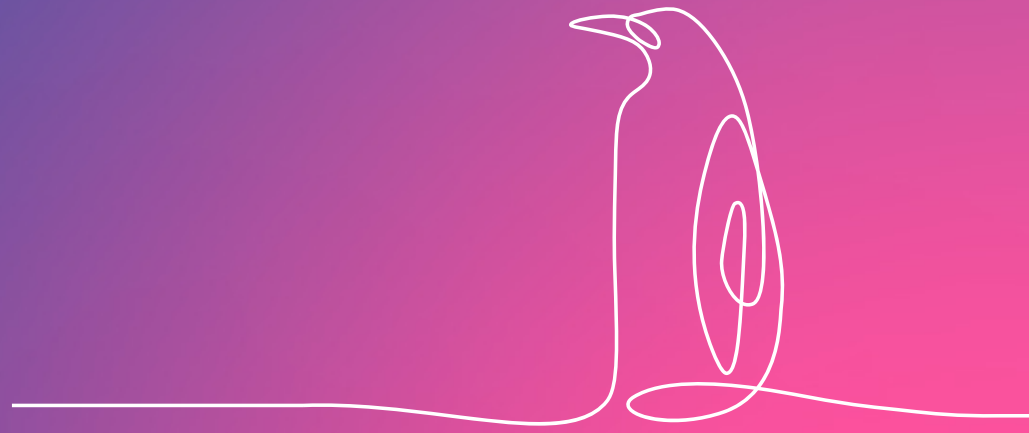
INTERNATIONAL POLAR FOUNDATION

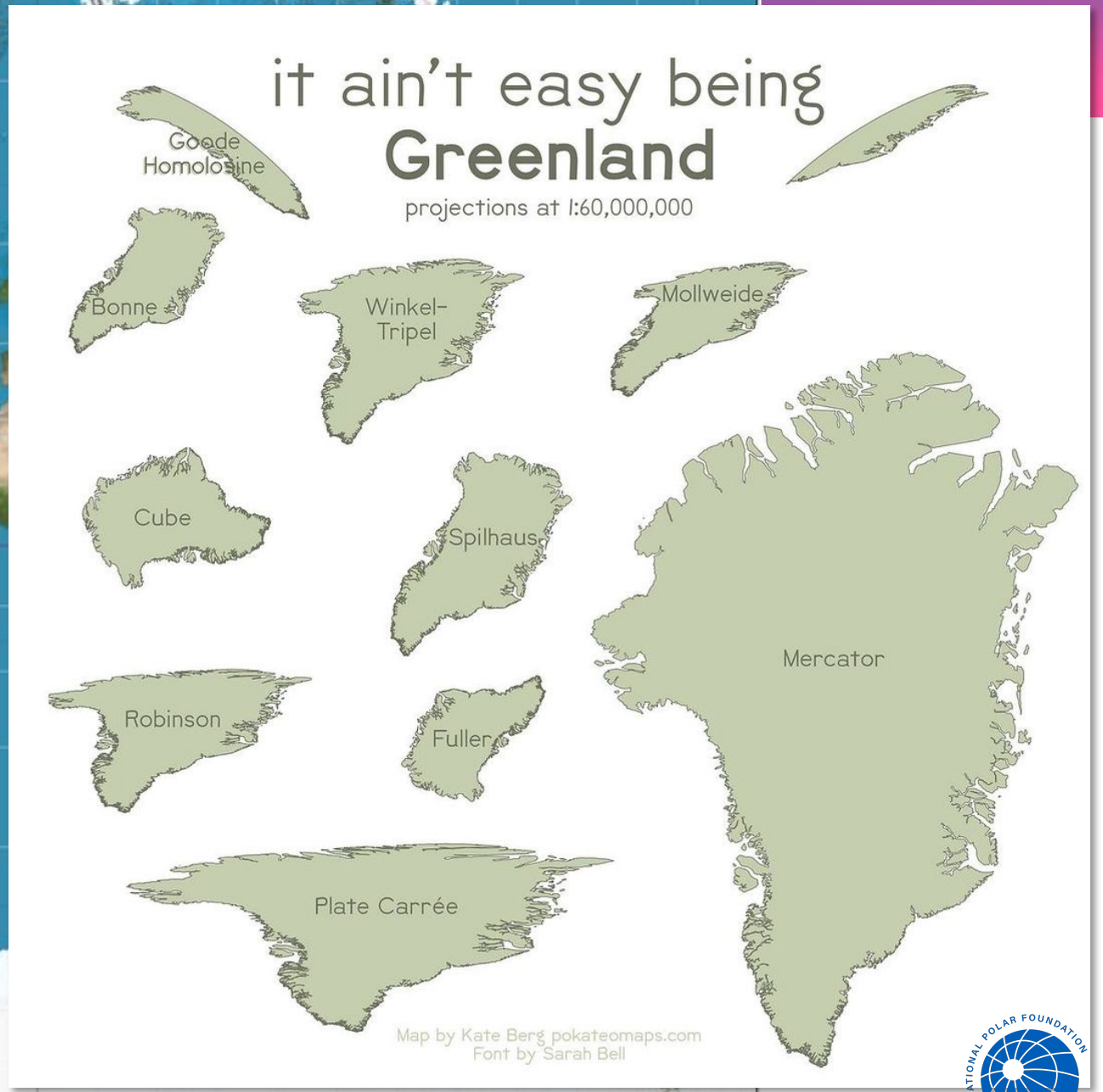
Deel I: Arctica – Antarctica : situering



Mercatorprojectie

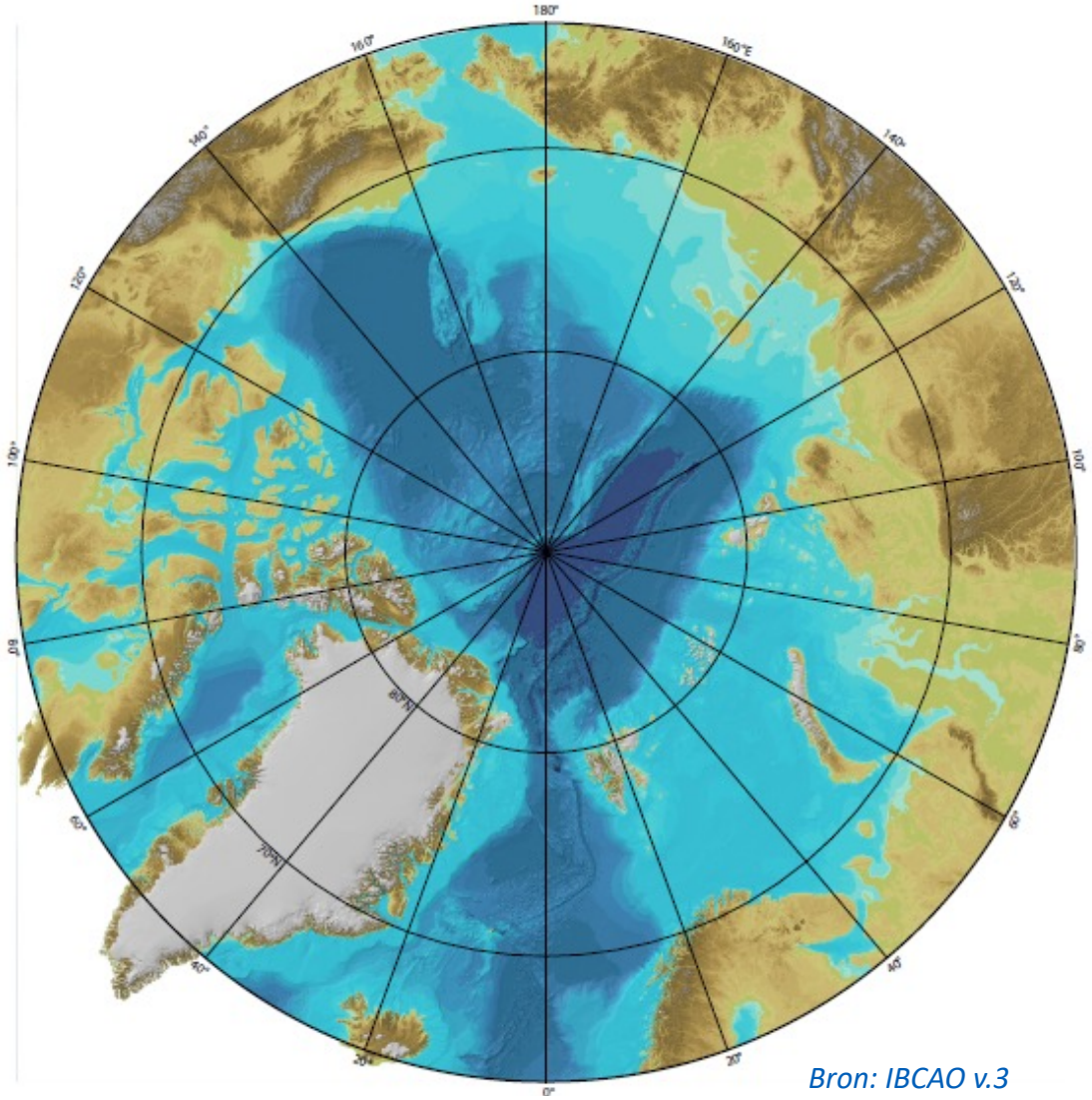
(*geen correcte weergave van de oppervlaktes: wegens projectie van een bol op een plat vlak –*

Antarctica en Groenland zien er veel te groot uit en hebben een andere vorm)

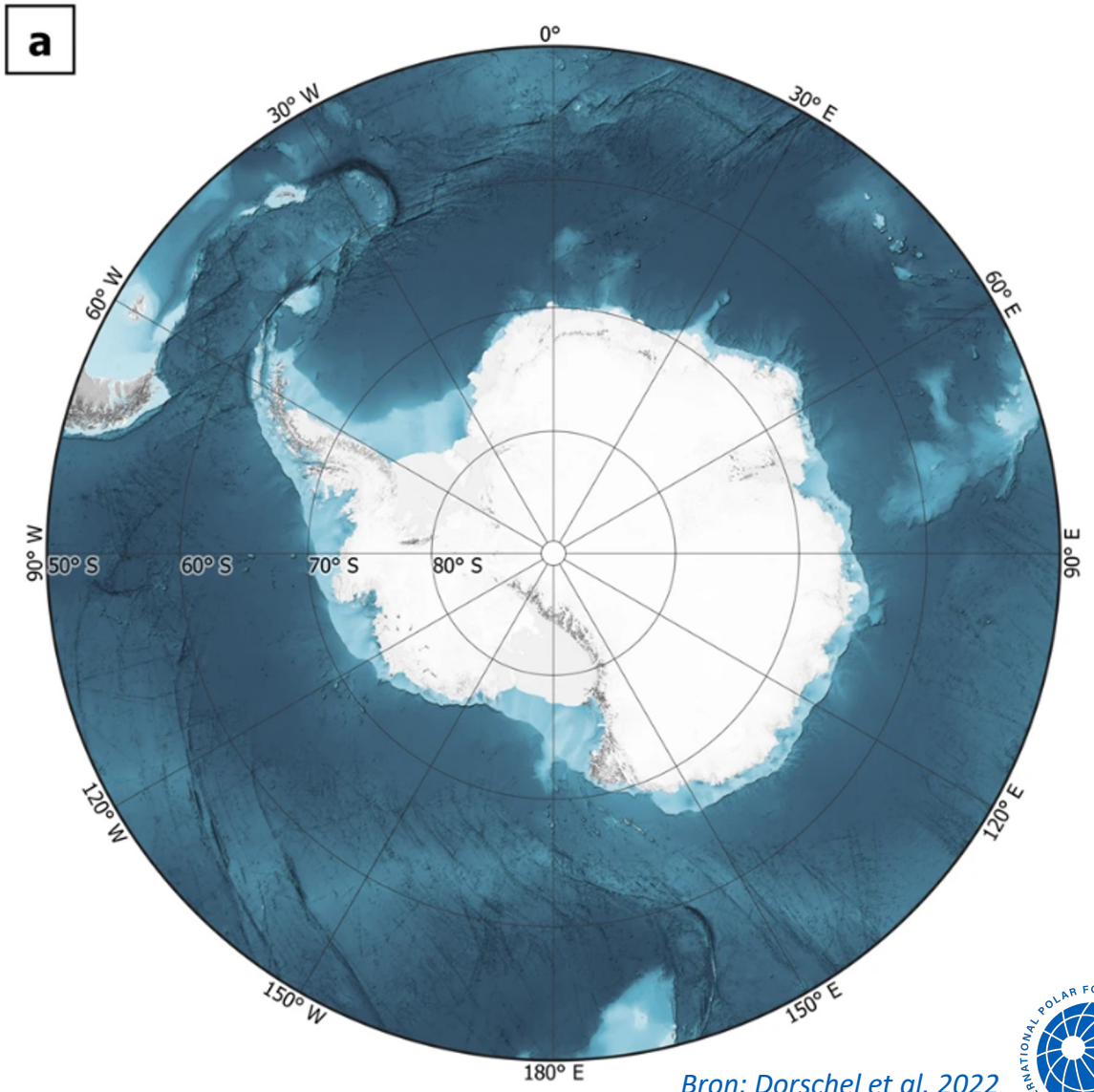


Bron kaart: CBCnews

Lokalisering



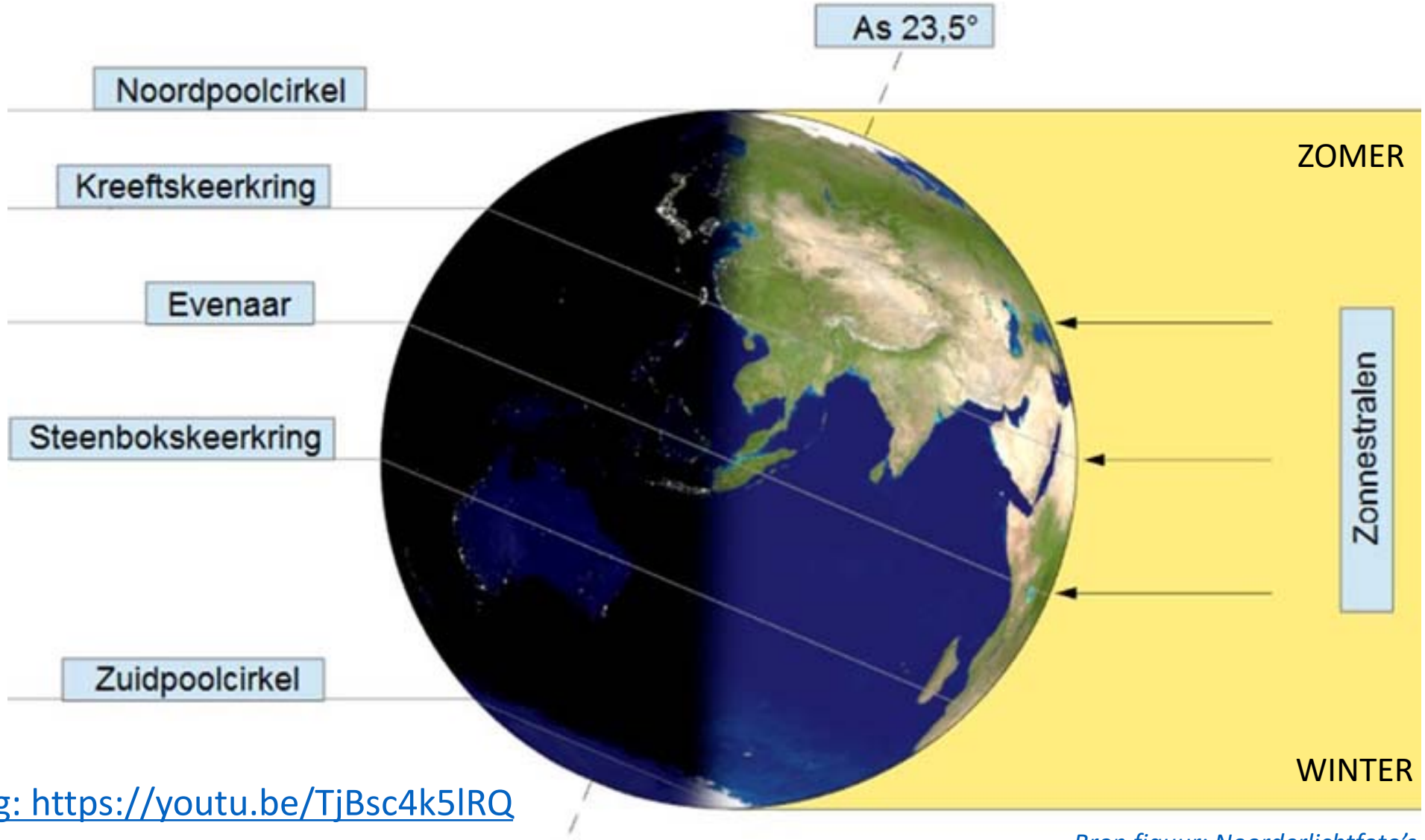
Bron: IBCAO v.3



Bron: Dorschel et al. 2022

Lokalisering: etymologie + seizoenen & dag-nacht variaties

Etymologie:
Arctica
Antarctica



[Meer uitleg: https://youtu.be/TjBsc4k5lRQ](https://youtu.be/TjBsc4k5lRQ)

Bron figuur: Noorderlichtfoto's

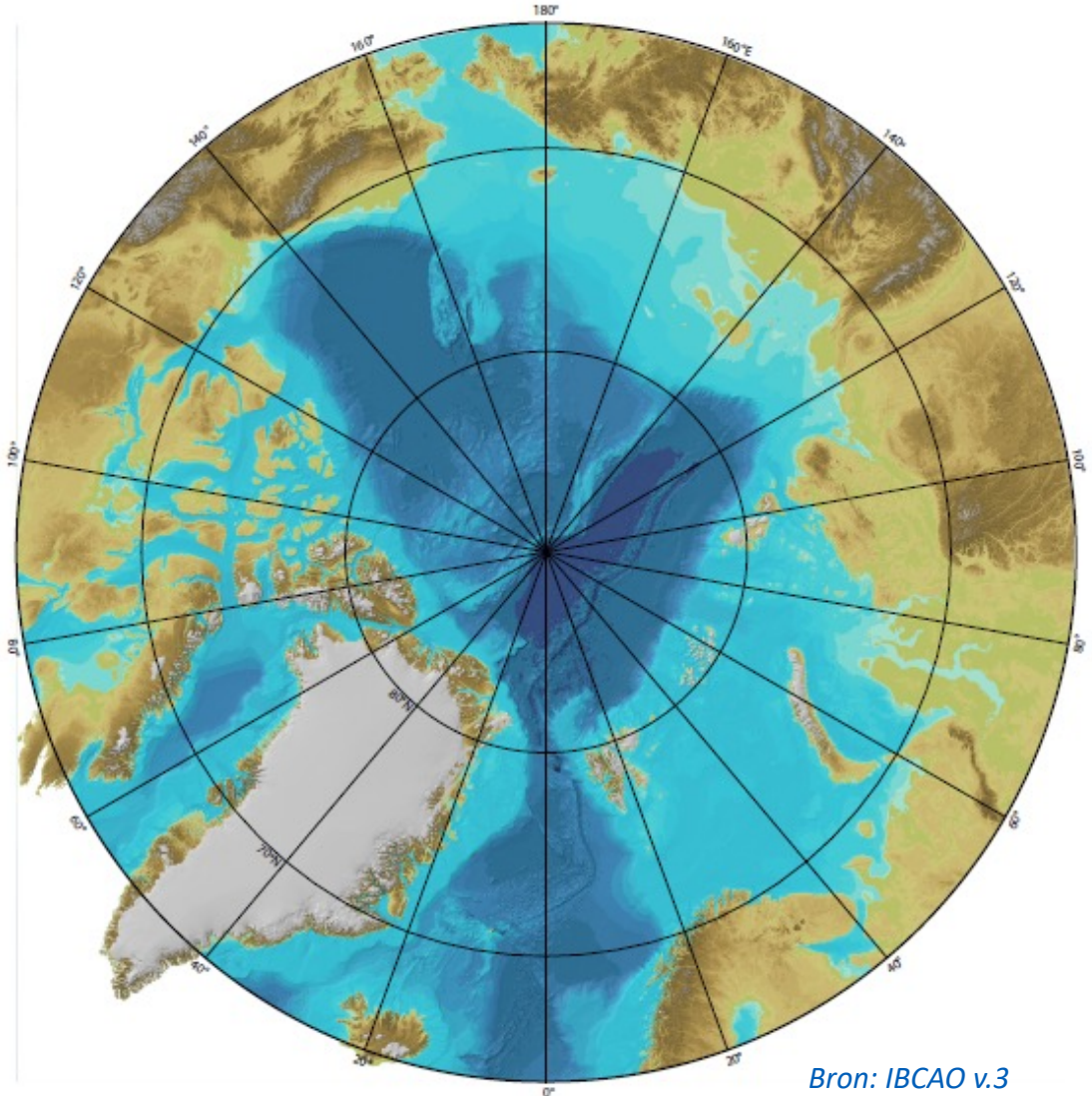
Lokalisering: etymologie + seizoenen & dag-nacht variaties

Poolnacht - Pooldag:
Ten noorden/zuiden van de poolcirkels
(66°33’ N & Z)

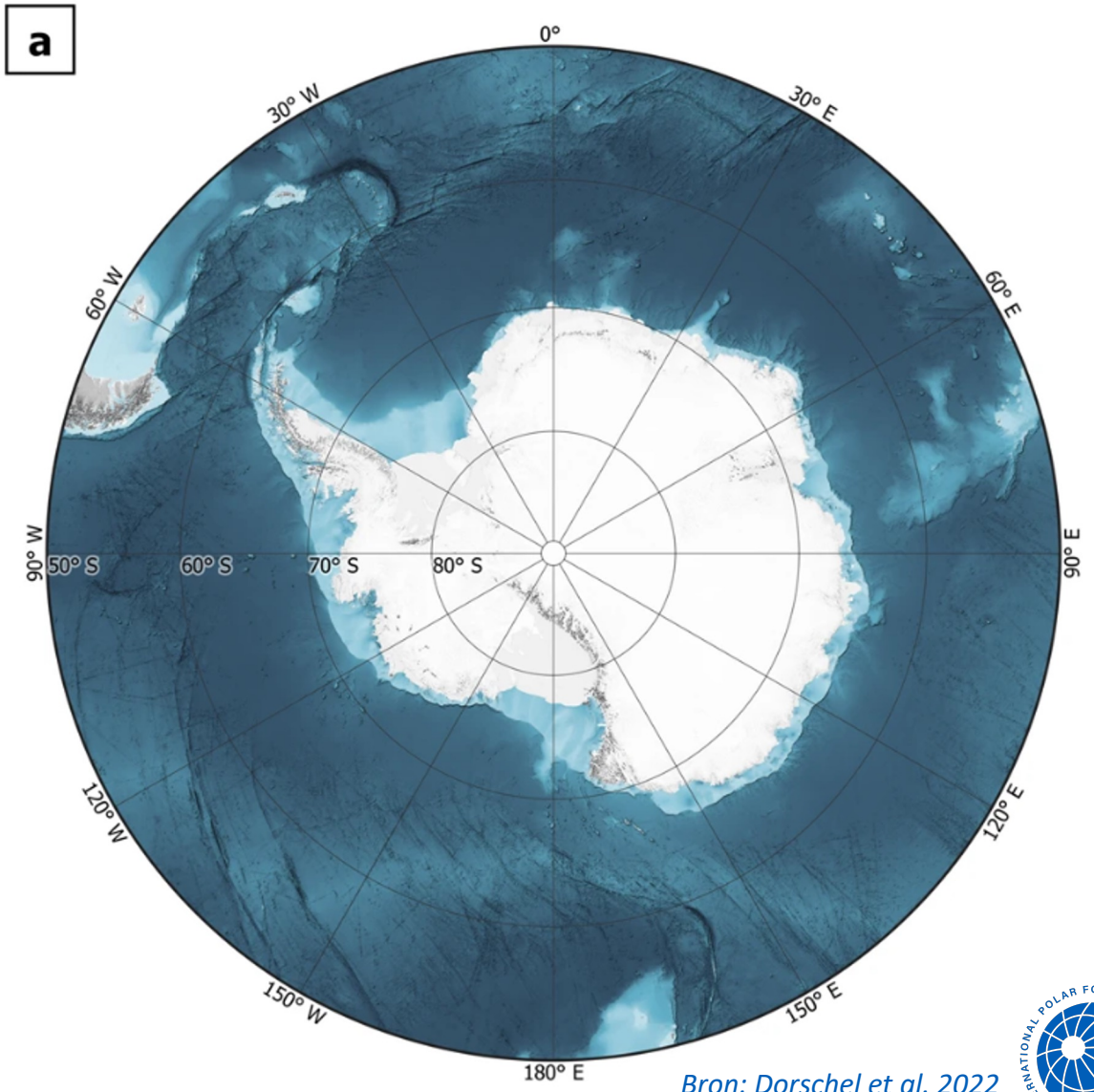
‘middernachtzon’

5 dagen timelapse aan PEA
februari 2023

Morfologie

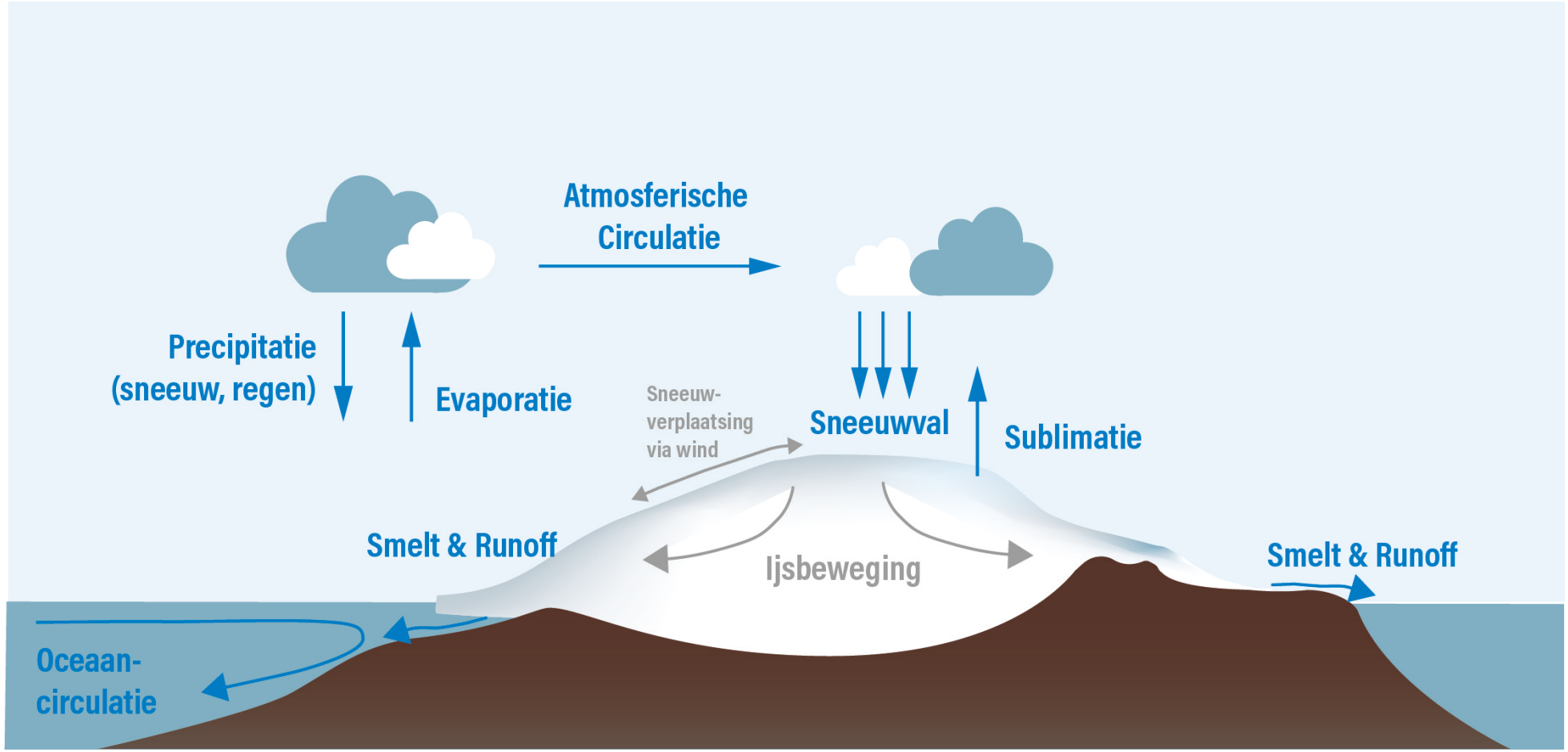


Bron: IBCAO v.3



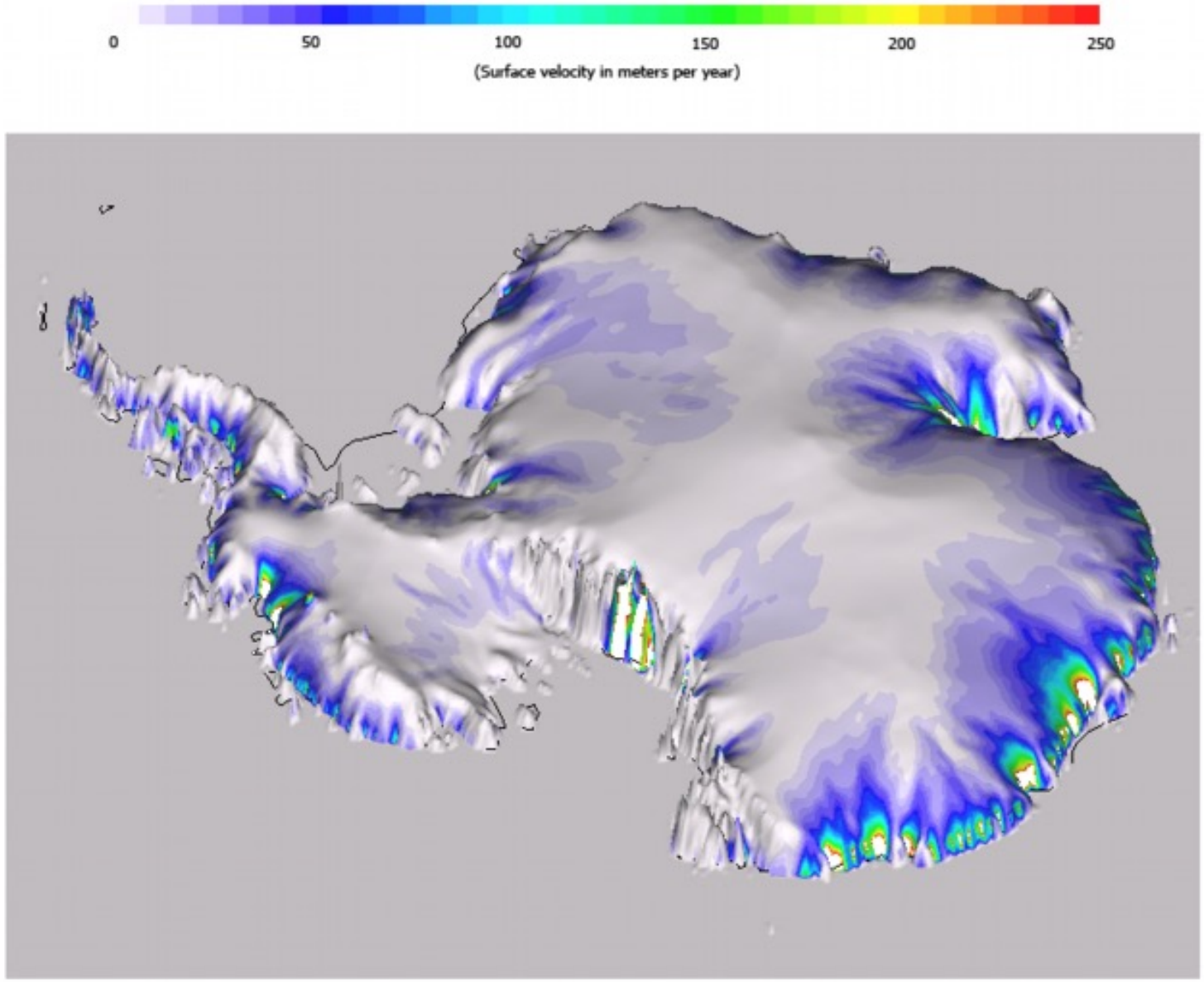
Bron: Dorschel et al. 2022

Ijskap: actief onderdeel van het klimaat-oceaansysteem

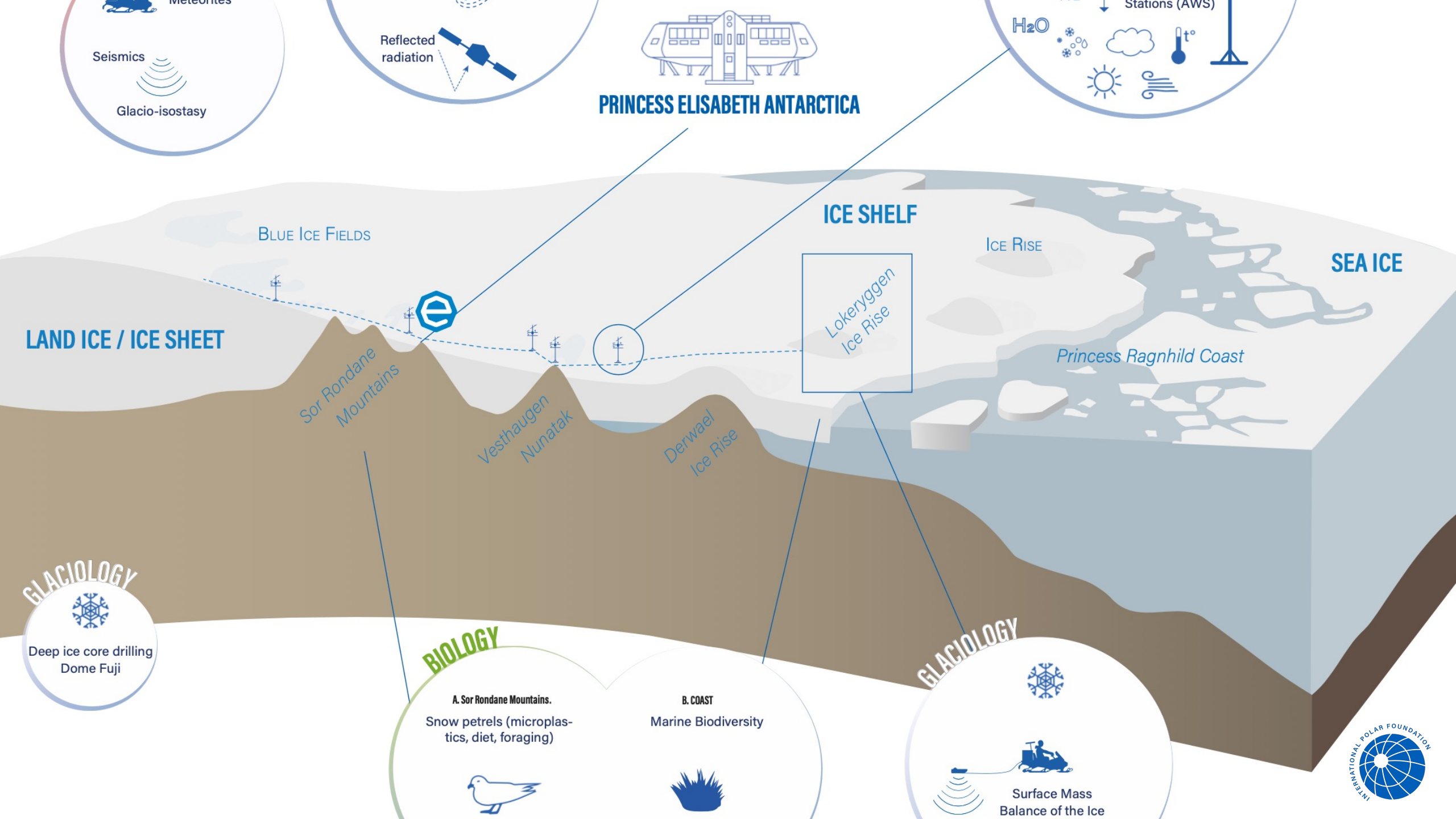


Figuur: *IPF*

3D image of Antarctica + speed of ice flow (m/yr)



Bron: Interactive System for Ice Sheet Simulation


Meteorites
Seismics
Glacio-isostasy
Reflected radiation
PRINCESS ELISABETH ANTARCTICA
Stations (AWS)
H2O
t°
ICE SHELF
Blue Ice Fields
Ice Rise
SEA ICE
LAND ICE / ICE SHEET
Lokeryggen Ice Rise
Princess Ragnhild Coast
Sor Rondane Mountains
Vesthaugen Nunatak
Derwael Ice Rise
GLACIOLOGY
Deep ice core drilling Dome Fuji
BIOLOGY
A. Sor Rondane Mountains.
Snow petrels (microplastics, diet, foraging)
B. COAST
Marine Biodiversity
GLACIOLOGY
Surface Mass Balance of the Ice
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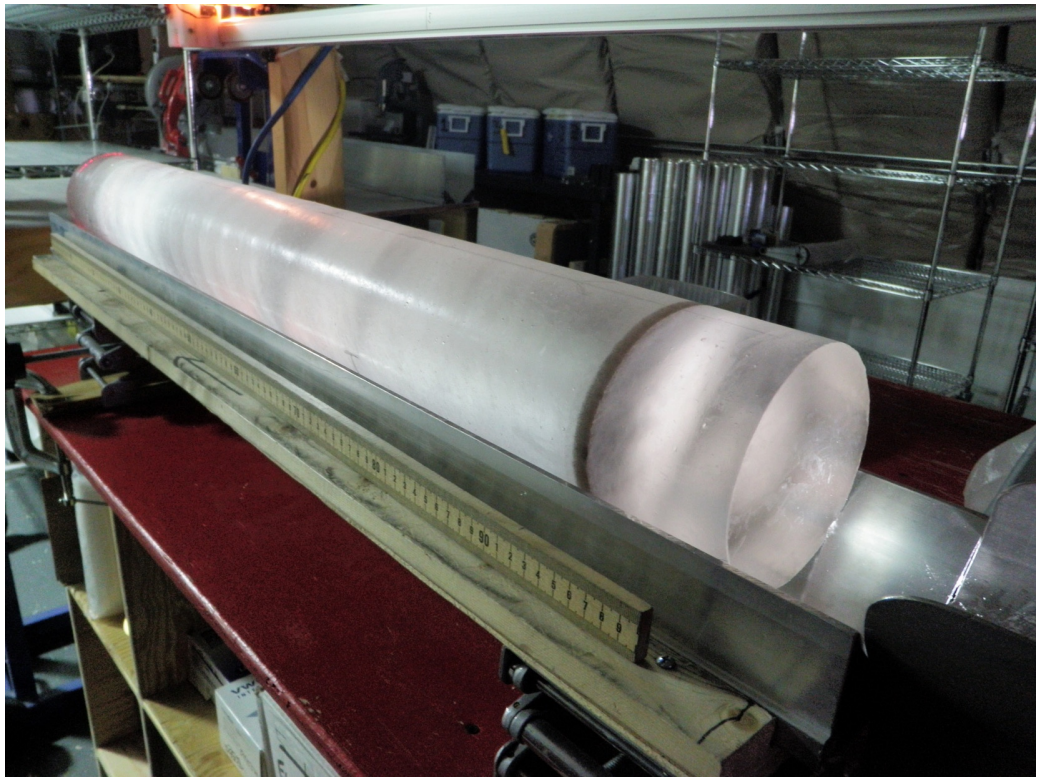
Intermezzo: Metakennis

Claude Lorius: Pioneering French climate change scientist dies aged 91

18 hours ago

Climate change

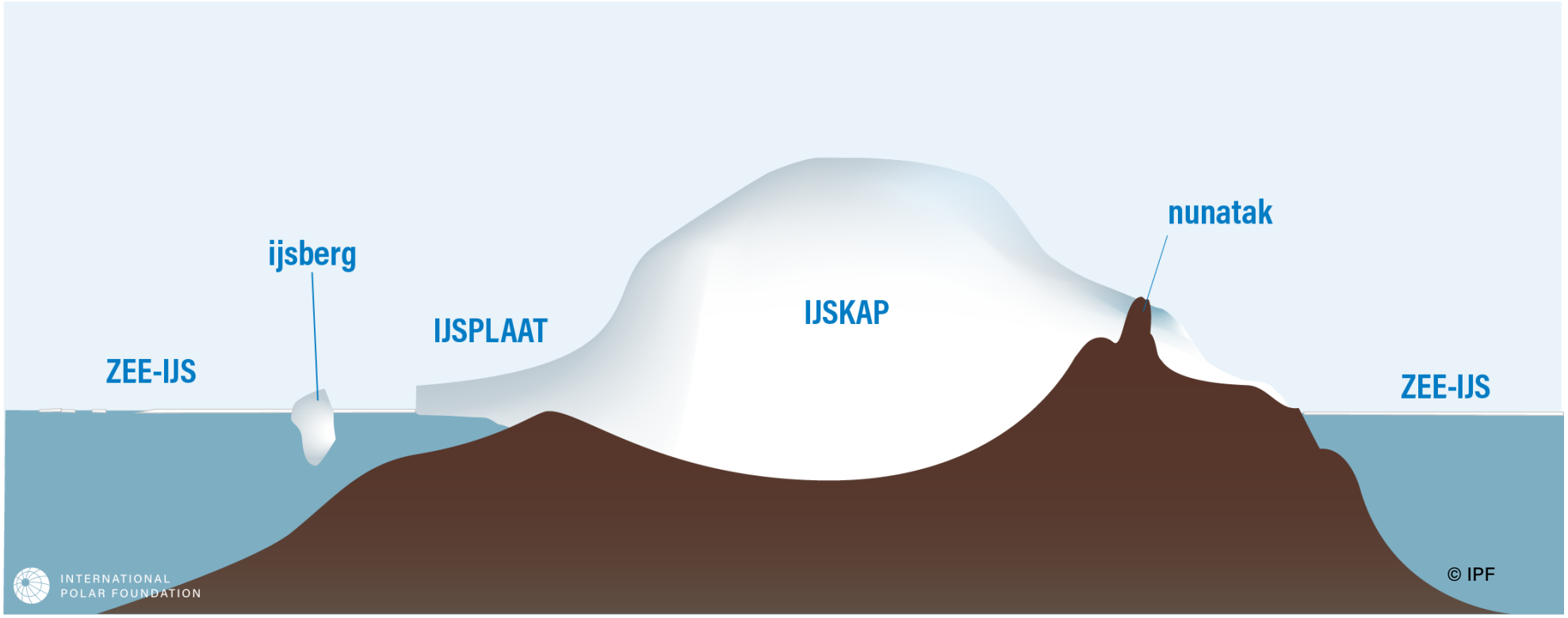
Glaciologist Claude Lorius, seen here in Paris in 2011, once said: "I did not choose science, I chose adventure"

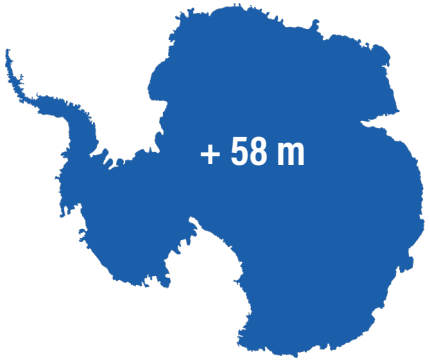


Bron foto: Santa Fe Institute

Klimaat: amplificatoren: zeespiegelstijging

Poolgebieden: “kanaries & versnellers”





Oostende: zeespiegel sinds jaren ‘90: +6 cm

‘worst case’ IPCC voorspelling: België tegen 2100: +80 cm

Figuur: *IPF*

Ijskap: actief onderdeel van het klimaat-oceaansysteem

GROENLAND IJSKAP:

mei 2002- aug 2016:
verlies van **281 GT/jaar**
Totaal verlies over 14 jaar: **3748 GT**

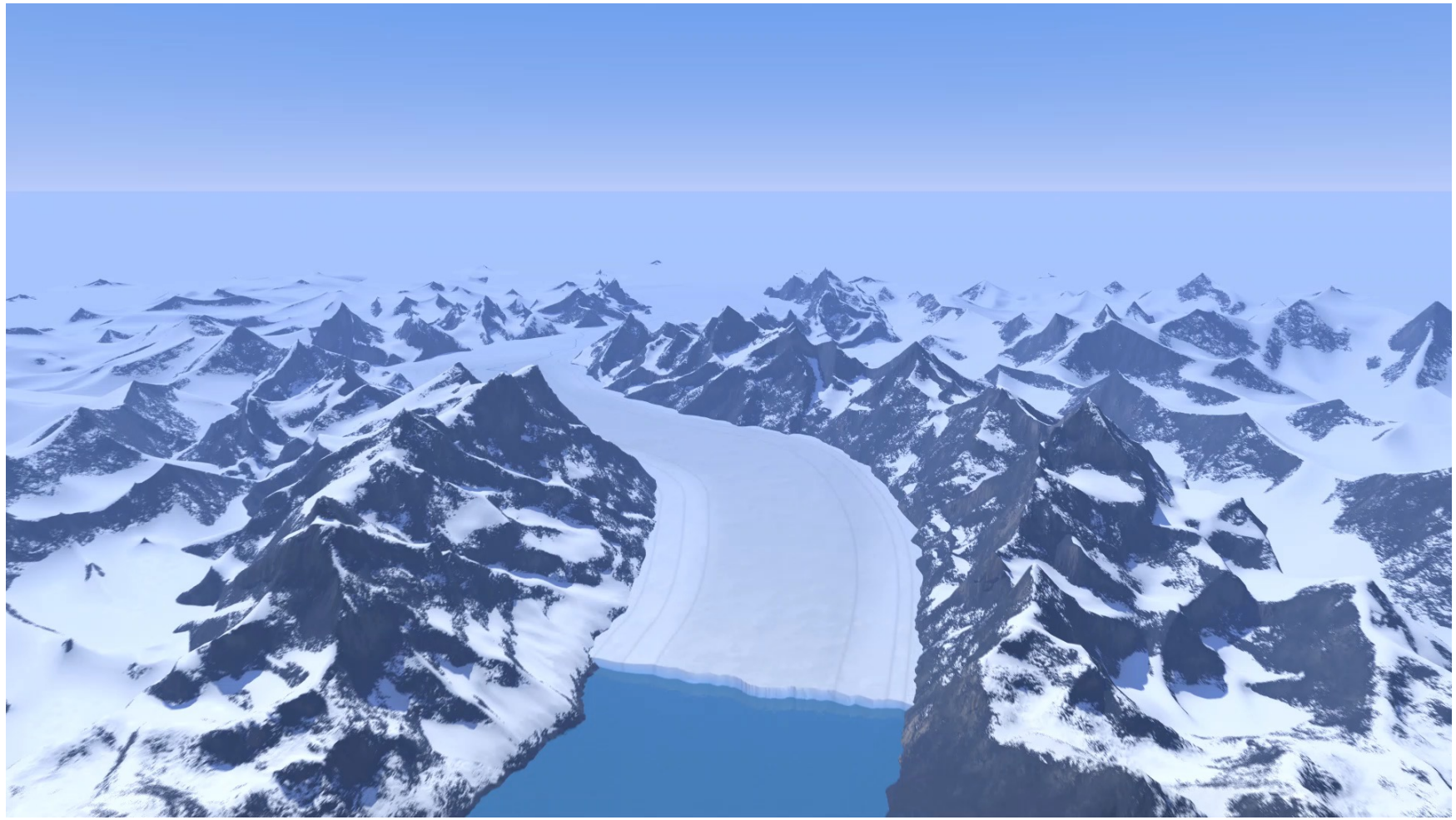
= 2500 per sec

= 5,5 per uur

Bron: *GRACE*

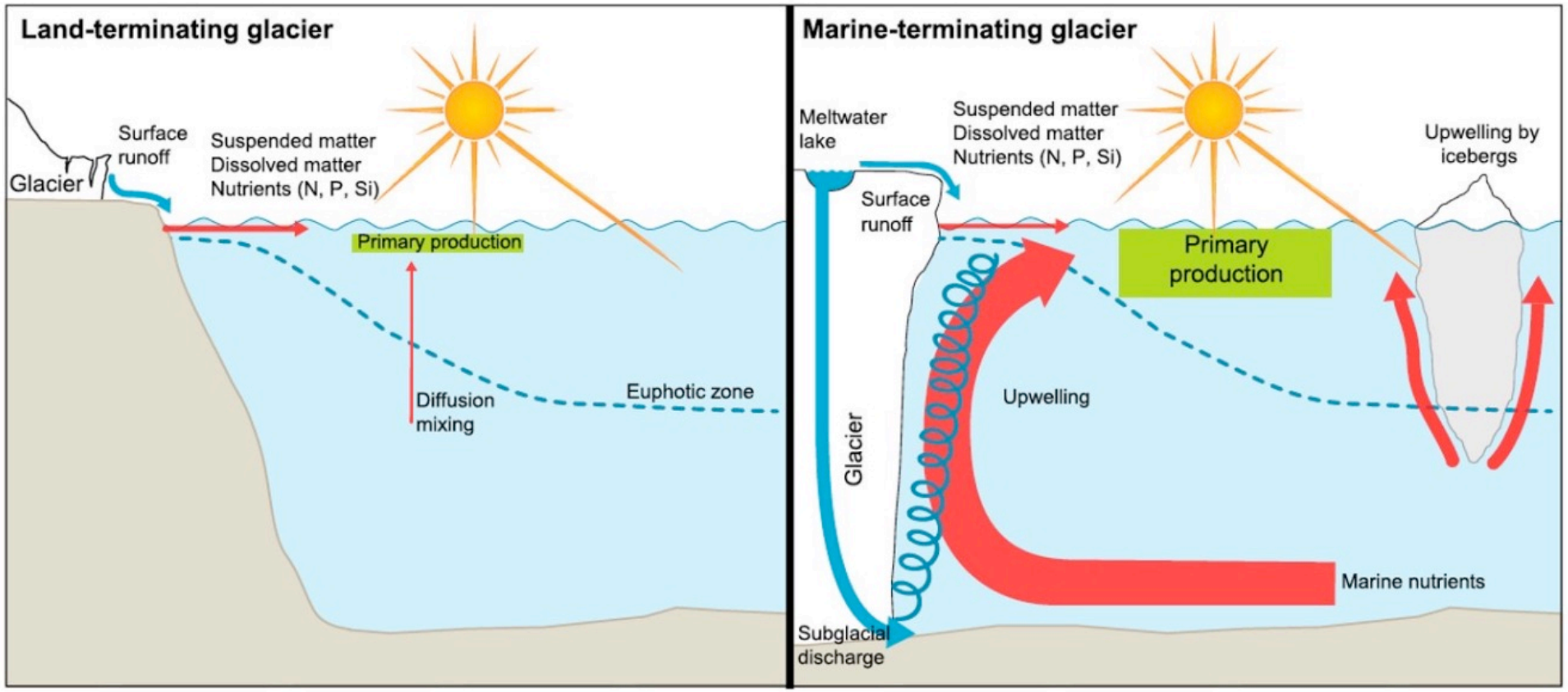
Animatie: *NASA*

Ijskap: actief onderdeel van het klimaat-oceaansysteem



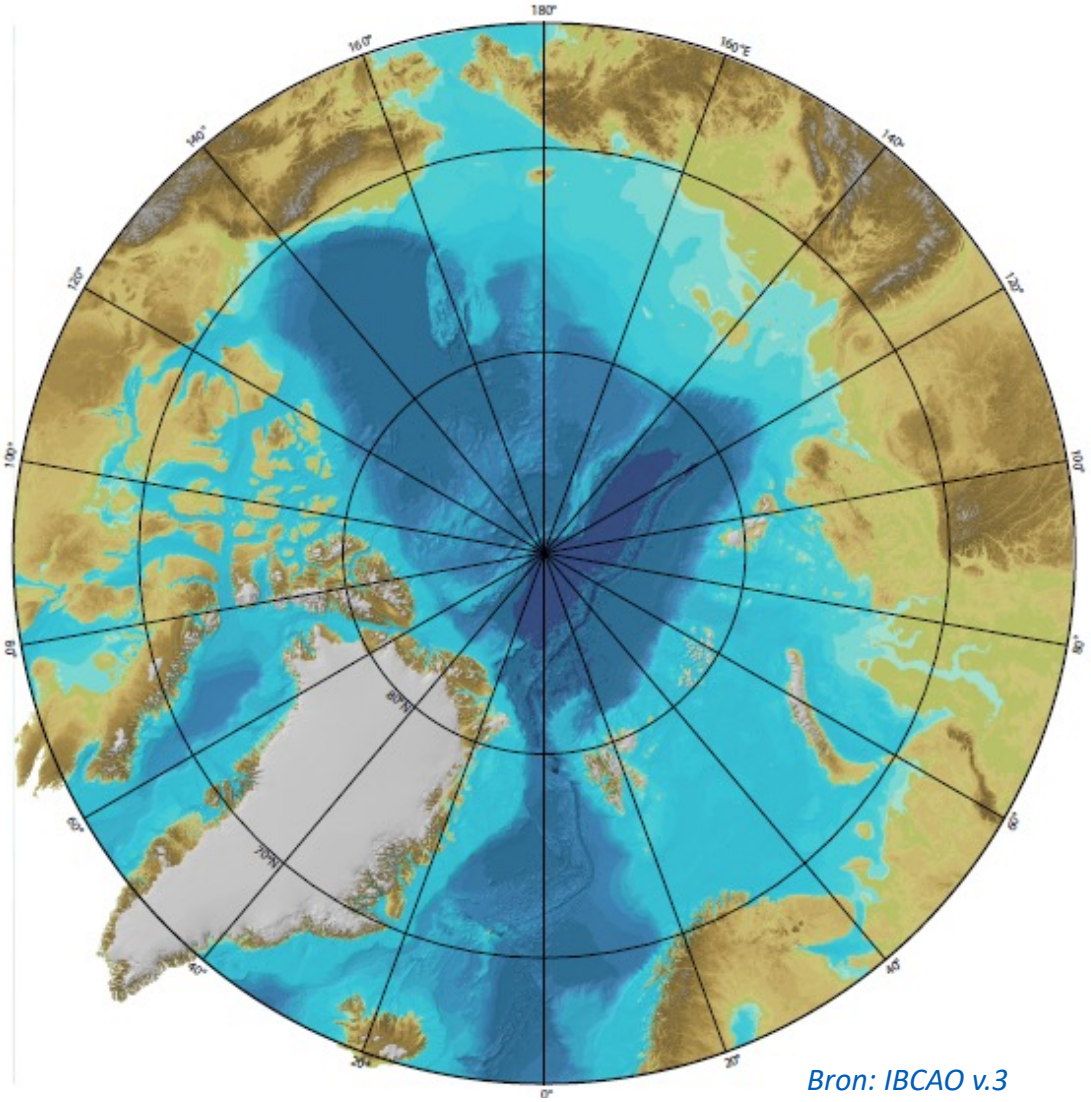
Animatie: *NASA*

Ijskap: actief onderdeel van het klimaat-oceaansysteem



Figuur: *Meire et al. 2017: Marine-terminating glaciers sustain high productivity in Greenland fjords. Global Change Biology, 23 (12), 5344-5357.*

Klimaat: kanaries



Bron: IBCAO v.3

ZEEIJS:

Klimaat: kanaries & versnellers

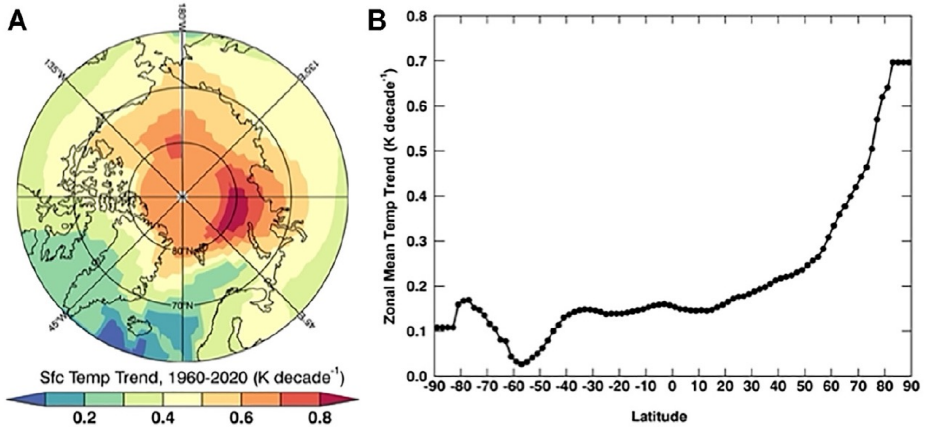
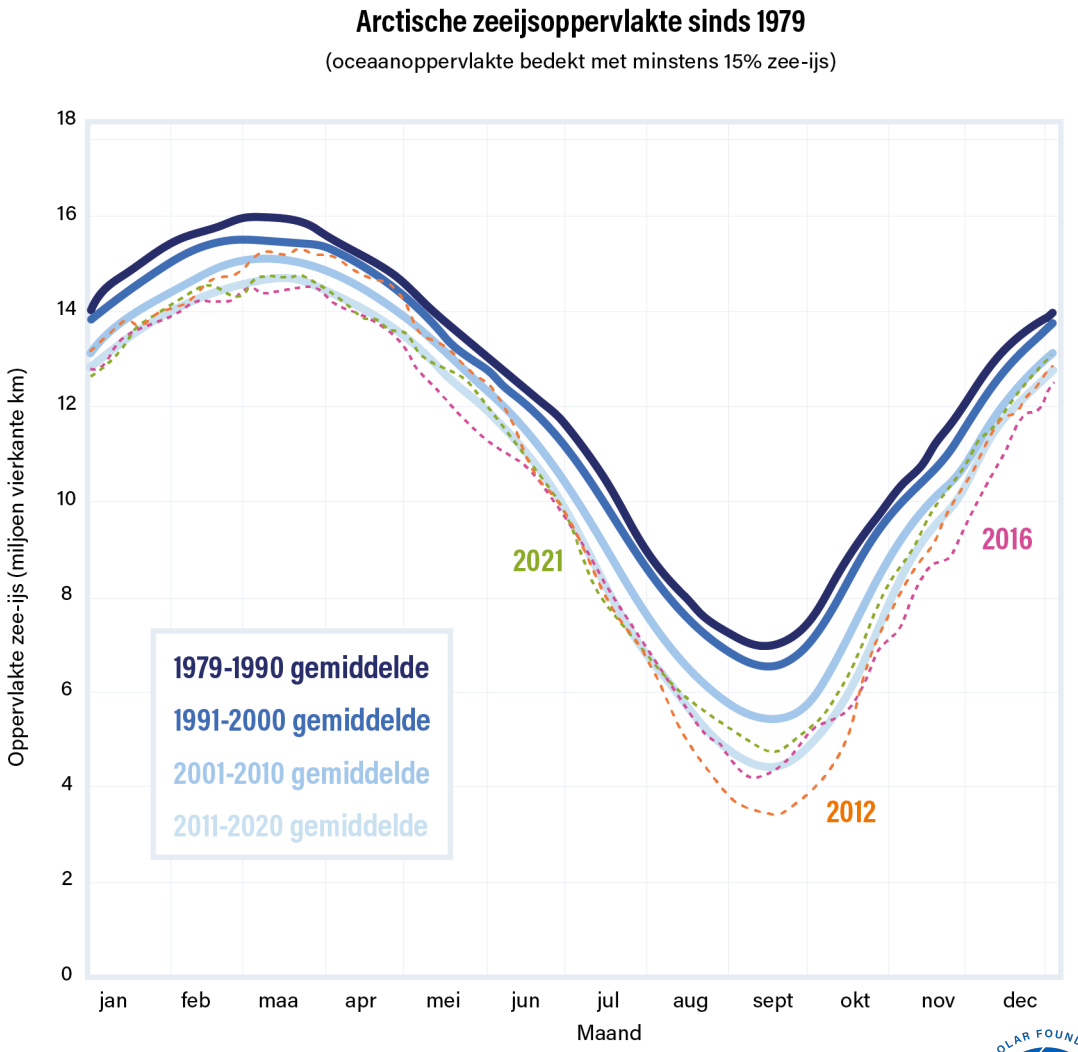


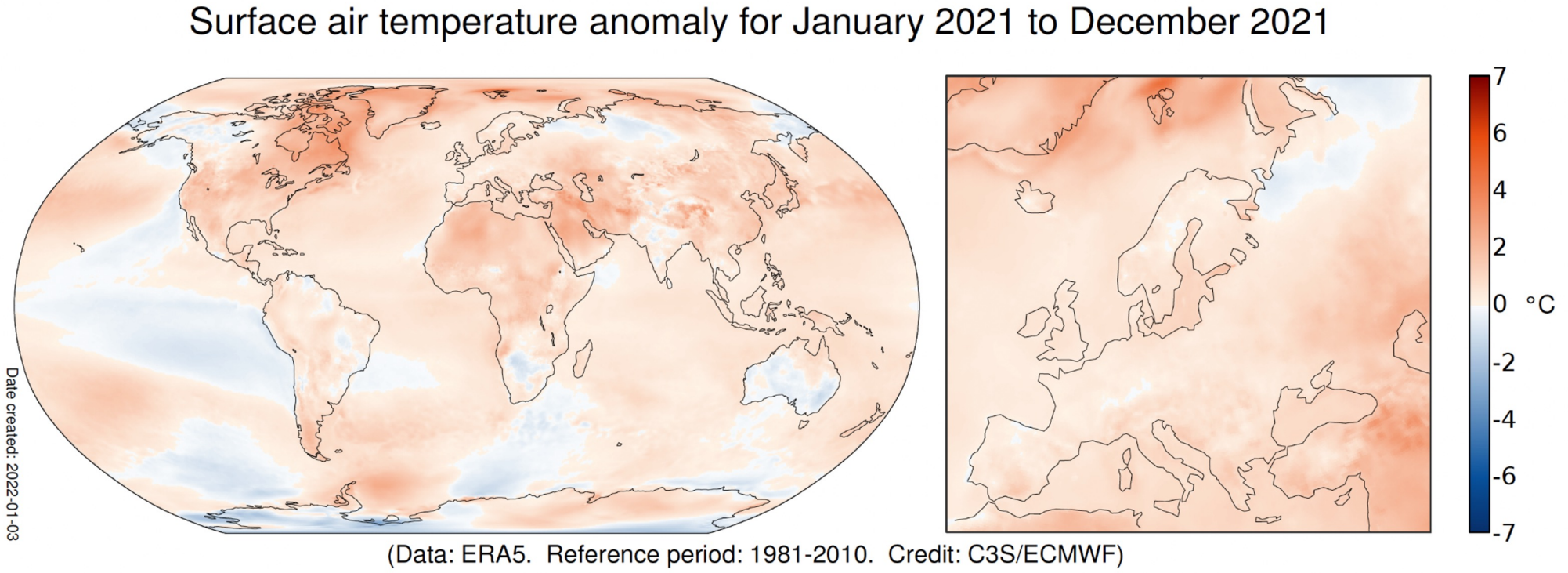
FIGURE 1 | Arctic and zonal mean linear surface temperature trends since 1960. **(A)** The spatial pattern of the surface temperature trend at 2° × 2° resolution and **(B)** the zonal mean surface temperature trend (K decade^{-1}) assessed by applying a ordinary least squares fit linear regression to the GISTEMP time series (Lenssen et al., 2019; GISTEMP Team 2021).

Bron: Taylor et al. 2022 – Frontiers in Earth Science



Bron: International Polar Foundation - IPF; figuur aangepast uit NSIDC.org (ChArctic v3.3.8 Interactive Sea Ice Graph)

Poolgebieden: “kanaries & versnellers”



European Commission

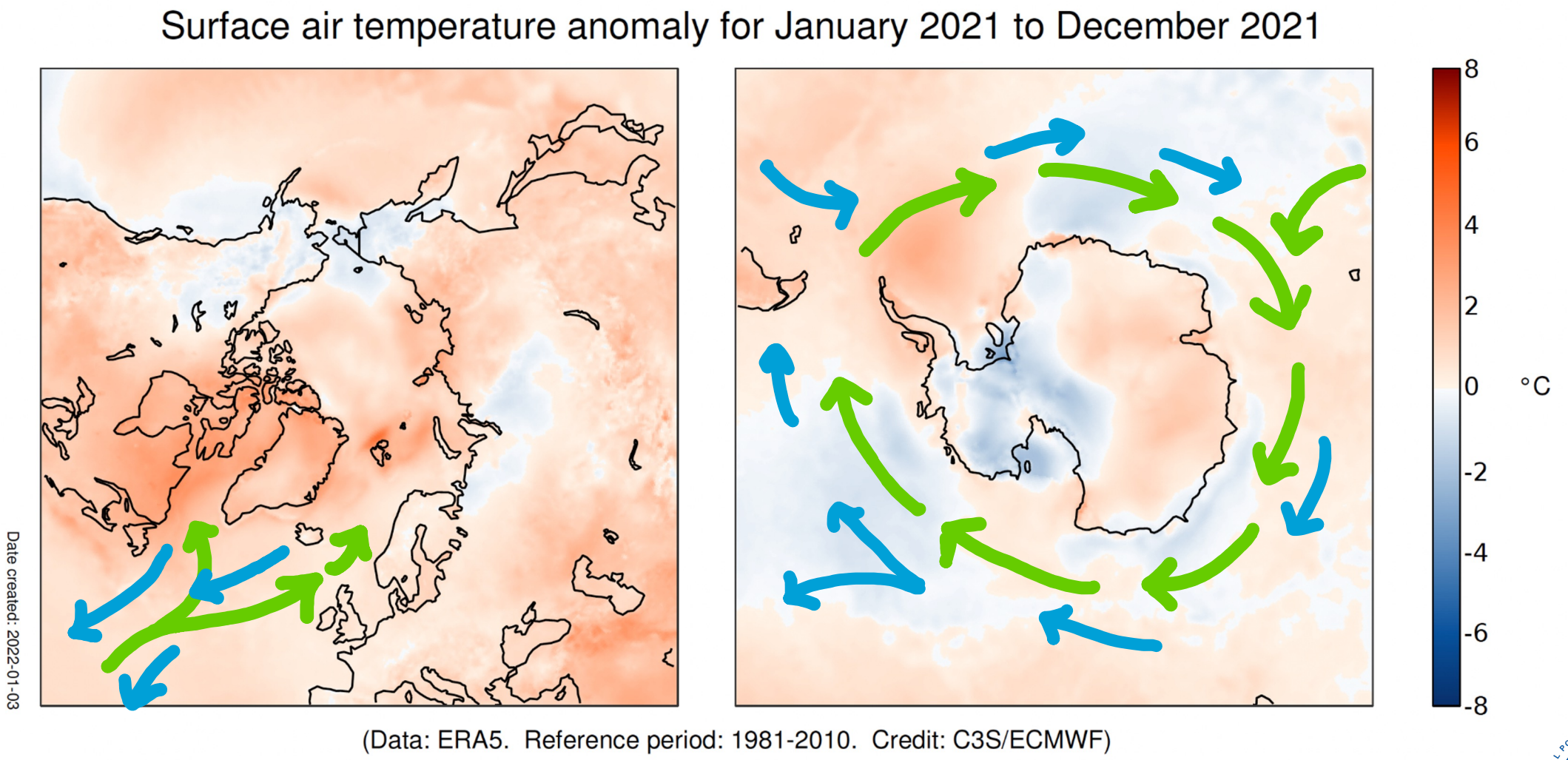
Copernicus
Europe's eyes on Earth

IMPLEMENTED BY
ECMWF

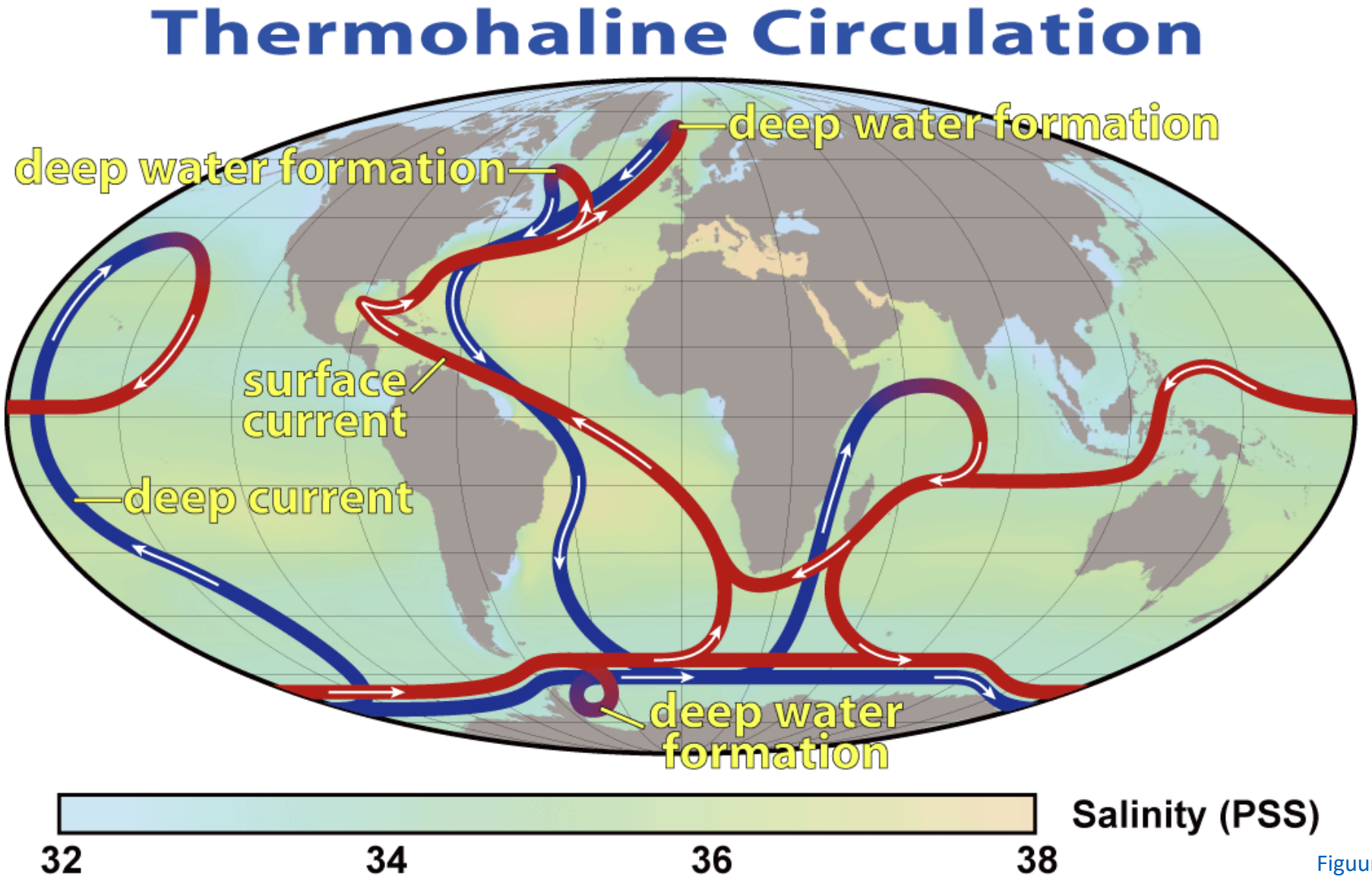
Climate Change Service
climate.copernicus.eu

INTERNATIONAL POLAR FOUNDATION

Klimaat: gevolgen & feedback



Klimaat: gevolgen & feedback

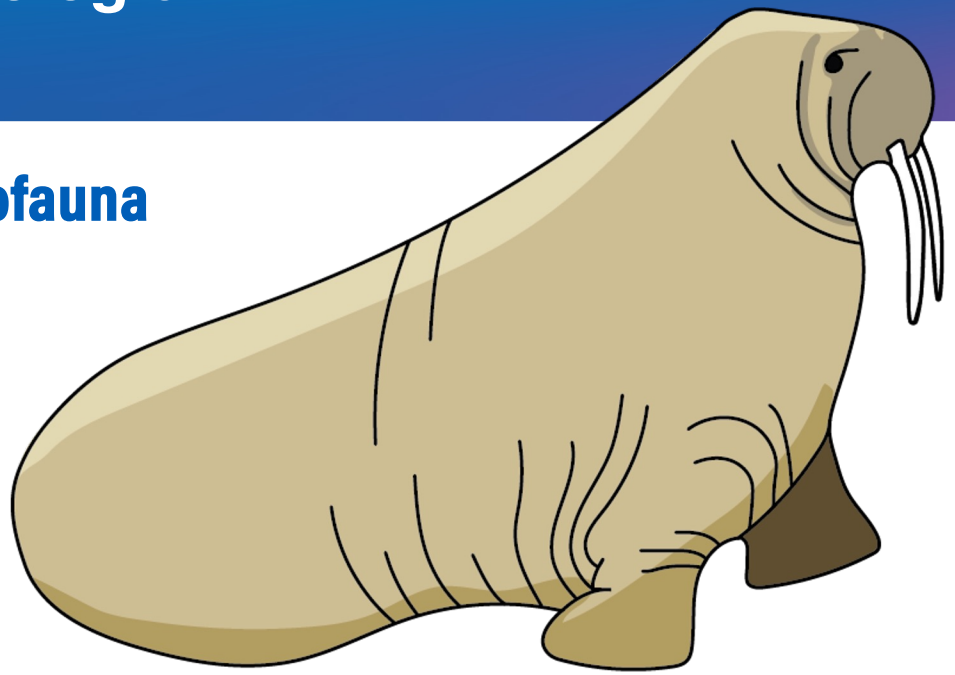


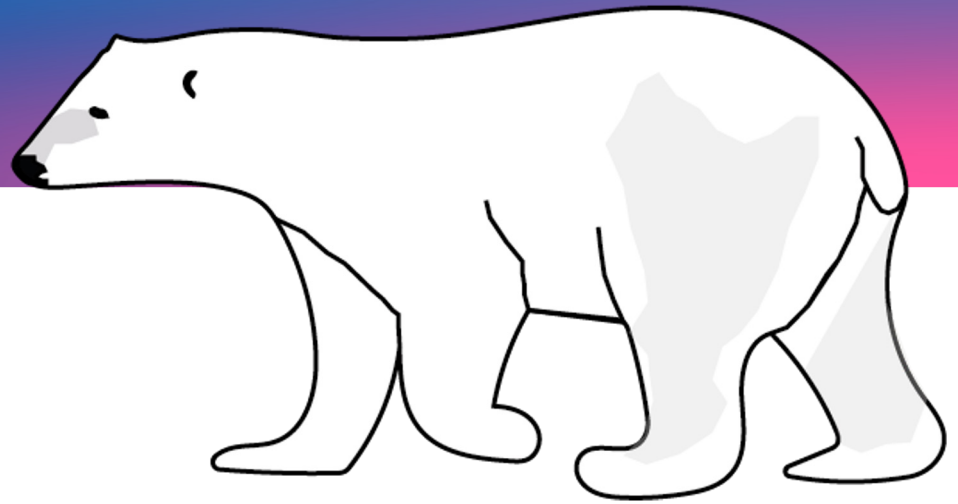
Figuur: *NASA*

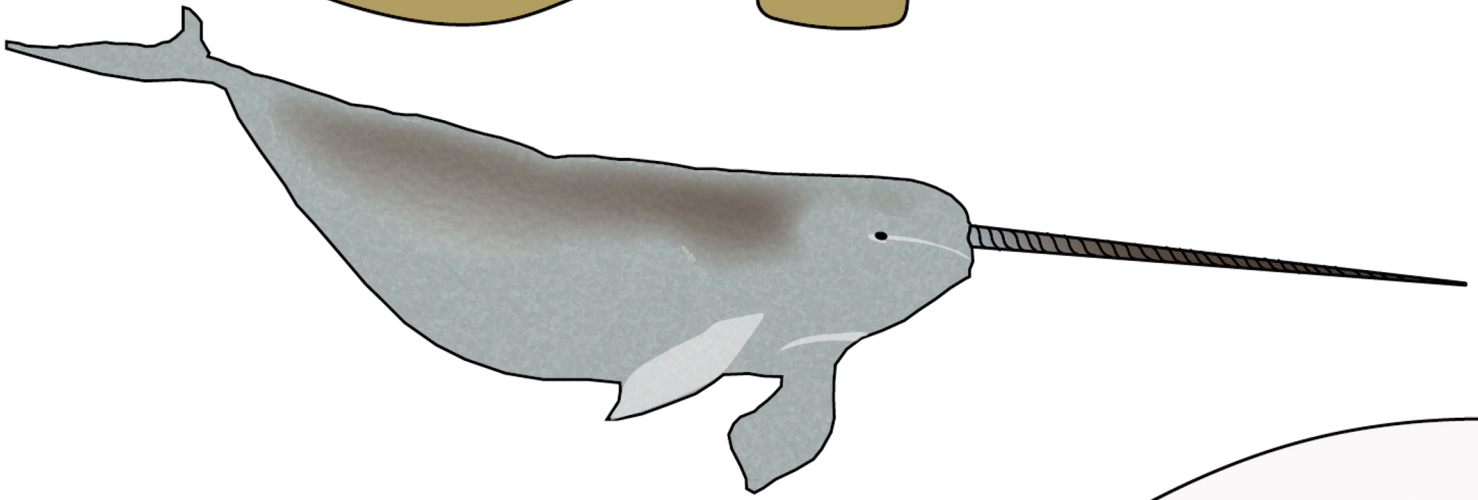
Klimaat: amplificatoren: albedo

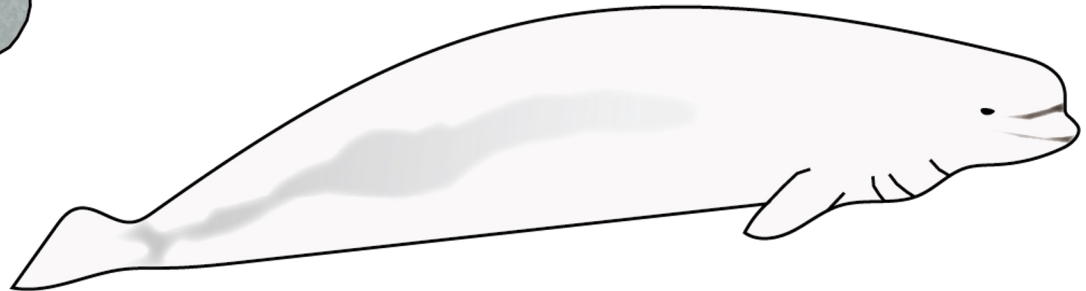
4. Biologie

Macrofauna

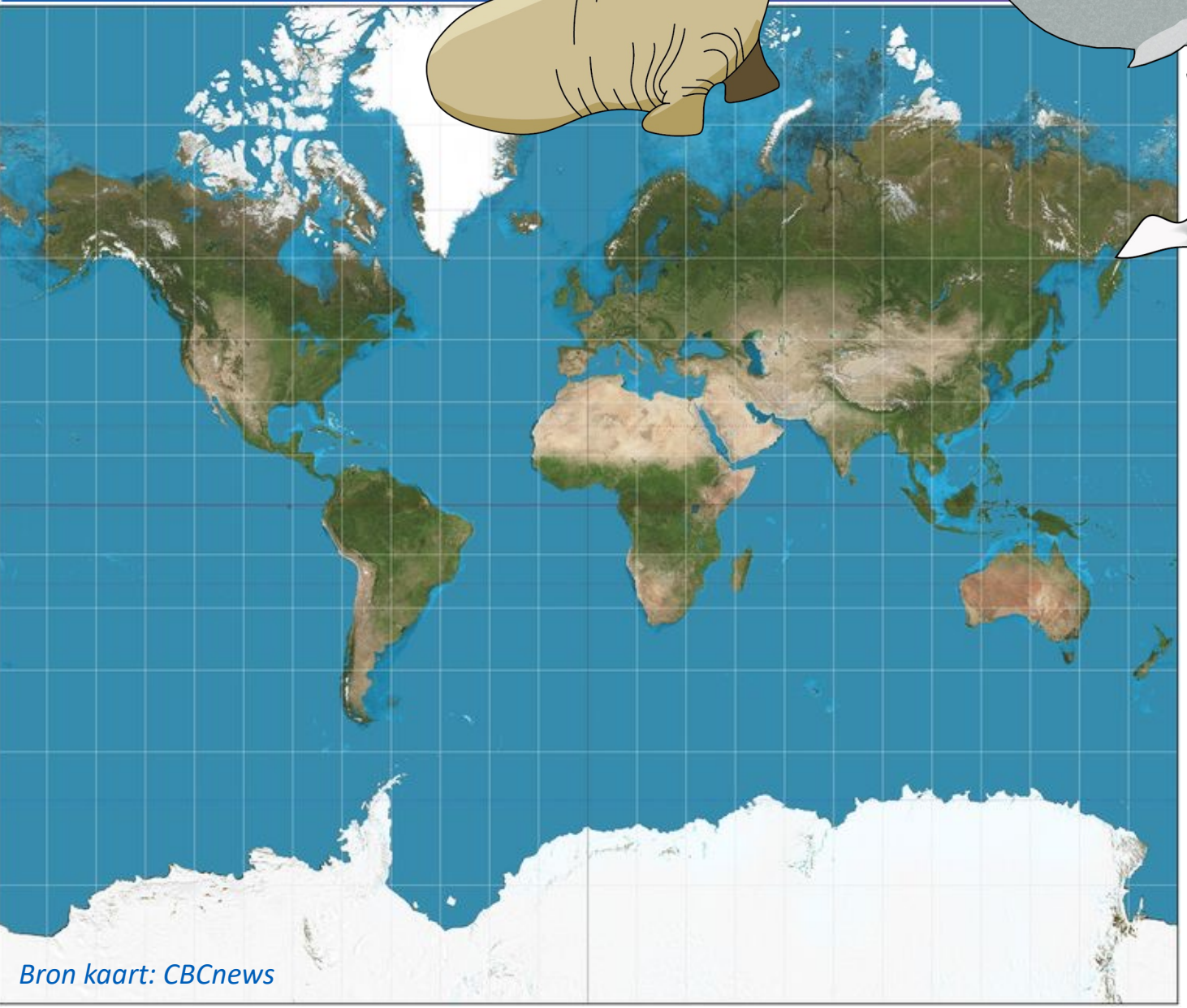


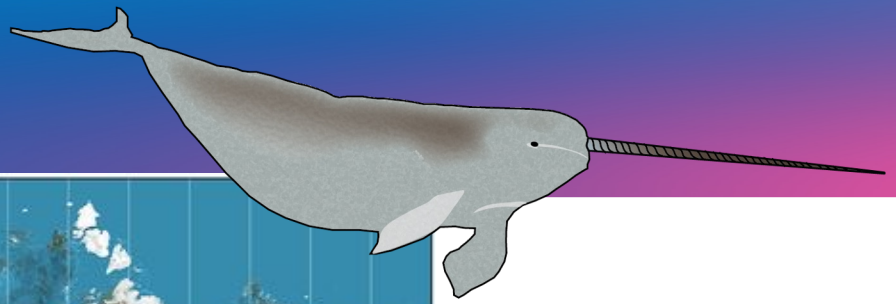


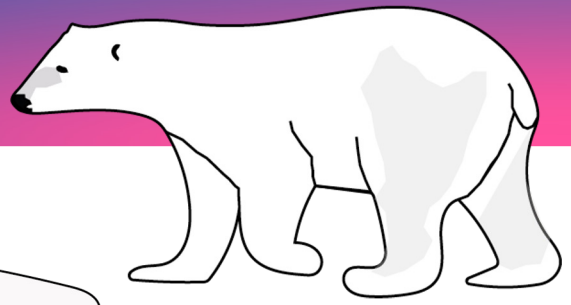


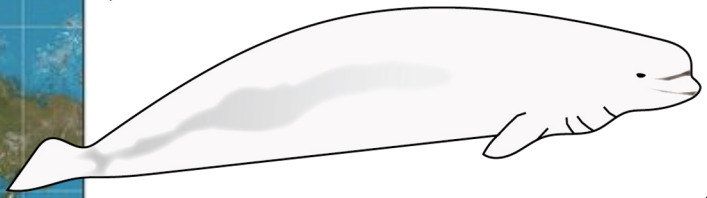


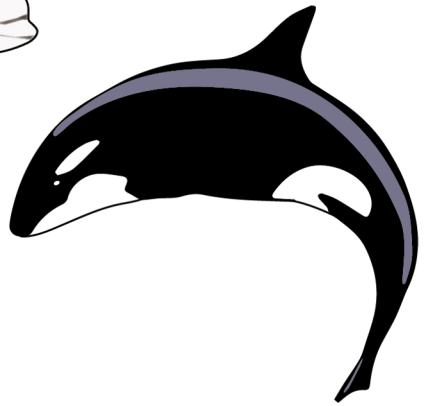
4. Biologie

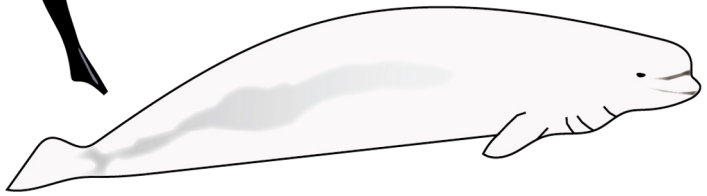






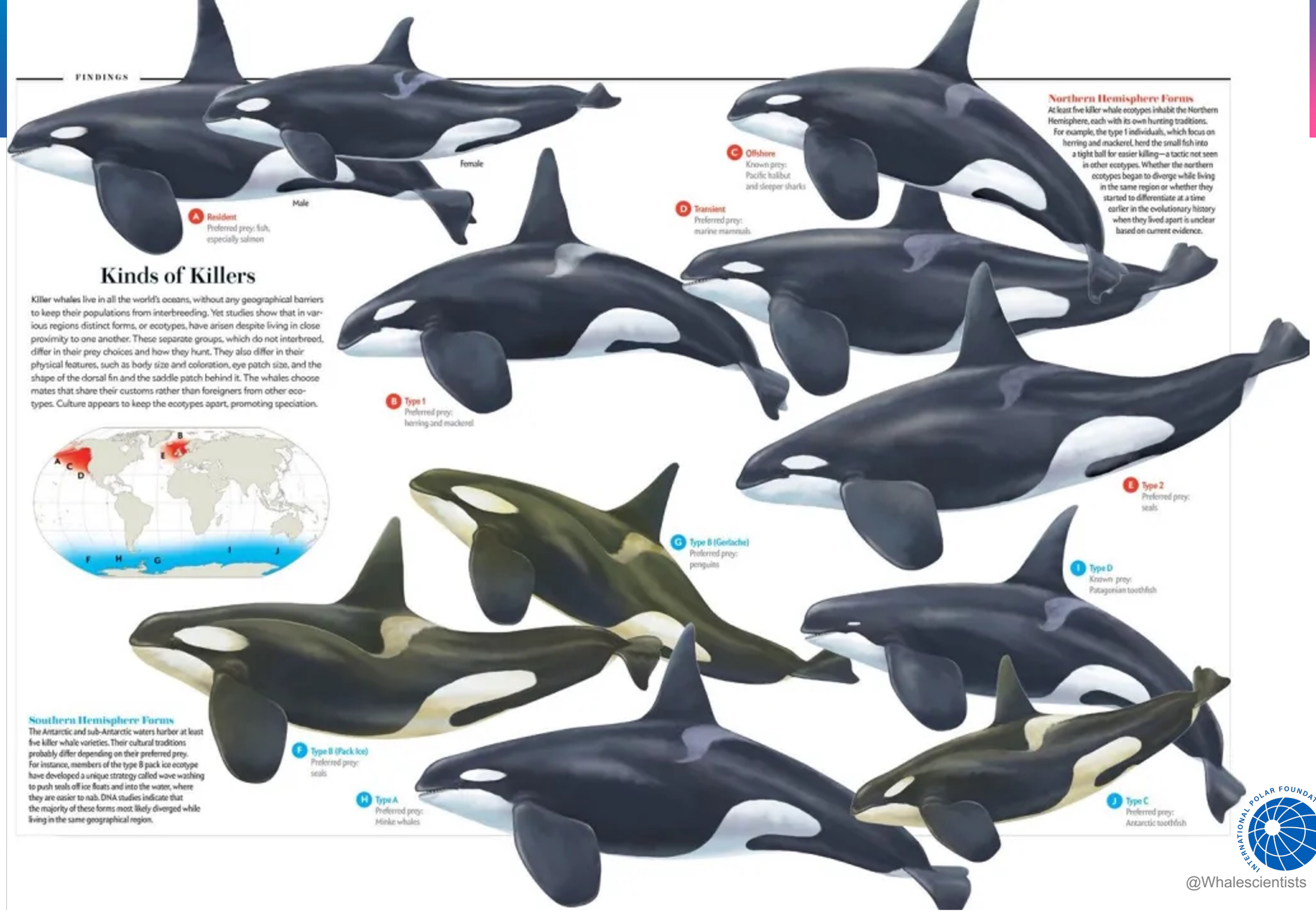






Bron kaart: CBCnews

4. Biologie



@Whalescientists

4. Biologie

4. Biologie

5. Mens

4 miljoen inwoners
500K inheemse mensen

Inheemse volkeren van Arctica

Onderverdeling naargelang de taalfamilies

- **Eskimo-Aleutische familie** (Inuit, Aleoeten,...)
- **Na'dené familie** (Gwich'in, Tlingit ...)
- **Penutiaanse familie**
- **Macro-Algische familie** (Algonkin,...)
- **Macro-Sioux familie** (Sioux, Iroquois)
- **Indo-Europese familie** Germaanse tak (Faroe Eilanden)
- **Oeraalse-Joekagierse familie** (Sami, Nenetsen,...)
- **Altaïsche familie** (Dolganen, Evenken, ...)
- **Chukchi-Kamchatkananse familie** (Tsjoektsjen,...)
- **Geïsoleerde taalgroepen** (Ketten, Nivkh, Ainu)

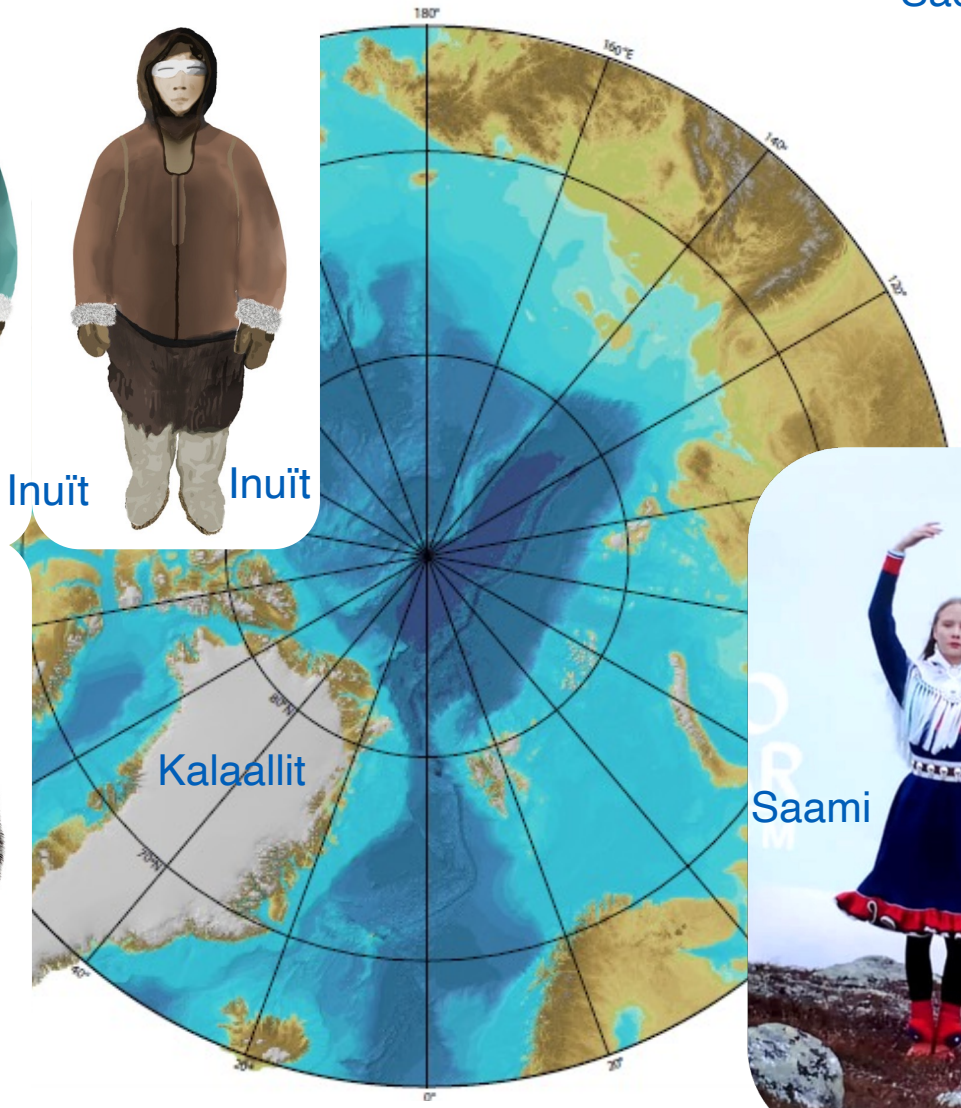
Bron: gebaseerd op W.K. Dallmann, Norwegian Polar Institute - aangepast door de International Polar Foundation

Bron: IPF-Educapoles

5. Mens

Inuït

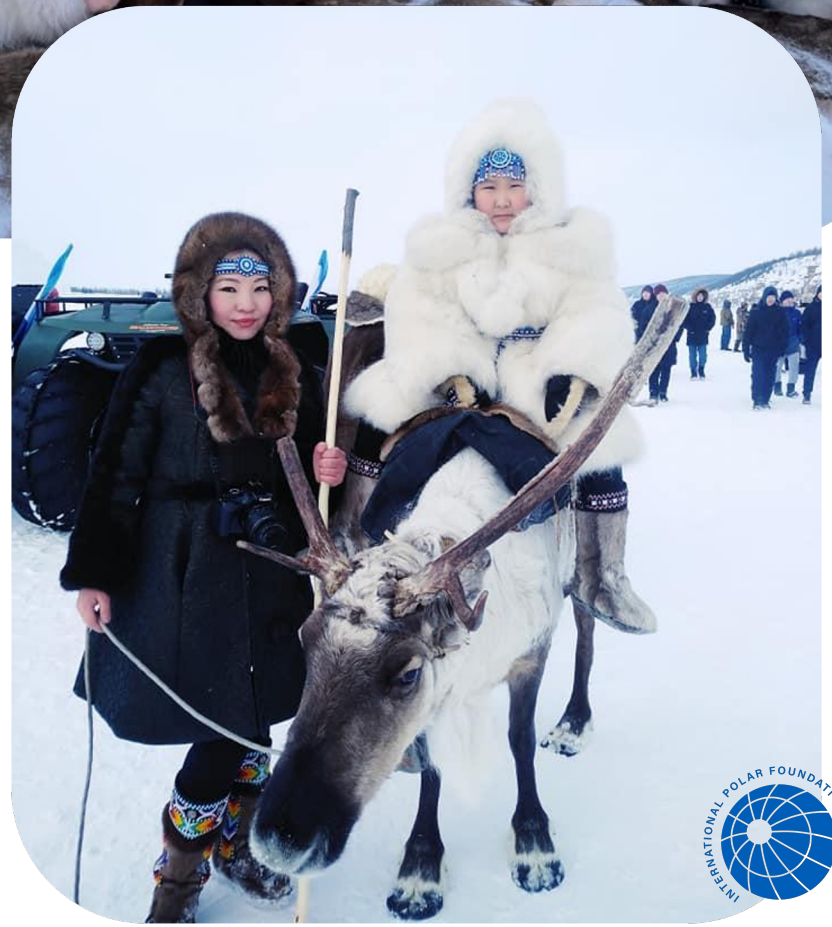
Inuït



Kalaallit

Sacha (Yakoeten)

Saami



6. Beleid & geopolitiek

ANTARCTICA

Antarctisch verdrag: Antarctica als condominium

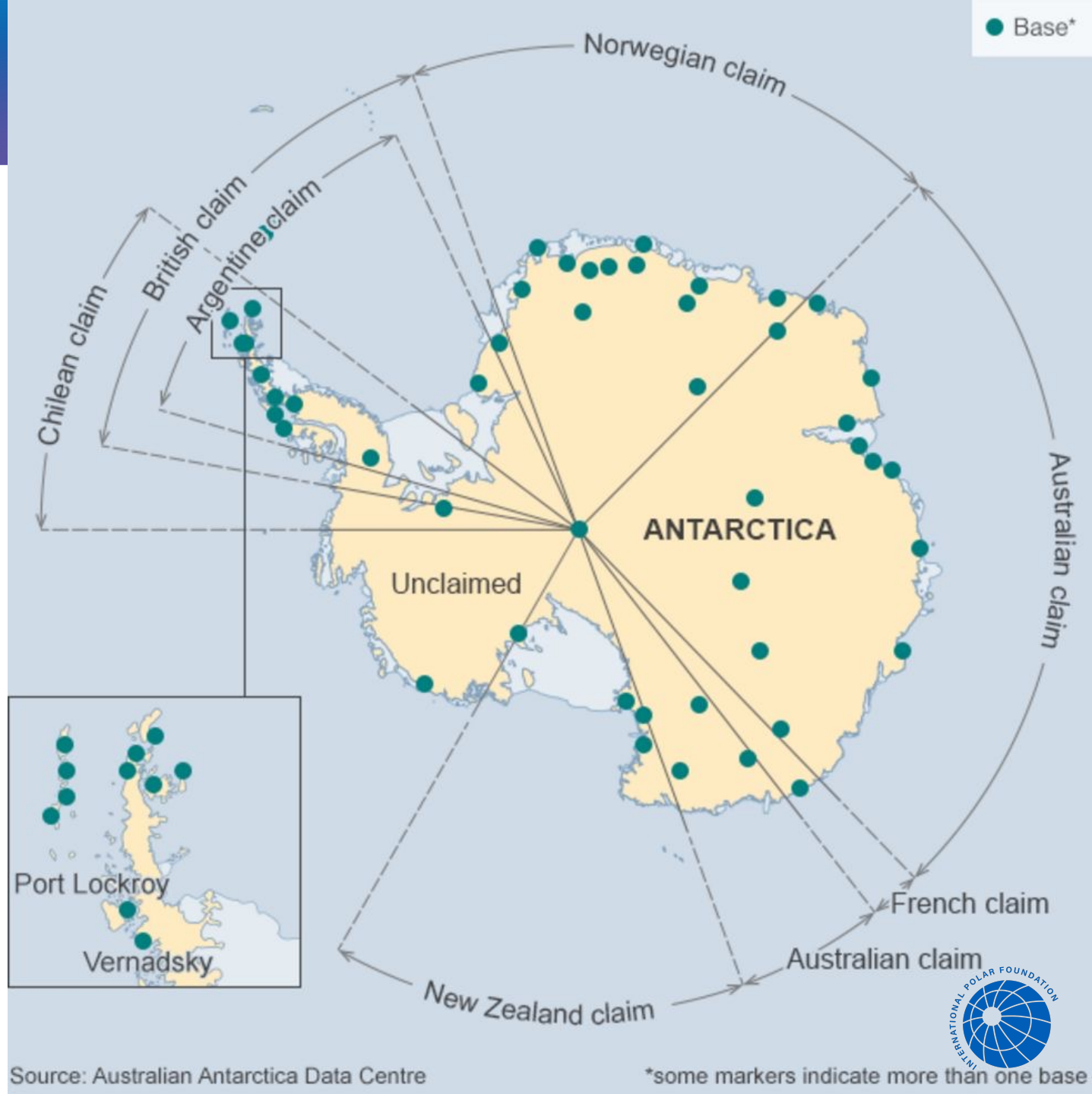
1959: 12 landen
1961: van kracht
1991: verlengd

VREDE
NATUURBEHOUD
WETENSCHAP

2023:
- 56 landen (29 met stemrecht)
- 7 met territorial claims (niet erkend)
- 42 tekenden ook het Protocol voor Mileubescherming van het Antarcticaverdrag

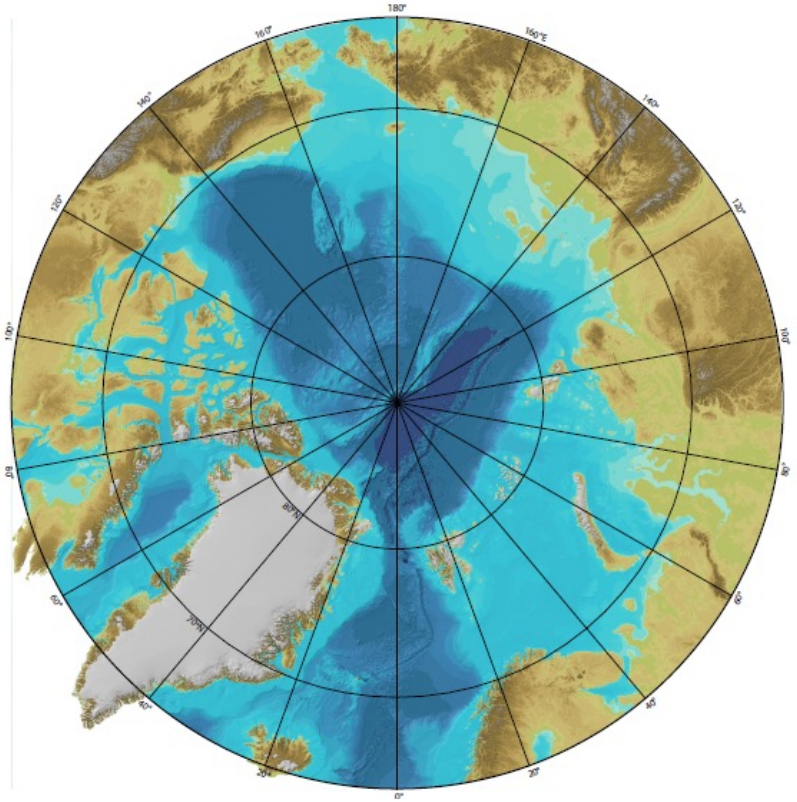
Tot 2048.

Bron: kaart gemaakt door BBC-news



6. Beleid & geopolitiek

ARCTICA



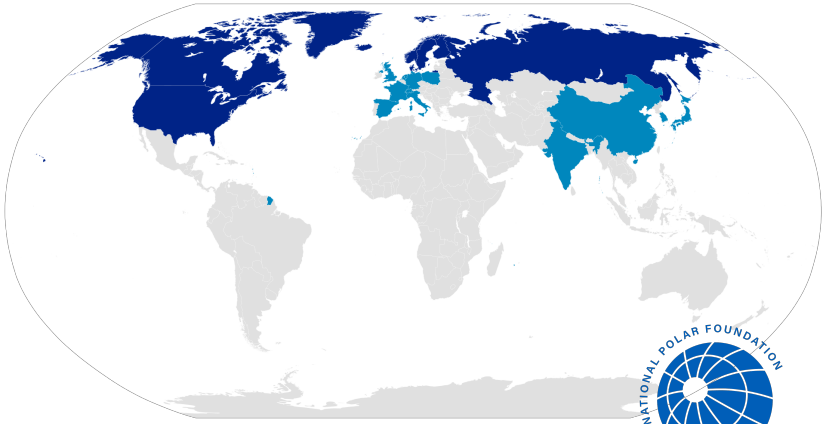
Landen: eigen wetgeving in territoriale wateren (22 km)

EEZ: economische zone (200 zeemijl = 370 km):
- Vrij verkeer maar bodemrijkdommen voor het aangrenzende land.

Diepzee: onder internationale wet van de zee (VN: UNCLOS, 1994)

ARCTISCHE RAAD
- 8 Arctische staten, roterend voorzitterschap
- 6 permanente leden (inheems)
- 38 observerende leden

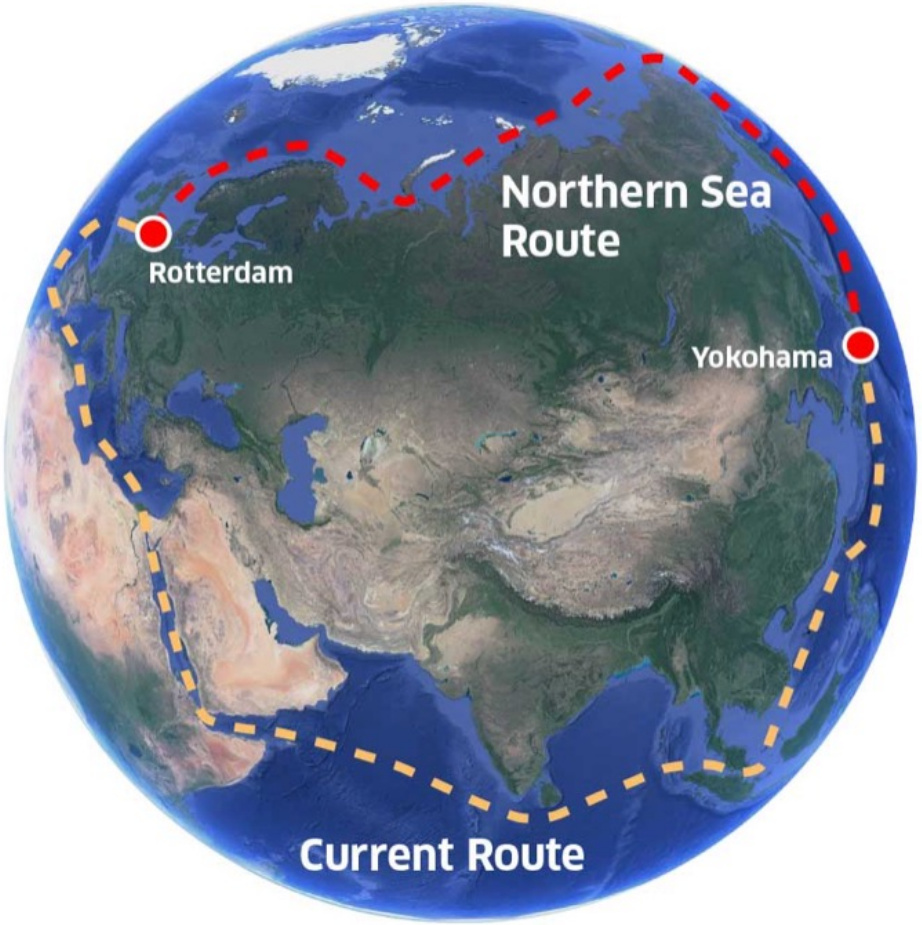
ARCTIC COUNCIL



Kaart: *Wikipedia*

Klimaat: kanaries

ZEE:



The new Arctic sea routes

Bron: *https://discoveringthearctic.org.uk/arctic-challenges/troubled-water/northwest-northeast-passages/*

Klimaat: kanaries

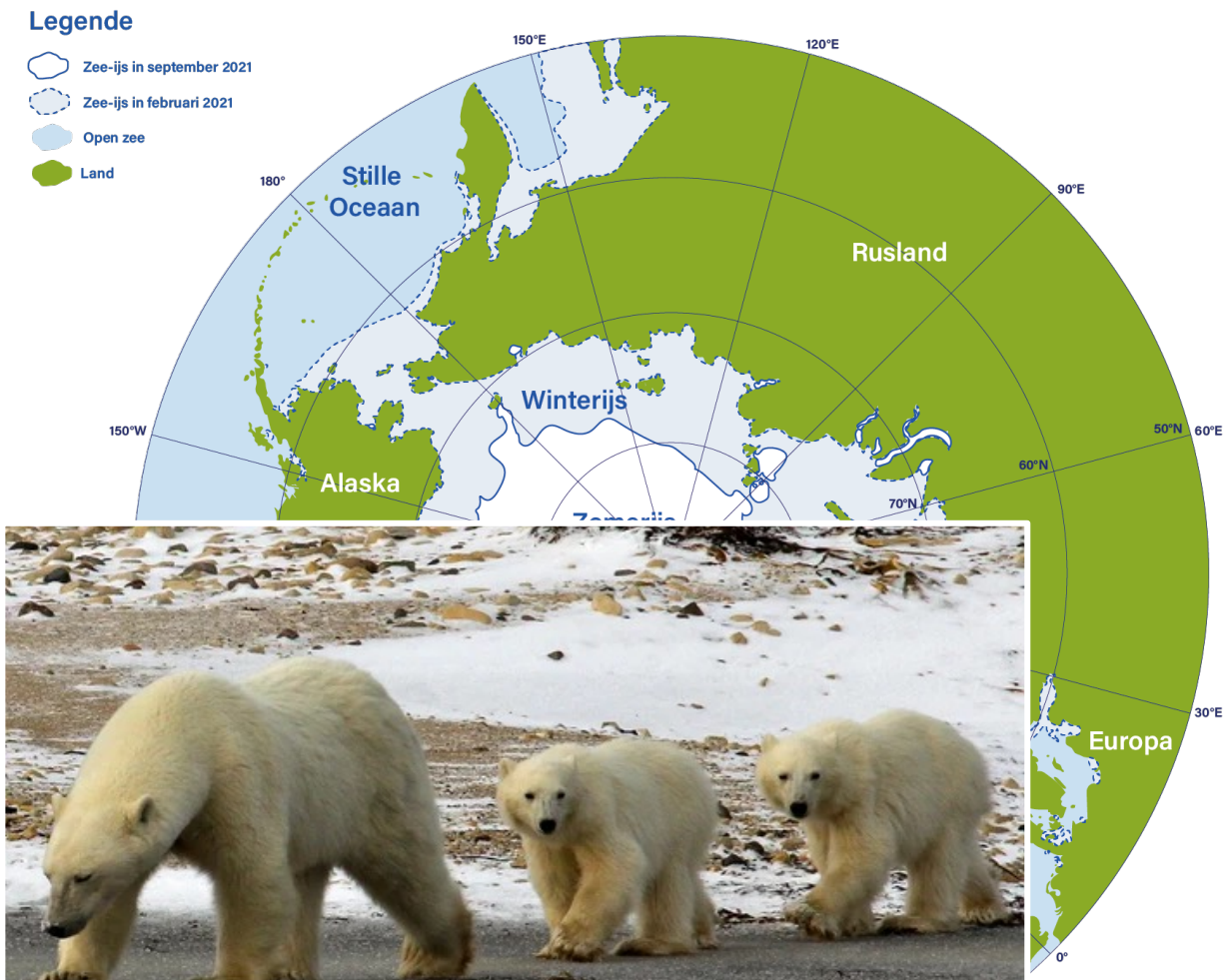
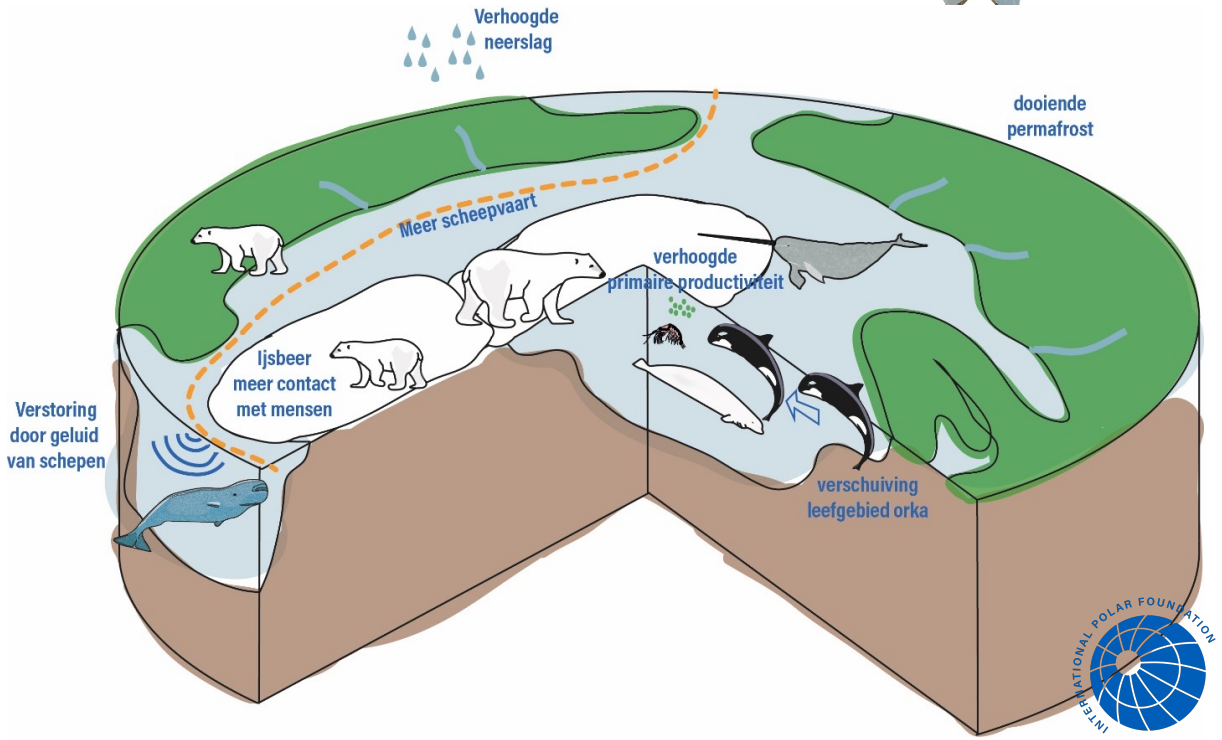


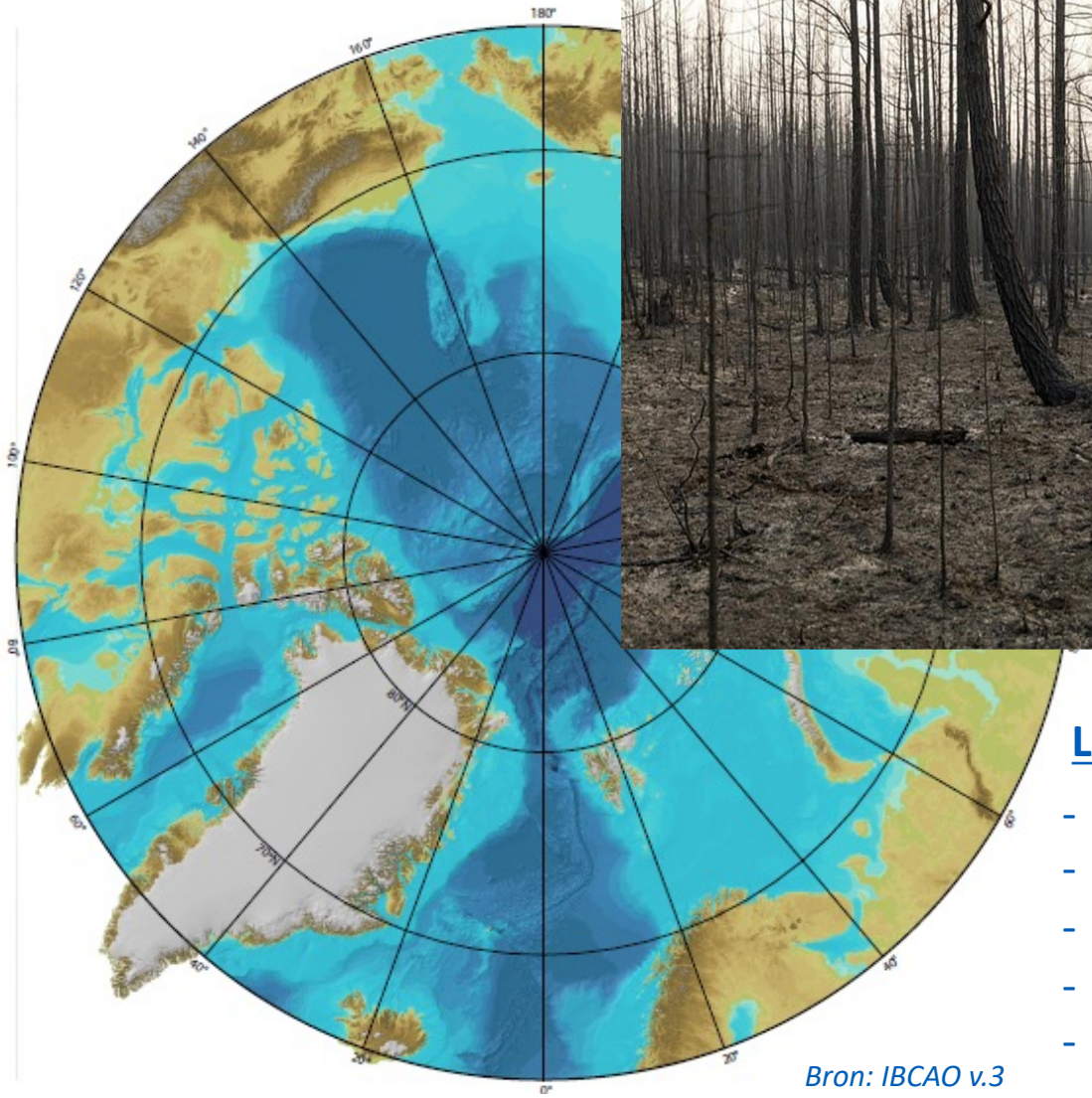
Foto: Emma (Flickr; cc by 2.0)

ZEE:

- Zee-ijs dunner
- Zee-ijs minder uitgebreid
- Ecologische verandering
- Vaarroutes
- Ontginningen
- Toerisme



Klimaat: kanaries

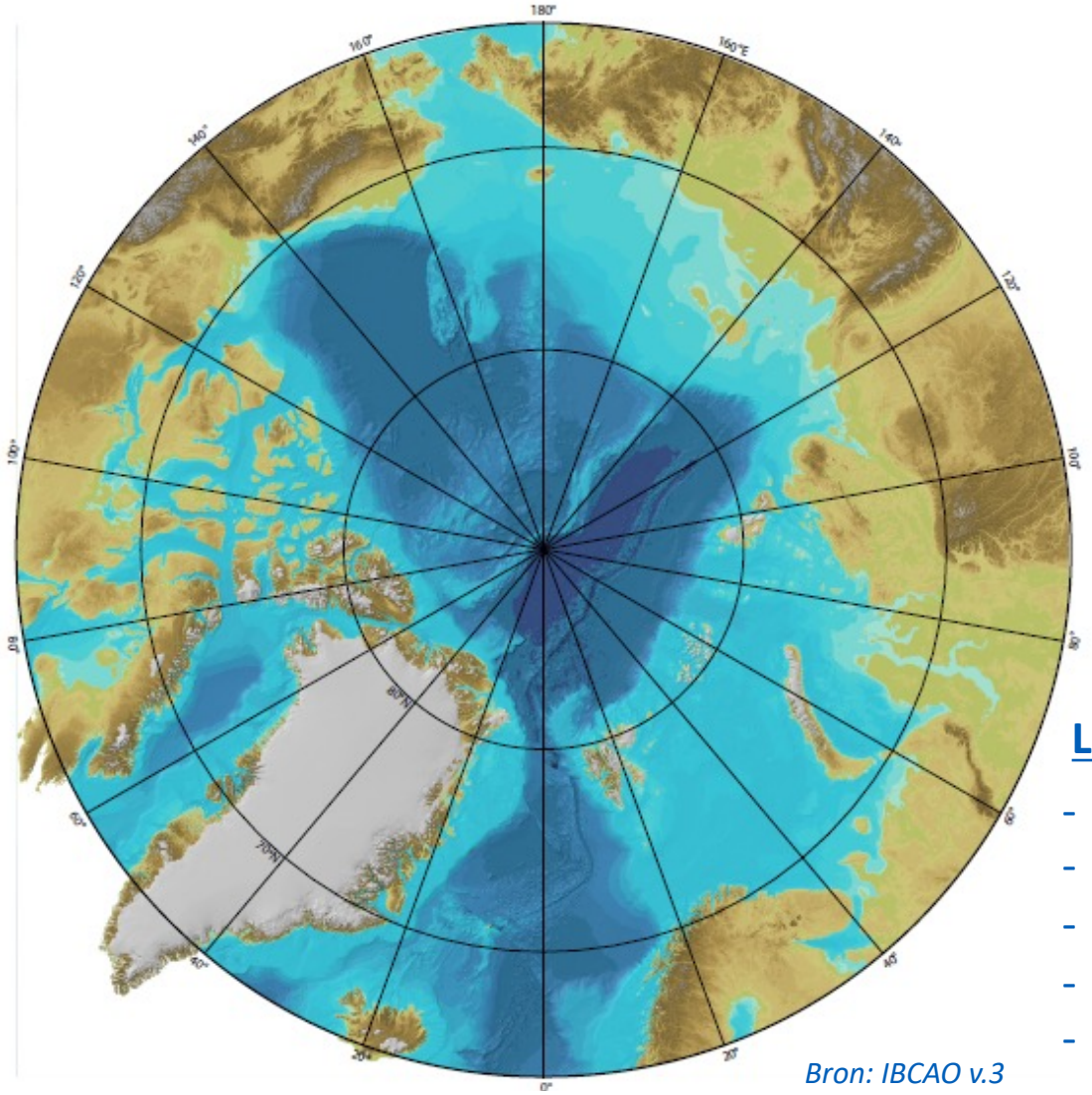


Bron: IBCAO v.3

LAND:

- Permafrost smelt
- Bosbranden
- Ontginningen
- Geopolitieke spanningen
- Windmolens in Scandinavië
- Seizoenaliteit verandert: migratieroutes

Klimaat: kanaries



Bron: IBCAO v.3

Foto: Vladimir Romanovski
https://www.newsweek.com/climate-change-permafrost-thawing-arctic-methane-infrastructure-1253152

LAND:

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Klimaat: kanaries

Foto: https://news.mongabay.com/2021/12/in-the-arctic-indigenous-sami-keep-life-centered-on-reindeer-herding/

Foto: https://sites.coloradocollege.edu/indigenoustraditions/sacred-lands/the-sami-reindeer-herders-of-sweden/

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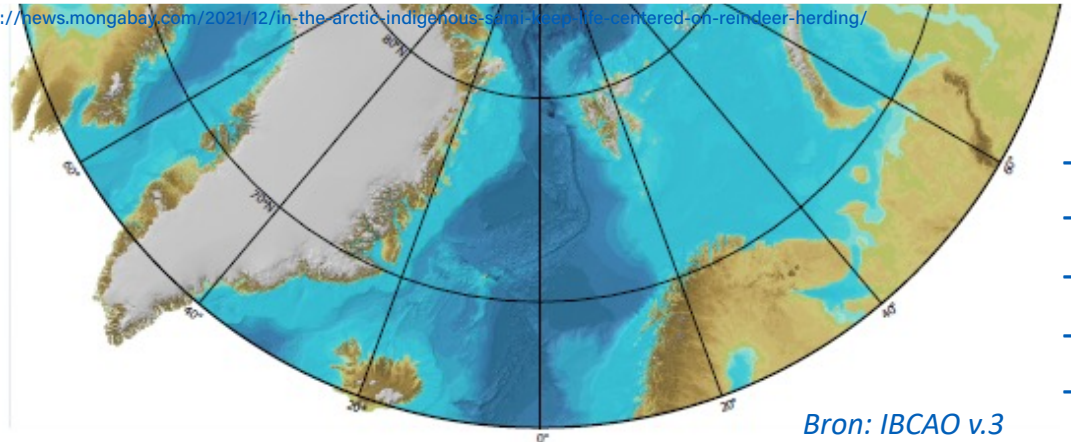

Bron: IBCAO v.3

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Klimaat: versnellers

Methaan: CH4

nature climate change

Article

https://doi.org/10.1038/s41558-022-01512-4

Seasonal increase of methane emissions linked to warming in Siberian tundra

Received: 19 April 2022

Accepted: 23 September 2022

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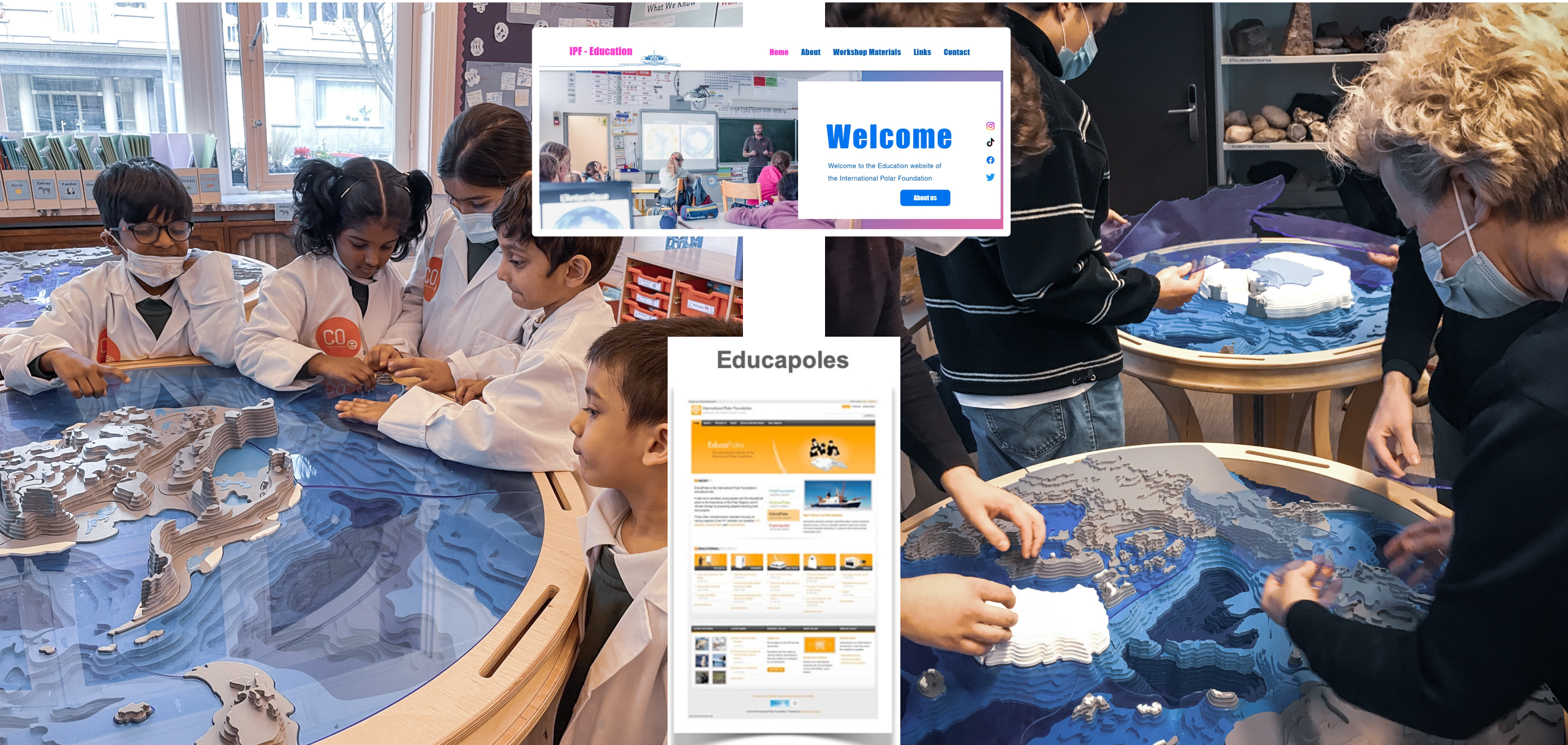
Check for updates

Norman Rößger[1,2], Torsten Sachs[1], Christian Wille[1], Julia Boike[3,4] and Lars Kutzbach[2]

While increasing methane emissions from thawing permafrost are anticipated to be a major climate feedback, no observational evidence for such an increase has previously been documented in the literature. Here we report a trend of increasing methane emissions for the early summer months of June and July at a permafrost site in the Lena River Delta, on the basis of the longest set of eddy covariance methane flux data in the Arctic. Along with a strong air temperature rise of $0.3 \pm 0.1\,°C\,yr^{-1}$ in June, which corresponds to an earlier warming of 11 d, the methane emissions in June and July have increased by roughly $1.9 \pm 0.7\%\,yr^{-1}$ since 2004. Although the tundra's maximum source strength in August has not yet changed, this increase in early summer methane emissions shows that atmospheric warming has begun to considerably affect the methane flux dynamics of permafrost-affected ecosystems in the Arctic.

Meer informatie?



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https://polarfoundation.org

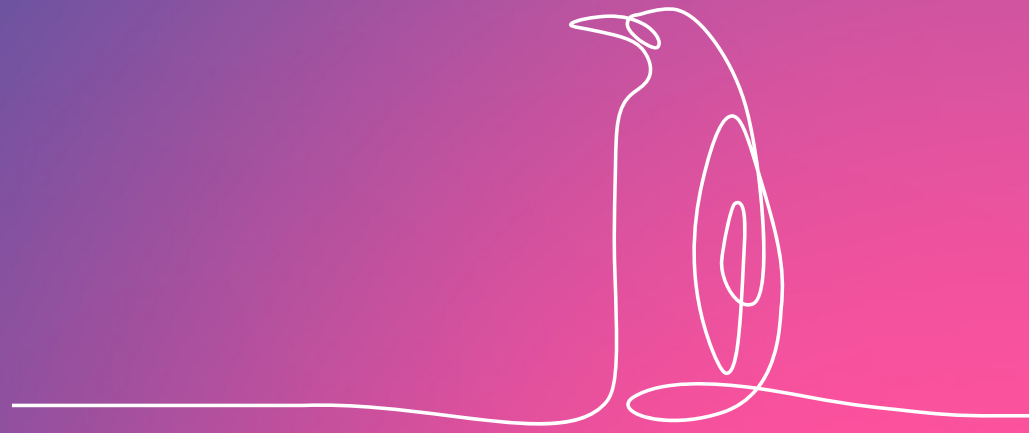
https://antarcticstation.org

https://arcticfutures.org

http://www.educapoles.org (2005-2015)

https://www.IPF-Education.org (2023)

Annex: reserveslides voor Q&A



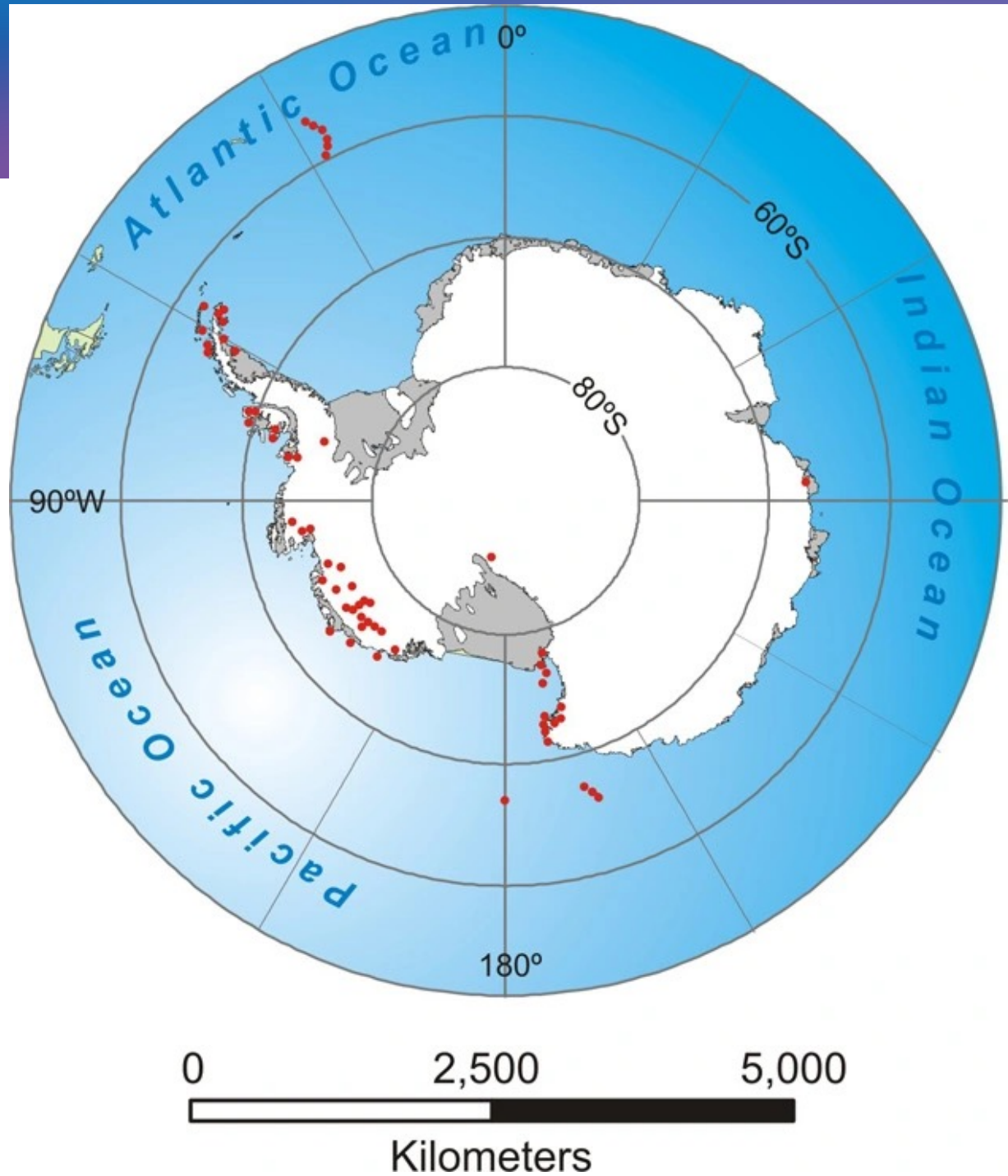
Extra slide: vulkanen in Antarctica

Mount Erebus (Ross Island, 3794 m)
- Vele malen uitgebarsten in de 20e eeuw

Deception Island
- uitgebarsten in 1969, 1972

19 ‘jonge’ vulkanen (< 10,000 jaar)
maar de meeste zijn ‘slapend’.

Meer info: https://volcano.si.edu/volcanolist_countries.cfm?country=Antarctica



Bron kaart: *Smellie, 2020*