



rijksuniversiteit  
groningen

arctisch centrum

# Feit en fictie in de berichten over klimaatverandering



Maarten J.J.E. Loonen

NIBI conferentie voor biologiedocenten  
bovenbouw HAVO en VWO

13 November 2021



ARCTIC  
CENTRE

University of Groningen The Netherlands



NOORDLAND  
Северная Земля

Rusland

Krasnojarsk  
Красноярск

Novosibirsk  
Новосибирск

Astana  
Астана

Kazachstan

Oezbek

Turkmenis

Azerbeidzjan

Oekraïne

Polen

Nederland

Verenigd  
Koninkrijk

Ierland

Litouwen

Denemarken

Wit-Rusland

Letland

Estland

Noorwegen

Zweden

Finland

Oostzee

Noordzee

Noorse Zee

Barentszee

Karazee

Arctische  
Oceaan

Groenlandzee

Baffinbaai

Alert

SPITSBERGEN

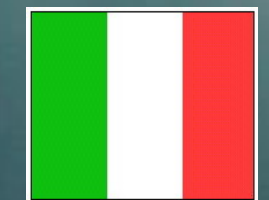
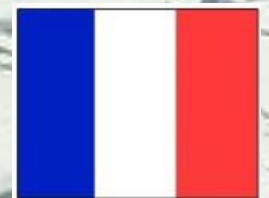
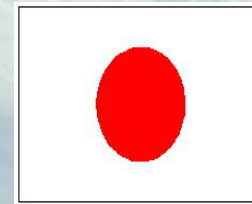
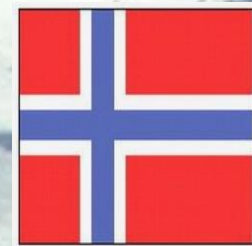
enland

IJsland

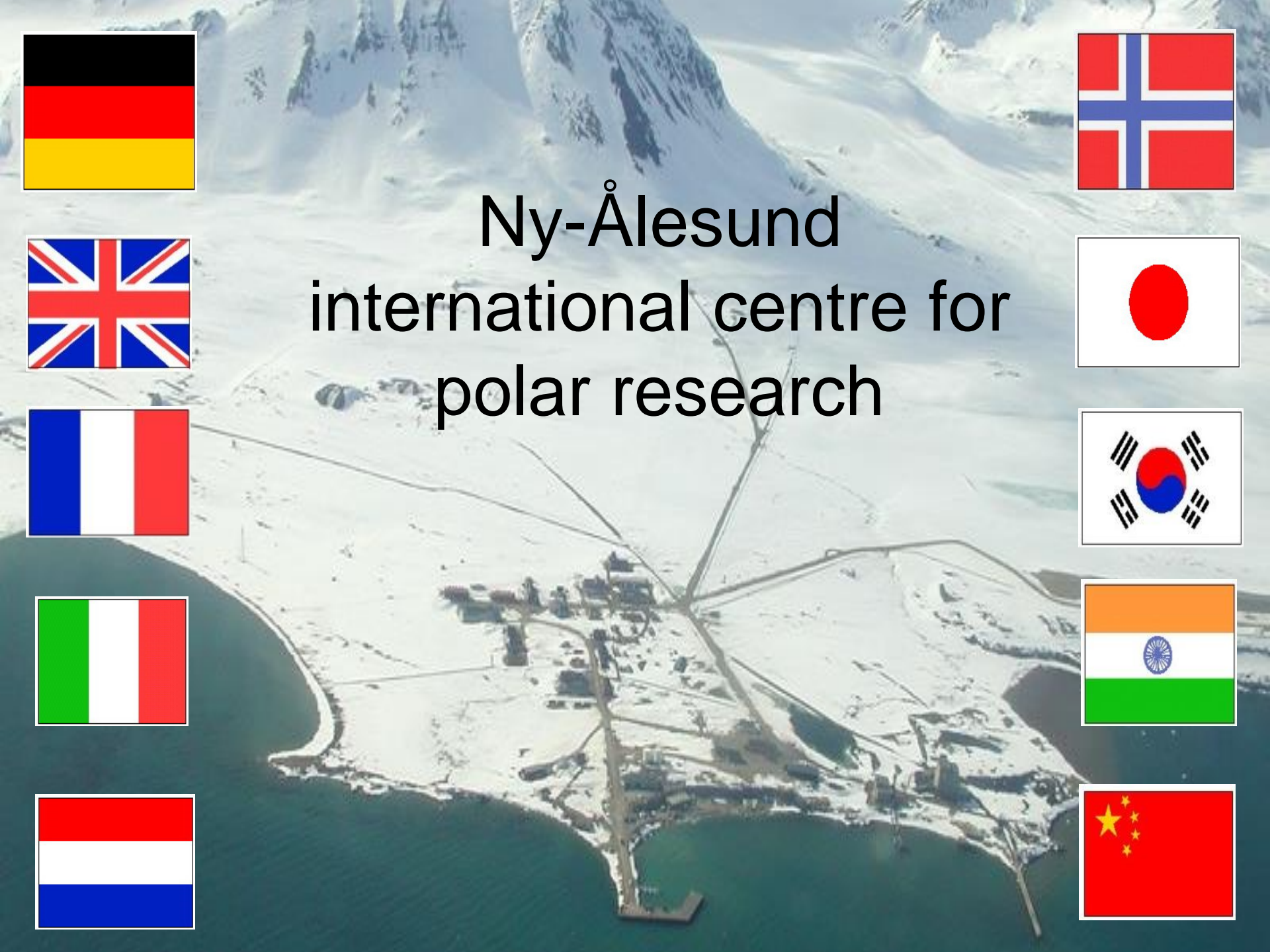
Moskou  
Москва

Londen

Berlijn



Ny-Ålesund  
international centre for  
polar research





NETHERLANDS  
ARCTIC STATION  
NY-ÅLESUND · SPITSBERGEN





FEIT

FICTIE



FEIT

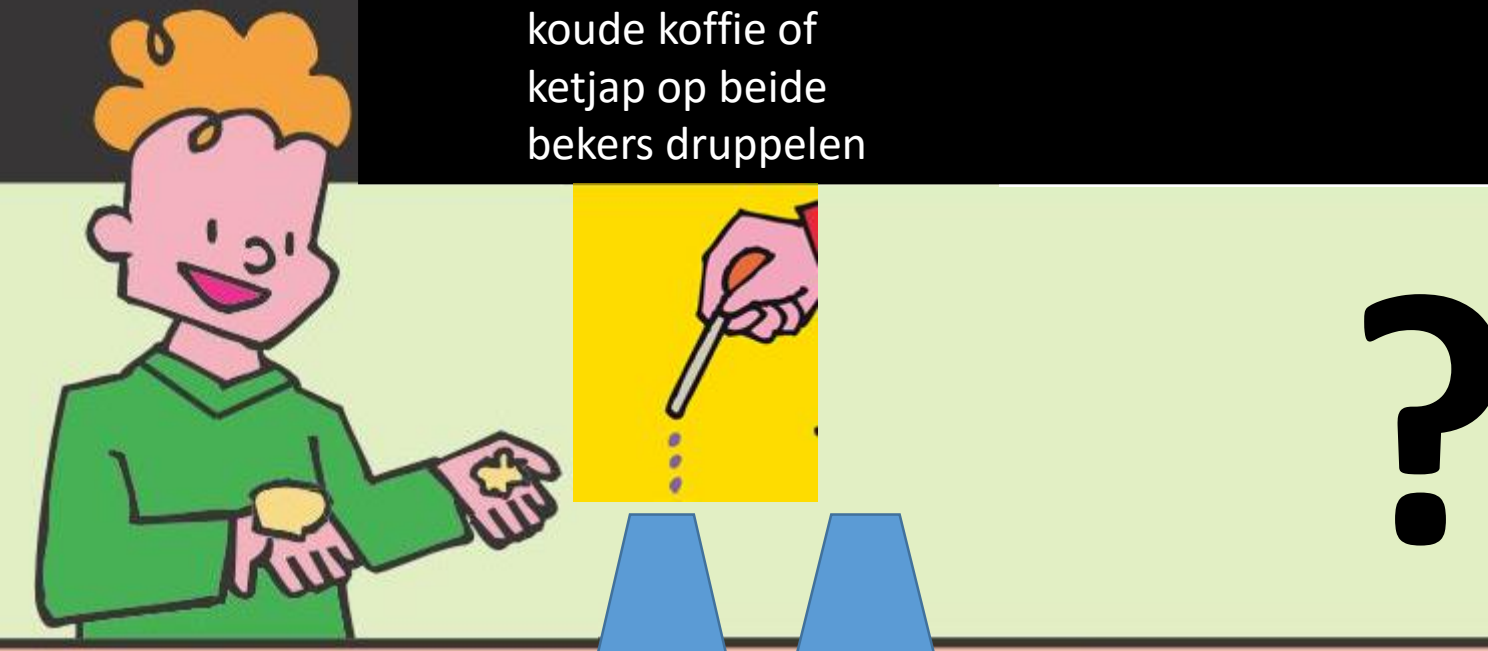
Vul beide plastic bekers met water.

Doe in één glas 1 eetlepel zout erbij. Roer tot het zout is opgelost.

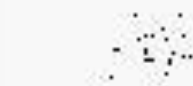
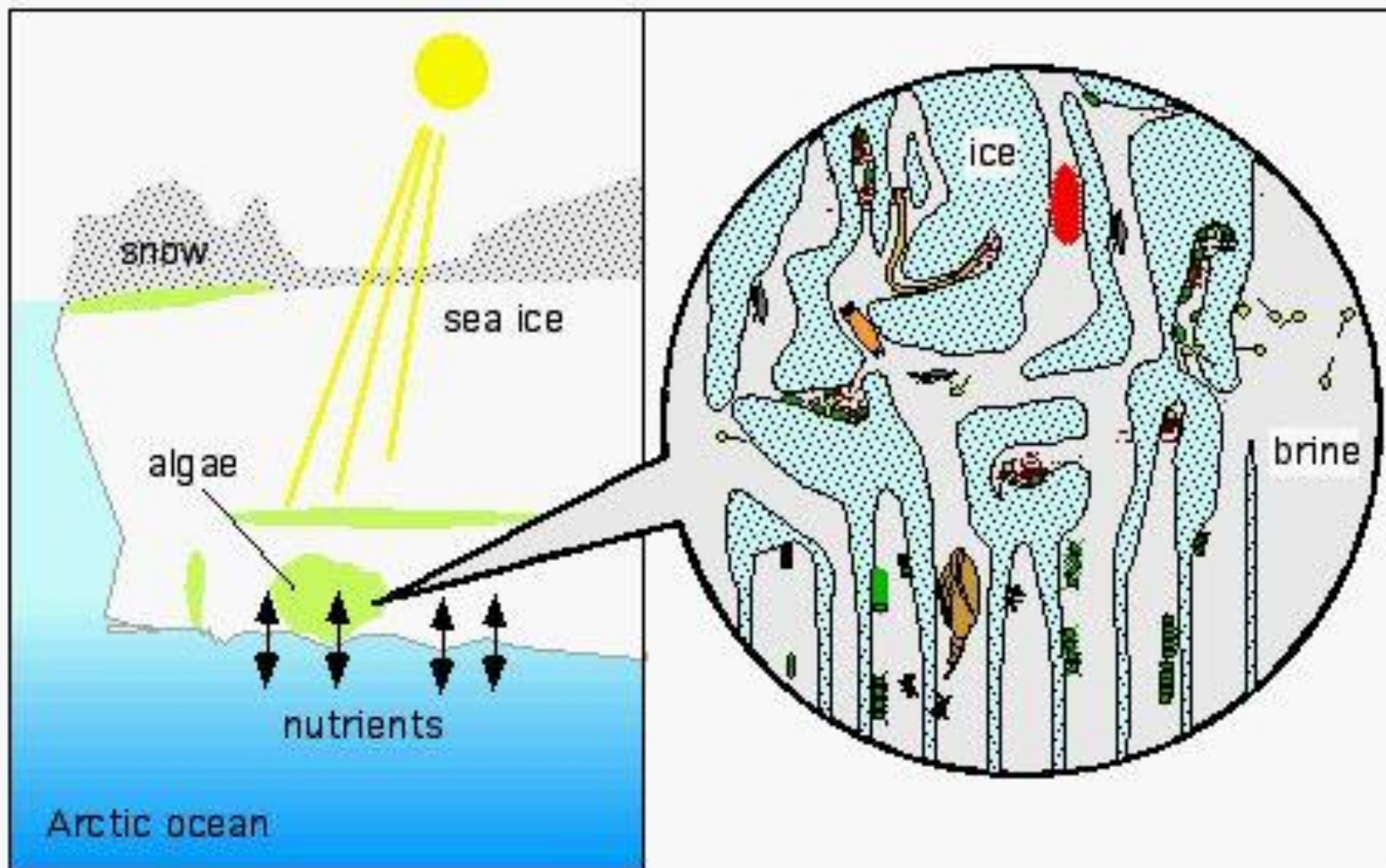
Invriezen, 10 min. wachten, omdraaien en uit beker halen



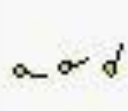
koude koffie of ketjap op beide bekers druppelen



## Magnification into brine channels



bacteria



unicellular algae and diatom chains



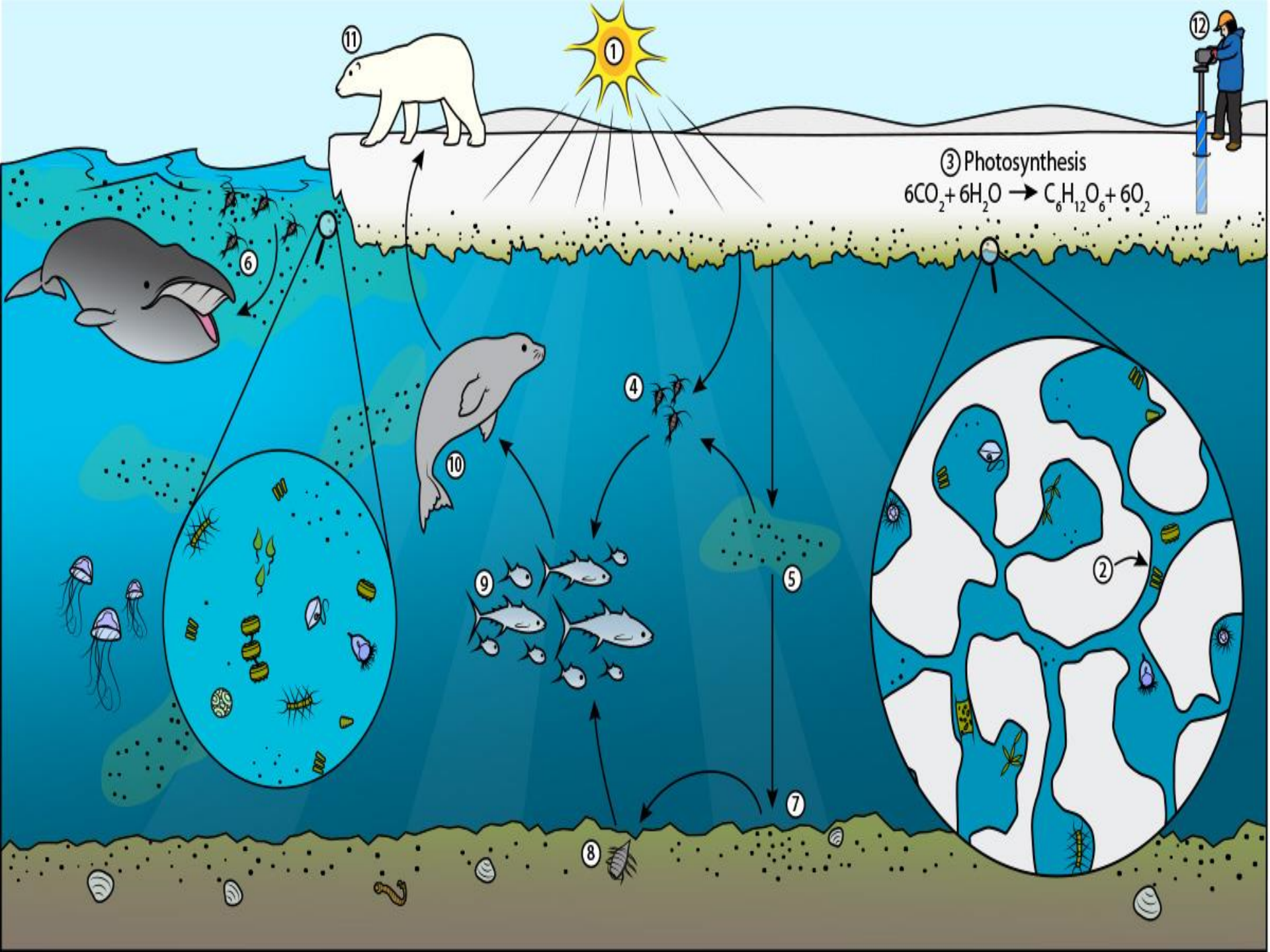
worms

crustaceans









Al het ijs  
is wit



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Scuba photo 30 meter under surface, without flash



Scuba photo 30 meter under surface, with flash



T

De normaal  
geeft een goed  
idee van de  
verandering

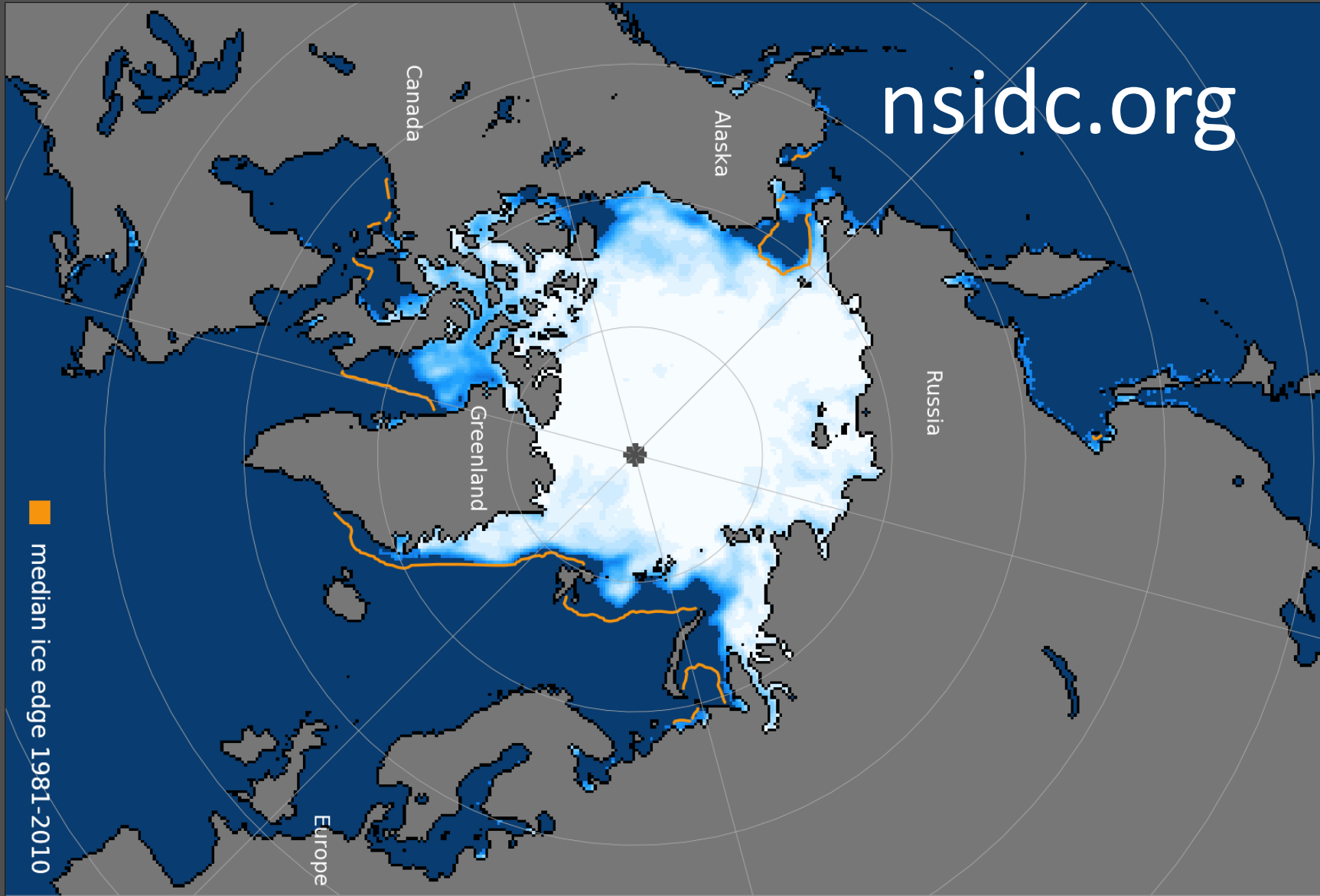


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near-real-time data

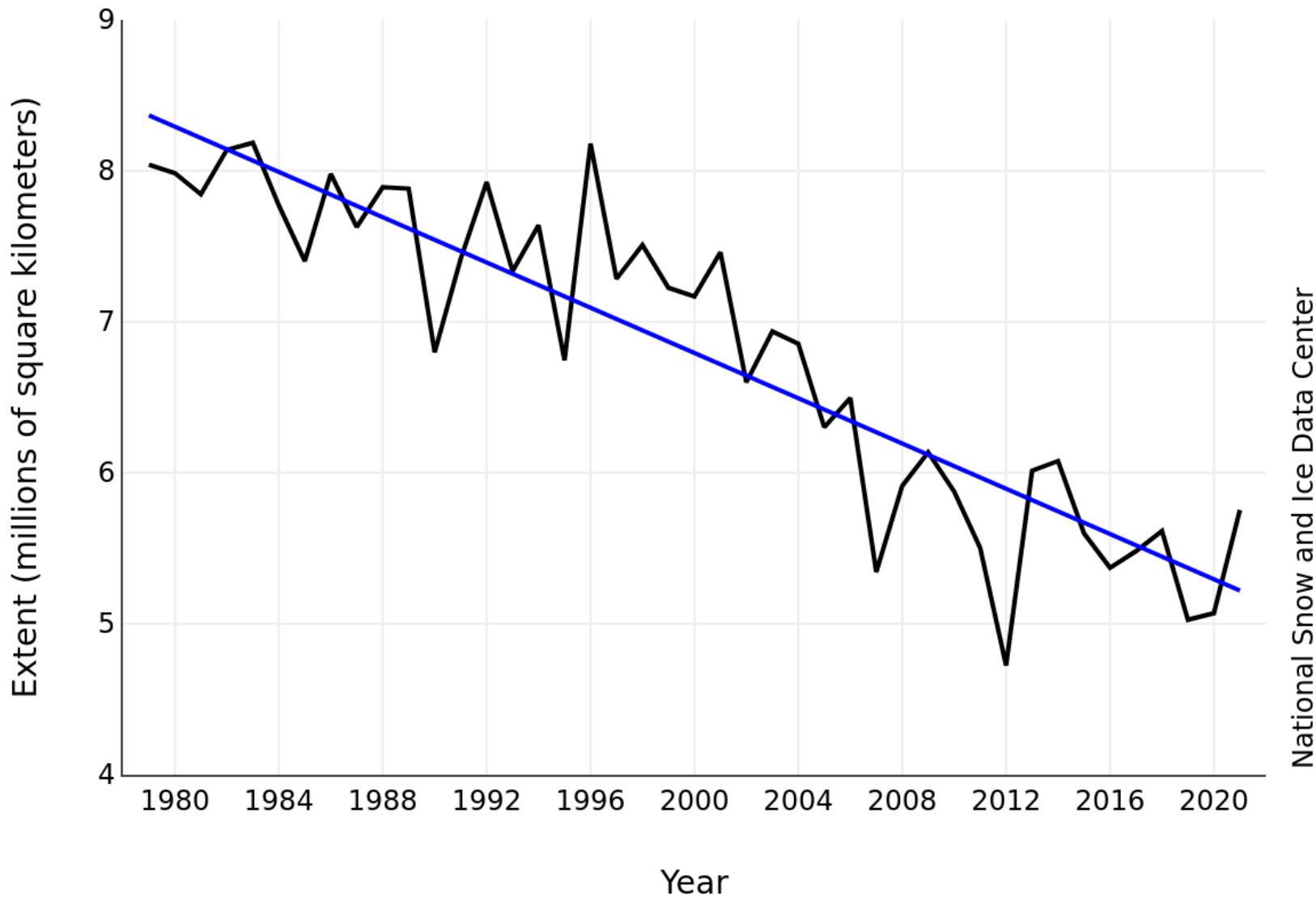


Sea Ice Concentration, 11 Nov 2021

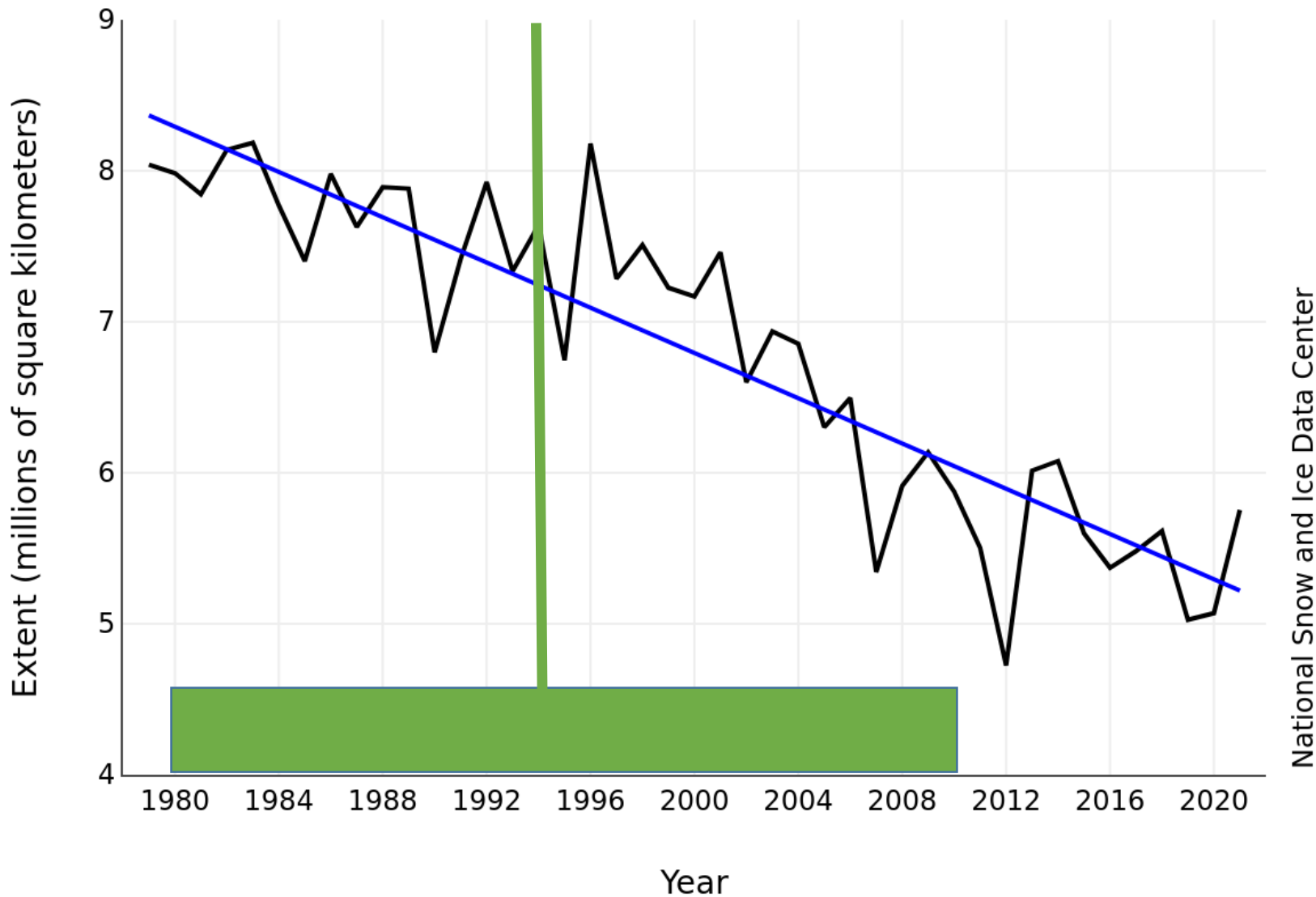
National Snow and Ice Data Center, University of Colorado Boulder



# Average Monthly Arctic Sea Ice Extent August 1979 - 2021

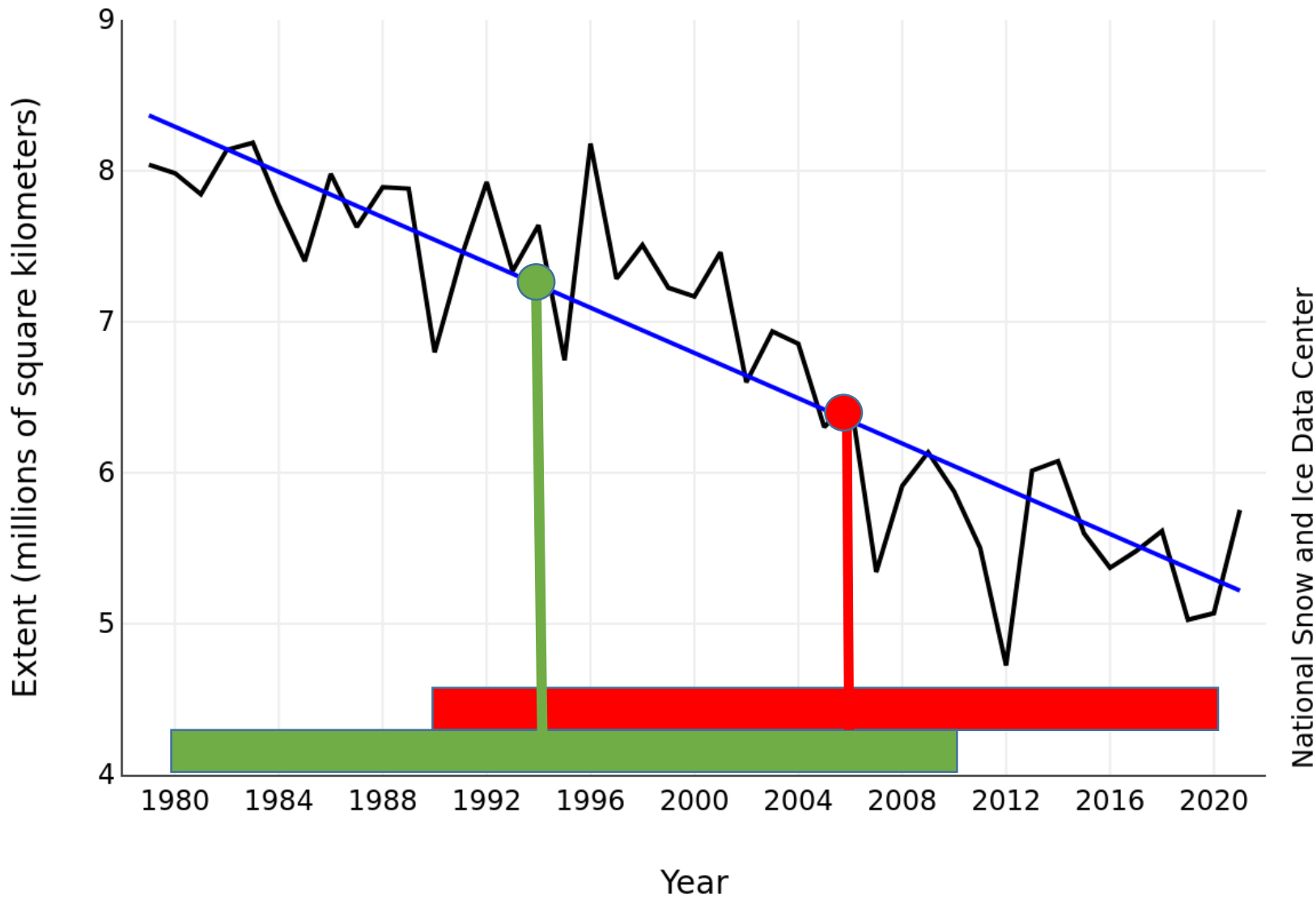


# Average Monthly Arctic Sea Ice Extent August 1979 - 2021



National Snow and Ice Data Center

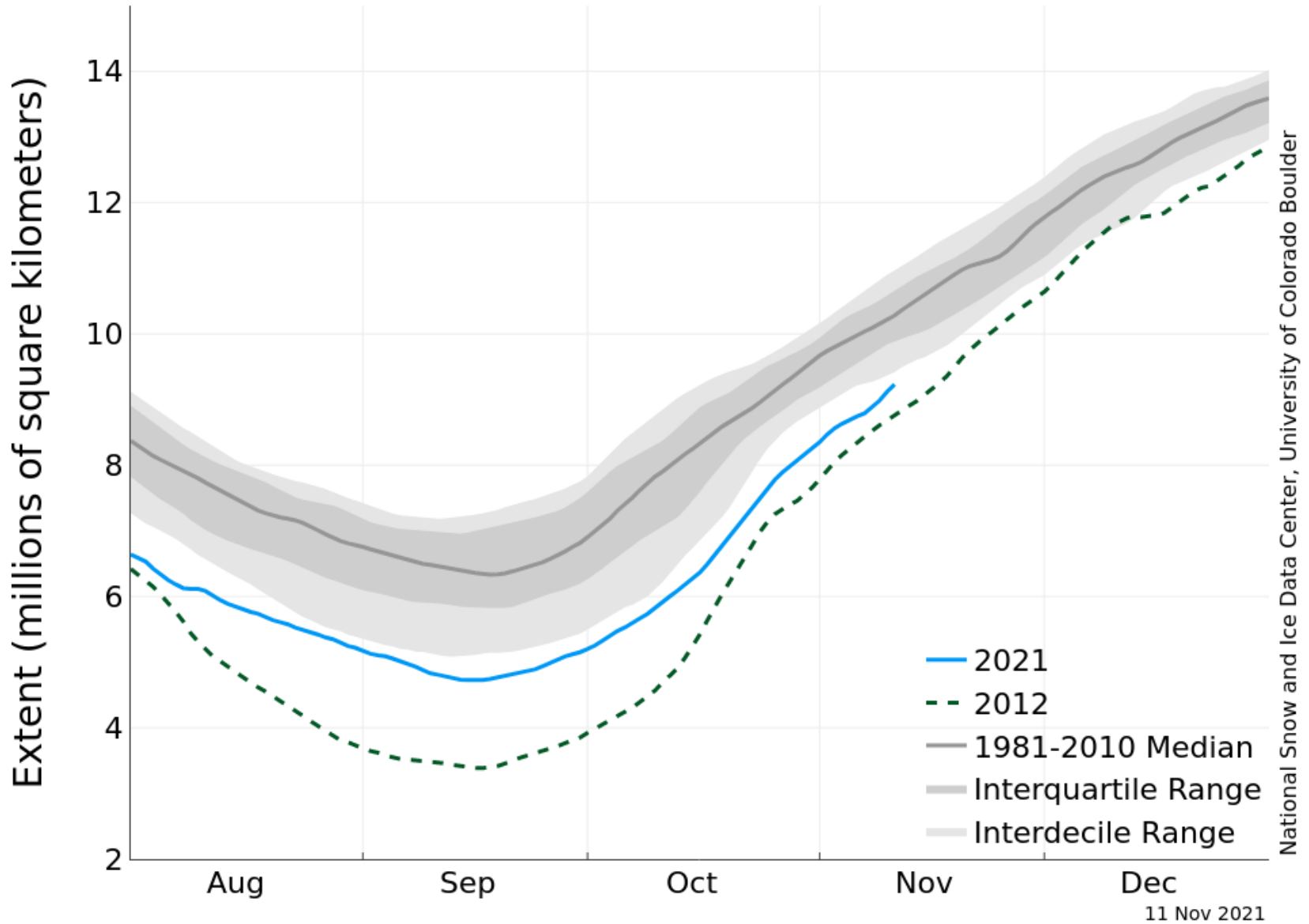
# Average Monthly Arctic Sea Ice Extent August 1979 - 2021



National Snow and Ice Data Center

# Arctic Sea Ice Extent

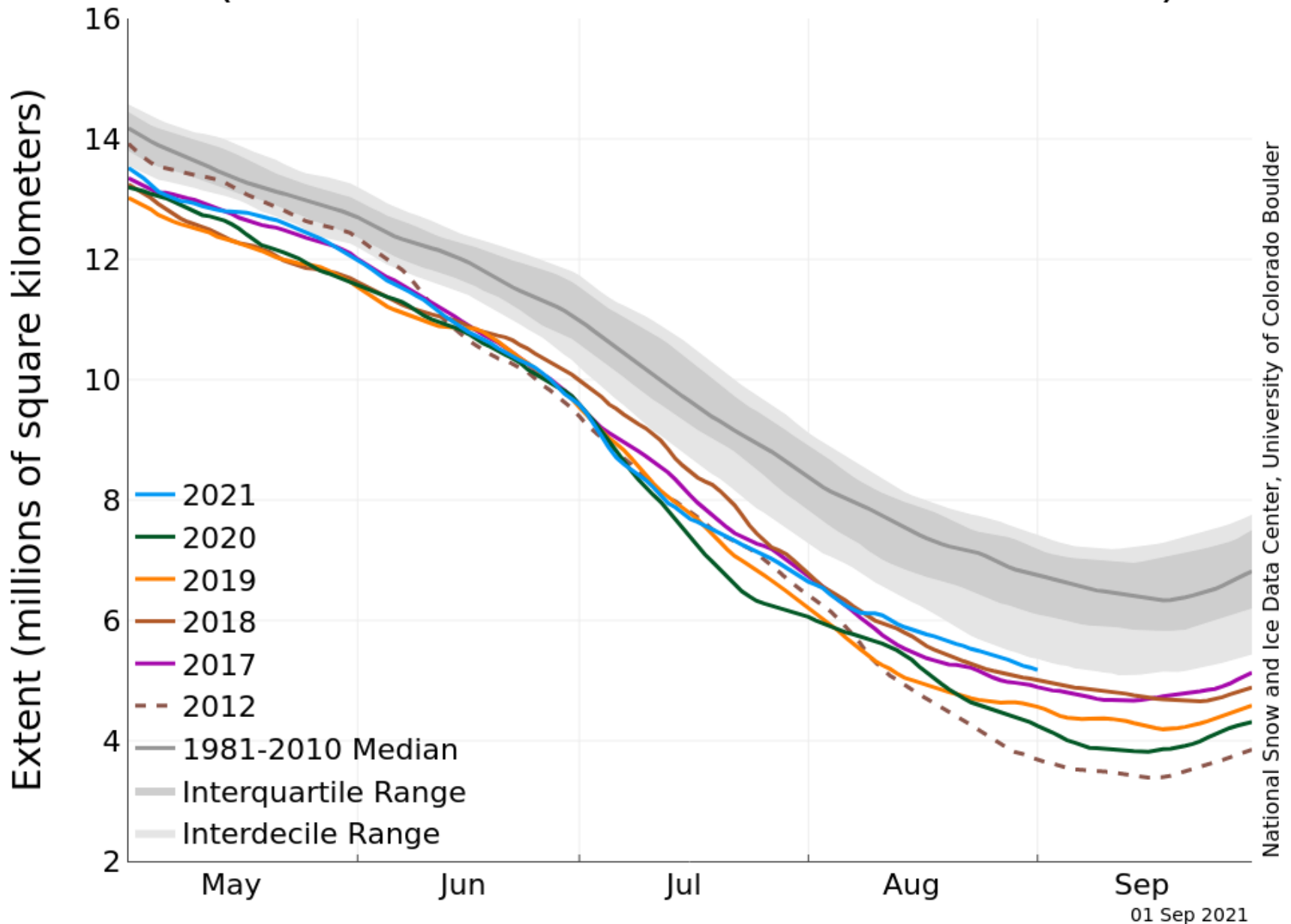
(Area of ocean with at least 15% sea ice)



National Snow and Ice Data Center, University of Colorado Boulder

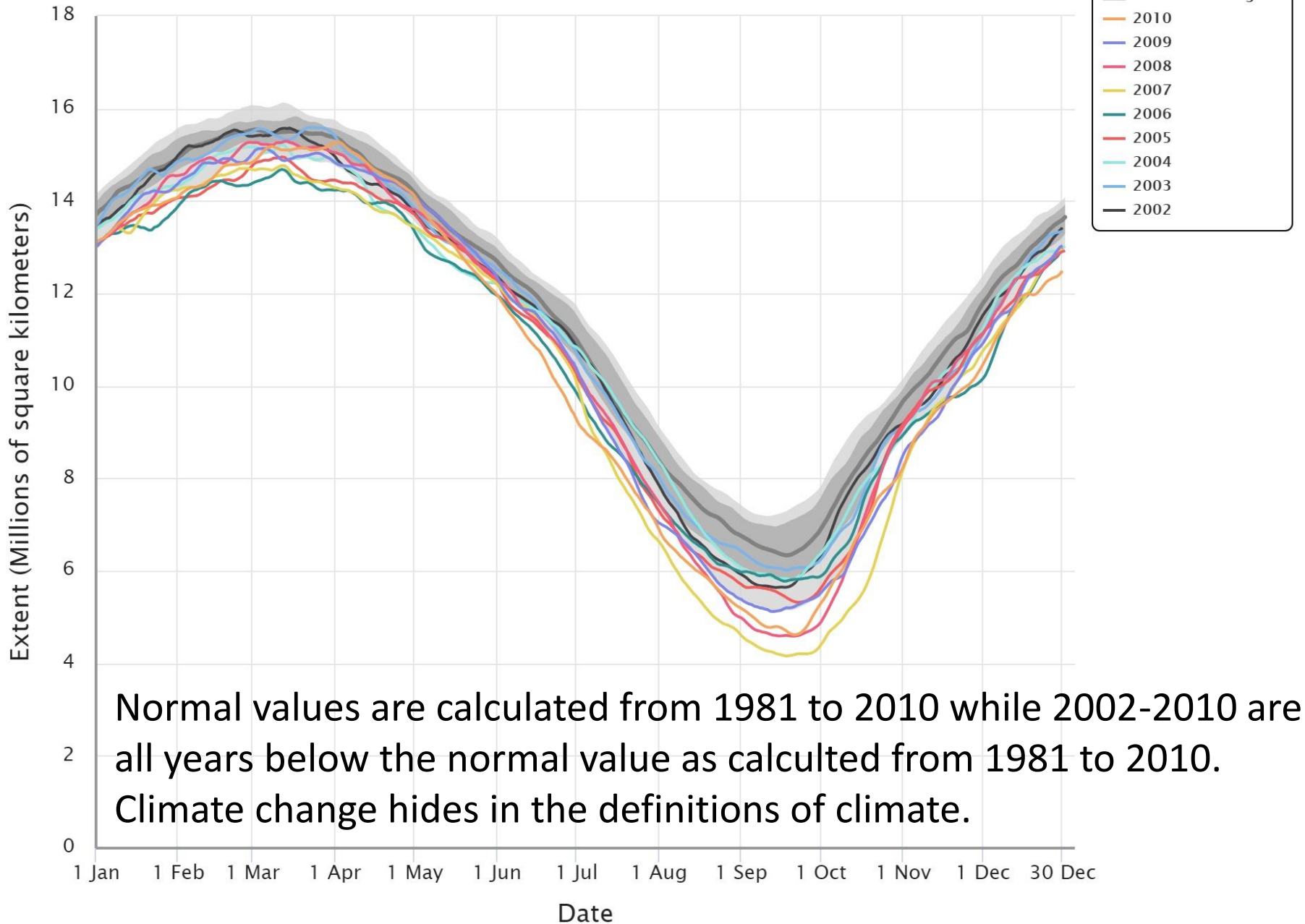
11 Nov 2021

# Arctic Sea Ice Extent (Area of ocean with at least 15% sea ice)



# Arctic Sea Ice Extent

(Area of ocean with at least 15% sea ice)



Normal values are calculated from 1981 to 2010 while 2002-2010 are all years below the normal value as calculated from 1981 to 2010. Climate change hides in the definitions of climate.

# Weerbericht aangepast na kritiek poolbioloog RUG

KOEN MARÉE

**GRONINGEN** Klimaatverandering wordt verstopt als weermannen en vrouwen de nieuwe 'jaarnormaal' van het KNMI gebruiken in hun journaals. Dat stelt RUG-ecoloog Maarten Loonen. De NOS is al overtuigd en neemt het woord 'normaal' niet meer in de mond.

Sinds 1 januari geldt een nieuw 'normaal' voor het klimaat. Dit is de standaard voor het gemiddelde weer, zoals de temperatuur en neerslag, over de afgelopen dertig jaar. Elke tien jaar update het Koninklijk Nederlands Meteorologisch Instituut (KNMI) de cijfers.

In weerberichten maken presentatoren van het weer vaak een vergelijking: 'Het is vandaag 3 graden warmer dan normaal', of 'er is de afgelopen maand veel minder neerslag gevallen dan gebruikelijk'. Met de nieuwe KNMI-standaard is dat problematisch, vindt RUG-poolbioloog

en klimaatdeskundige Maarten Loonen. Doordat het rekenmodel nu opschuift van het gemiddelde van de periode 1981-2010 naar dat van 1991-2020, lijkt de klimaatverandering in zo'n vergelijking veel minder groot dan hij werkelijk is.

„Terwijl het vooral de laatste tien jaar juist heel hard gaat”, zegt Loonen. „We kunnen niet meer spreken van een 'normaal', het huidige weer is niet normaal. Door dit toch te gebruiken, is het – ruig gezegd – volksverlakkerij. Het verstopt de klimaatverandering, die door de mens veroorzaakt wordt, en daarmee de urgentie om er wat aan te doen. Eigenlijk zou je moeten kijken naar de trend over de afgelopen tien jaar.”

De wetenschapper ging in gesprek met de NOS over het gebruik van de jaarnormaal in de berichtgeving. Met gedeeltelijk succes. Weerman Peter Kuipers Munneke liet weten het woord 'normaal' niet meer te gaan gebruiken. In plaats daarvan

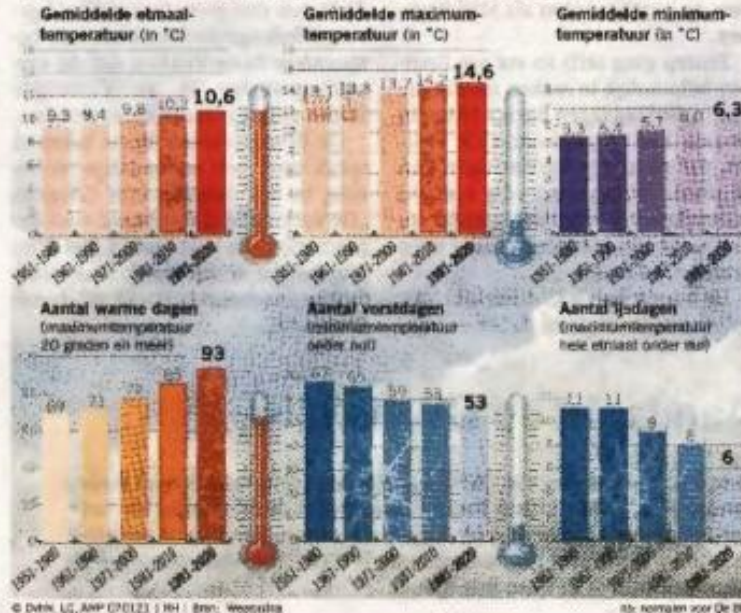
spreekt de nationale omroep in het vervolg van 'gemiddelde'.

Een goede ontwikkeling, stelt Loonen: „Hoewel ze voor die gemiddelden nog wel het KNMI-model blijven gebruiken. Dat rekenmodel was een hele goede methode toen het klimaat niet veranderde. Maar er is geen enkele reden om te verwachten dat de opwarming nu minder snel zal gaan dan de afgelopen tien jaar. Dan is het gek om het weer te vergelijken met een gemiddelde van dertig jaar.”

Het belangrijkste vindt de poolwetenschapper dat Nederlanders bewust worden van de klimaatverandering en de gevolgen: „Enkele decennia terug ging het om de zeespiegelstijging in het jaar 2100. Maar nu al zien we veel onverwachte dingen. Neem de toenemende droogte in de zomer, die grote consequenties heeft voor Nederlandse boeren en hun zaden. Of aardverschuivingen in Noorwegen doordat het niet meer sneeuwt, maar regent.”

## De nieuwe 'jaarnormaal'

Om te zien of het actuele weer normaal is voor de tijd van het jaar kijken meteorologen naar de gemiddelde temperatuur in een dertigjarig tijdvak, de 'normaal'. De huidige normaal is berekend over 1981-2010. De nieuwe normaal bestrijkt de periode 1991-2020.



© DWH, LG, ANP (D123) | RH | Bron: Weerstat

nb: normaal voor de 1981-2010



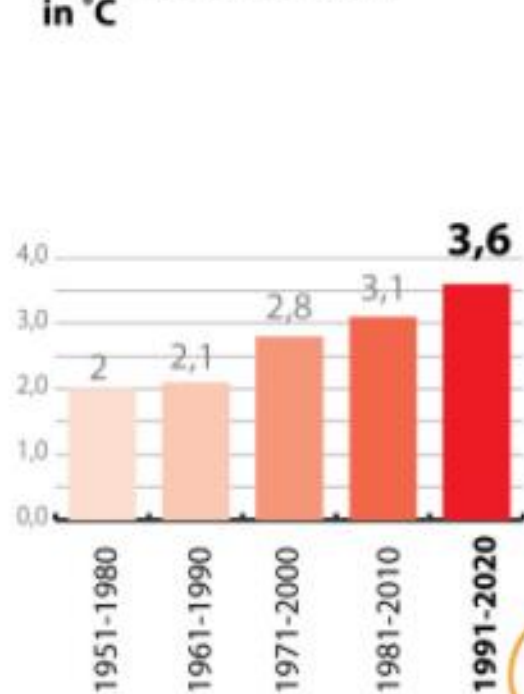
[https://www.npostart.nl/nos-journaal/30-12-2020/POW\\_04508491](https://www.npostart.nl/nos-journaal/30-12-2020/POW_04508491)



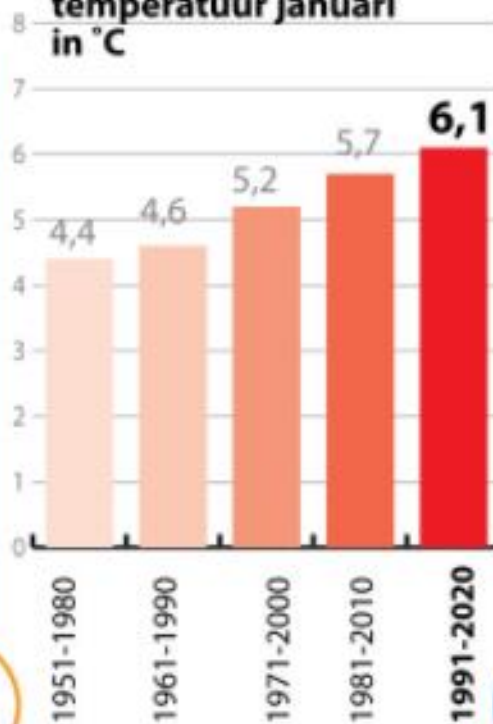
## De nieuwe 'normaal' voor januari is warmer dan ooit

Om te zien of het actuele weer normaal is voor de tijd van het jaar kijken meteorologen naar de gemiddelde temperatuur in een dertigjarig tijdvak, de 'normaal'. De huidige normaal is berekend over 1981-2010. De nieuwe normaal bestrijkt de periode 1991-2020.

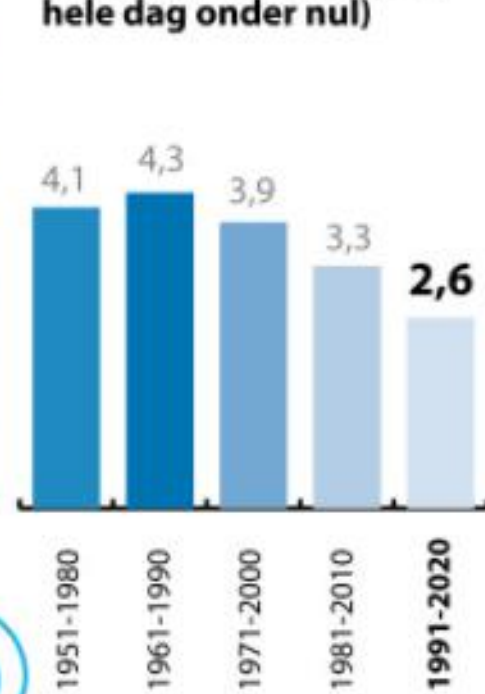
**Etmaalgemiddelde  
temperatuur januari  
in °C**



**Gemiddelde maximum-  
temperatuur januari  
in °C**



**Aantal ijsdagen januari  
(maximumtemperatuur  
hele dag onder nul)**



bron: Weeronline

nb: normalen voor De Bilt

ANP



**Peter Kuipers Munneke**  
@PKuipersMunneke



Vanaf morgen geldt er, voor de komende 10 jaar, een nieuwe normaal voor het klimaat. Dat is het gemiddelde weer over 1991-2020. Maar het weer is niet meer normaal. Daarom stoppen @marcopverhoef, @whoebert, @GerritHiemstra en ik met de term "normaal"  
[nos.nl/artikel/236253...](https://nos.nl/artikel/236253...)



11:22 AM · Dec 31, 2020



## Weeronline past klimaatnormaal voortaan jaarlijks aan

Aangemaakt: 25 jan 2020, 07:29 uur

Door de sterke opwarming van het klimaat verandert 'het normale weer' razendsnel. Daarom vinden wij het relevant om de klimaatnormaal vanaf nu jaarlijks aan te passen in plaats van één keer in de tien jaar. Hiermee sluit wat onze meteorologen als normaal weer beschrijven beter aan bij wat mensen als gewoon weer ervaren.



**Gerrit Hiemstra**  
@GerritHiemstra



Nieuw [#klimaatnormaal](#) leidt tot discussie: is het weer nog wel 'normaal'?  
[nos.nl/l/t/2362535](https://nos.nl/l/t/2362535) via @NOS

We gaan de term 'normaal' niet meer gebruiken (behoudens uit de macht der gewoonte) en vervangen door 'gemiddelde'. Het 'normale' weer bestaat namelijk al niet meer.



Nieuw klimaatnormaal leidt tot discussie: is het weer nog wel 'normaal'?

[nos.nl](https://nos.nl)

9:59 PM · Dec 30, 2020





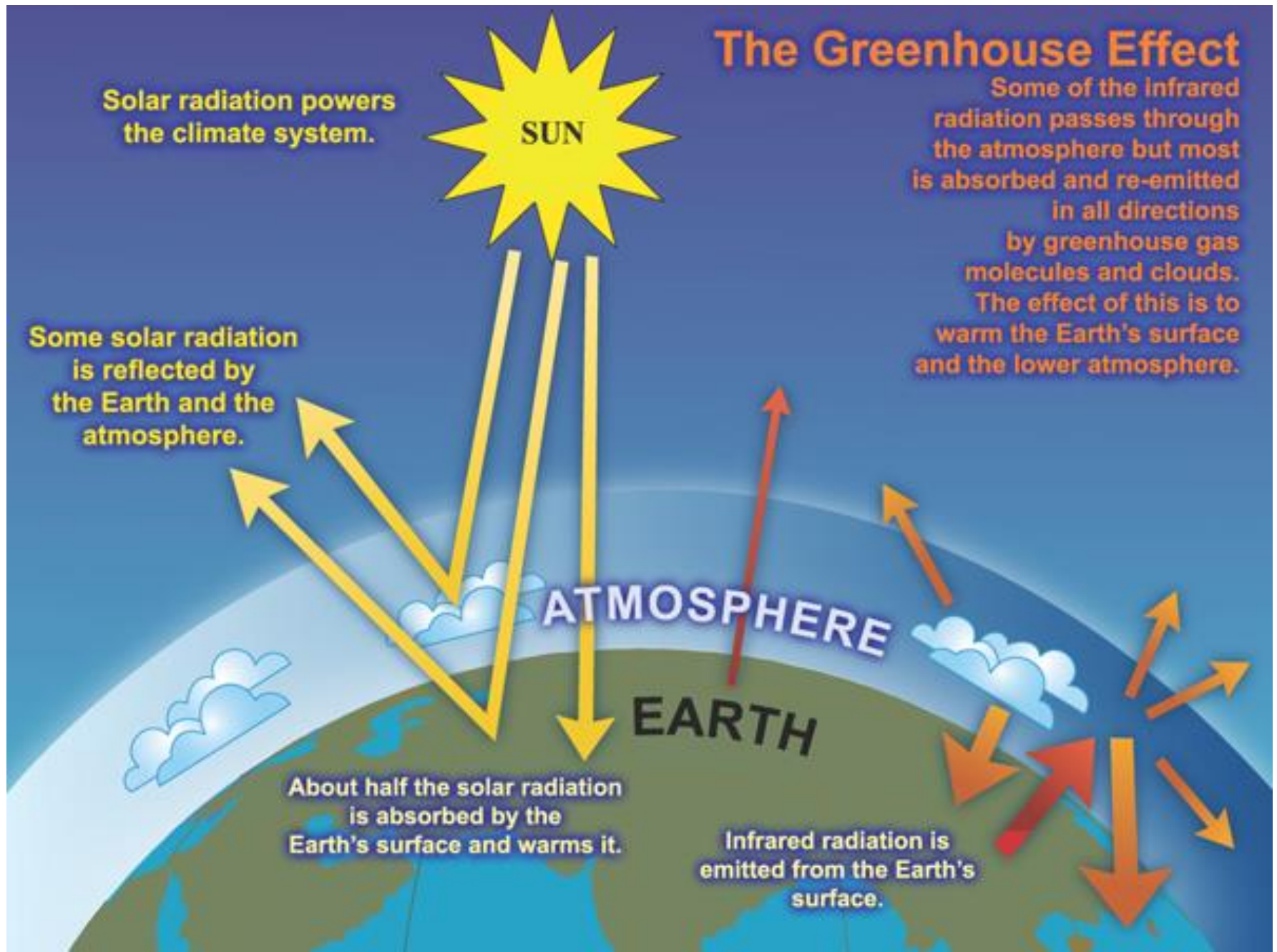
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FICTIE



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greenhouse gasses are natural; without=-18°C ; with=+15°C



D IS  
EEN

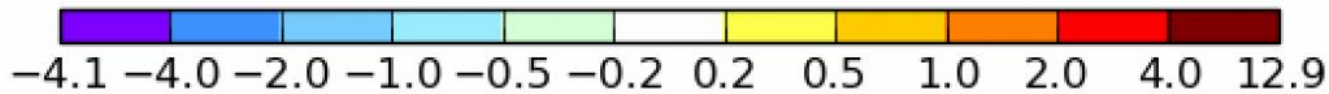
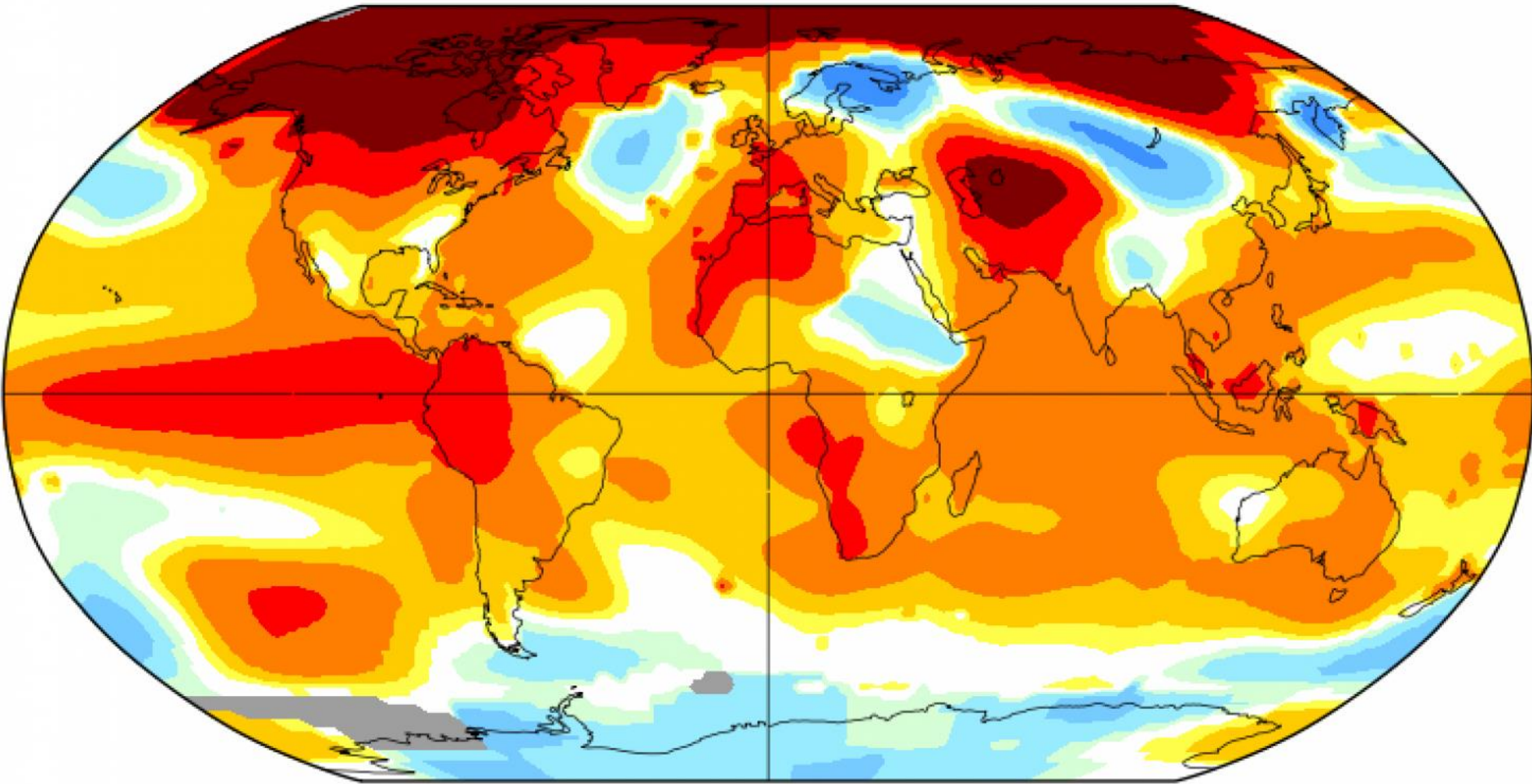
De Noordpool  
warmt het  
snelst op



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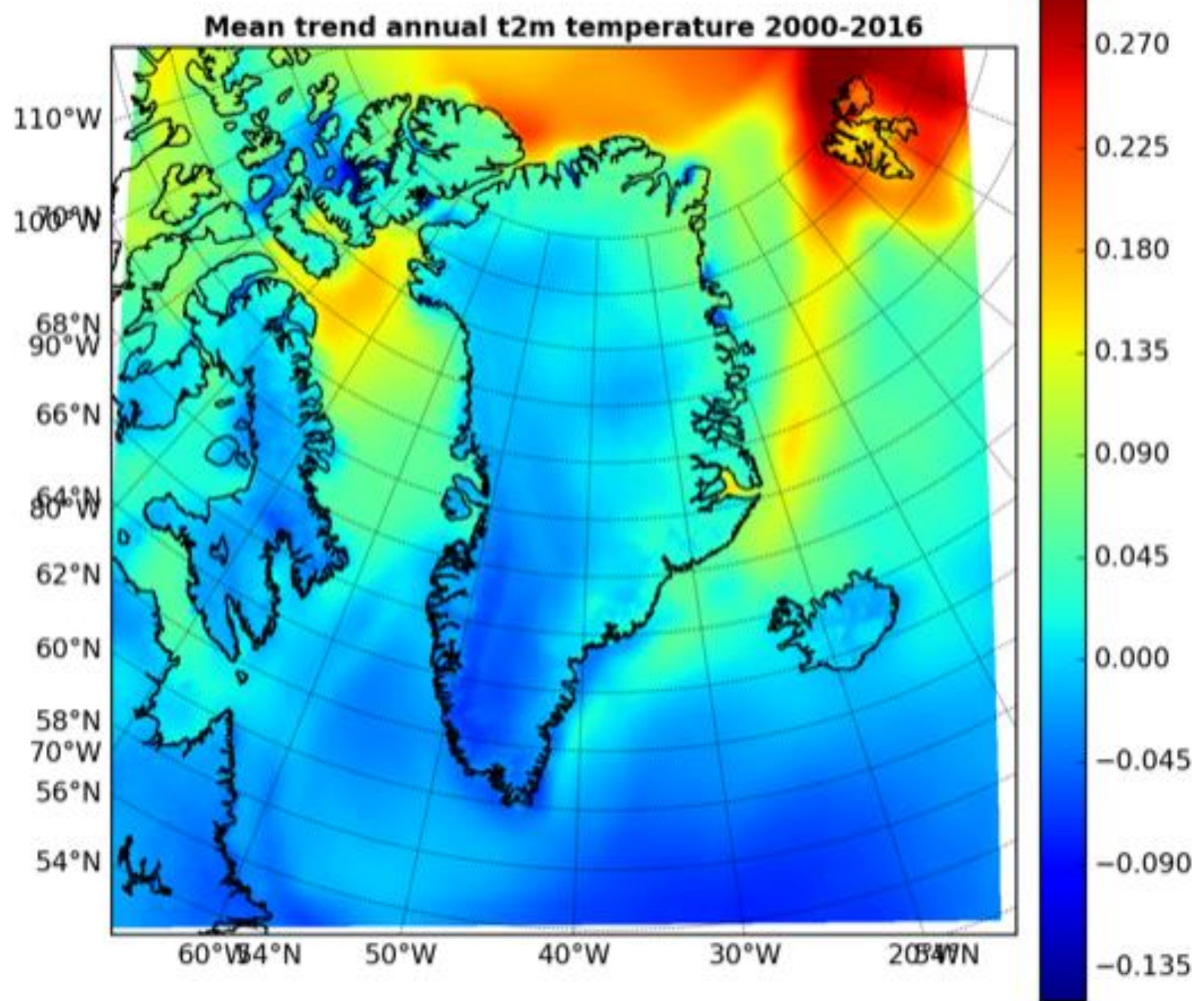
FIC





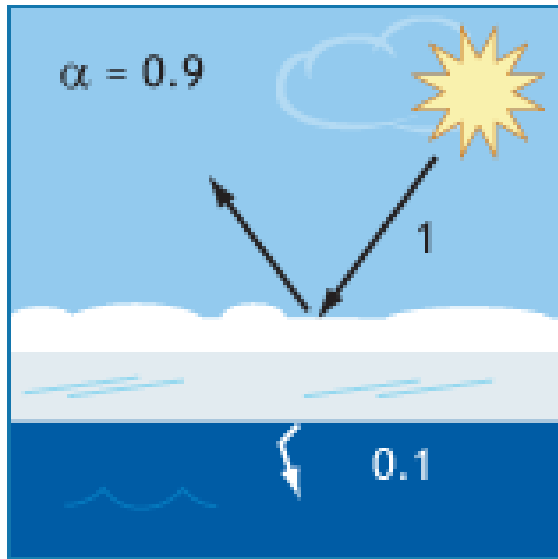
# Arctic amplification

Red means 4.5 degrees increase in 20 years

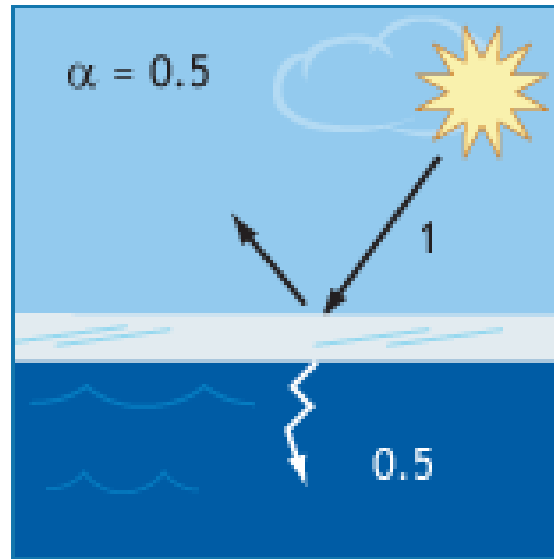


**albedo** fraction of incoming radiation which is reflected

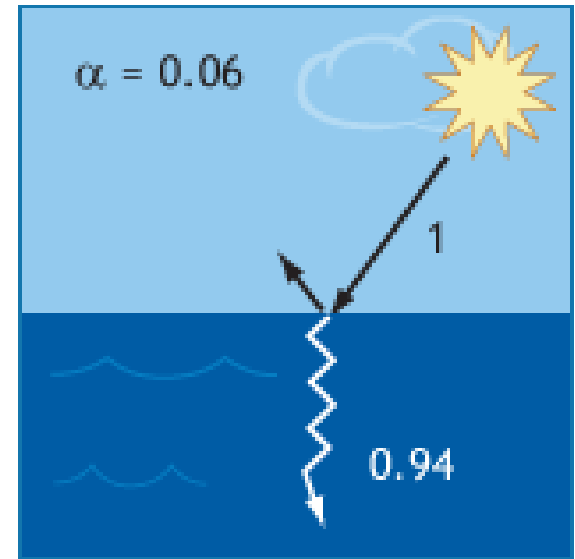
Ice with Snow



Bare Ice



Open Ocean



**Absorbs** **Reflects**



**0**

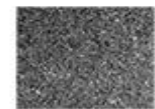
0% Reflected

**0.5**

50% Reflected

**1**

100% Reflected



asphalt (0.10)



grass (0.25)



white paint (0.80)





Wolken  
beïnvloeden  
klimaatmodellen



5G VEROOR  
CORON

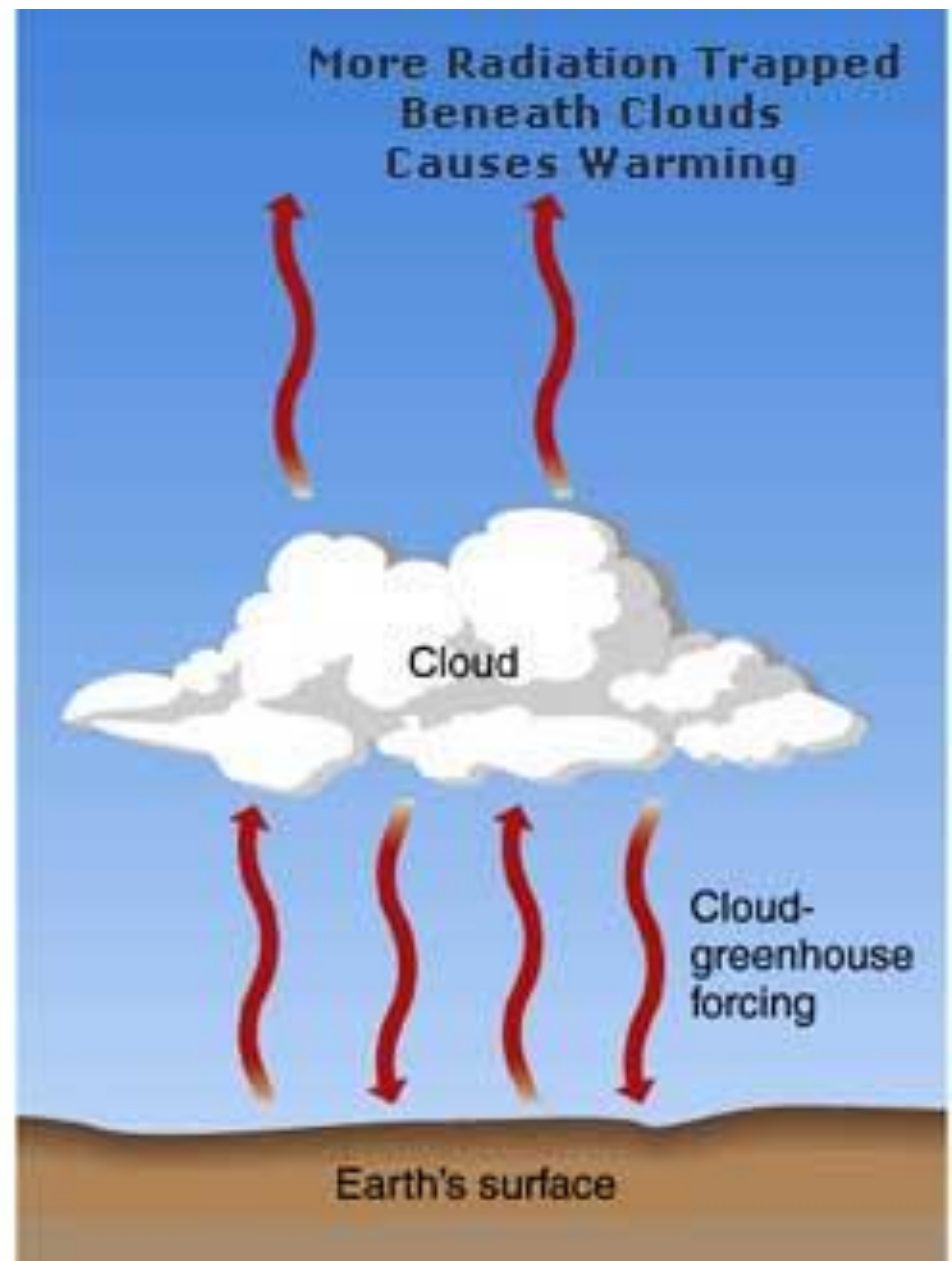
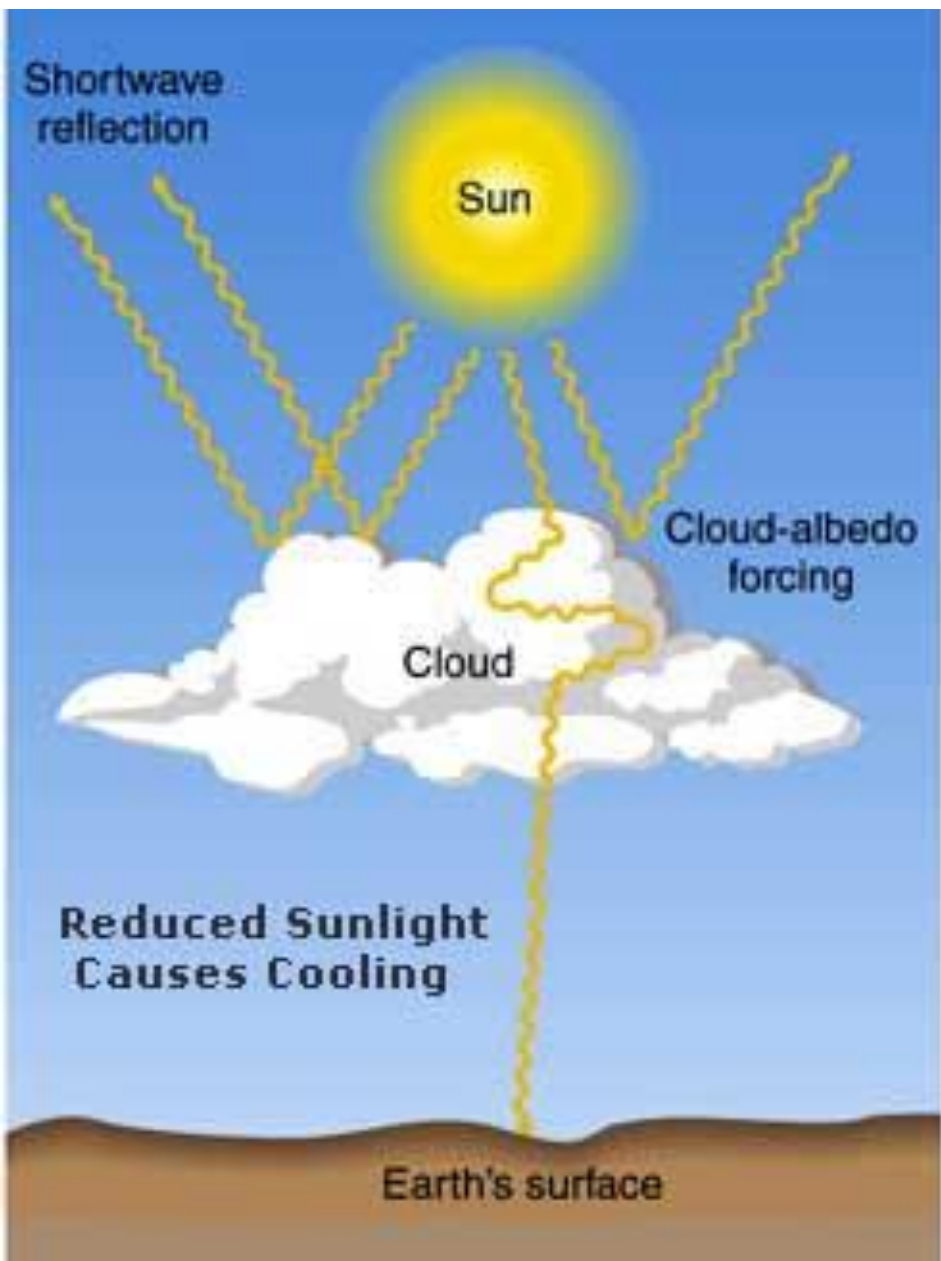
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FICTIE

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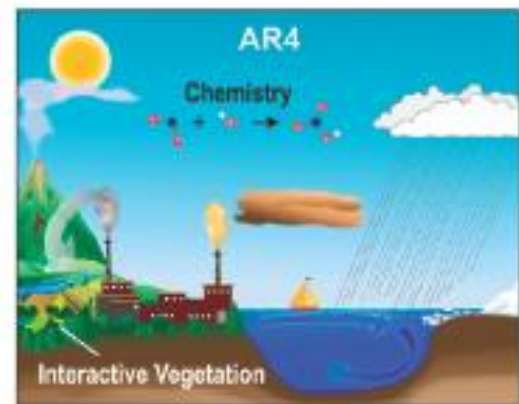
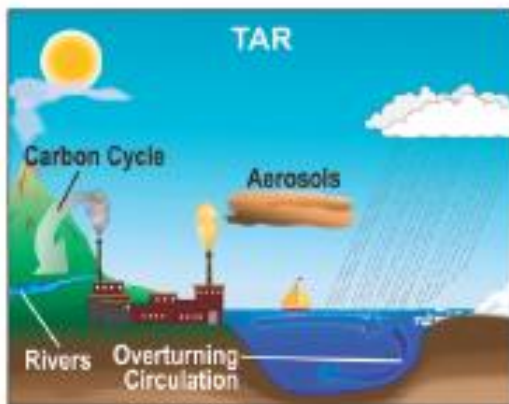
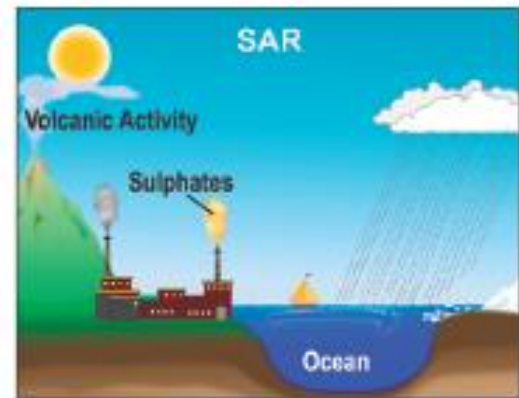
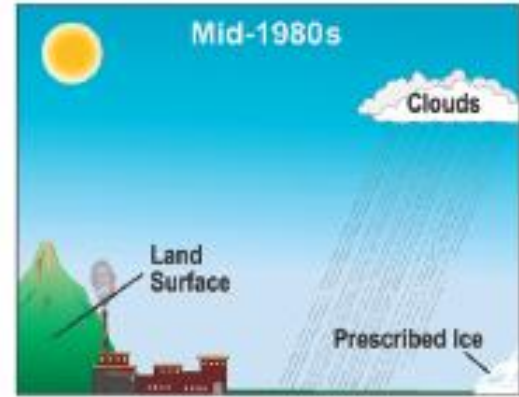
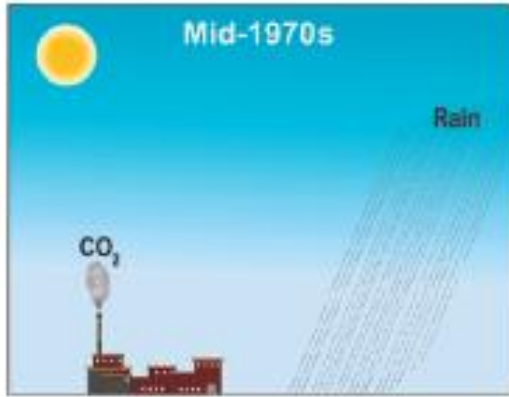
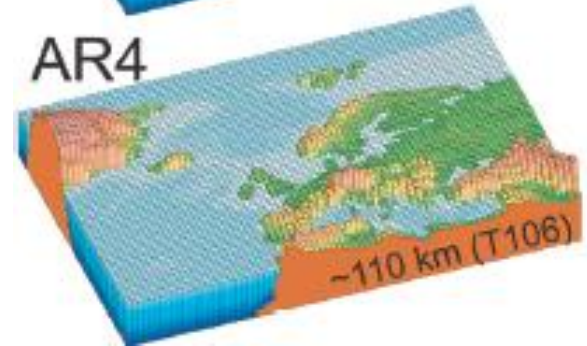
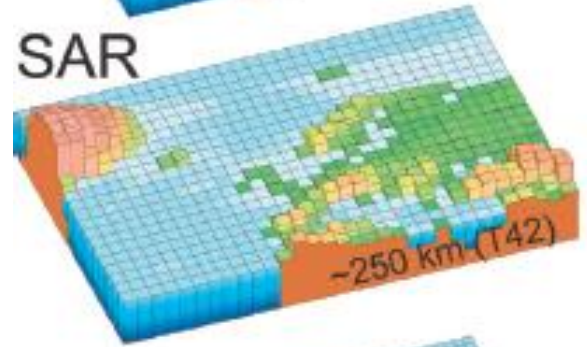
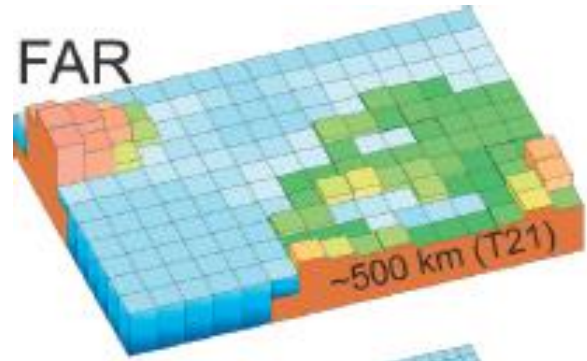
# Effects of clouds.

Remember pattern of light and dark periods at the poles



# Improvement in climate models (scale and processes)

## The World in Global Climate Models



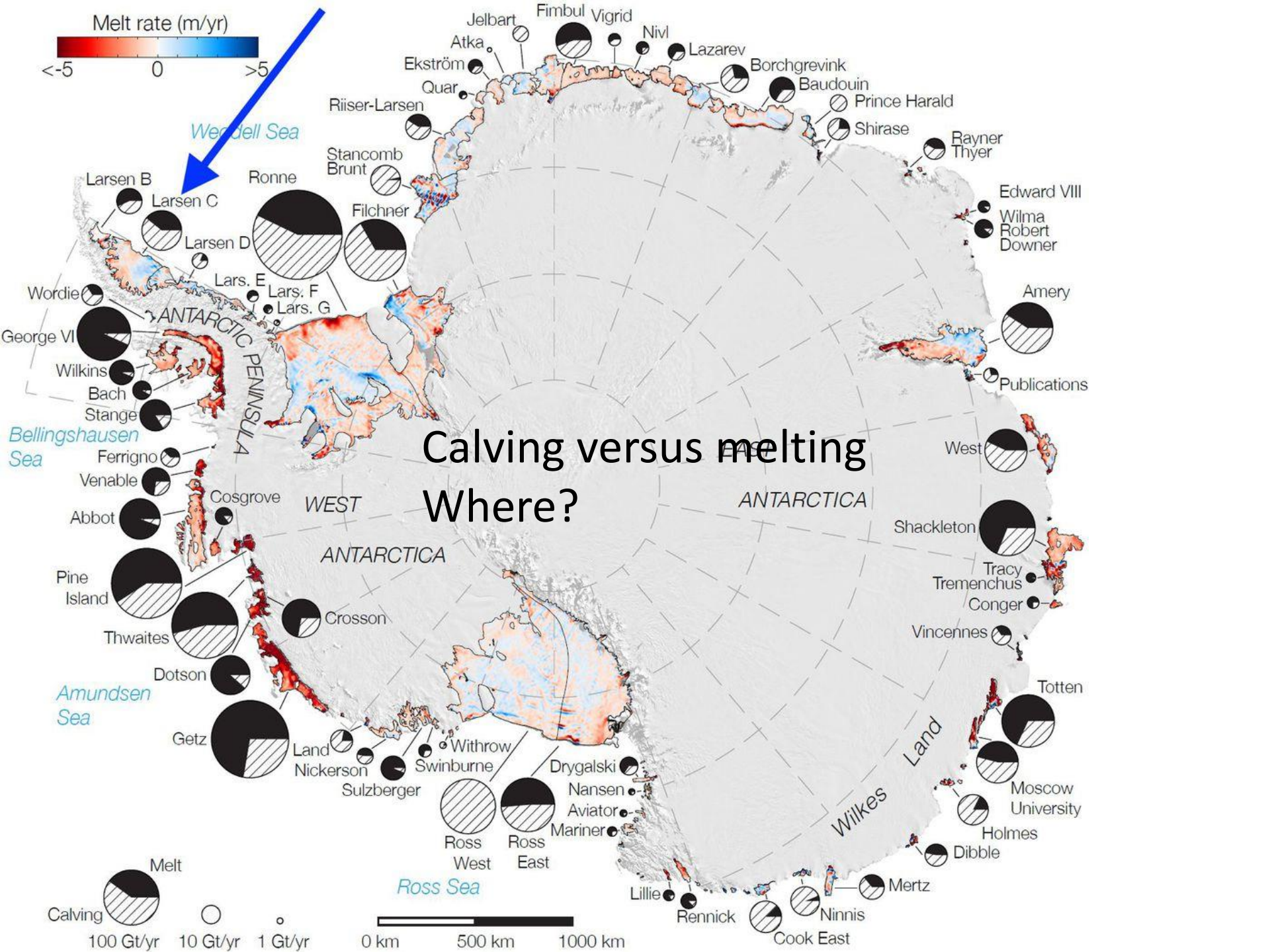
T

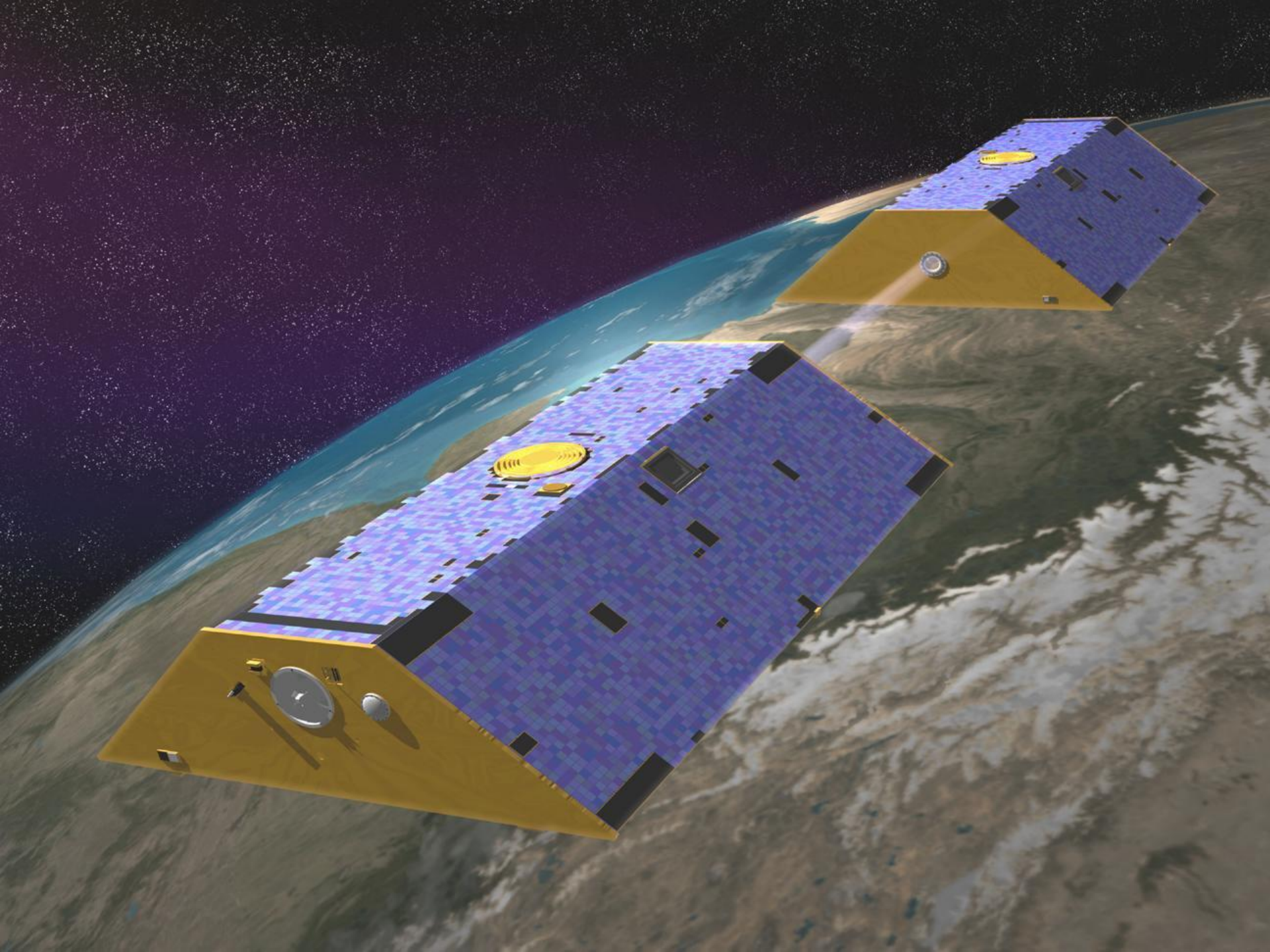
Afname van ijs op  
Antarctica komt  
door afbreken

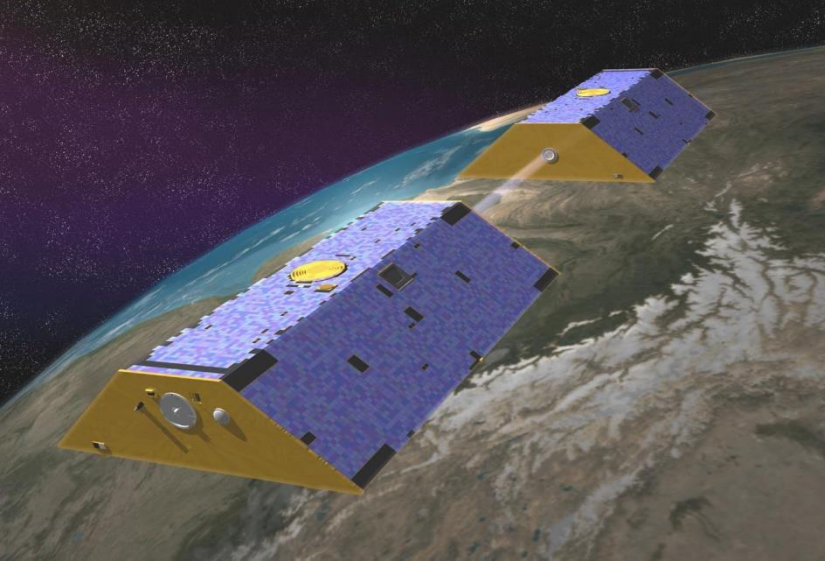


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FICTIE







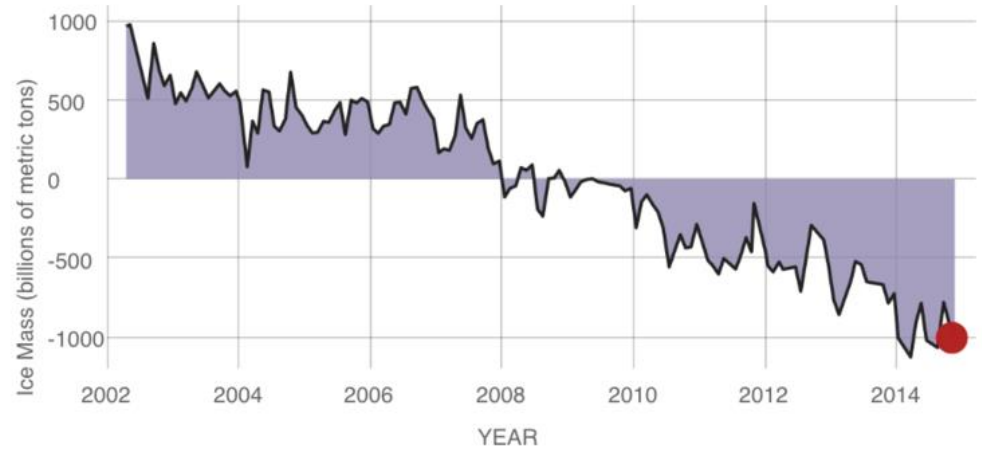
### ANTARCTICA MASS VARIATION SINCE 2002

Data source: Ice mass measurement by NASA's Grace satellites.  
Credit: NASA

RATE OF CHANGE

↓ -134

billion metric tons per year



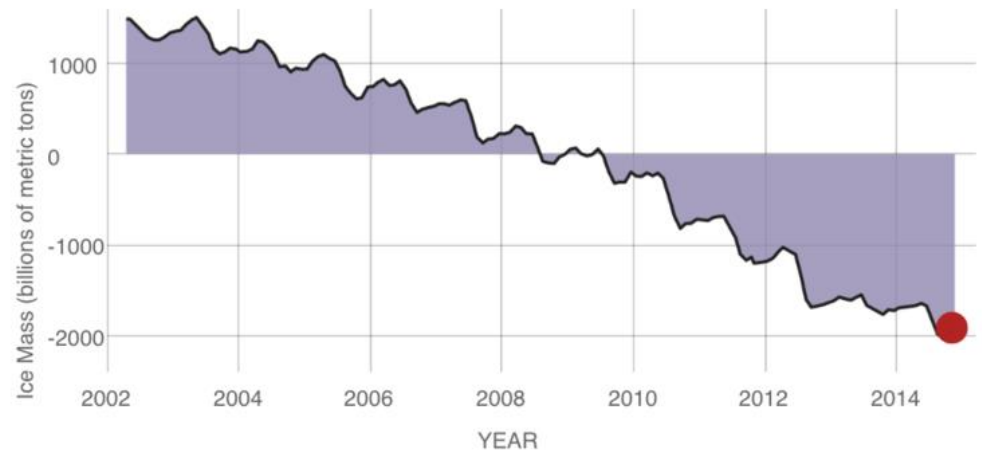
### GREENLAND MASS VARIATION SINCE 2002

Data source: Ice mass measurement by NASA's Grace satellites.  
Credit: NASA

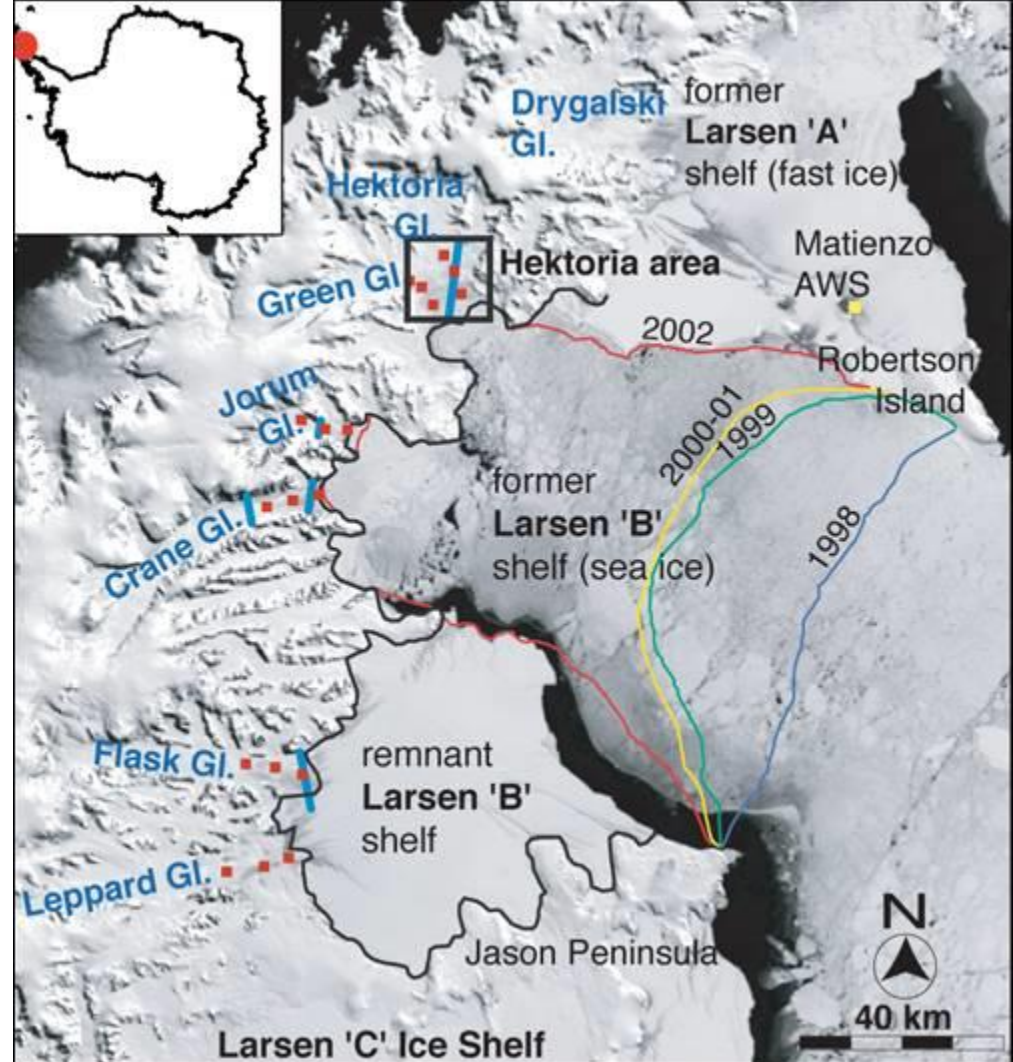
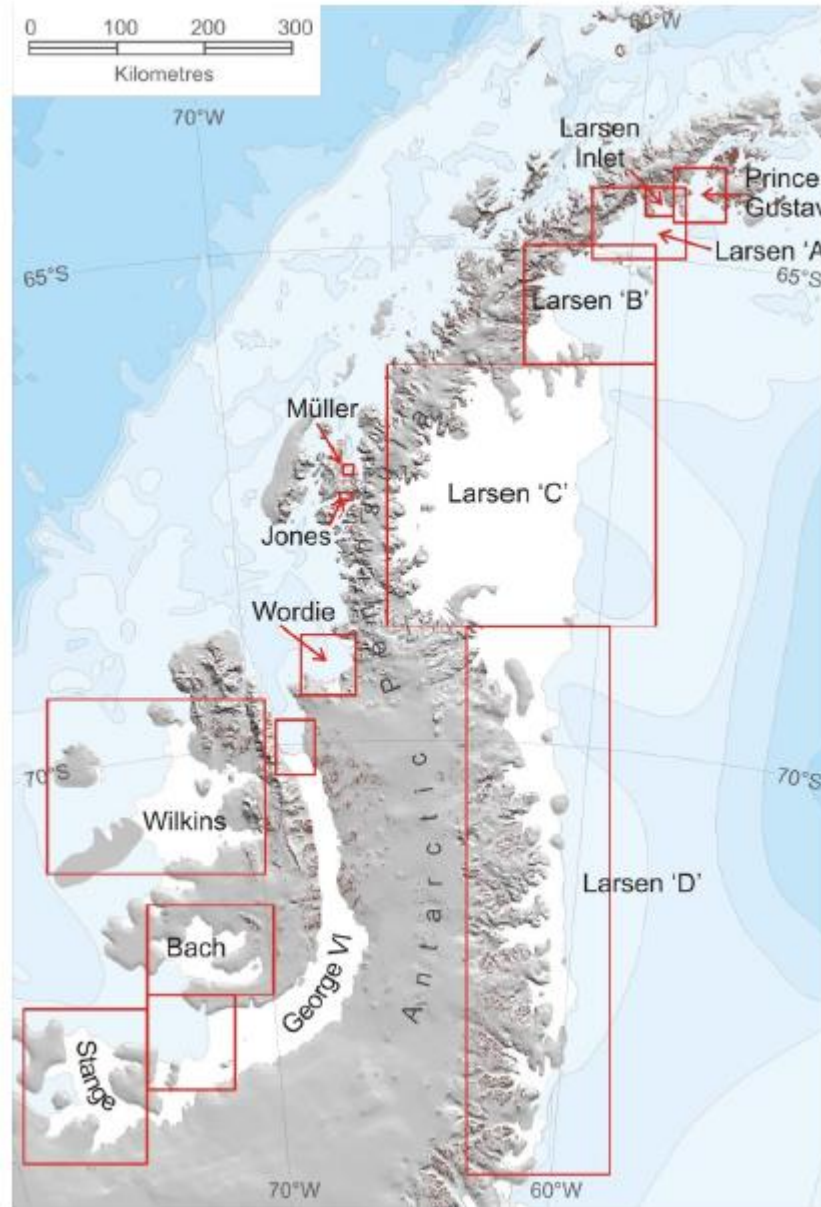
RATE OF CHANGE

↓ -287

billion metric tons per year

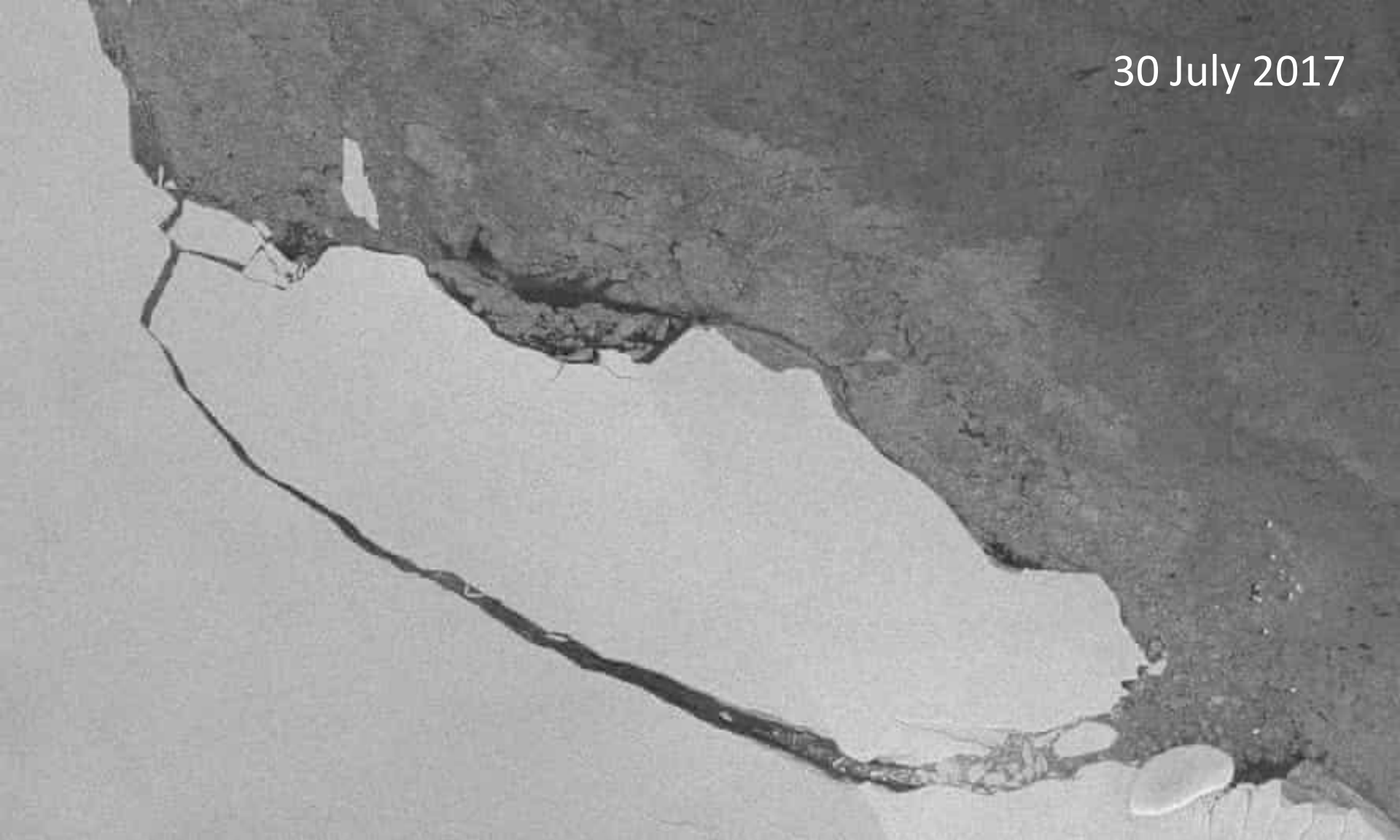


het meten van ijsmassa gebeurt m.b.v. satelieten die zwaartekracht meten





30 July 2017





**Greater London**  
580 sq miles



**Hawaii**  
4,015 sq miles



**Cyprus**  
3,590 sq miles



**Delaware**  
2,490 sq miles



**A68 Iceberg**  
2,239 sq miles



9 February 2020

Elephant island —

open water

A-68

South Shetland Islands

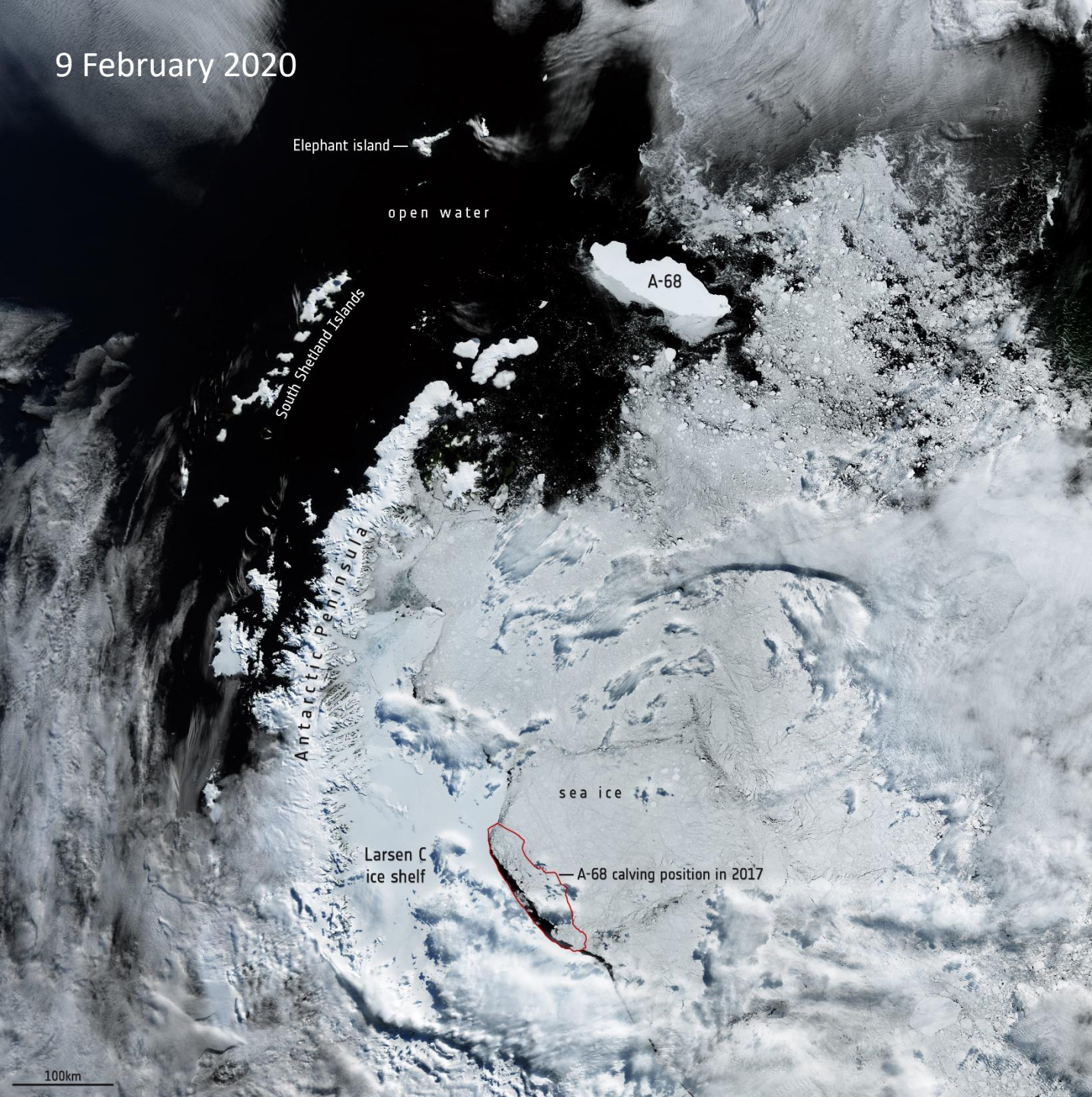
Antarctic Peninsula

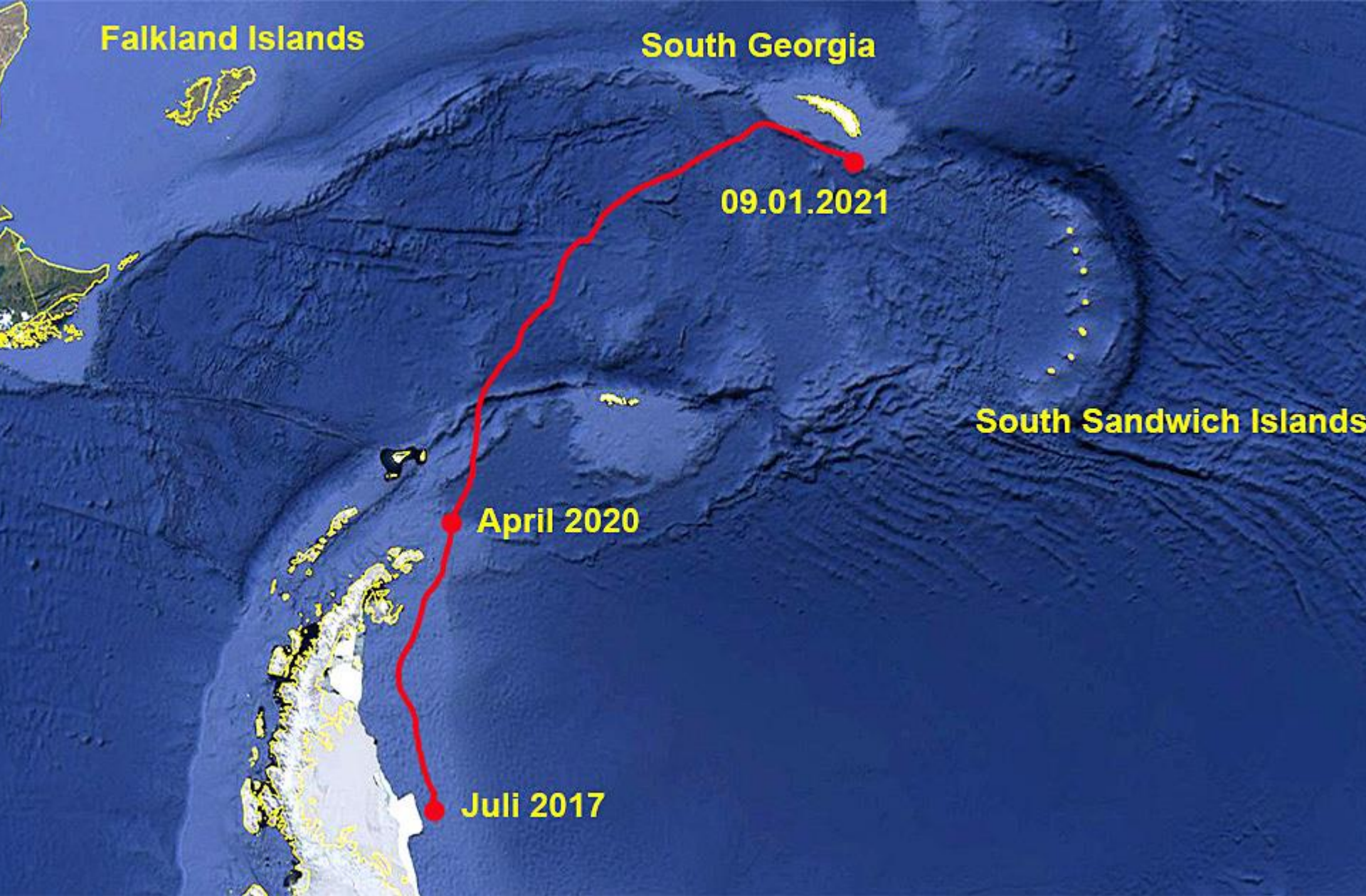
sea ice

Larsen C  
ice shelf

— A-68 calving position in 2017

100km





Falkland Islands

South Georgia

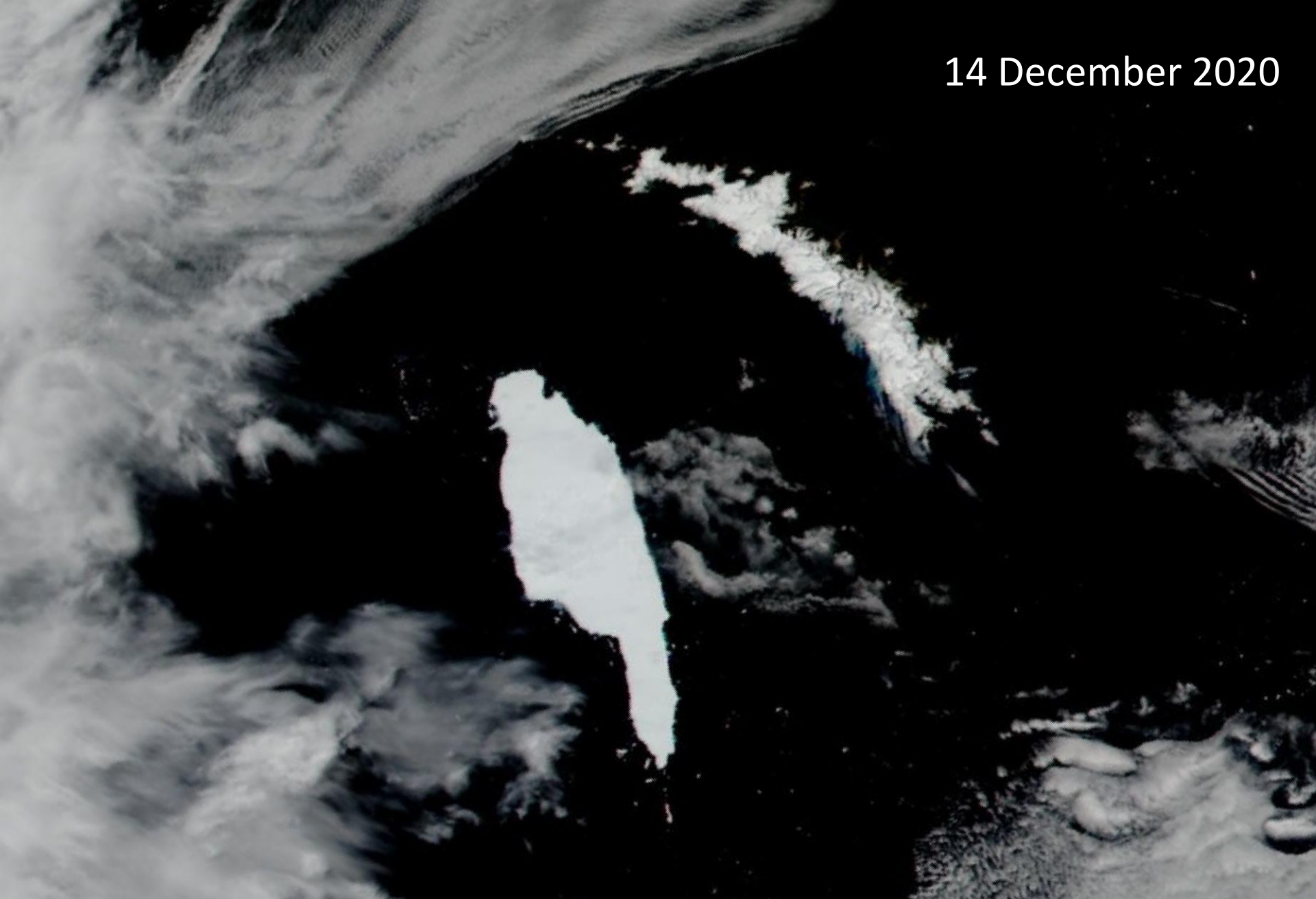
09.01.2021

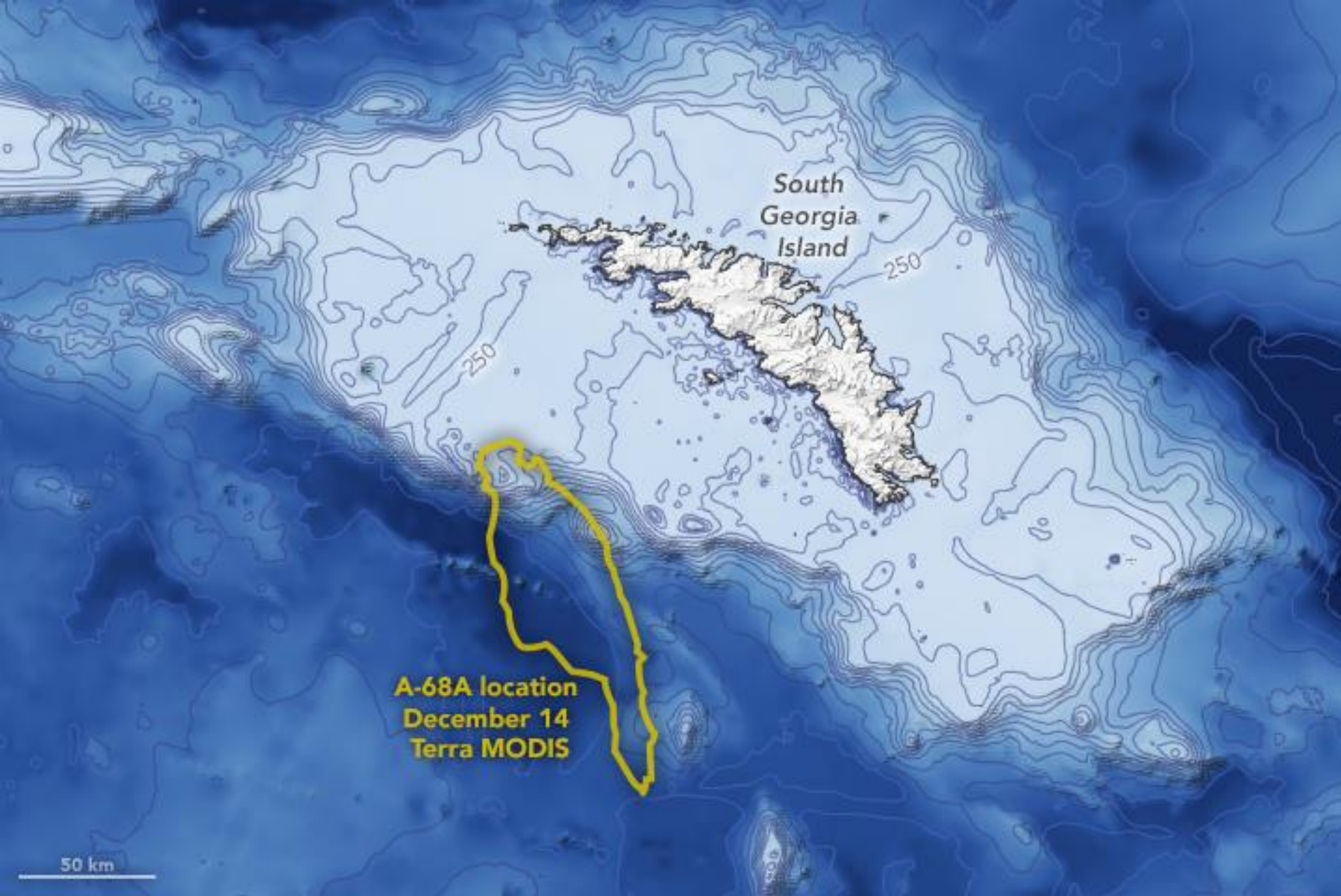
April 2020

Juli 2017

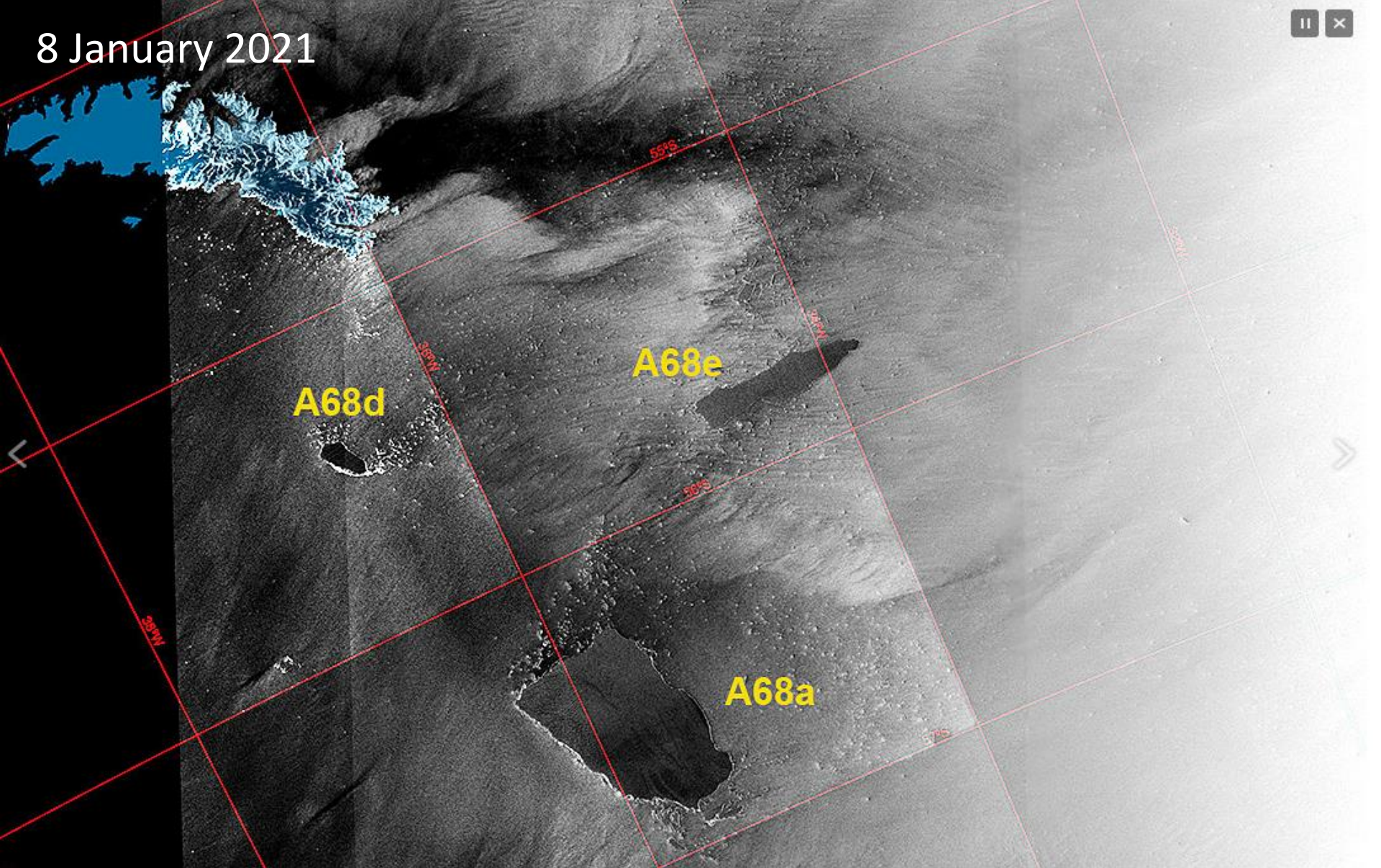
South Sandwich Islands

14 December 2020





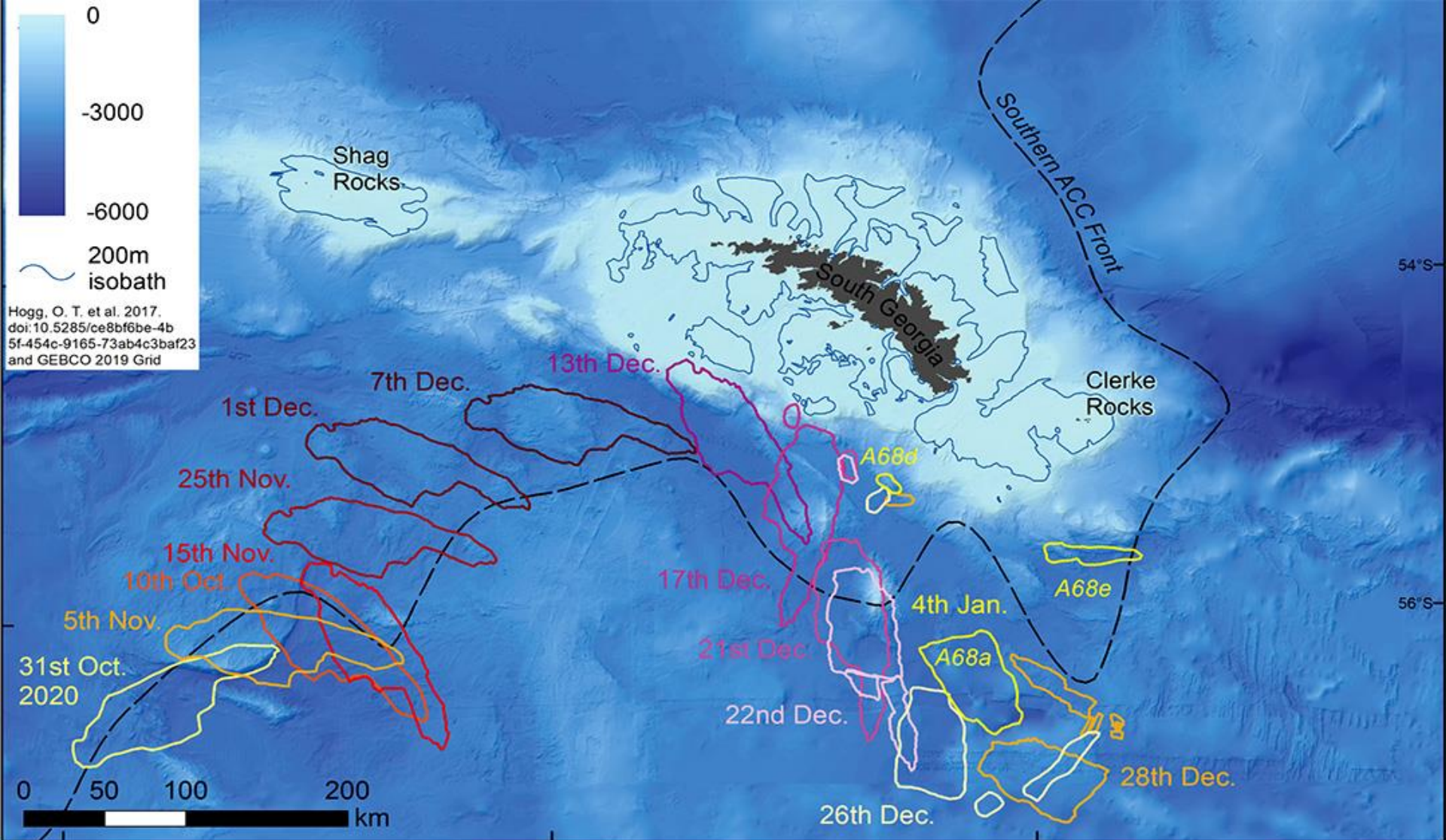
8 January 2021



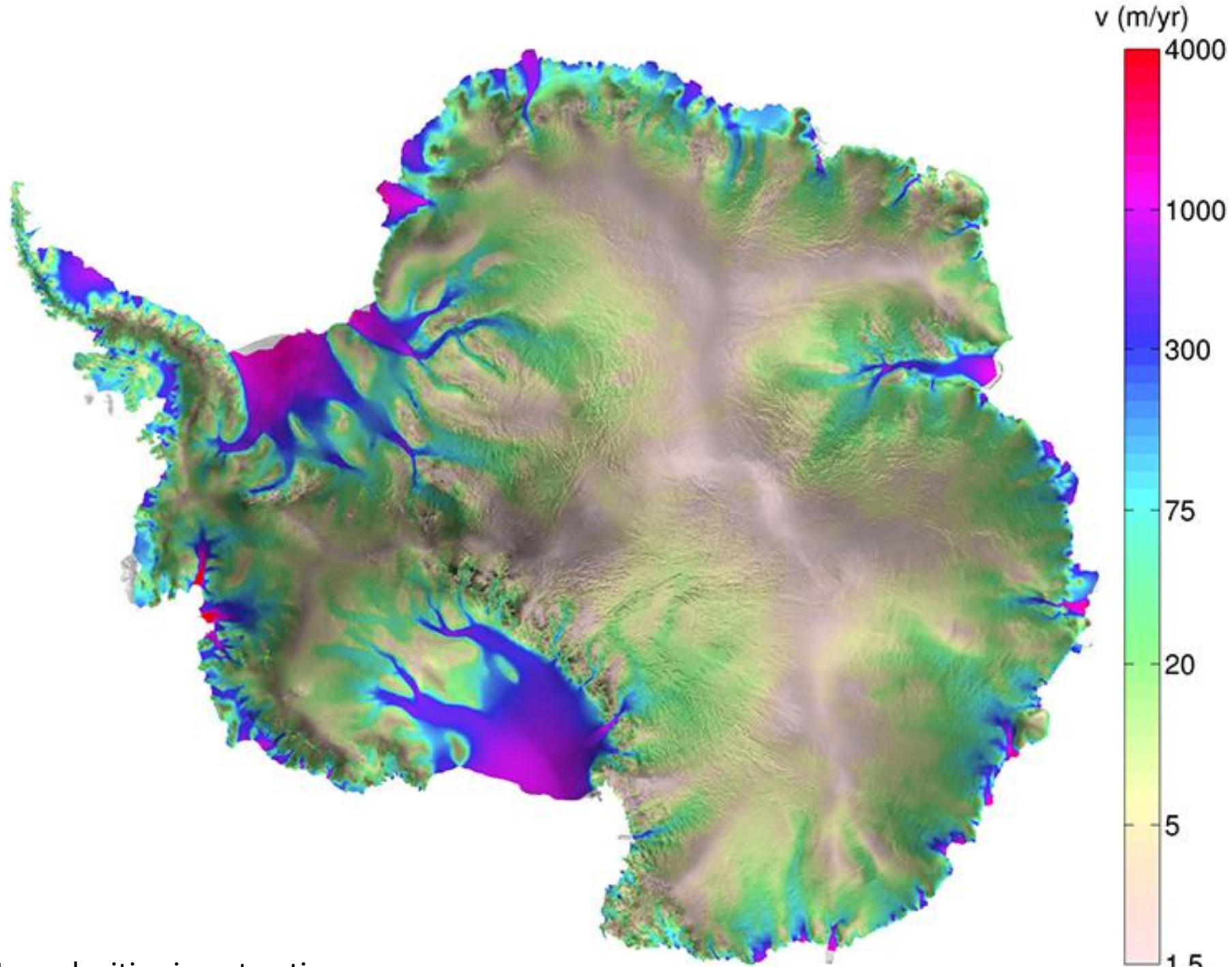
A68d

A68e

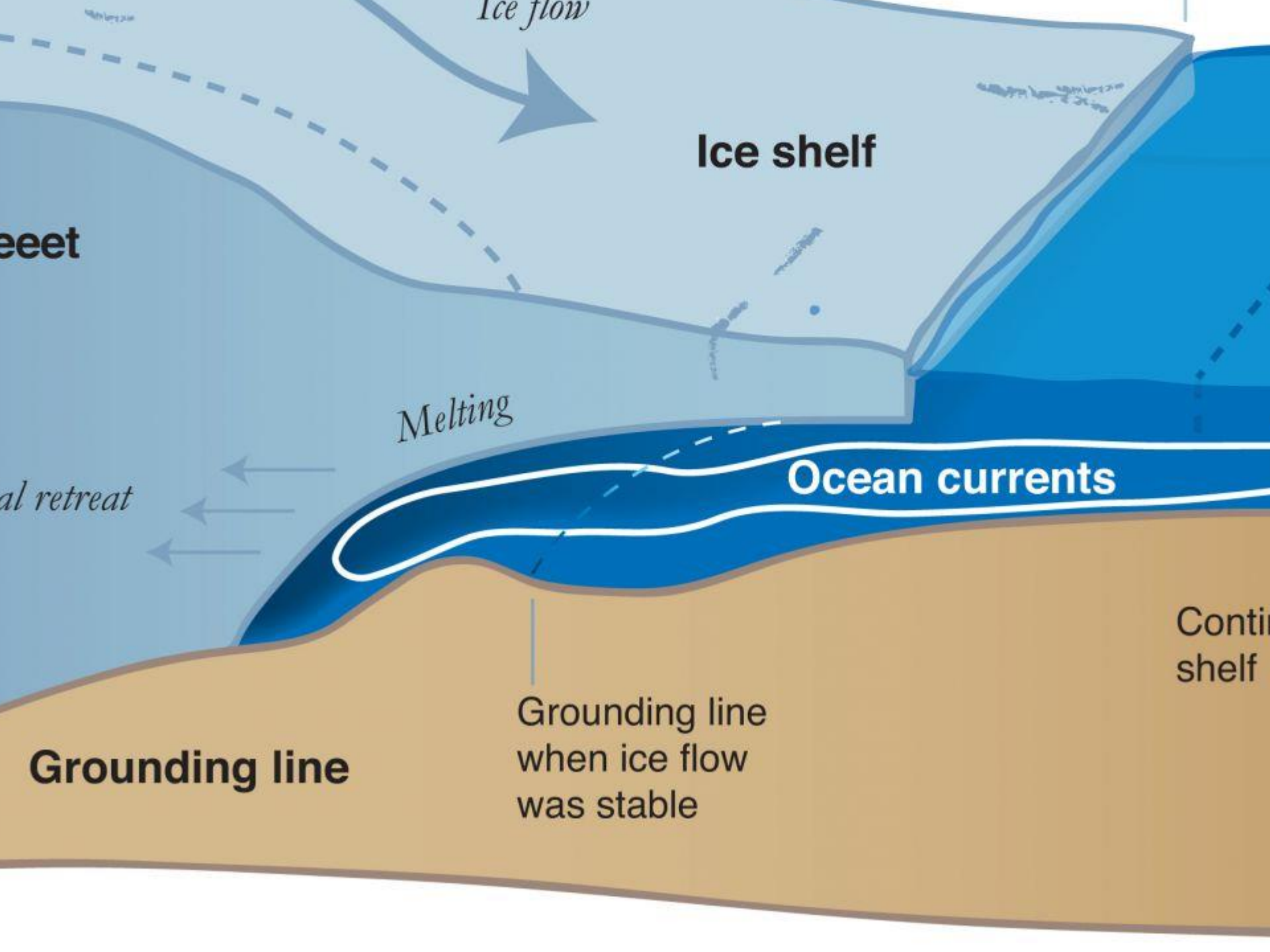
A68a



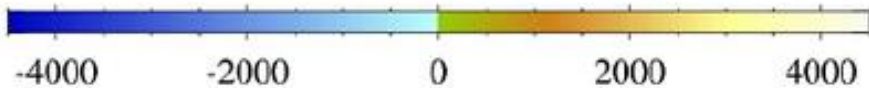
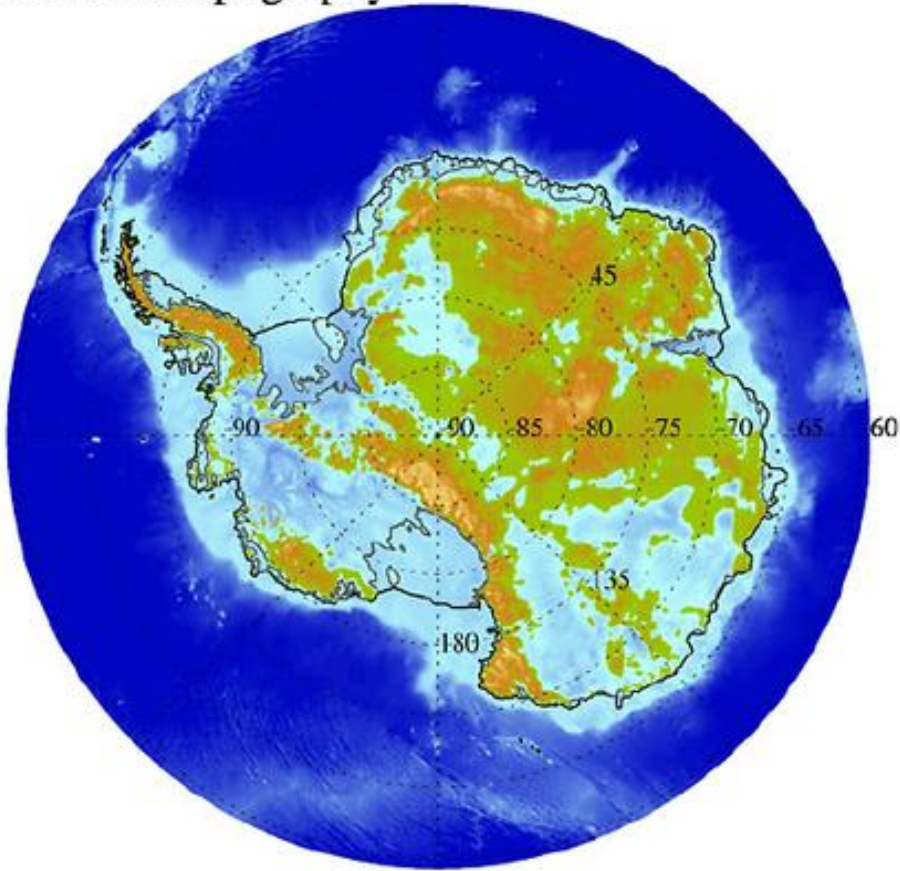




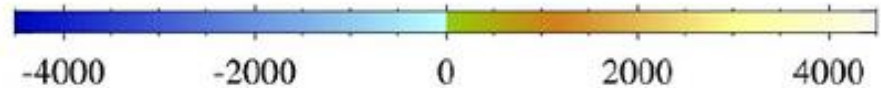
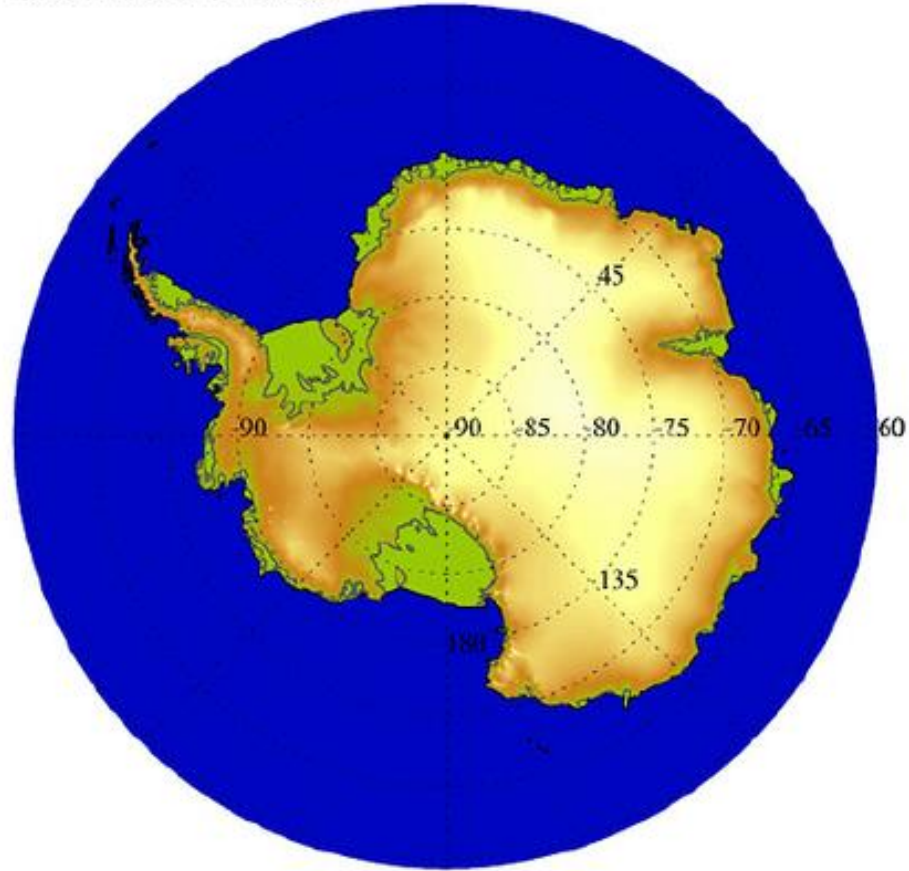
Ice velocities in antarctica



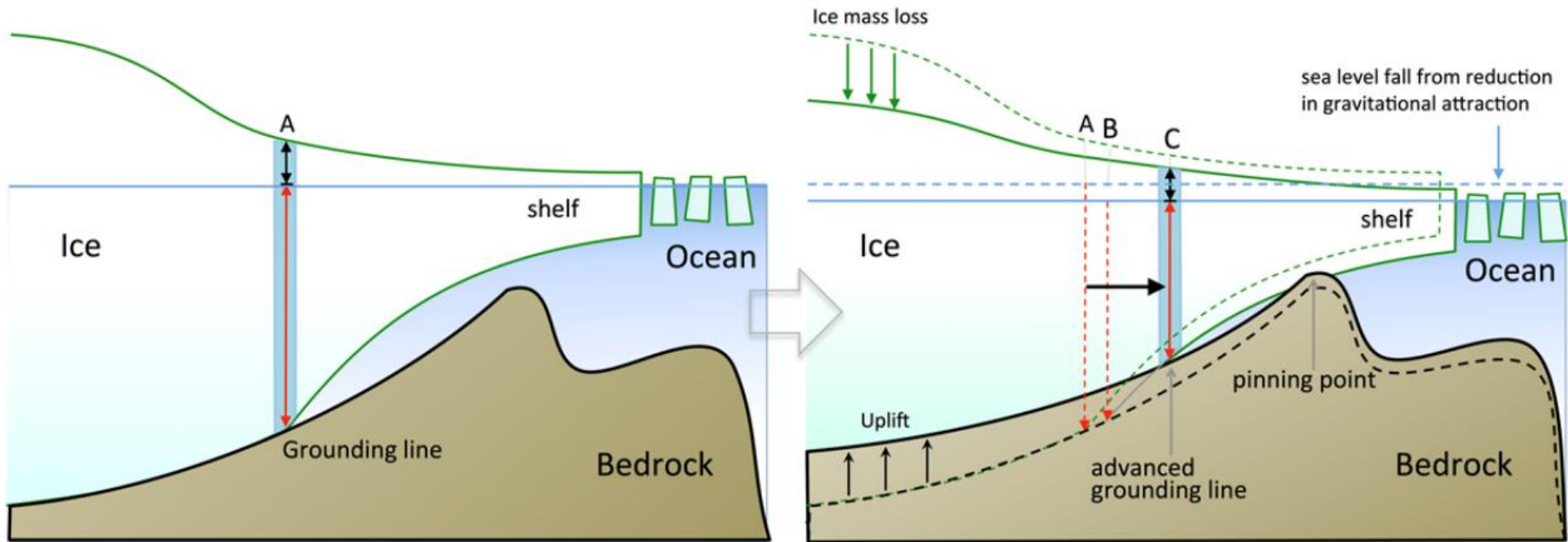
Bedrock topography



Surface elevation



Large parts of the Antarctic continent are pushed below sea level due to the weight of the ice cap. These areas can fill with warm ocean water when the grounding line retreats.



Grounding lines are the junctions where marine-based ice sheets become sufficient buoyant to detach from the sea floor and float. Grounding line penetrating into continent, accelerates calving. Less ice on land, reduces weight and can cause isostatic uplift, which might bring the grounding line outside the continent. It all depends on the speed of disappearing ice mass and isostatic uplift



Glacier Watching Day 17

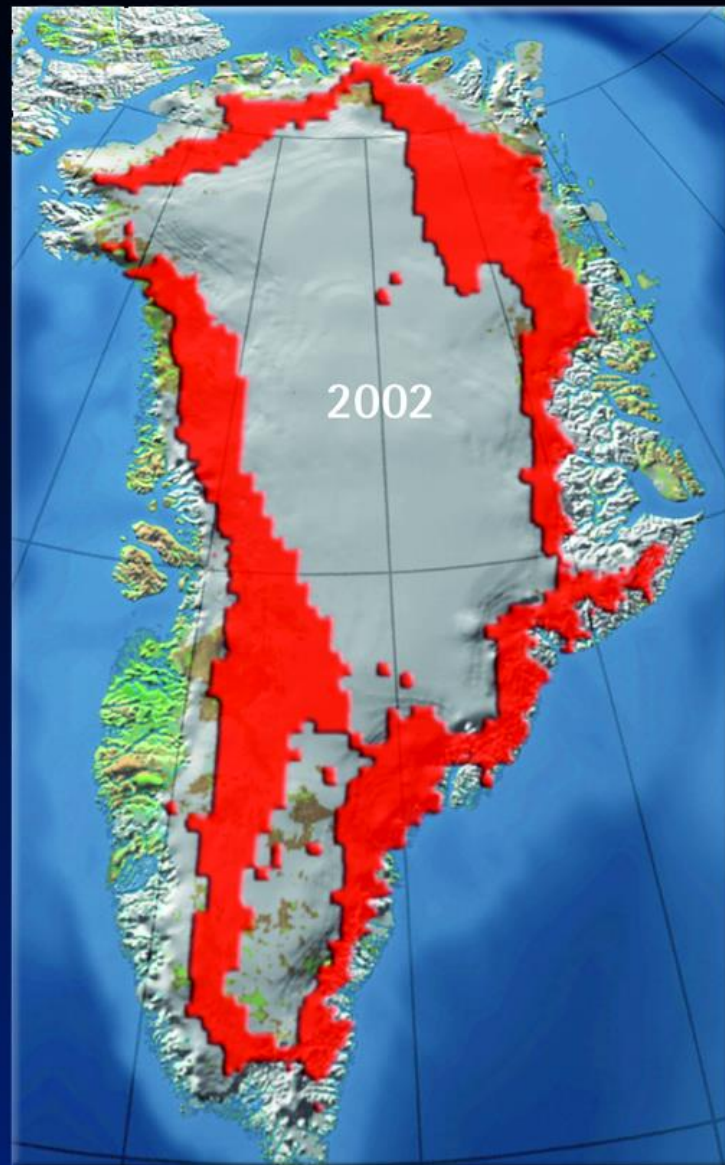
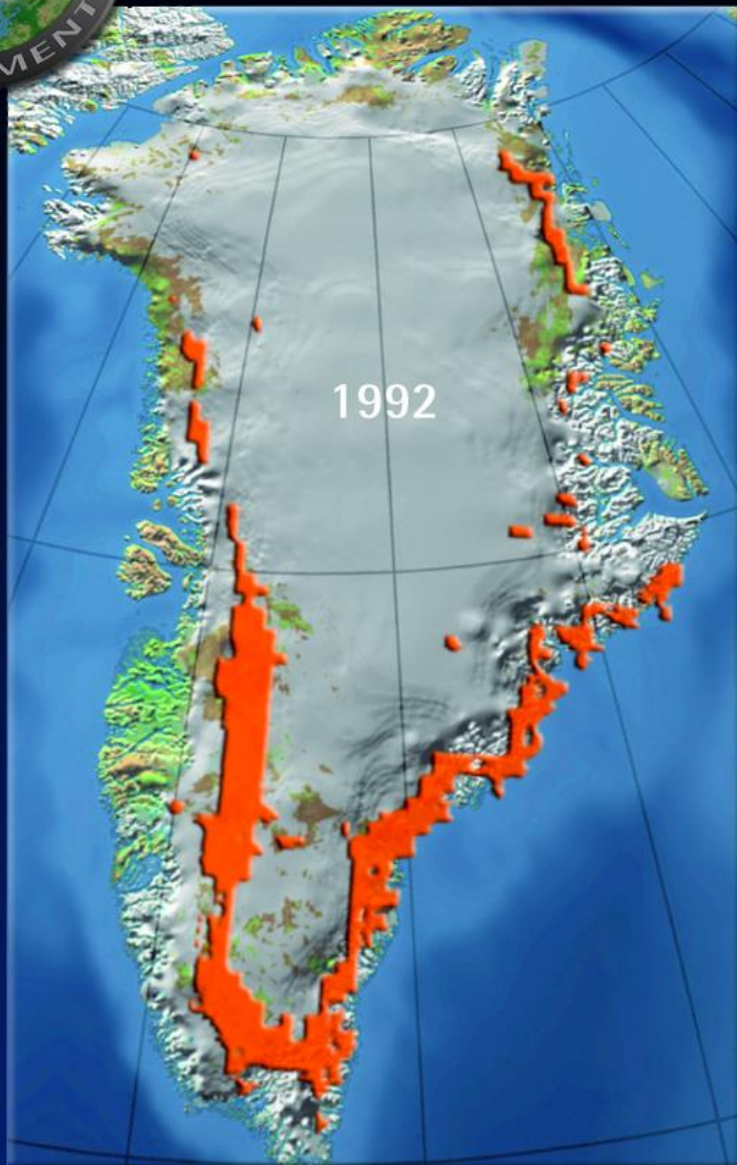
Largest glacier calving ever filmed

<https://www.youtube.com/watch?v=hC3VTgIPoGU>



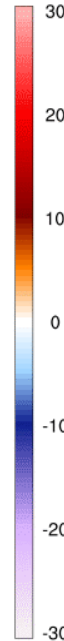
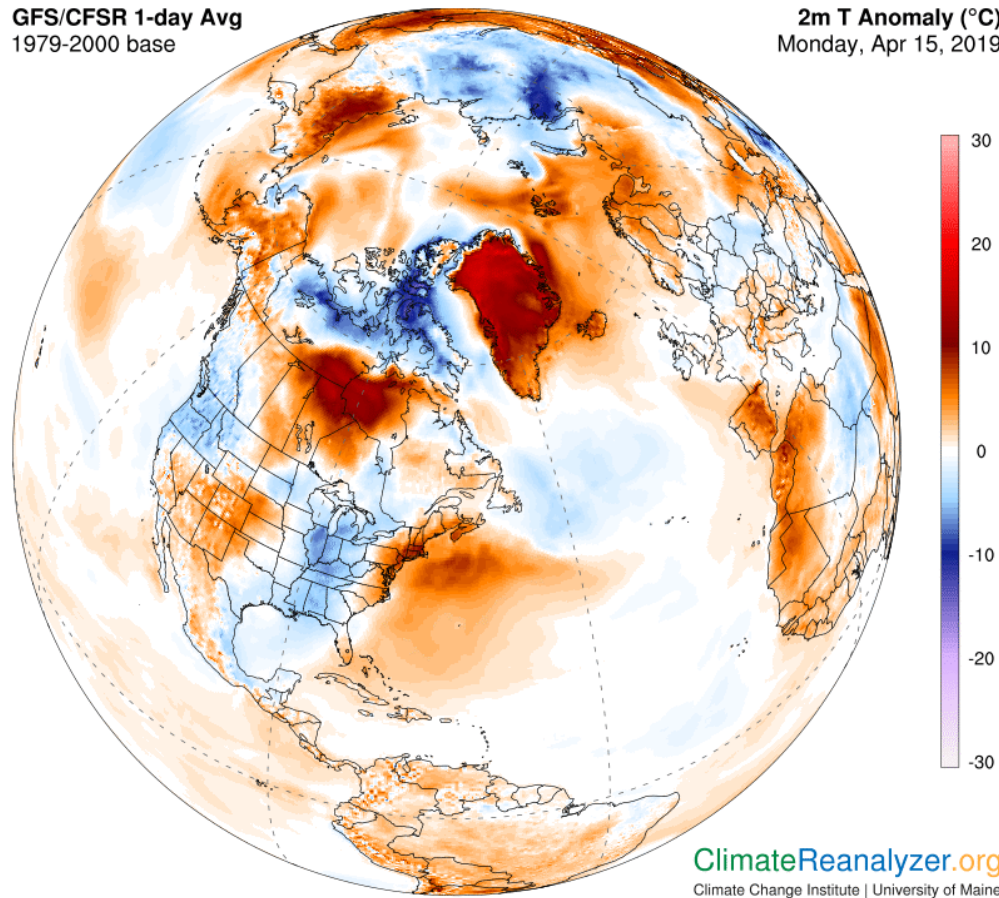
# IMPACTS OF A WARMING ARCTIC

## Greenland Ice Sheet Melt Extent



GFS/CFSR 1-day Avg  
1979-2000 base

2m T Anomaly (°C)  
Monday, Apr 15, 2019



ClimateReanalyzer.org  
Climate Change Institute | University of Maine

World  
+ 0.5 °C

Northern Hemisphere  
+ 0.7 °C

Arctic  
+ 1.7 °C

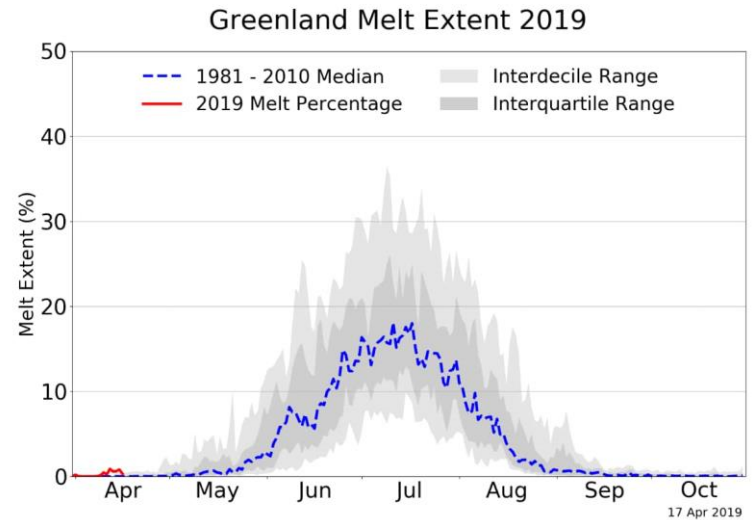
Tropics  
+ 0.6 °C

Southern Hemisphere  
+ 0.2 °C

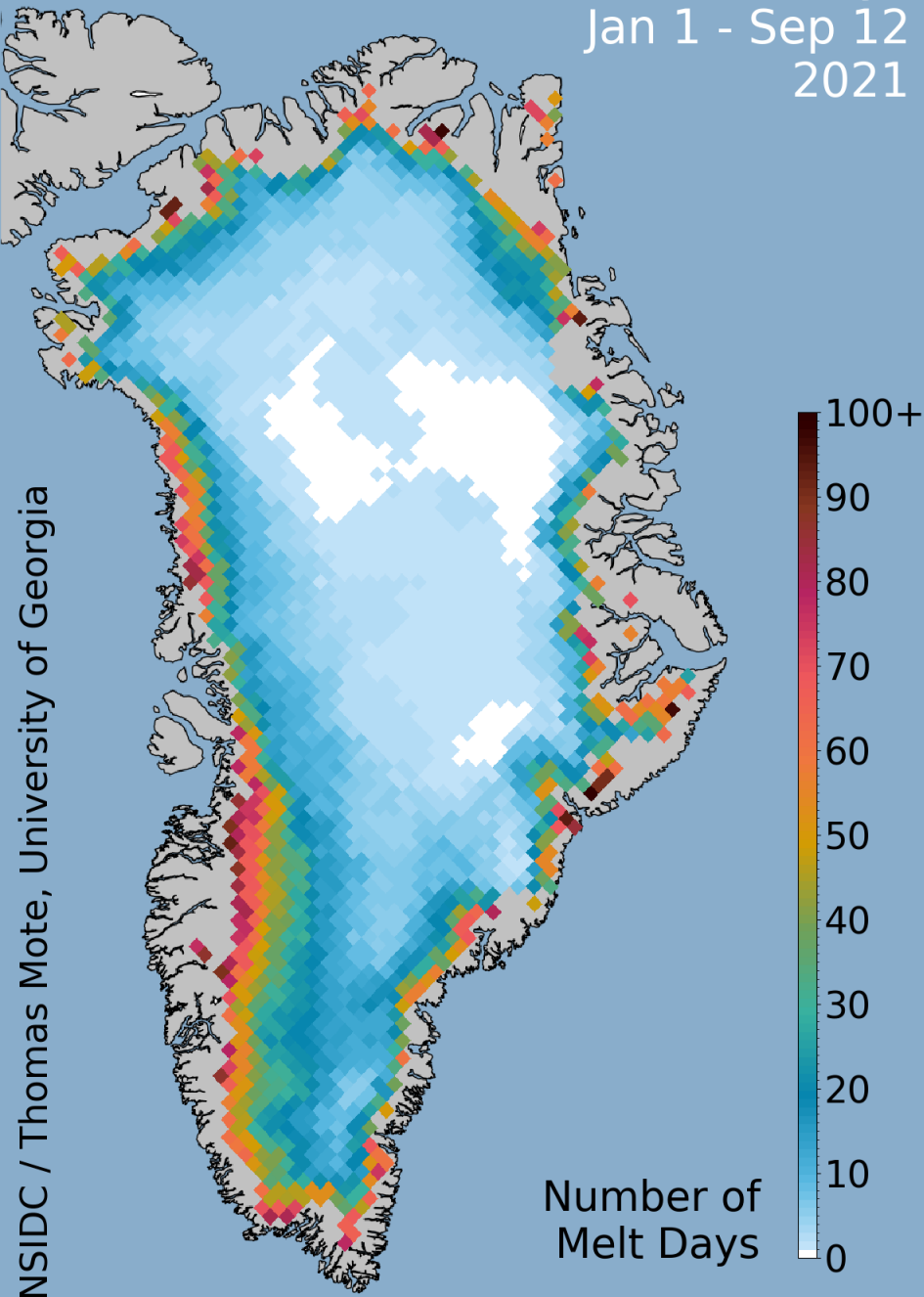
Antarctic  
- 1.3 °C

March 2019 is globally the second warmest month on record.

Summer melt in greenland has started in mid-April, more than a month earlier than normal



# Greenland Cumulative Melt Days Jan 1 - Sep 12 2021

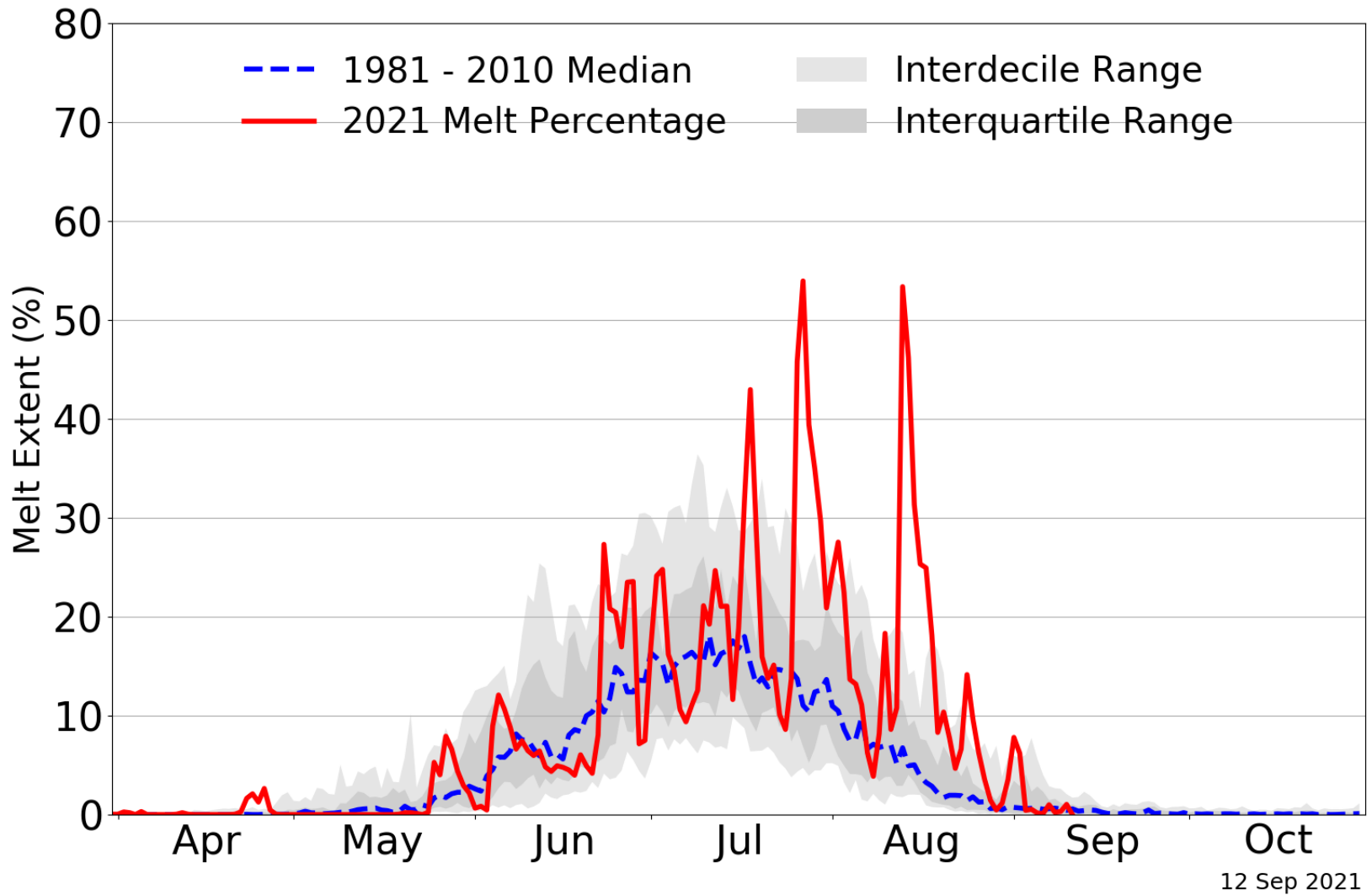


On August 14, 2021, rain was observed at the highest point on the Greenland Ice Sheet for several hours, and air temperatures remained above freezing for about nine hours.

There is no previous report of rainfall at this location, which reaches 3,216 meters in elevation.



# Greenland Melt Extent 2021



12 Sep 2021

D IS  
EEN

Een  
smeltende  
ijskap is een  
kantelpunt



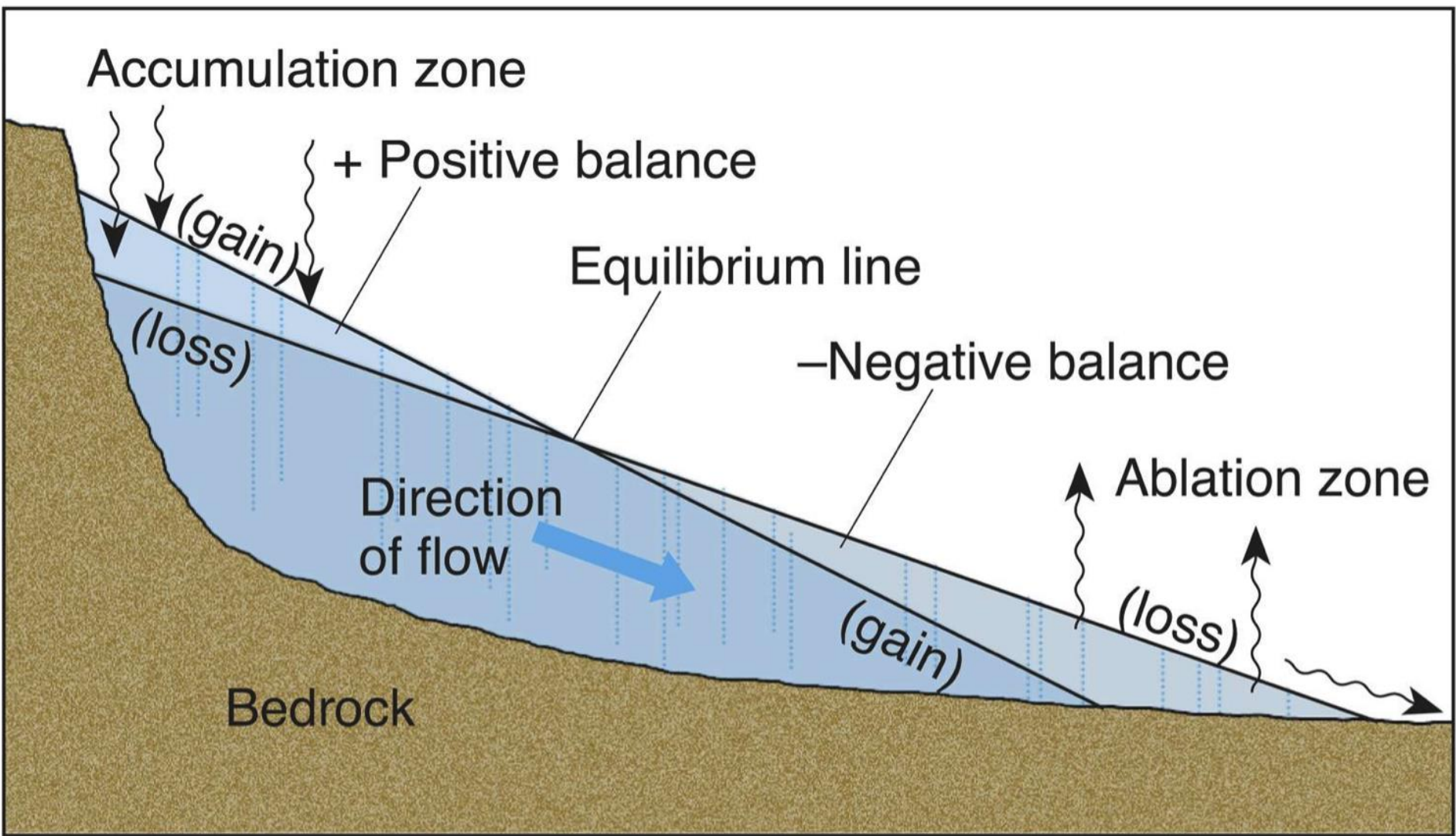
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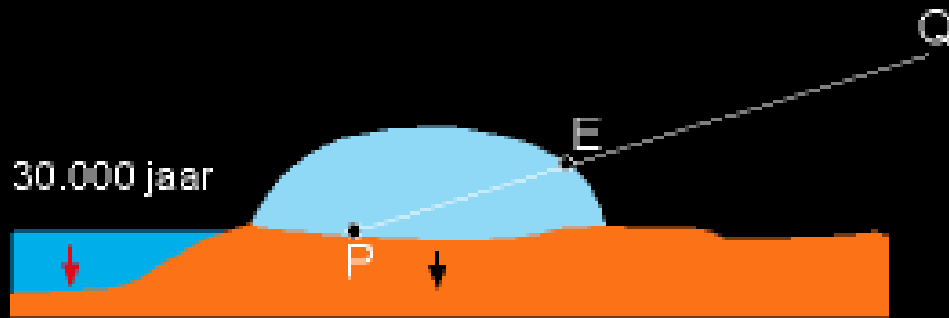
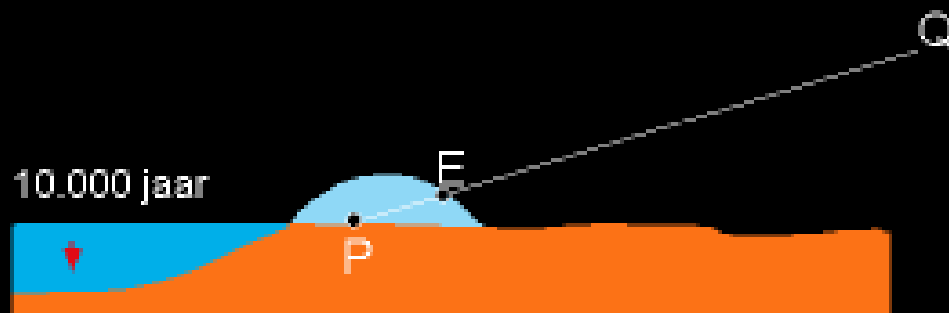
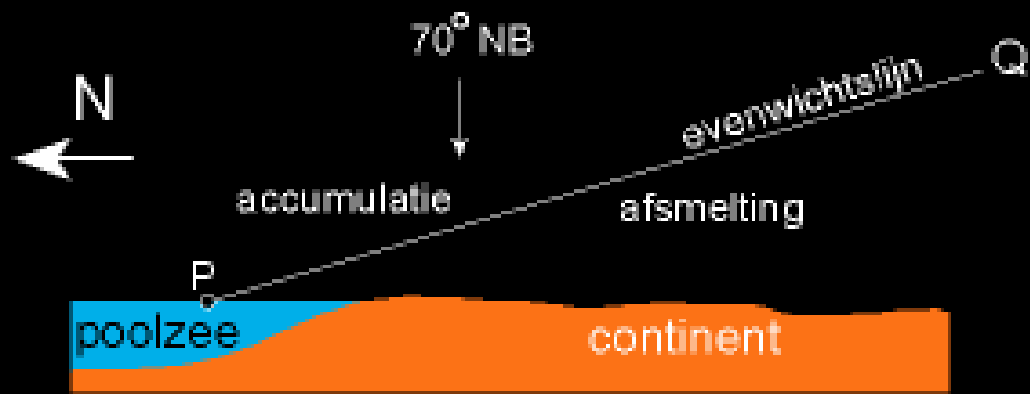
FIC

Per kilometer omhoog  
daalt de temperatuur  
6 graden Celsius

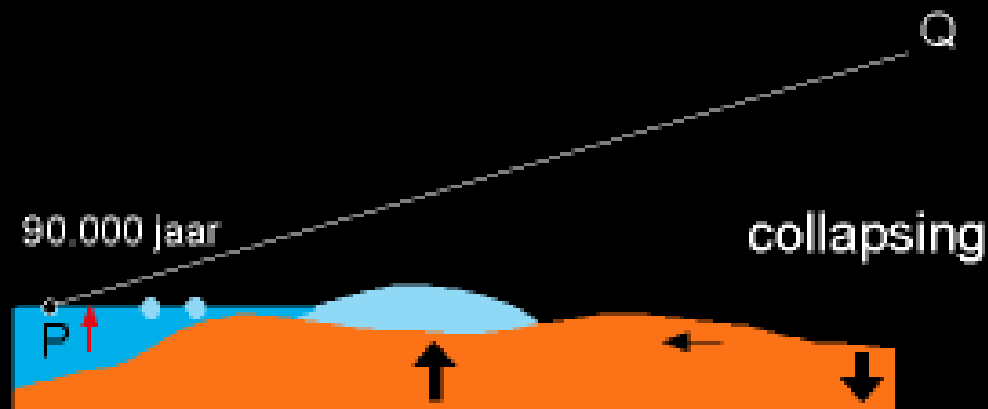
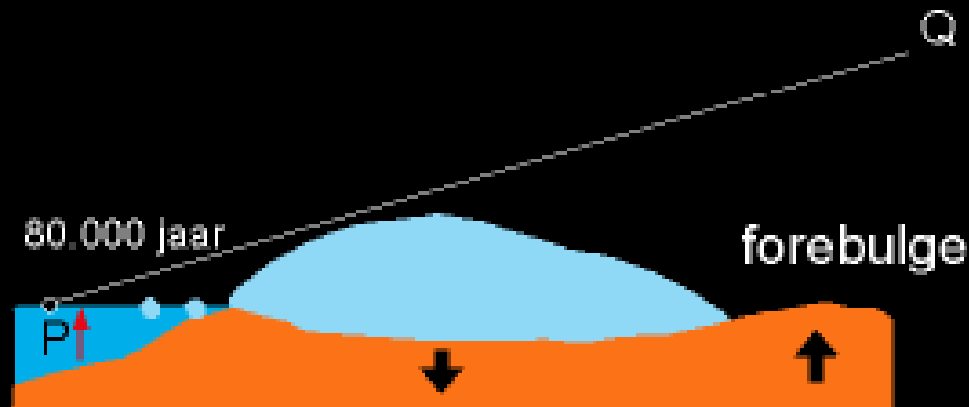
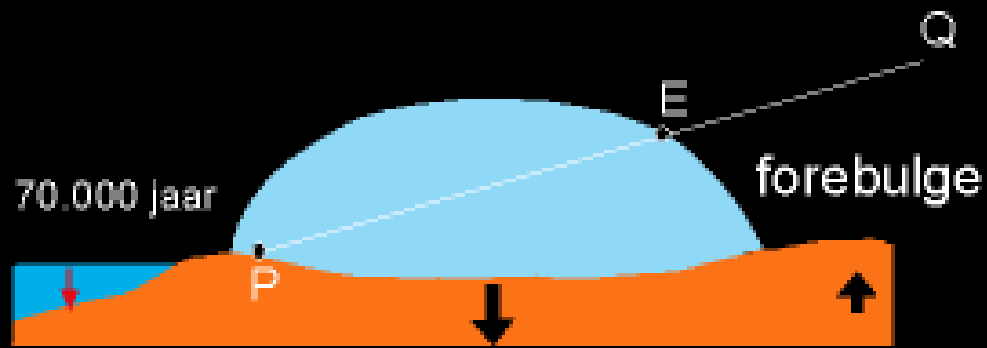


# Mass balance of a glacier

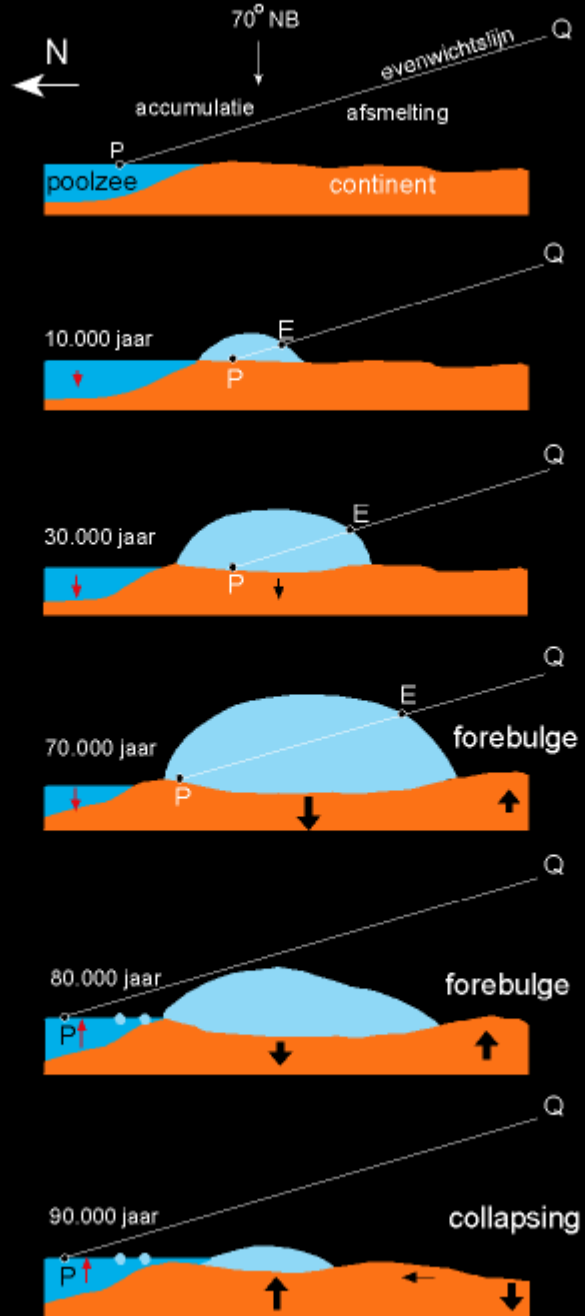




Q



## Dynamiek van ijskappen en ondergrond



Ice cap formation when equilibrium line reaches land

The equilibrium line in the figure is not straight going up as temperature increases going up in the atmosphere with about 6 degrees every 1000 meter while climbing a mountain

Dynamiek van ijskappen en ondergrond



Nederland verzuipt als Groenland smelt



5G VEROOR  
CORON

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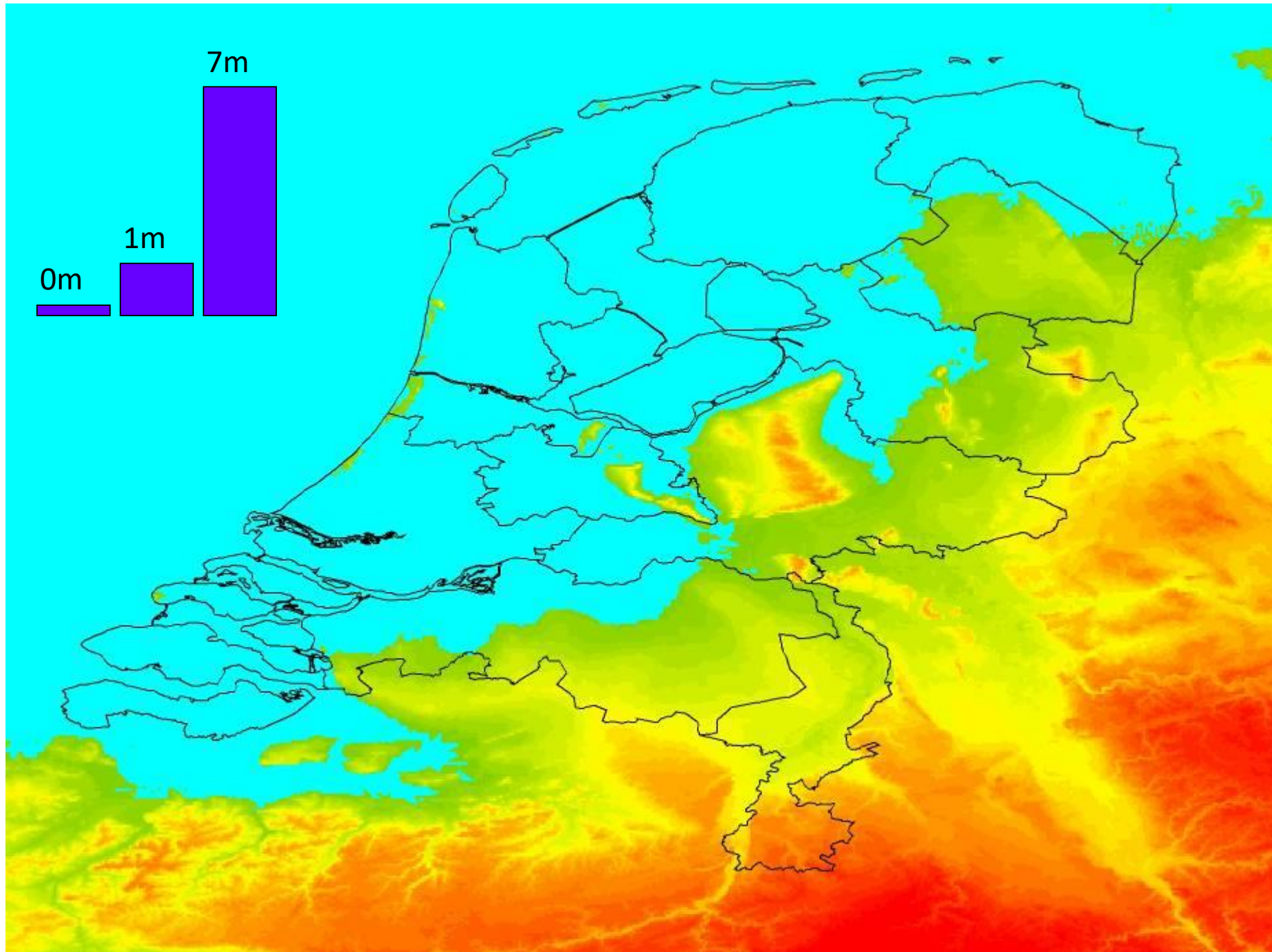


Climate change

Al Gore

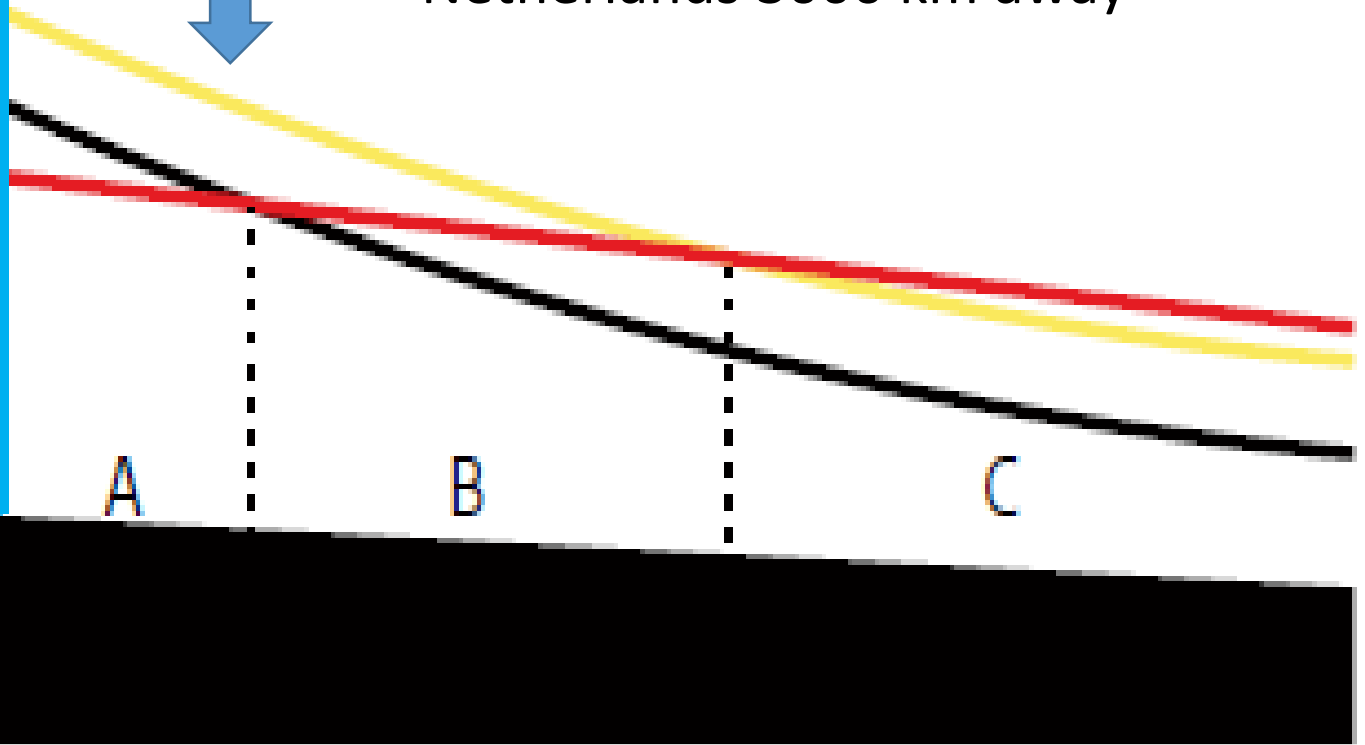
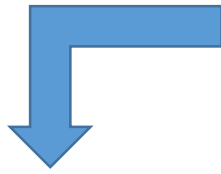
The inconvenient truth 1 & 2

<https://www.youtube.com/watch?v=u7E1v24DIlk>



Greenland ice cap 2500 meter thick creates gravity. Ice amount equals 7 meter sea level rise

2500 km away : no effect  
Netherlands 3000 km away



- Original sea level
- Sea level increase when meltwater has equal distribution
- True sea level when gravity of ice cap is lost



FEIT

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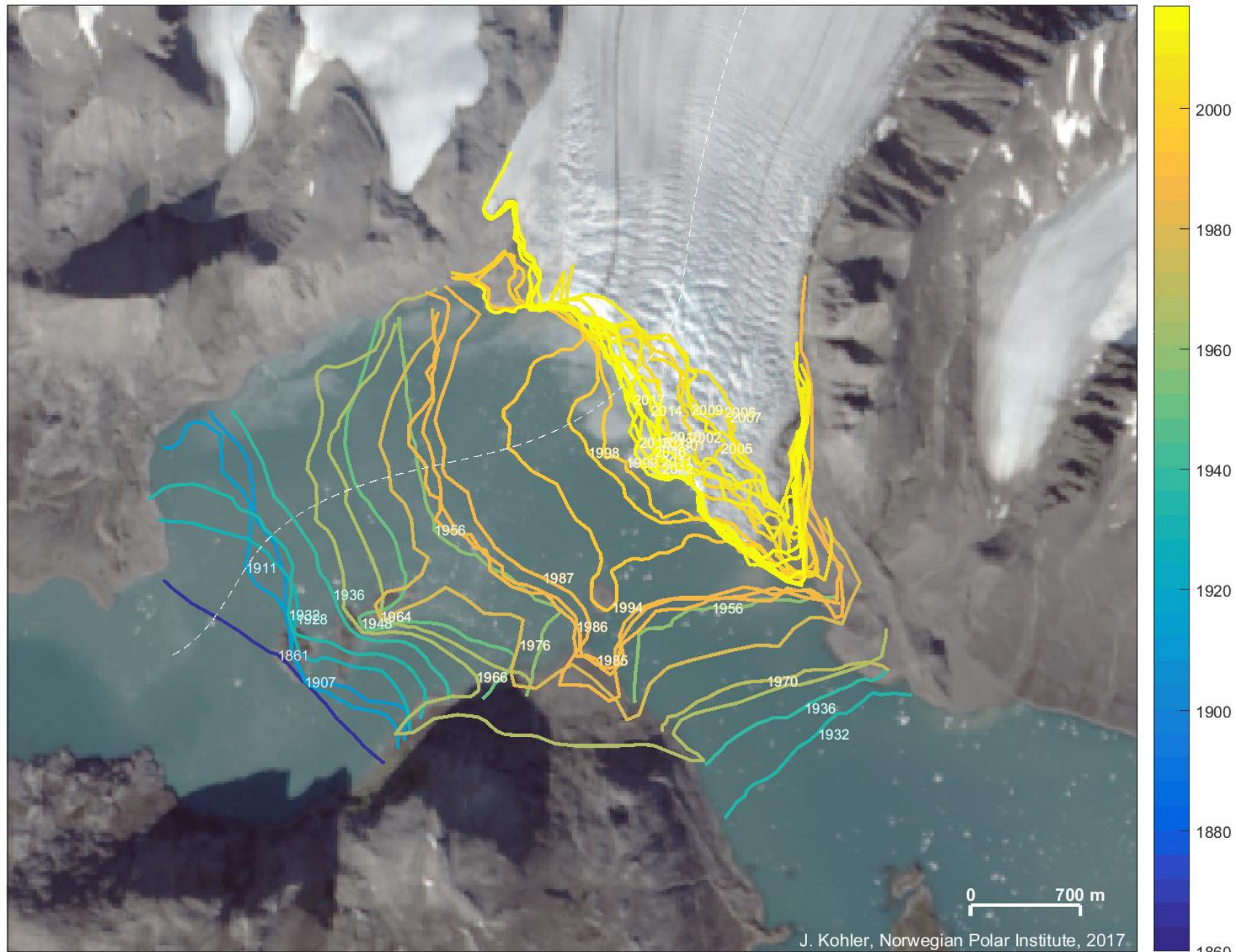


FEIT





# Blomstrandbreen



J. Kohler, Norwegian Polar Institute, 2017

2002





1918





Blomstrandbreen glacier 1918 ↑ 2002 ↓ Greenpeace Magazine 2002(4)





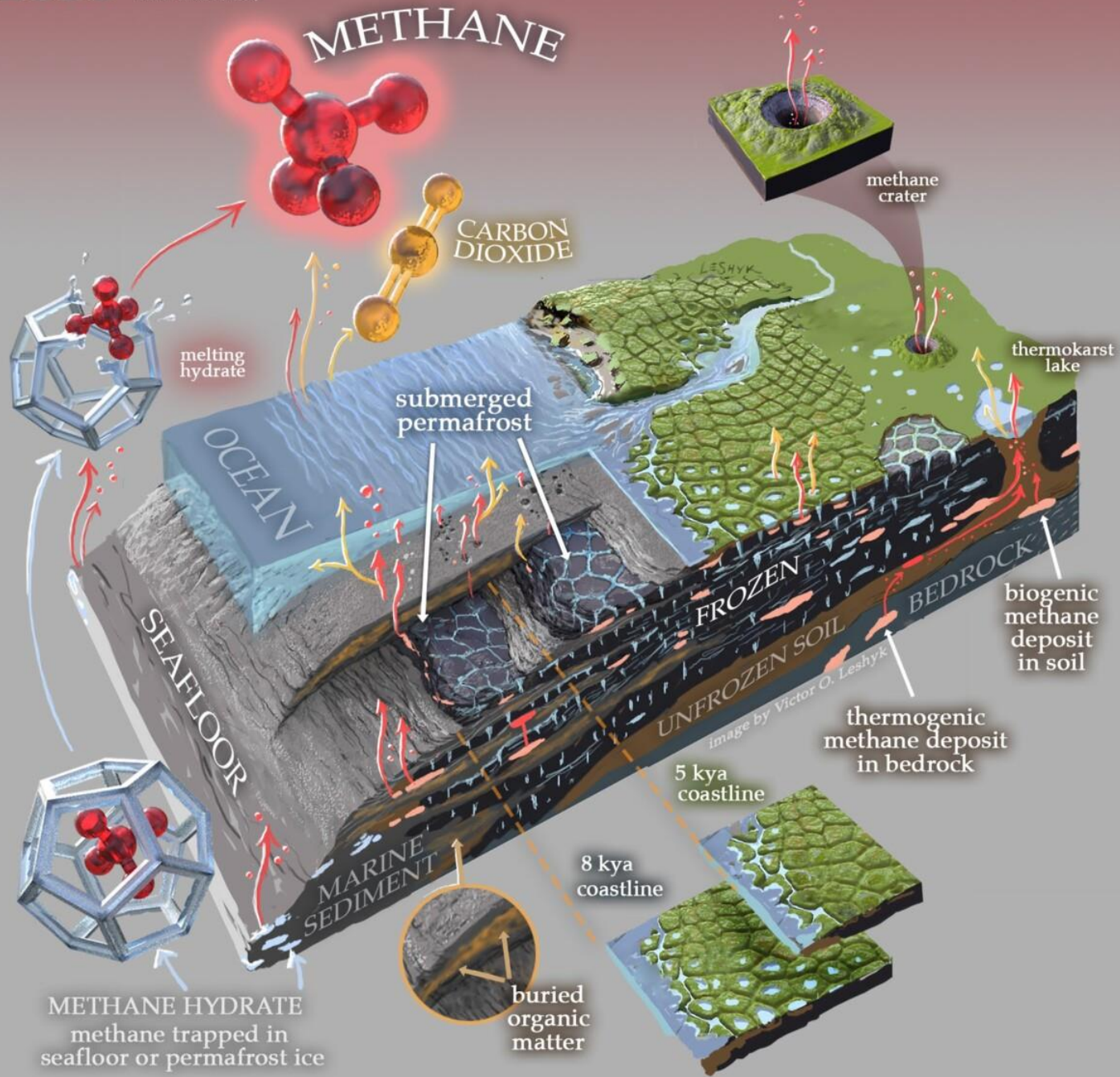
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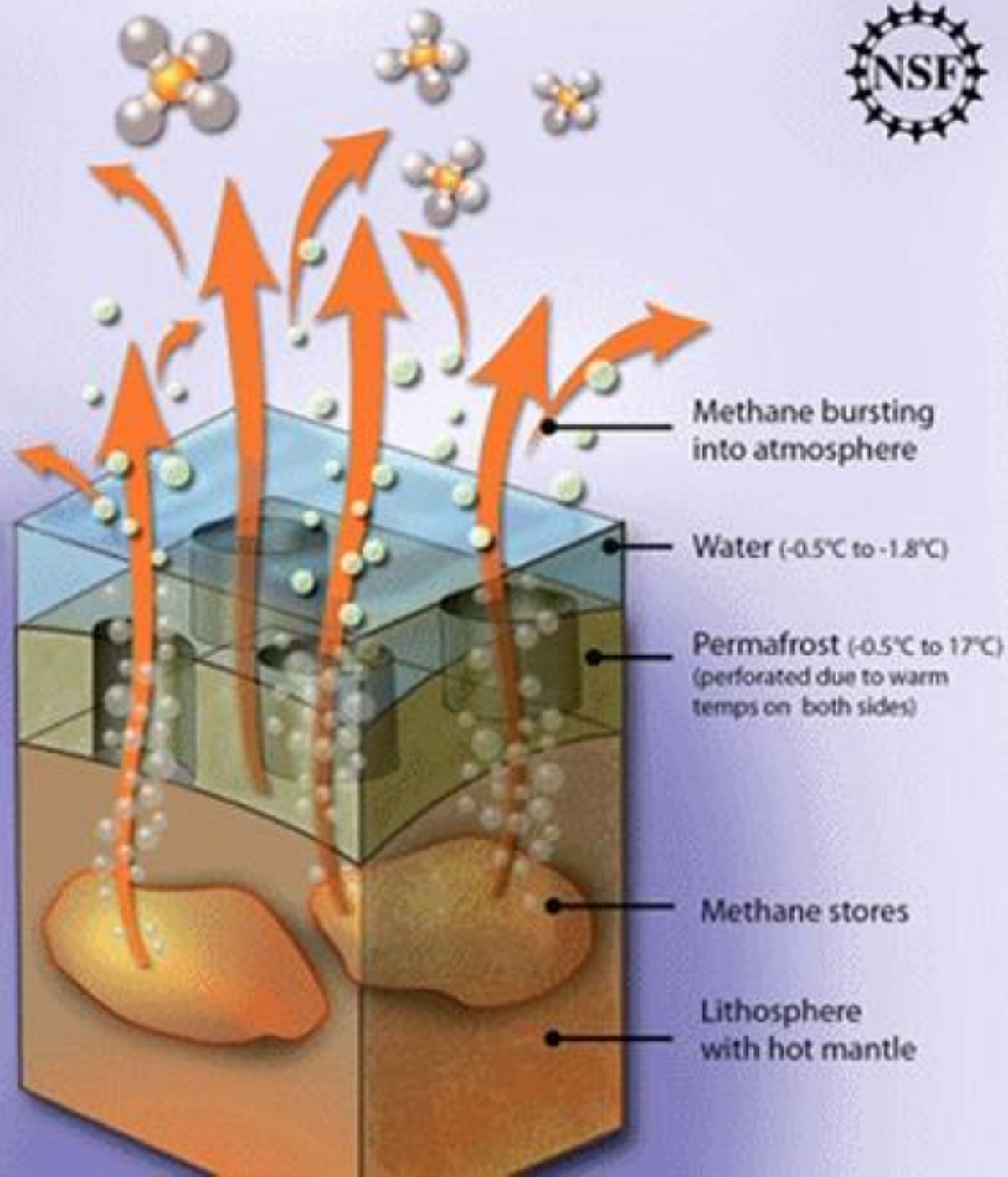
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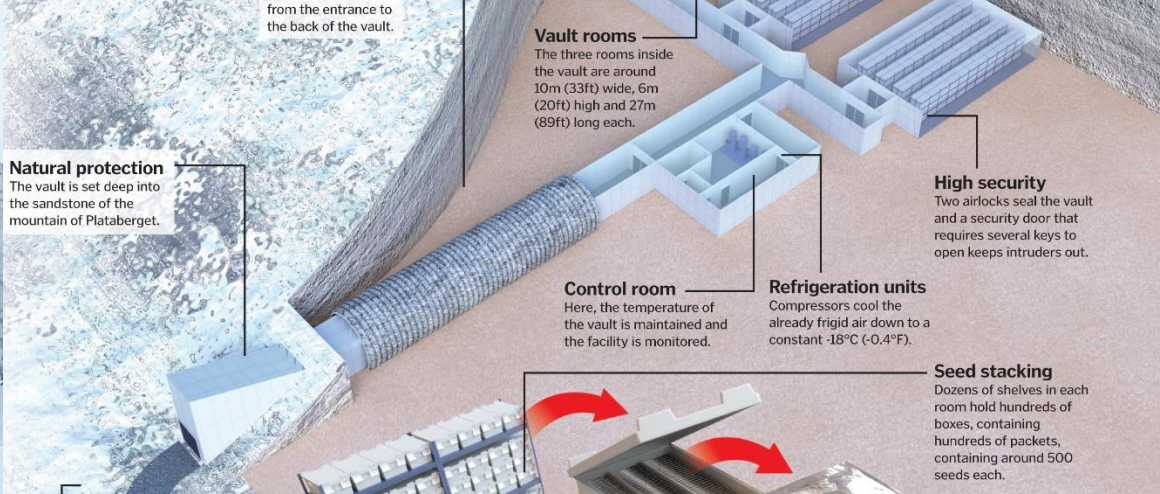
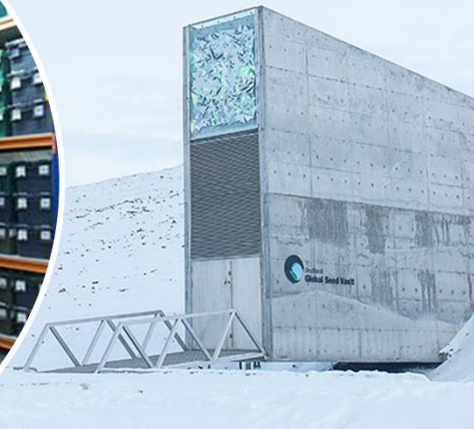








Svalbard  
**Global Seed V**



Anleggsområde  
Adgang forbudt

Plant Area  
No trespassing

T

Elfstedentocht  
zou nog  
kunnen



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# (Polar Vortices)

Occurs in Tropopause & extends upto Stratosphere



Arctic region  
**\*stronger**

The Northern hemisphere is about  
**60.7% water and 39.3% land.**

Stratosphere



<https://youtu.be/fLFovCPs4vI>

Troposphere

Antarctica

The Southern hemisphere is about  
**80.9% water and 19.1% land.**

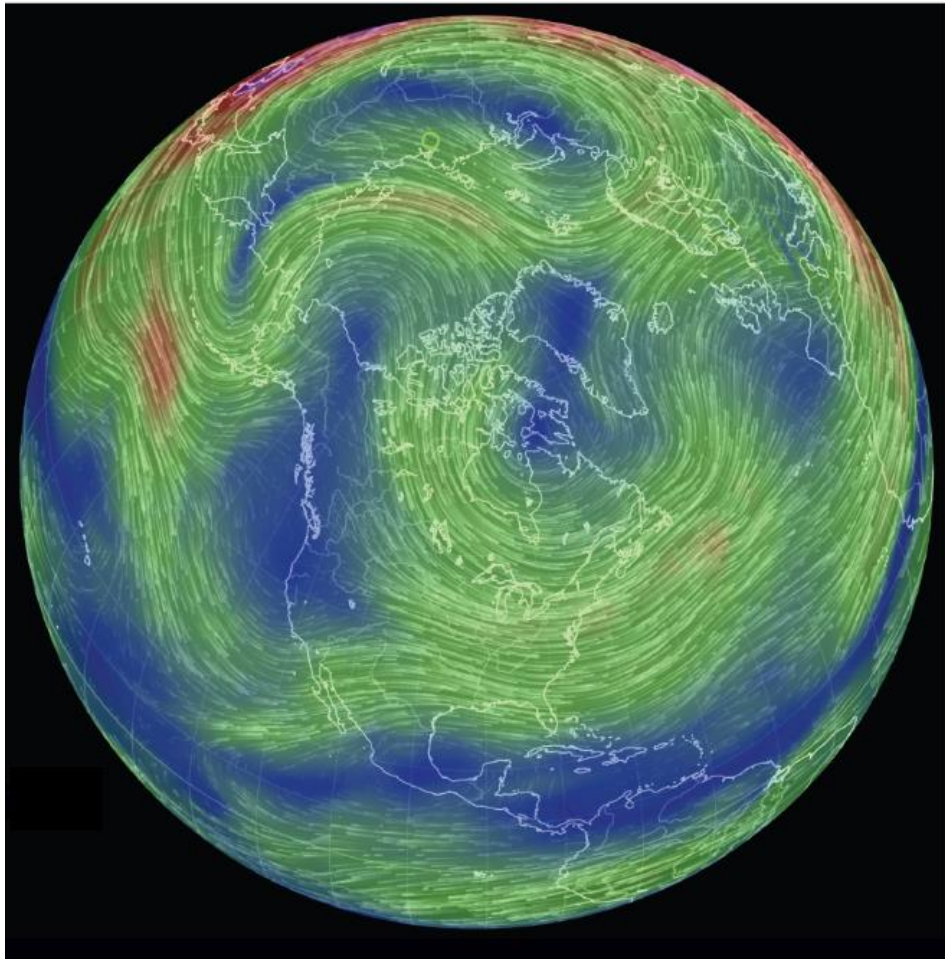
Polar vortex

<https://youtu.be/fLFovCPs4vI>

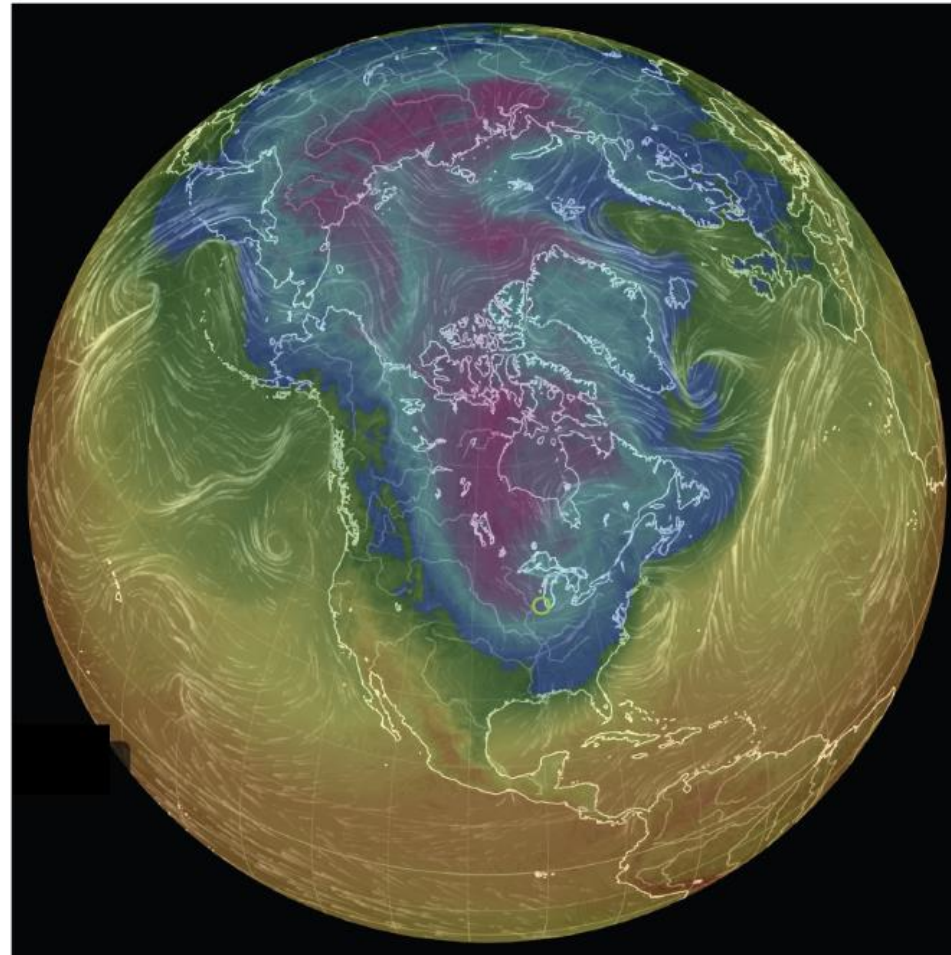


When the Arctic sky splits apart  
<https://youtu.be/Y1sw5qLpuSU>

Wind Pattern  
January 15, 2019



Surface Temperatures  
January 30, 2019







Ijsberen  
sterven uit



5G VEROOR  
CORON

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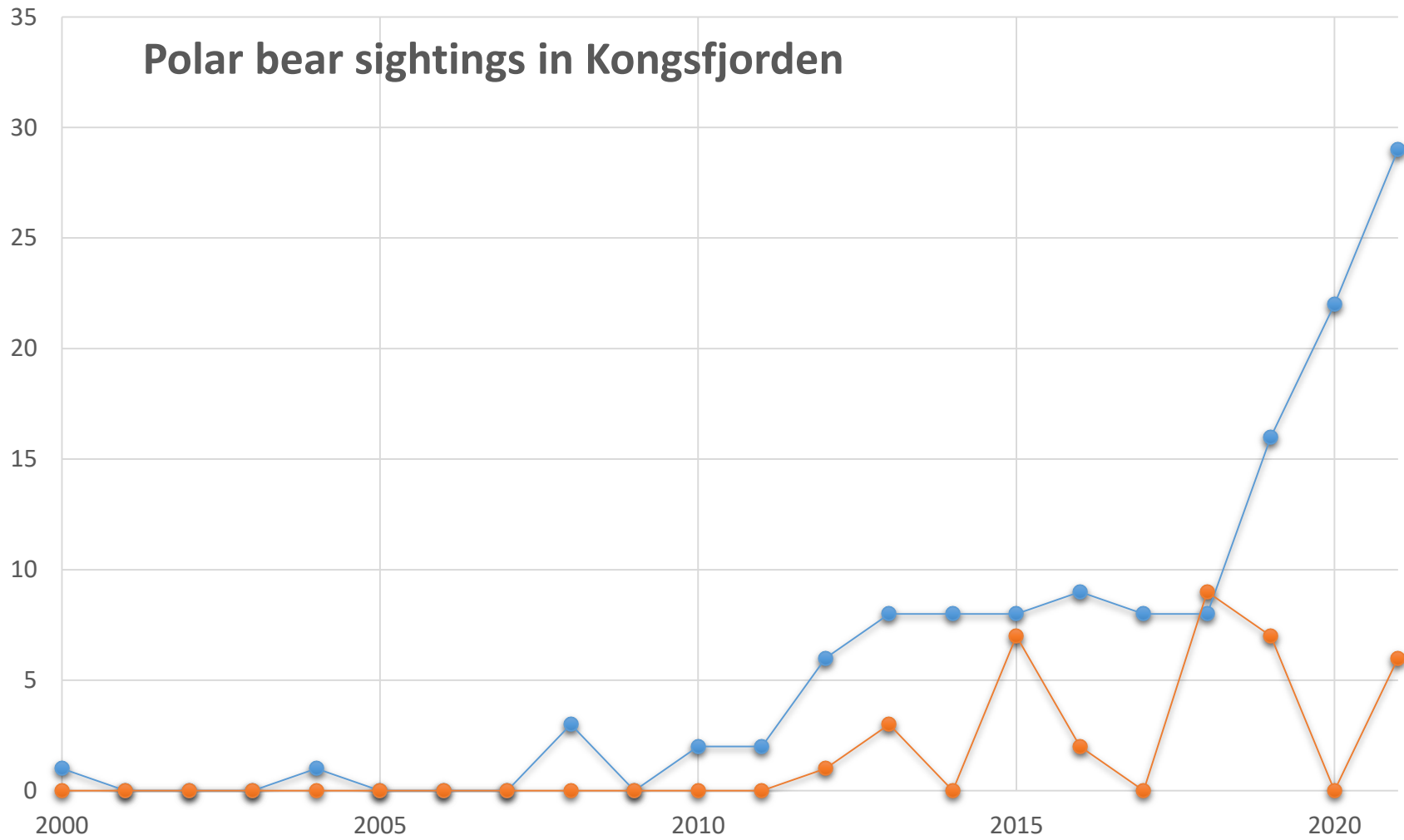
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# Polar bear sightings in Kongsfjorden



—● Adult —● Young





Source: YouTube: BBC earth – the hunt



Recovering from  
hunting



# Polar bears fond of goose eggs



Nordenskiöldkysten goose research 2012



Pooldieren  
hebben  
bijzondere  
aderen



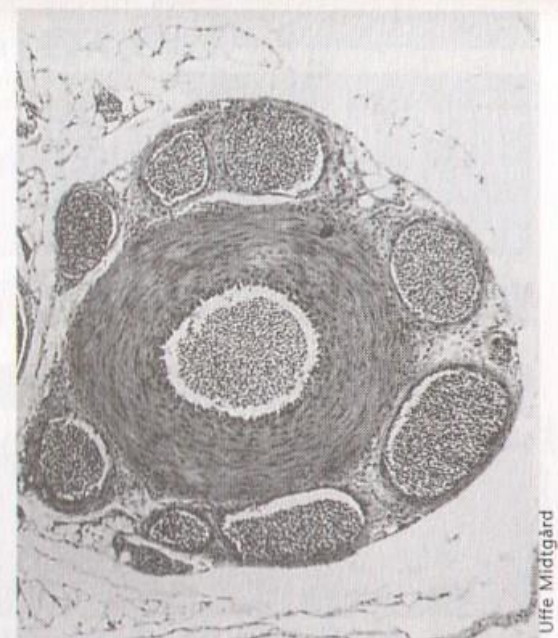
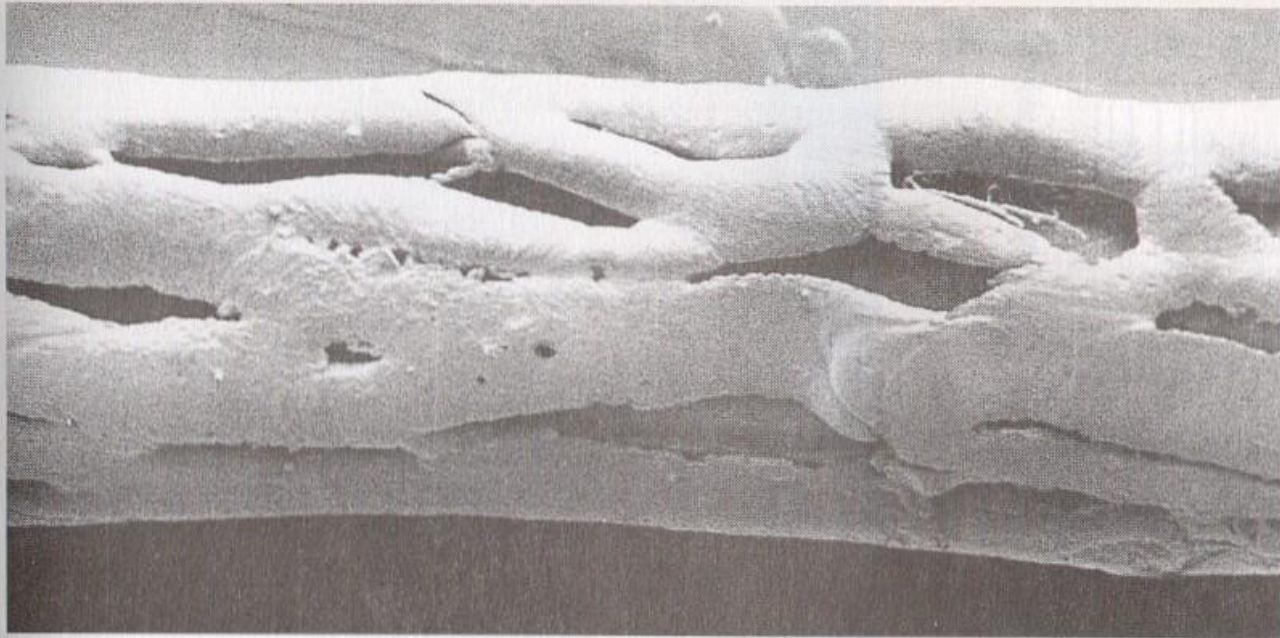
5G VEROOR  
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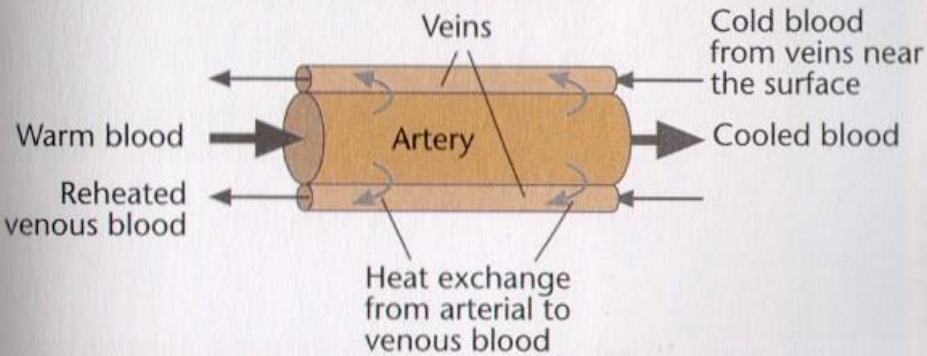
FICTIE

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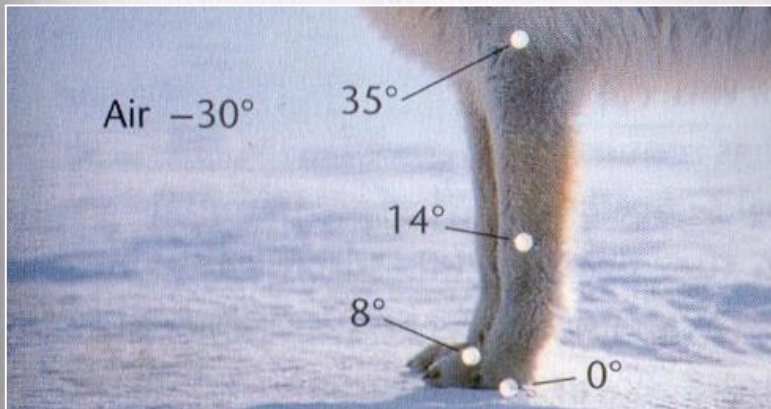




Uffe Midtgård

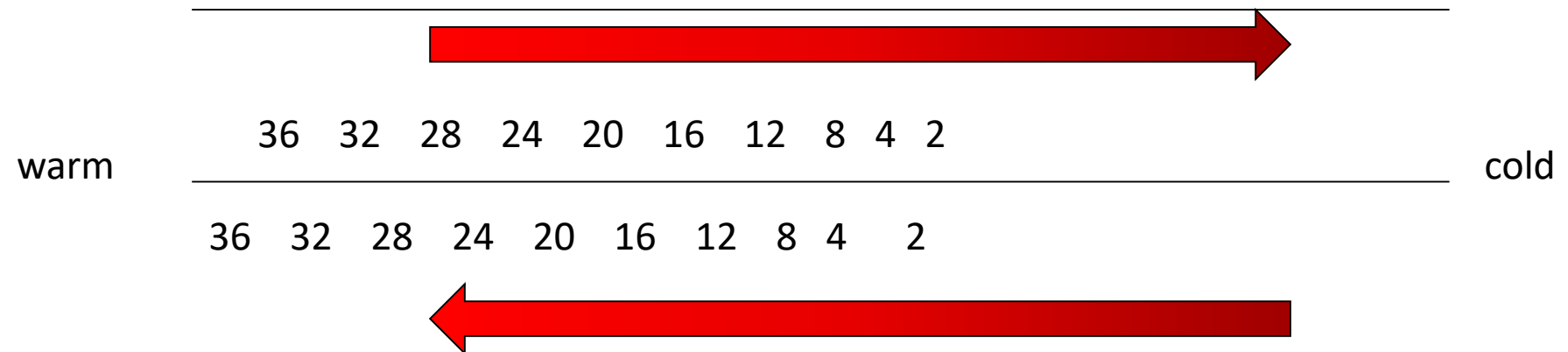


**Figure 4.15** *The principle of “heat exchanging” blood vessels. Cooled blood from the surface of the extremities flows to deeper lying veins apposed to arteries. Thus, heat is exchanged between the two different types of vessels, but blood is not. Cooled arterial blood flows to the surface and “pre-heated” venous blood enters the body. The electron microscope photographs show heat exchanging blood vessels in the leg of a raven (on the left) and a rook. Diameter = 2 mm.*

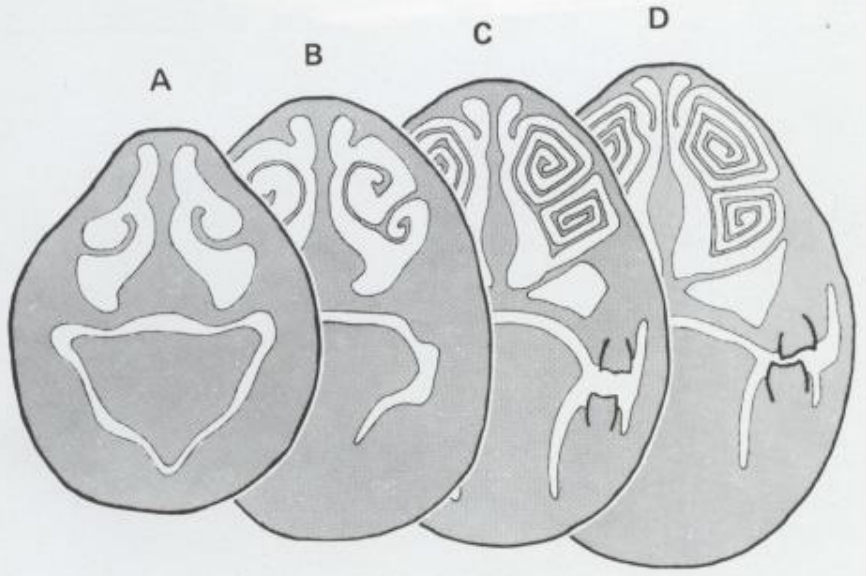
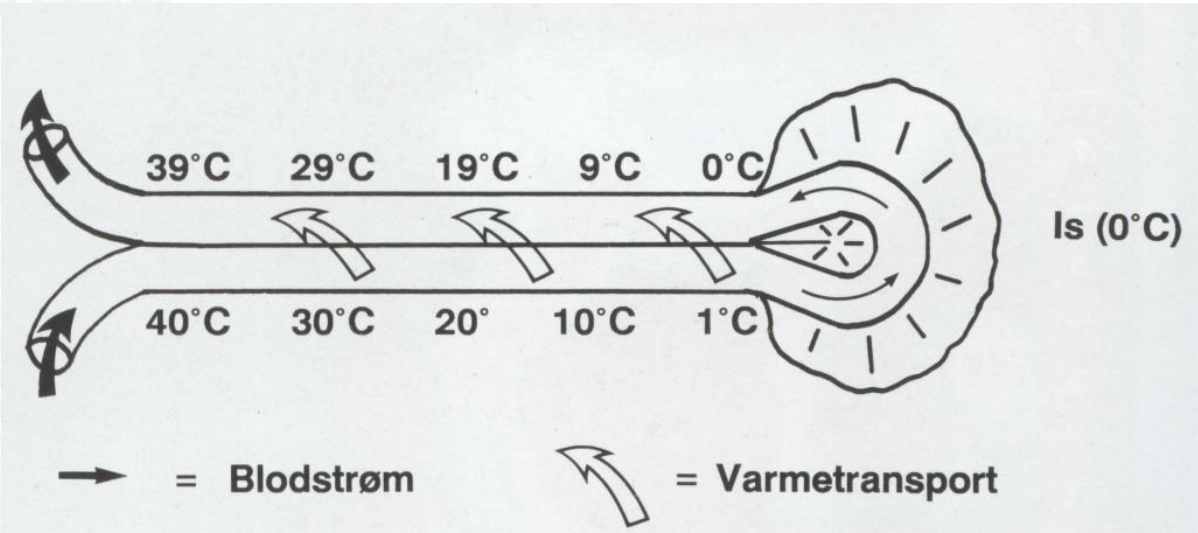


Counter current principle for heat exchange

# Counter current principle in blood flow and industry, used for optimal heat exchange



There is always a temperature gradient and the final temperature on return is almost the starting temperature. If mixed in the same bowl all blood would be 14 degrees and not become 37 again.



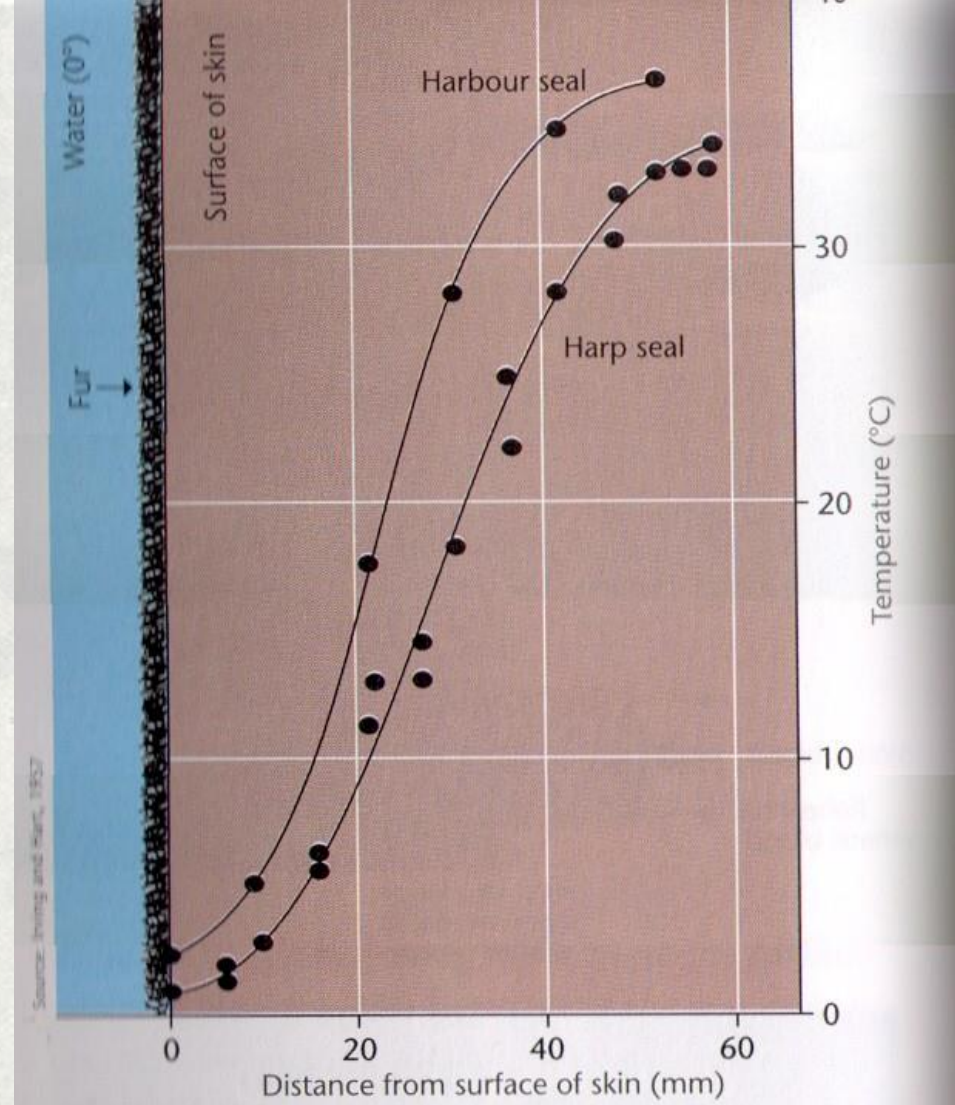
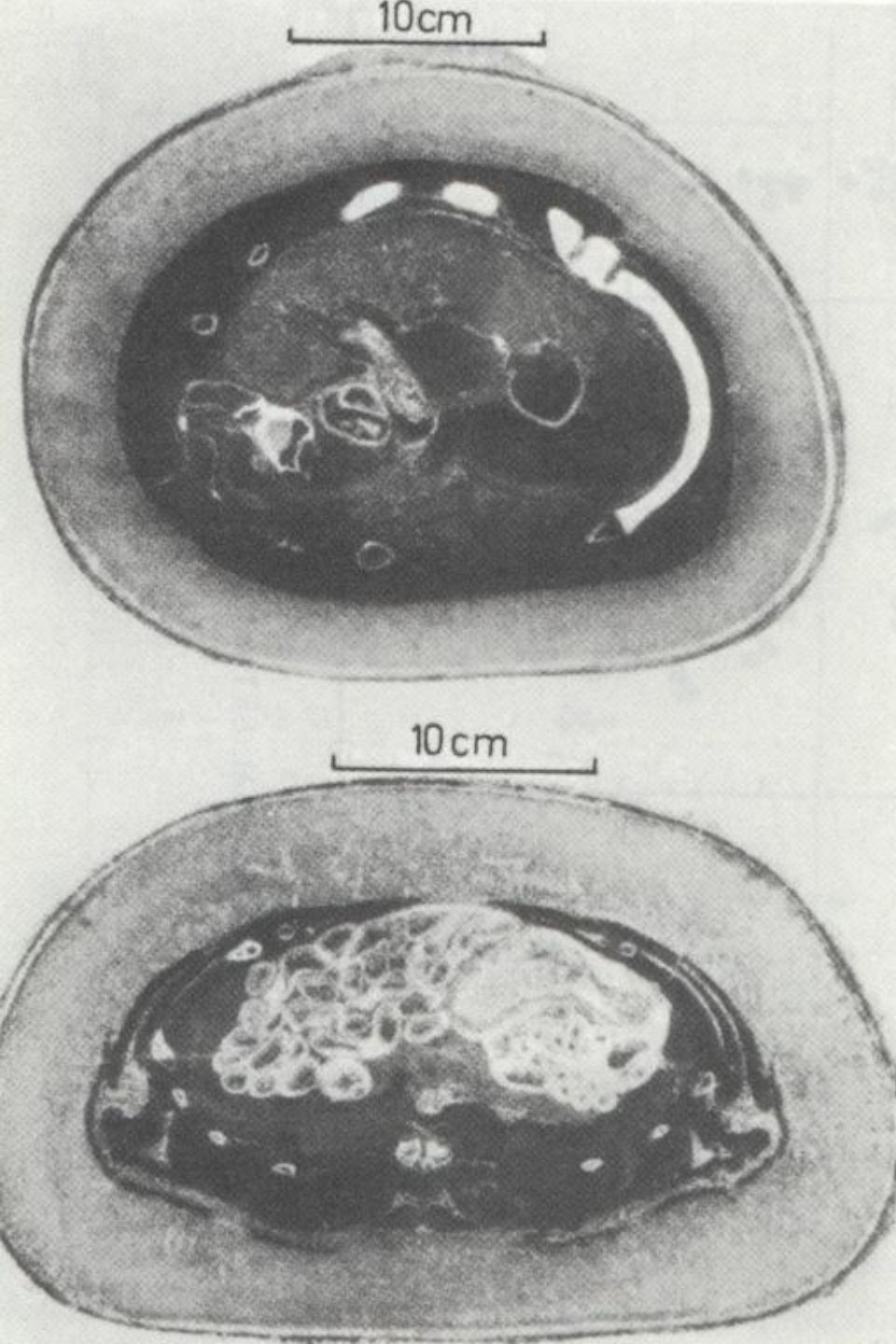
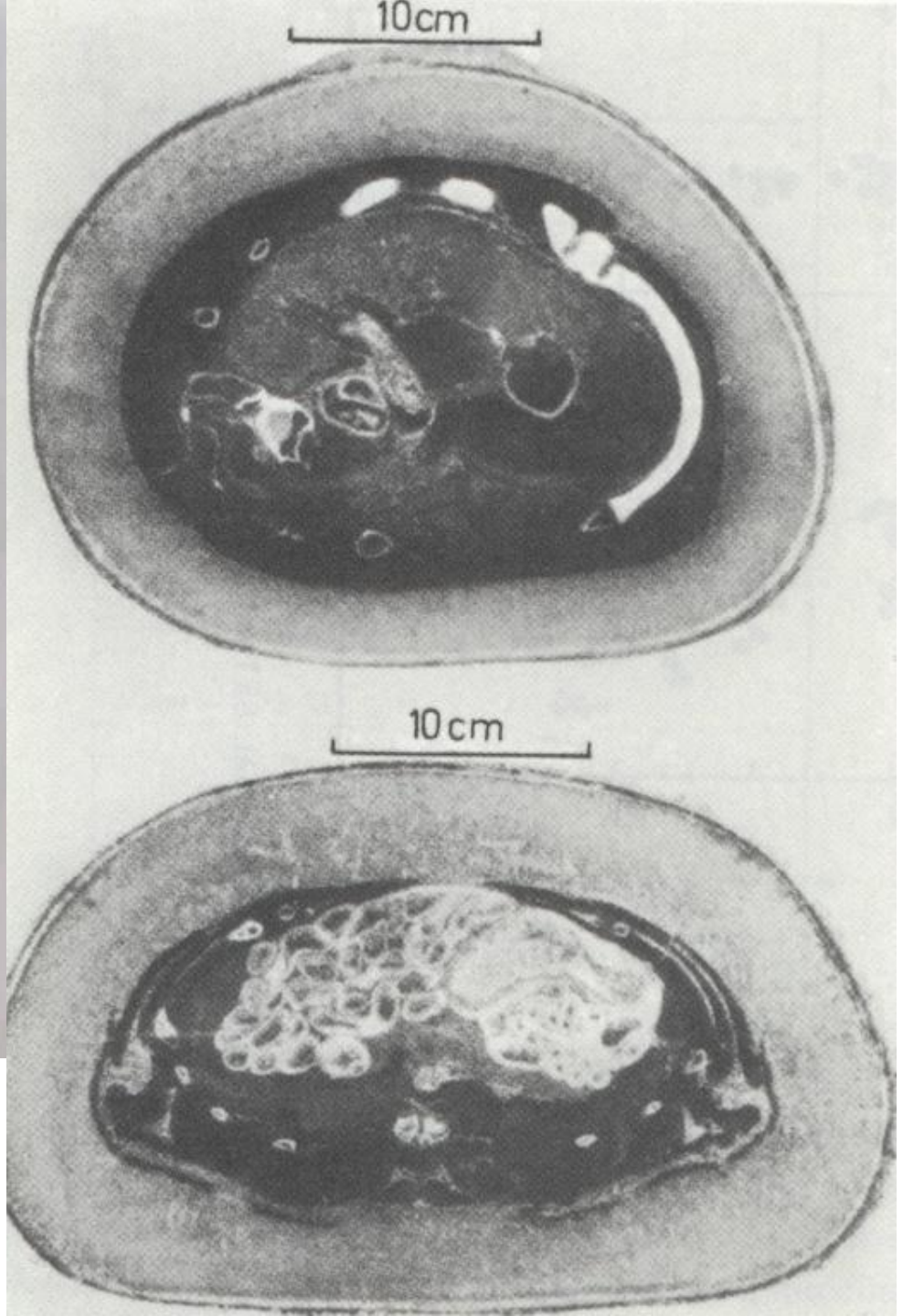
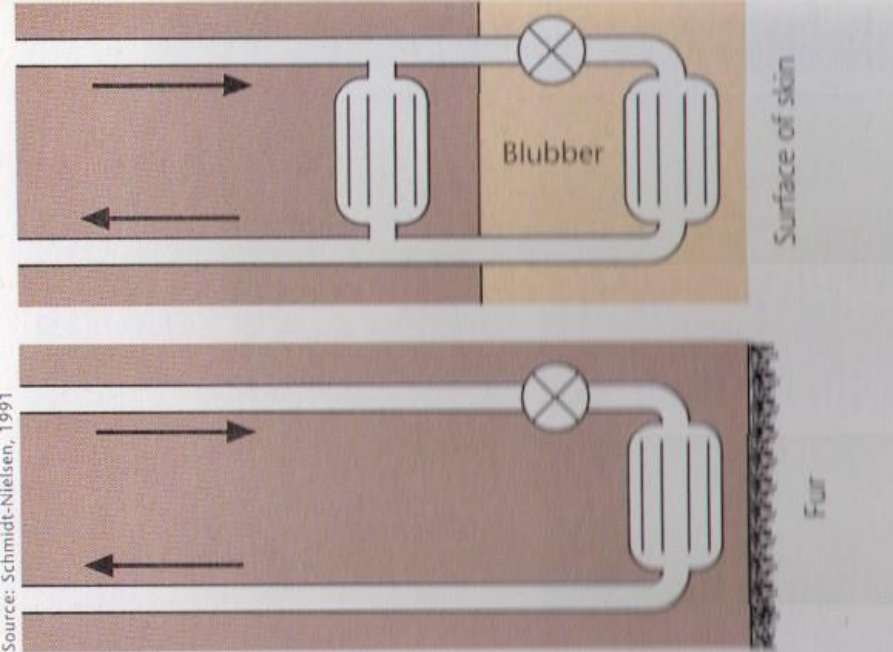


Figure 4.18 *The insulating ability of blubber is illustrated in this figure which shows temperatures measured through the blubber layer of seals in ice-cold water. The animal's temperature at the surface is close to 0°C.*



**Figure 4.17** *The insulating layer of blubber can be crossed by warm blood when there is a need to emit heat. The same mechanism does not work through fur, which consists of dead tissue. The circle indicates the ability to regulate the flow of blood.*



**Figure 5.120** *In order to cool off this walrus has directed blood to the skin and is waving an extended flipper.*

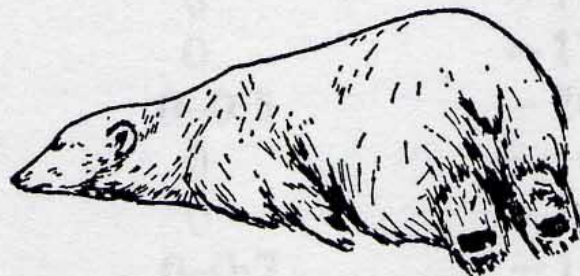
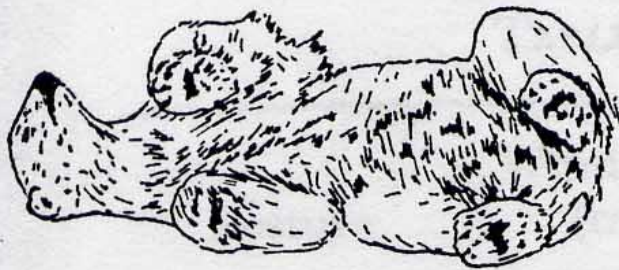
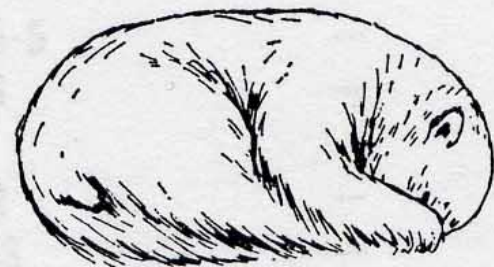
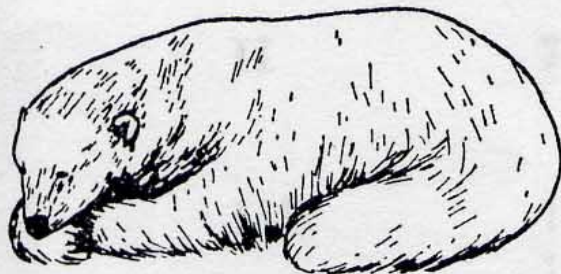
**I****III**

FIG. 5. Polar bears' postures at mean windchills  $830 \text{ W/m}^2$  (I),  $1410 \text{ W/m}^2$  (II) and  $1910 \text{ W/m}^2$  (III). Detailed observations are listed in Table 1.

T

Het rendier-  
gewei is koel-  
element



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**Figure 10.44** A typical skinned carcass of an adult and apparently healthy female Svalbard reindeer which was shot late in winter (April), when muscle mass has atrophied and the fat deposits (seen in Fig. 10.43) have been mobilized and used in anticipation of spring and a new growth season (Tyler, 1987).



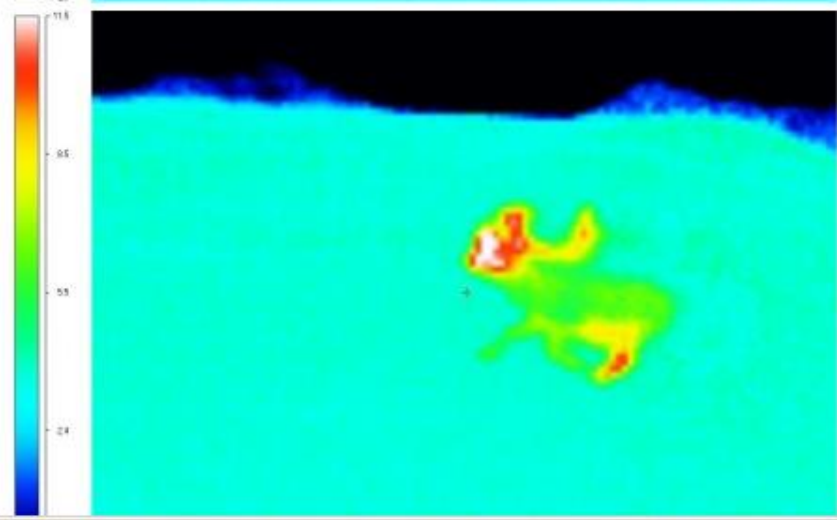
click [here](#) to view this page in original view

13 August 2008 19:09

### Thermal imagery



Reindeer or karibou are the only antler-bearers where the female also is wearing an antler. One of the hypothesis for this fact is that the reindeer need an extra cooling device during summer, when they are fattening and the fur is growing thick. Reindeer are so well adapted to the cold environment that loosing heat has become a problem. As long as the antler is covered with skin, the reindeer can regulate the amount of blood



[www.arcticstation.nl](http://www.arcticstation.nl)

I war  
expe  
Mære, Janwillem and I go testing.  
We try to make a picture from a resting reindeer and a running reindeer. That was quite a challenge. But on the pictures you can see beautifully that the antler is a warm spot and that more of the antler becomes warm during running. This is what I hoped. And I'm trying to develop a new research project



Dieren kunnen zich aanpassen aan klimaat



SG VEROOR  
CORON

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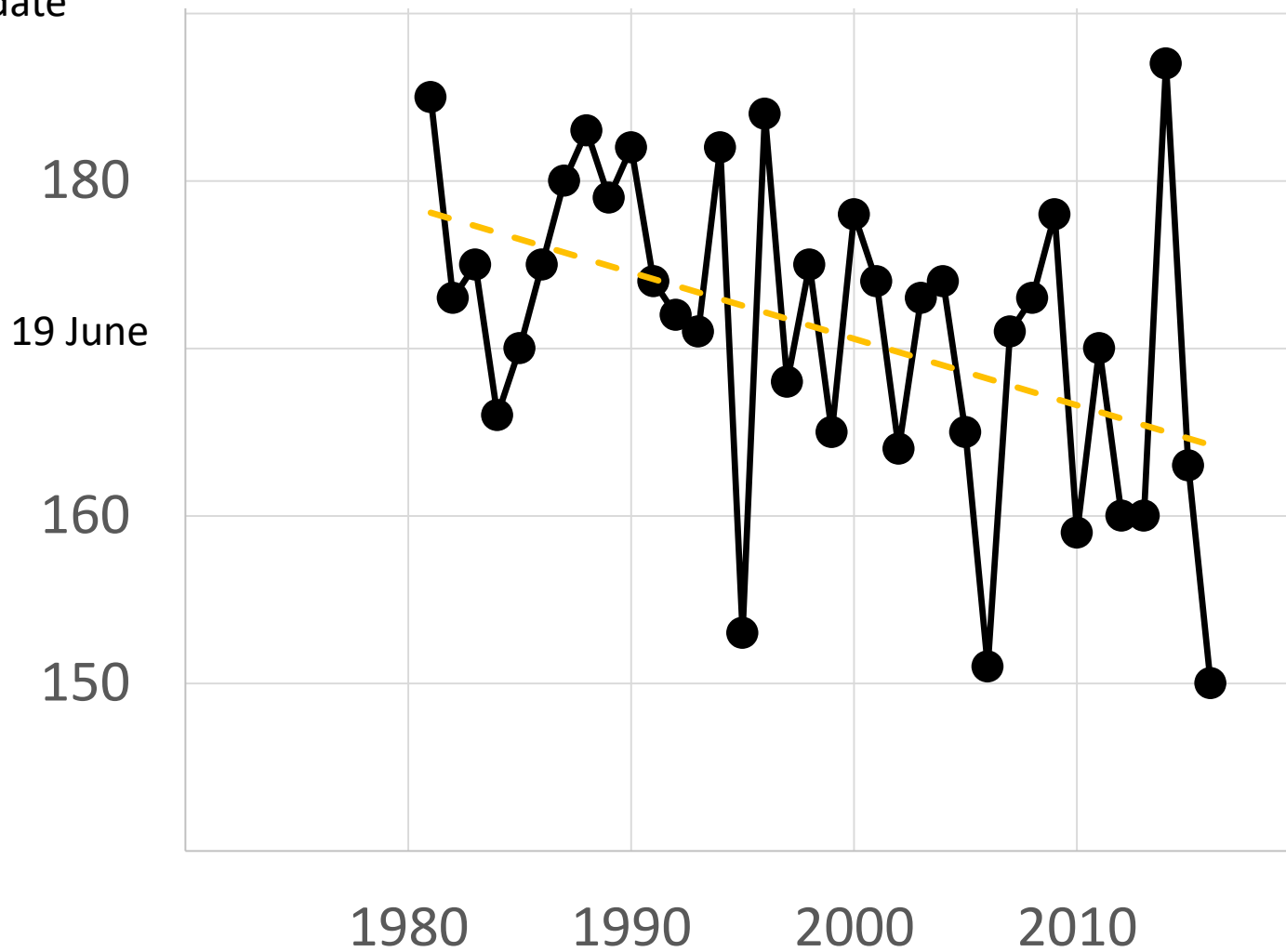


uitkomstdatum



Julian date

-0.4 day per year



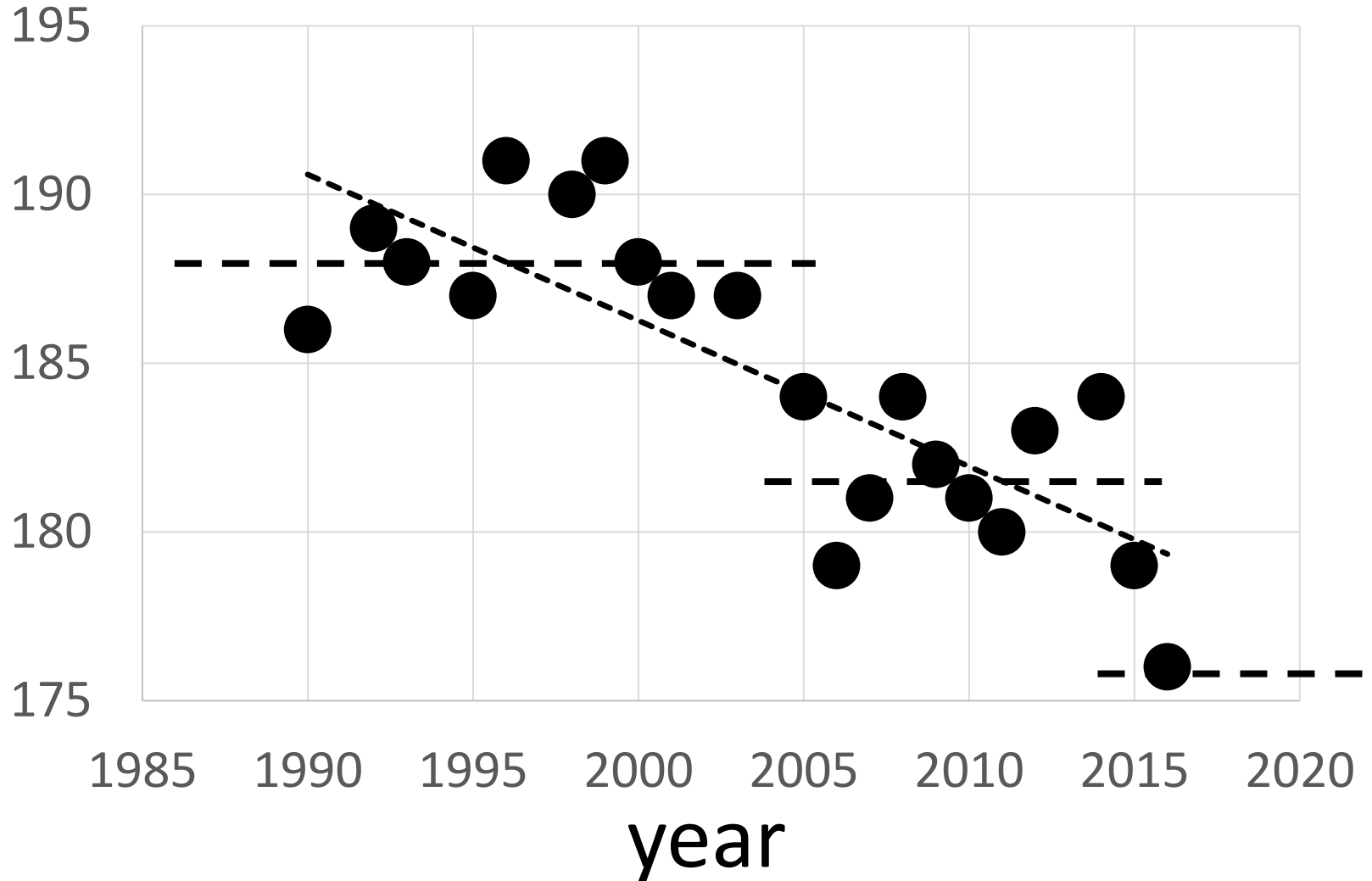
# Date of snowfree tundra (albedo<0.2)

Data: NPI, Børge Moe (NINA), Marion Maturilli (AWI), Mauro Mazzola (CNR)



# average annual hatchdate (Julian date)

-0.4 day per year







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FE

rain on snow



2012







arctic fox



T

Jonge pinguins  
zijn  
koukleumen



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FICTIE

FLIR i5

\* -5.1°C

FLIR

-14

8

Meat object  
Halfmat ( $\epsilon=0.80$ )

Menu

Auto/veg

+

◀

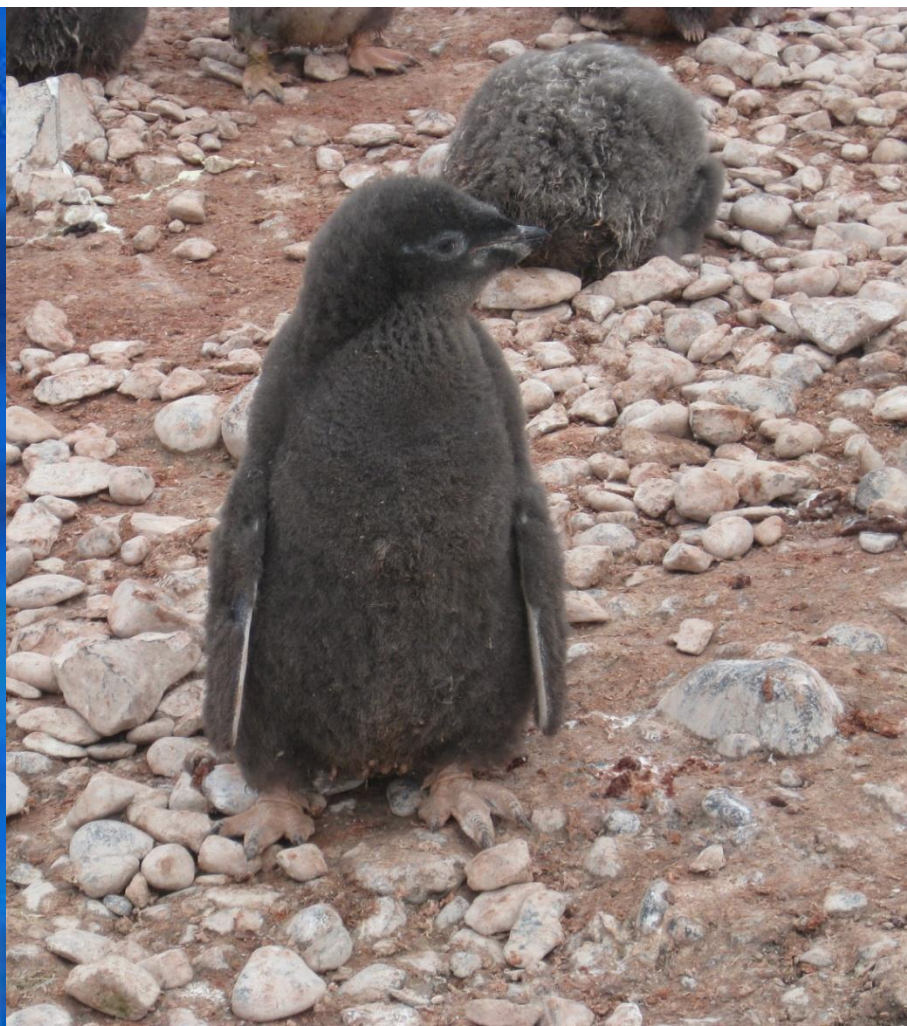
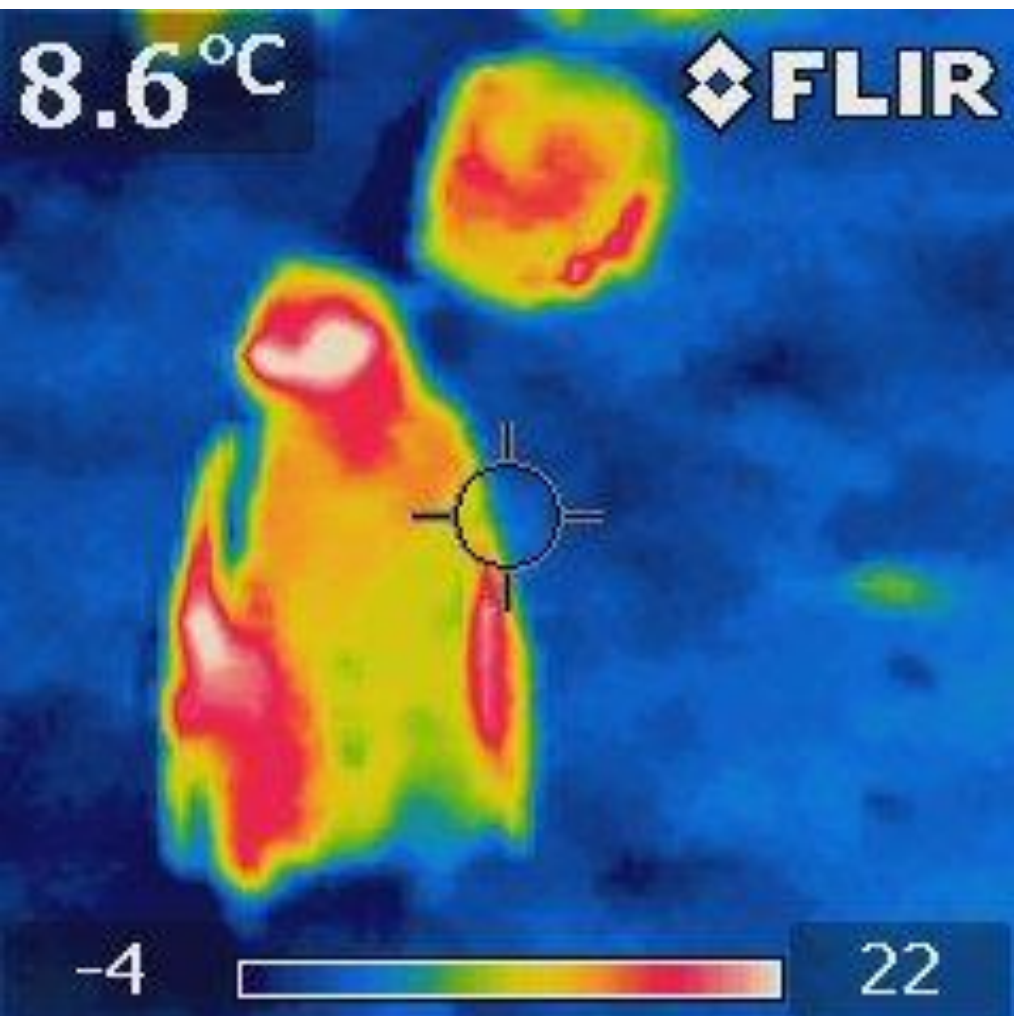
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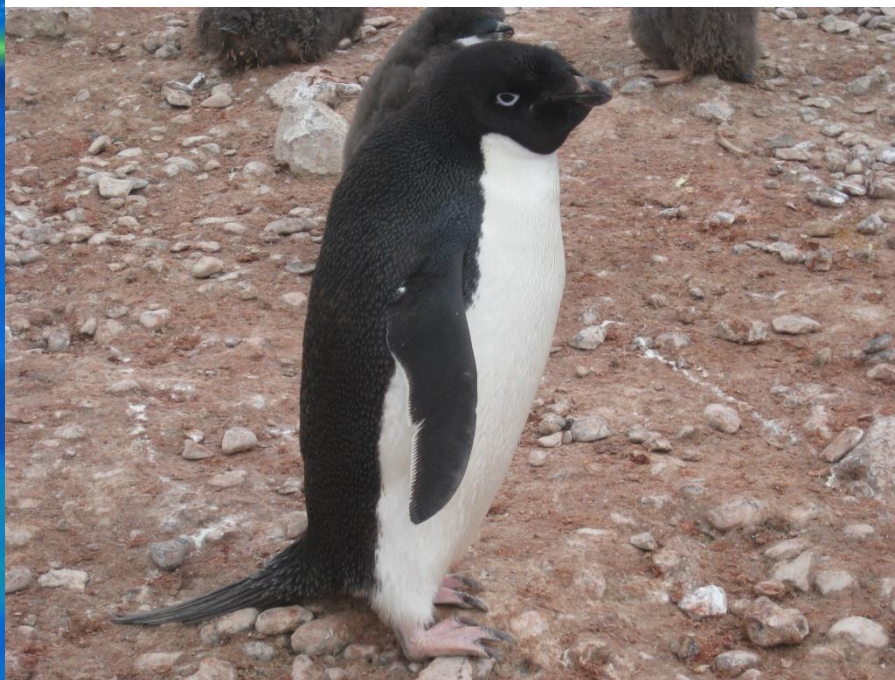
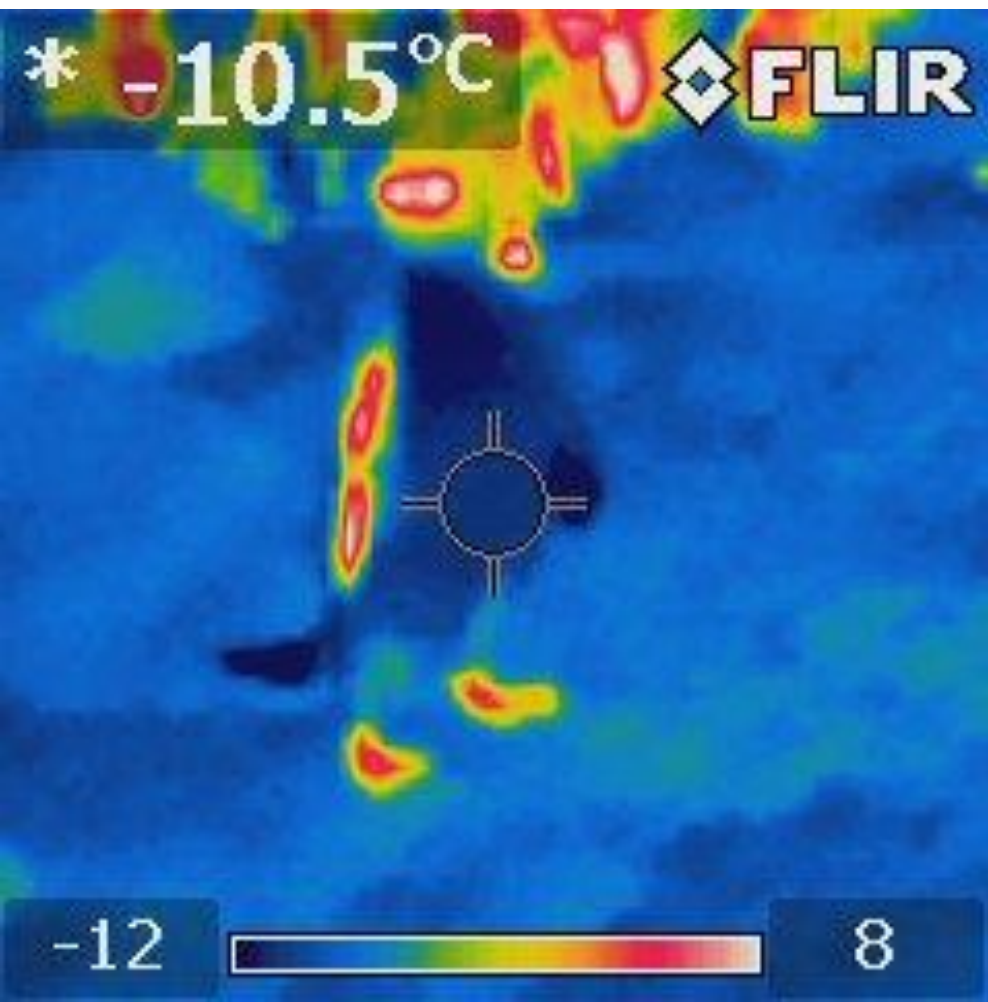
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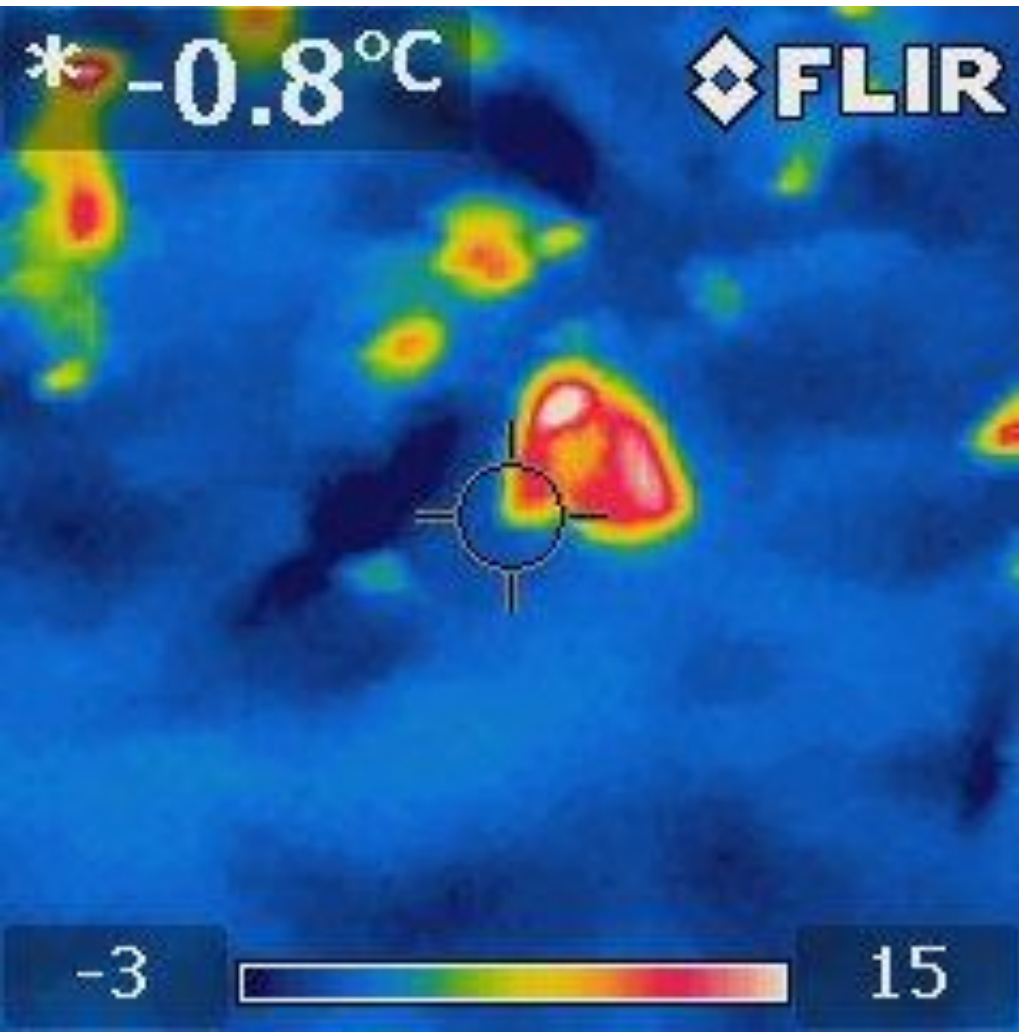
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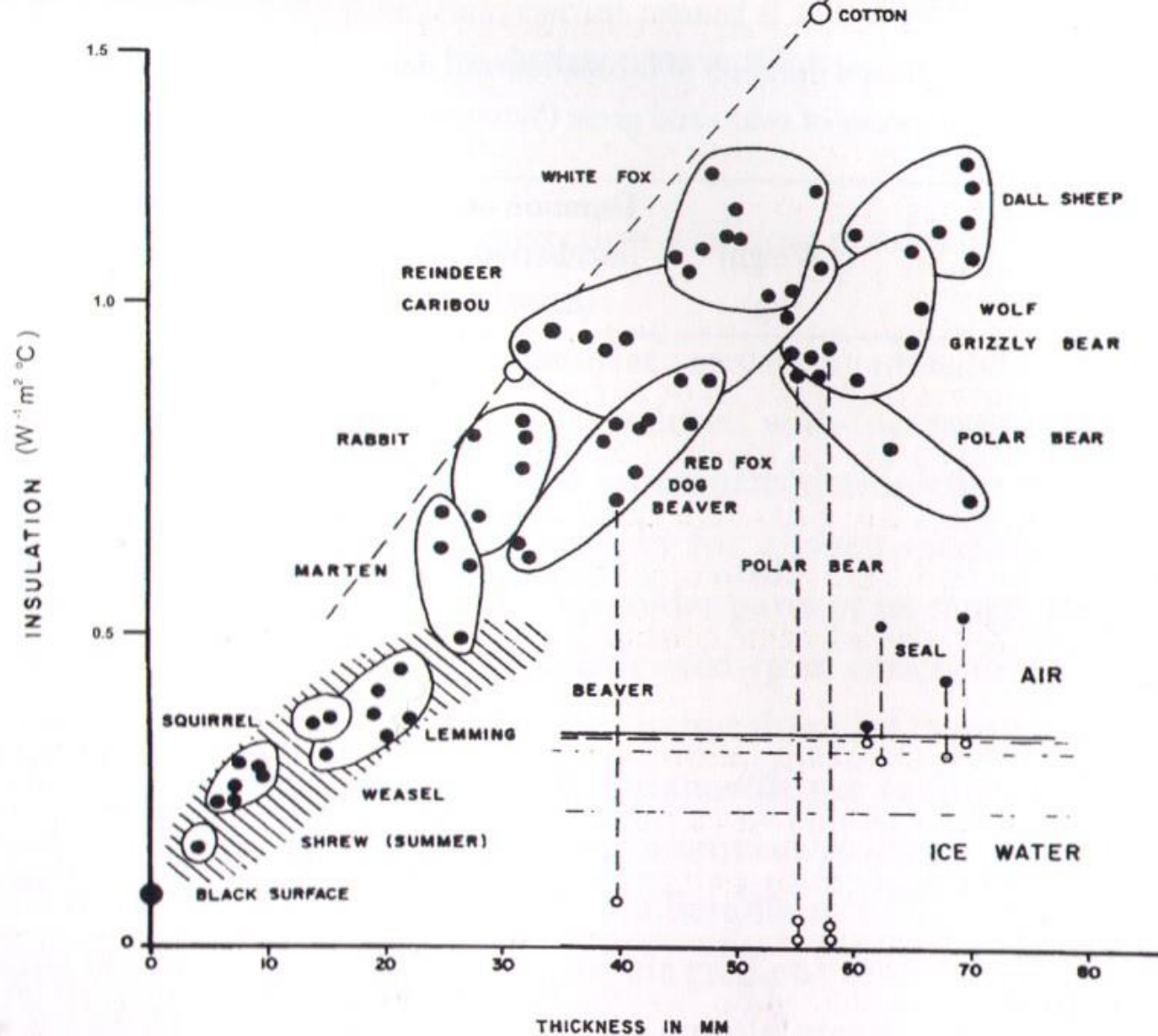


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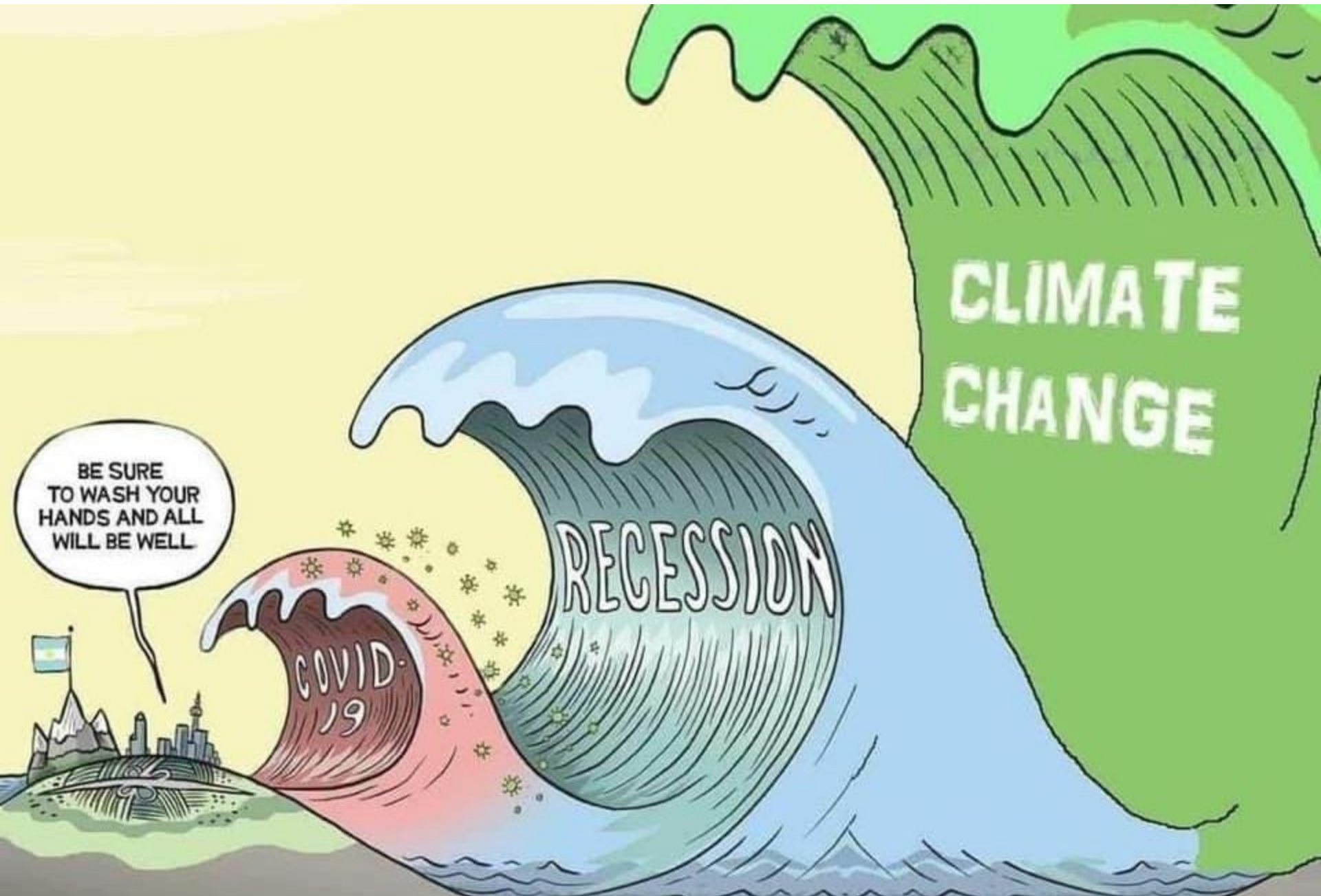


**Figure 10.5** The insulation value of animal fur in relation to fur thickness. Insulation values for fur in air are indicated by closed circles; values for fur submerged in water, by open circles. The sloping broken line represents the insulation values of cotton of various thicknesses (Scholander *et al.*, 1950a).









BE SURE  
TO WASH YOUR  
HANDS AND ALL  
WILL BE WELL

COVID-19

RECESSION

CLIMATE  
CHANGE

# Dank voor uw aandacht



[poolstation.nl](http://poolstation.nl)

[m.j.j.e.loonen@rug.nl](mailto:m.j.j.e.loonen@rug.nl)