

# Klimaatdag

Samen voor fossielvrij

2 mei 2024 | Heusden-Zolder

**VVSG**

**heusden  
zolder**



**Vlaanderen**  
is energie en klimaat



sessie B9

# Over weer en klimaat

Frank Deboosere | Weerman

**vvs**g

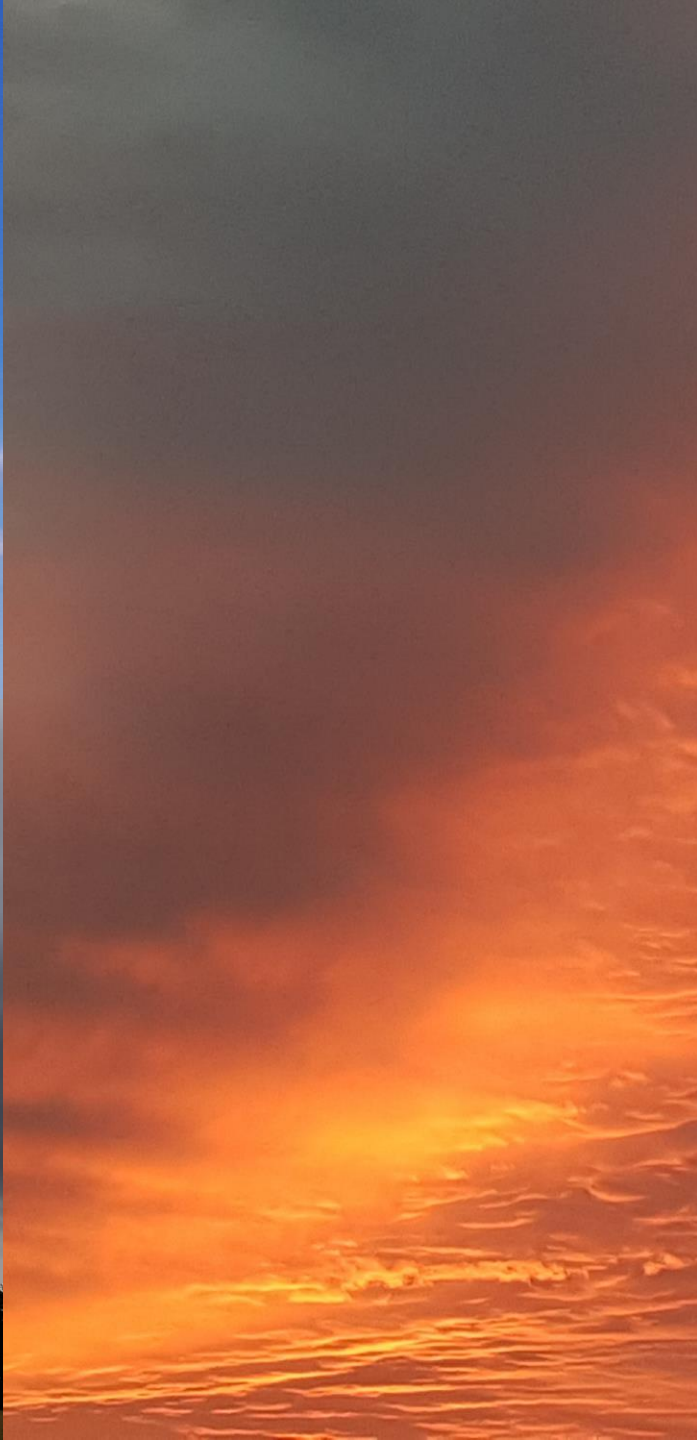
heusden  
zolder



1. Verandert het klimaat?
2. Wat zijn de oorzaken?
3. Hoe gaat het verder?
4. Wat kunnen wij doen?

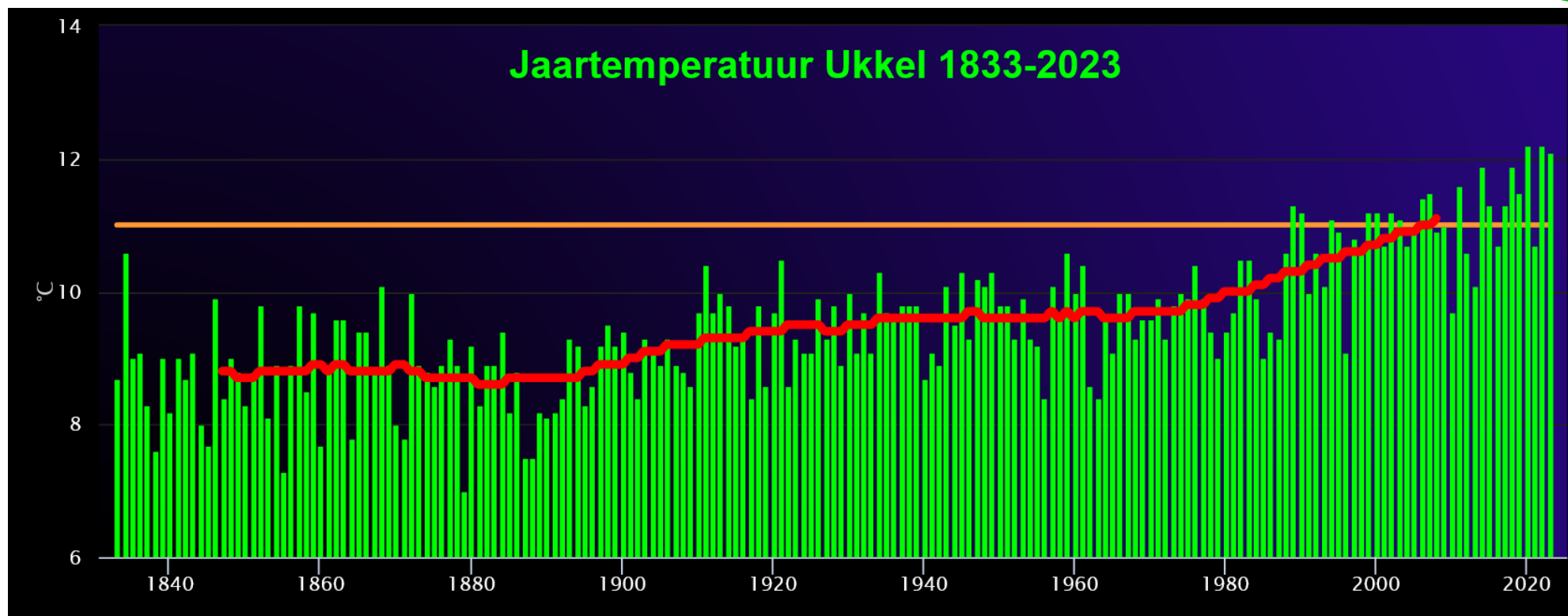




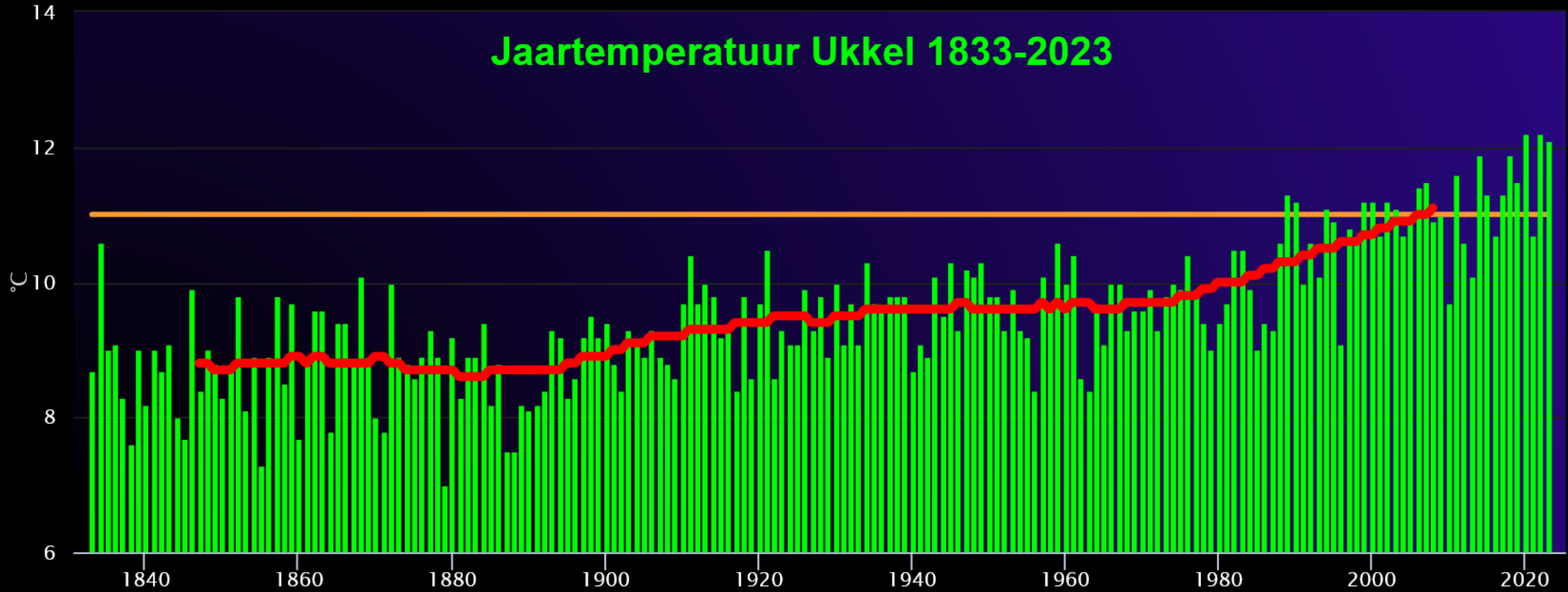




# 1. Verandert het klimaat?

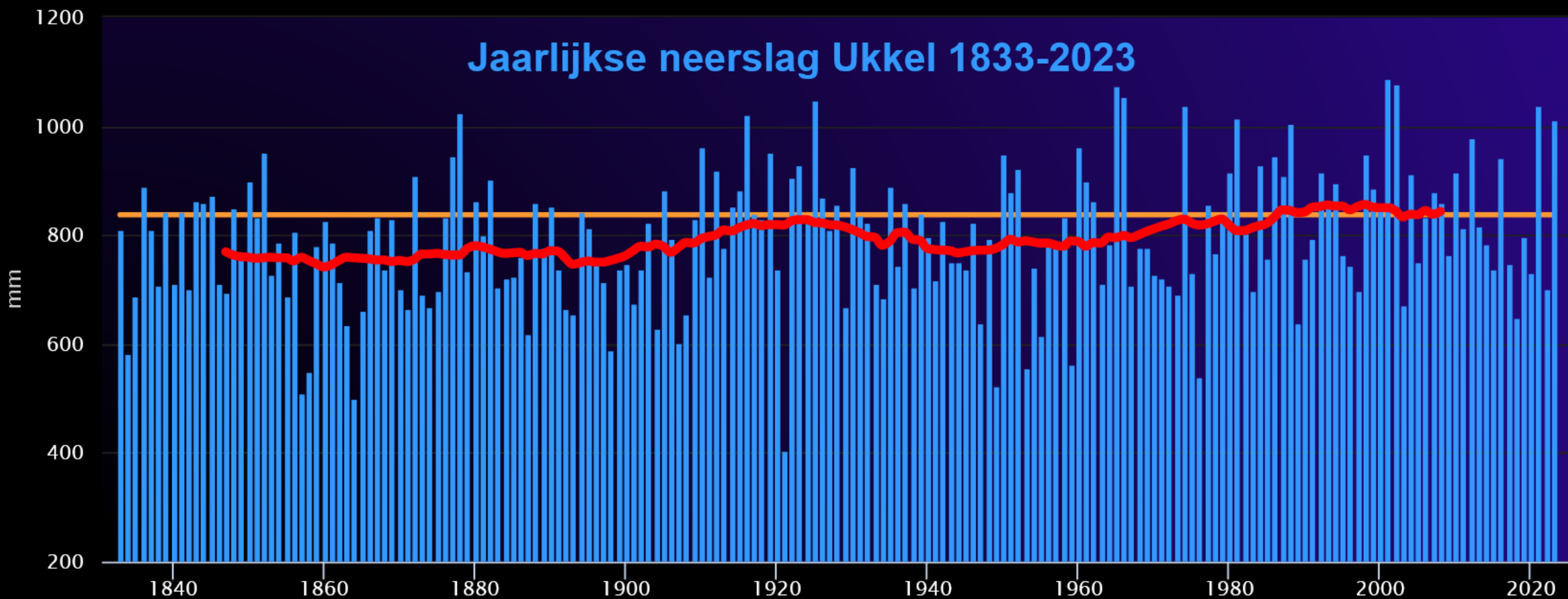


# Jaartemperatuur Ukkel 1833-2023

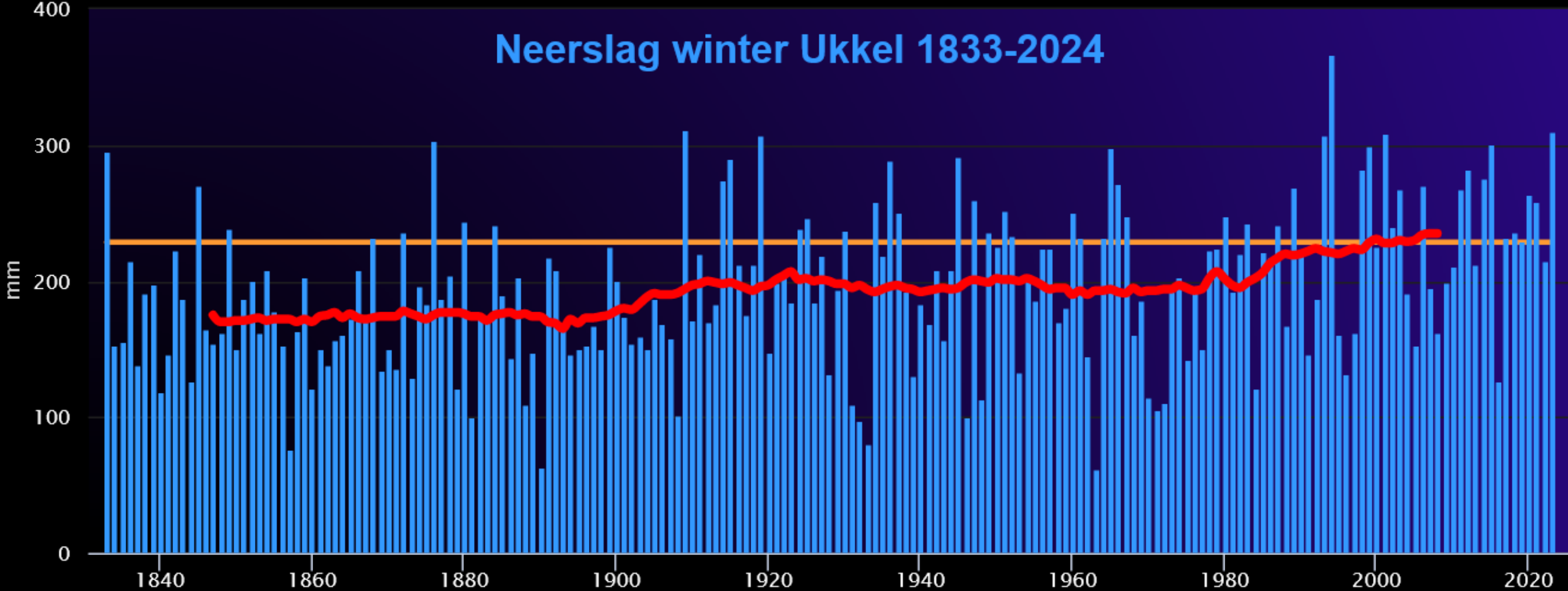




# Jaarlijkse neerslag Ukkel 1833-2023

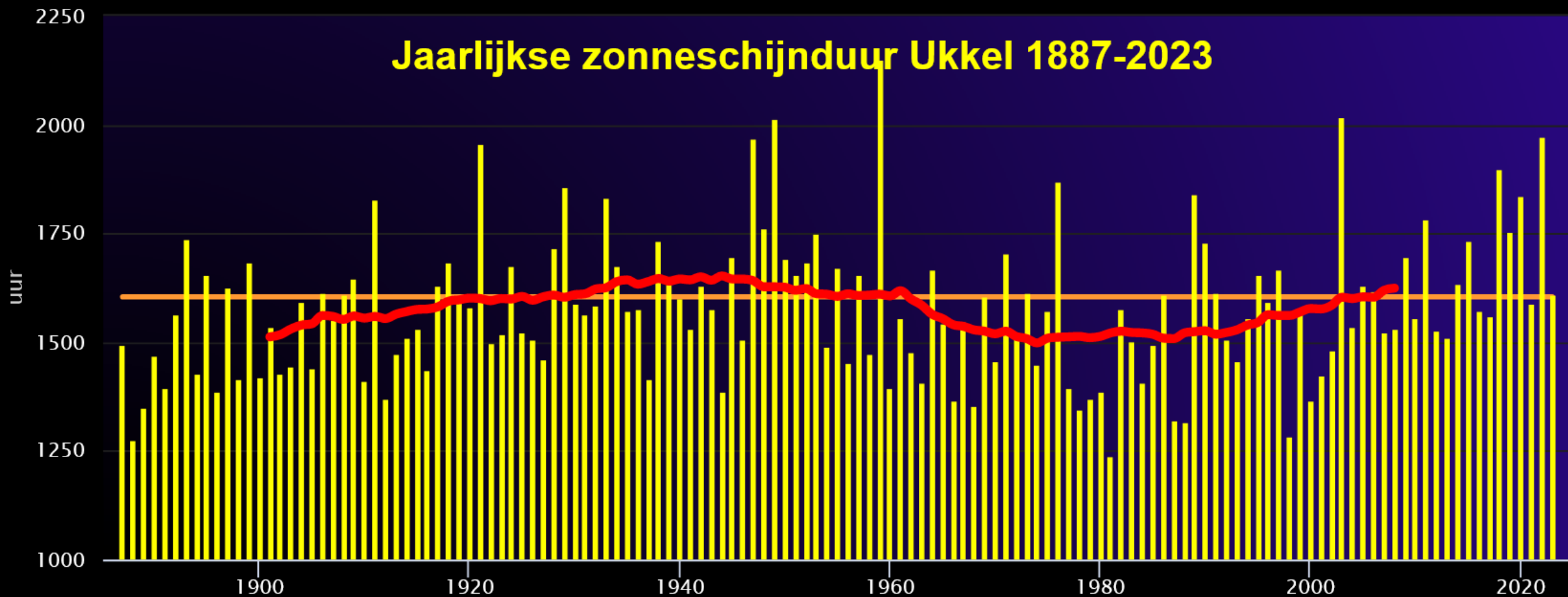


# Neerslag winter Ukkel 1833-2024

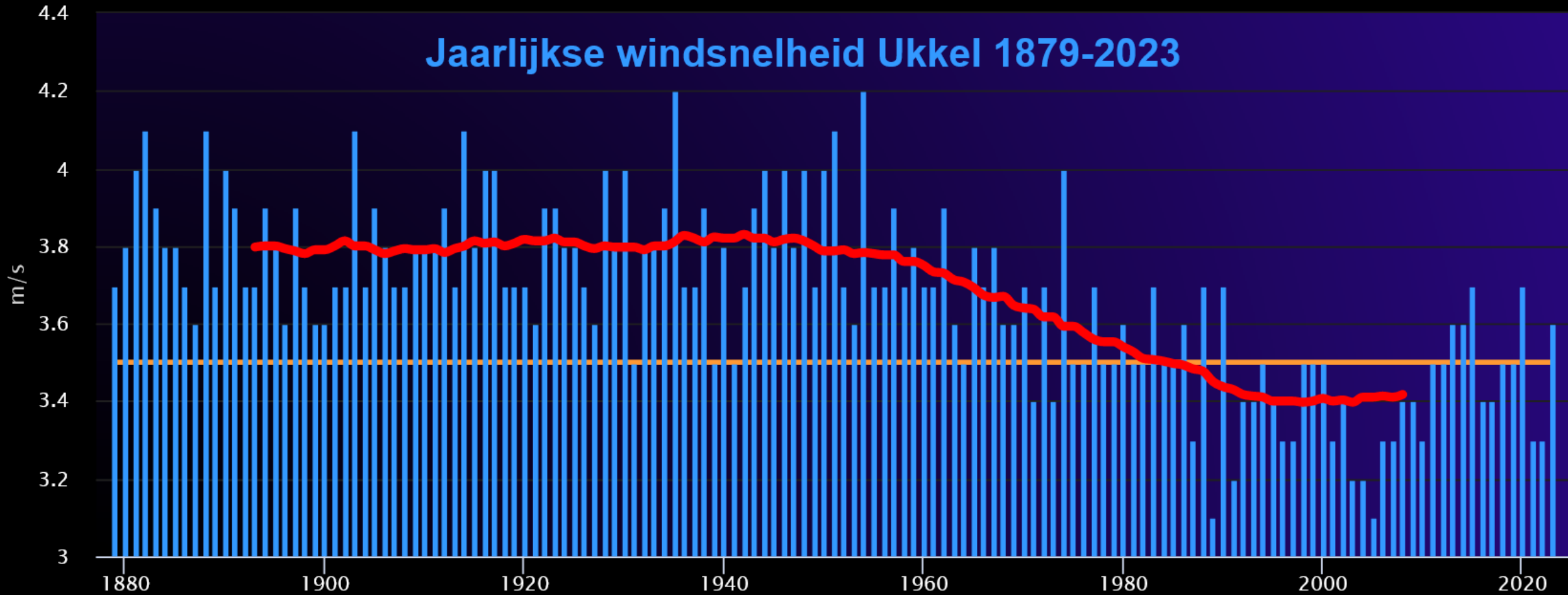




# Jaarlijkse zonneshijnduur Ukkel 1887-2023

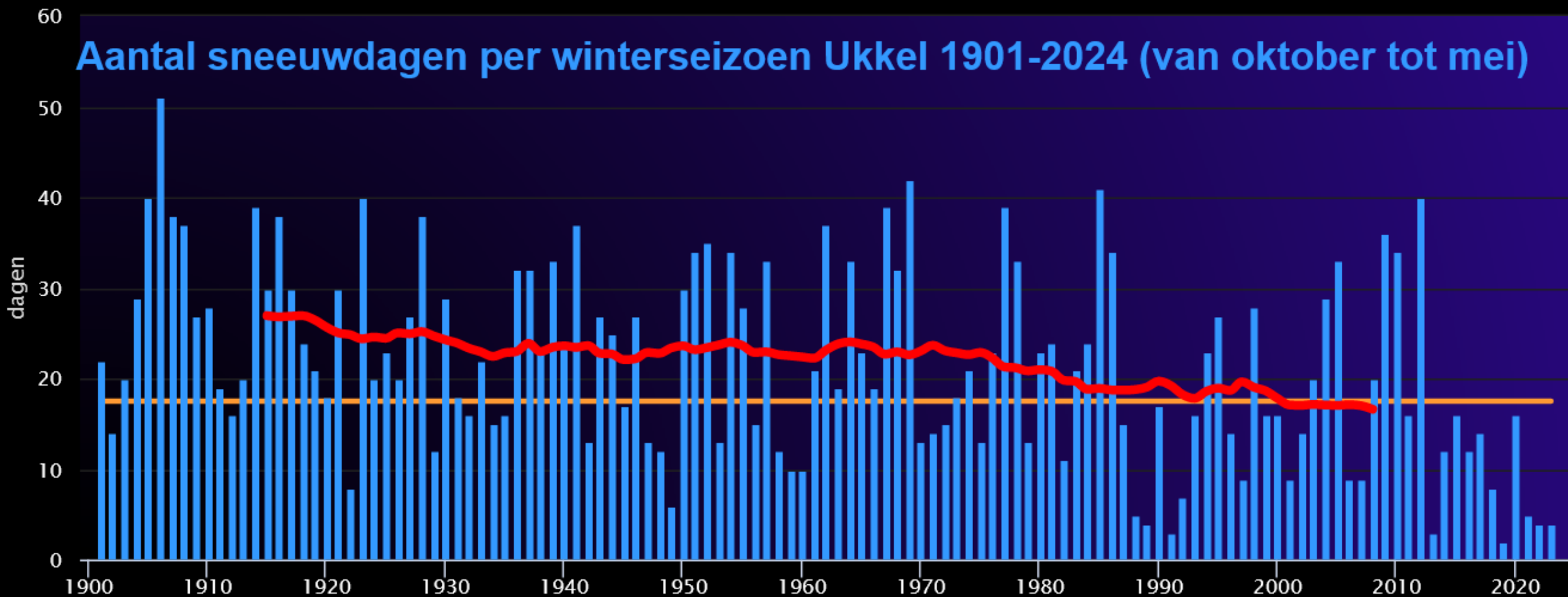


# Jaarlijkse windsnelheid Ukkel 1879-2023

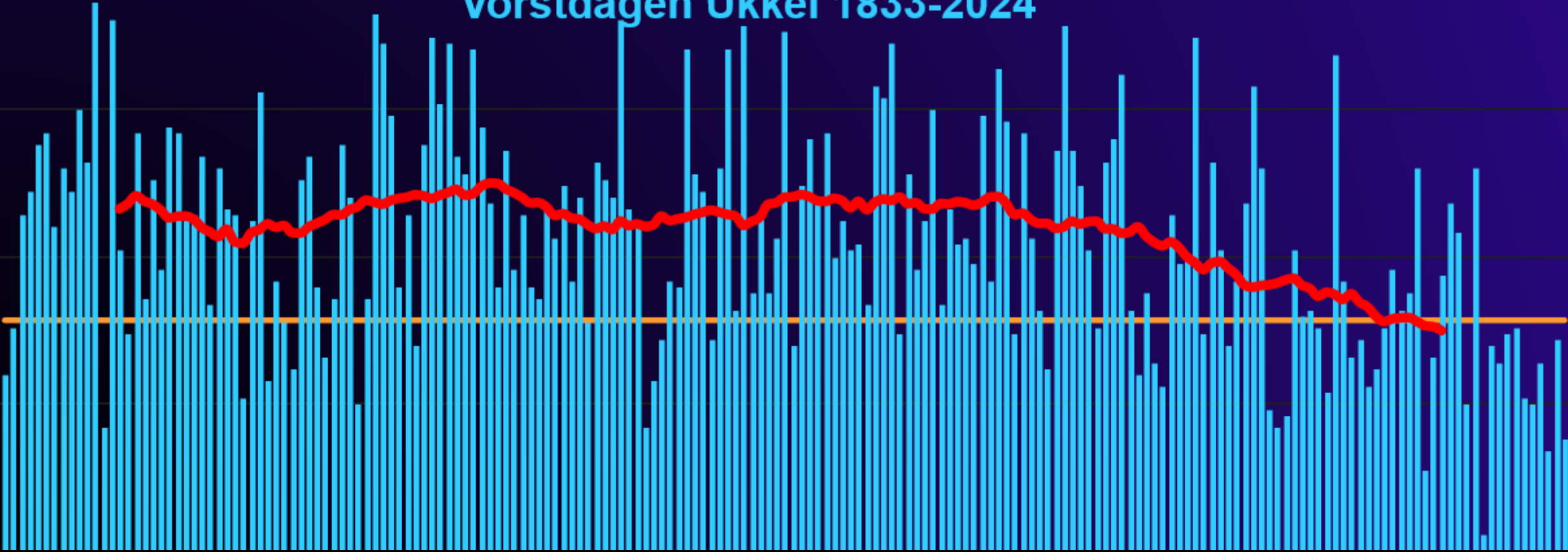




# Aantal sneeuwdagen per winterseizoen Ukkel 1901-2024 (van oktober tot mei)

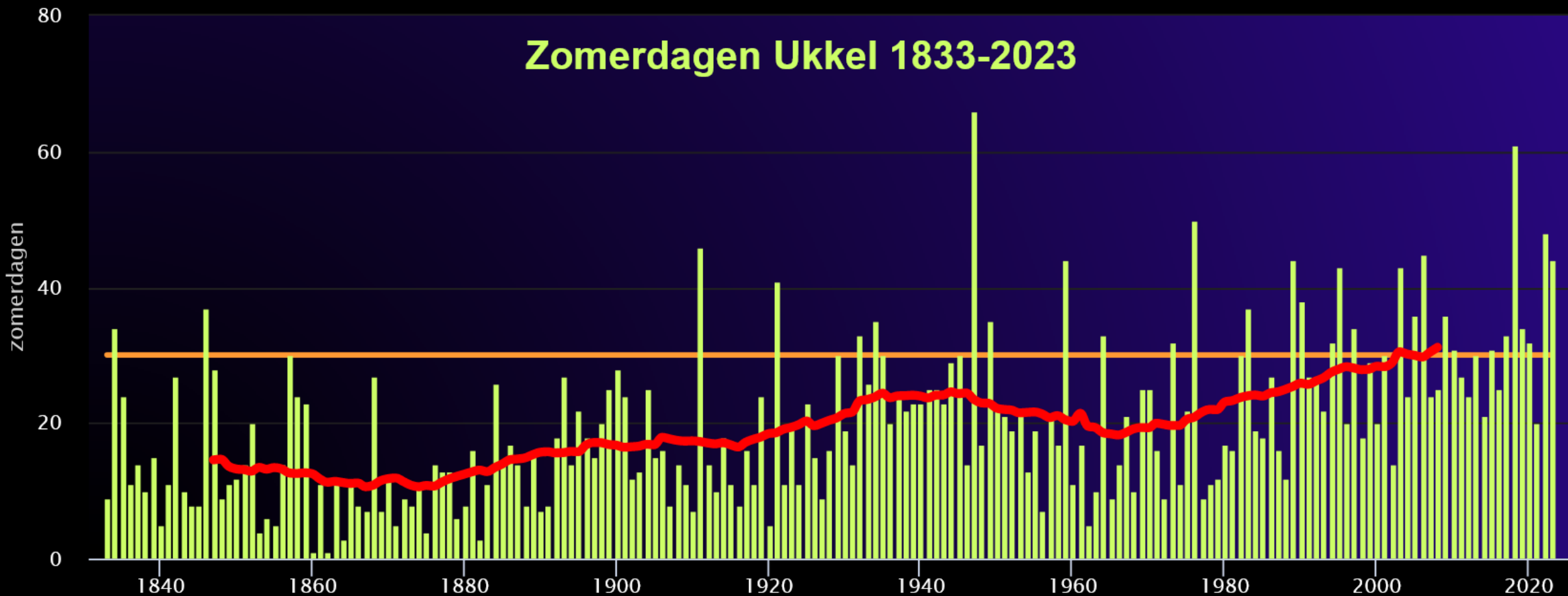


# Vorstdagen Ukkel 1833-2024





# Zomerdagen Ukkel 1833-2023



## Dagrecords vanaf 2010

Hoogste maxT	Laagste maxT	Hoogste minT	Laagste minT
105 dagen	18 dagen	101 dagen	6 dagen

## Dagrecords vanaf 2000

Hoogste maxT	Laagste maxT	Hoogste minT	Laagste minT
151 dagen	22 dagen	172 dagen	9 dagen

## Dagrecords tot en met 1916

**Hoogste maxT**   **Laagste maxT**   **Hoogste minT**   **Laagste minT**

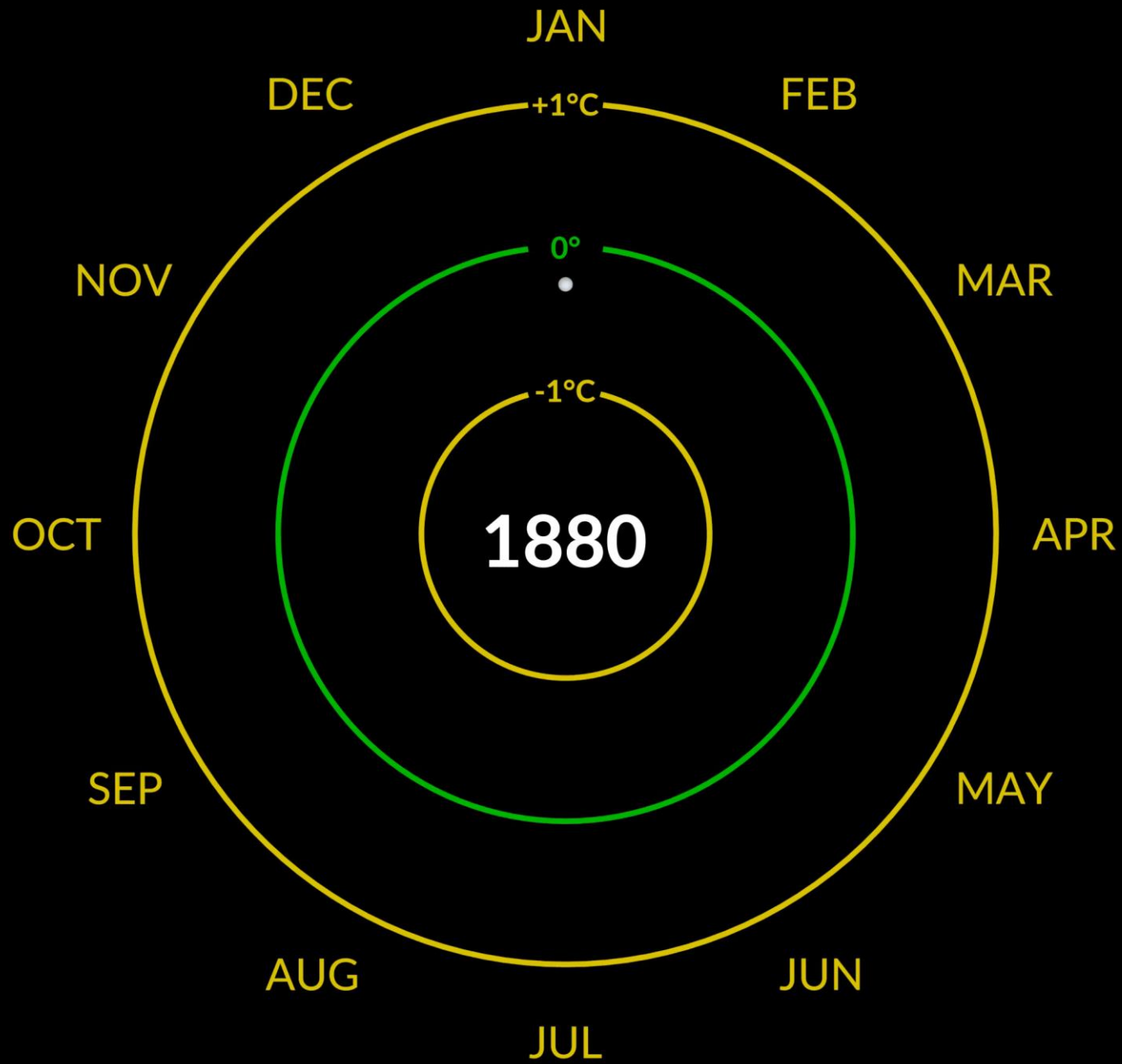
**26 dagen**

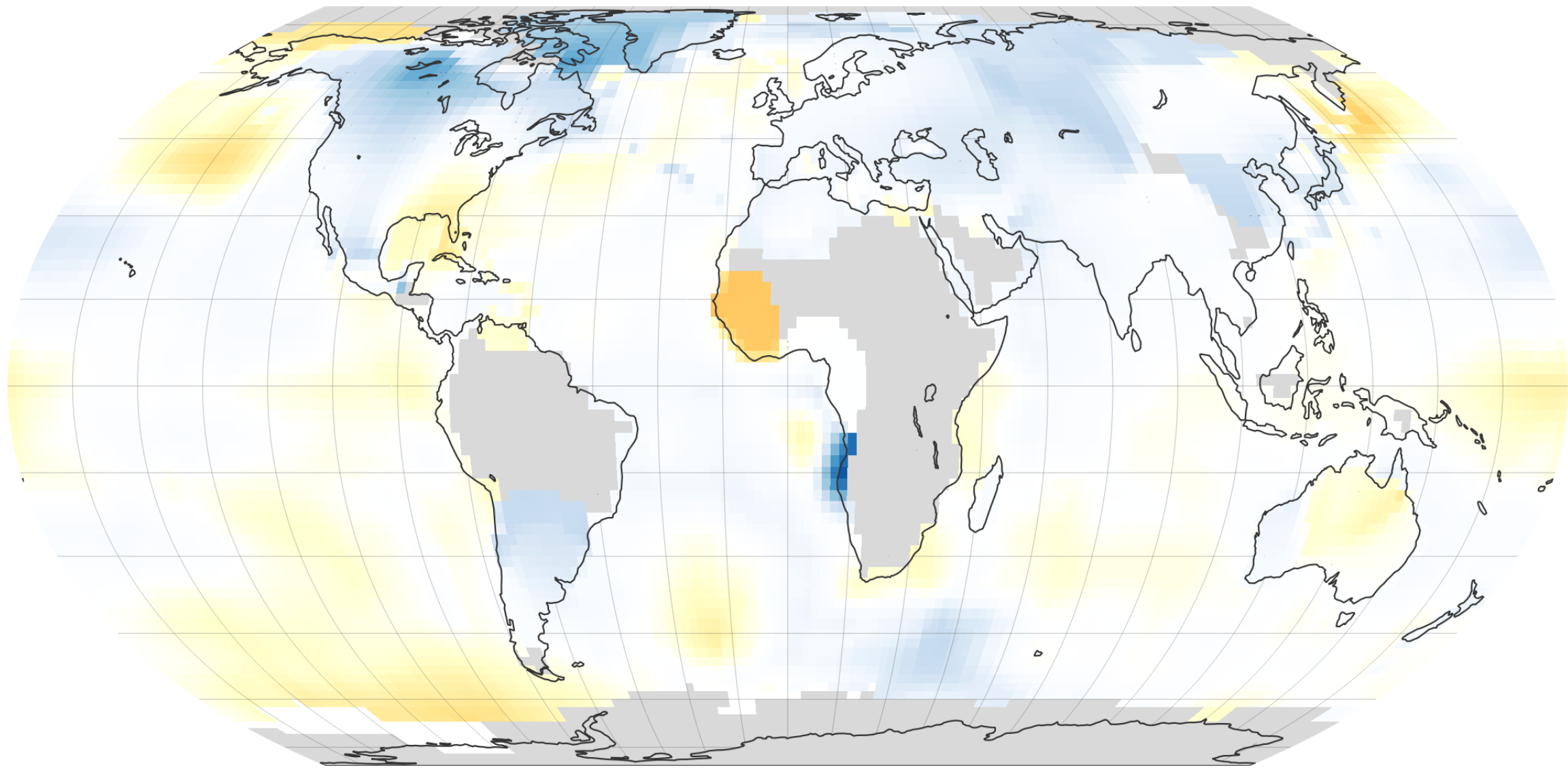
**116 dagen**

**24 dagen**

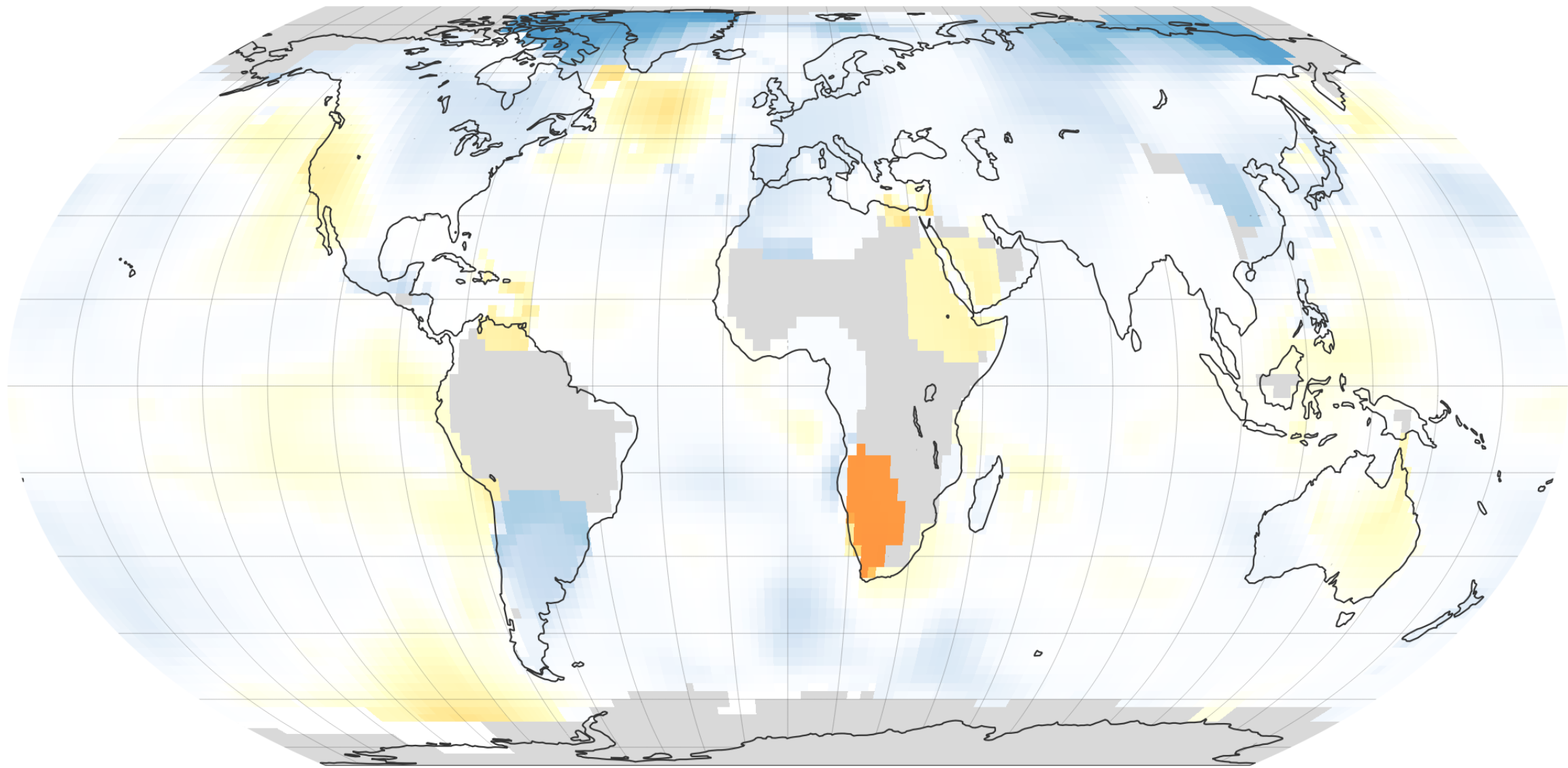
**99 dagen**



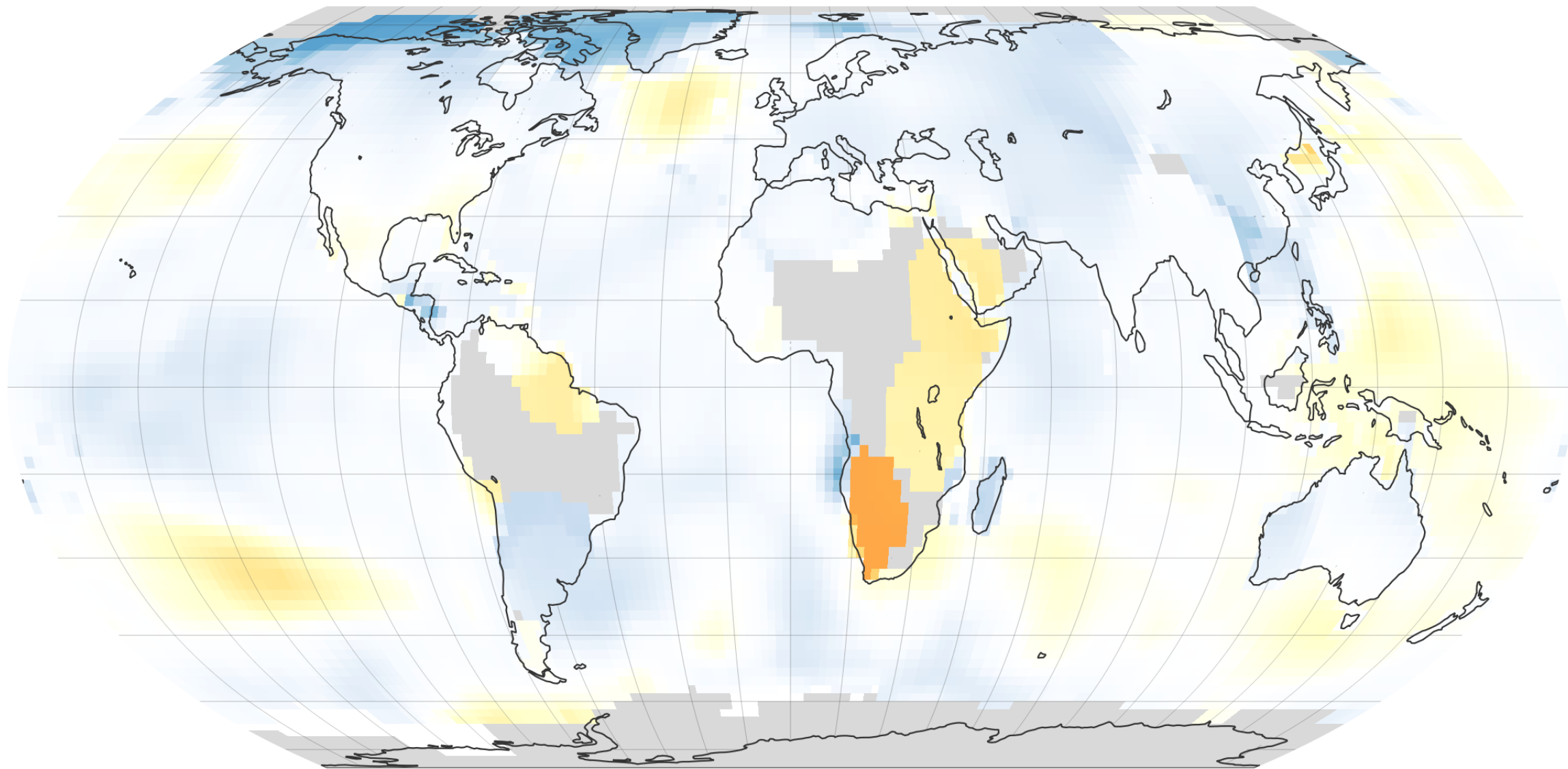




1880 - 1884

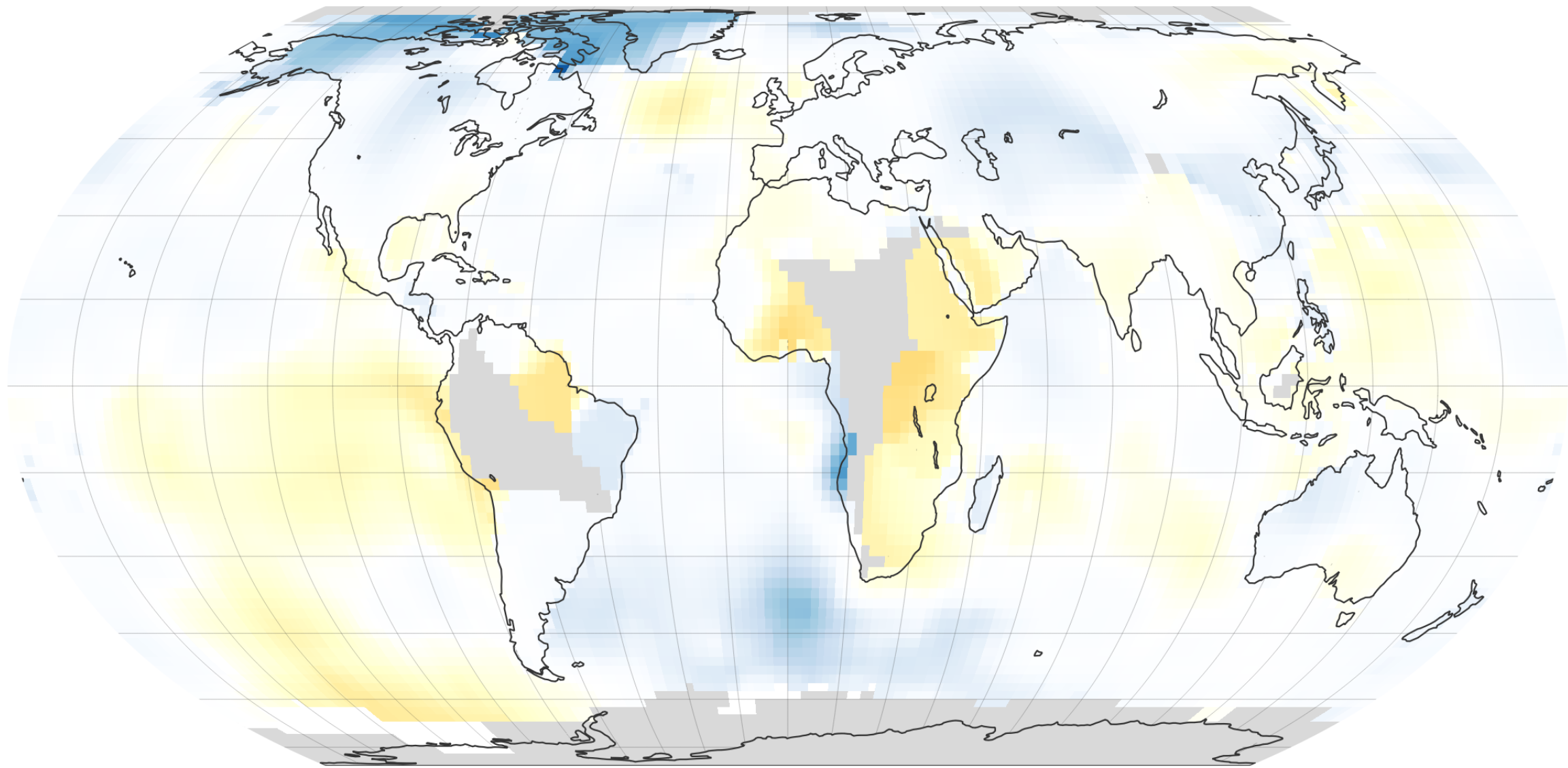


1885 - 1889

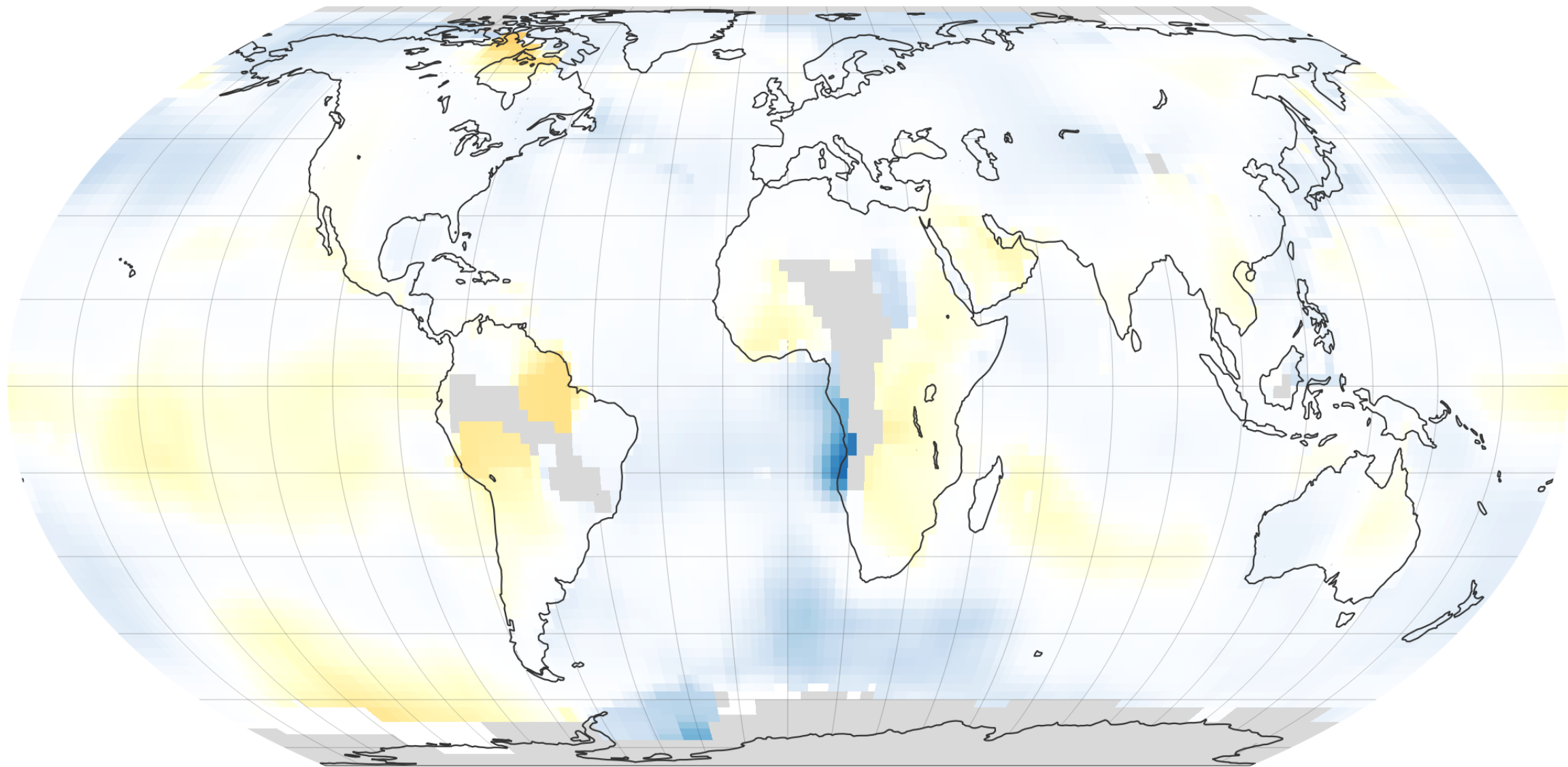


1890 - 1894

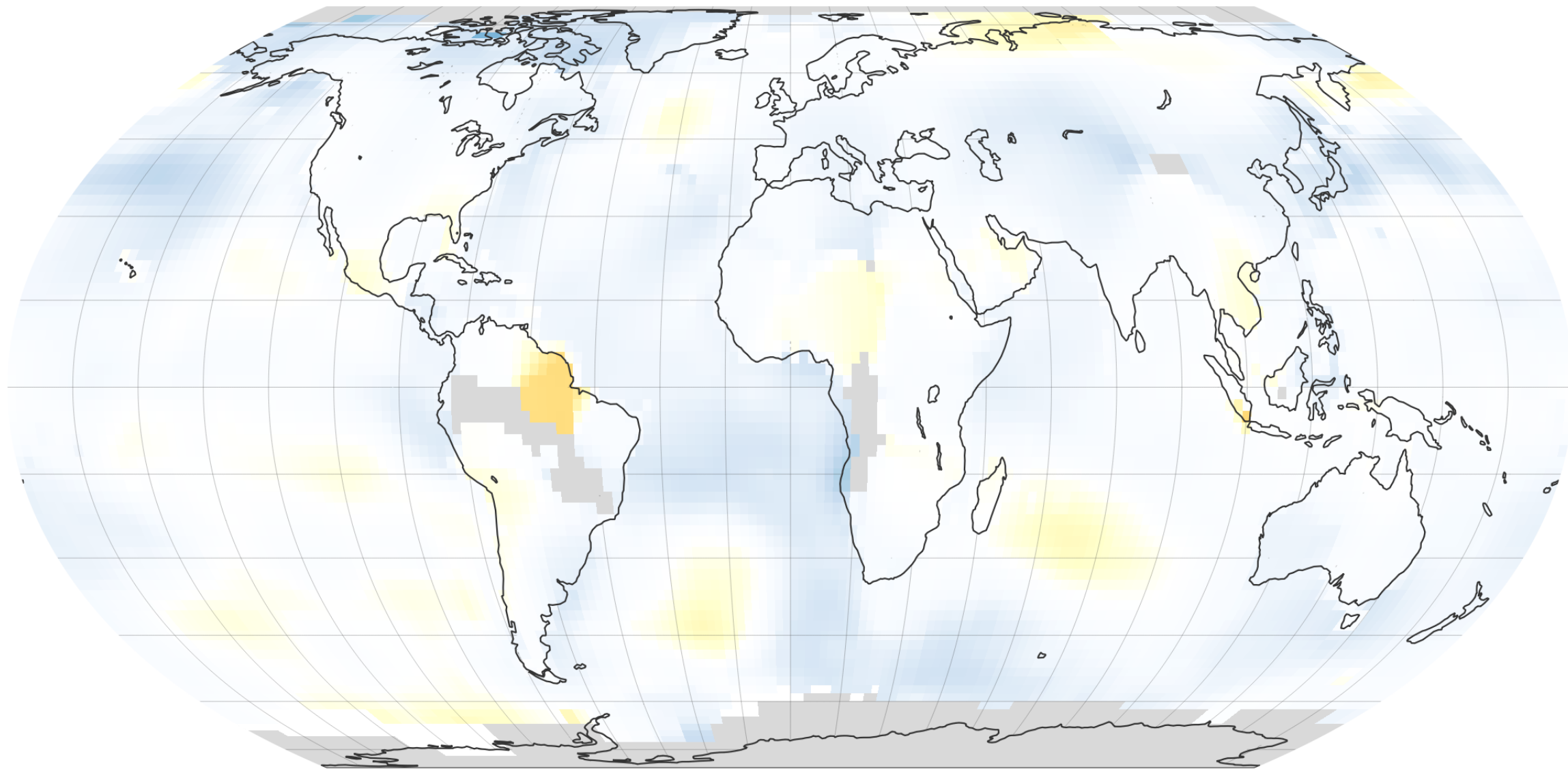




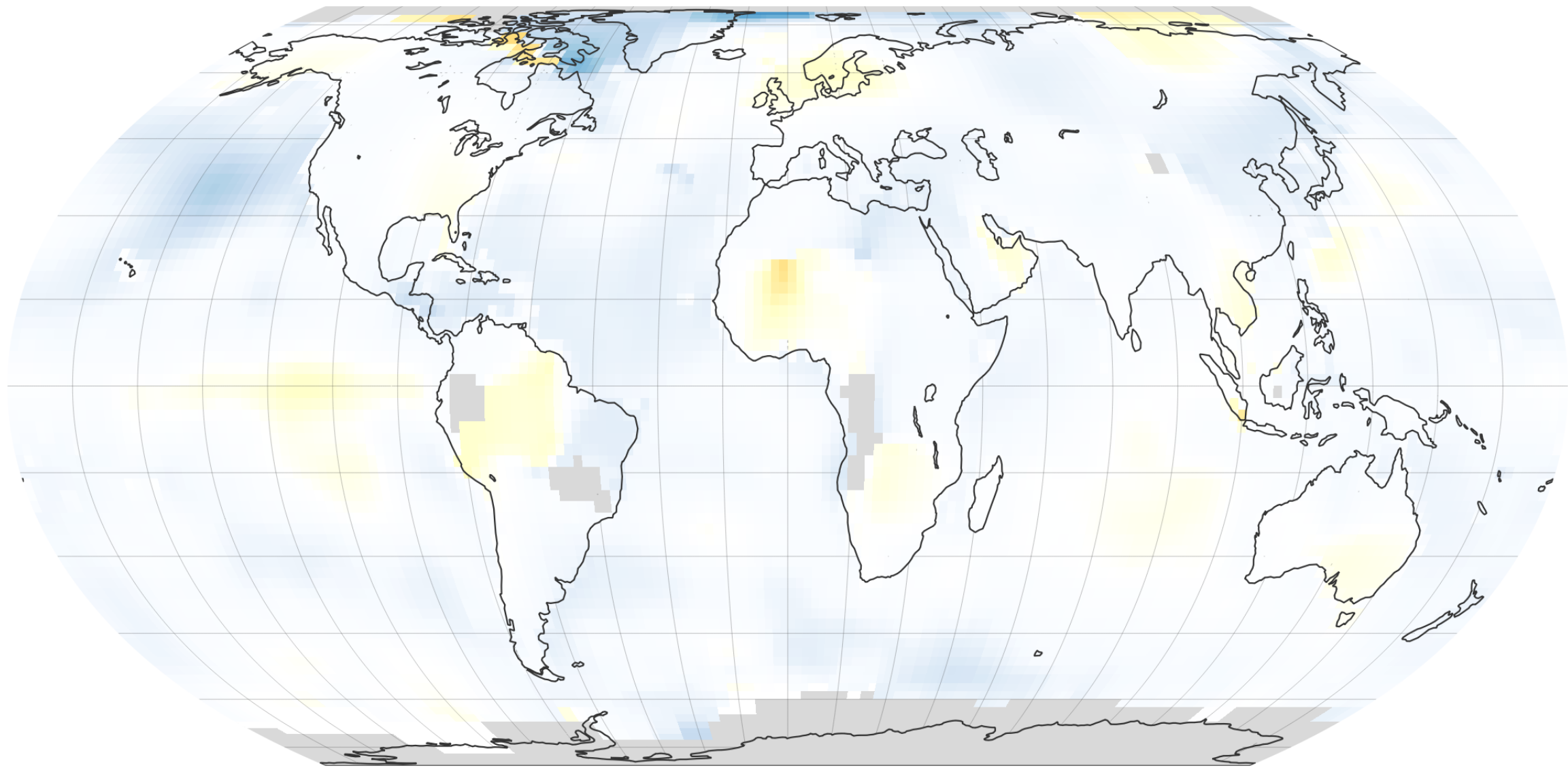
1895 - 1899



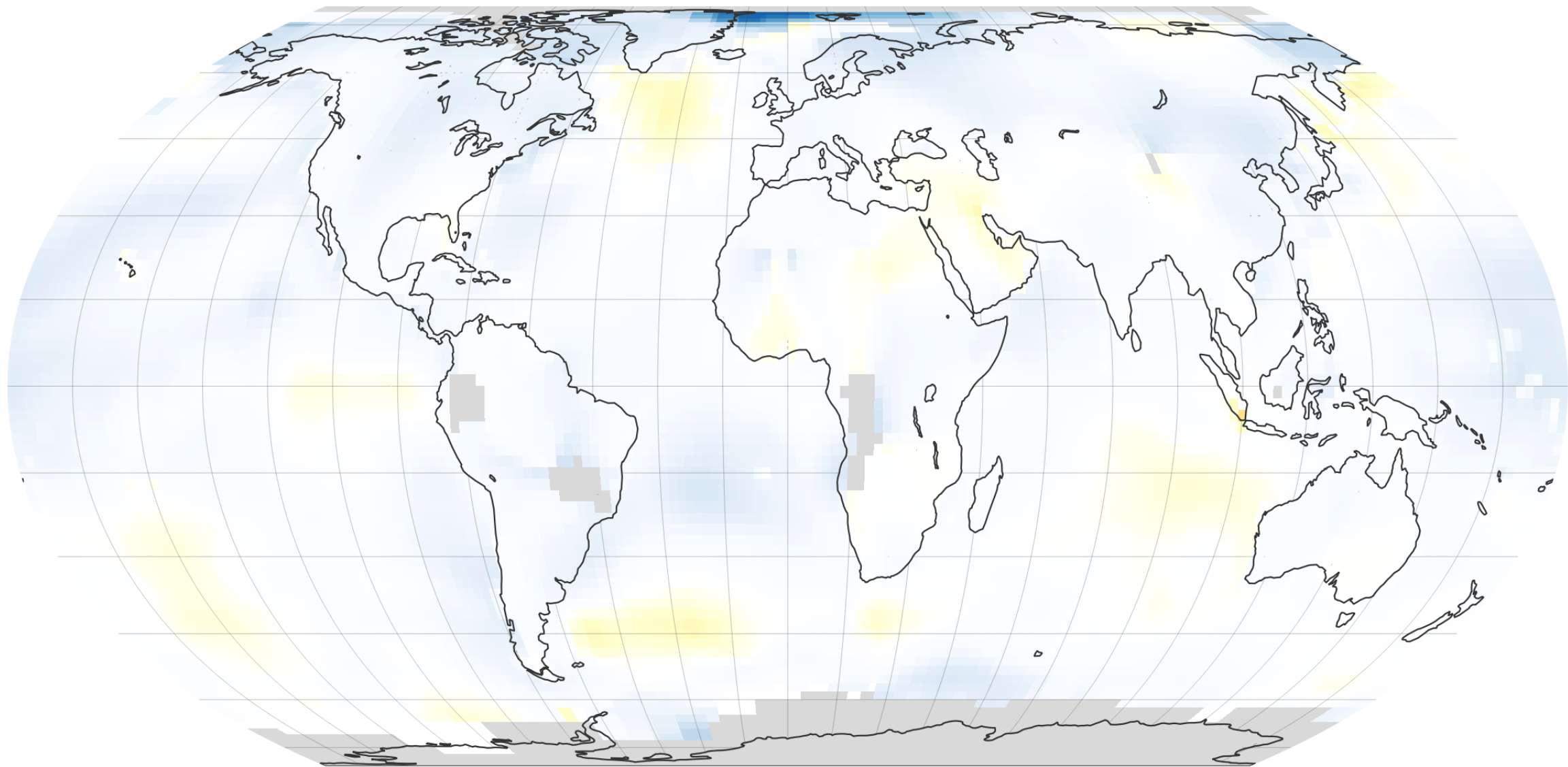
1900 - 1904



1905 - 1909

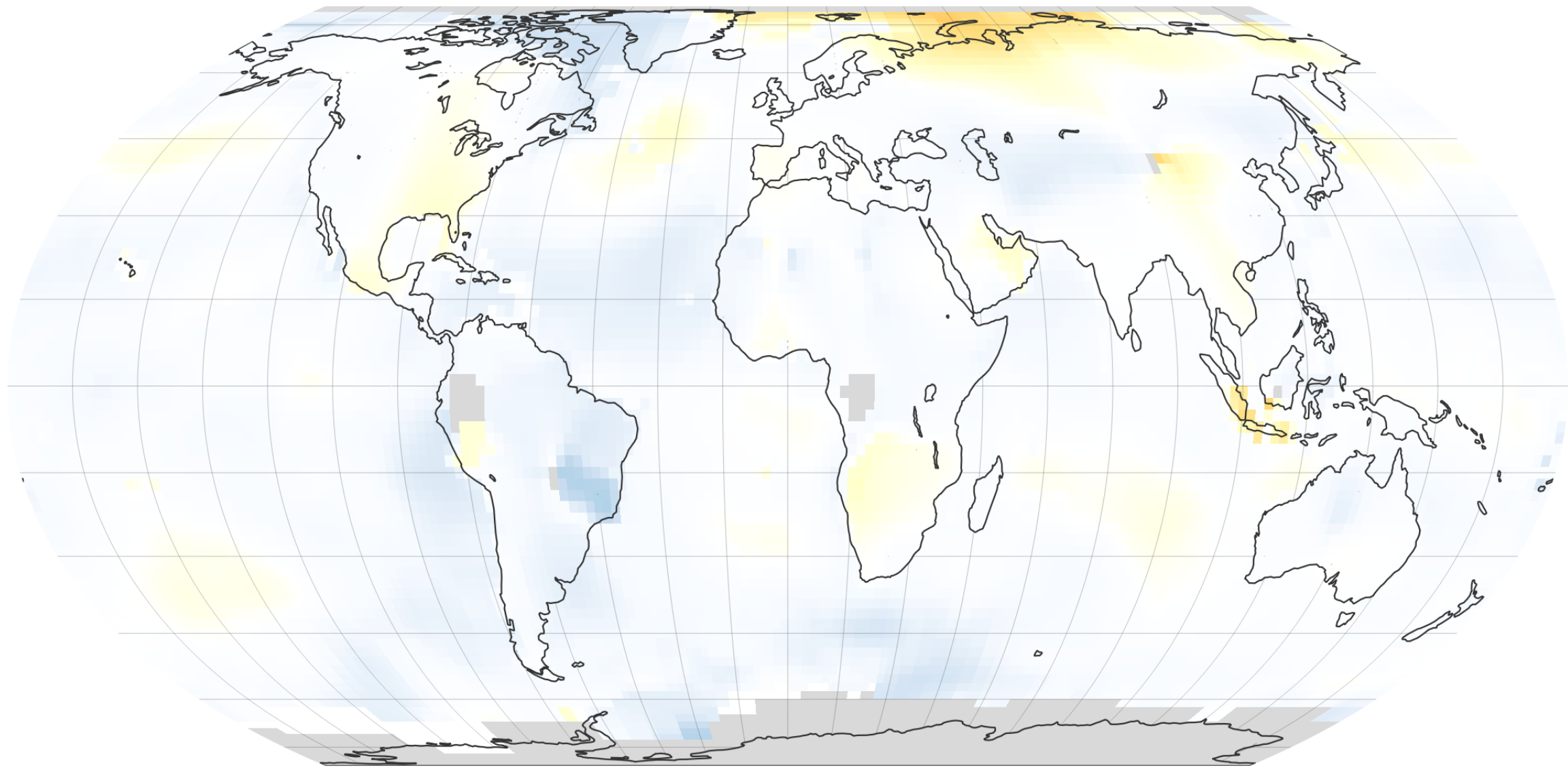


1910 - 1914



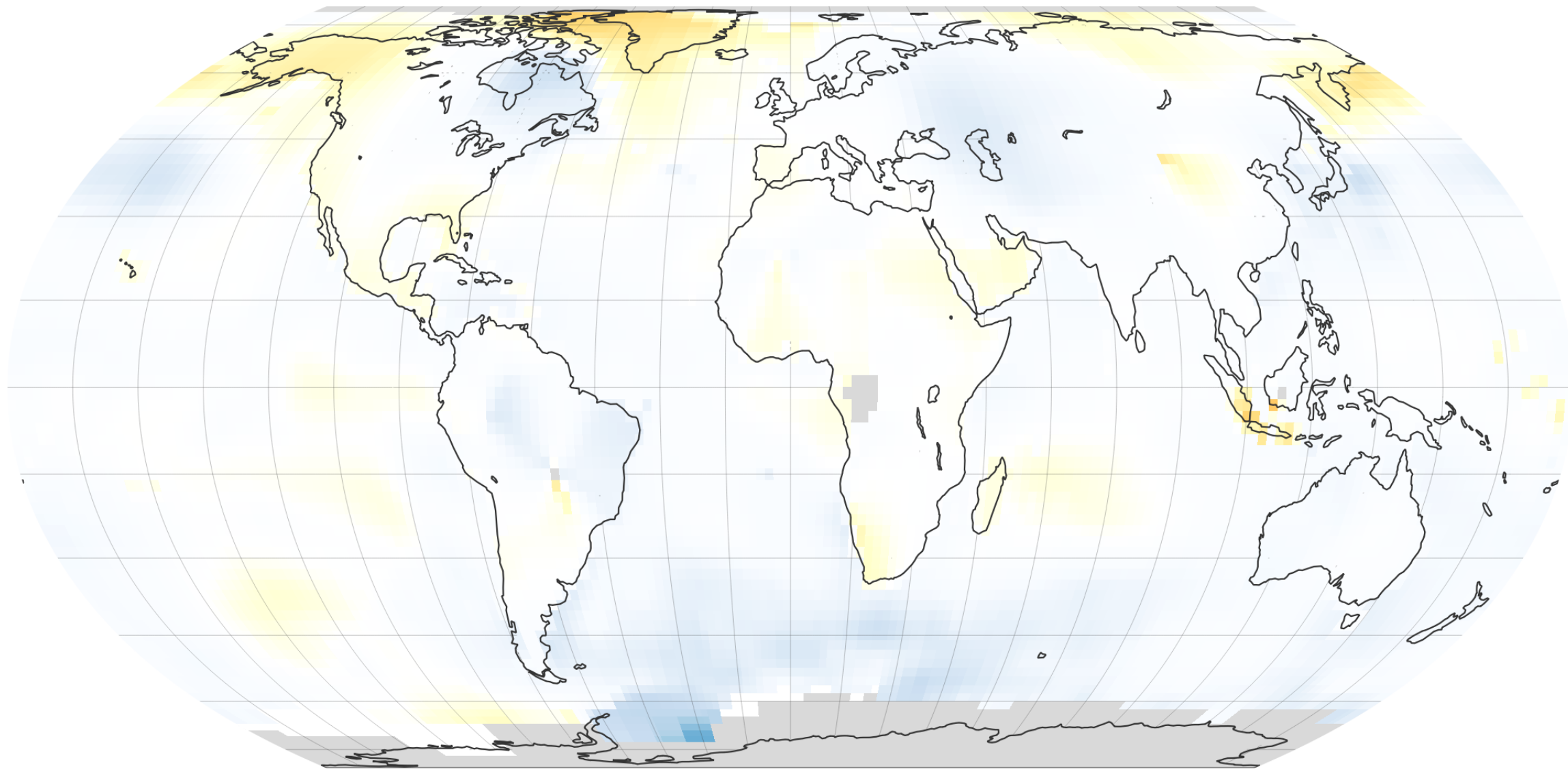
1915 - 1919



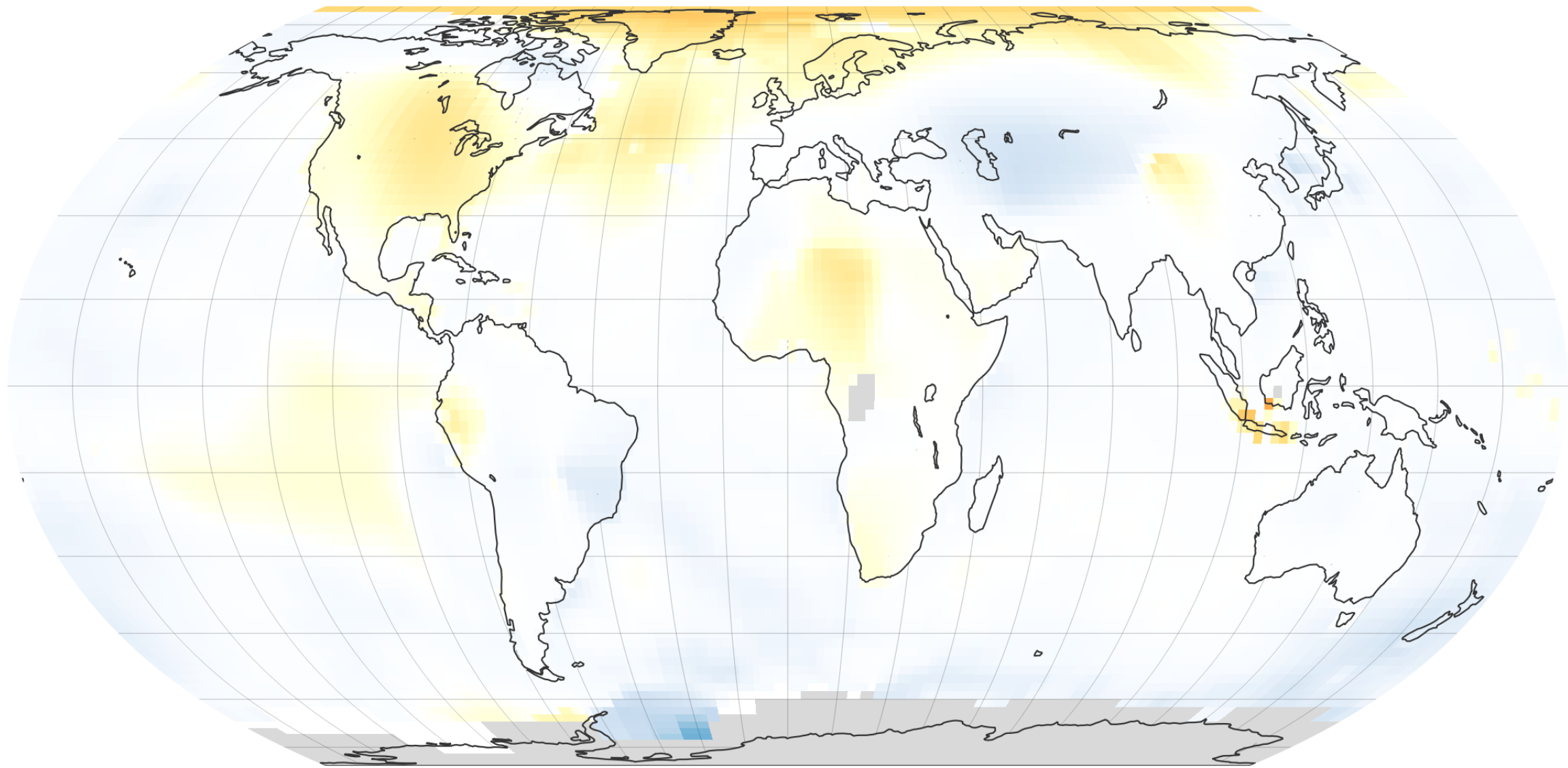


1920 - 1924

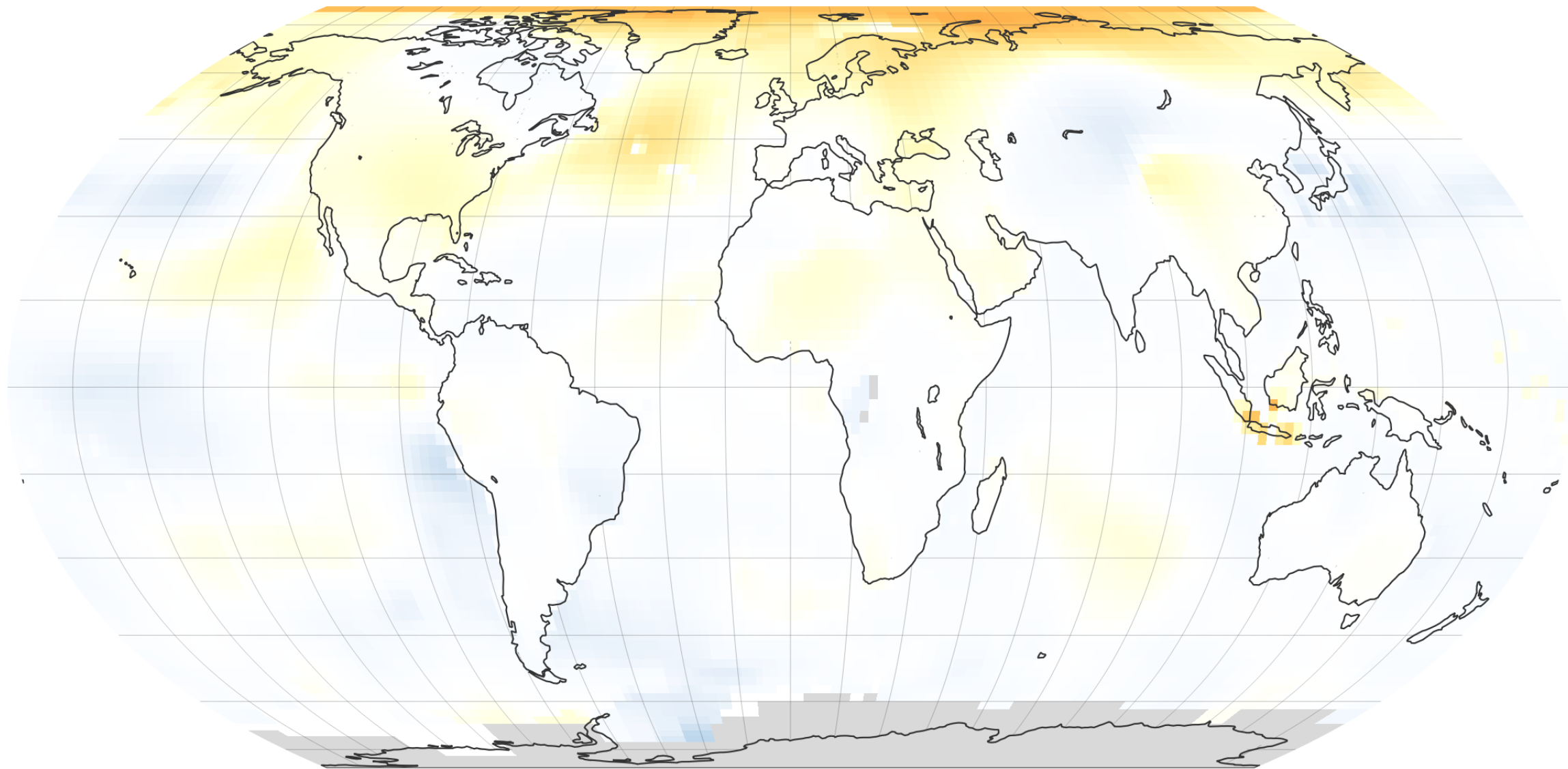




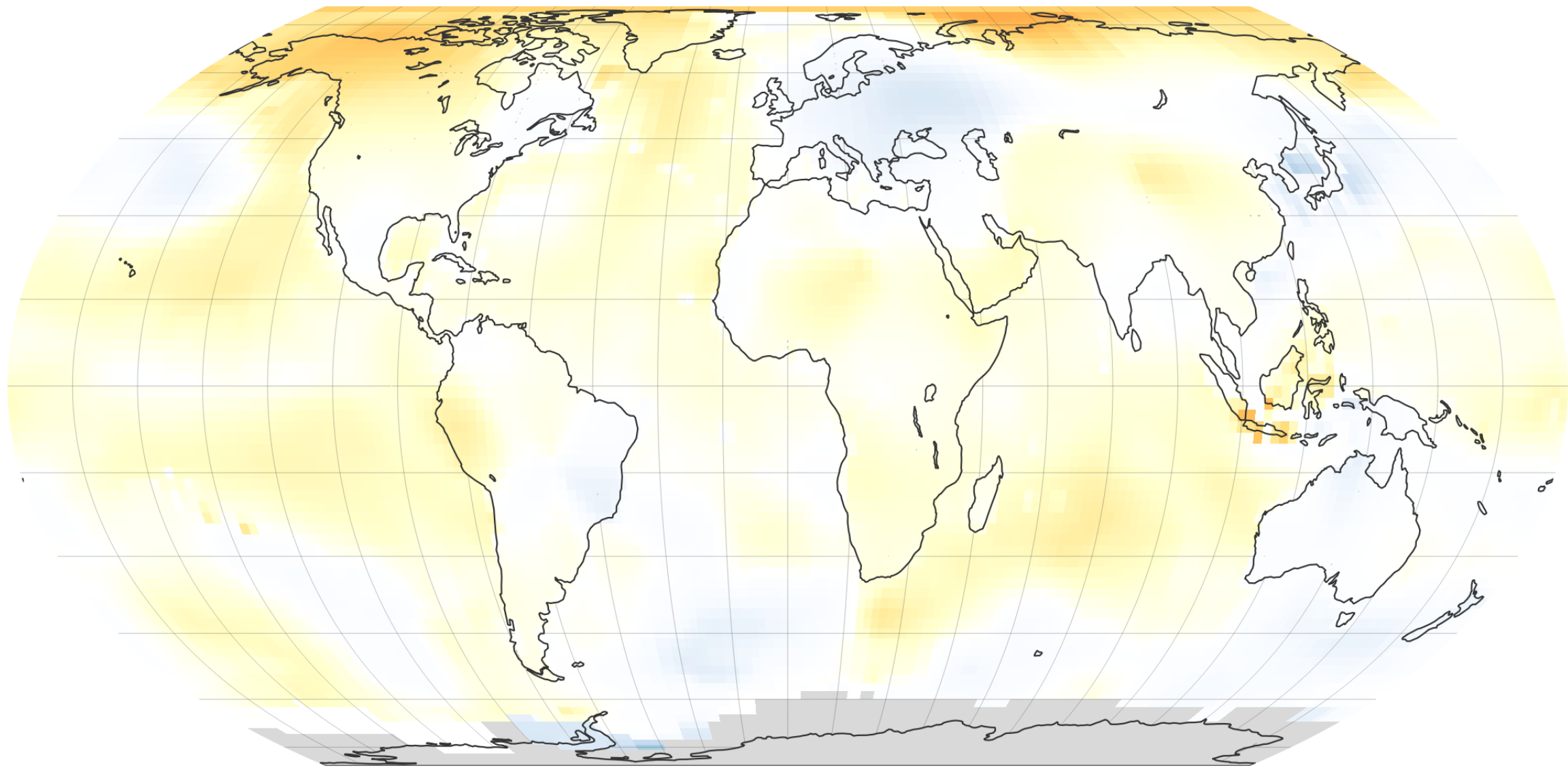
1925 - 1929



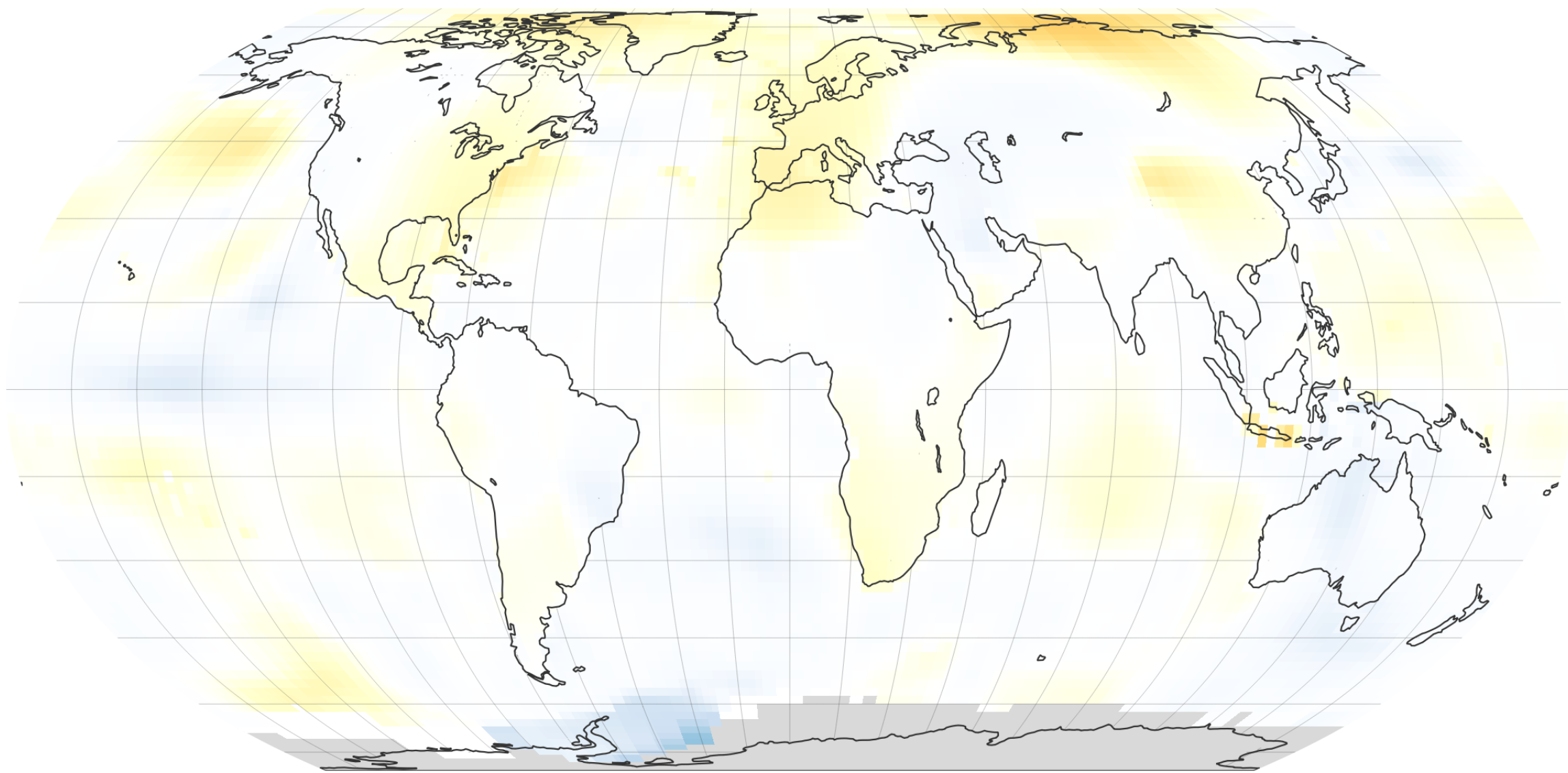
1930 - 1934



1935 - 1939

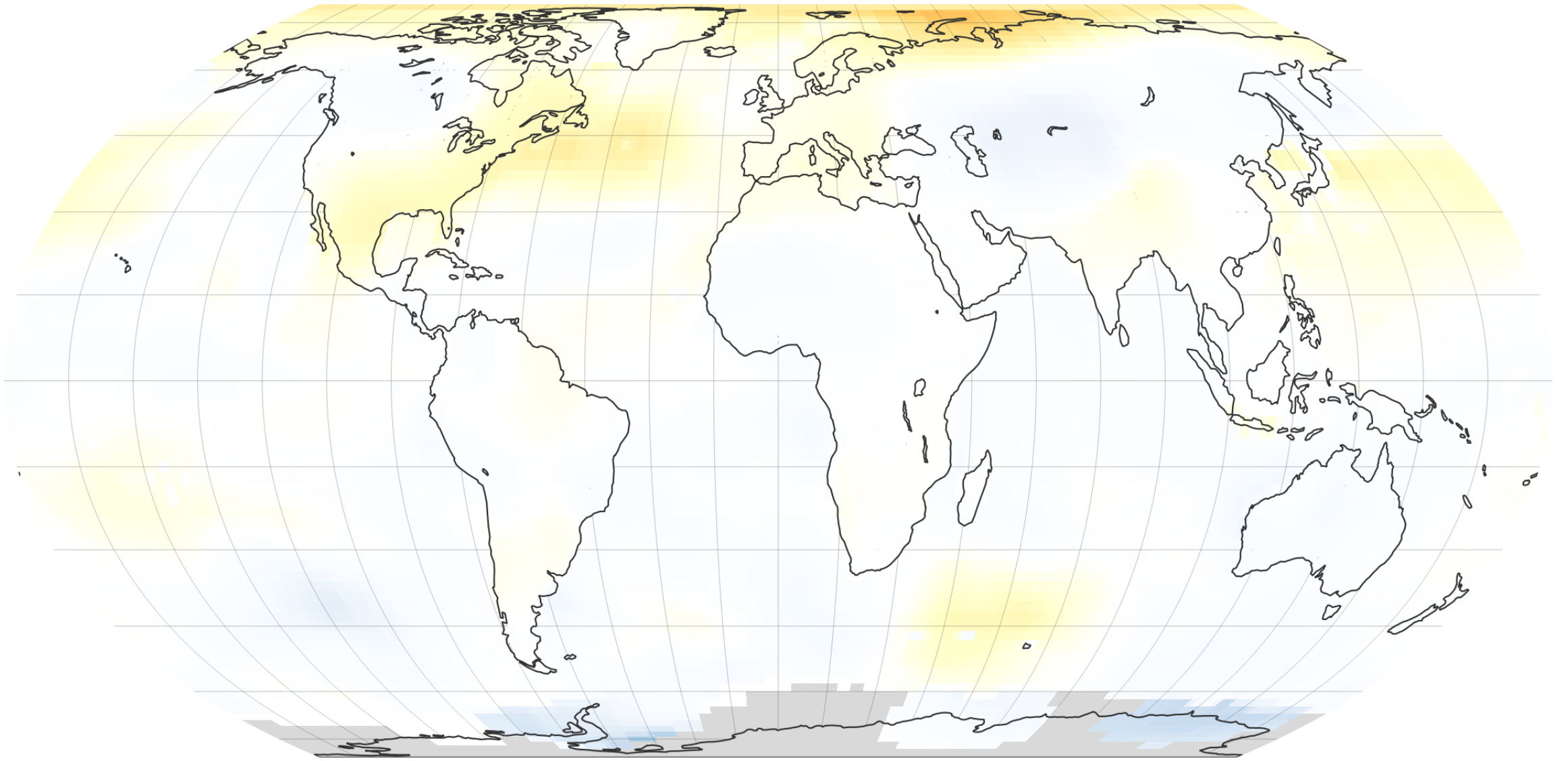


1940 - 1944



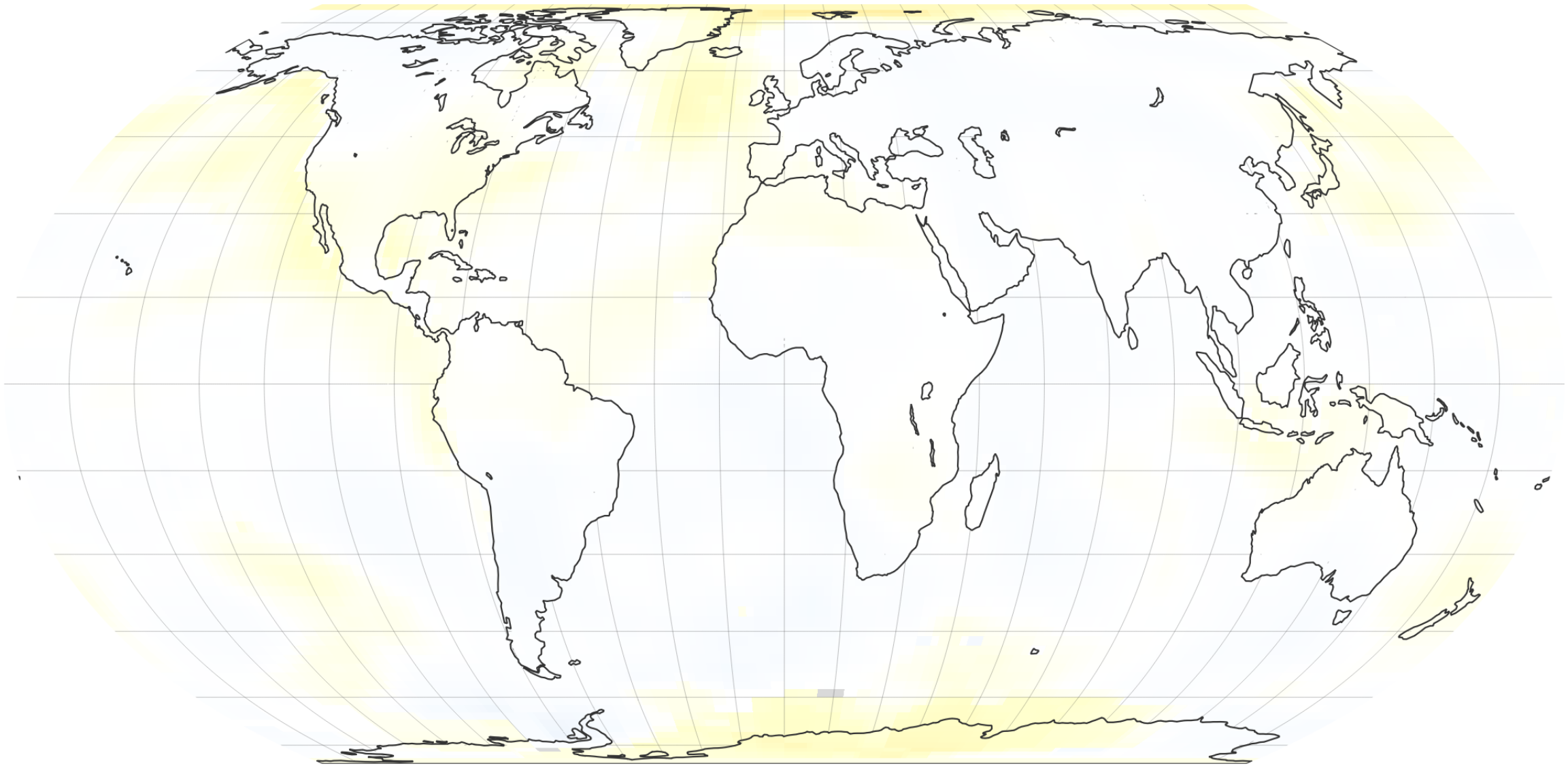
1945 - 1949



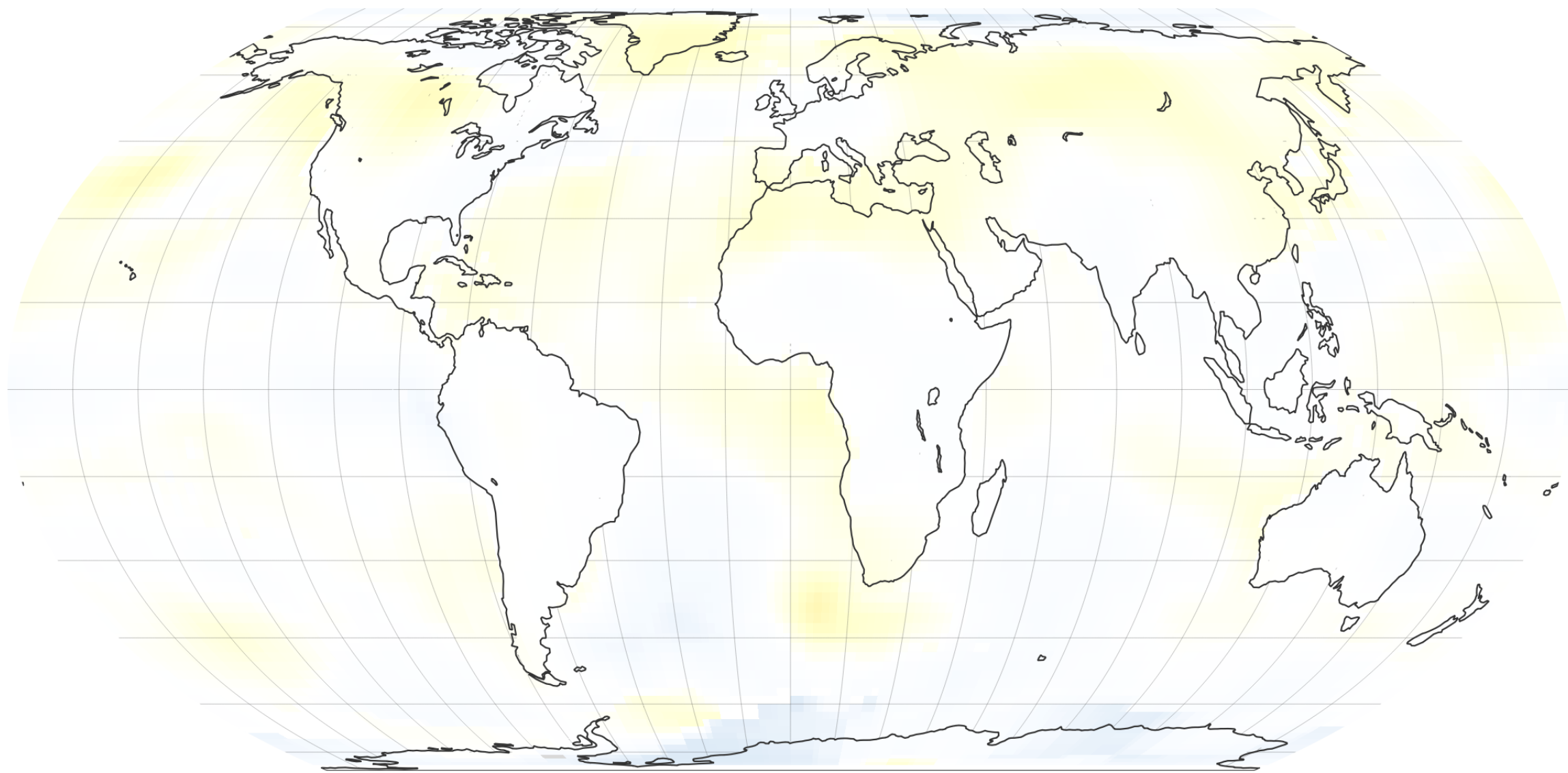


1950 - 1954

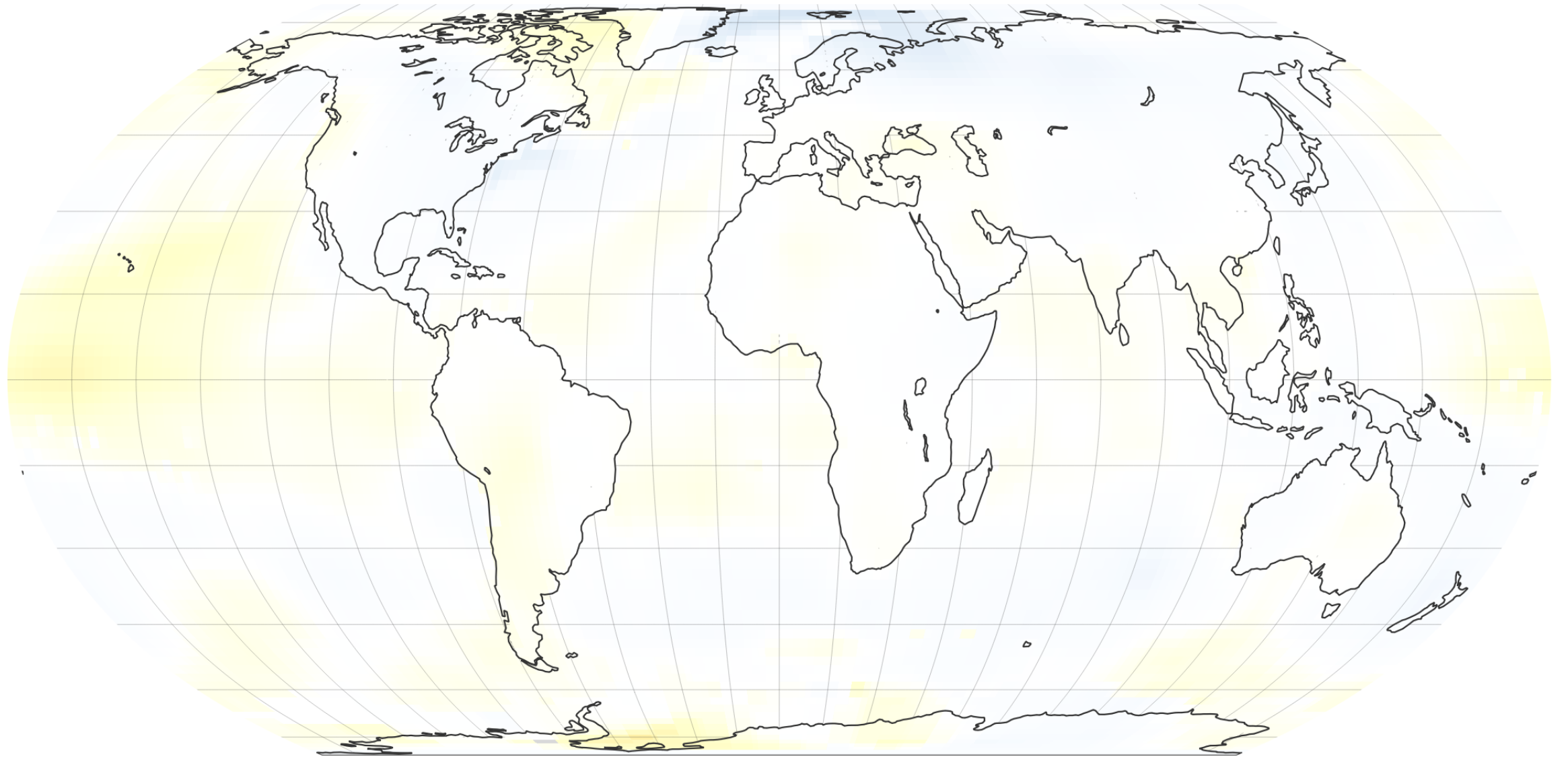




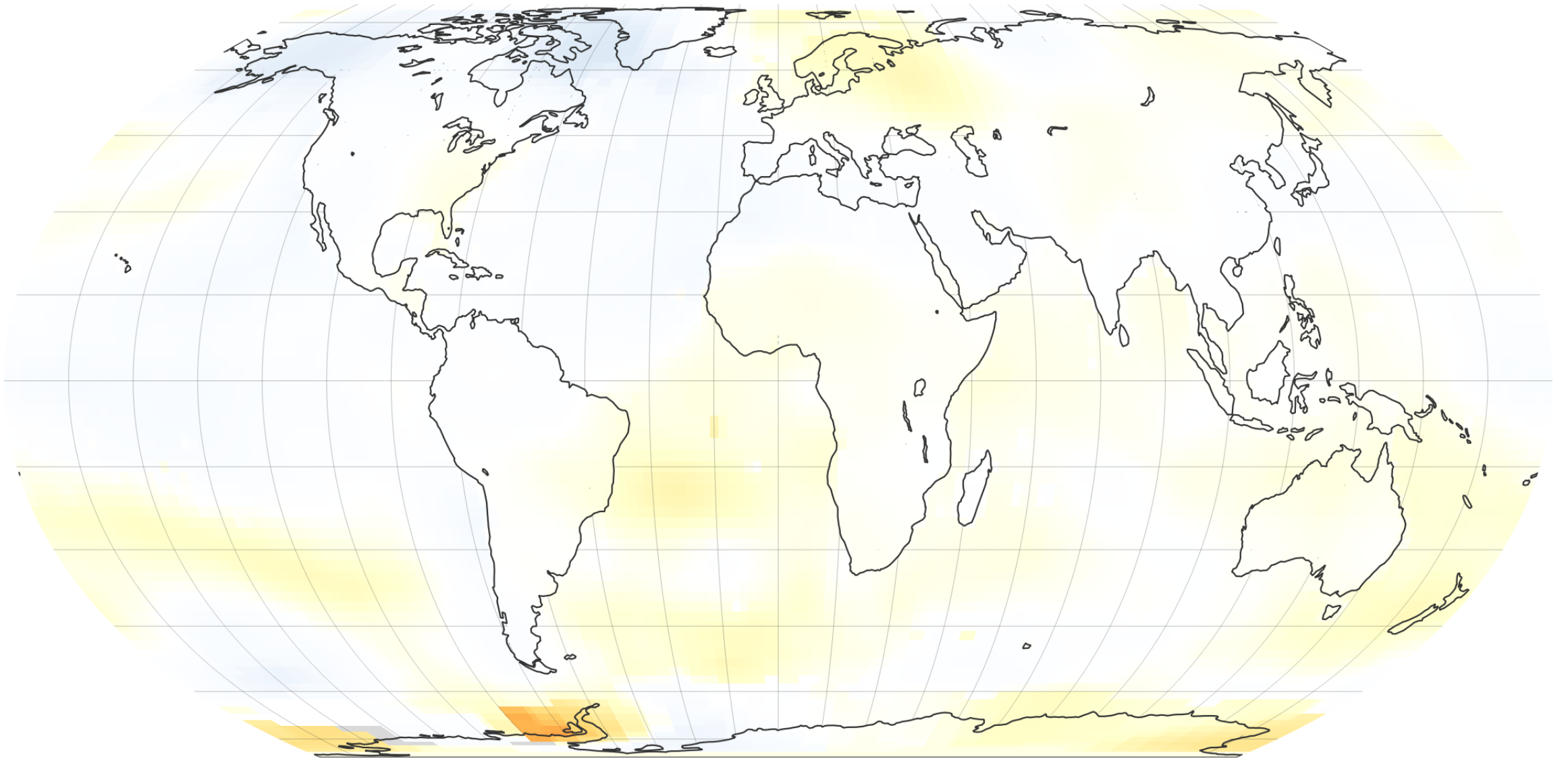
1955 - 1959



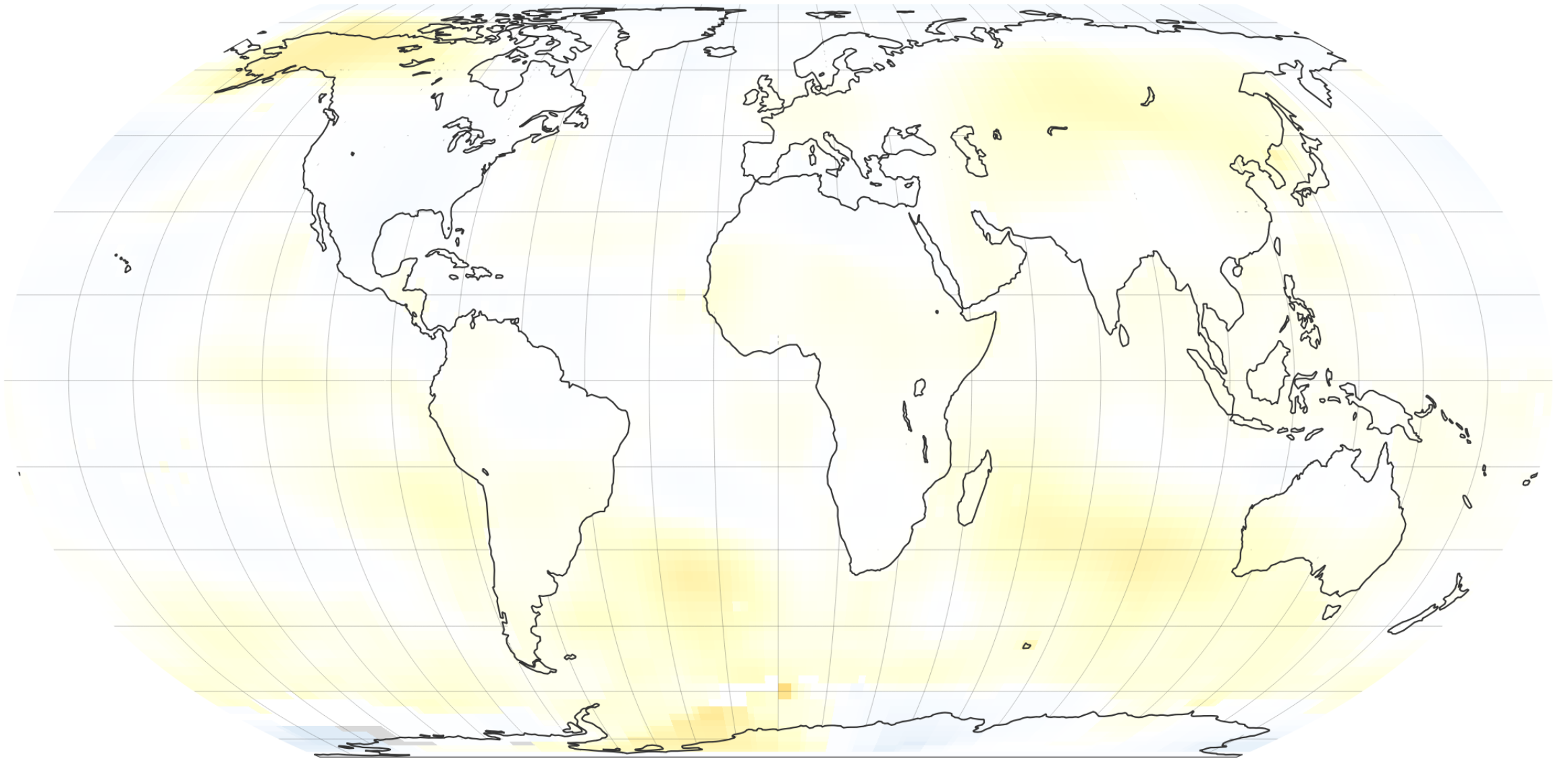
1960 - 1964



1965 - 1969

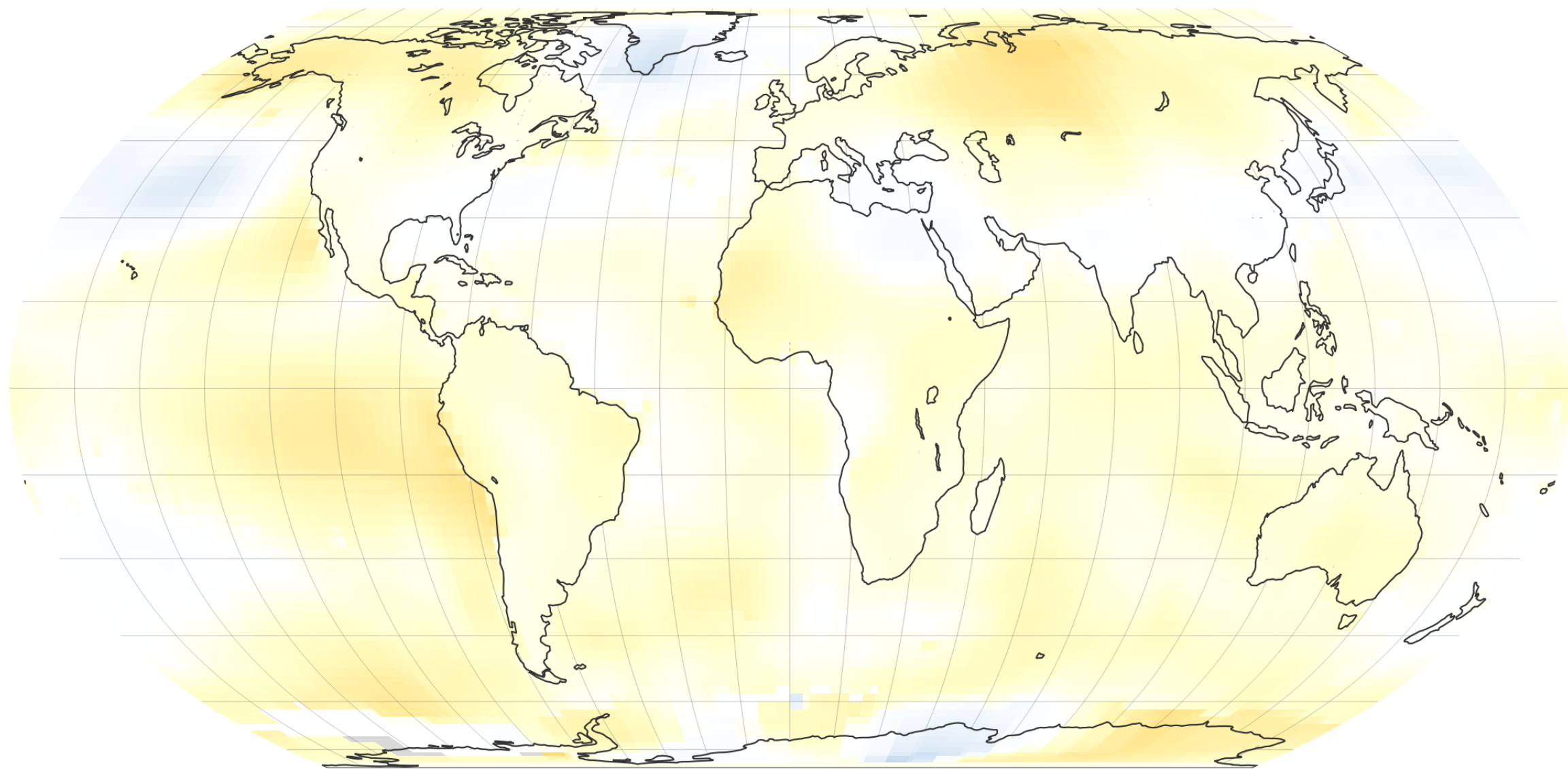


1970 - 1974

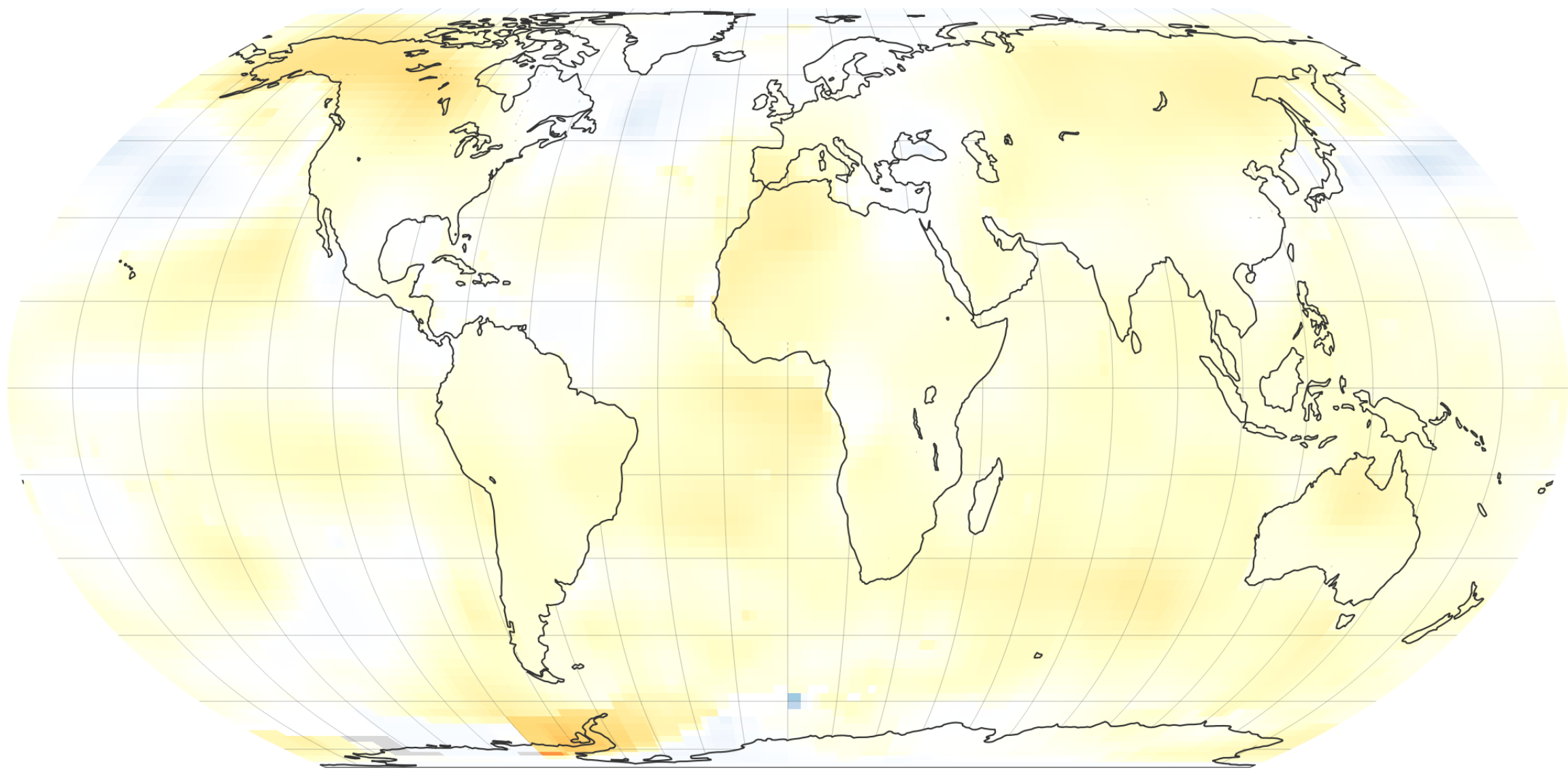


1975 - 1979



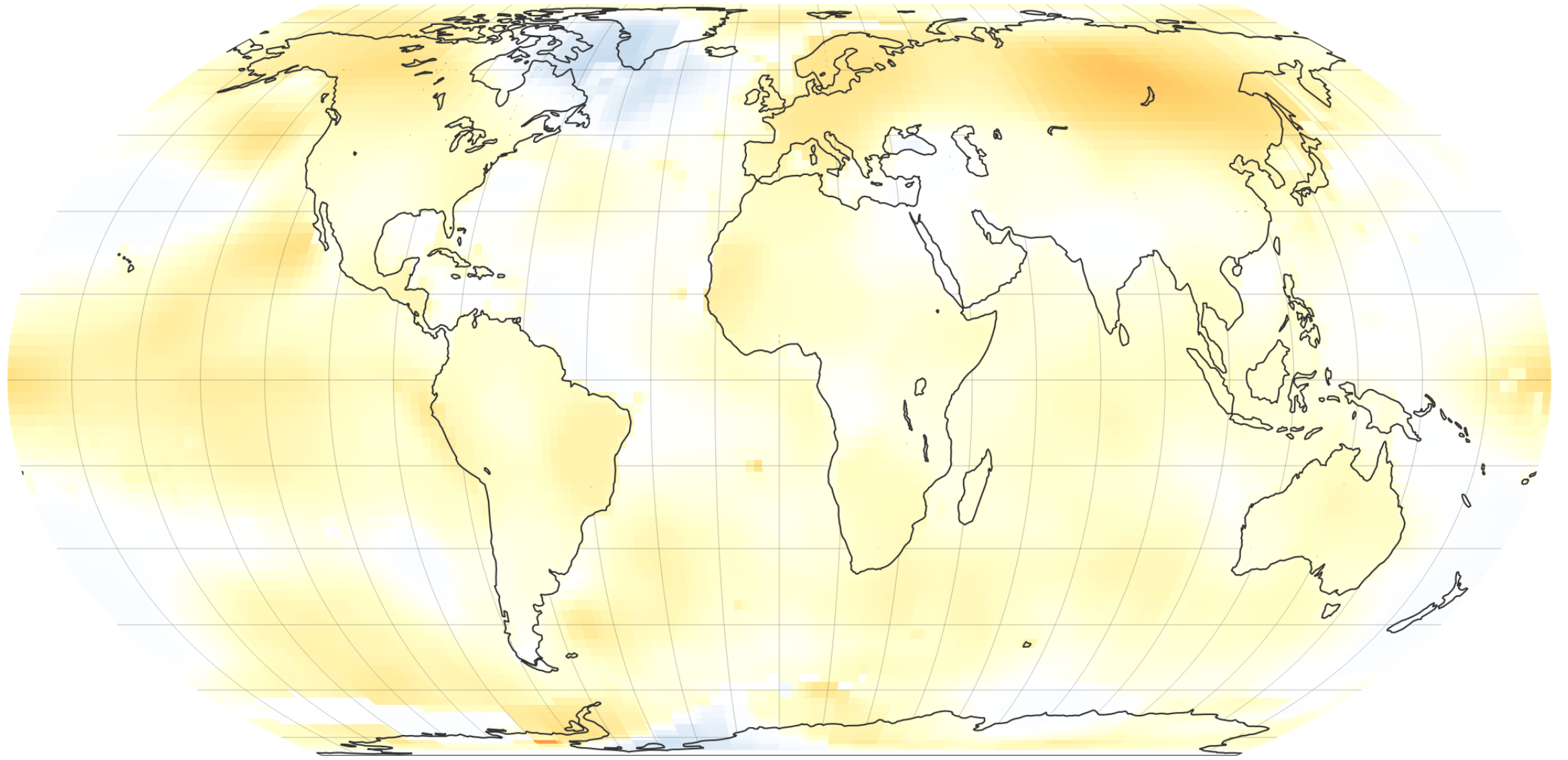


1980 - 1984

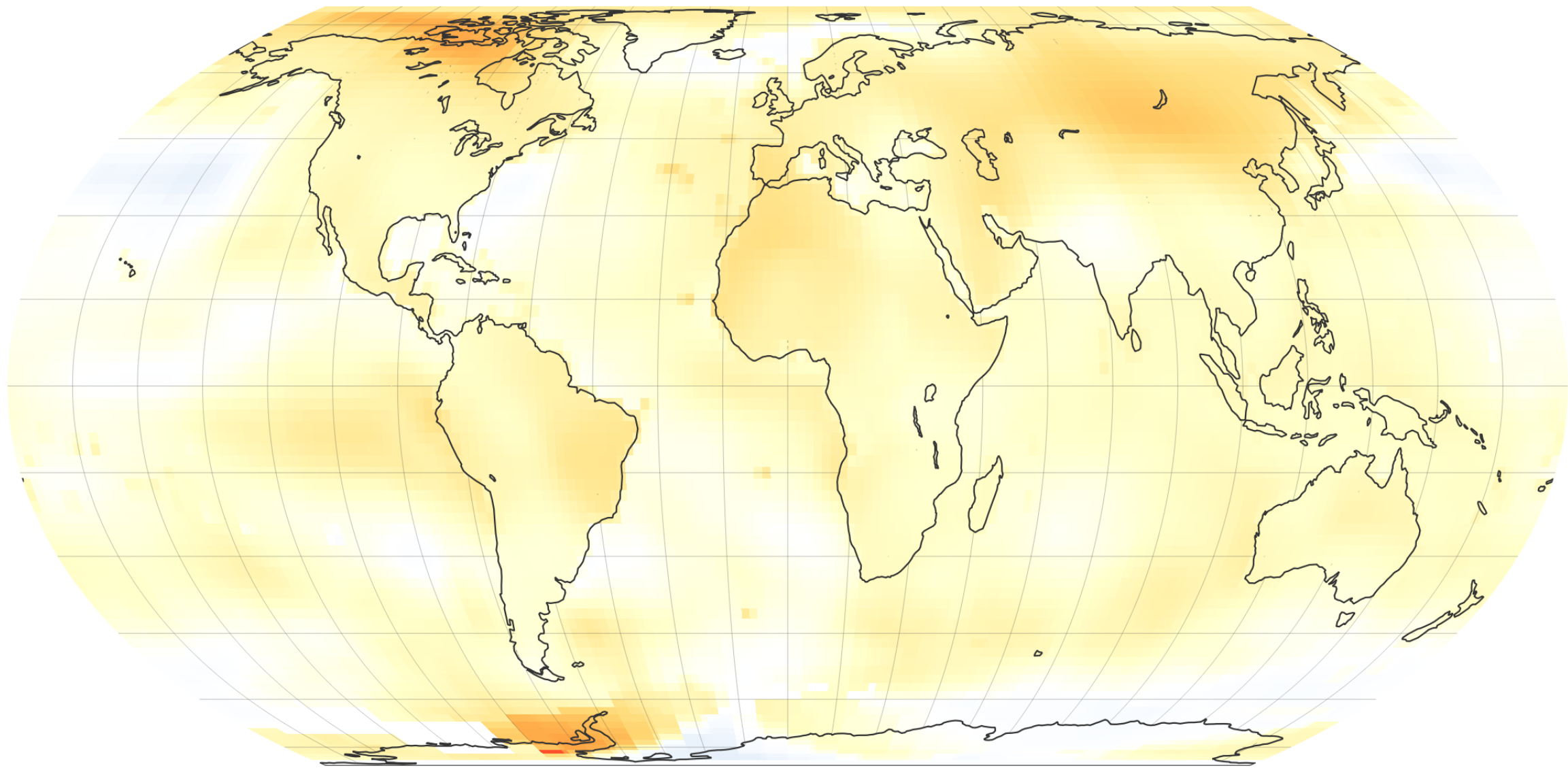


1985 - 1989

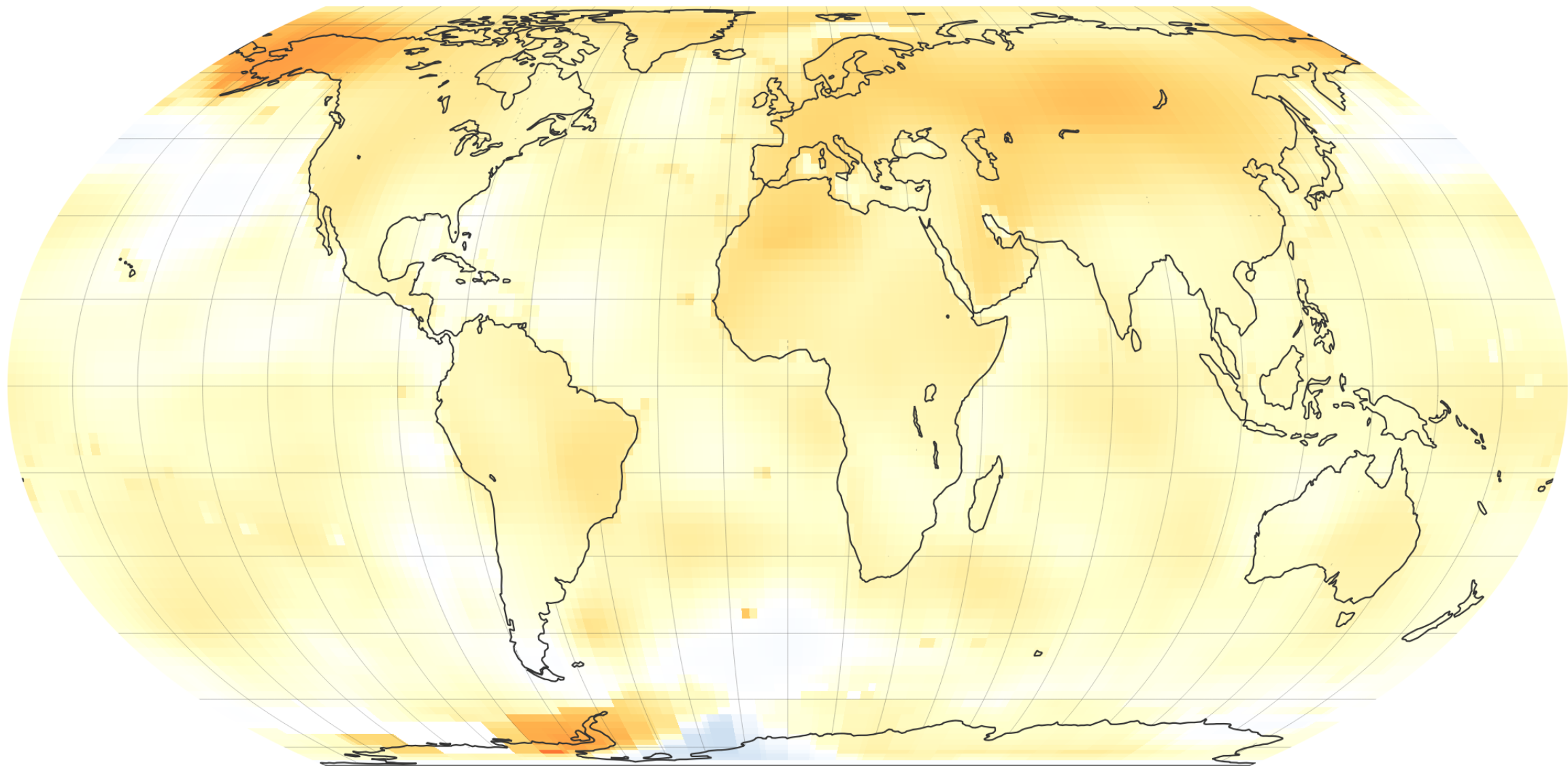




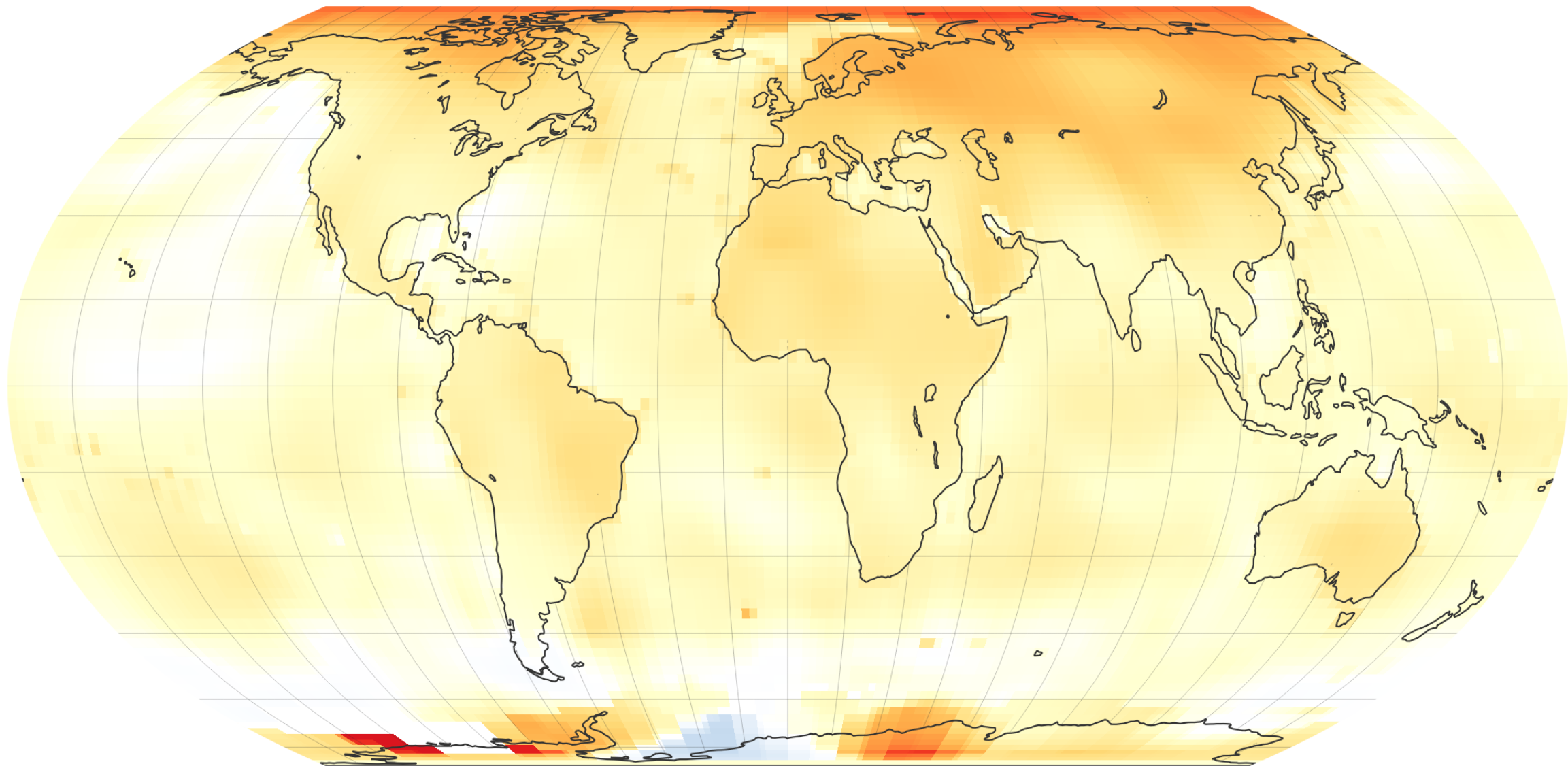
1990 - 1994



1995 - 1999

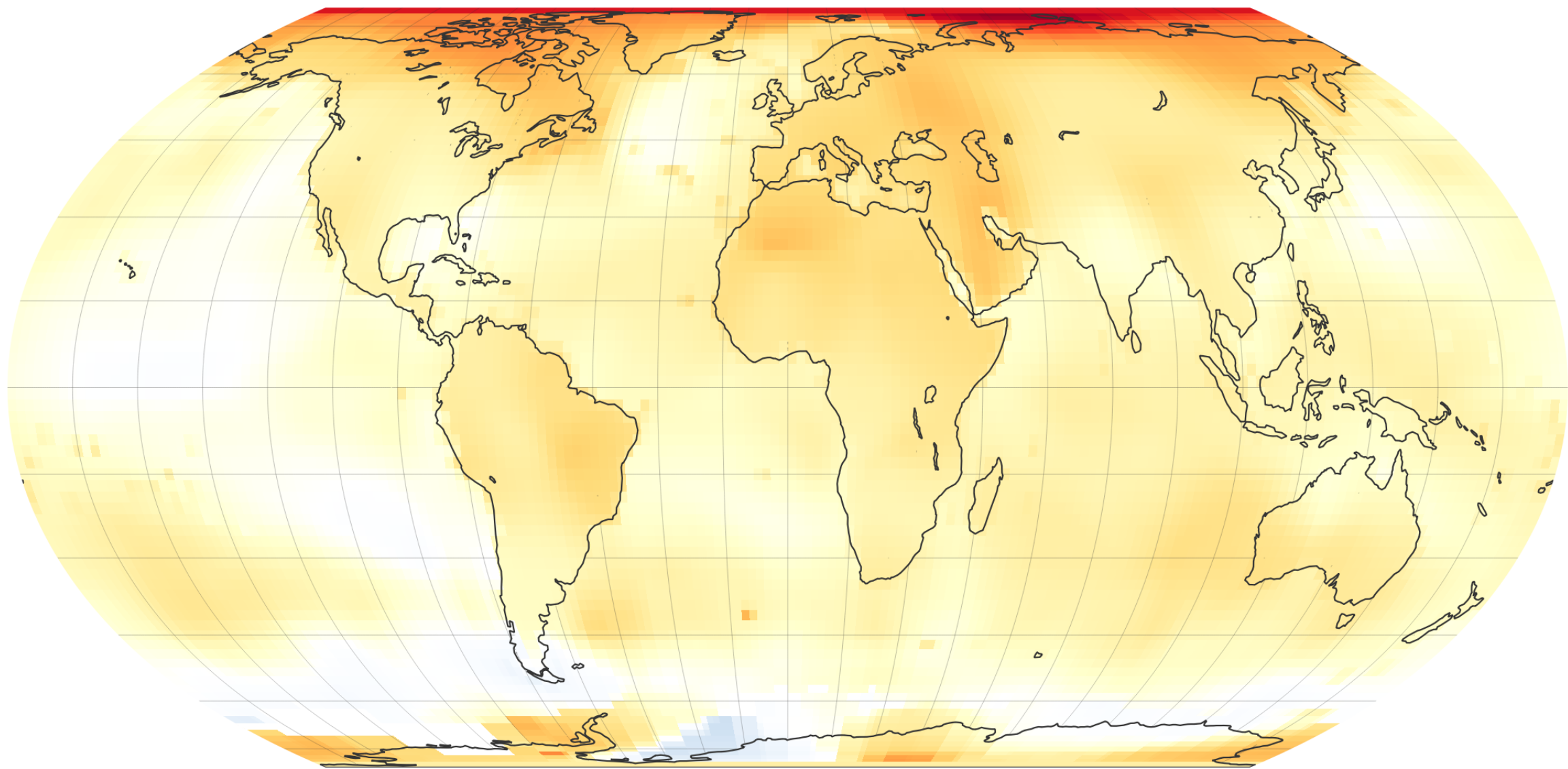


2000 - 2004

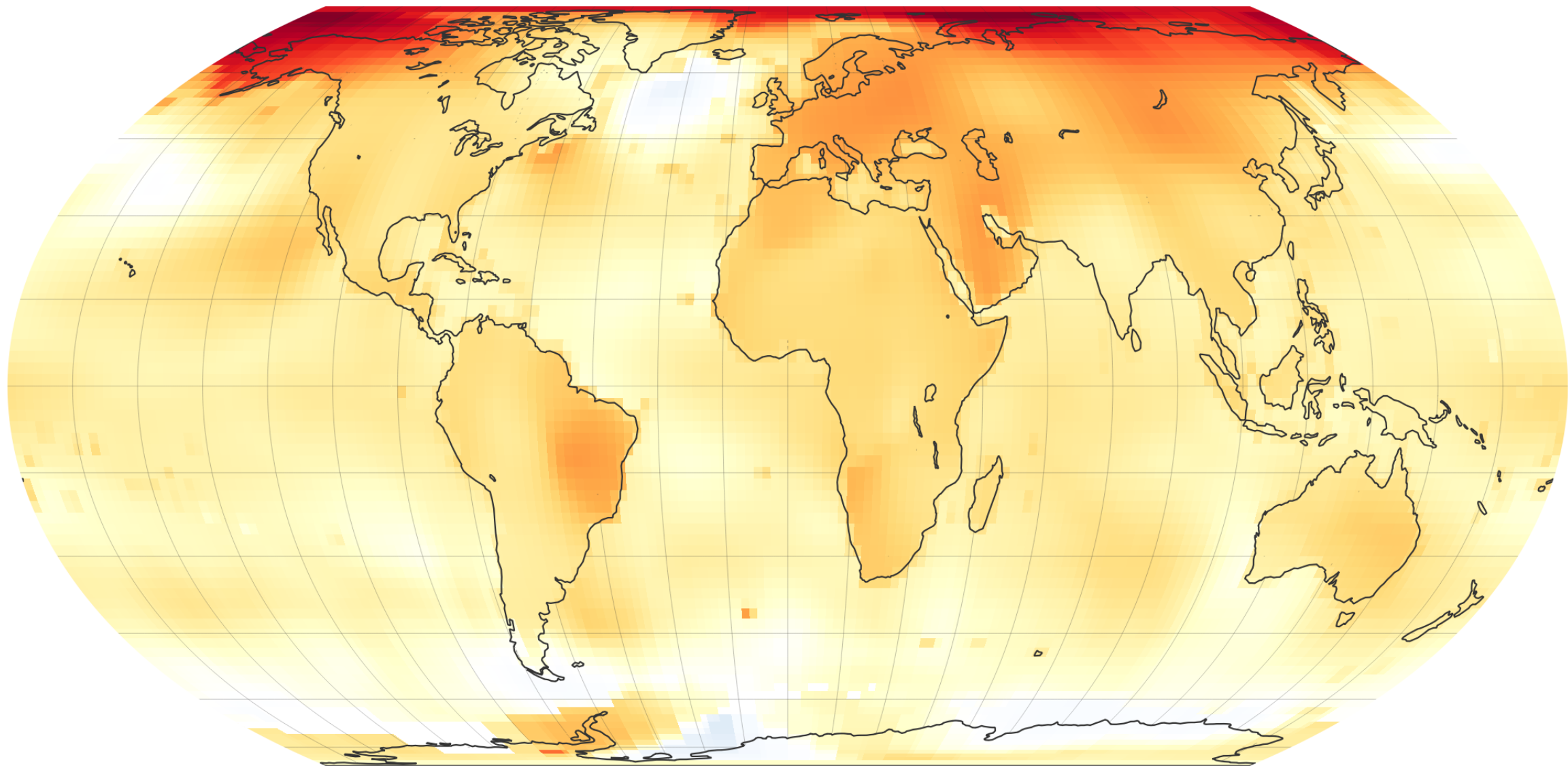


2005 - 2009





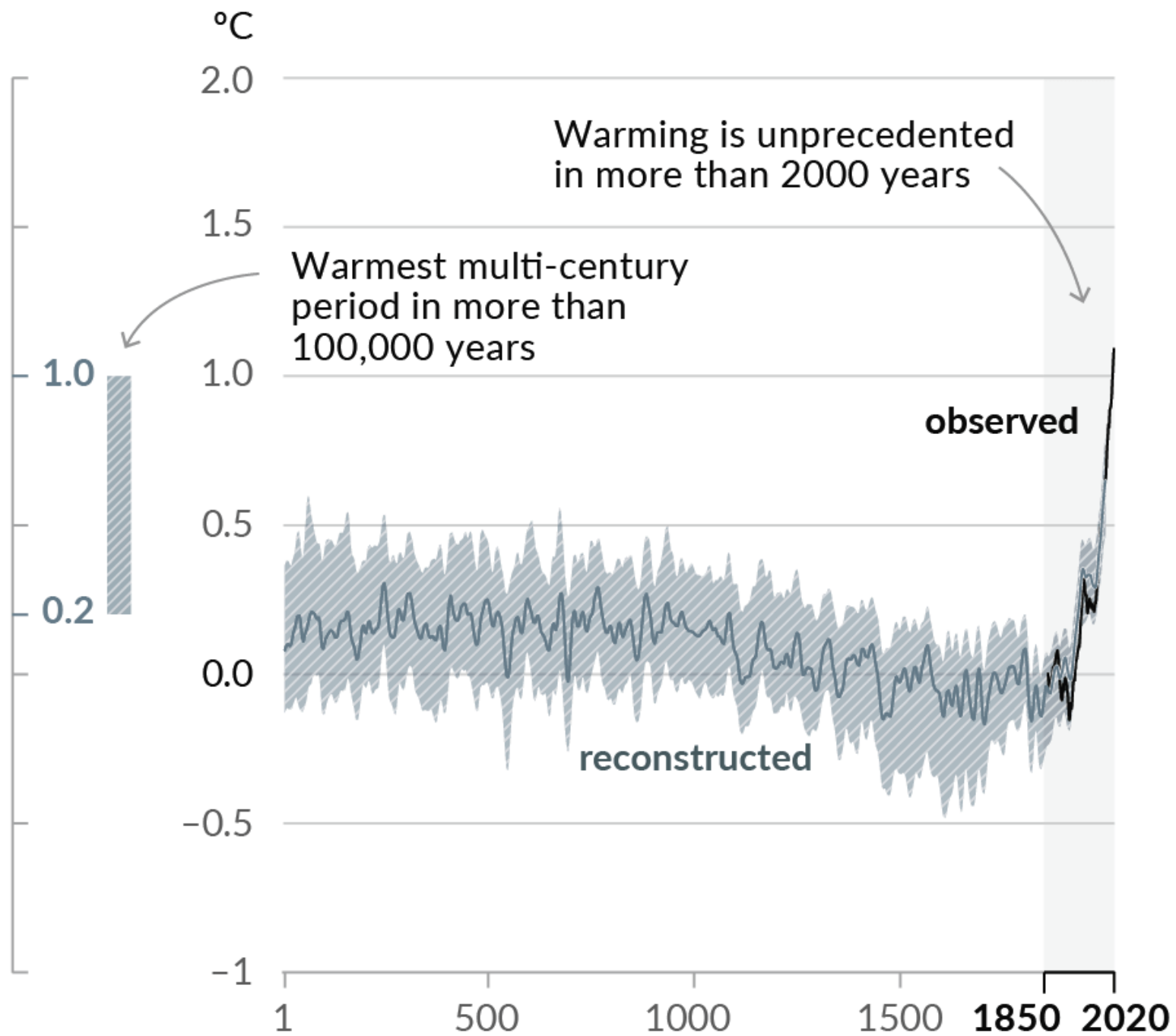
2010 - 2014



2015 - 2019





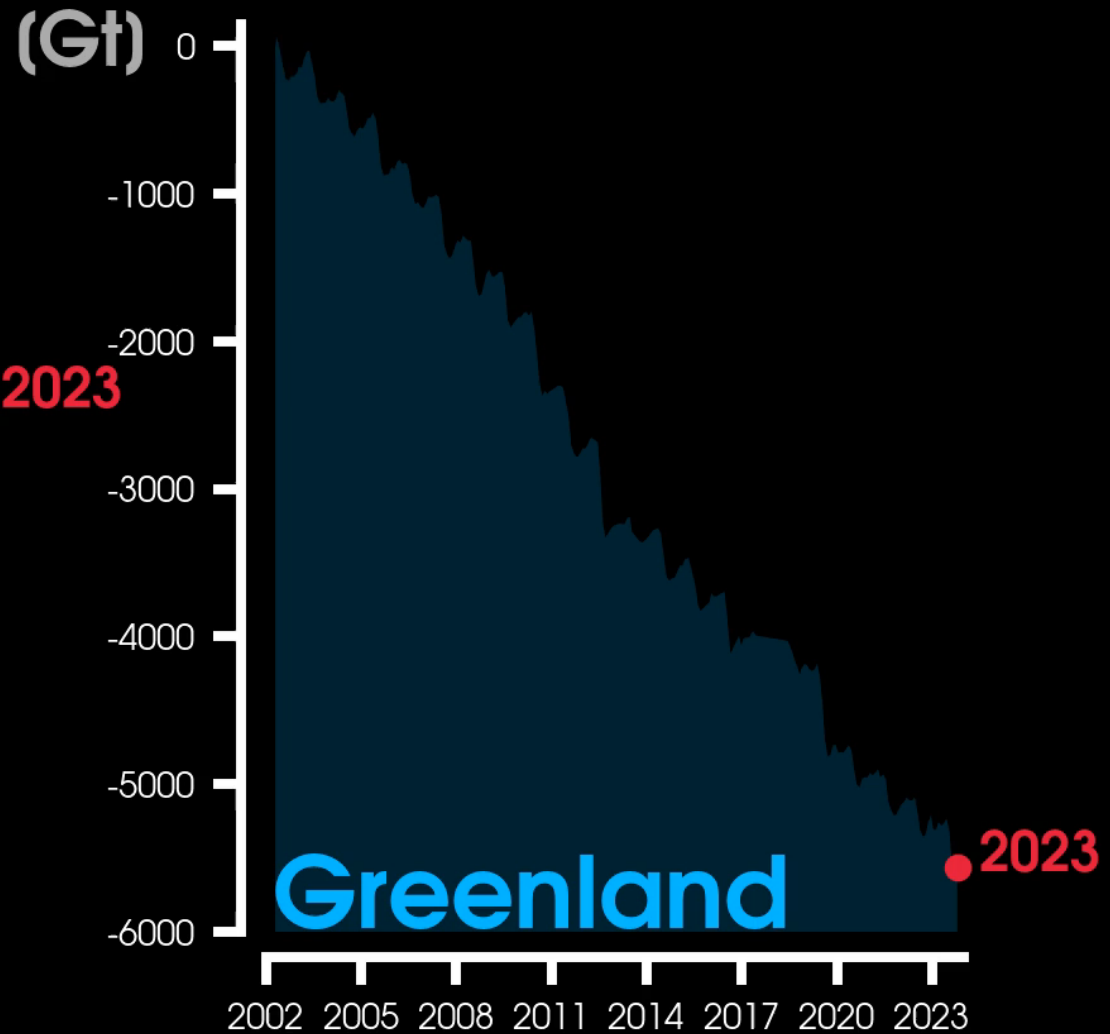
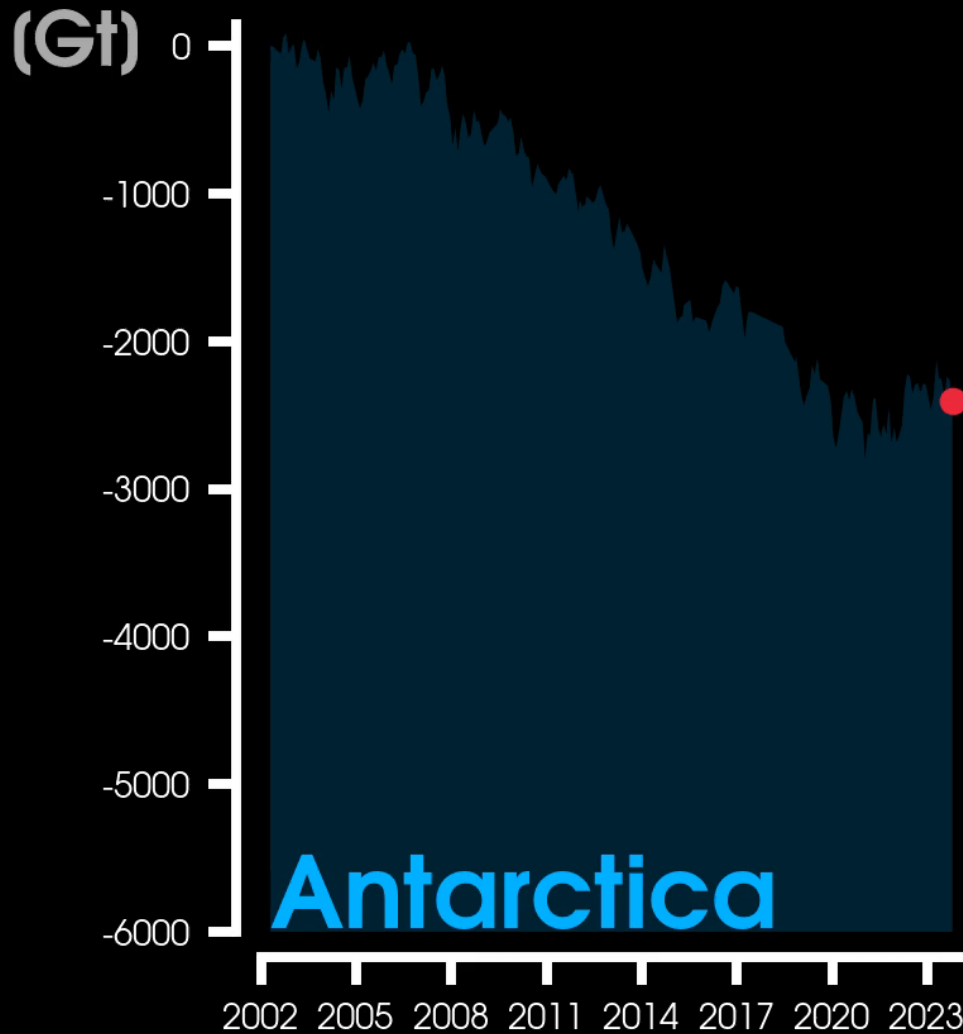




Source: <http://psc.apl.washington.edu/wordpress/research/projects/arctic-sea-ice-volume-analysis/>  
Created by: Andy Lee Robinson Oct 2021 YT: <https://youtube.com/ahaveland> T: @ahaveland

In 2023  
nog 3200 km<sup>3</sup>

# LOSS OF LAND ICE

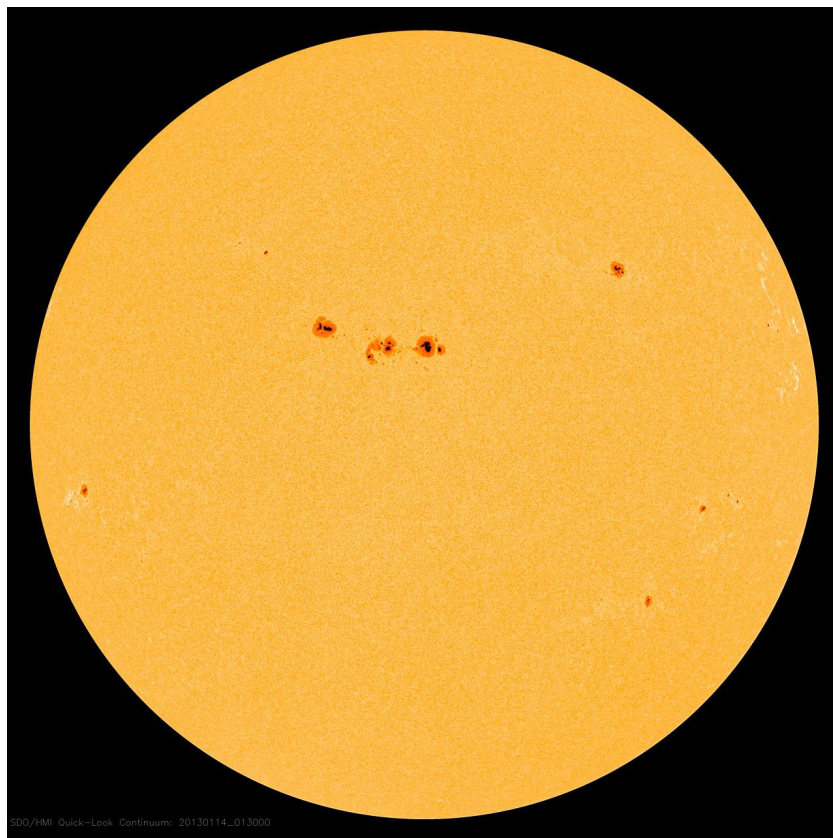


DATA: Gravity Recovery and Climate Experiment (GRACE/GRACE-FO)  
SOURCE: <https://climate.nasa.gov/vital-signs/land-ice/> (NASA JPL)  
REFERENCE: Wiese et al. (2015, 2019)  
UPDATED: through October 2023

GRAPHIC: Zachary Labe (@ZLabe)

#VVSGklimaatdag

## 2. Wat zijn de oorzaken?



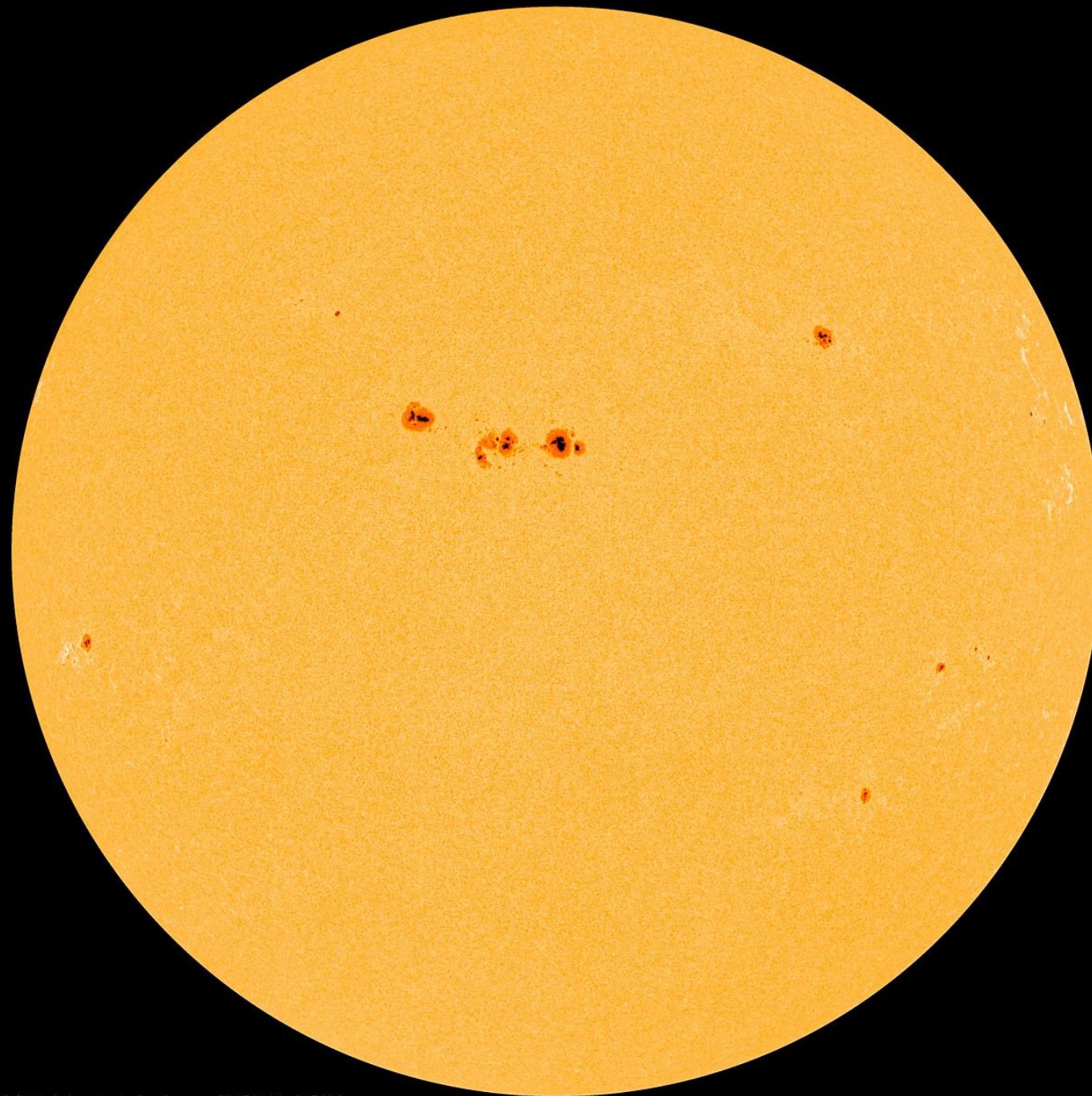
SDO/HMI Quick-Look Continuum: 20130114\_013000

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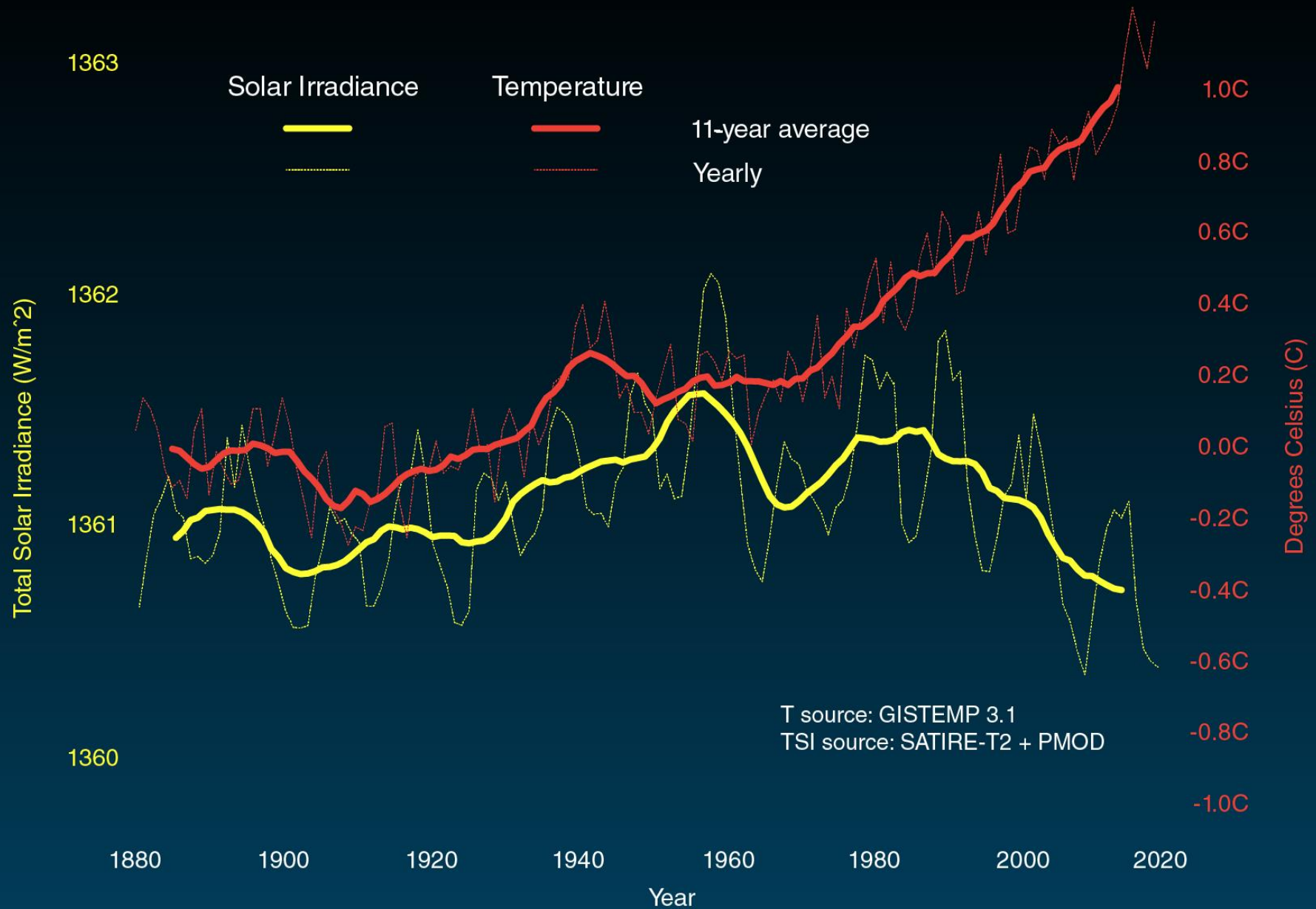








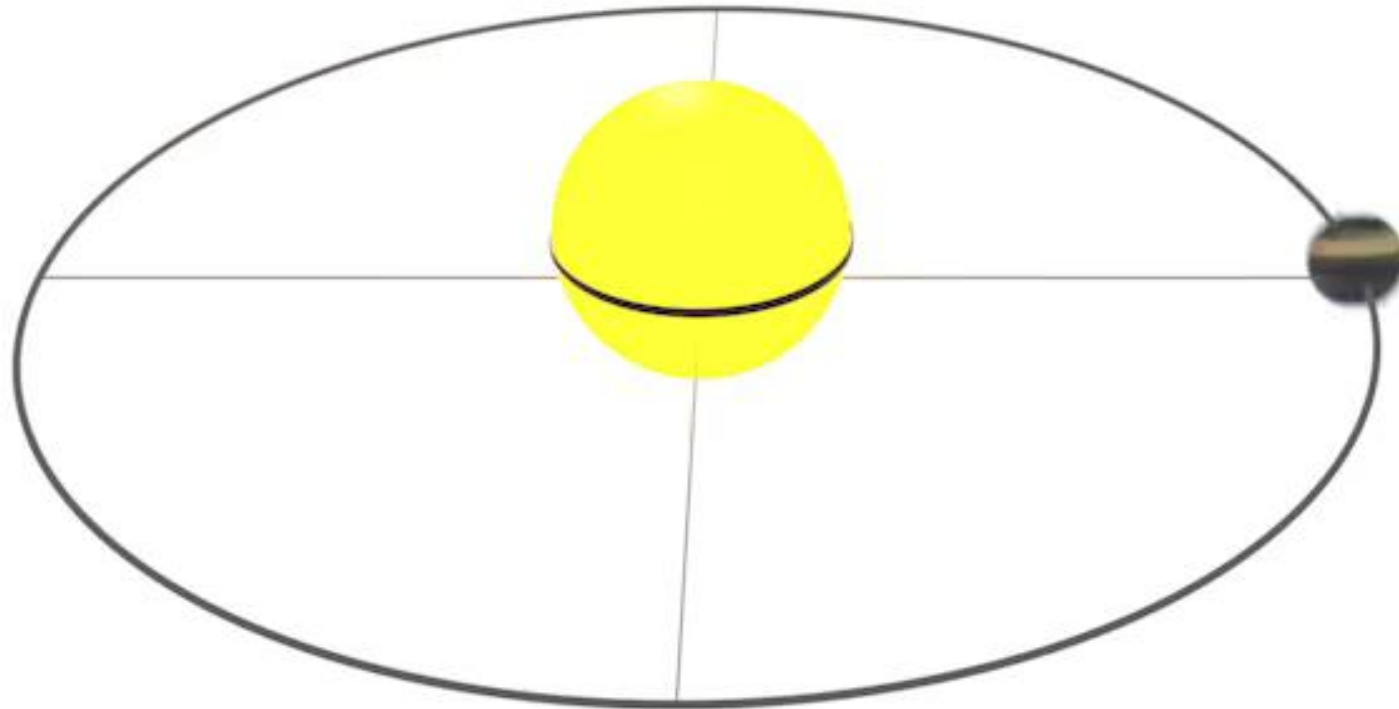
# Temperature vs Solar Activity



T source: GISTEMP 3.1  
TSI source: SATIRE-T2 + PMOD



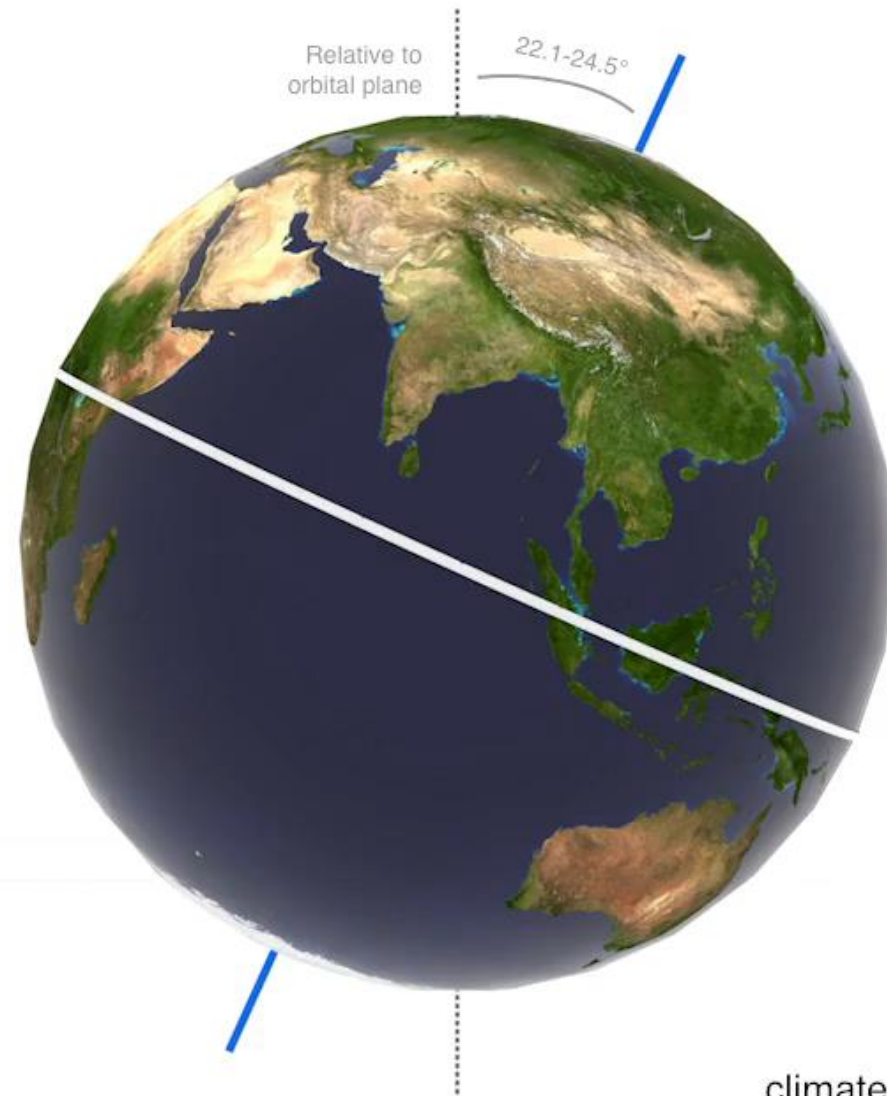
## Changes in Eccentricity (Orbit Shape)



\*Changes in eccentricity exaggerated so the effect can be seen. Earth's orbit shape varies between 0.0034 (almost a perfect circle) to 0.058 (slightly elliptical).

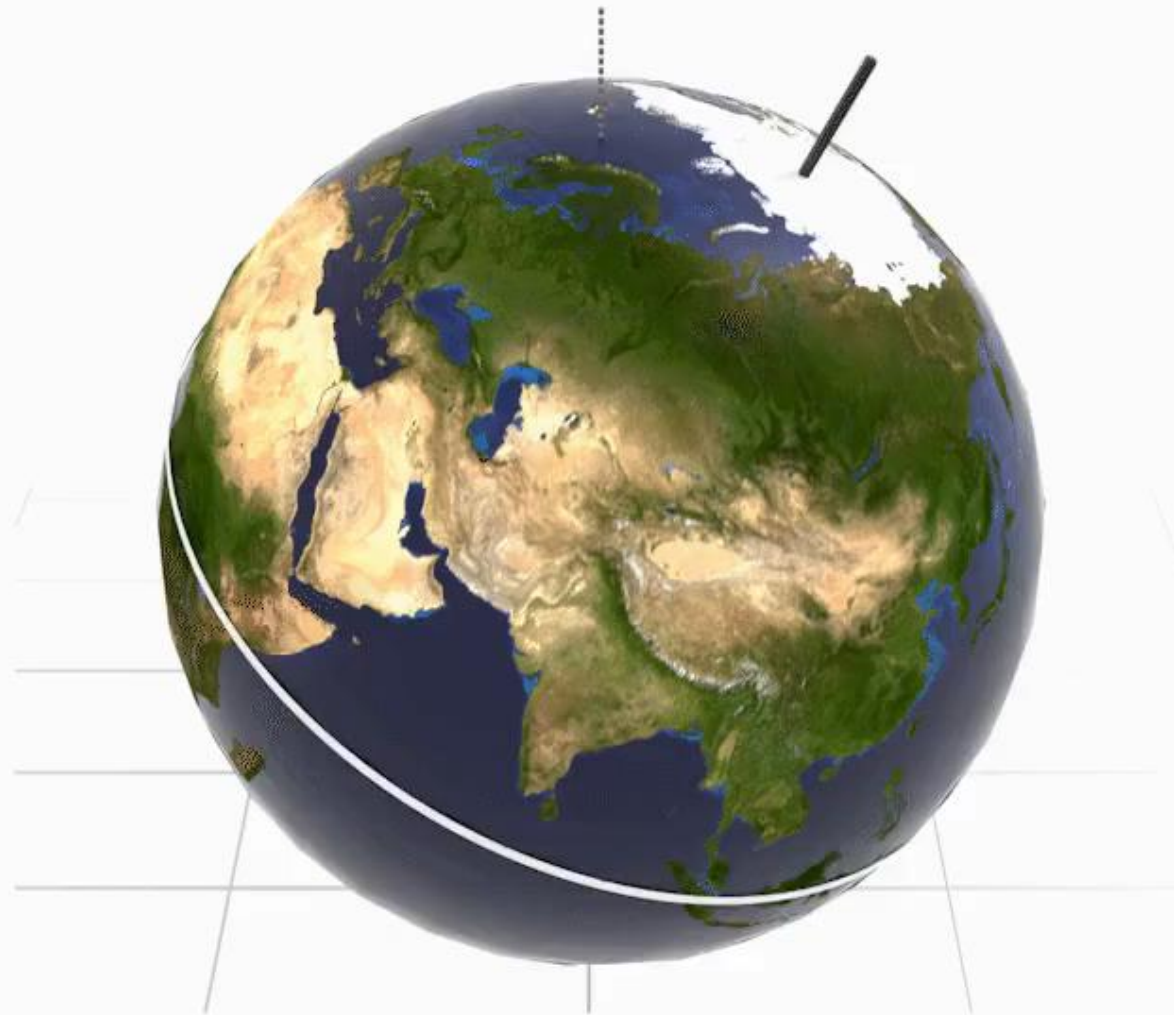
[climate.nasa.gov](http://climate.nasa.gov)

## Changes in Obliquity (Tilt)





## Axial Precession (Wobble)

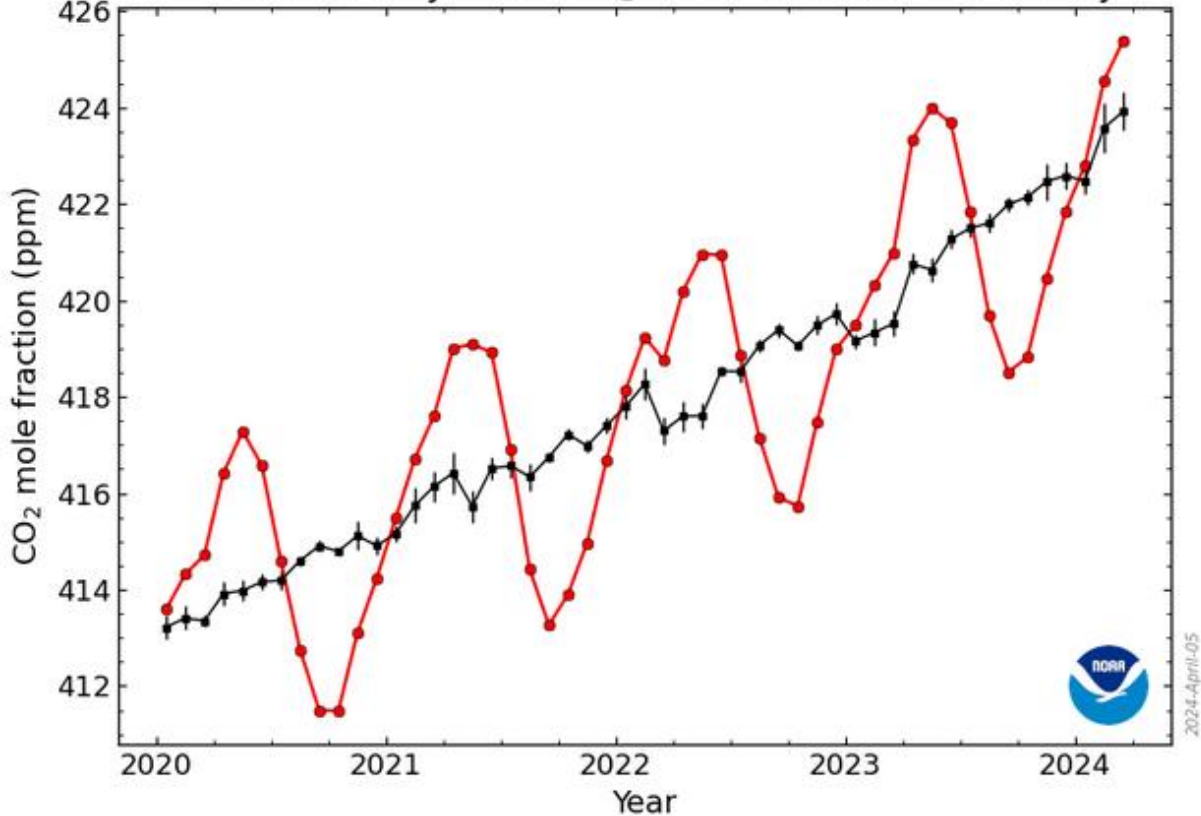


**March 2024: 425.38 ppm**

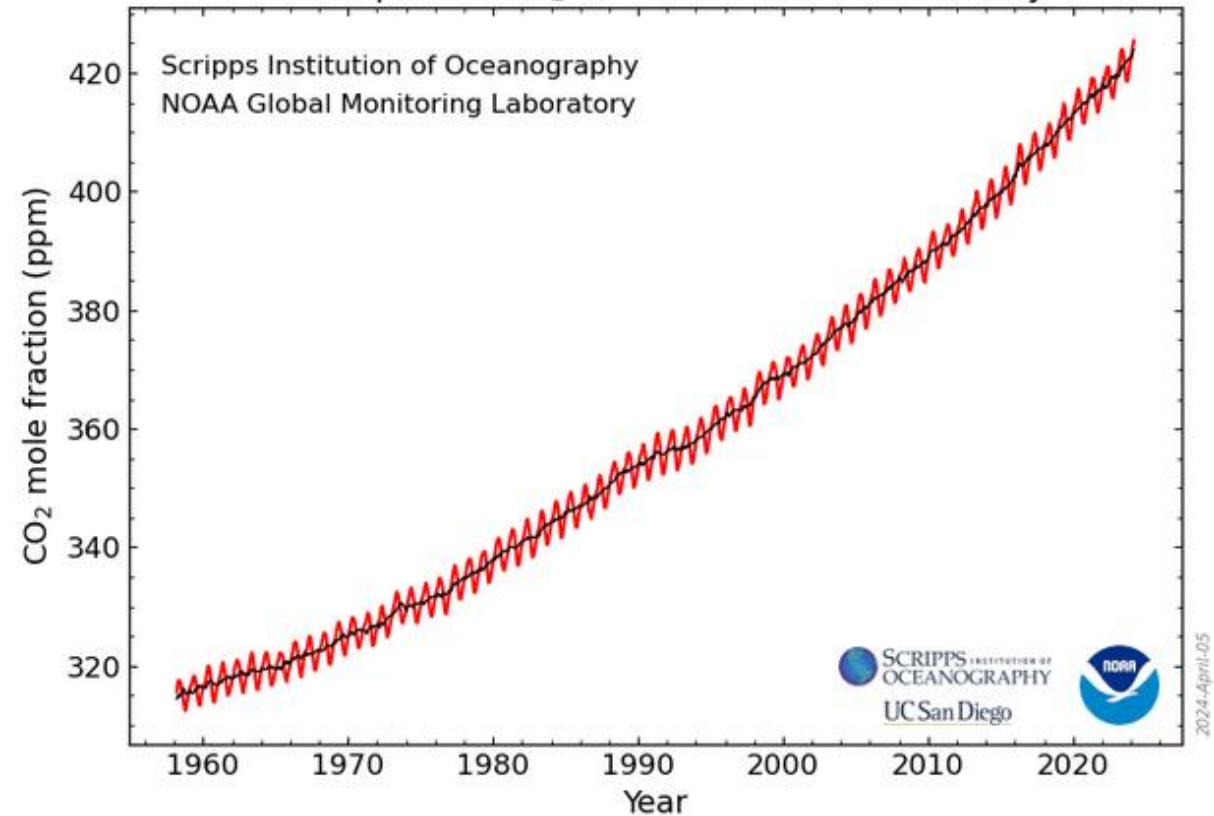
**March 2023: 420.99 ppm**

*Last updated: Apr 05, 2024*

Recent Monthly Mean CO<sub>2</sub> at Mauna Loa Observatory



Atmospheric CO<sub>2</sub> at Mauna Loa Observatory



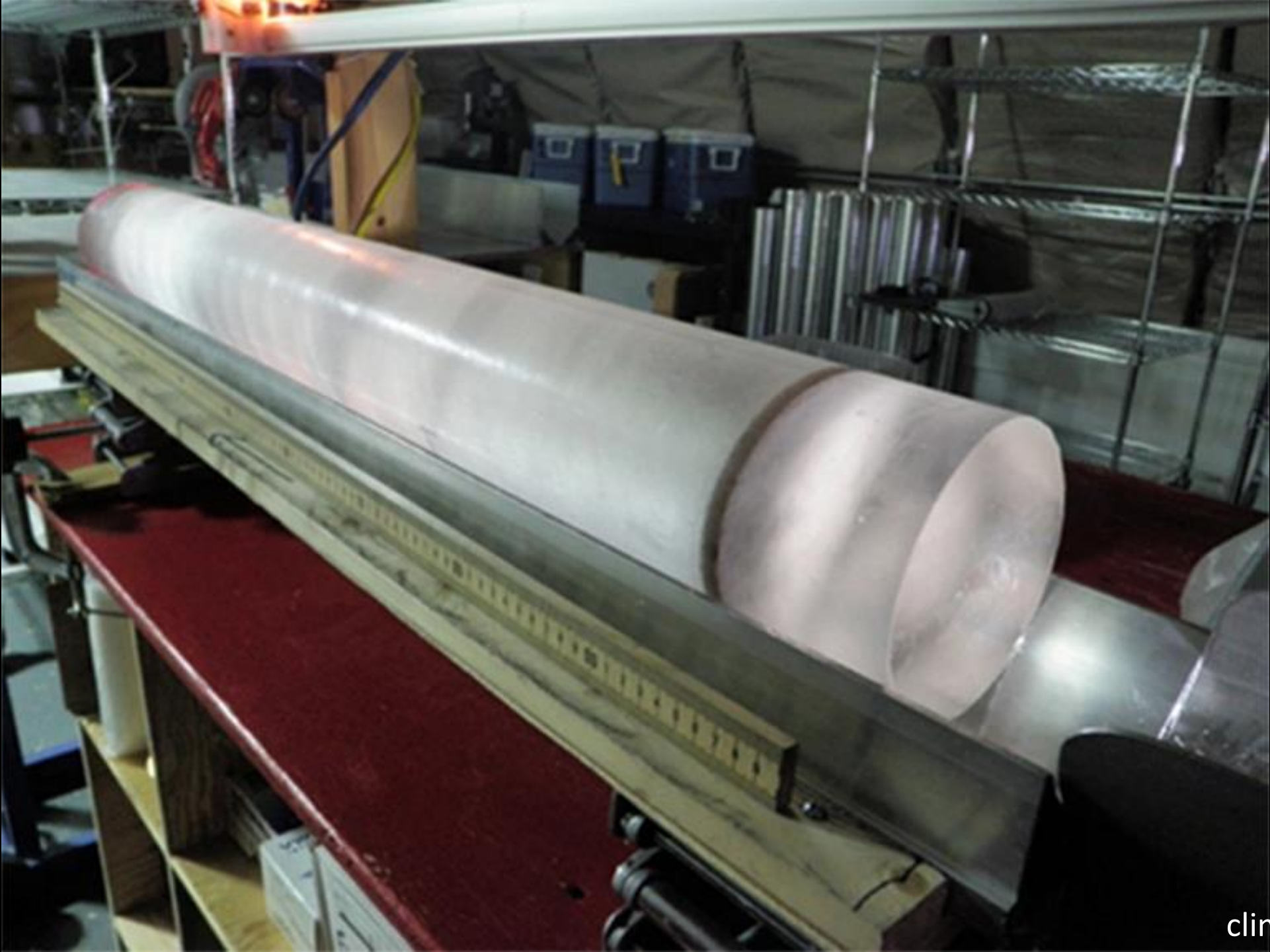




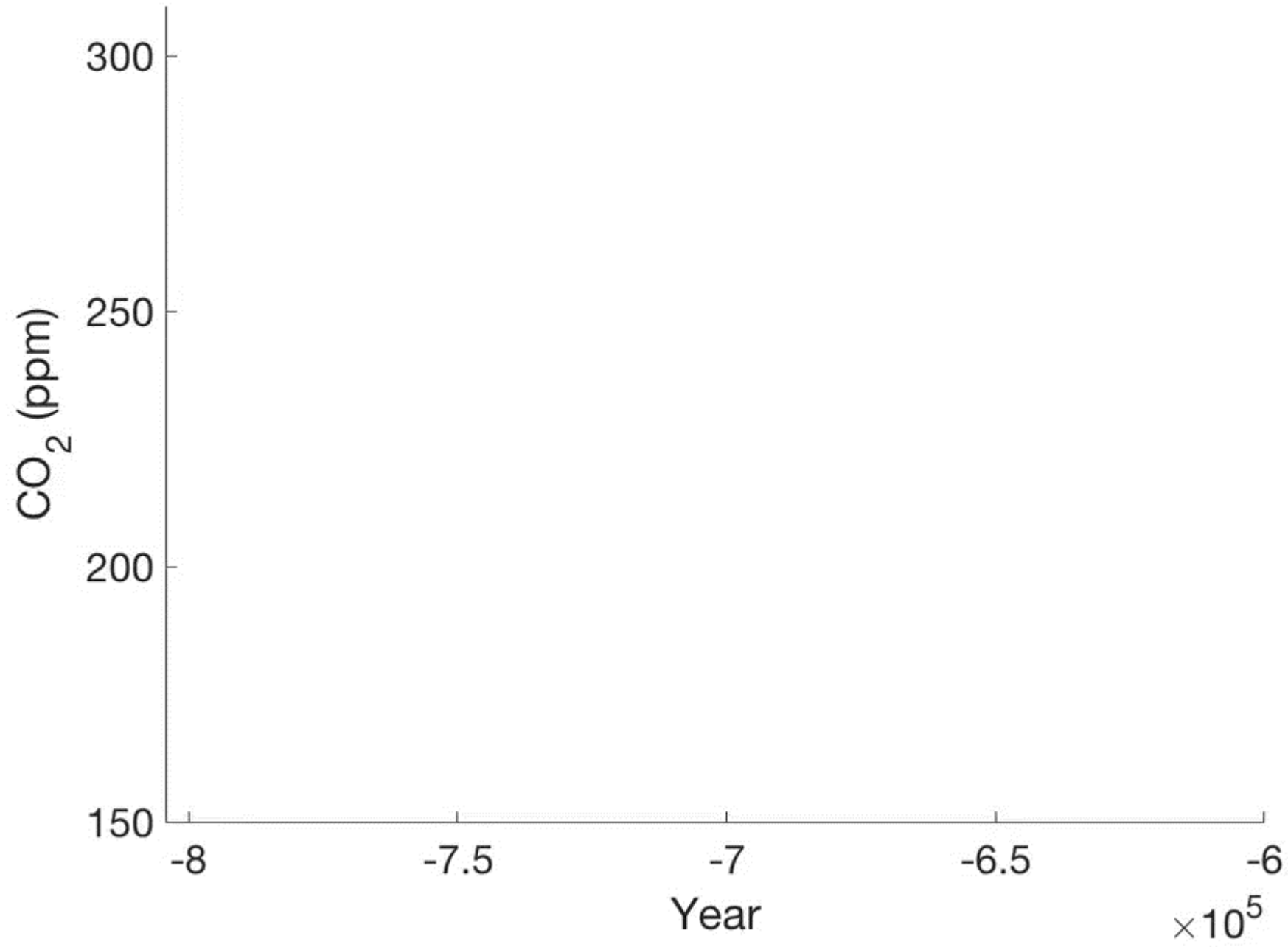
NASA







**-800300**  
**199**

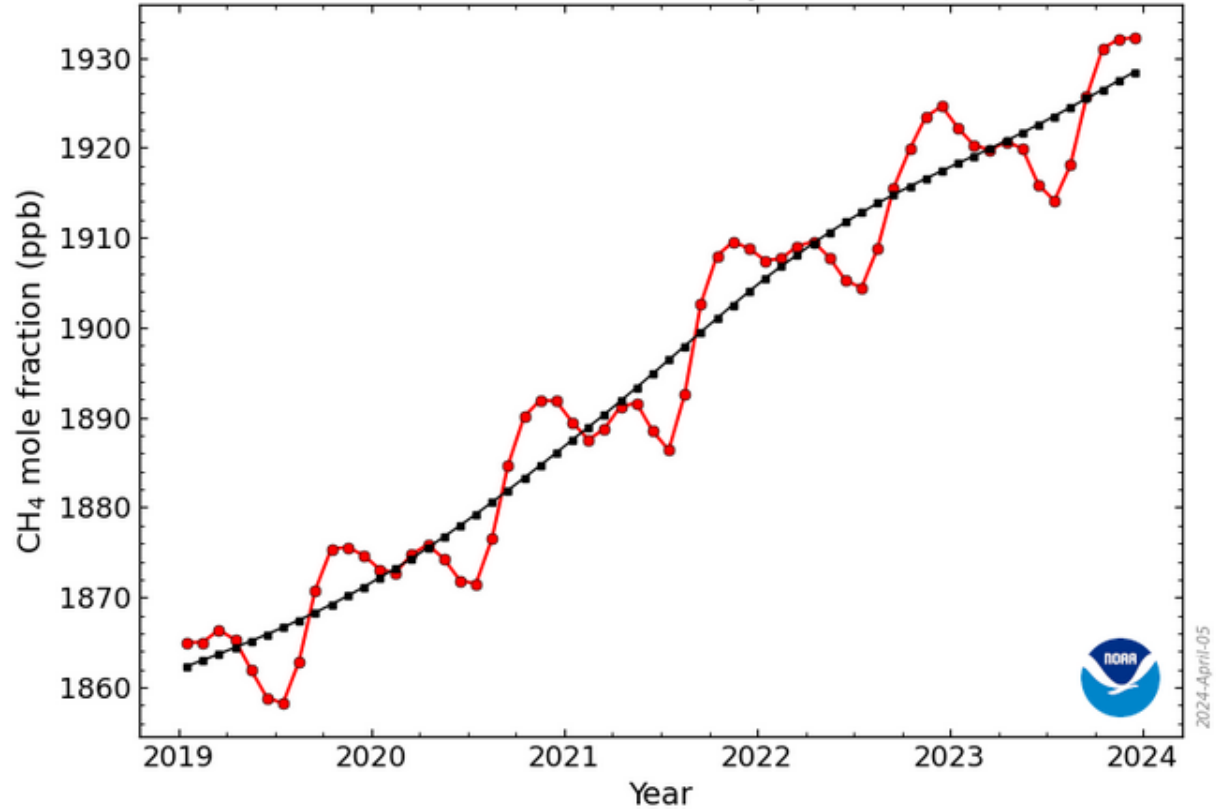


**December 2023: 1932.23 ppb**

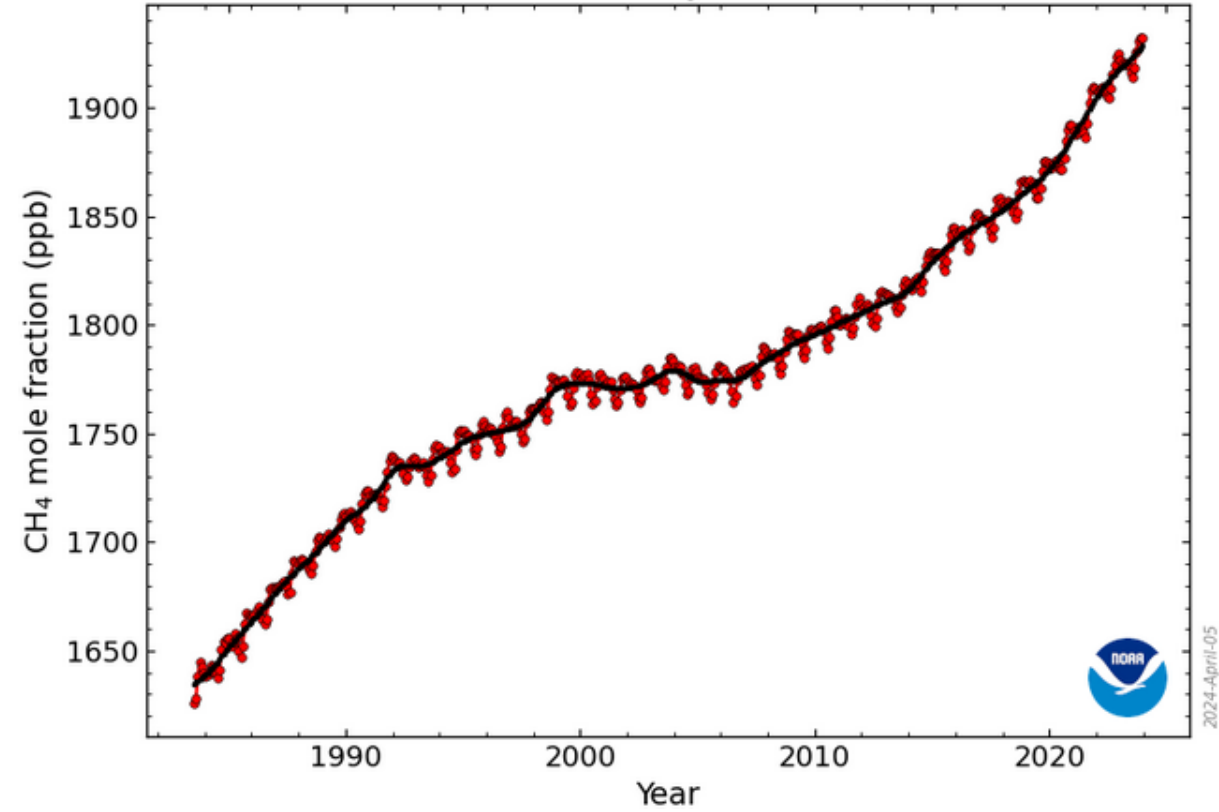
**December 2022: 1924.61 ppb**

*Last updated: Apr 05, 2024*

Recent Global Monthly Mean CH<sub>4</sub>

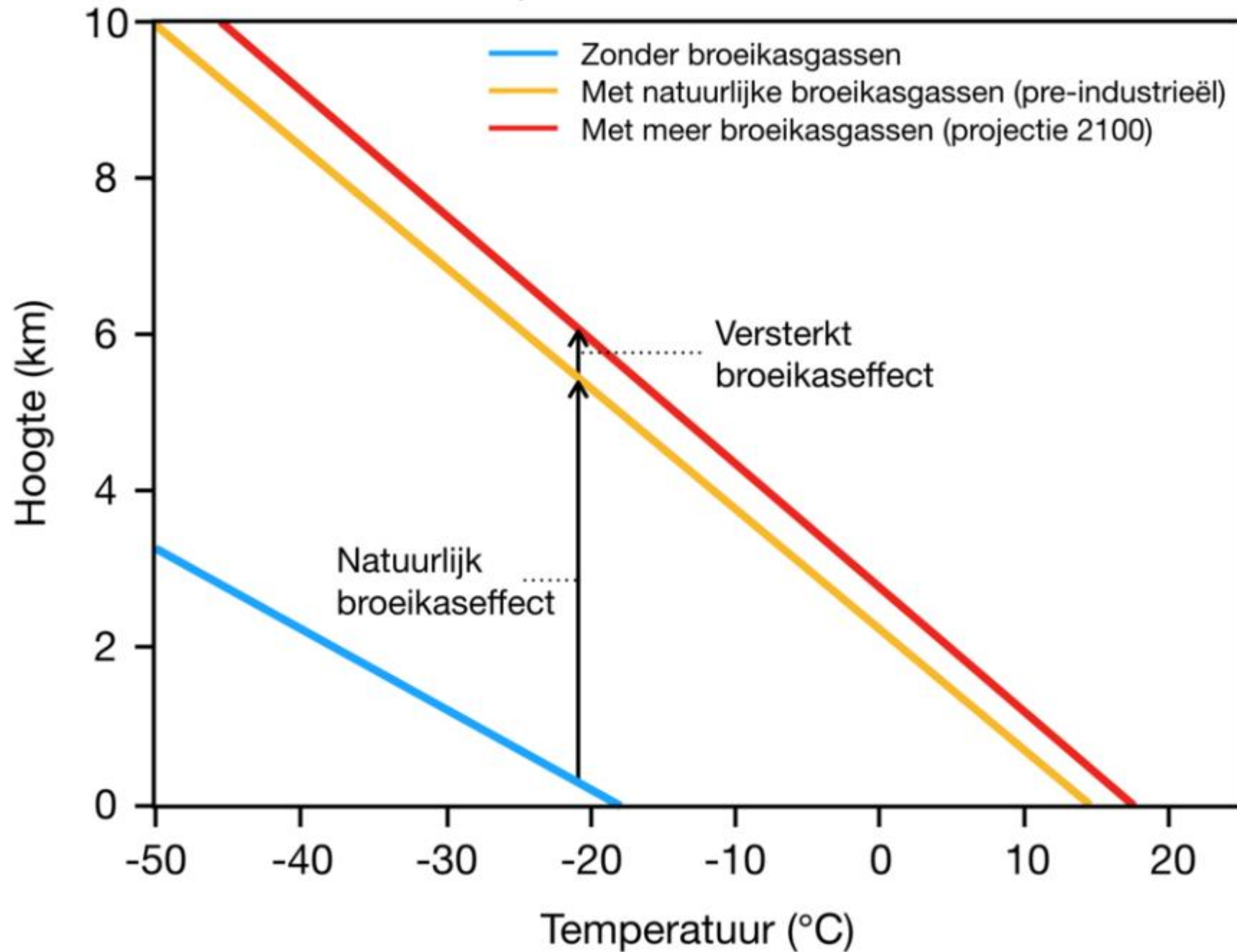


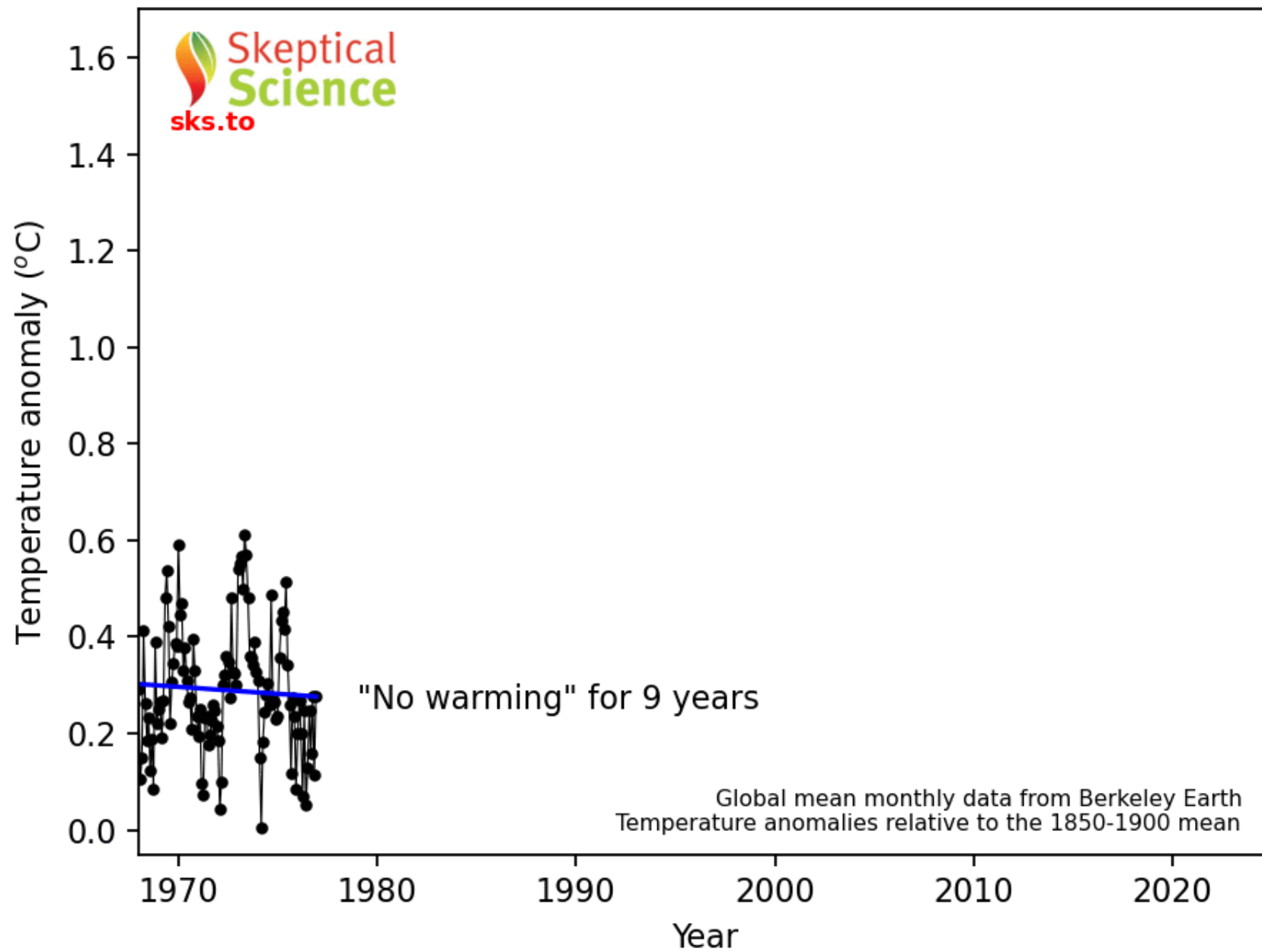
Global Monthly Mean CH<sub>4</sub>

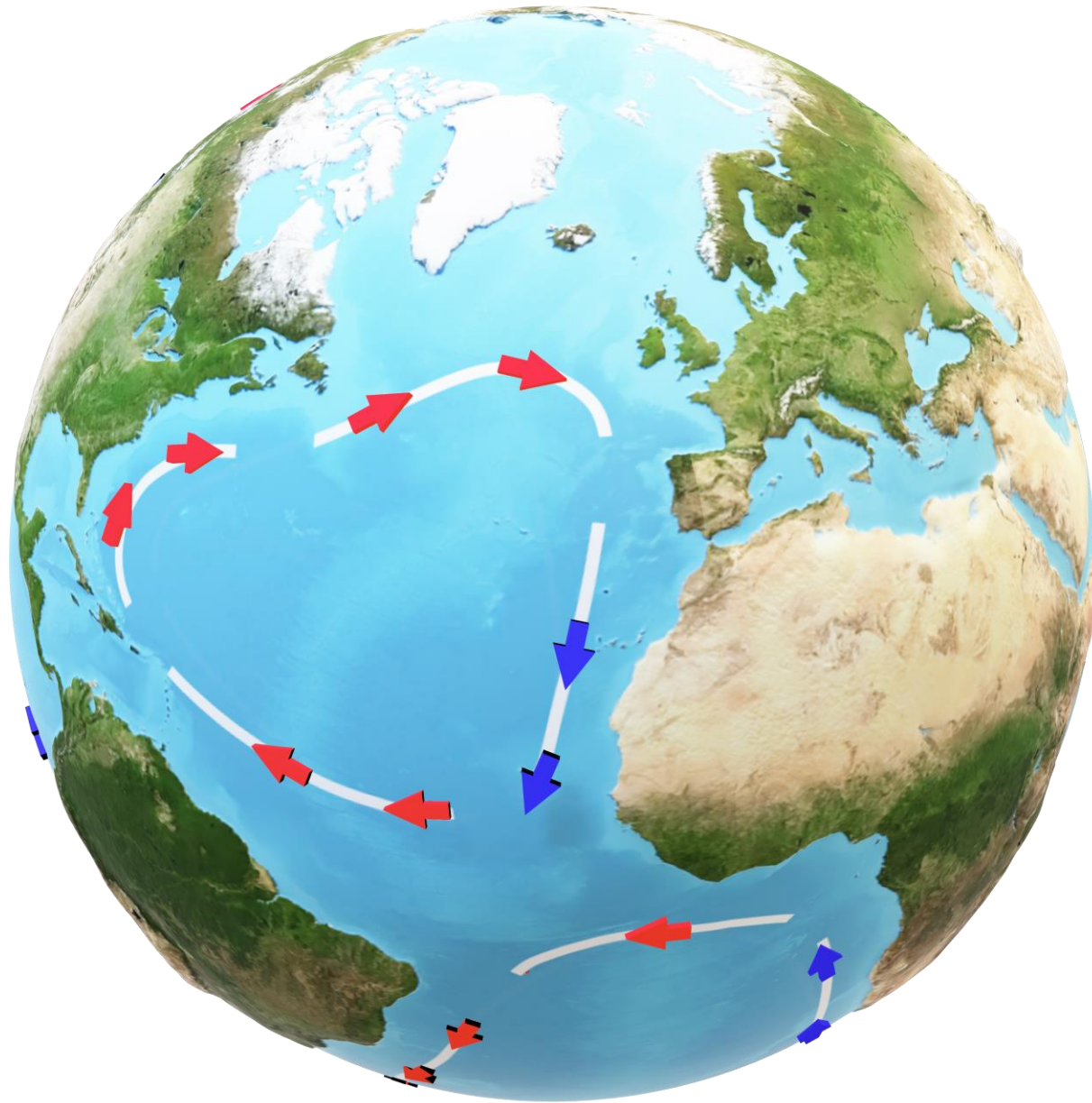




# Temperatuur in atmosfeer





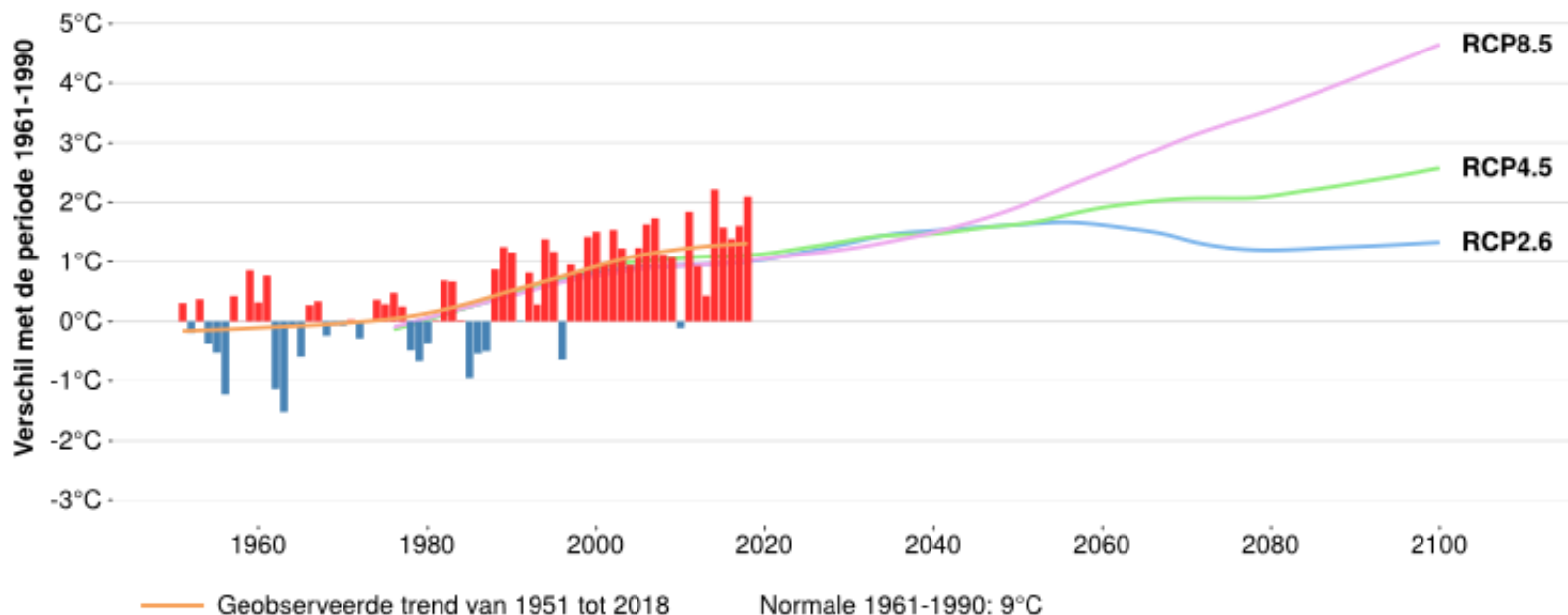


### 3. Hoe gaat het verder?



Evolutie van de gemiddelde jaartemperatuur in België

Klimaatprojecties tot 2100 volgens 3 broeikasgasscenario's (RCP2.6, RCP4.5 en RCP8.5)  
Observaties van 1951 tot 2018 (gemiddelde voor 8 historische stations)

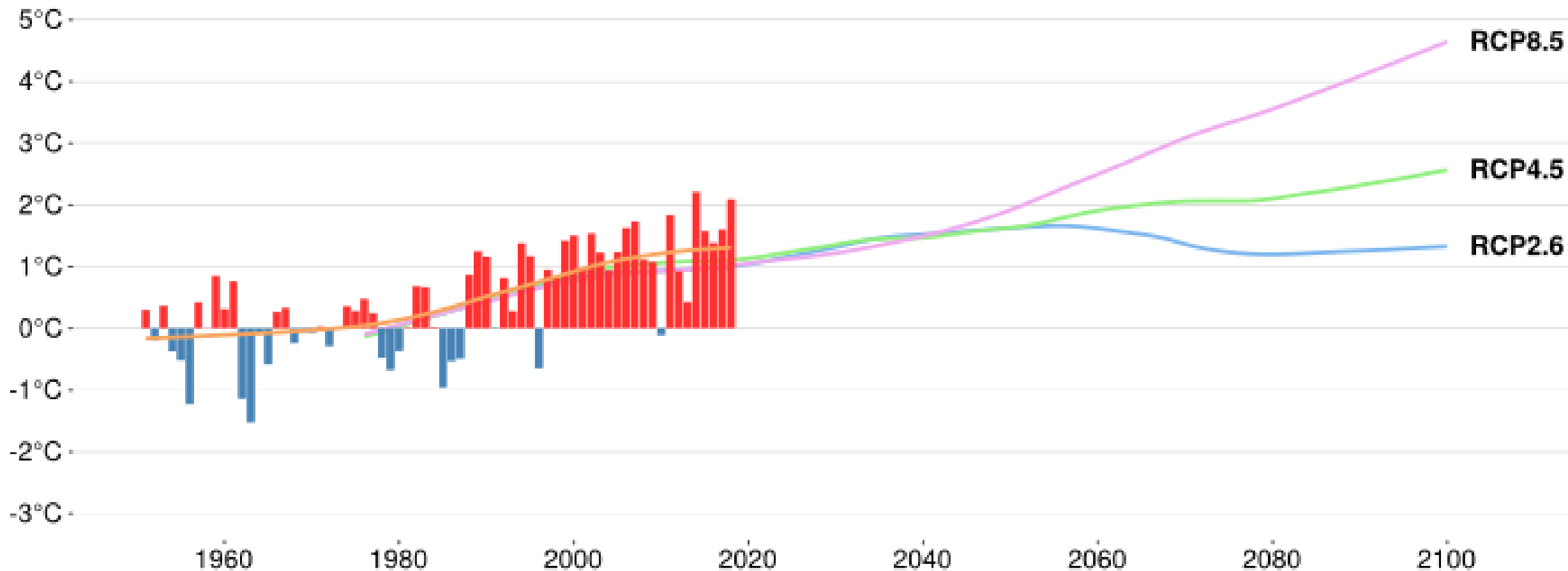




# Evolutie van de gemiddelde jaartemperatuur in België

Klimaatprojecties tot 2100 volgens 3 broeikasgasscenario's (RCP2.6, RCP4.5 en RCP8.5)  
Observaties van 1951 tot 2018 (gemiddelde voor 8 historische stations)

Verschil met de periode 1961-1990

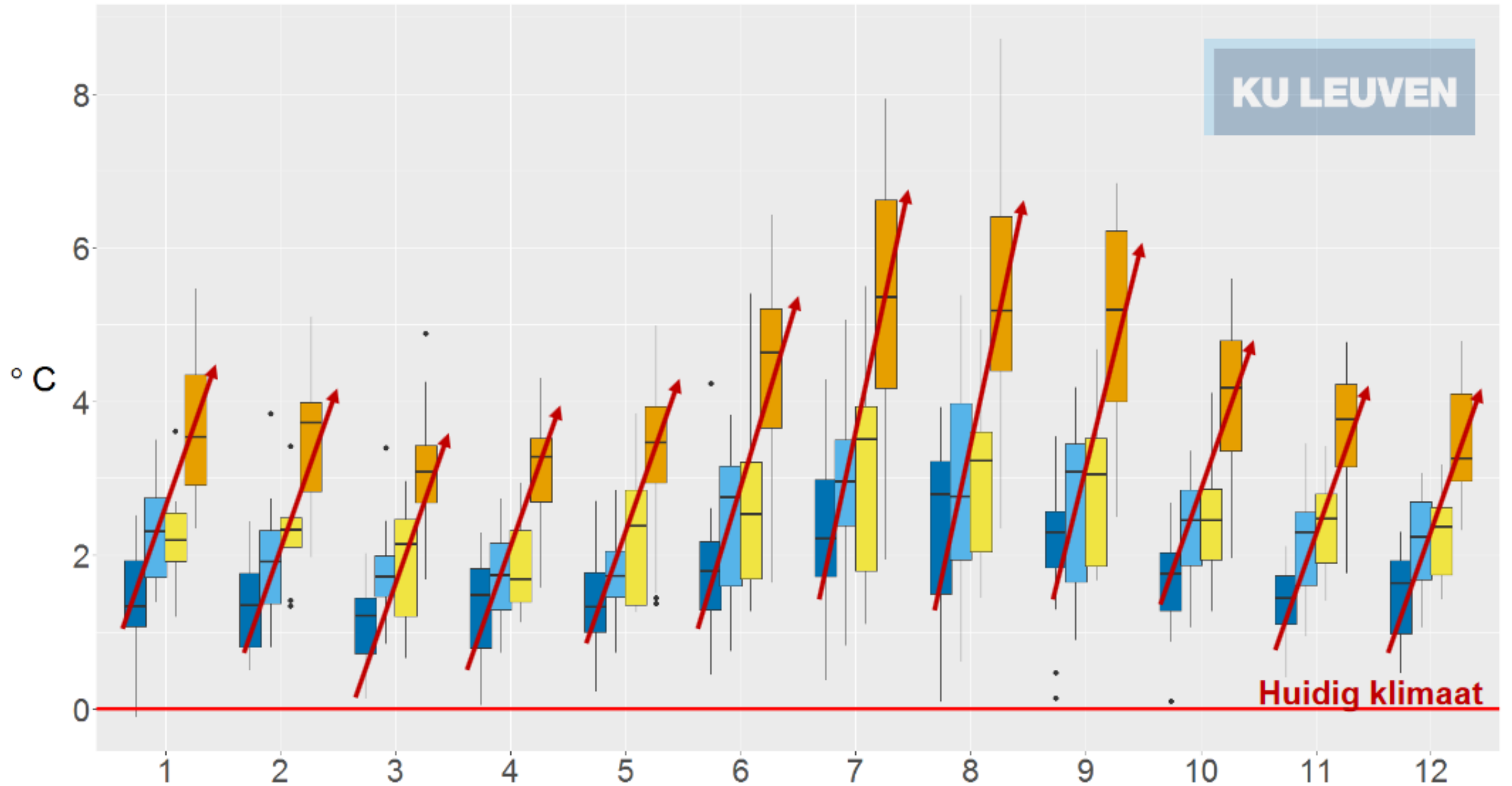


Geobserveerde trend van 1951 tot 2018

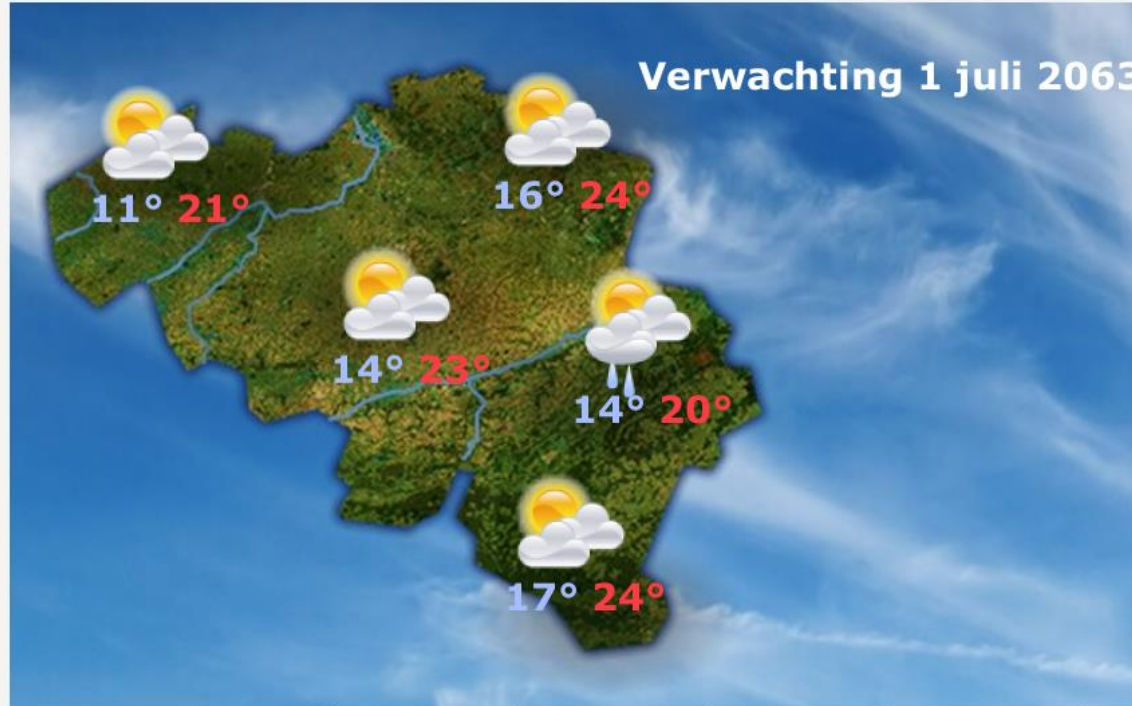
Normale 1961-1990: 9°C



RCP 2.6 RCP 4.5 RCP 6.0 RCP 8.5



# Verwachting 1 juli 2063



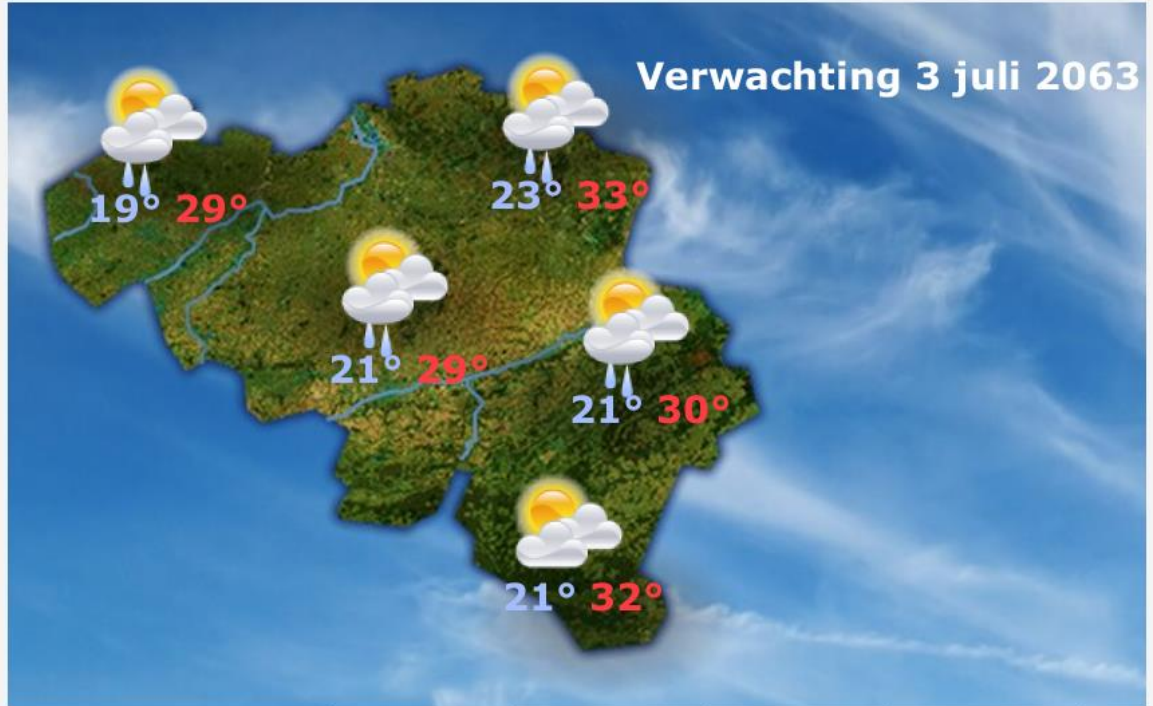
	2 juli	3 juli	4 juli	5 juli	6 juli
<b>Kust</b> Oostende, Knokke-Heist, Nieuwpoort, De Panne, ...	29° 16°	29° 19°	27° 20°	36° 20°	37° 27°
<b>Centrum</b> Brussel, Antwerpen, Gent, Leuven, Mechelen, Kortrijk, Luik, Charleroi, Nijvel, Namen, Bergen, ...	30° 16°	29° 21°	30° 22°	36° 23°	37° 27°
<b>Kempen</b> Turnhout, Hasselt, Genk, Heist-op-den-Berg, Brasschaat, Mol, ...	31° 17°	33° 23°	32° 23°	37° 25°	37° 27°
<b>Ardennen</b> NeufChâteau, Marche-en- Famenne, Bastogne, ...	29° 13°	30° 21°	30° 20°	33° 23°	33° 24°
<b>Belgisch Lotharingen</b> Arlon, Virton, ...	31° 15°	32° 21°	32° 22°	35° 23°	35° 25°

# Verwachting 2 juli 2063

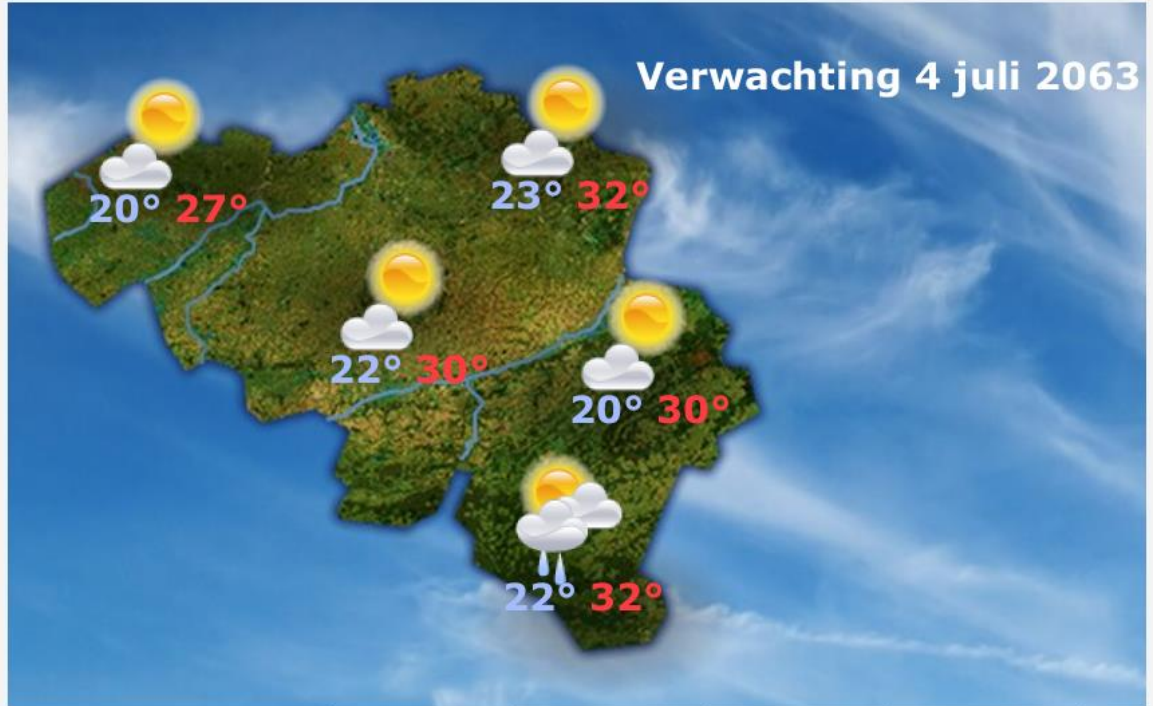


	3 juli	4 juli	5 juli	6 juli	7 juli
<b>Kust</b> Oostende, Knokke-Heist, Nieuwpoort, De Panne, ...	 29° 19°	 27° 20°	 36° 20°	 37° 27°	 37° 28°
<b>Centrum</b> Brussel, Antwerpen, Gent, Leuven, Mechelen, Kortrijk, Luik, Charleroi, Nijvel, Namen, Bergen, ...	 29° 21°	 30° 22°	 36° 23°	 37° 27°	 36° 28°
<b>Kempen</b> Turnhout, Hasselt, Genk, Heist-op-den-Berg, Brasschaat, Mol, ...	 33° 23°	 32° 23°	 37° 25°	 37° 27°	 37° 28°
<b>Ardennen</b> NeufChâteau, Marche-en-Famenne, Bastogne, ...	 30° 21°	 30° 20°	 33° 23°	 33° 24°	 33° 24°
<b>Belgisch Lotharingen</b> Arlon, Virton, ...	 32° 21°	 32° 22°	 35° 23°	 35° 25°	 34° 25°





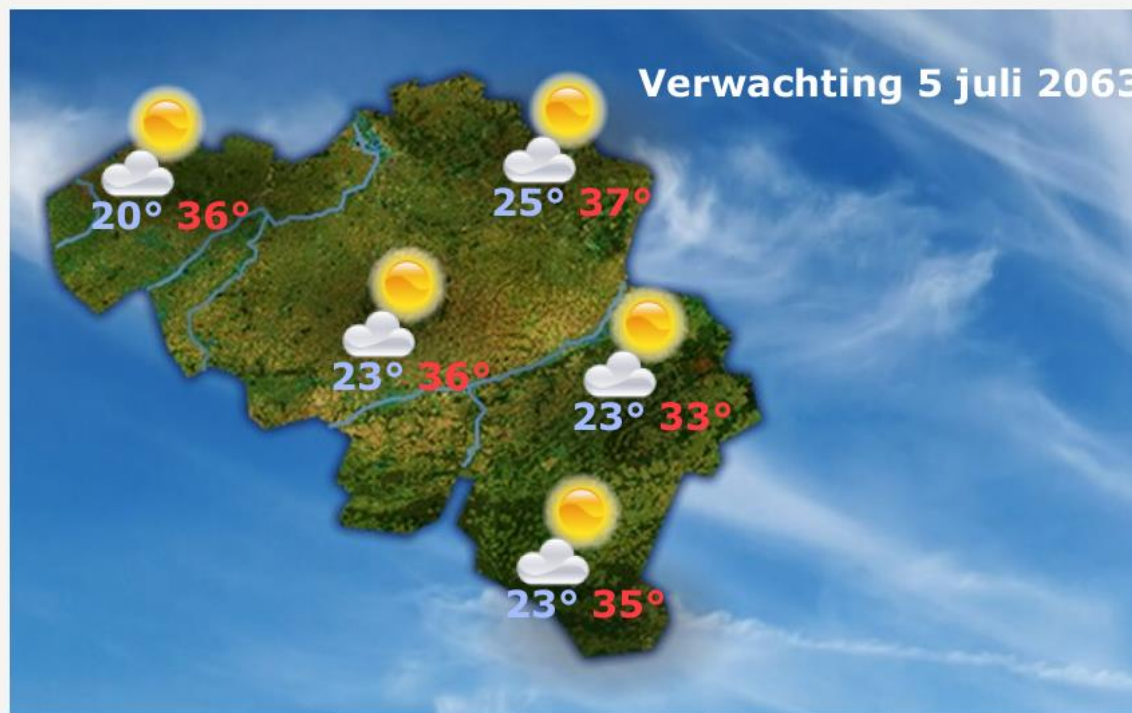
	4 juli	5 juli	6 juli	7 juli	8 juli
<b>Kust</b> Oostende, Knokke-Heist, Nieuwpoort, De Panne, ...	27° 20°	36° 20°	37° 27°	37° 28°	33° 24°
<b>Centrum</b> Brussel, Antwerpen, Gent, Leuven, Mechelen, Kortrijk, Luik, Charleroi, Nijvel, Namen, Bergen, ...	30° 22°	36° 23°	37° 27°	36° 28°	36° 28°
<b>Kempen</b> Turnhout, Hasselt, Genk, Heist-op-den-Berg, Brasschaat, Mol, ...	32° 23°	37° 25°	37° 27°	37° 28°	36° 28°
<b>Ardennen</b> NeufChâteau, Marche-en- Famenne, Bastogne, ...	30° 20°	33° 23°	33° 24°	33° 24°	33° 23°
<b>Belgisch Lotharingen</b> Arlon, Virton, ...	32° 22°	35° 23°	35° 25°	34° 25°	34° 24°



	5 juli	6 juli	7 juli	8 juli	9 juli
<b>Kust</b> Oostende, Knokke-Heist, Nieuwpoort, De Panne, ...	36° 20°	37° 27°	37° 28°	33° 24°	33° 23°
<b>Centrum</b> Brussel, Antwerpen, Gent, Leuven, Mechelen, Kortrijk, Luik, Charleroi, Nijvel, Namen, Bergen, ...	36° 23°	37° 27°	36° 28°	36° 28°	35° 27°
<b>Kempen</b> Turnhout, Hasselt, Genk, Heist-op-den-Berg, Brasschaat, Mol, ...	37° 25°	37° 27°	37° 28°	36° 28°	35° 26°
<b>Ardennen</b> NeufChâteau, Marche-en- Famenne, Bastogne, ...	33° 23°	33° 24°	33° 24°	33° 23°	31° 22°
<b>Belgisch Lotharingen</b> Arlon, Virton, ...	35° 23°	35° 25°	34° 25°	34° 24°	32° 25°



# Verwachting 5 juli 2063



6 juli

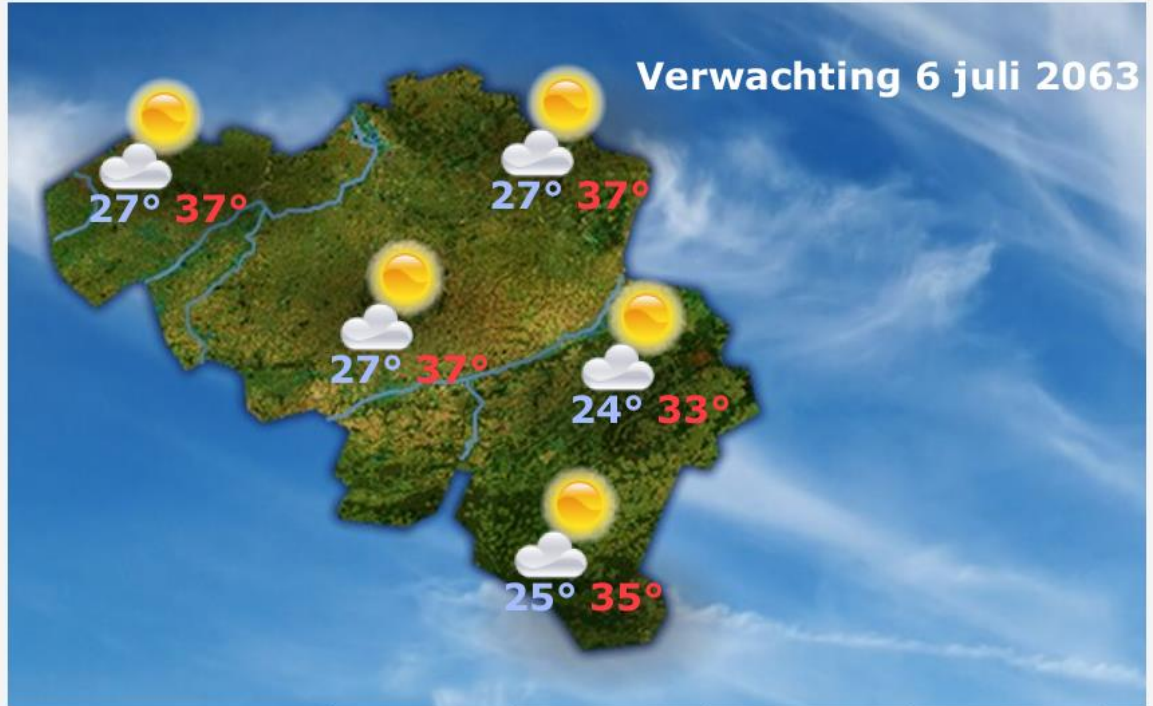
7 juli

8 juli

9 juli

10 juli

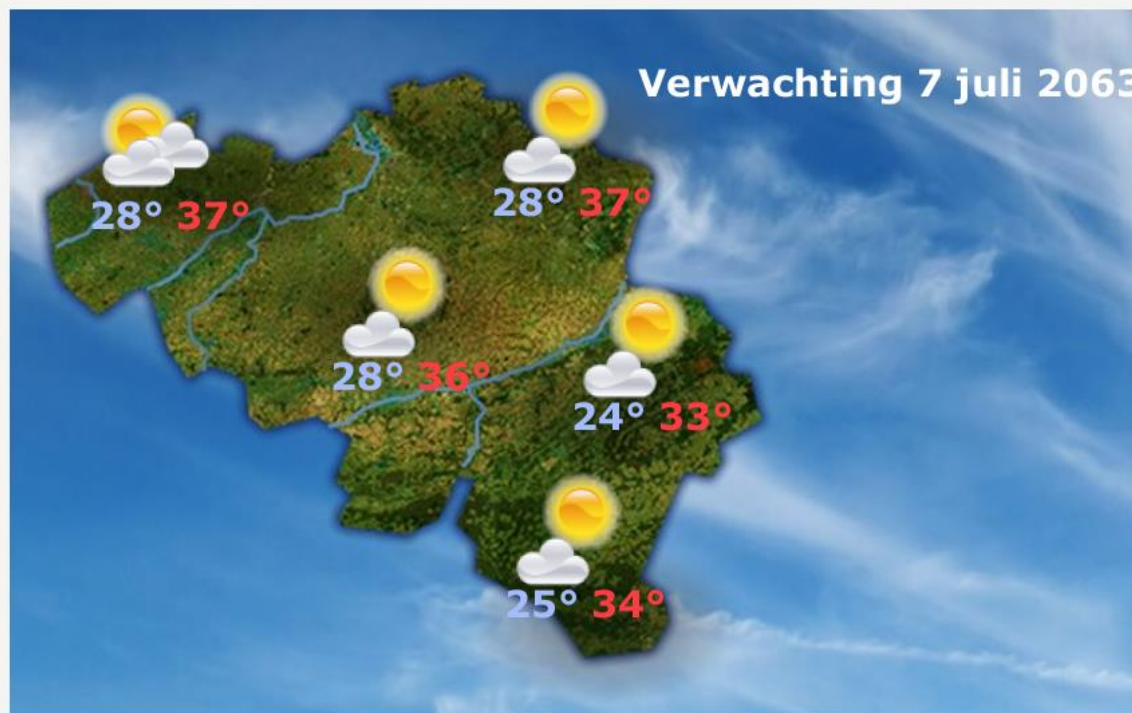
	6 juli	7 juli	8 juli	9 juli	10 juli
<b>Kust</b> Oostende, Knokke-Heist, Nieuwpoort, De Panne, ...	 37° 27°	 37° 28°	 33° 24°	 33° 23°	 26° 19°
<b>Centrum</b> Brussel, Antwerpen, Gent, Leuven, Mechelen, Kortrijk, Luik, Charleroi, Nijvel, Namen, Bergen, ...	 37° 27°	 36° 28°	 36° 28°	 35° 27°	 32° 22°
<b>Kempen</b> Turnhout, Hasselt, Genk, Heist-op-den-Berg, Brasschaat, Mol, ...	 37° 27°	 37° 28°	 36° 28°	 35° 26°	 32° 22°
<b>Ardennen</b> NeufChâteau, Marche-en- Famenne, Bastogne, ...	 33° 24°	 33° 24°	 33° 23°	 31° 22°	 29° 21°
<b>Belgisch Lotharingen</b> Arlon, Virton, ...	 35° 25°	 34° 25°	 34° 24°	 32° 25°	 33° 23°



	7 juli	8 juli	9 juli	10 juli	11 juli
<b>Kust</b> Oostende, Knokke-Heist, Nieuwpoort, De Panne, ...	37° 28°	33° 24°	33° 23°	26° 19°	23° 17°
<b>Centrum</b> Brussel, Antwerpen, Gent, Leuven, Mechelen, Kortrijk, Luik, Charleroi, Nijvel, Namen, Bergen, ...	36° 28°	36° 28°	35° 27°	32° 22°	28° 19°
<b>Kempen</b> Turnhout, Hasselt, Genk, Heist-op-den-Berg, Brasschaat, Mol, ...	37° 28°	36° 28°	35° 26°	32° 22°	29° 20°
<b>Ardennen</b> NeufChâteau, Marche-en- Famenne, Bastogne, ...	33° 24°	33° 23°	31° 22°	29° 21°	25° 18°
<b>Belgisch Lotharingen</b> Arlon, Virton, ...	34° 25°	34° 24°	32° 25°	33° 23°	29° 21°



# Verwachting 7 juli 2063



8 juli

9 juli

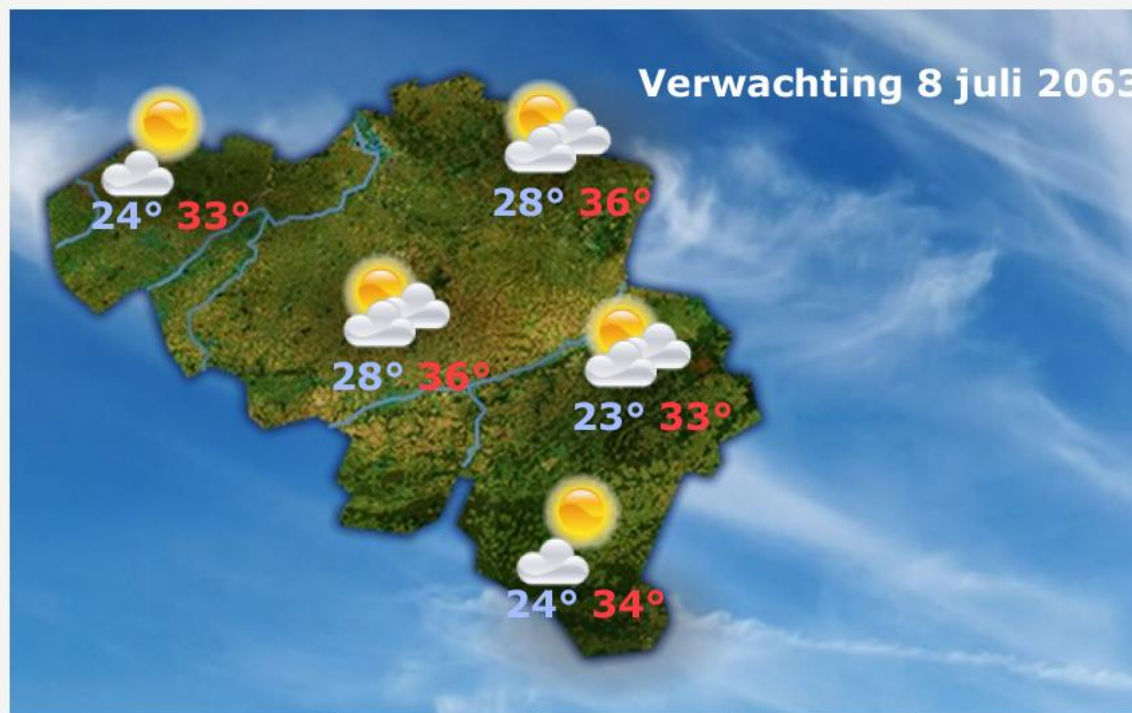
10 juli

11 juli

12 juli

	8 juli	9 juli	10 juli	11 juli	12 juli
<b>Kust</b> Oostende, Knokke-Heist, Nieuwpoort, De Panne, ...	 33° 24°	 33° 23°	 26° 19°	 23° 17°	 23° 16°
<b>Centrum</b> Brussel, Antwerpen, Gent, Leuven, Mechelen, Kortrijk, Luik, Charleroi, Nijvel, Namen, Bergen, ...	 36° 28°	 35° 27°	 32° 22°	 28° 19°	 26° 17°
<b>Kempen</b> Turnhout, Hasselt, Genk, Heist-op-den-Berg, Brasschaat, Mol, ...	 36° 28°	 35° 26°	 32° 22°	 29° 20°	 27° 18°
<b>Ardennen</b> NeufChâteau, Marche-en- Famenne, Bastogne, ...	 33° 23°	 31° 22°	 29° 21°	 25° 18°	 23° 16°
<b>Belgisch Lotharingen</b> Arlon, Virton, ...	 34° 24°	 32° 25°	 33° 23°	 29° 21°	 26° 19°

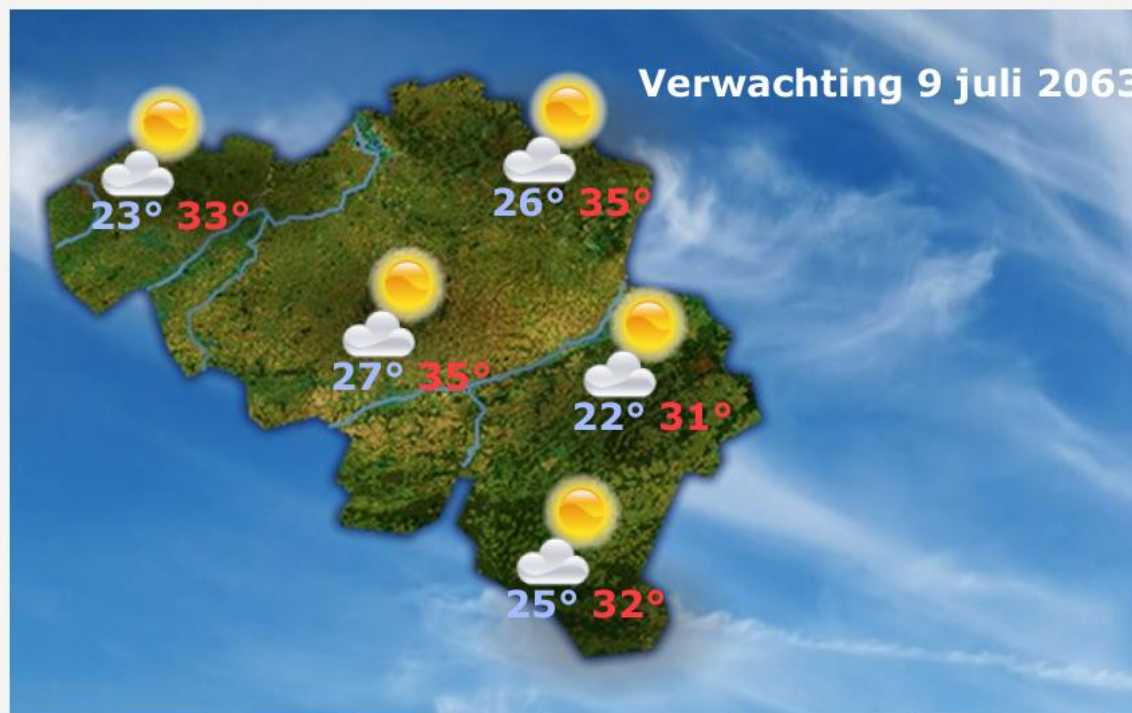
# Verwachting 8 juli 2063



	9 juli	10 juli	11 juli	12 juli	13 juli
<b>Kust</b> Oostende, Knokke-Heist, Nieuwpoort, De Panne, ...	 33° 23°	 26° 19°	 23° 17°	 23° 16°	 23° 15°
<b>Centrum</b> Brussel, Antwerpen, Gent, Leuven, Mechelen, Kortrijk, Luik, Charleroi, Nijvel, Namen, Bergen, ...	 35° 27°	 32° 22°	 28° 19°	 26° 17°	 27° 16°
<b>Kempen</b> Turnhout, Hasselt, Genk, Heist-op-den-Berg, Brasschaat, Mol, ...	 35° 26°	 32° 22°	 29° 20°	 27° 18°	 28° 17°
<b>Ardennen</b> NeufChâteau, Marche-en- Famenne, Bastogne, ...	 31° 22°	 29° 21°	 25° 18°	 23° 16°	 25° 15°
<b>Belgisch Lotharingen</b> Arlon, Virton, ...	 32° 25°	 33° 23°	 29° 21°	 26° 19°	 28° 18°



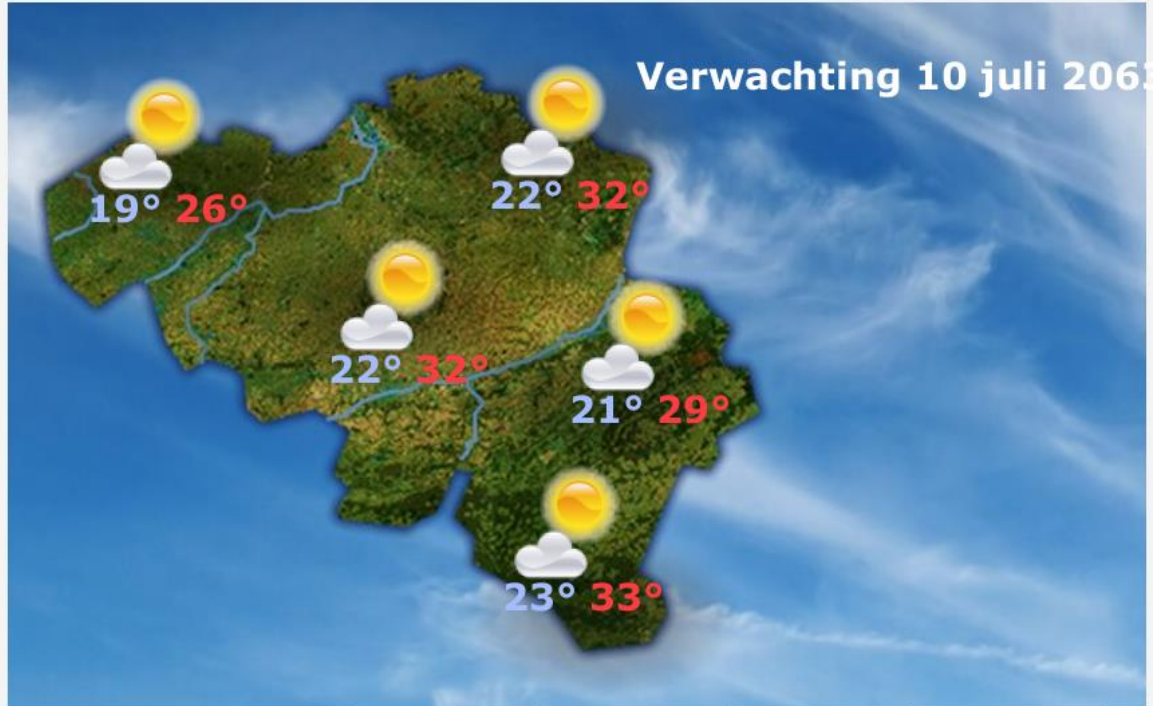
# Verwachting 9 juli 2063



10 juli    11 juli    12 juli    13 juli    14 juli

	10 juli	11 juli	12 juli	13 juli	14 juli
<b>Kust</b> Oostende, Knokke-Heist, Nieuwpoort, De Panne, ...	26° 19°	23° 17°	23° 16°	23° 15°	22° 16°
<b>Centrum</b> Brussel, Antwerpen, Gent, Leuven, Mechelen, Kortrijk, Luik, Charleroi, Nijvel, Namen, Bergen, ...	32° 22°	28° 19°	26° 17°	27° 16°	26° 17°
<b>Kempen</b> Turnhout, Hasselt, Genk, Heist-op-den-Berg, Brasschaat, Mol, ...	32° 22°	29° 20°	27° 18°	28° 17°	28° 18°
<b>Ardennen</b> NeufChâteau, Marche-en- Famenne, Bastogne, ...	29° 21°	25° 18°	23° 16°	25° 15°	25° 15°
<b>Belgisch Lotharingen</b> Arlon, Virton, ...	33° 23°	29° 21°	26° 19°	28° 18°	27° 19°

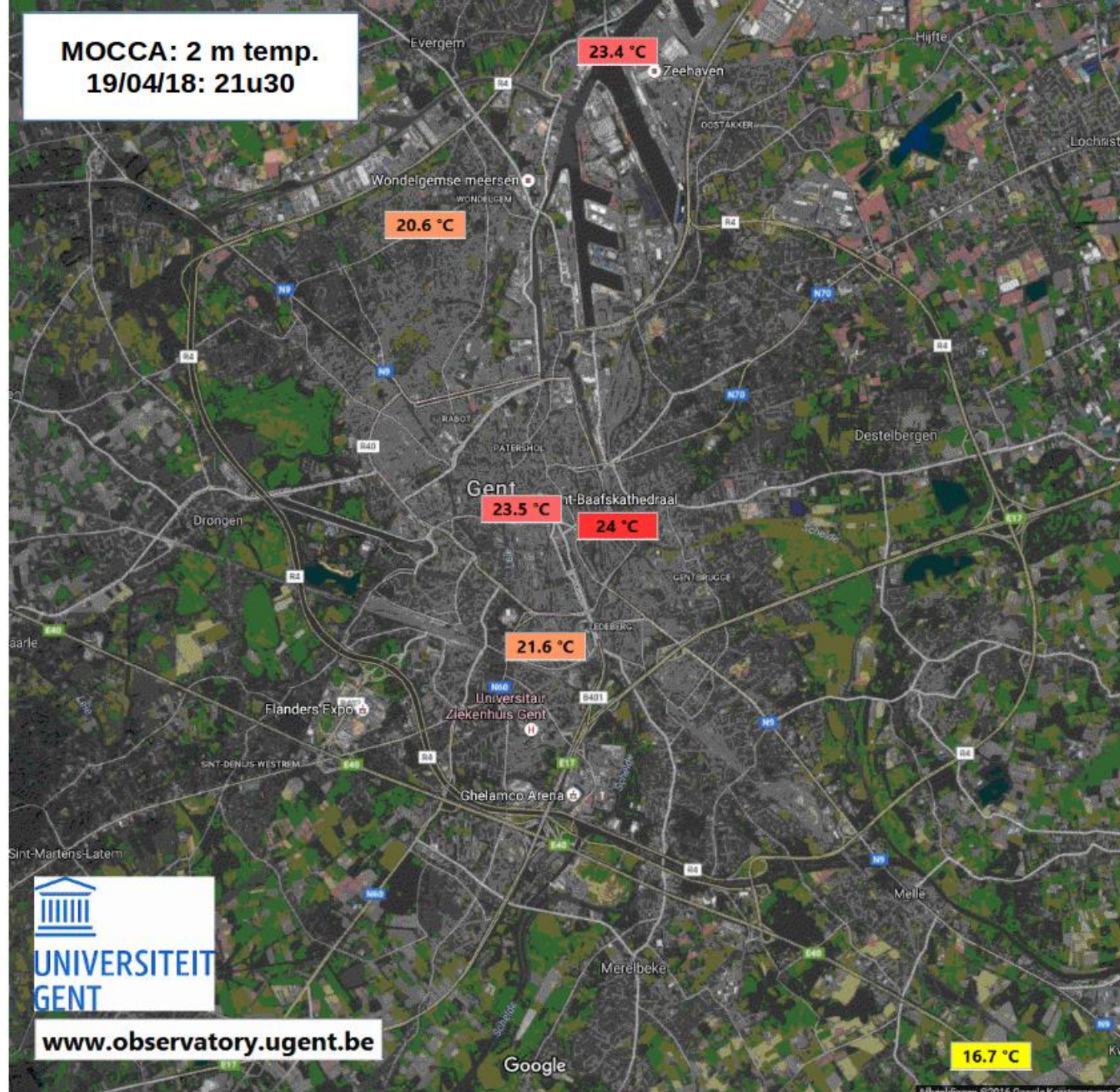




	11 juli	12 juli	13 juli	14 juli	15 juli
<b>Kust</b> Oostende, Knokke-Heist, Nieuwpoort, De Panne, ...	23° 17°	23° 16°	23° 15°	22° 16°	22° 17°
<b>Centrum</b> Brussel, Antwerpen, Gent, Leuven, Mechelen, Kortrijk, Luik, Charleroi, Nijvel, Namen, Bergen, ...	28° 19°	26° 17°	27° 16°	26° 17°	23° 18°
<b>Kempen</b> Turnhout, Hasselt, Genk, Heist-op-den-Berg, Brasschaat, Mol, ...	29° 20°	27° 18°	28° 17°	28° 18°	24° 19°
<b>Ardennen</b> NeufChâteau, Marche-en- Famenne, Bastogne, ...	25° 18°	23° 16°	25° 15°	25° 15°	21° 16°
<b>Belgisch Lotharingen</b> Arlon, Virton, ...	29° 21°	26° 19°	28° 18°	27° 19°	22° 15°



MOCCA: 2 m temp.  
19/04/18: 21u30



[www.observatory.ugent.be](http://www.observatory.ugent.be)

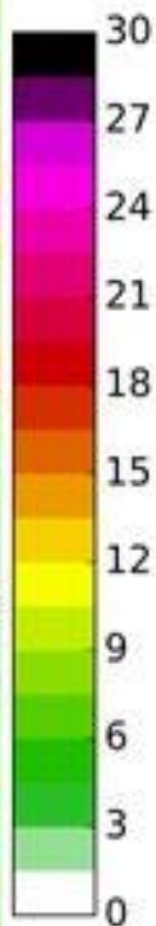
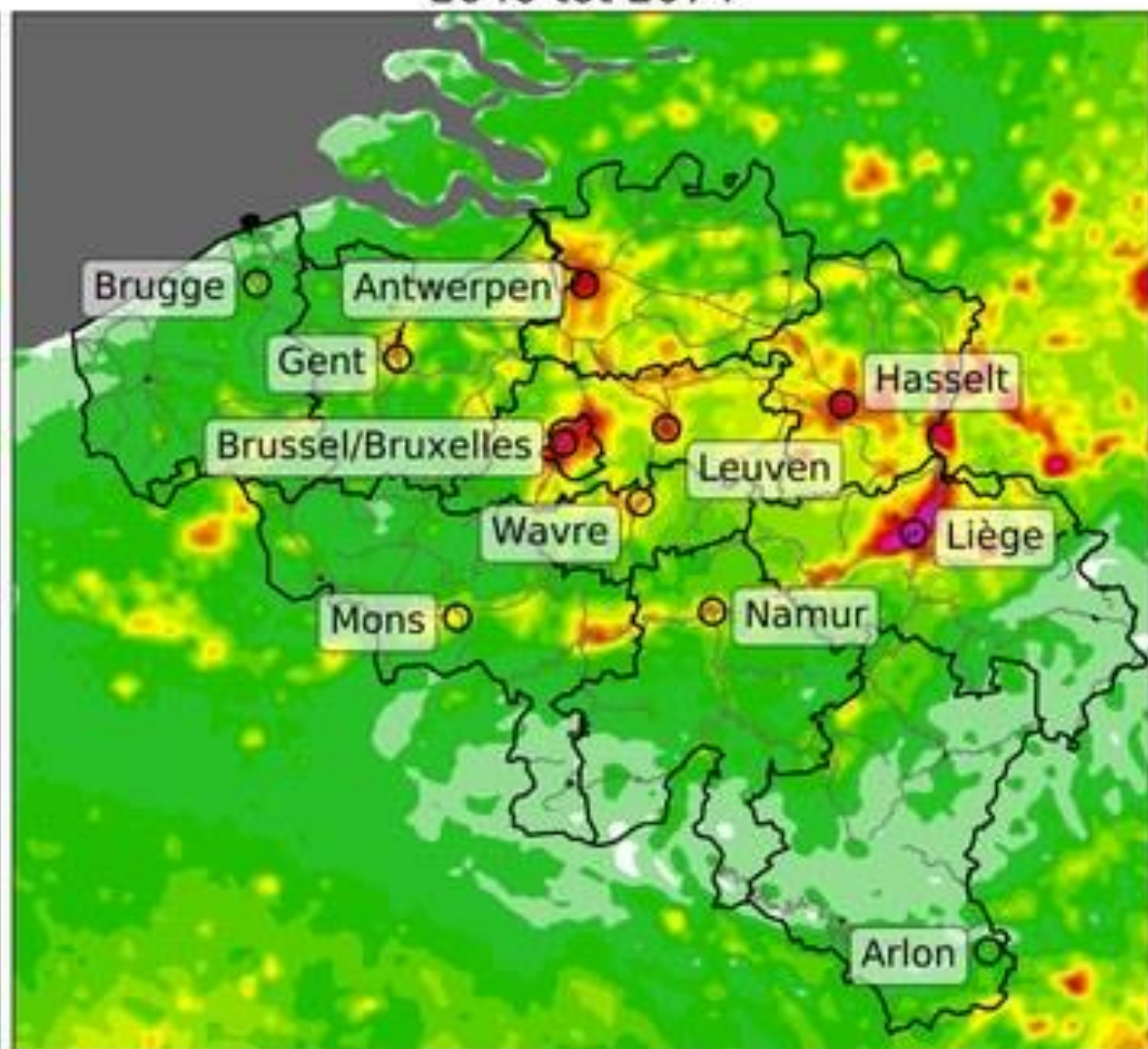
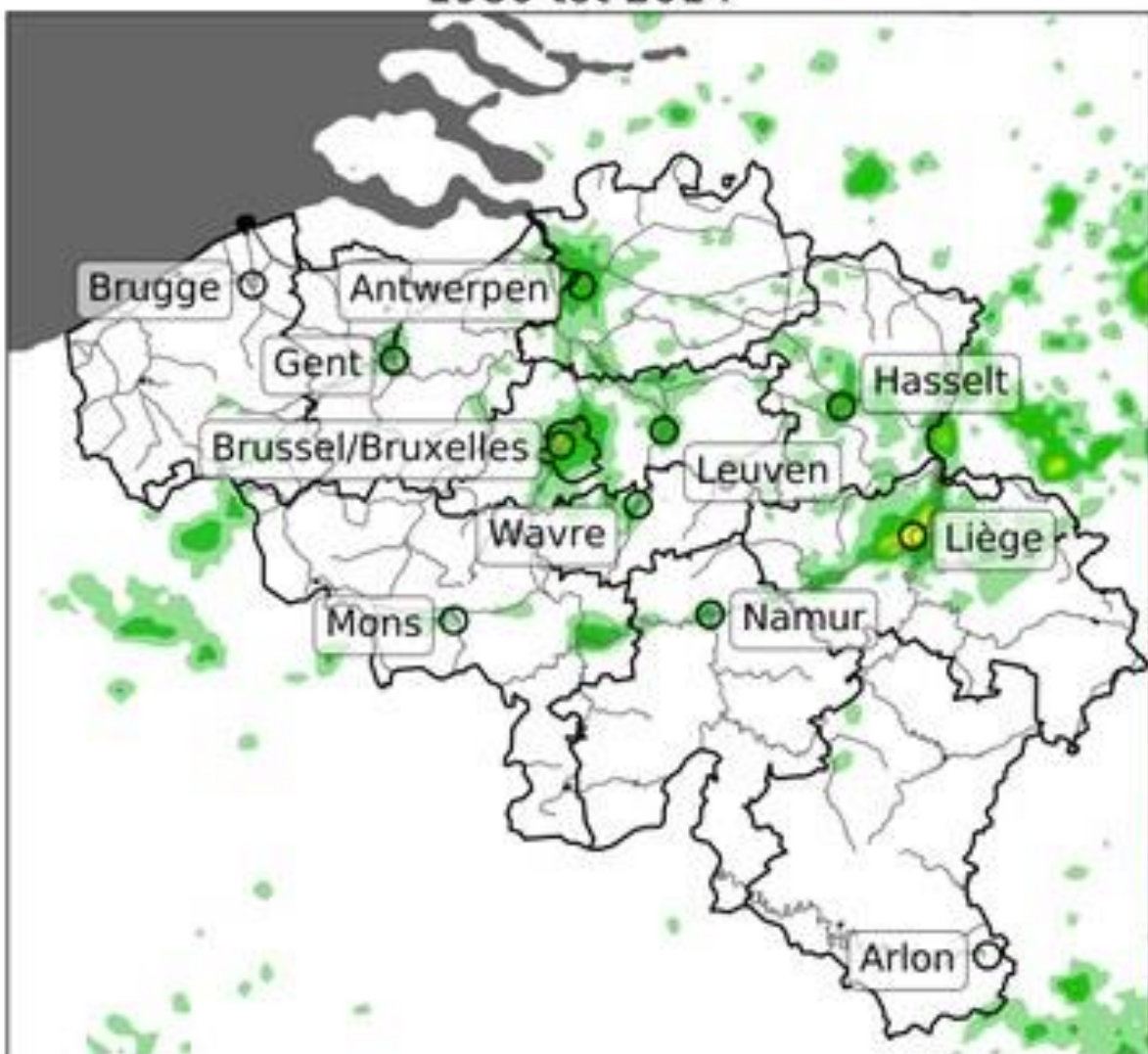
Google



# Het aantal hittegolfdagen per jaar

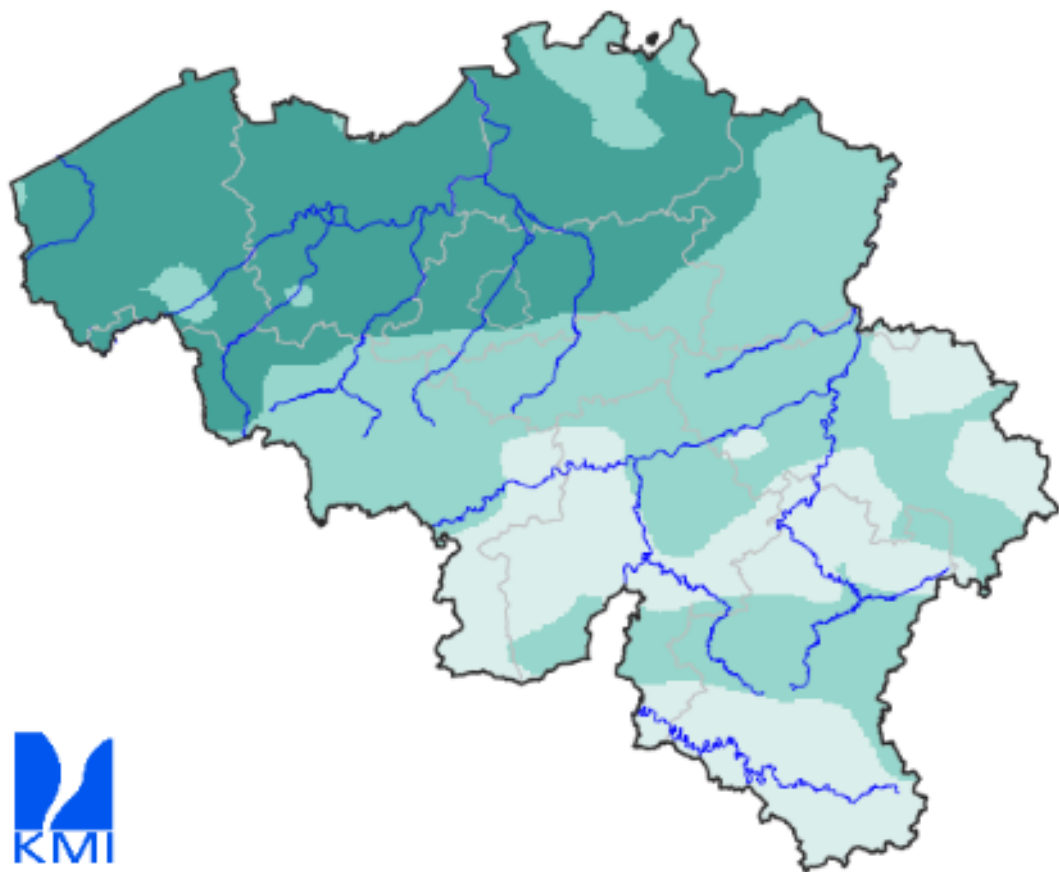
1980 tot 2014

2040 tot 2074



### Regenval in de winter rond 2050 volgens het scenario RCP2.6

Verschil (in %) ten opzichte van de periode 1976-2005



### Regenval in de winter rond 2085 volgens het scenario RCP2.6

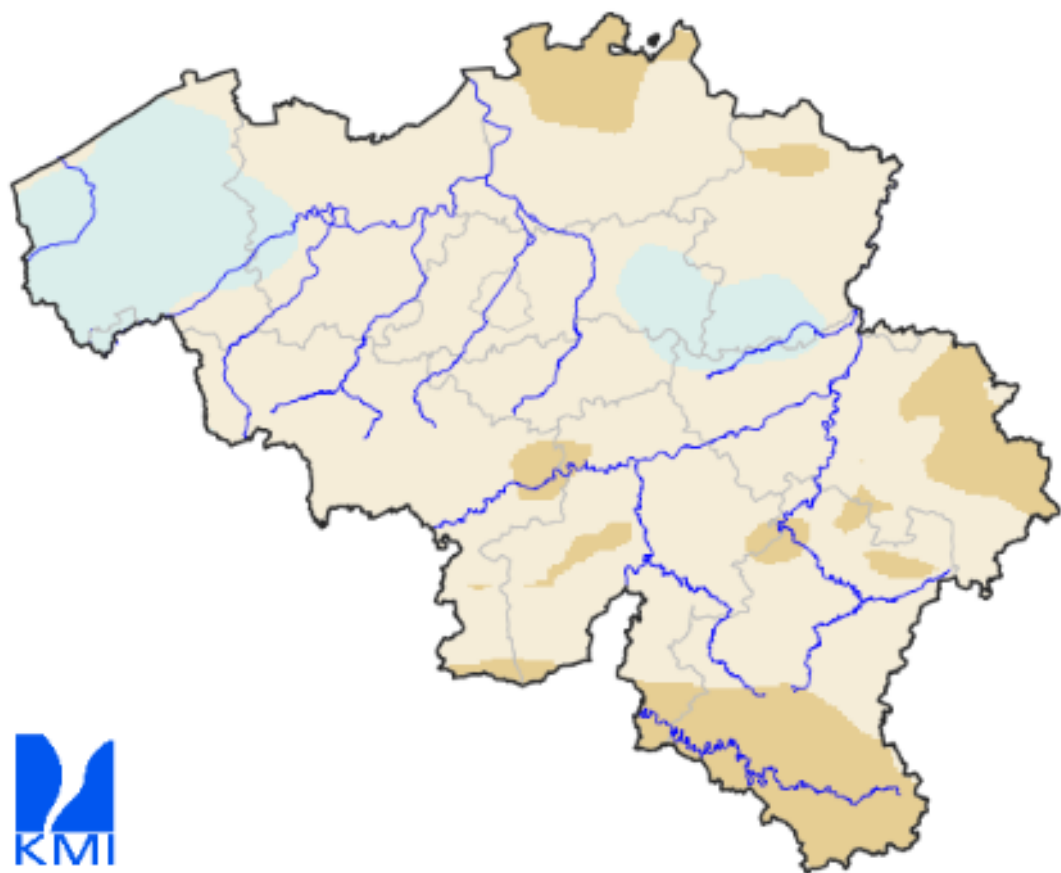
Verschil (in %) ten opzichte van de periode 1976-2005





### Regenval in de winter rond 2050 volgens het scenario RCP4.5

Verschil (in %) ten opzichte van de periode 1976-2005



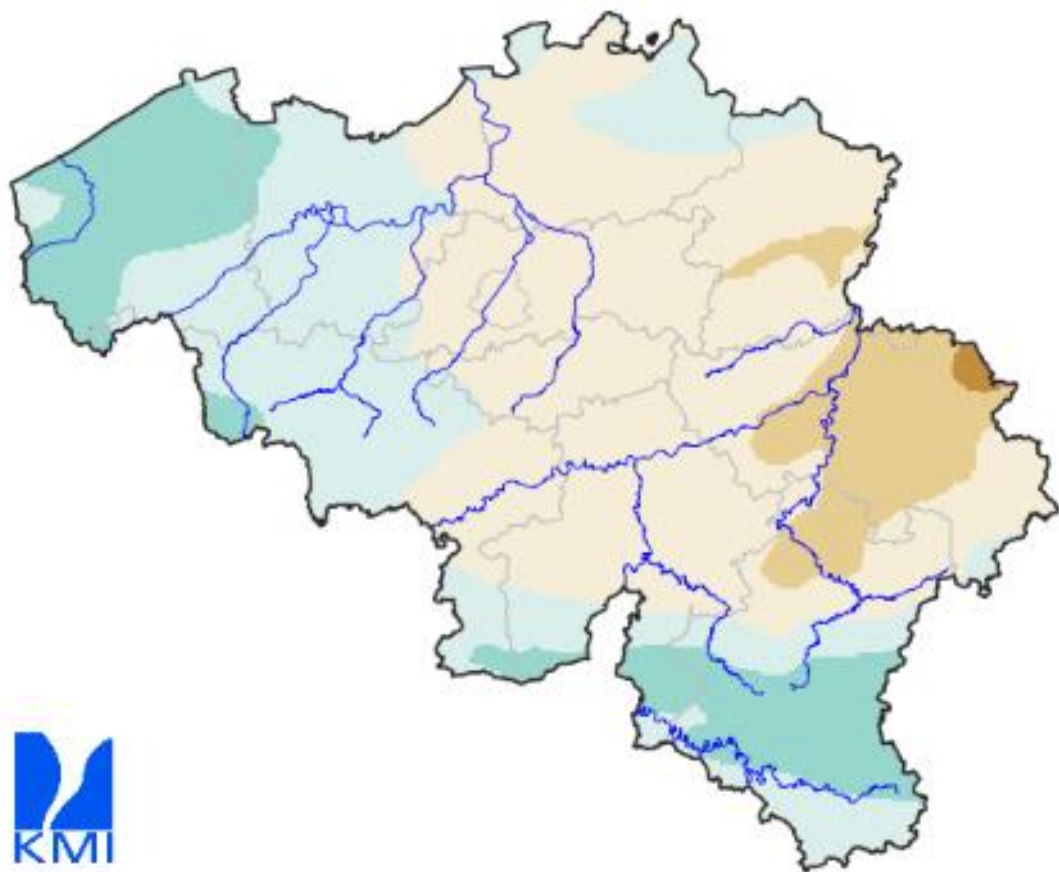
### Regenval in de winter rond 2085 volgens het scenario RCP4.5

Verschil (in %) ten opzichte van de periode 1976-2005



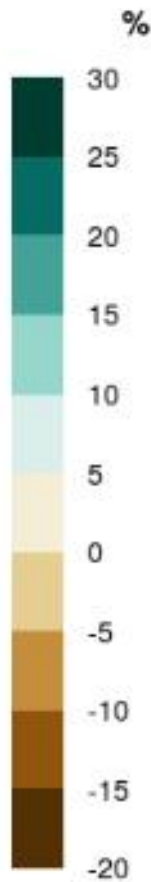
### Regenval in de winter rond 2050 volgens het scenario RCP8.5

Verschil (in %) ten opzichte van de periode 1976-2005

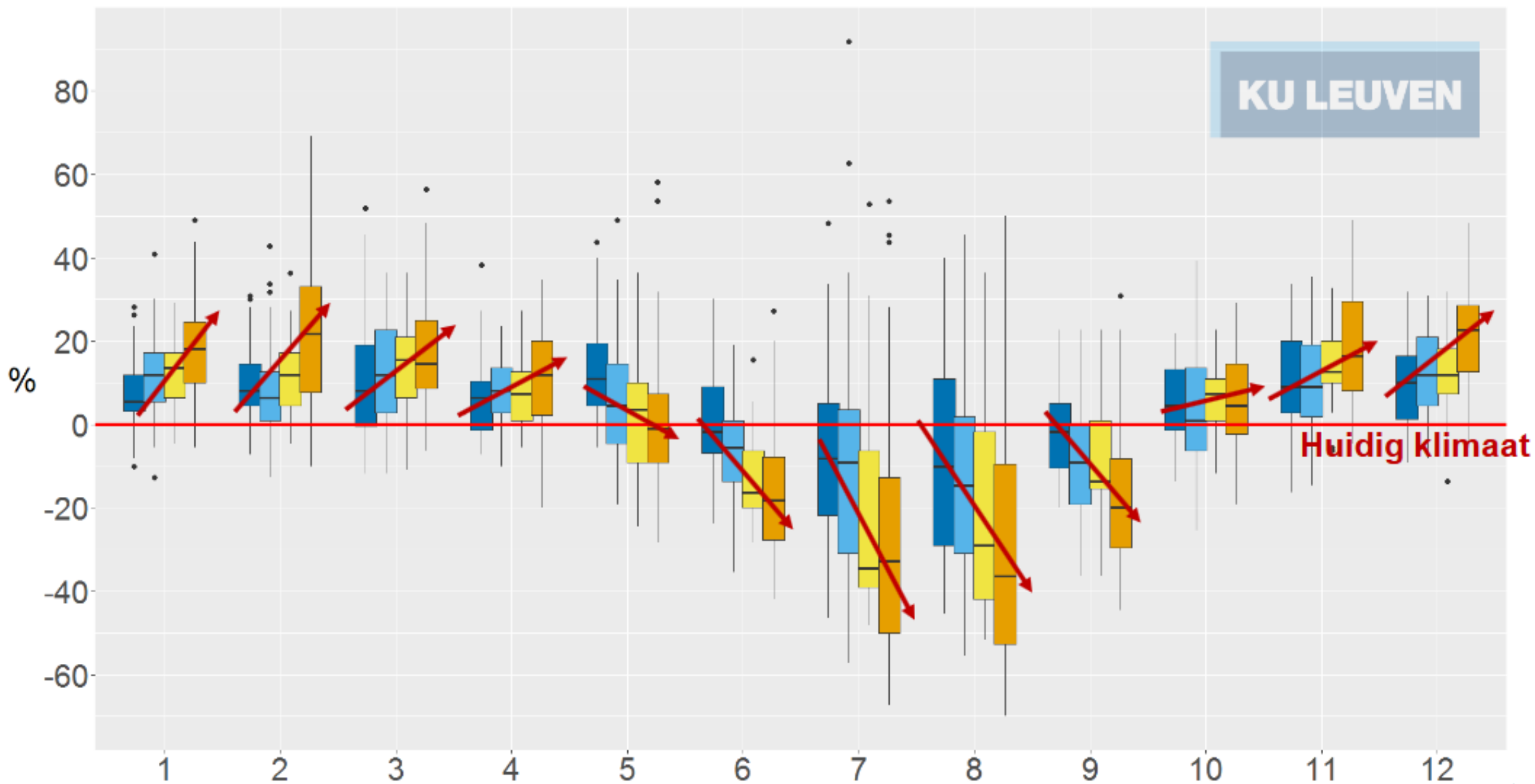


### Regenval in de winter rond 2085 volgens het scenario RCP8.5

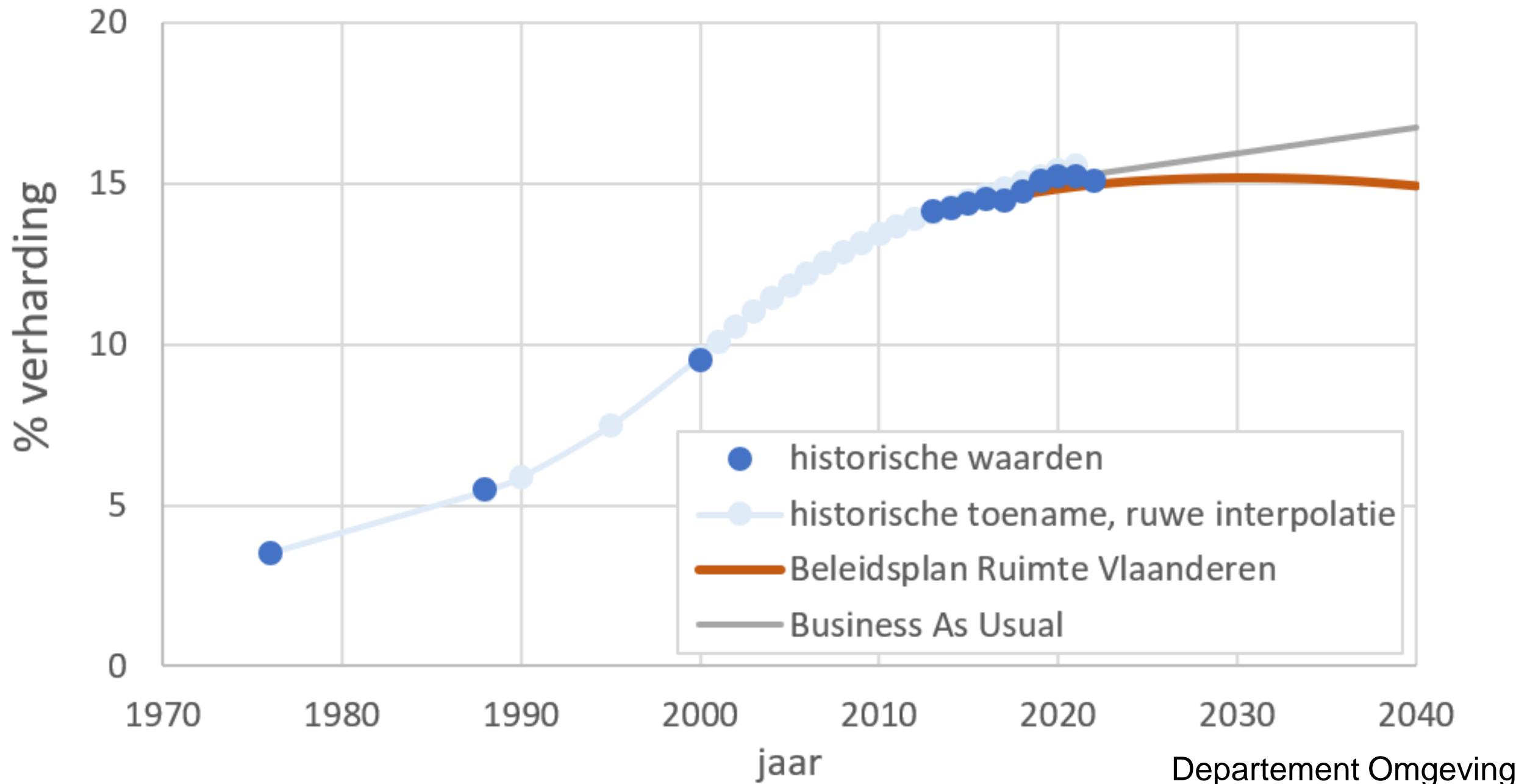
Verschil (in %) ten opzichte van de periode 1976-2005



RCP 2.6 RCP 4.5 RCP 6.0 RCP 8.5



# % verharding in Vlaanderen

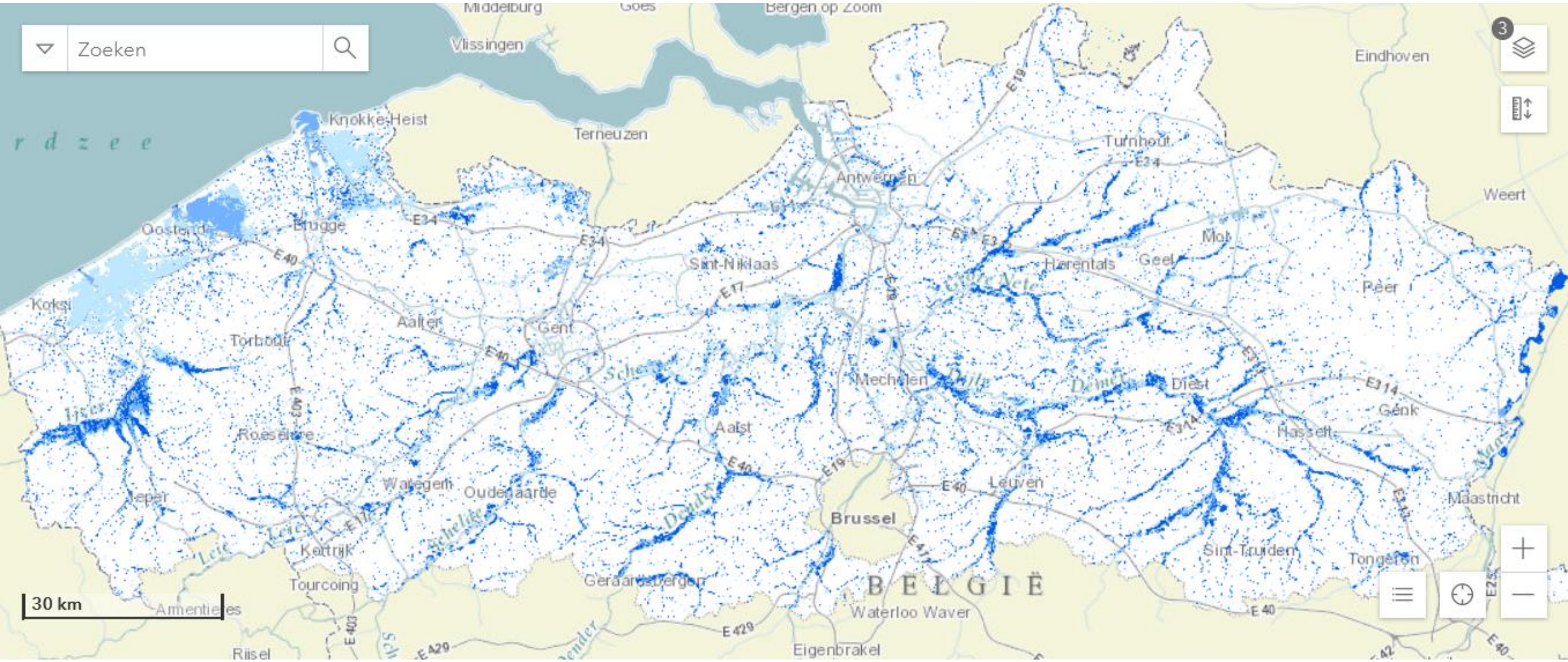






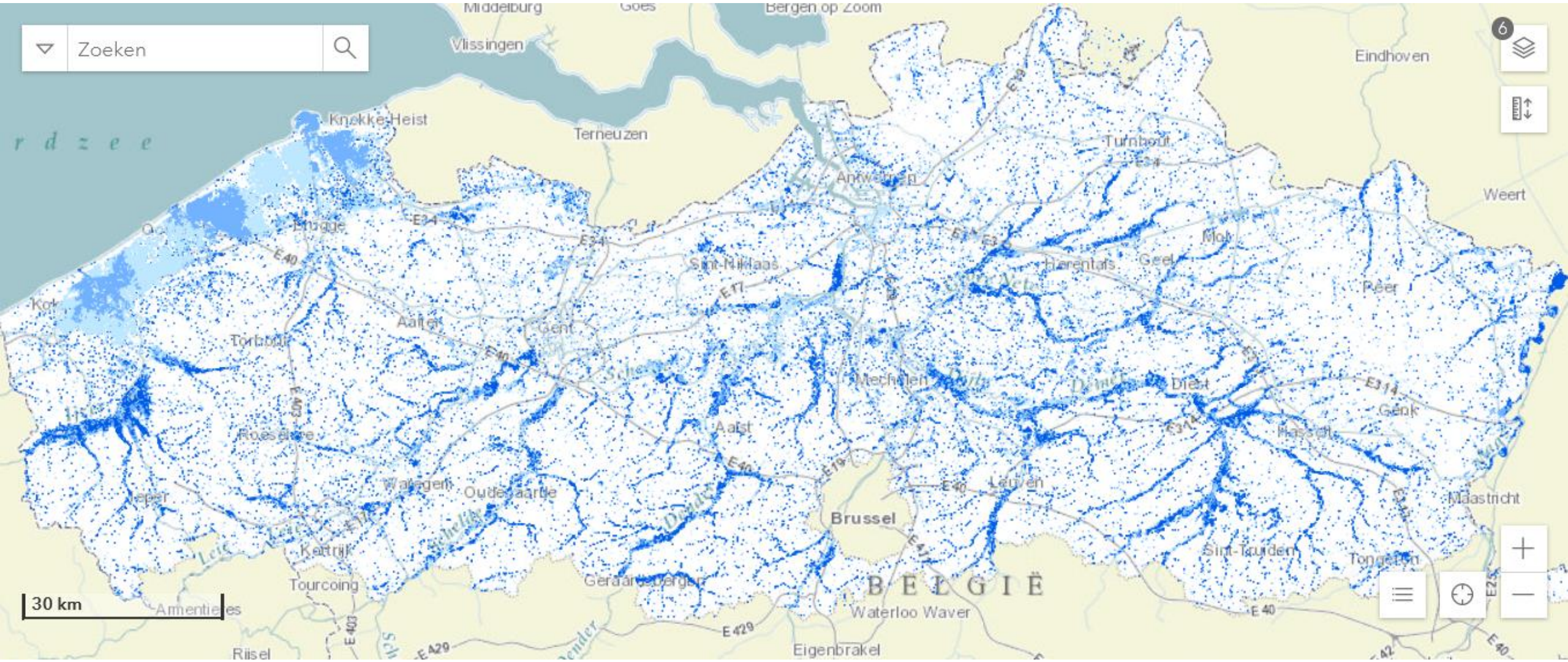


# Fluviale en pluviale gevaarkaarten + kust (2023)





# Fluviale en pluviale gevaarkaarten + kust (2100)



#VVSGklimaatdag

## 4. Wat kunnen wij doen?



**vvsg**

**heusden  
zolder**







# Zonnepanelen: aantal kWh/dag Meise tot 8 november 2019

jaartotaal 4057.5 kWh

jan 109.5 kWh

feb 283.8 kWh

maa 301.4 kWh

apr 510.3 kWh

mei 519.8 kWh

jun 574.2 kWh

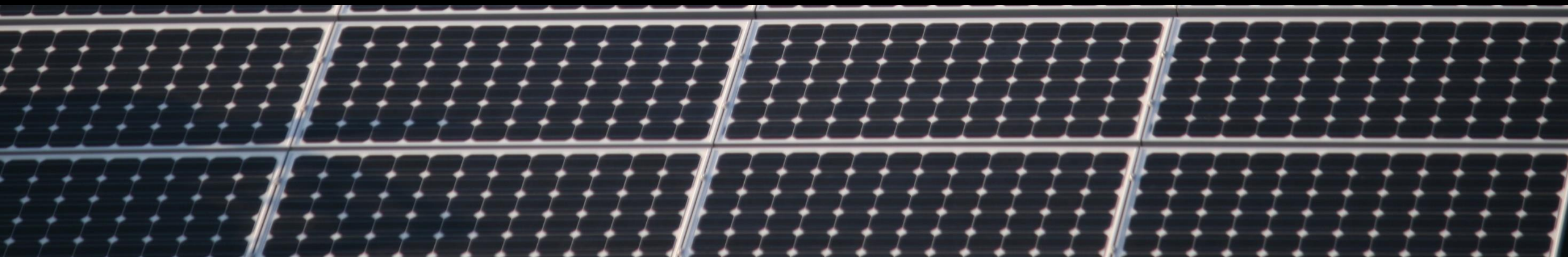
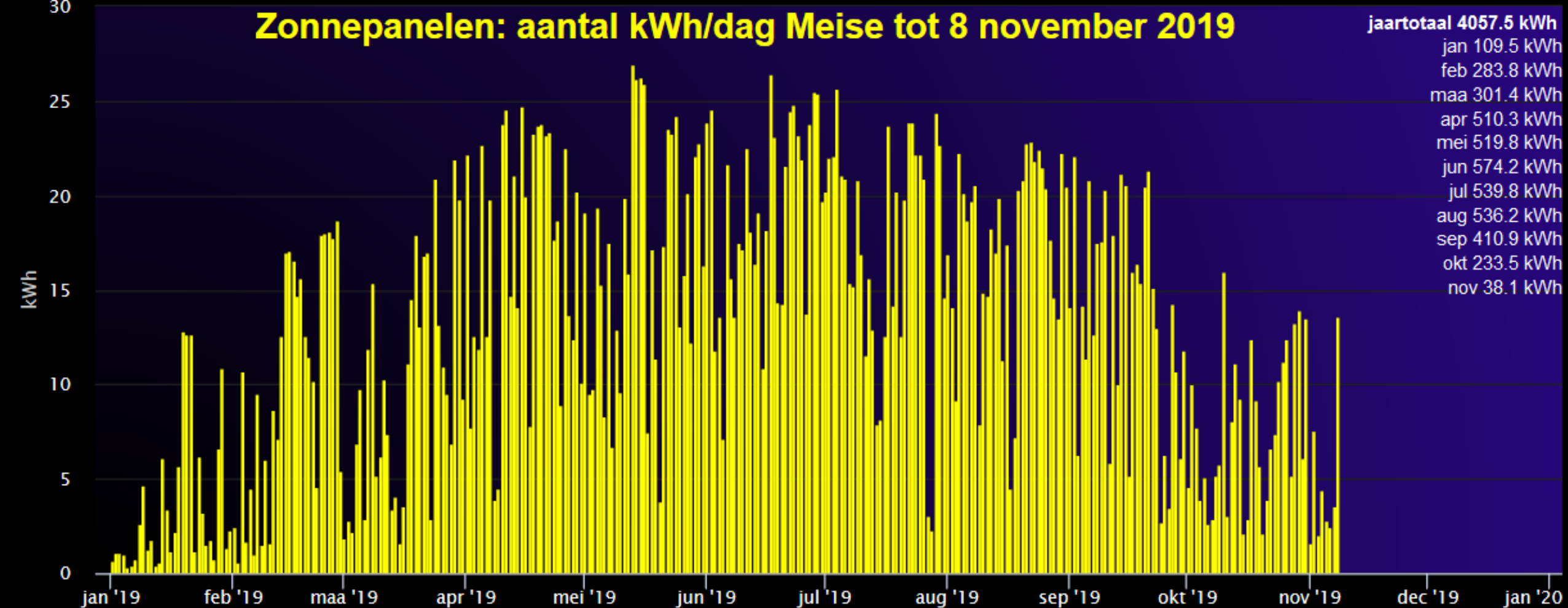
jul 539.8 kWh

aug 536.2 kWh

sep 410.9 kWh

okt 233.5 kWh

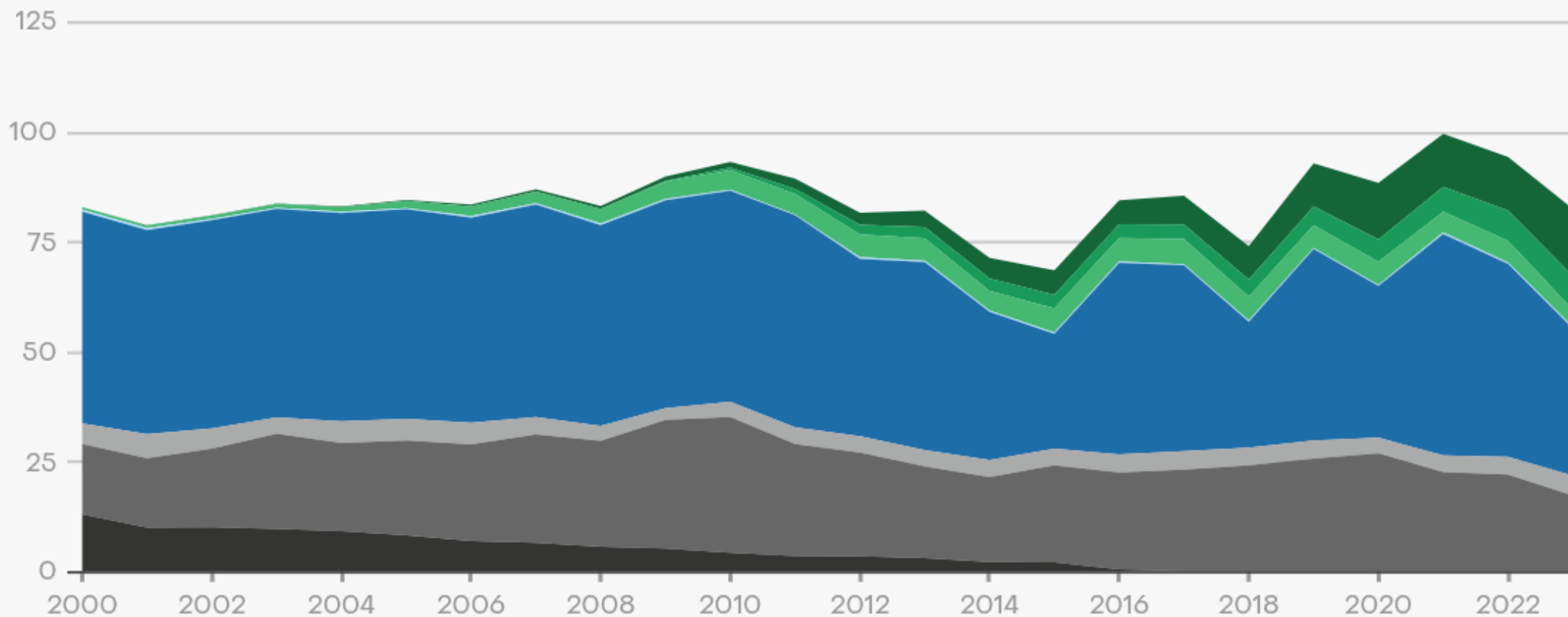
nov 38.1 kWh



# Belgium electricity generation by source

Terawatt hours

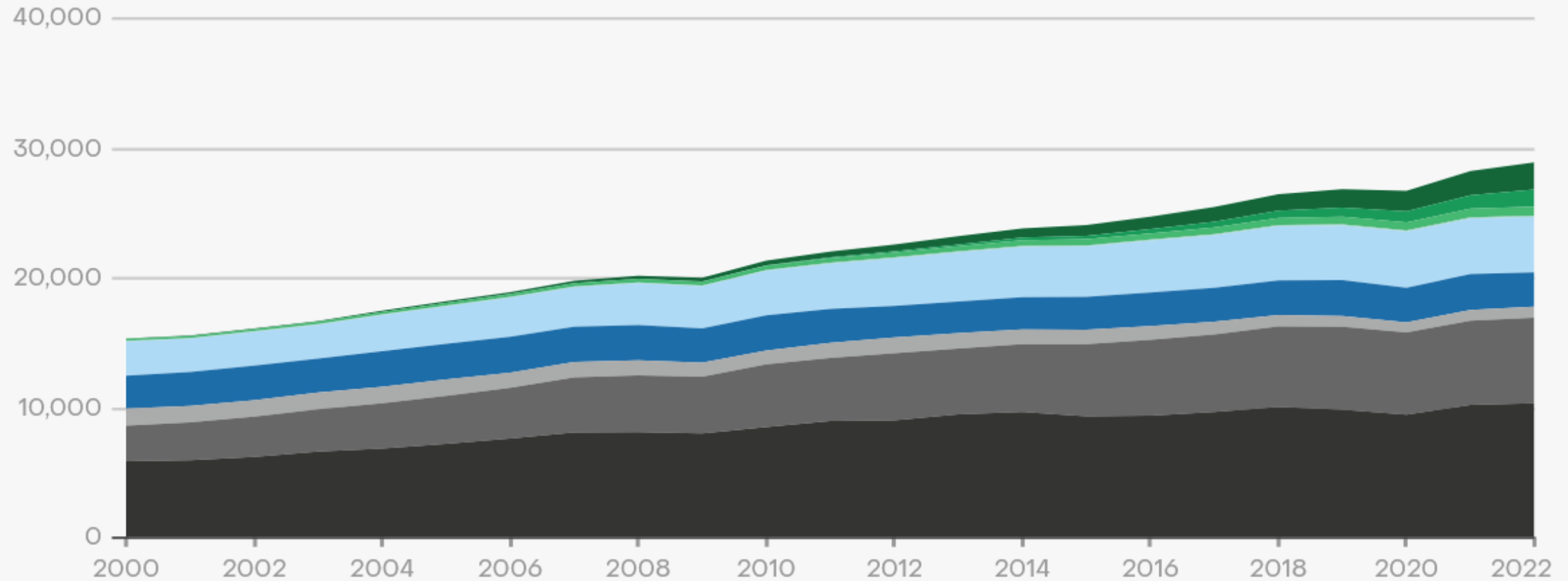
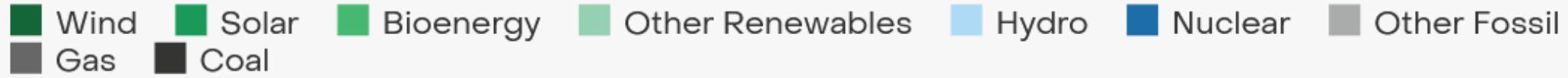
Wind Solar Bioenergy Other Renewables Hydro Nuclear Gas Coal Other Fossil



Source: Ember Electricity Data Explorer, [ember-climate.org](https://ember-climate.org)

# World electricity generation by source

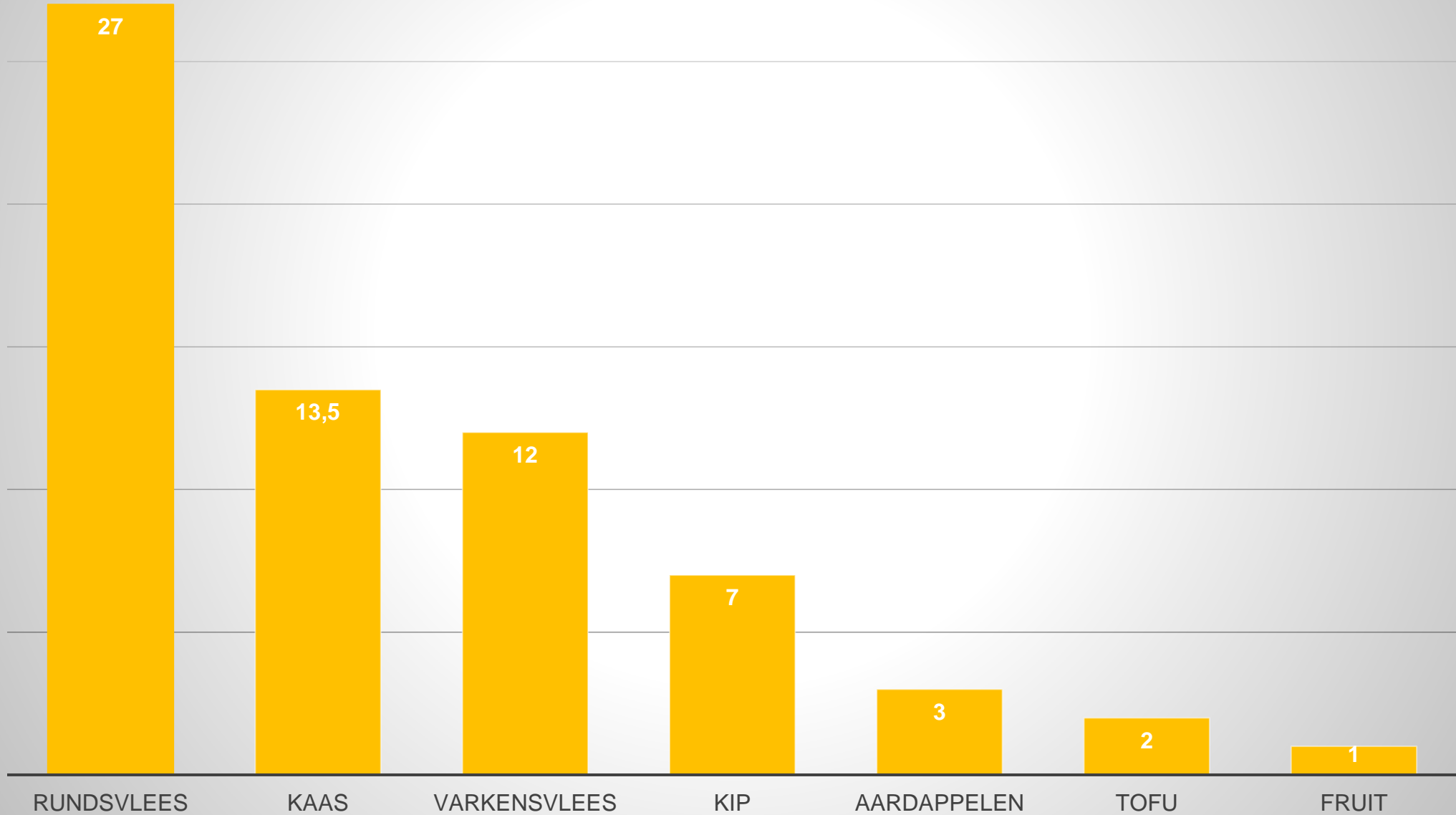
Terawatt hours



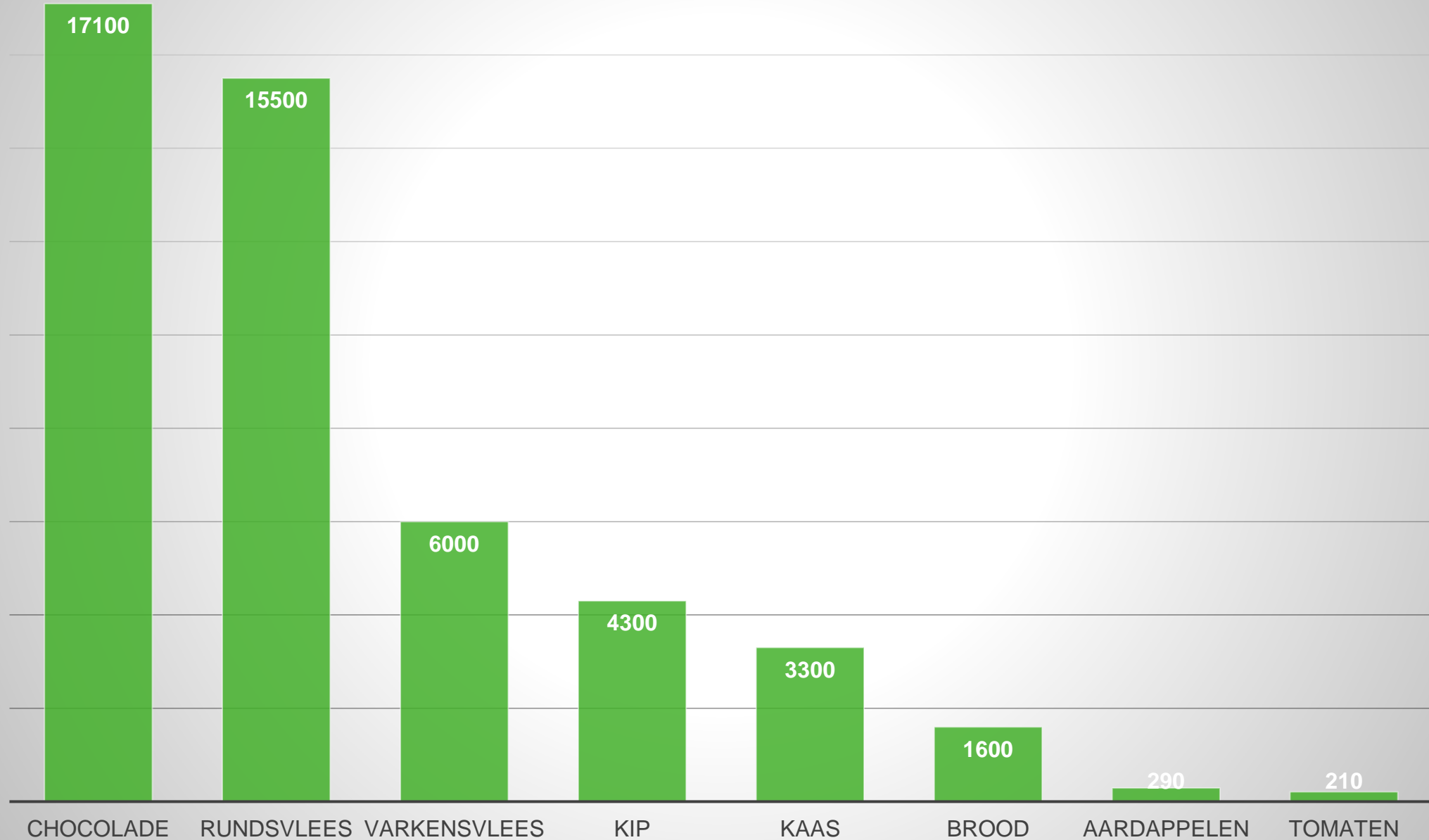
Source: Ember Electricity Data Explorer, [ember-climate.org](https://ember-climate.org)



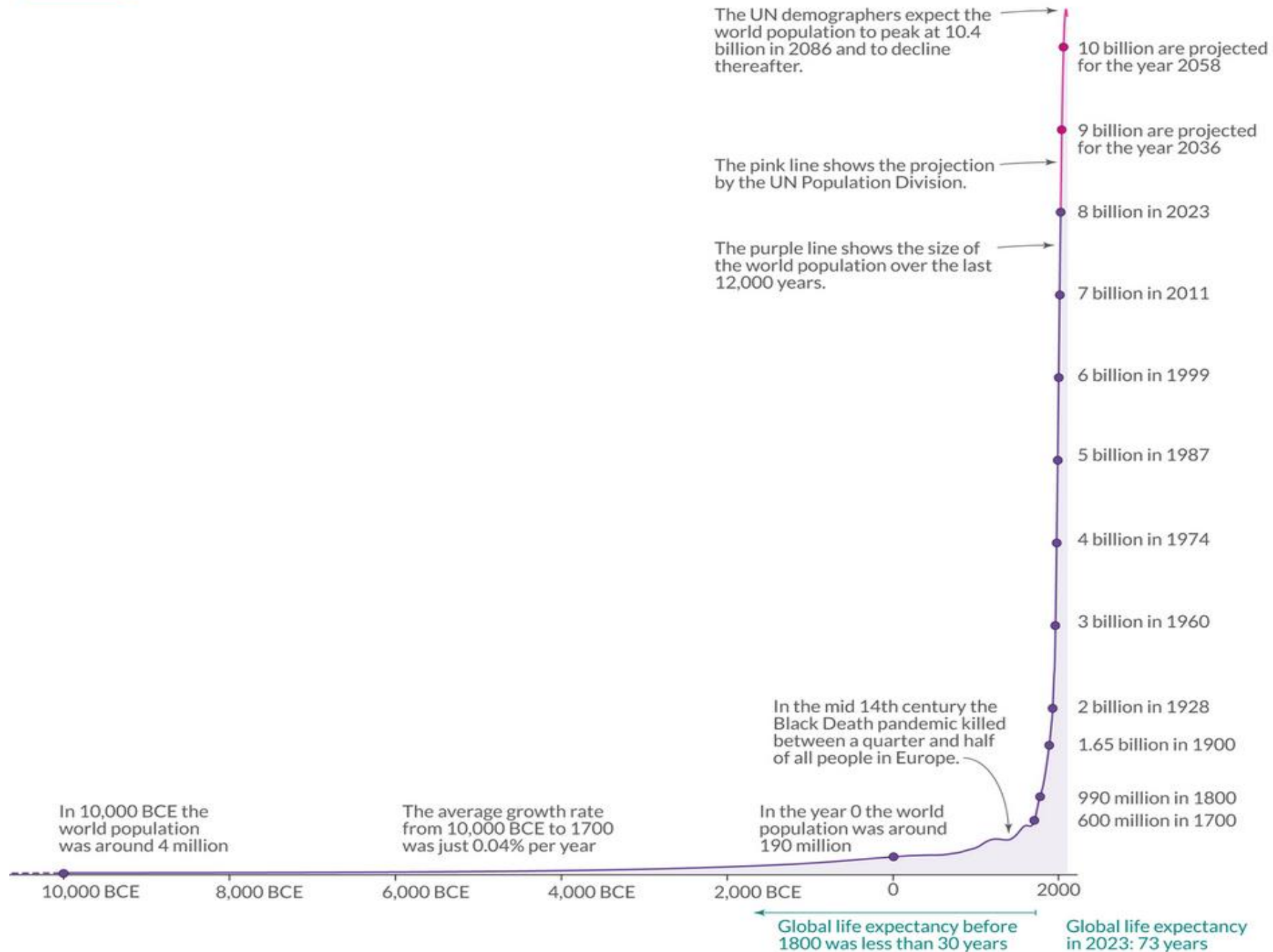
# Hoeveel kg CO2 equivalent is er nodig voor 1kg ...?



# Hoeveel liter water is er nodig voor 1 kg ...?

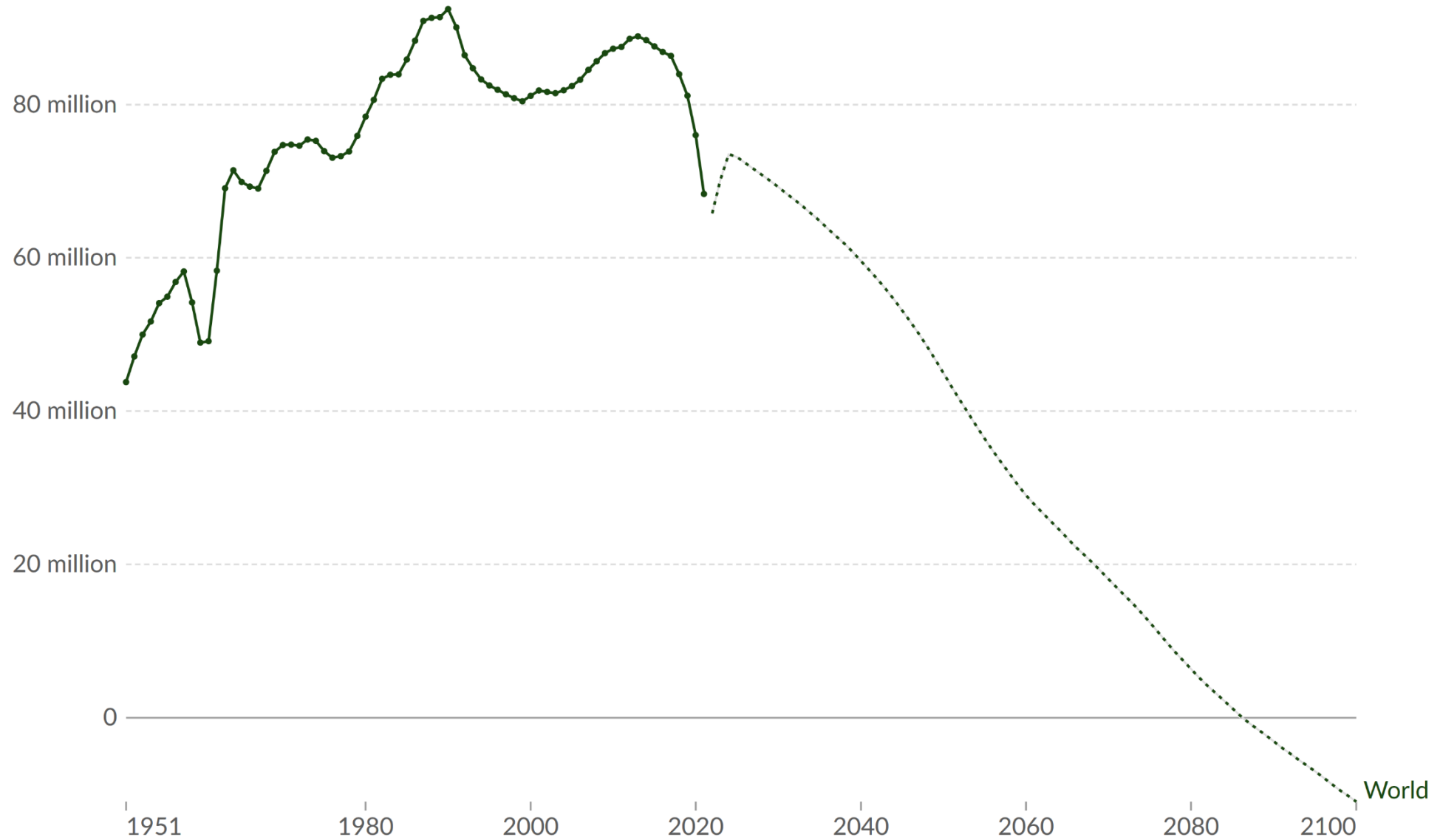


# The size of the world population over the long-run



# Annual population growth

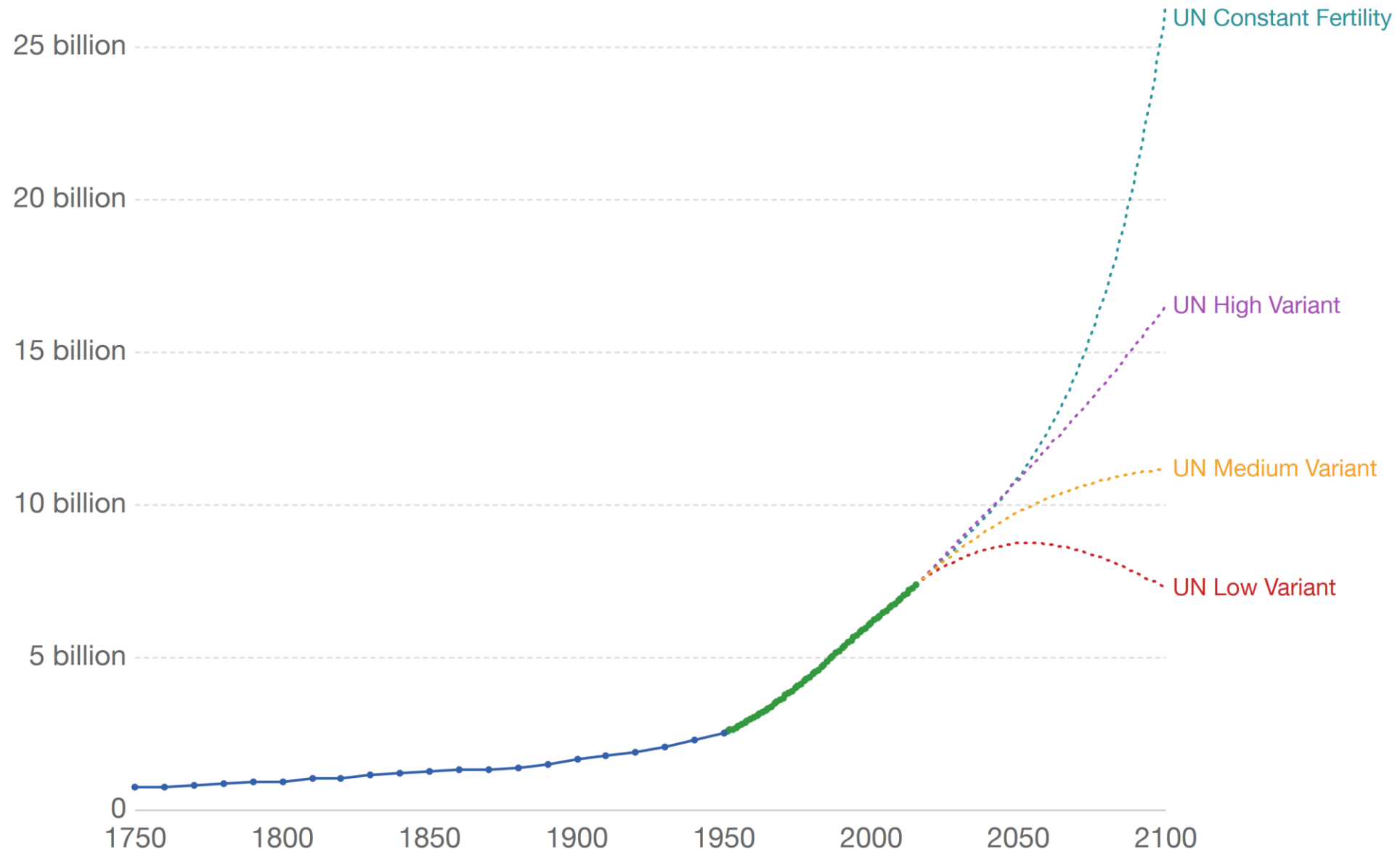
Historic estimates with future projections based on the UN medium-fertility scenario<sup>1</sup>.





# Comparison of world population projections

Projections from 2015 onwards depict different fertility variants





← BRUSSEL   
← Zaventem  

WILLE



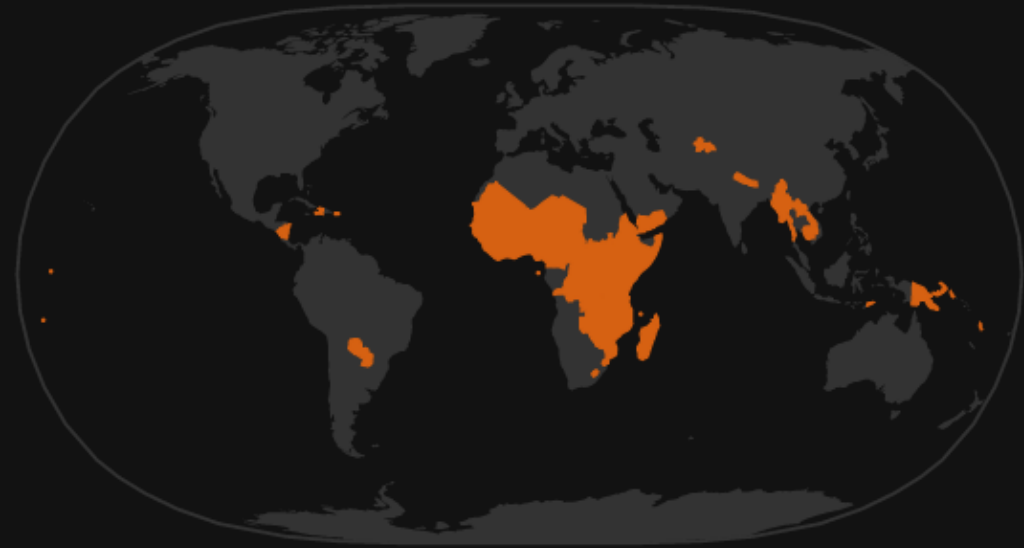
### London-Rome

234 kg CO<sub>2</sub>



### London-New York City

986 kg CO<sub>2</sub>



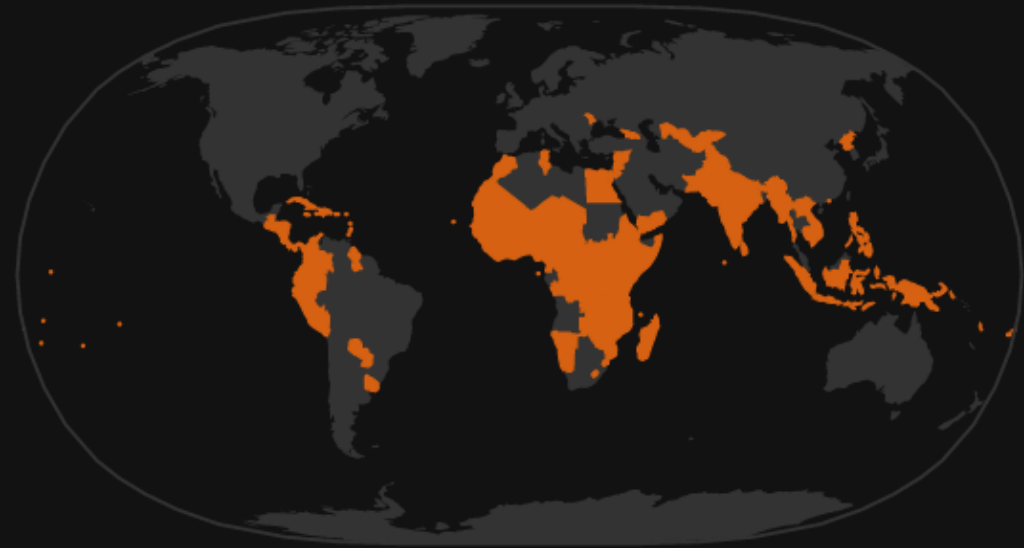
### London-Los Angeles

1,650 kg CO<sub>2</sub>

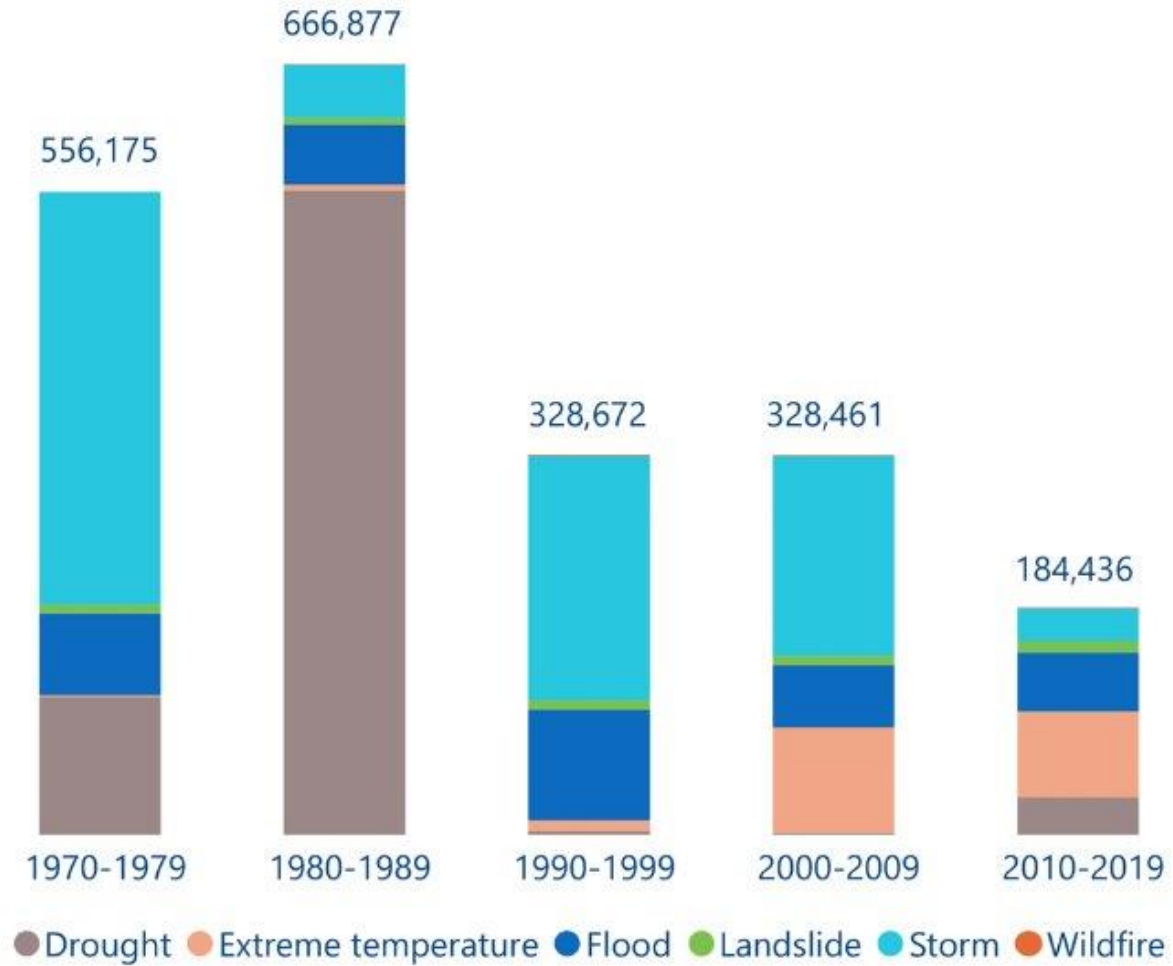


### London-Perth

3,153 kg CO<sub>2</sub>

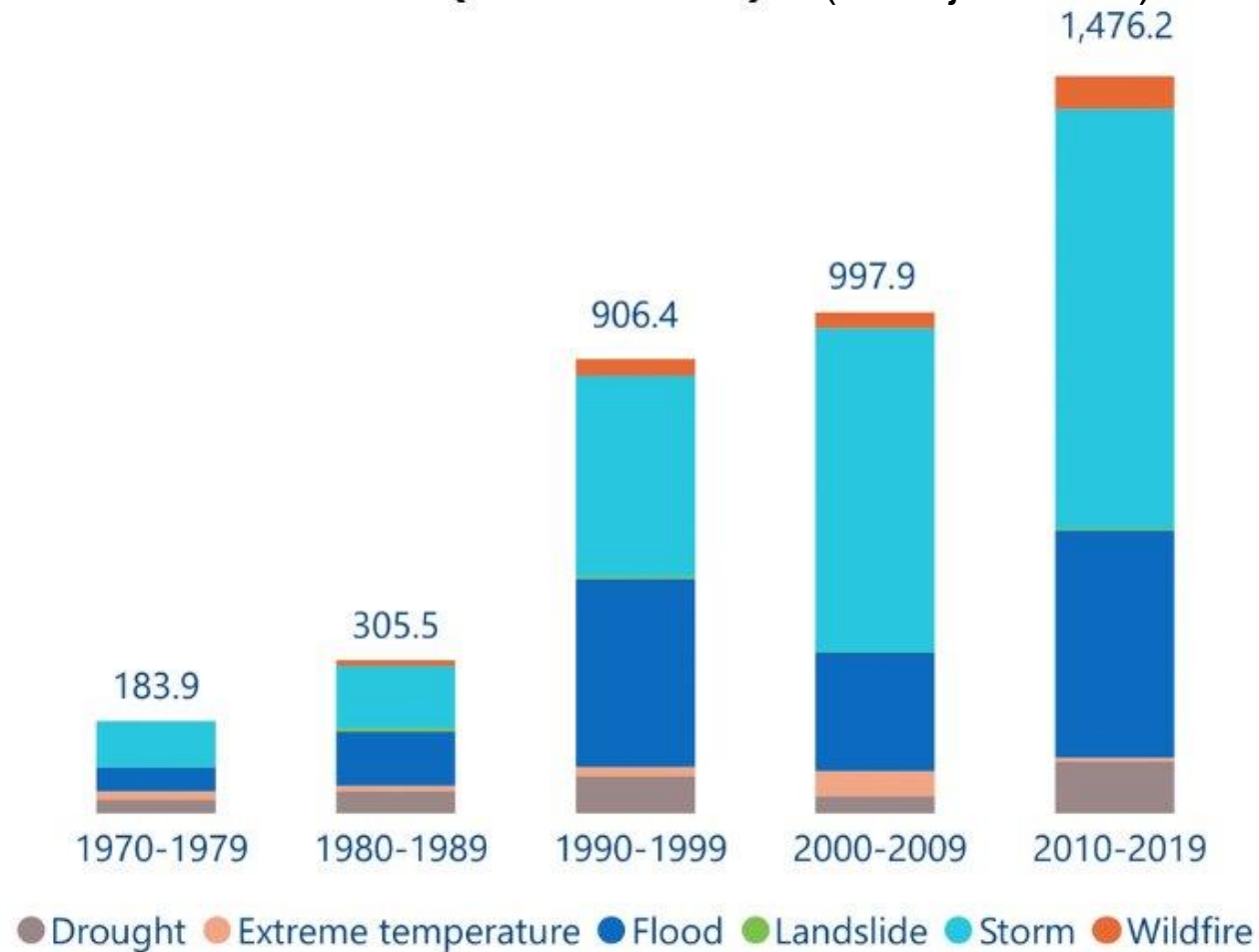


## Reported deaths worldwide by hazard type (1970-2021)



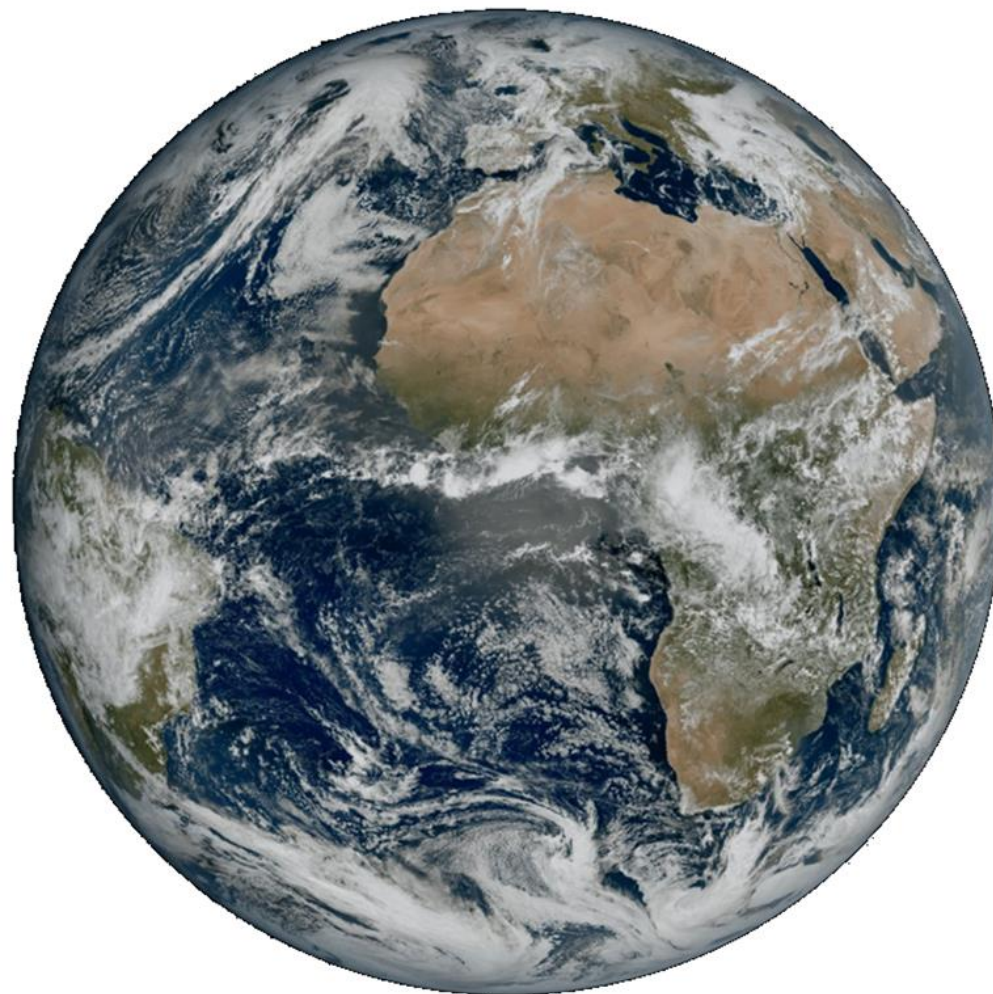


# Reported economic losses worldwide by hazard type (1970-2021) (in miljard euro)



#VVSGklimaatdag

Bedankt voor je deelname!





**Vlaanderen**  
is energie en klimaat

**heusden  
zolder**



**vvsq** netwerk  
klimaat



**Aqua  
Flanders**

*fluvius.*

**ethias**



**elia**

| Elia Group

 **Belfius**

**proximus**













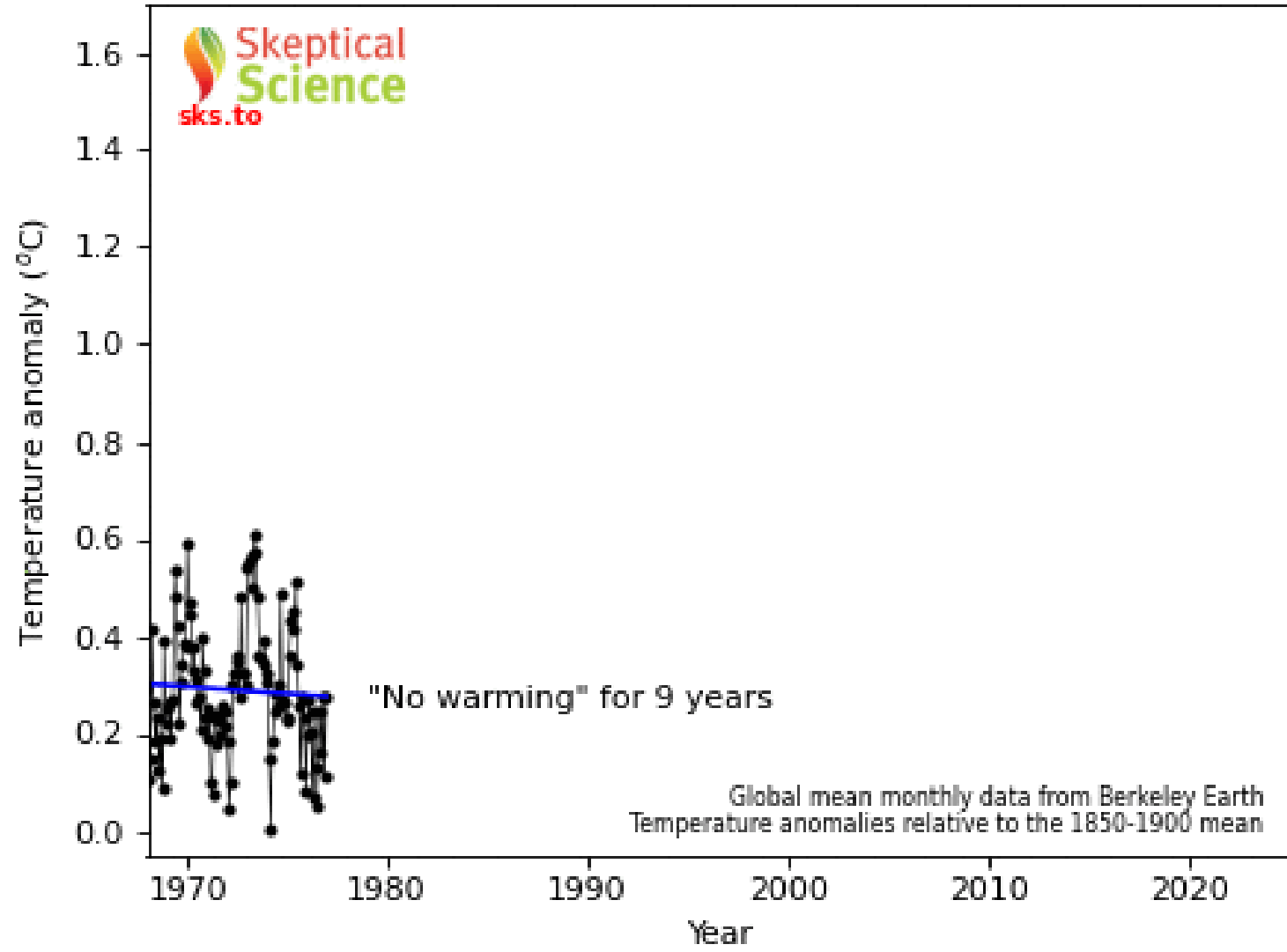
















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**heusden  
zolder**



**vvsg** netwerk  
klimaat



*fluvius.*

**ethias**



**elia**

| Elia Group

 **Belfius**

**proximus**

