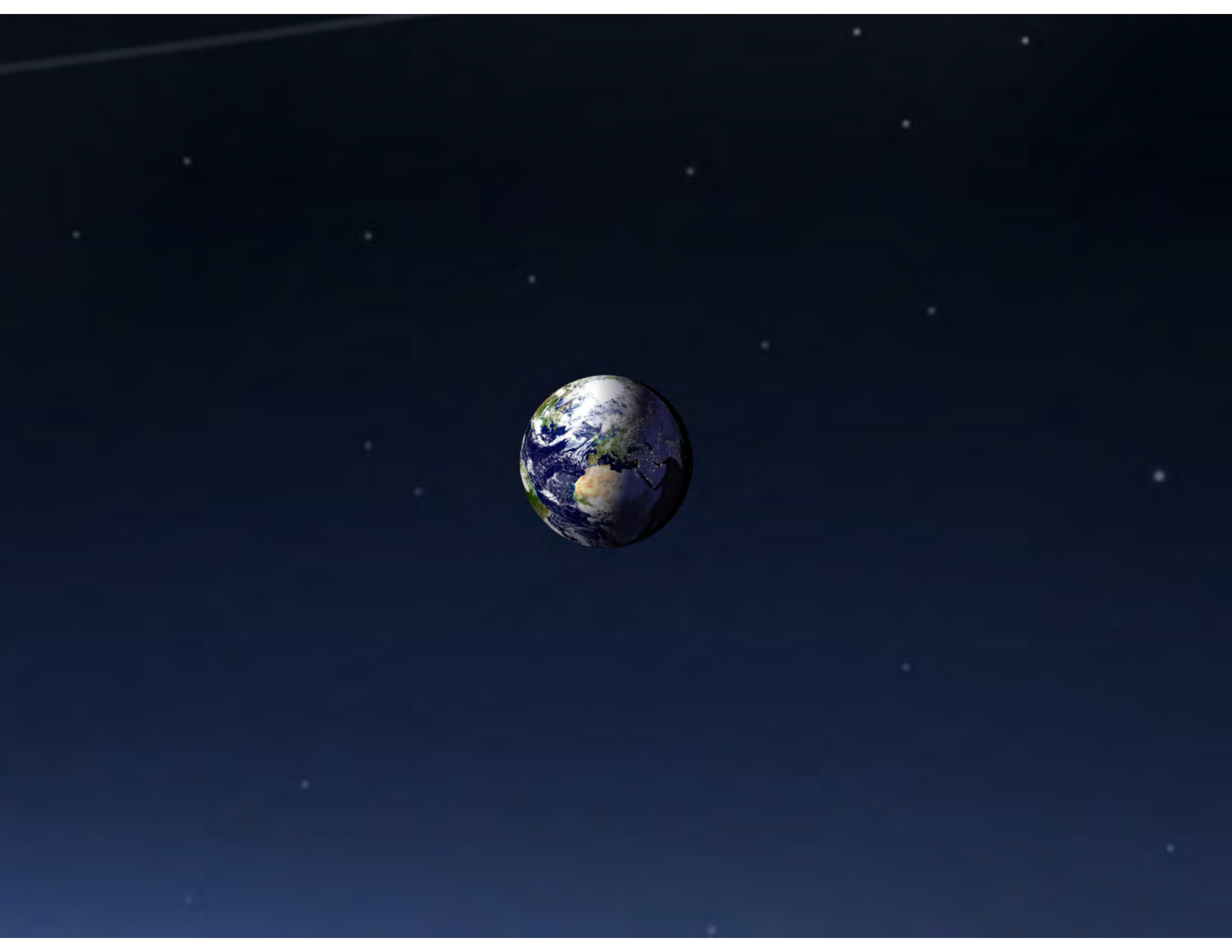


A white bus with a red stripe is driving through a flooded street lined with tall, thin trees. The water is deep, reaching up to the windows of the bus. The bus has a destination sign that reads "7372 Insel Reichenau" and a logo that says "S+G". The scene is set in a lush, green environment with a blue sky visible through the trees.

Nach Paris: Wie kriegen wir die Klimakrise noch in den Griff?

Prof. Stefan Rahmstorf
Potsdam-Institut für Klimafolgenforschung








Der Mensch verändert das Klima „durch Fällen der Wälder [...] und durch die Entwicklung großer Dampf- und Gasmassen an den Mittelpunkten der Industrie“.

Alexander von Humboldt, 1843



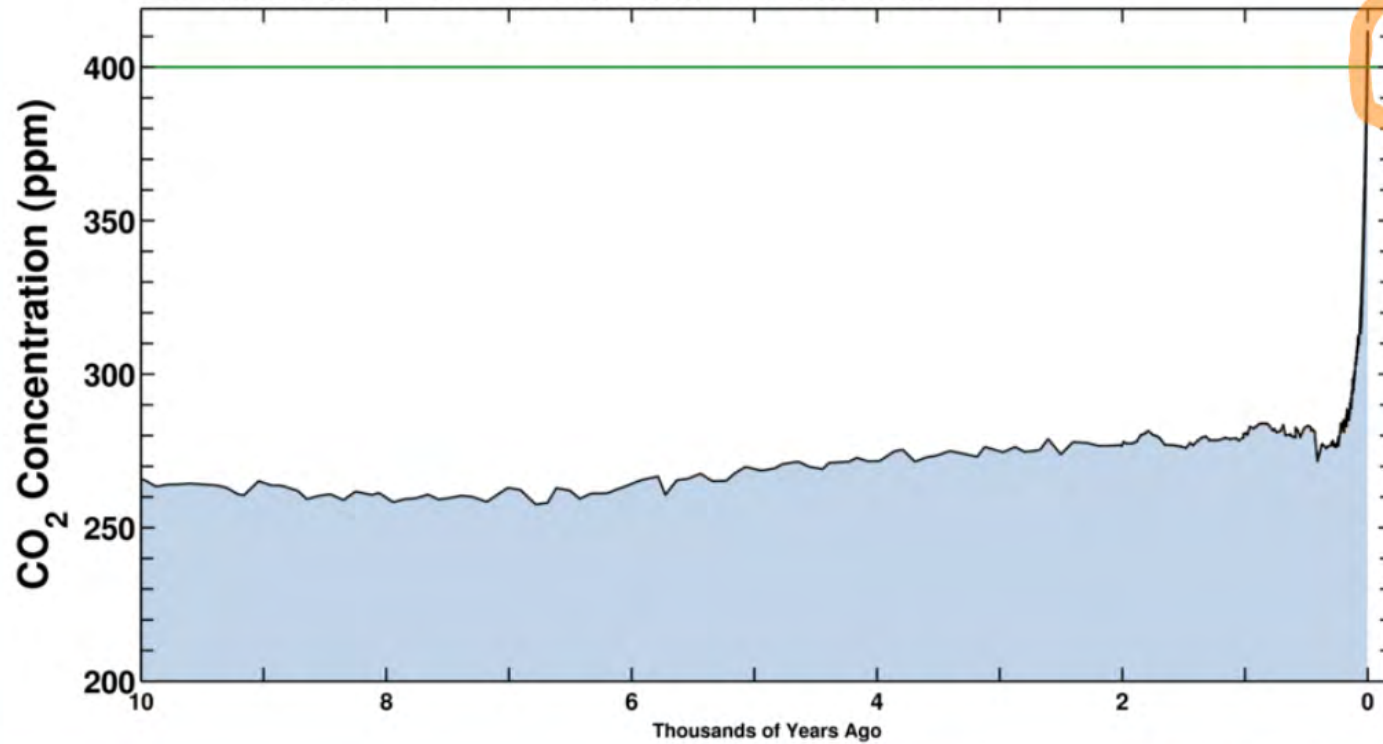
Alexander von Humboldt: Central-Asien. Untersuchungen über die Gebirgsketten und die vergleichende Klimatologie.



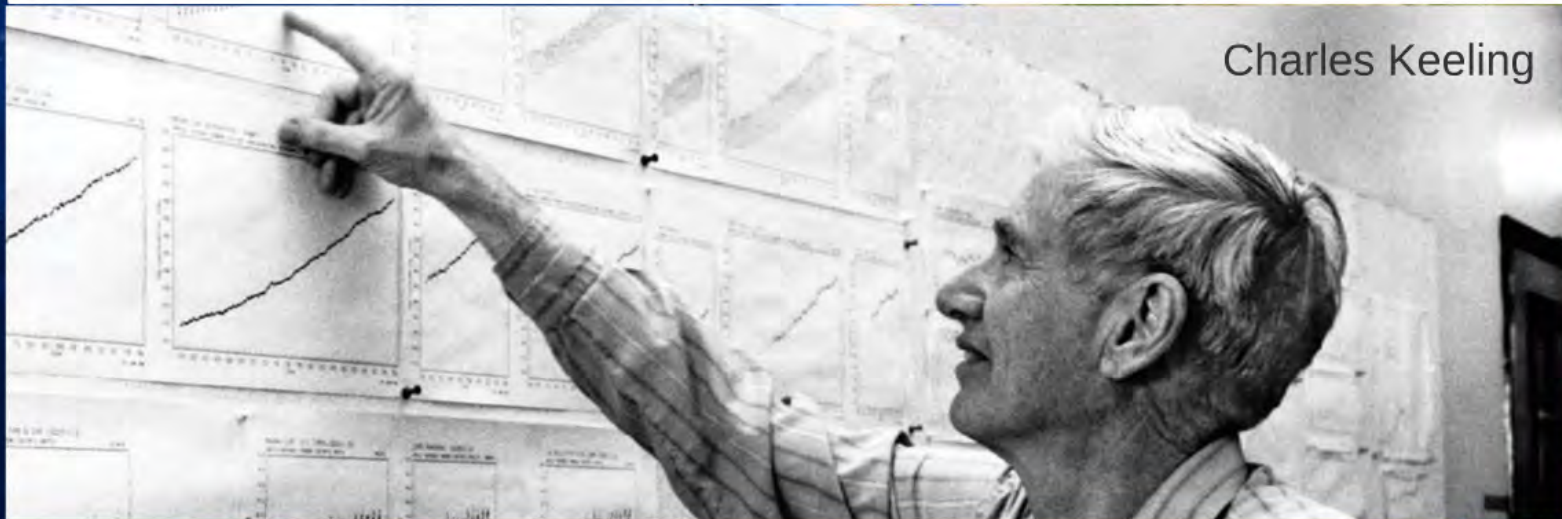
Latest CO₂ reading
March 09, 2019

413.45 ppm

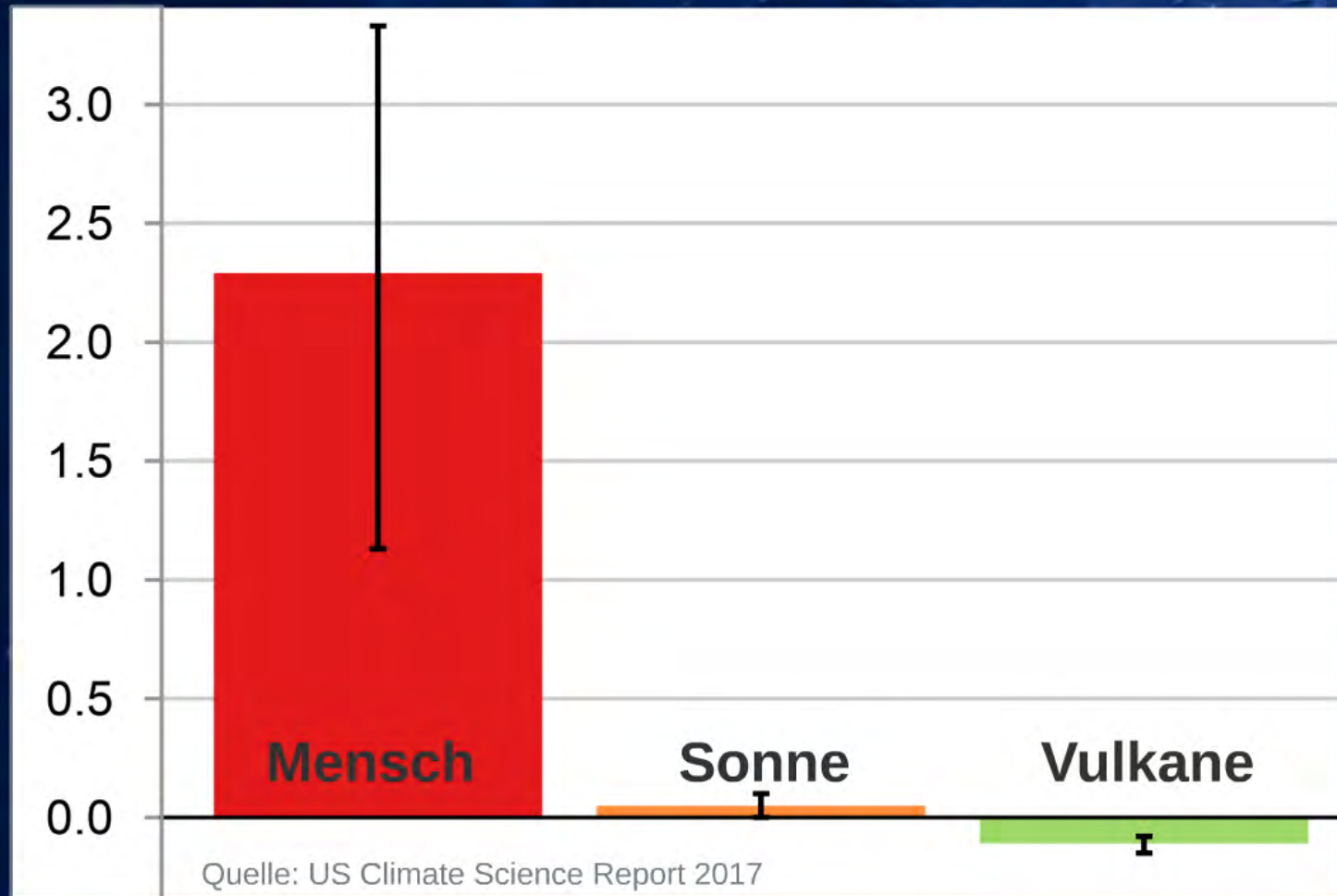
Ice-core data before 1958. Mauna Loa data after 1958.



2 Watt/m²



Strahlungsantrieb: die Ursache der Erwärmung



Strahlungsantrieb in Watt pro Quadratmeter seit 1750

THE
LONDON, EDINBURGH, AND DUBLIN
PHILOSOPHICAL MAGAZINE
AND
JOURNAL OF SCIENCE.

[FIFTH SERIES.]

APRIL 1896.

XXXI. *On the Influence of Carbonic Acid in the Air upon the Temperature of the Ground.* By Prof. SVANTE ARRHENIUS*.

I. *Introduction: Observations of Langley on Atmospherical Absorption.*

A GREAT deal has been written on the influence of the absorption of the atmosphere upon the climate. Tyndall † in particular has pointed out the enormous importance of this question. To him it was chiefly the diurnal and annual variations of the temperature that were lessened by this circumstance. Another side of the question, that has long attracted the attention of physicists, is this: Is the mean temperature of the ground in any way influenced by the presence of heat-absorbing gases in the atmosphere? Fourier ‡ maintained that the atmosphere acts like the glass of a hot-house, because it lets through the light rays of the sun but retains the dark rays from the ground. This idea was elaborated by Pouillet §; and Langley was by some of his researches led to the view, that "the temperature of the earth under direct sunshine, even though our atmosphere were present as now, would probably fall to -200° C., if that atmosphere did not possess the quality of selective

* Extract from a paper presented to the Royal Swedish Academy of Sciences, 11th December, 1895. Communicated by the Author.

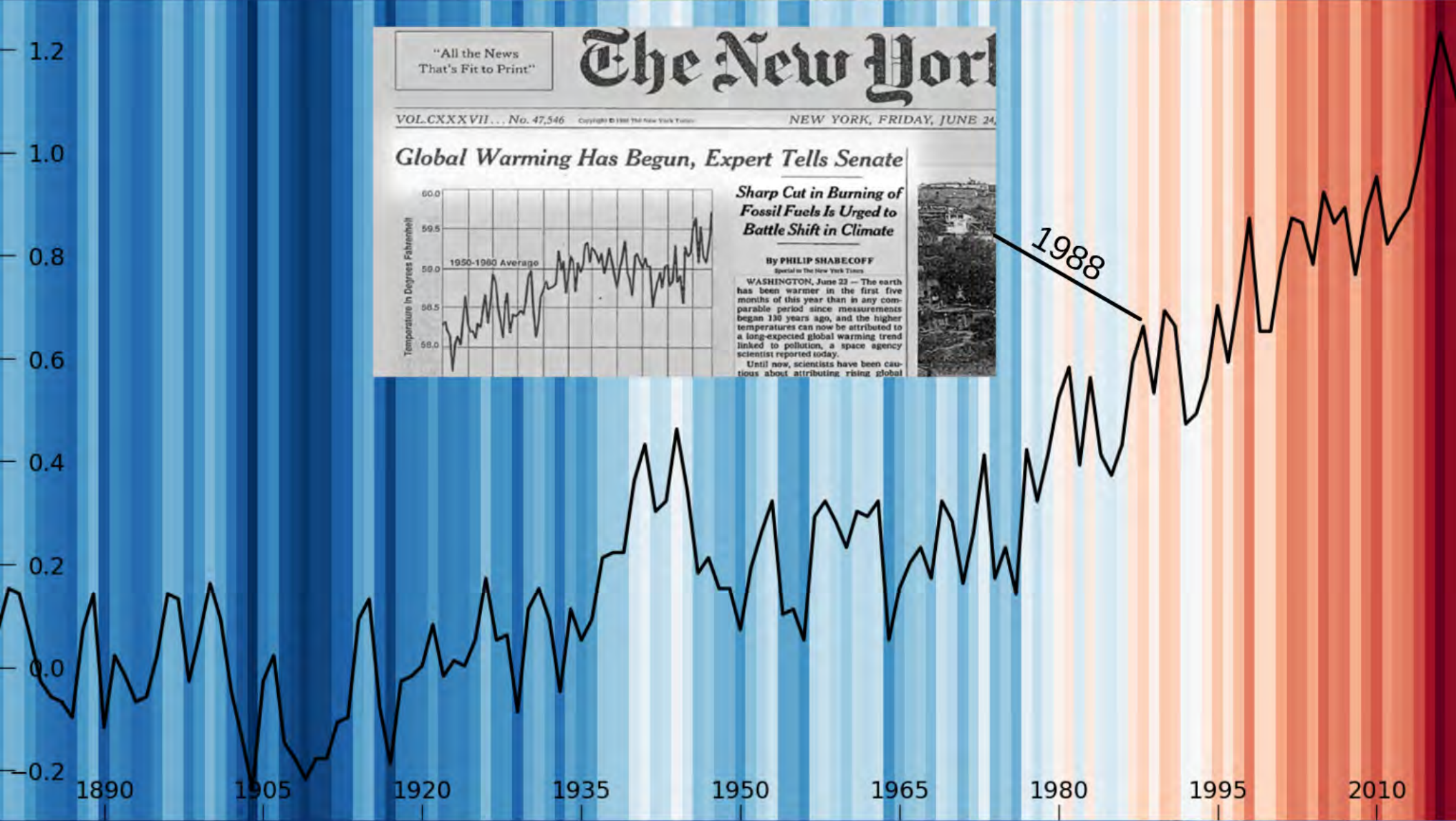
† 'Heat a Mode of Motion,' 2nd ed. p. 495 (Lond., 1865).

‡ *Mém. de l'Ac. R. d. Sci. de l'Inst. de France*, t. vii. 1827.

§ *Comptes rendus*, t. vii. p. 41 (1838).



Erwärmung bei CO₂-Verdoppelung: **Klimasensitivität**



"All the News That's Fit to Print"

The New York Times

VOL. CXXXVII... No. 47,546 Copyright © 1988 The New York Times NEW YORK, FRIDAY, JUNE 24, 1988

Global Warming Has Begun, Expert Tells Senate

Sharp Cut in Burning of Fossil Fuels Is Urged to Battle Shift in Climate

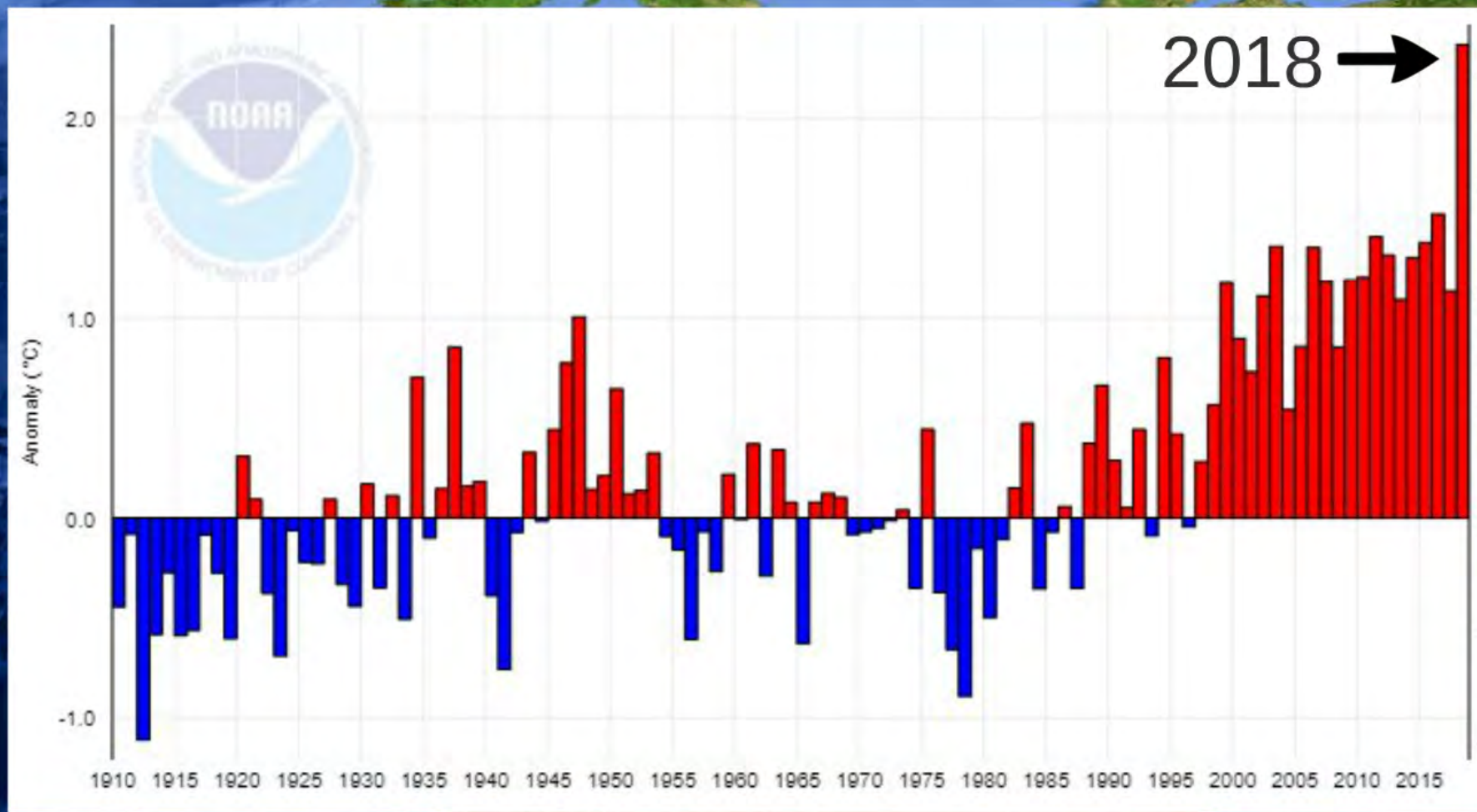
By PHILIP SHABECOFF
Special to The New York Times

WASHINGTON, June 23 — The earth has been warmer in the first five months of this year than in any comparable period since measurements began 130 years ago, and the higher temperatures can now be attributed to a long-expected global warming trend linked to pollution, a space agency scientist reported today.

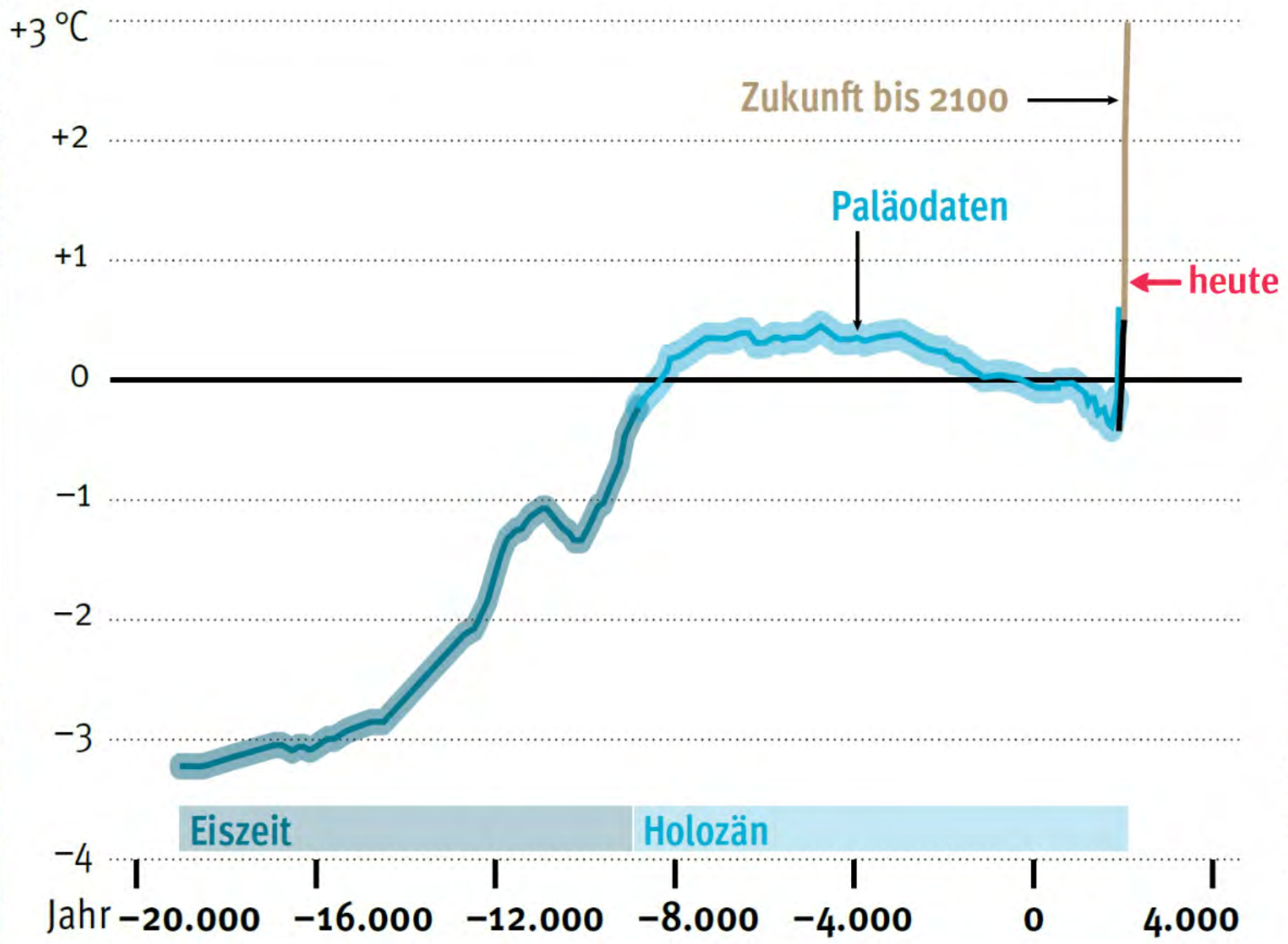
Until now, scientists have been cautious about attributing rising global

1988

Europa-Temperatur, April - September



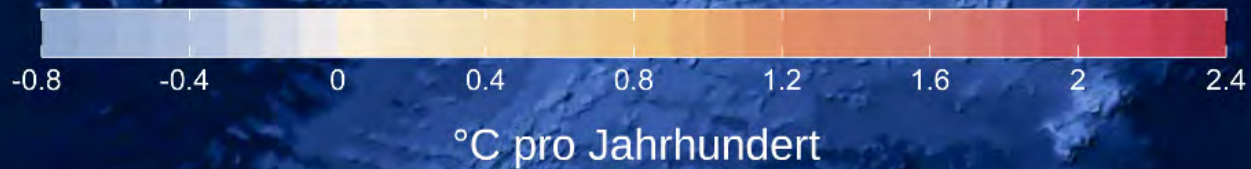
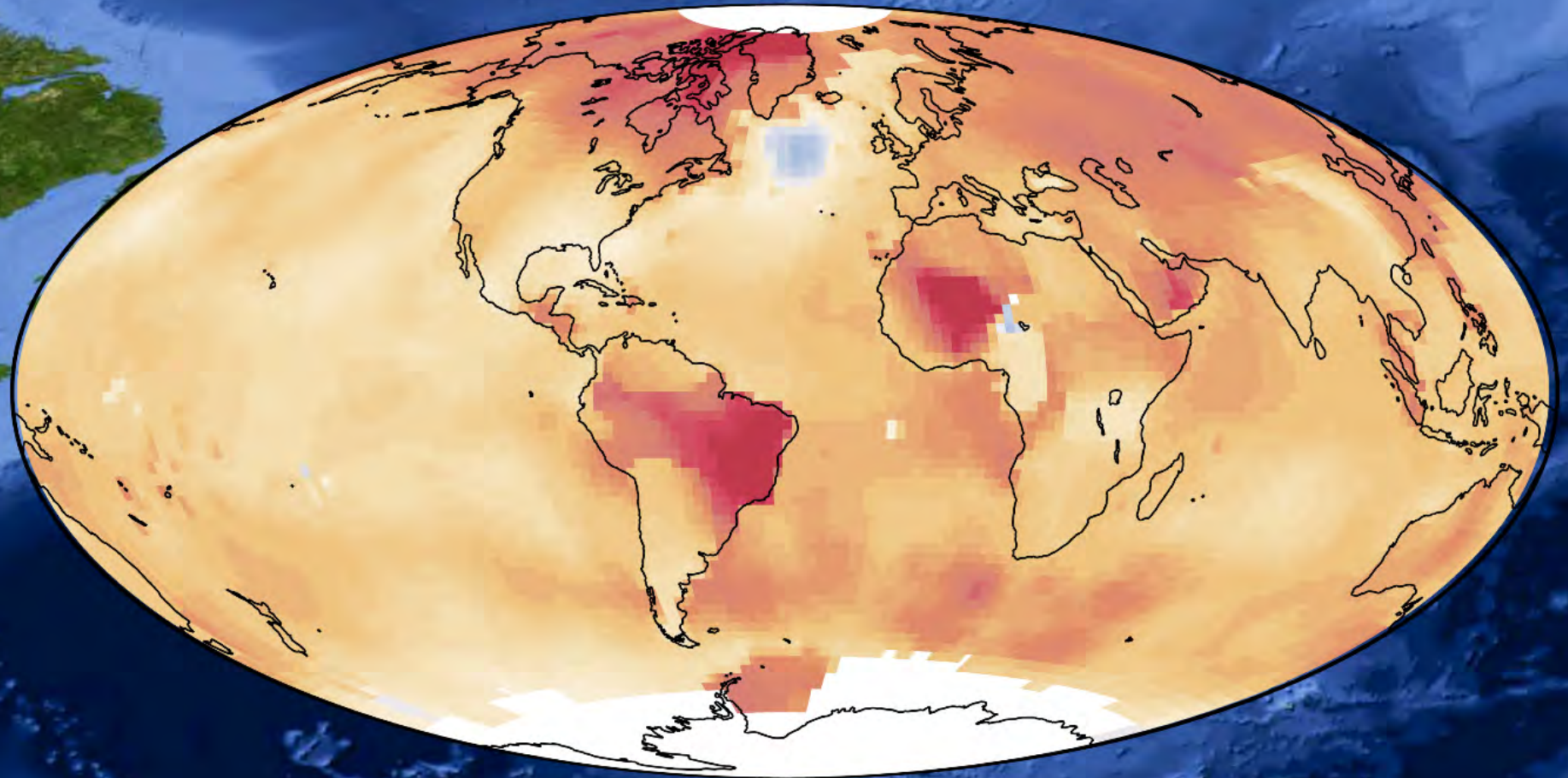
Globale Temperaturänderung seit der Eiszeit



Quelle: Nature 2012, Science 2013



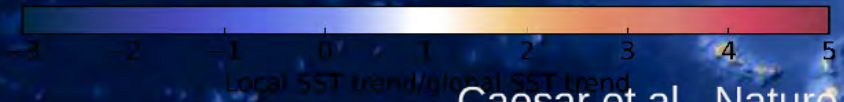
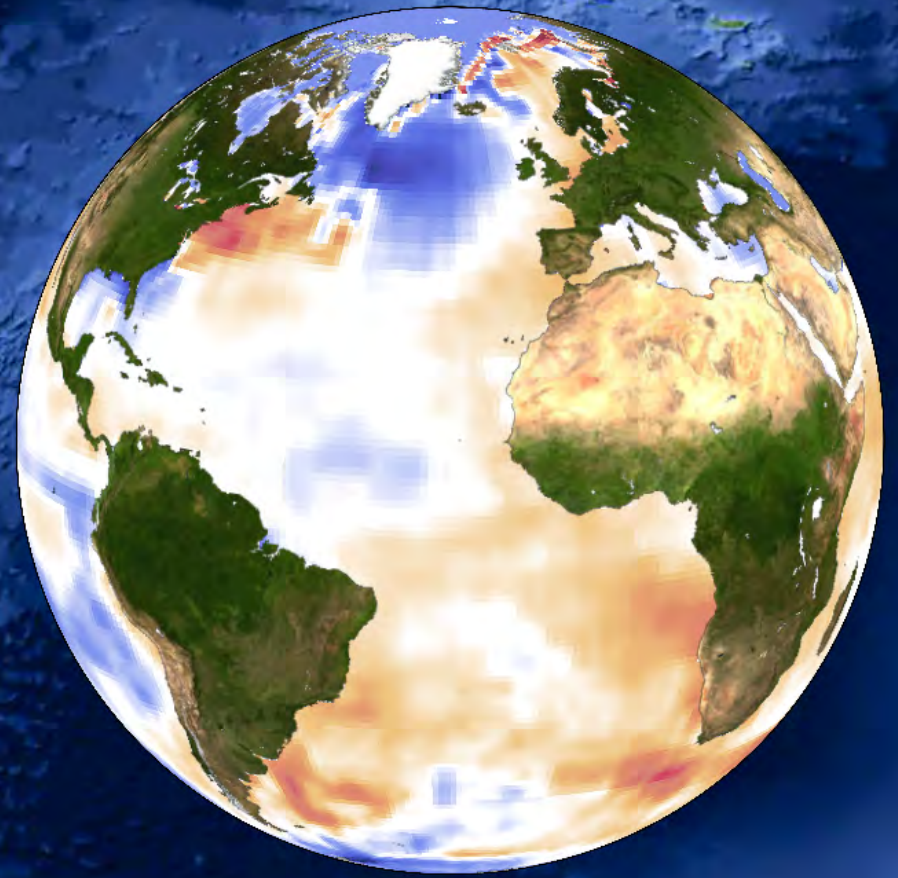
Globaler Temperatrentrend 1901 - 2013



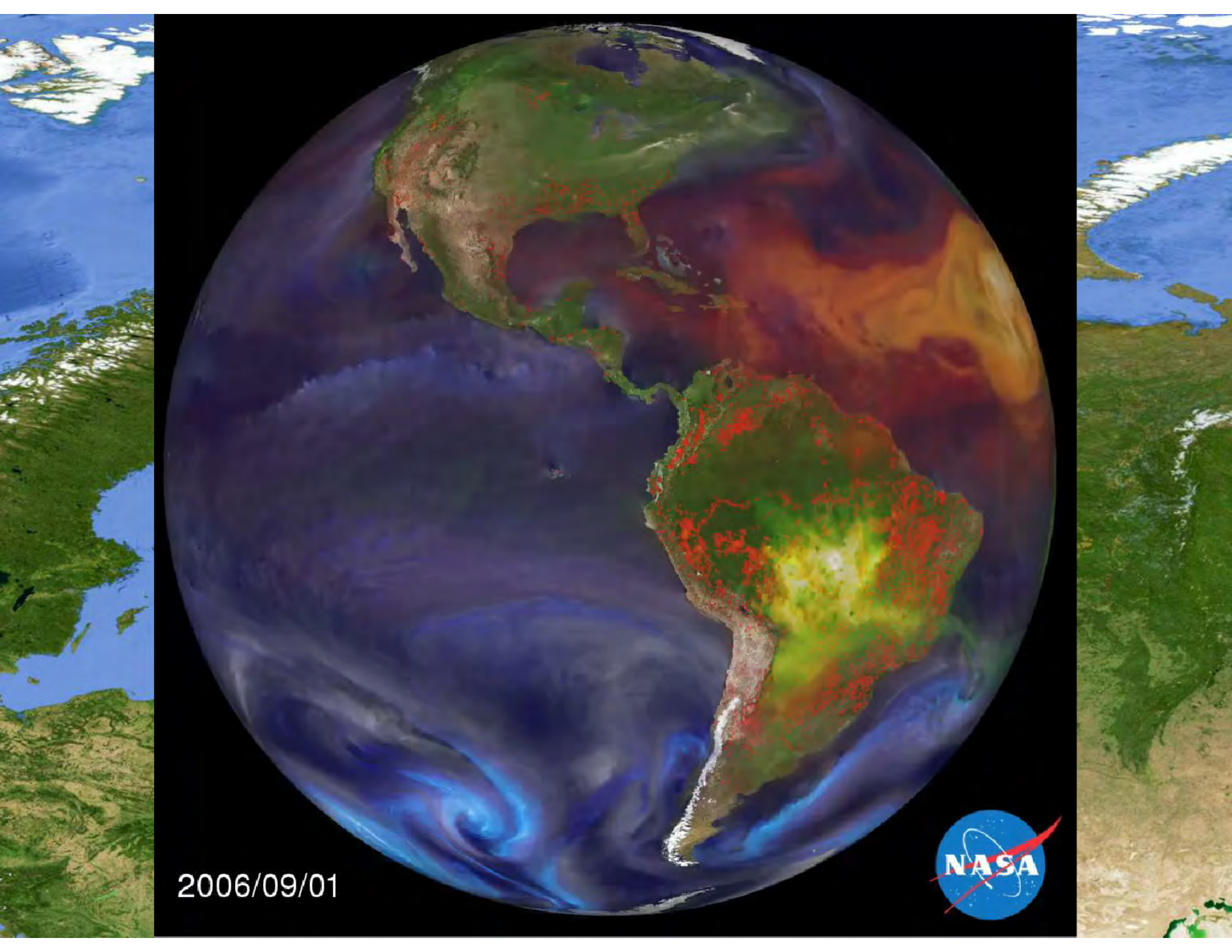
Rahmstorf et al. Nature Climate Change 2015

Klimamodell

Messdaten



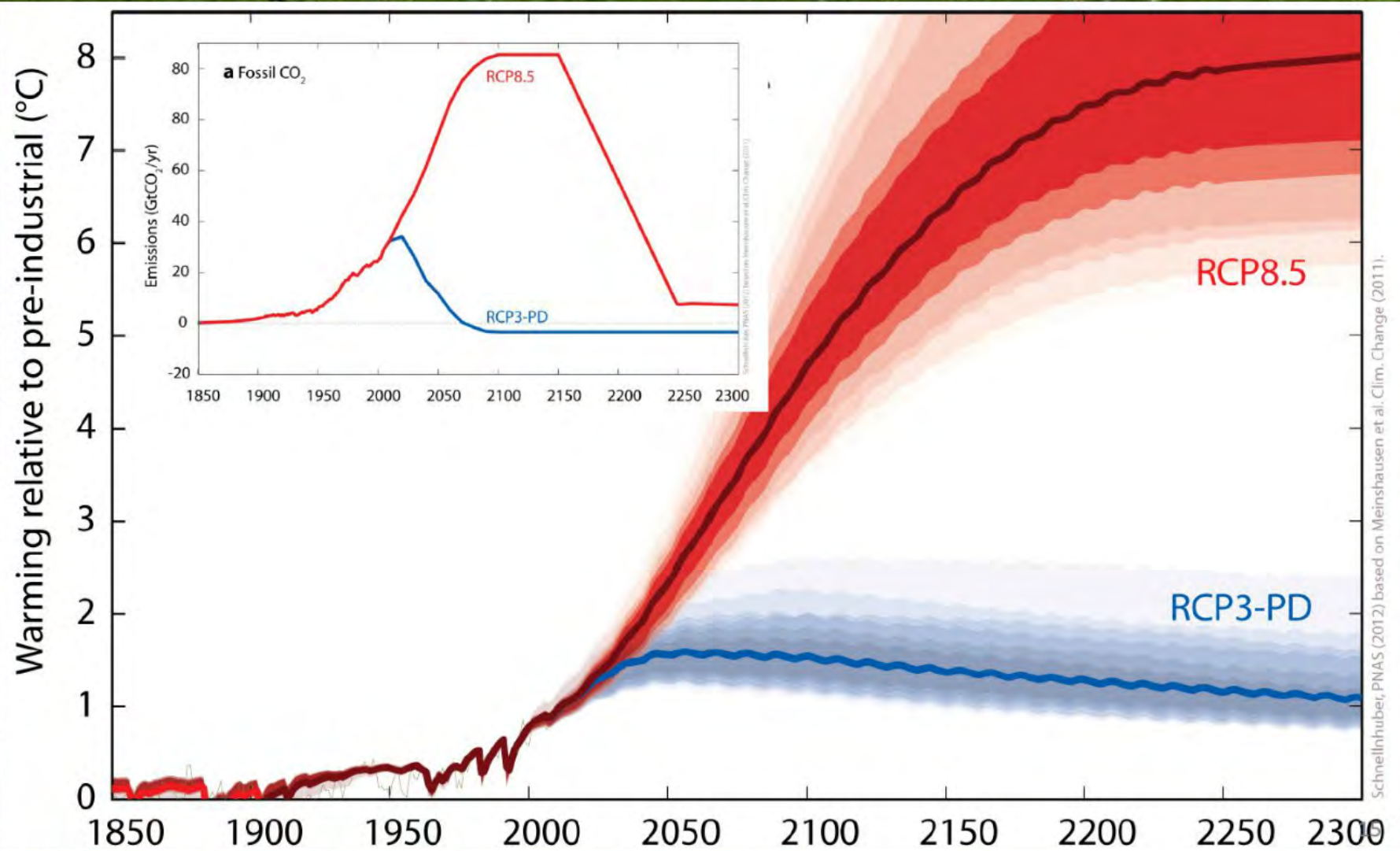
Caesar et al., Nature 2018



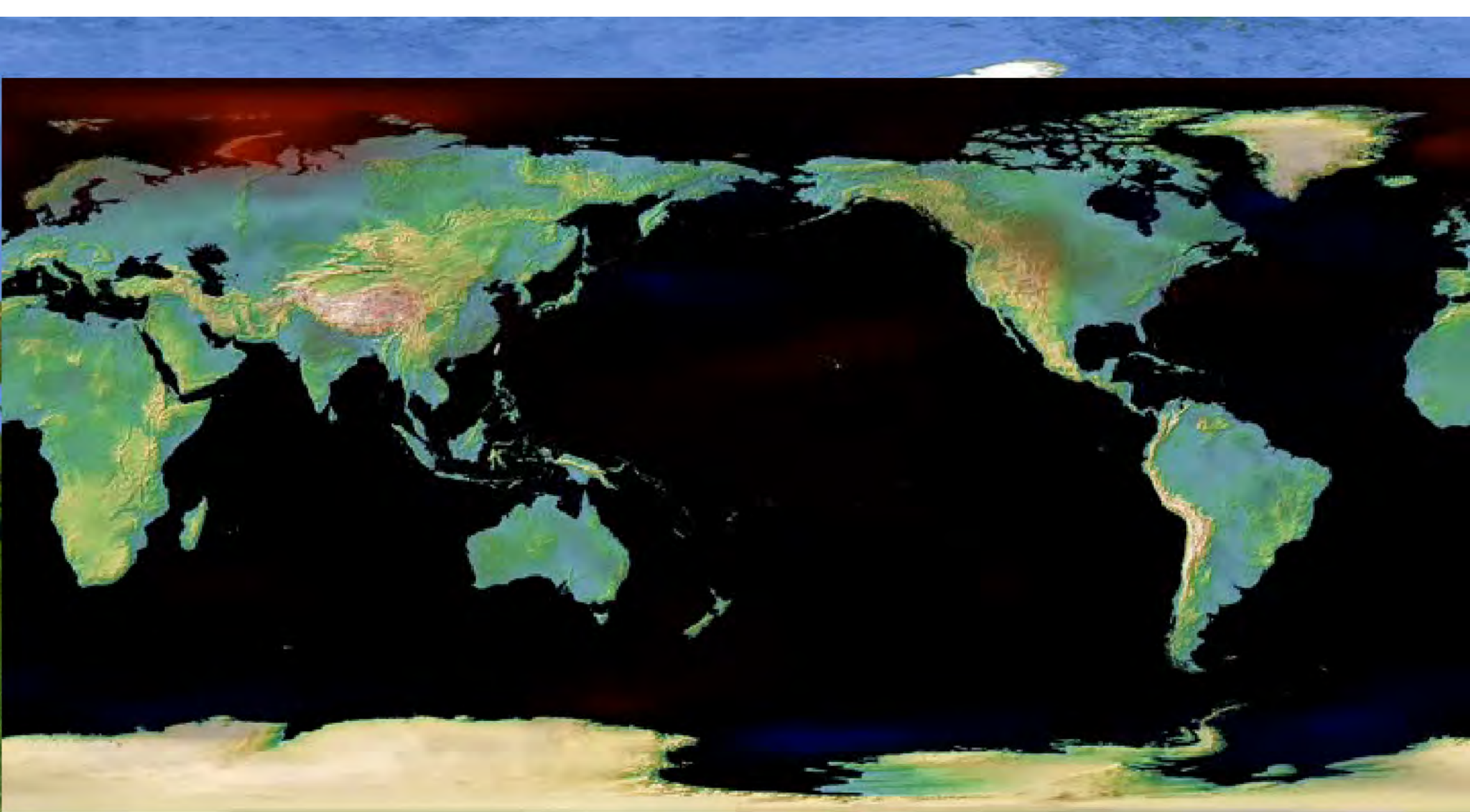
2006/09/01



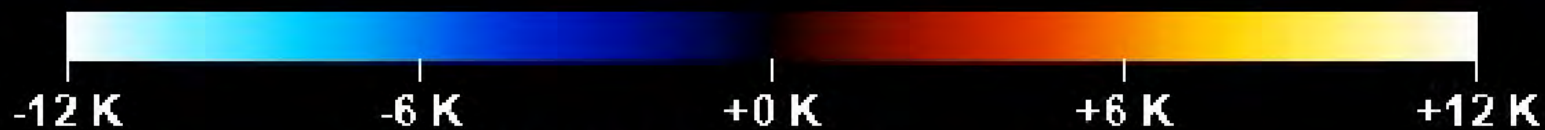
Die Zukunft liegt in unserer Hand



Schnellhuber, PNAS (2012) based on Meinshausen et al. Clim. Change (2011).



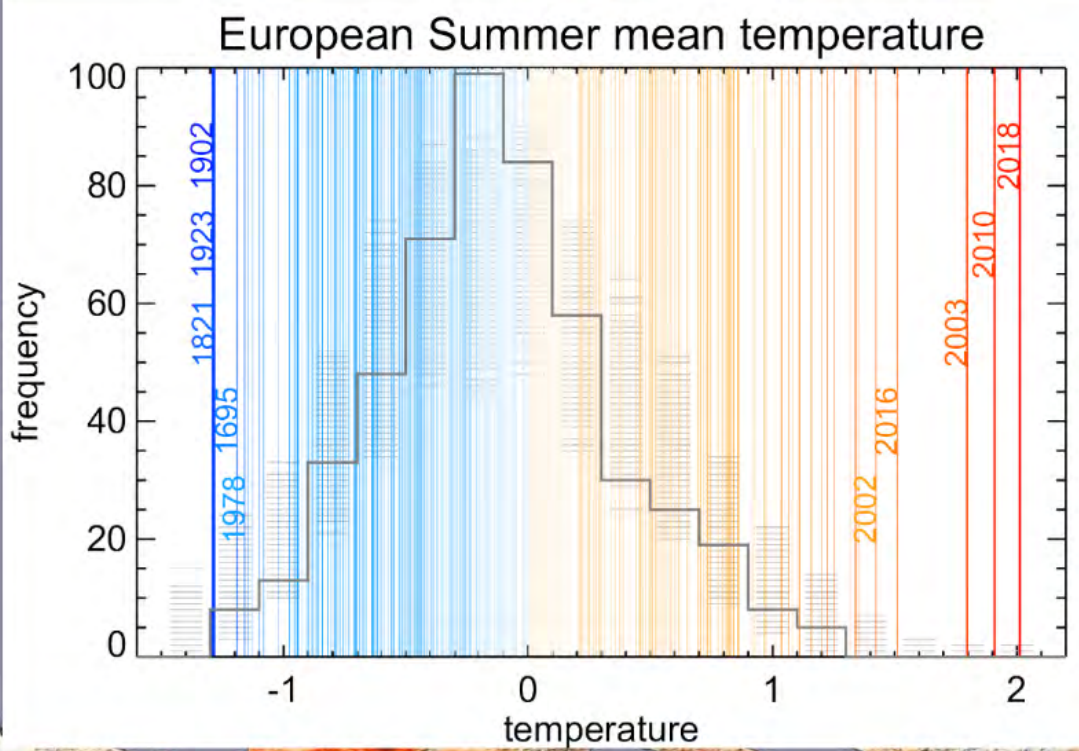
1950



2m temperature change (A1B / MIROC-hi)

CCSR/NIES/FRCGC
MEXT RR2002

Die heißesten Sommer
in Europa seit AD 1500:

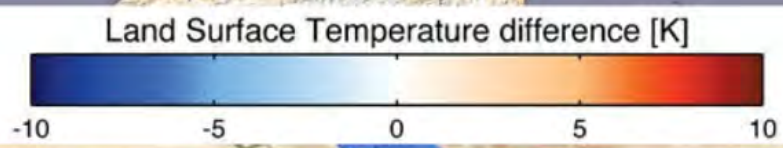


- 2018
- 2010
- 2003
- 2016
- 2002

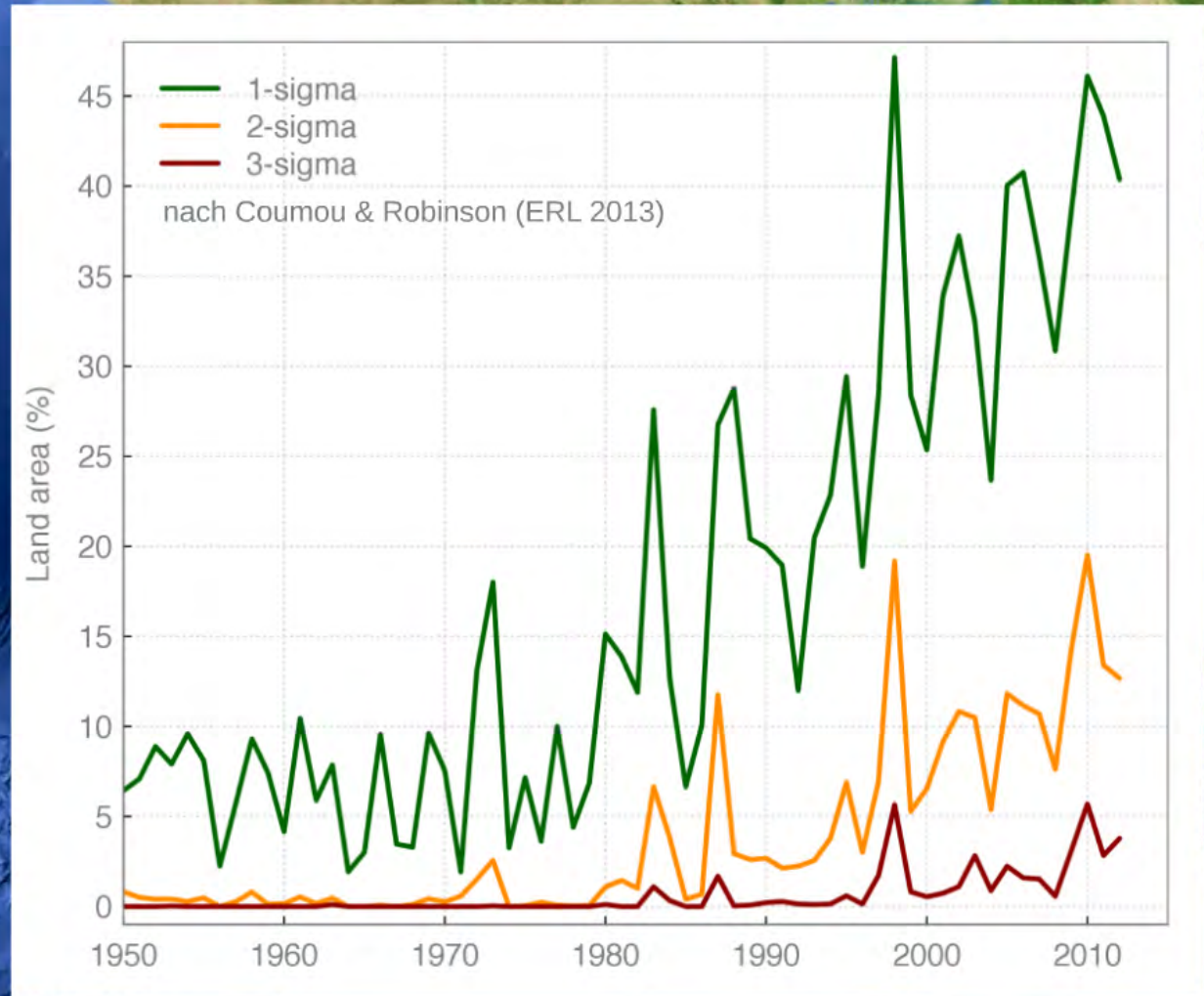
Barriopedro et al. (Science 2011)
& update 2019

2003

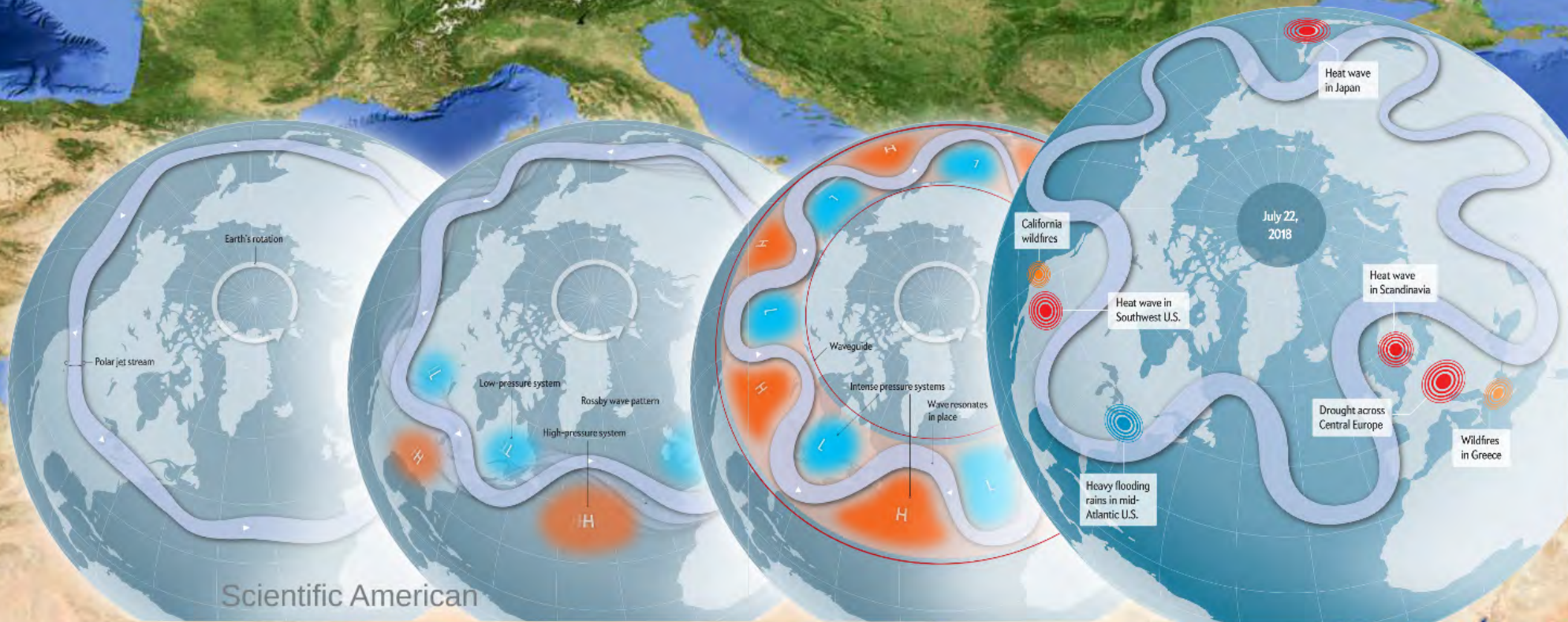
Jahrhundertsommer
70 000 Hitzetote



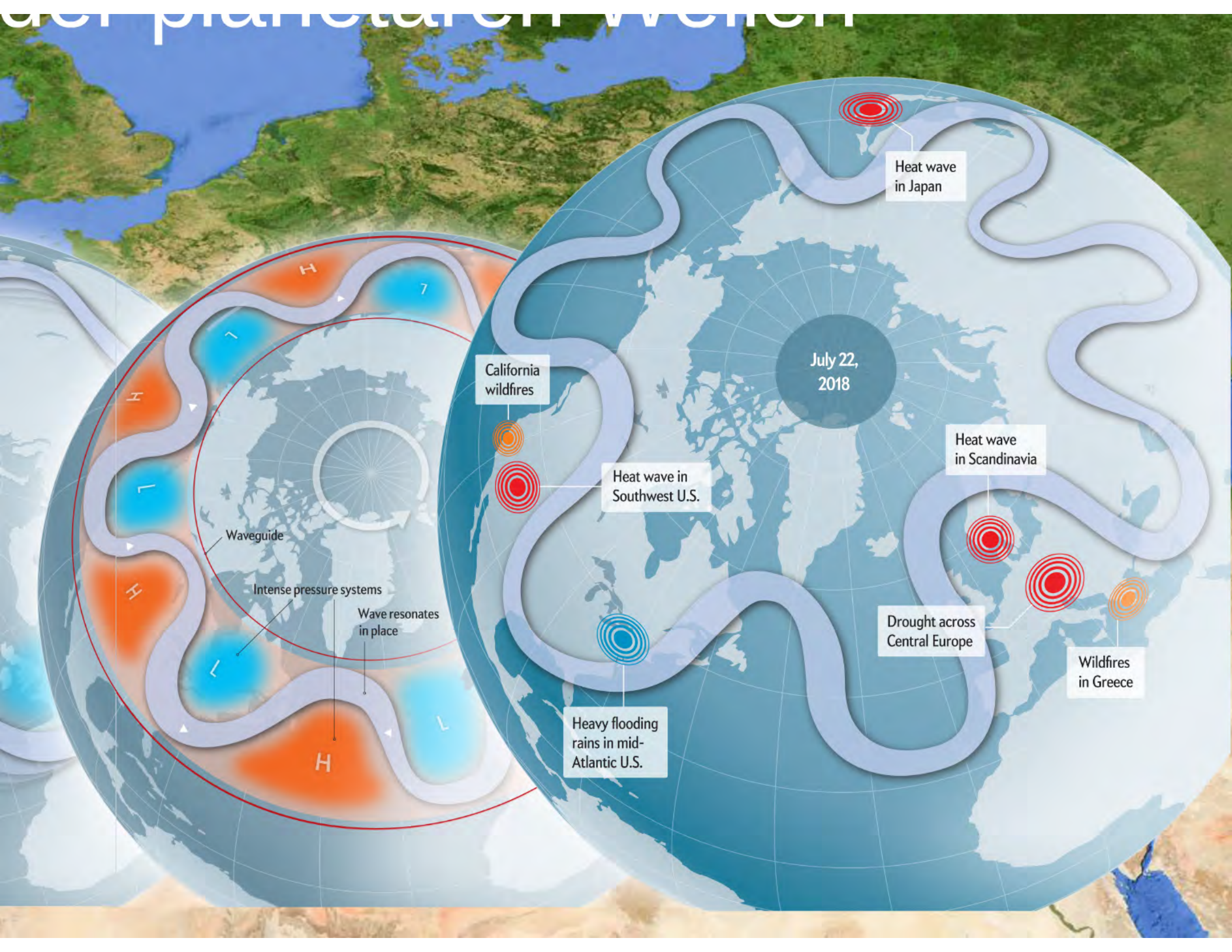
Prozentsatz der
Landfläche mit
ungewöhnlich hohen
Temperaturen



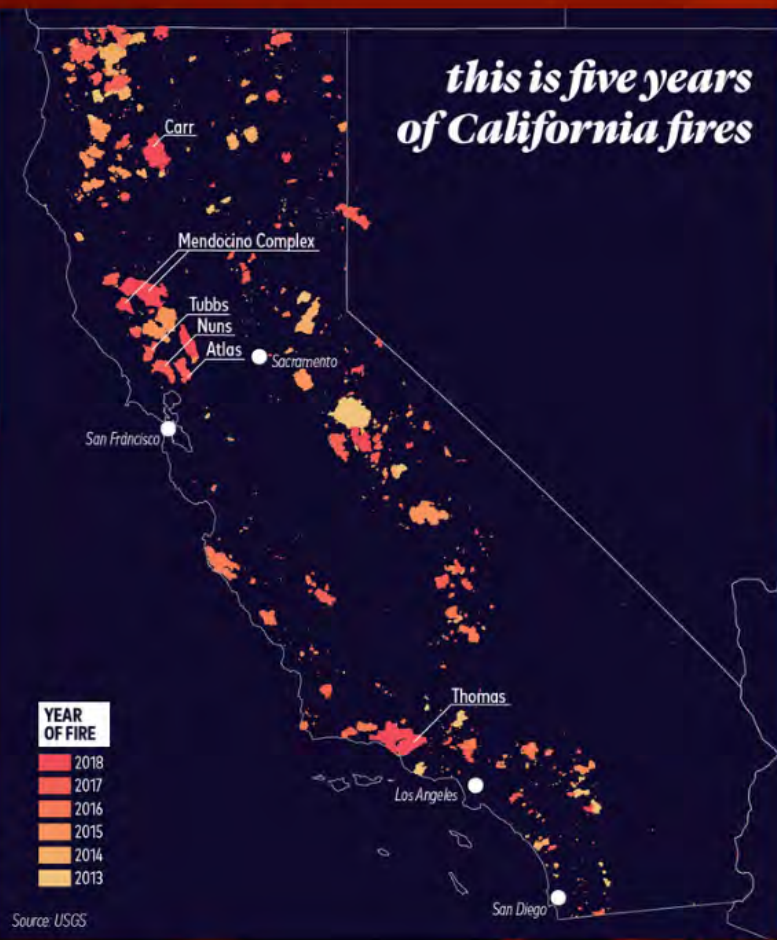
Extremwetter durch aufschaukeln der planetaren Wellen



Great planet talker on wavefront

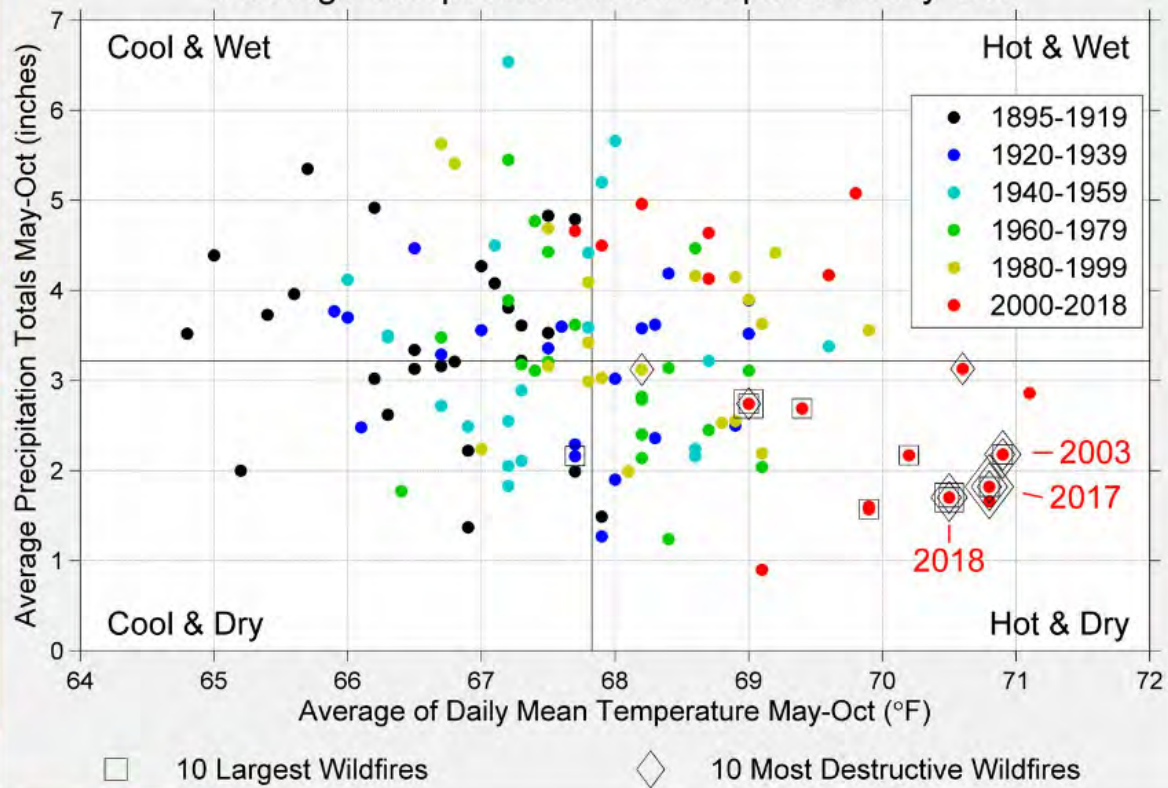


*this is five years
of California fires*



California Fire Season Weather

Average Temperature and Precipitation May-Oct





Sommer 2018: Über 400 Waldbrände in Brandenburg



55N
50N
45N
40N
35N
30N
25N



theguardian

home > environment > climate change
wildlife energy pollution UK world all

Climate change

Climate change rate to turn southern Spain to desert by 2100, report warns

Mediterranean ecosystems will change to a state unprecedented in the past 10,000 years unless temperature rises are held to within 1.5C, say scientists



Crescent and implications

by David Seager^a, and Yochanan Kushnir^b
^aPublic Affairs, Columbia University, New York, NY 10027; and ^bLamont-Doherty

ngdom, and approved January 30, 2015 (received for review November 16, 2014)

le Syria's water security by exploiting limited land and water resources without regard for sustainability (10). One critical consequence of these unsustainable policies is the decline of groundwater. Nearly all rainfall in the FC occurs during the 6-month winter season, November through April, and this rainfall exhibits large year-to-year variability (Figs. 1A and 2A). In Syria, the rain falls along the country's Mediterranean Sea coast and in the north and northeast, the primary agricultural region. Farmers depend strongly on year-to-year rainfall, as two thirds of the cultivated land in Syria is rain fed, but the remainder relies upon irrigation canals linked to river tributaries, pump access to irrigation canals linked to river tributaries, pump groundwater supplies over half (60%) of all water used for irrigation purposes, and this groundwater has become increasingly depleted as extraction has been greatly overexploited (4). The government attempted to stem the rate of groundwater depletion by enacting a law in 2005 requiring a license to dig wells, but this legislation was not enforced (6). Overuse of groundwater has been blamed for the recent drying of the Khabur River in the northeast (6). The depletion of groundwater during the drought is clearly evident from remotely sensed data.

model climate for the Ea... model simulations indicate... recent Syrian drought... more than twice as likely as... climate system.

Tagesrekorde bei Niederschlägen

Zunahme der Anzahl der Rekordergebnisse (%)

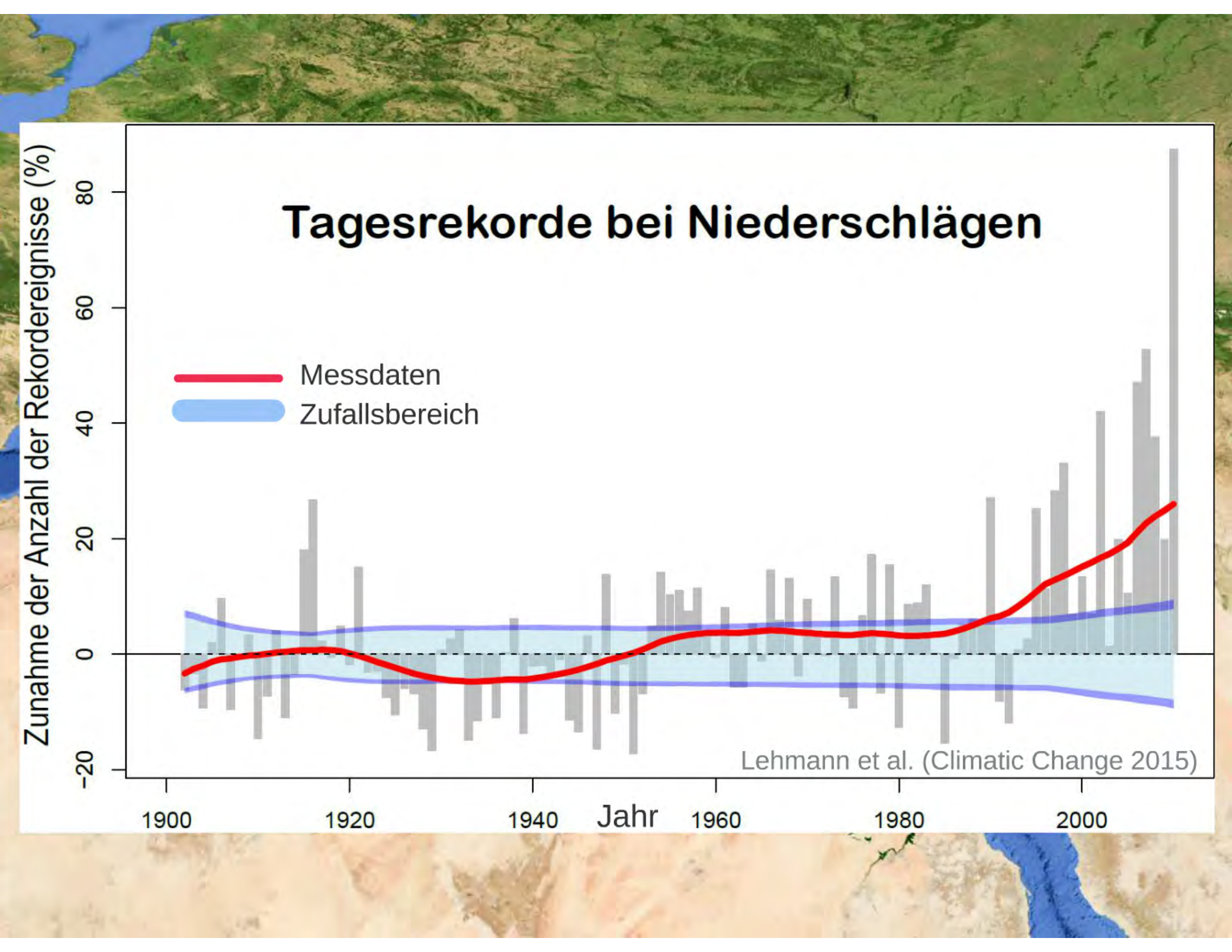
80
60
40
20
0
-20

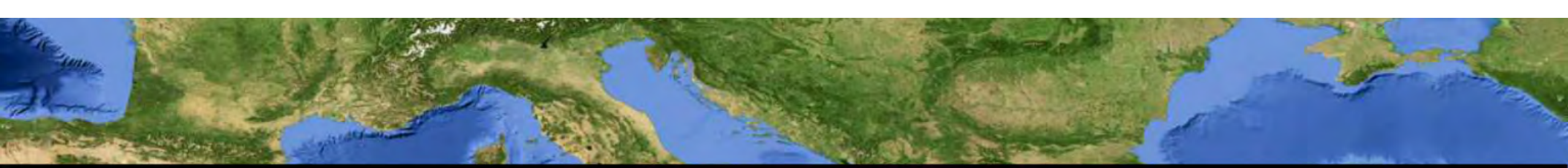
- Messdaten
- Zufallsbereich

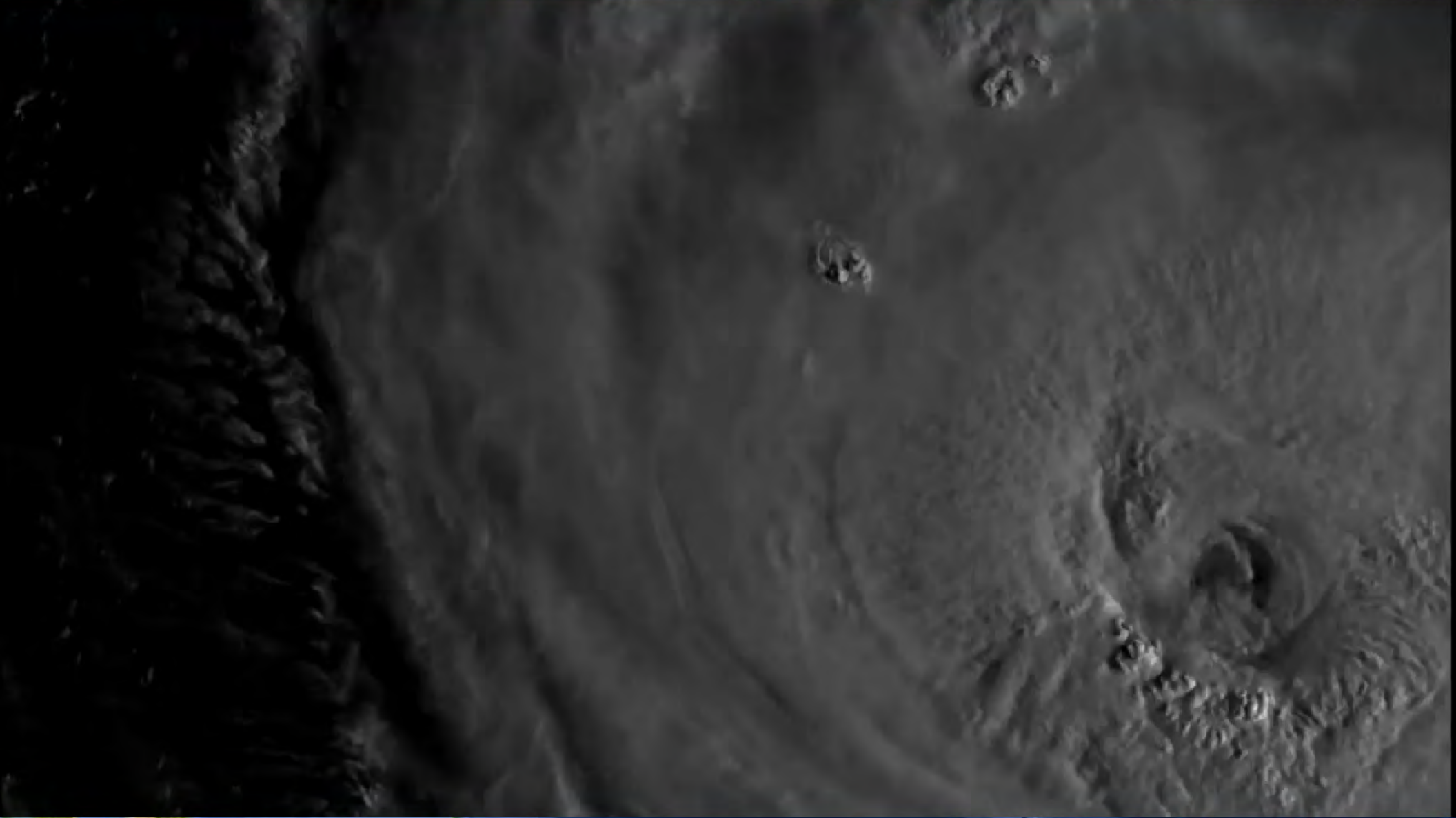
1900 1920 1940 1960 1980 2000

Jahr

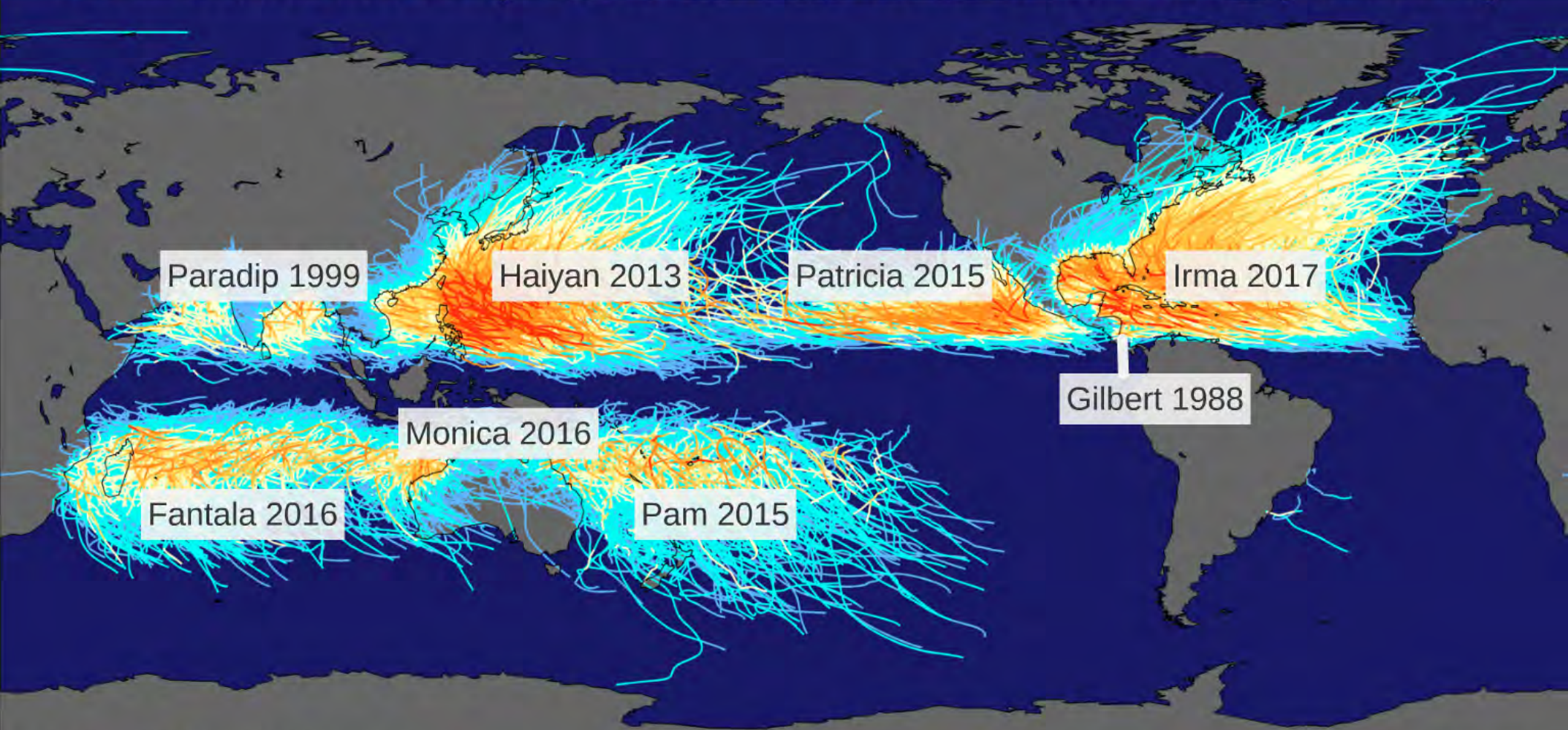
Lehmann et al. (Climatic Change 2015)







Die stärksten Tropenstürme in der Satellitenära (ab 1979)



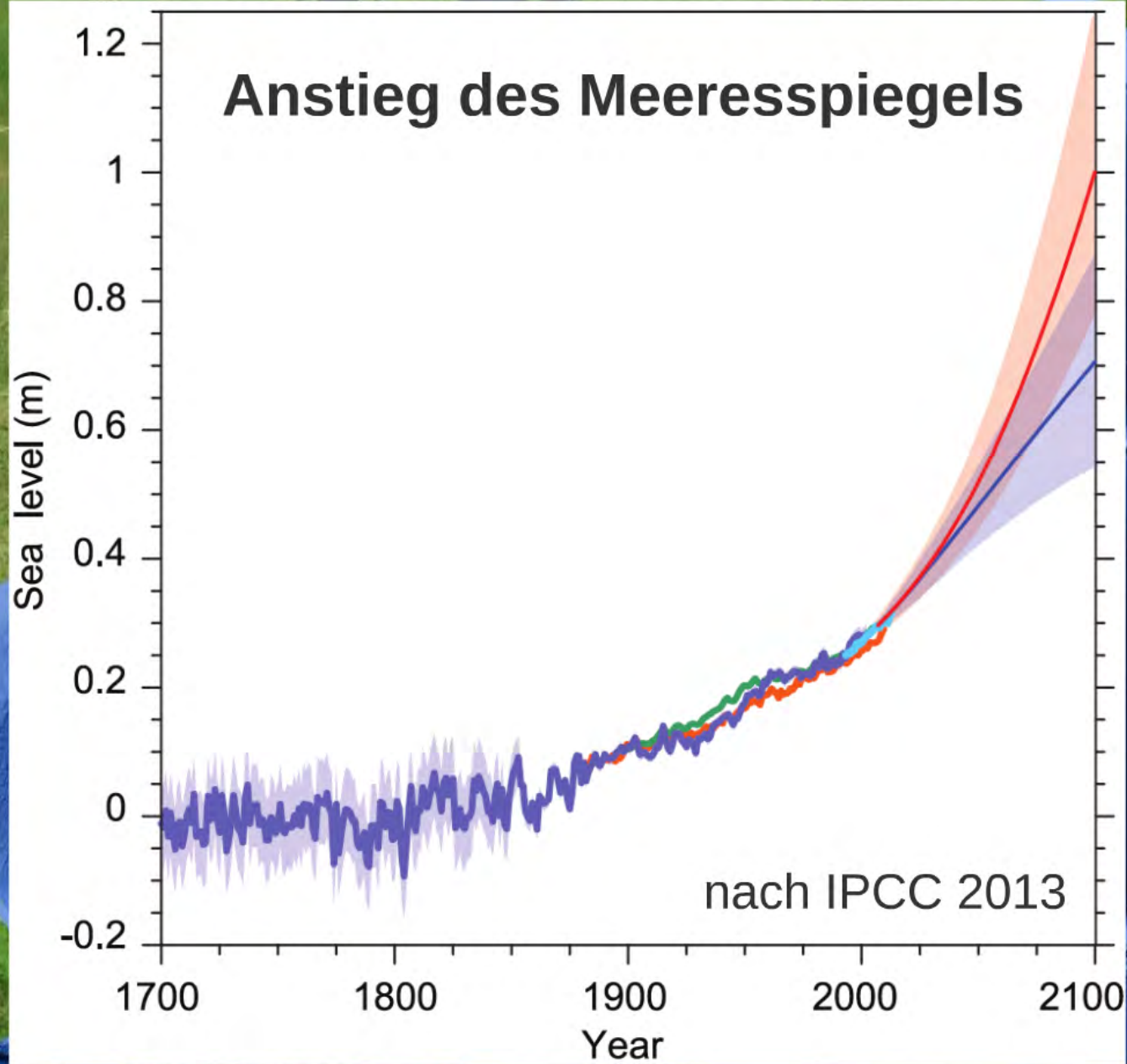
Data from IBTrACS (v03r10, 1851-2015)

Robert A. Rohde (@rarohde)

Stärkste Stürme: Velden et al. *Mon. Weather Rev.* 2017

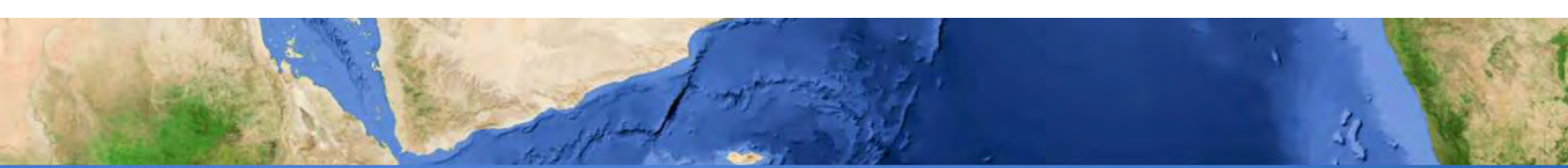
Historische Zugbahnen: Robert Rohde

Anstieg des Meeresspiegels



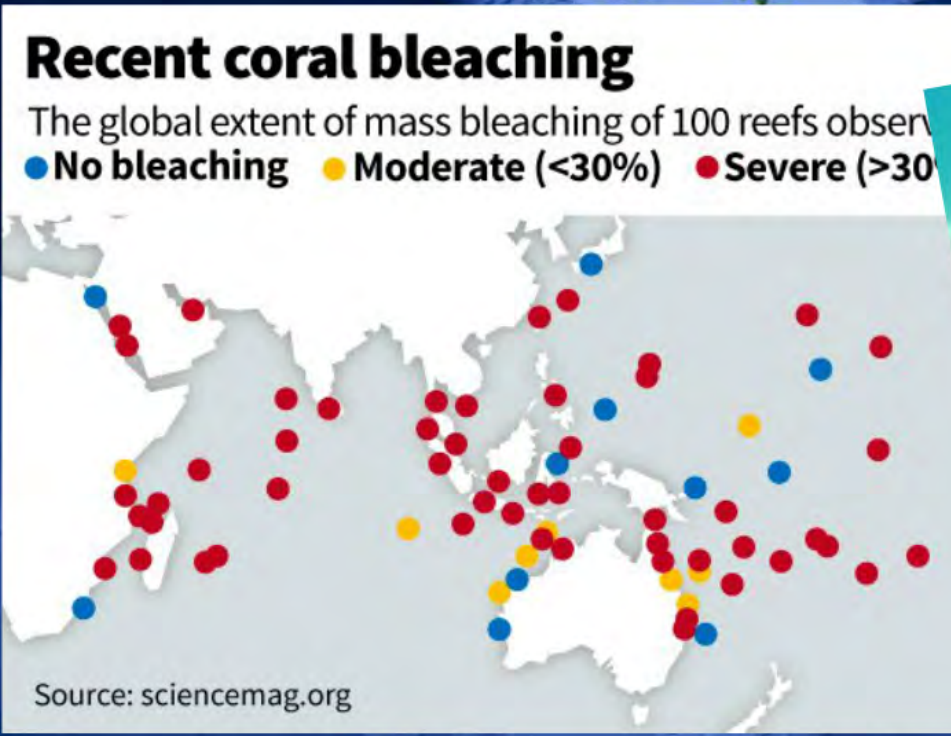
Hohe Emissionen

Niedrige Emissionen

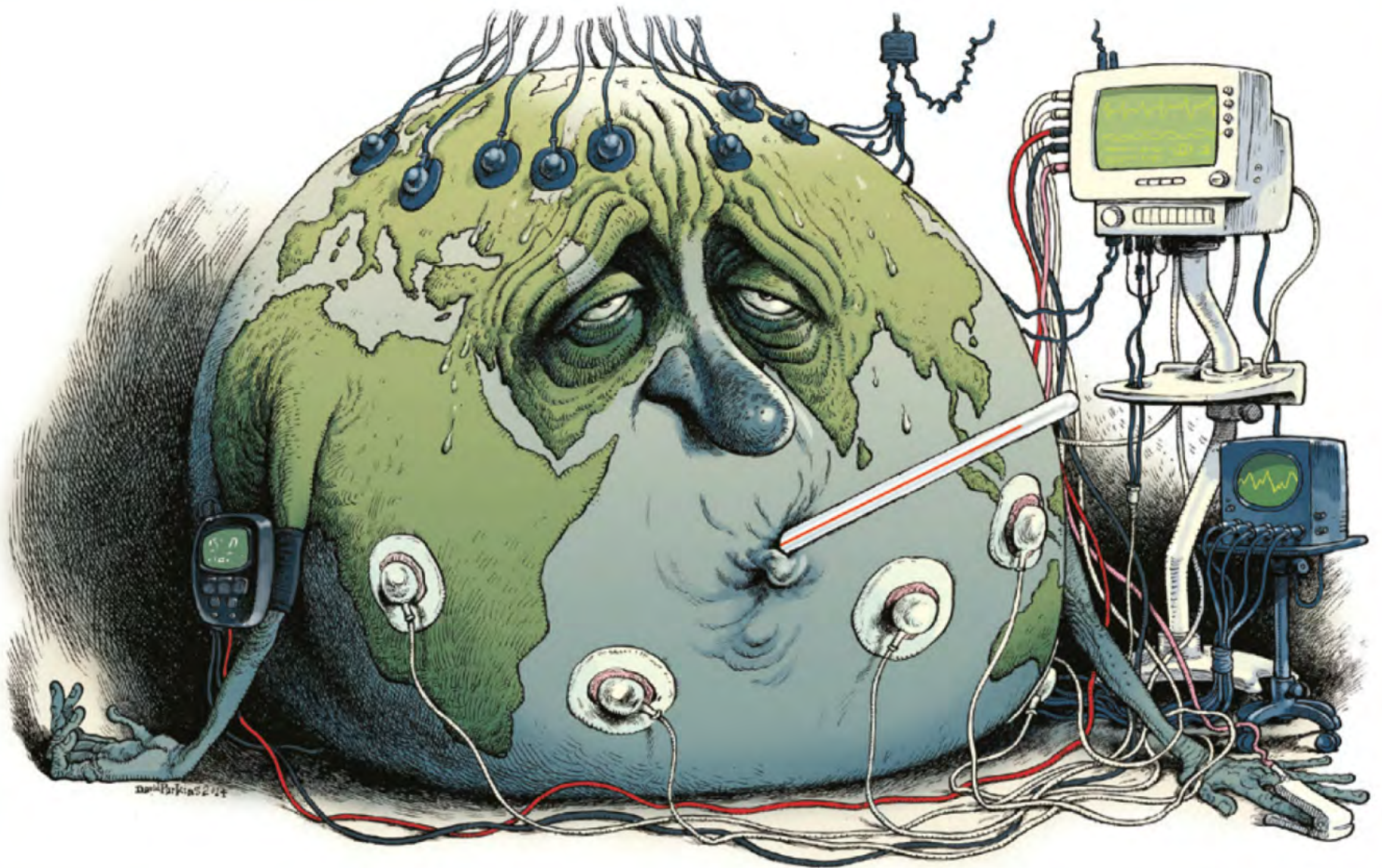


Hughes et al. Nature 2017

"Immediate global action to curb future warming is essential to secure a future for coral reefs"



I saw the Great Barrier Reef die last weekend, and I wept
There will be no rescue. We have killed the world's greatest living structure.
THEAGE.COM.AU
11.3.2017



Der Klimavertrag von Paris

Conférence sur les Changements Climatiques 2015

COP21/CMP11

Paris France



“...holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels”.

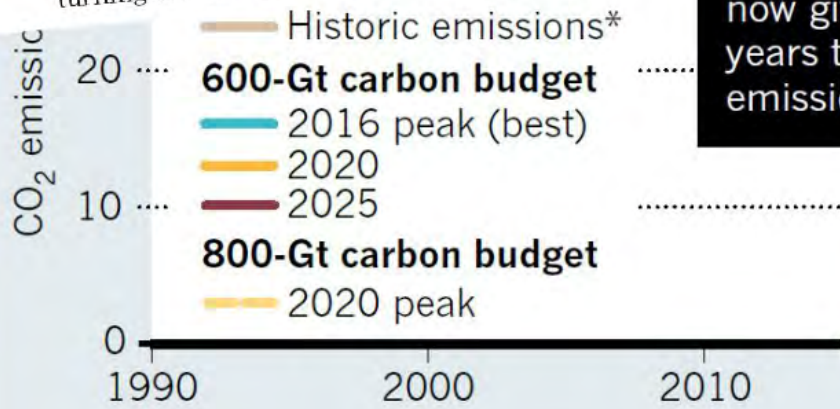
Paris-kompatible globale Emissionspfade



Decarbonizing the world economy will require renewable energy generation from vast solar farms, such as this one in Nevada.

Three years to safeguard our climate

Christiana Figueres and colleagues set out a six-point plan for turning the tide of the world's carbon dioxide by 2020.



Figueres et al. Nature 2017

es (Gt) o
C. Stretc
tempera
5 202

GEHEIMER KLIMA-BERICHT
Wir haben nur noch 13 Jahre...

Freitag, 23. Februar 2017 8.30 €

Bild
UNABHÄNGIG · ÜBERPARTeilICH

...um die Erde zu retten!

Jetzt GOLD-BINGO-Scheme holen!

NACHRICHTEN

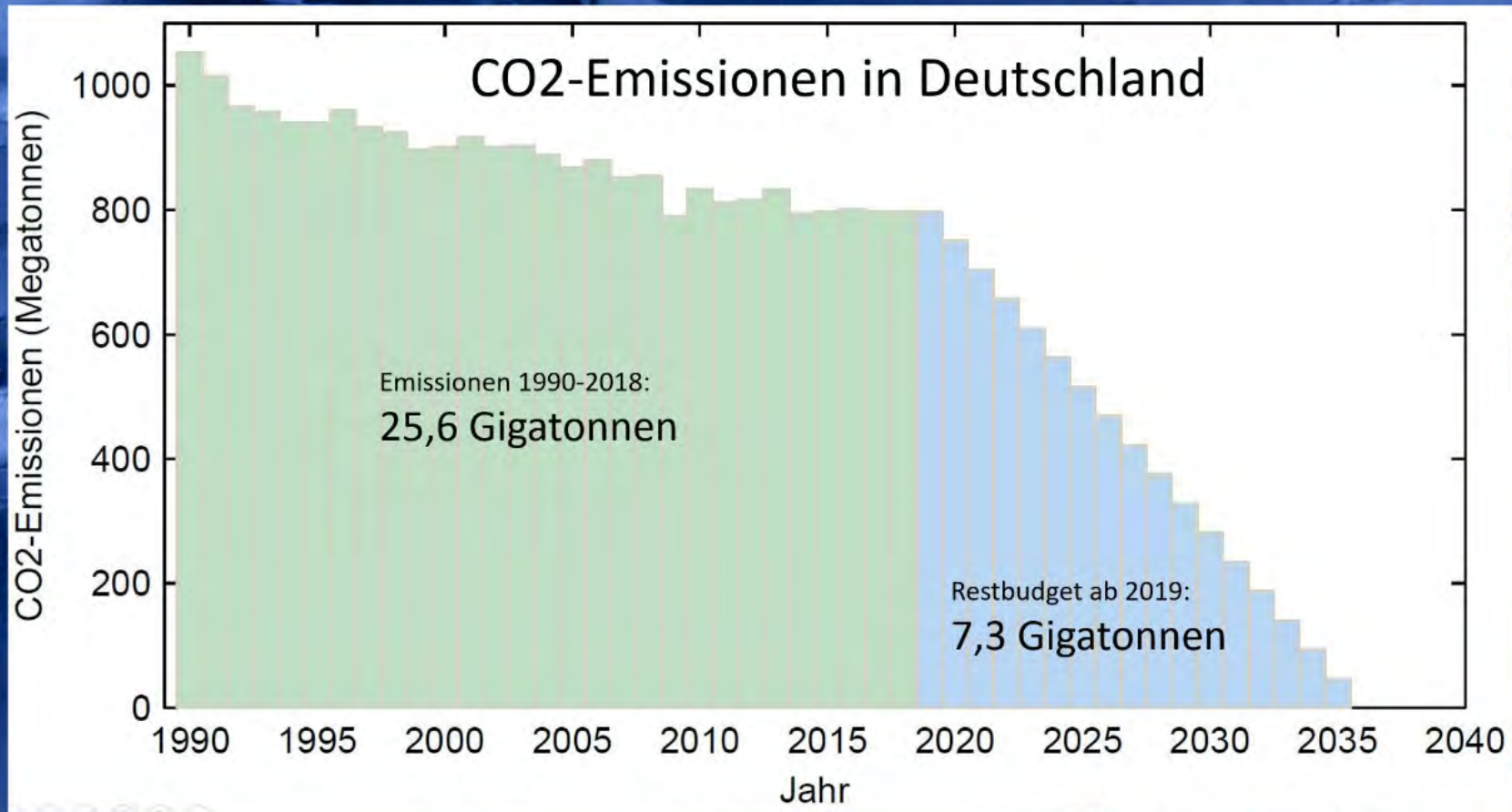
Vater findet tote Söhne

Schneechaos in Dänemark

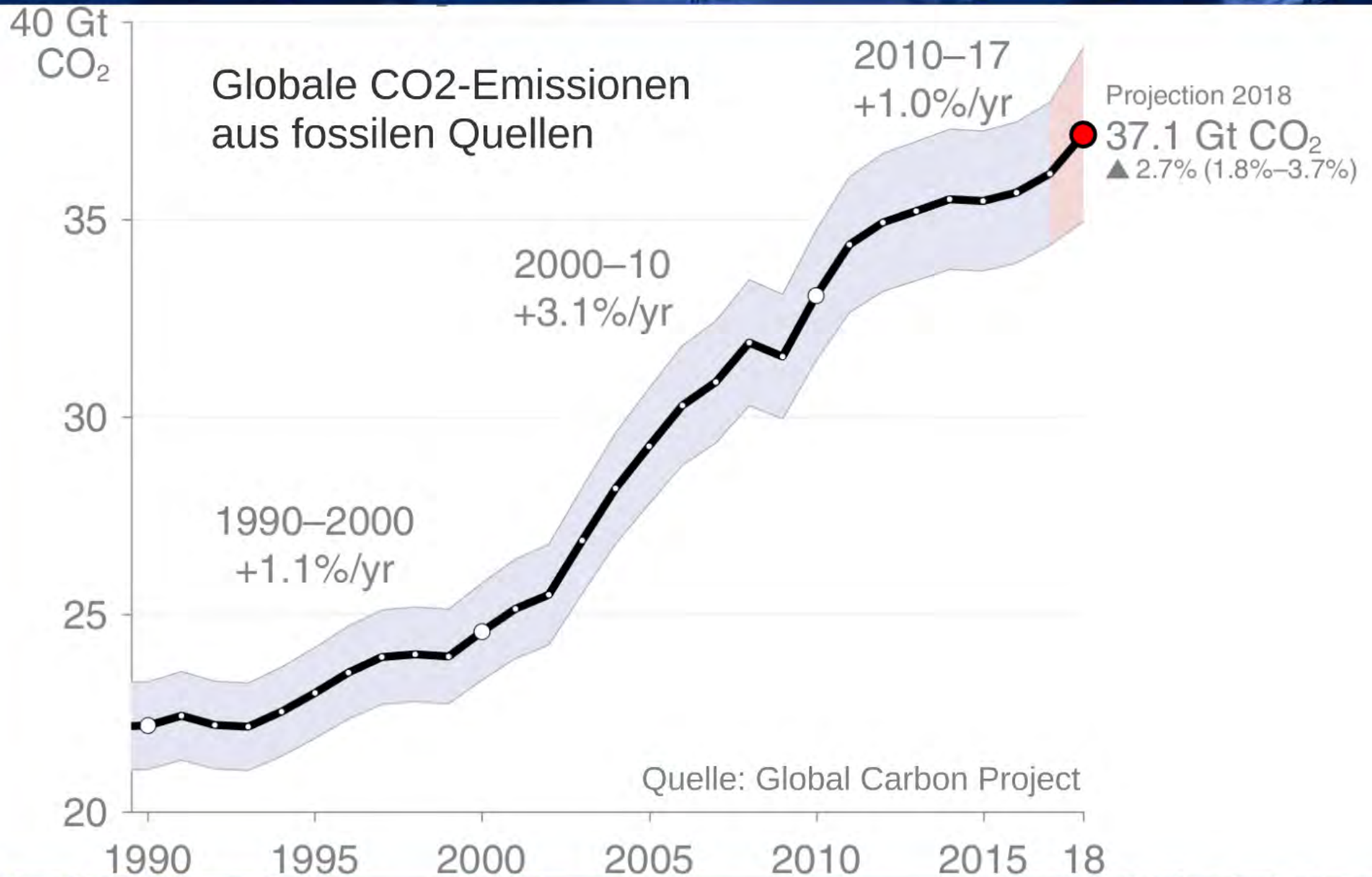
Carbon Project.

Mit den Paris-Zielen kompatibles Emissionsbudget für Deutschland

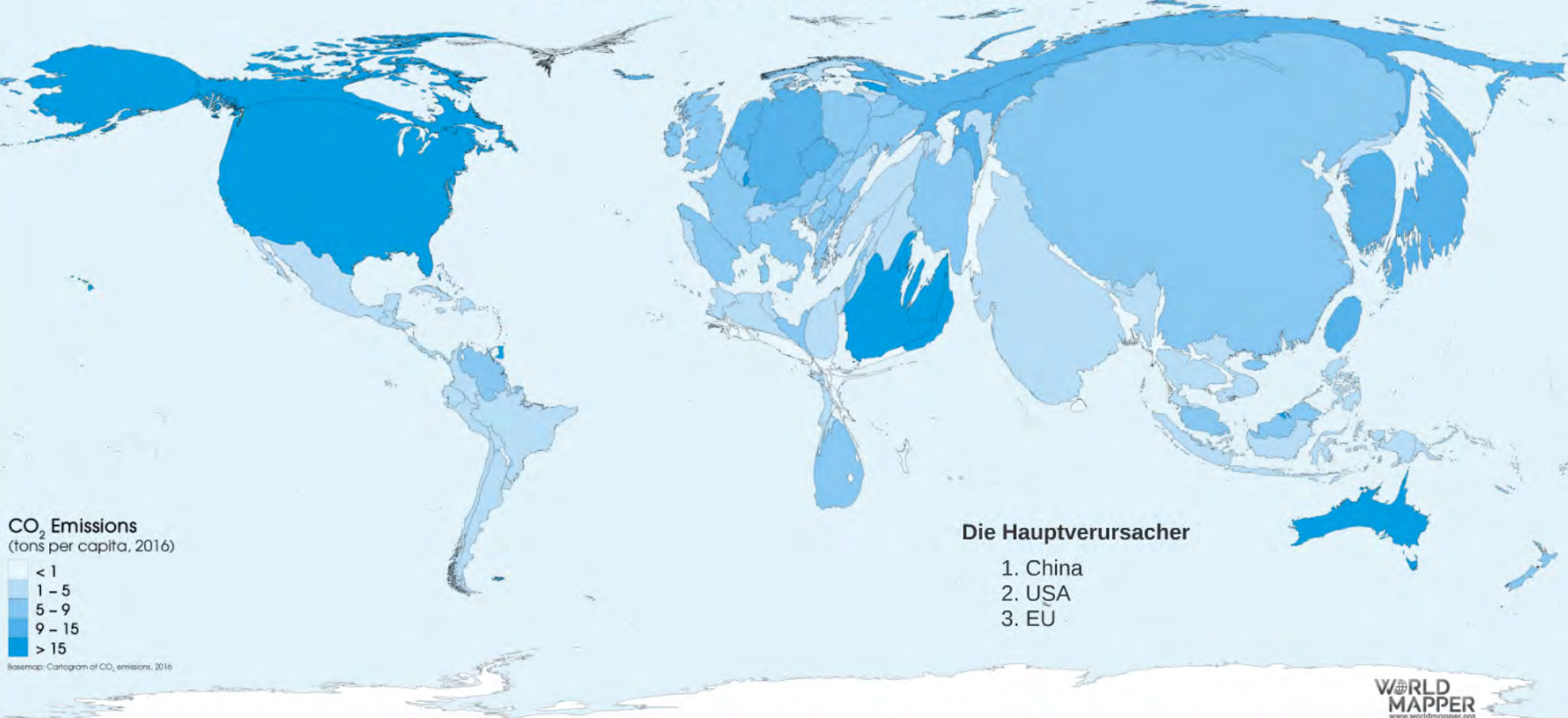
IPCC 2018: für 1,75 °C ist das Budget 880 Gt CO₂ ab Anfang 2016
Davon 1,1 % sind 9,7 Gt ab Anfang 2016, d.h. 7,3 Gt ab Anfang 2019



Naht die globale Emissionswende?



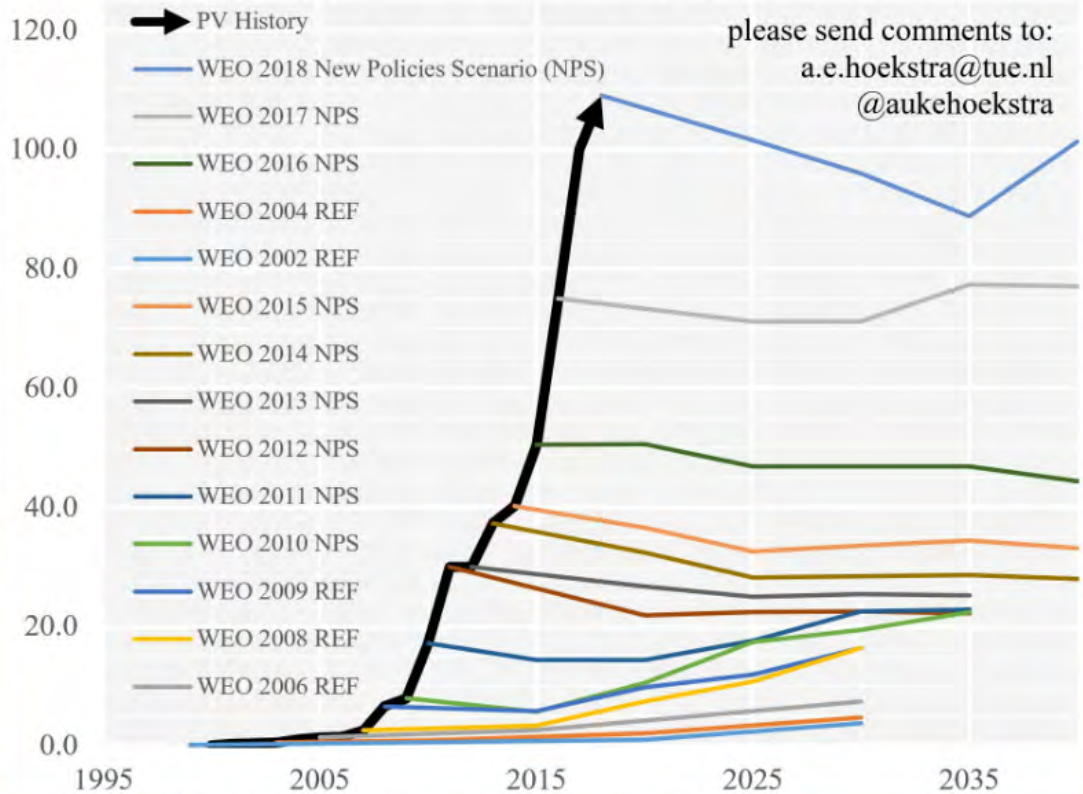
CO₂-Ausstoß nach Ländern



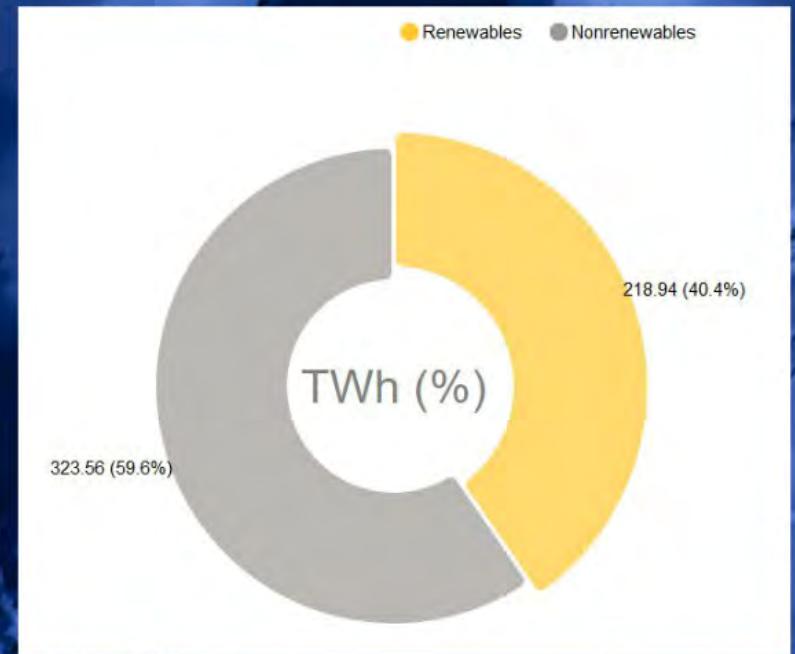
Etwas Optimismus...

Annual PV additions: historic data vs IEA WEO predictions

In GW of added capacity per year - source International Energy Agency - World Energy Outlook



Stromerzeugung Deutschland 2018





Einige Folgerungen

Die Klimakrise ist real, von uns verursacht und dringend

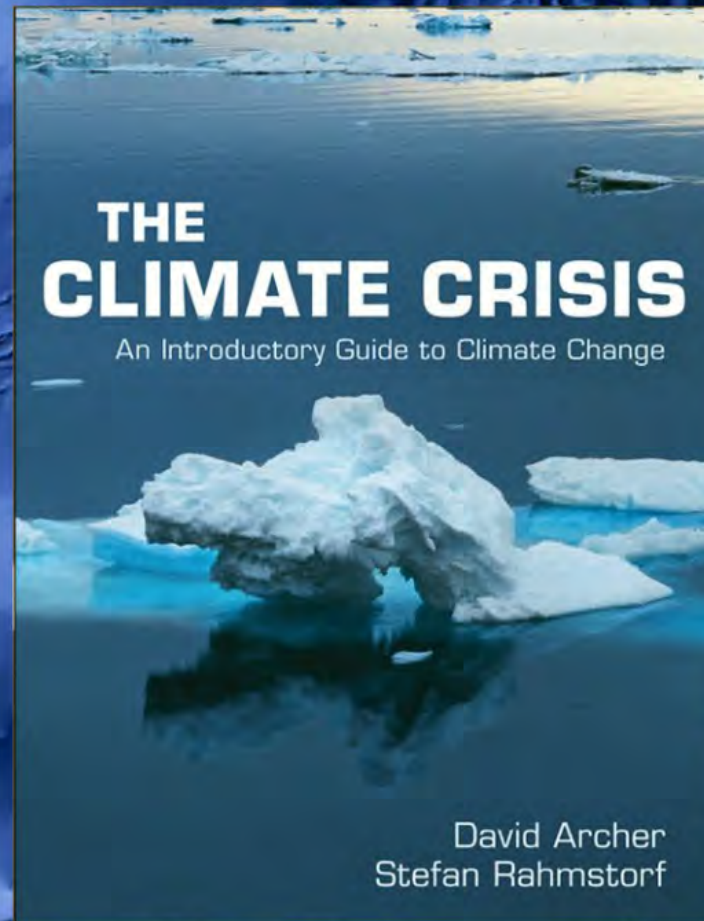
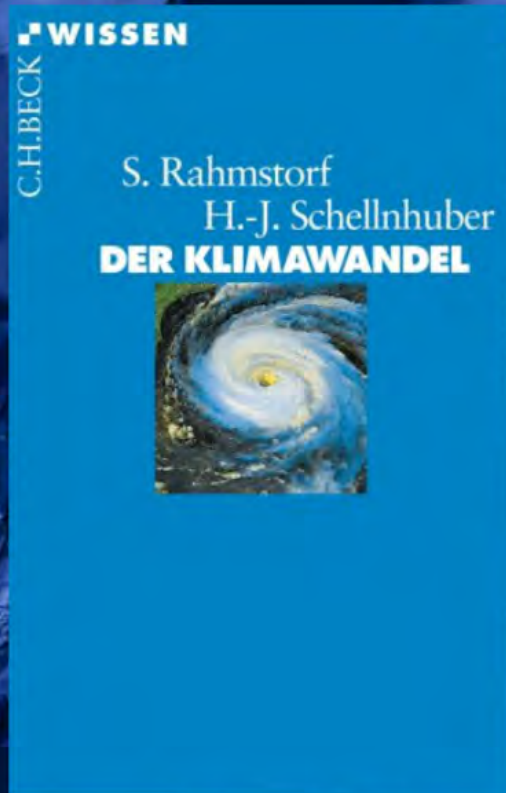
Die Folgen für uns Menschen in Form von Extremereignissen, Ernteaufschlägen usw. sind heute schon spürbar und werden massiv zunehmen

Die Ziele des Pariser Klimaabkommens müssen daher konsequent umgesetzt werden

Sie bedeuten Nullemission weltweit bis spätestens 2050!

Weltweit und auch in Deutschland reicht das Tempo der Emissionsreduktion noch lange nicht aus.

Herzlichen Dank für Ihr Interesse! Mehr lesen?



Blog: KlimaLounge

Folgen Sie mir:

