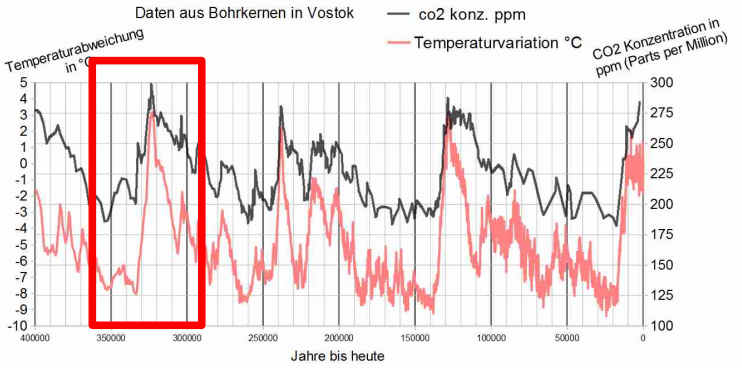
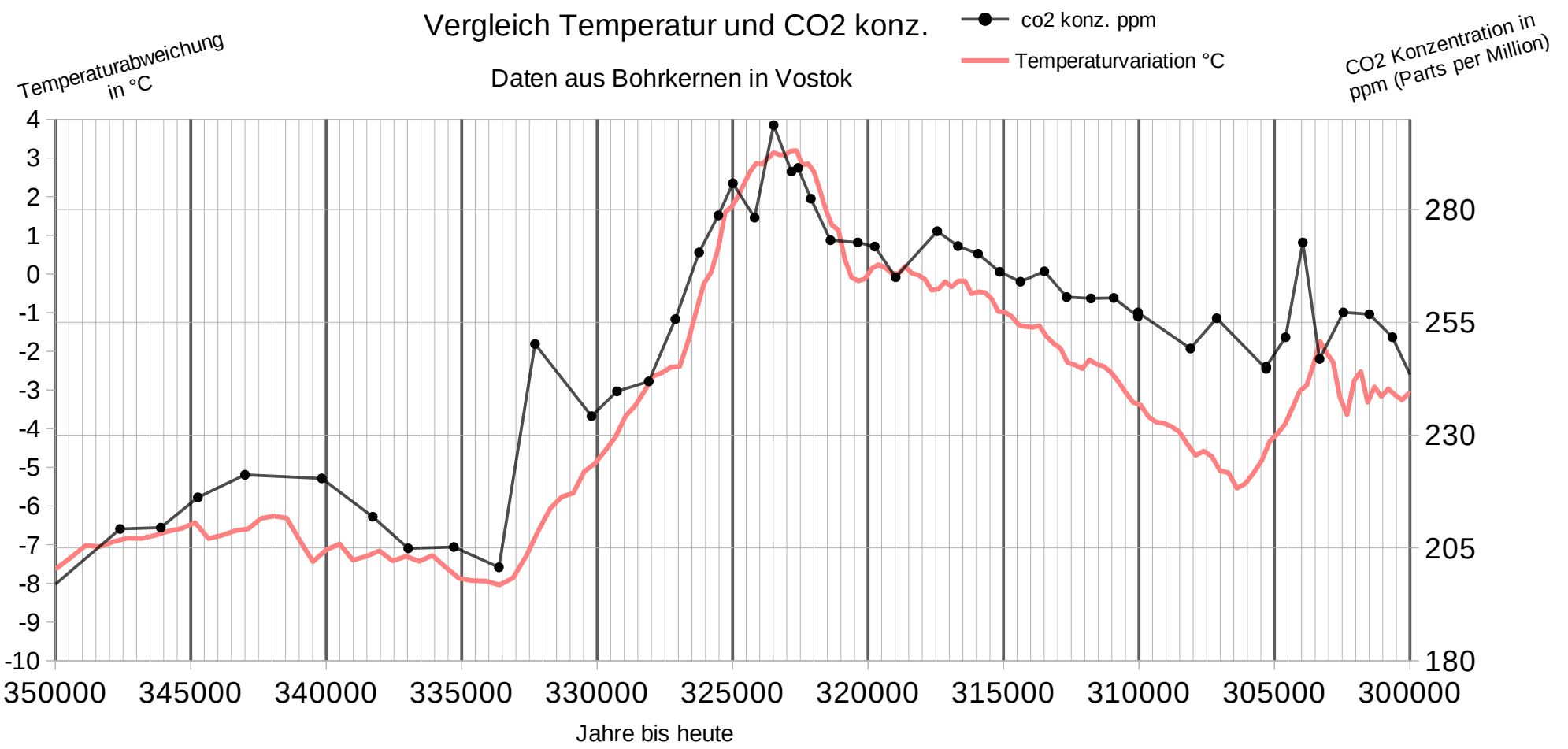
# Vostok Temperatur + CO2

Folie Z 2

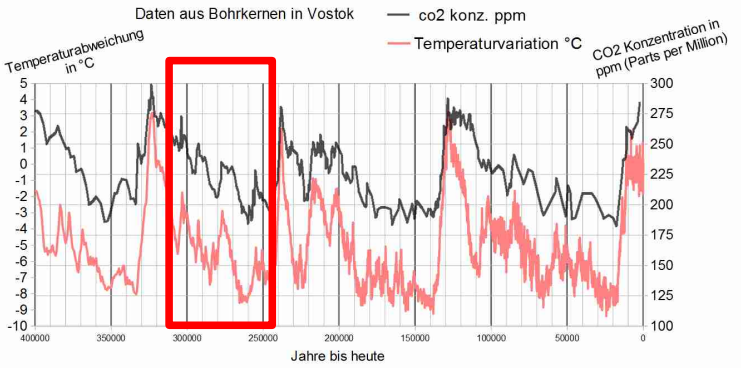
# 300.000 bis 340.000 Jahre vor unserer Zeit

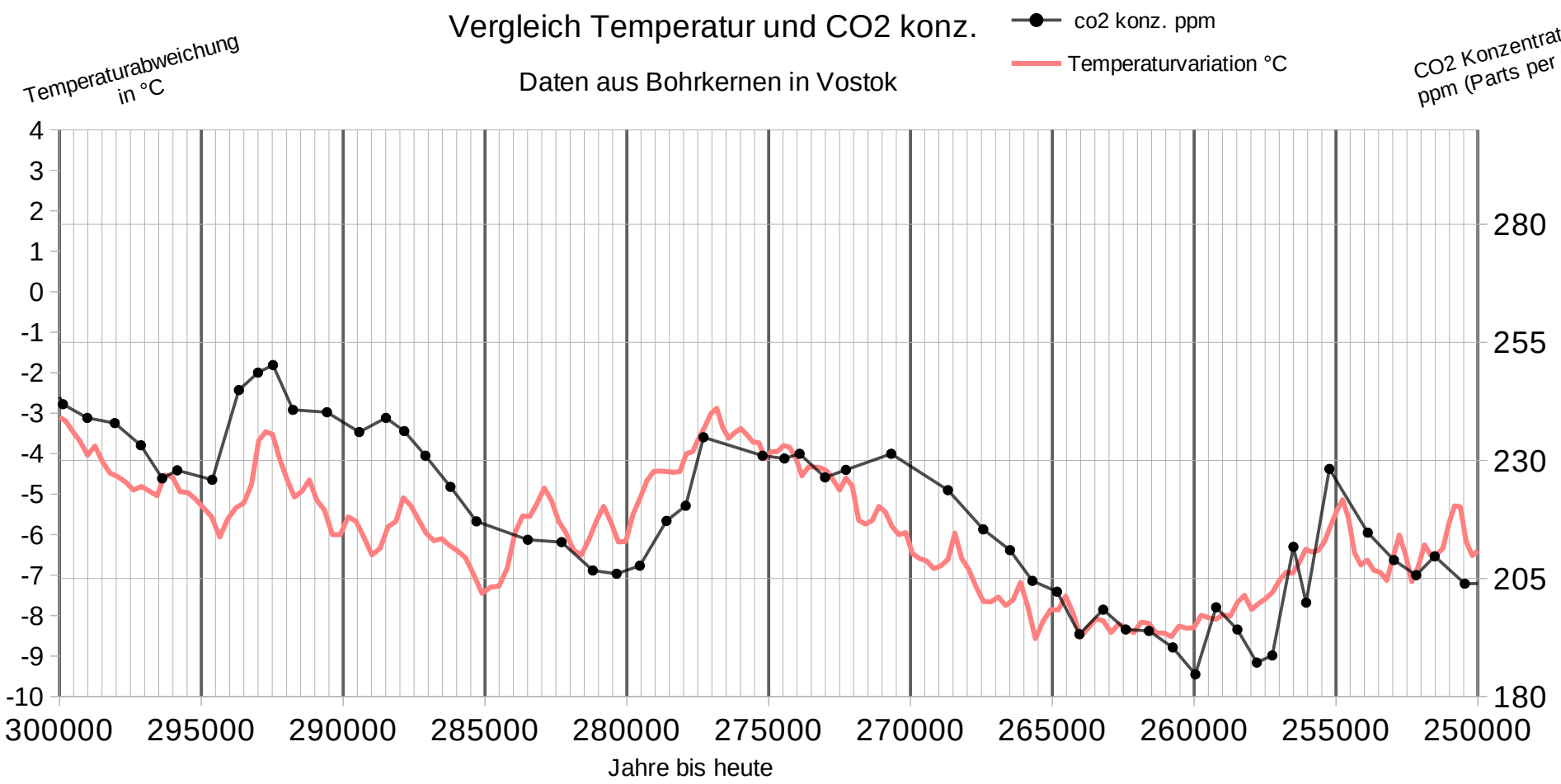


Folie Z 3

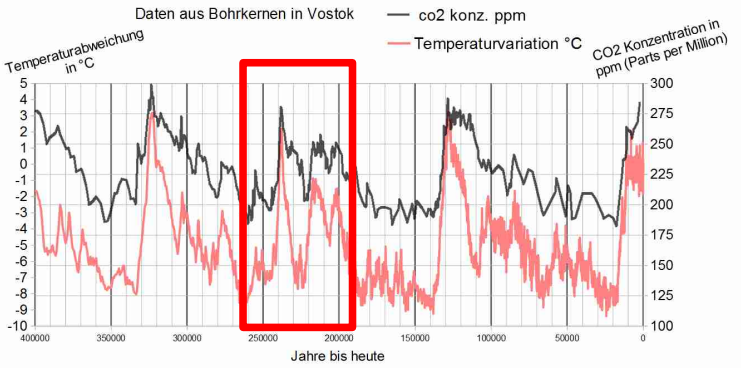
# 250.000 bis 300.000 Jahre vor unserer Zeit

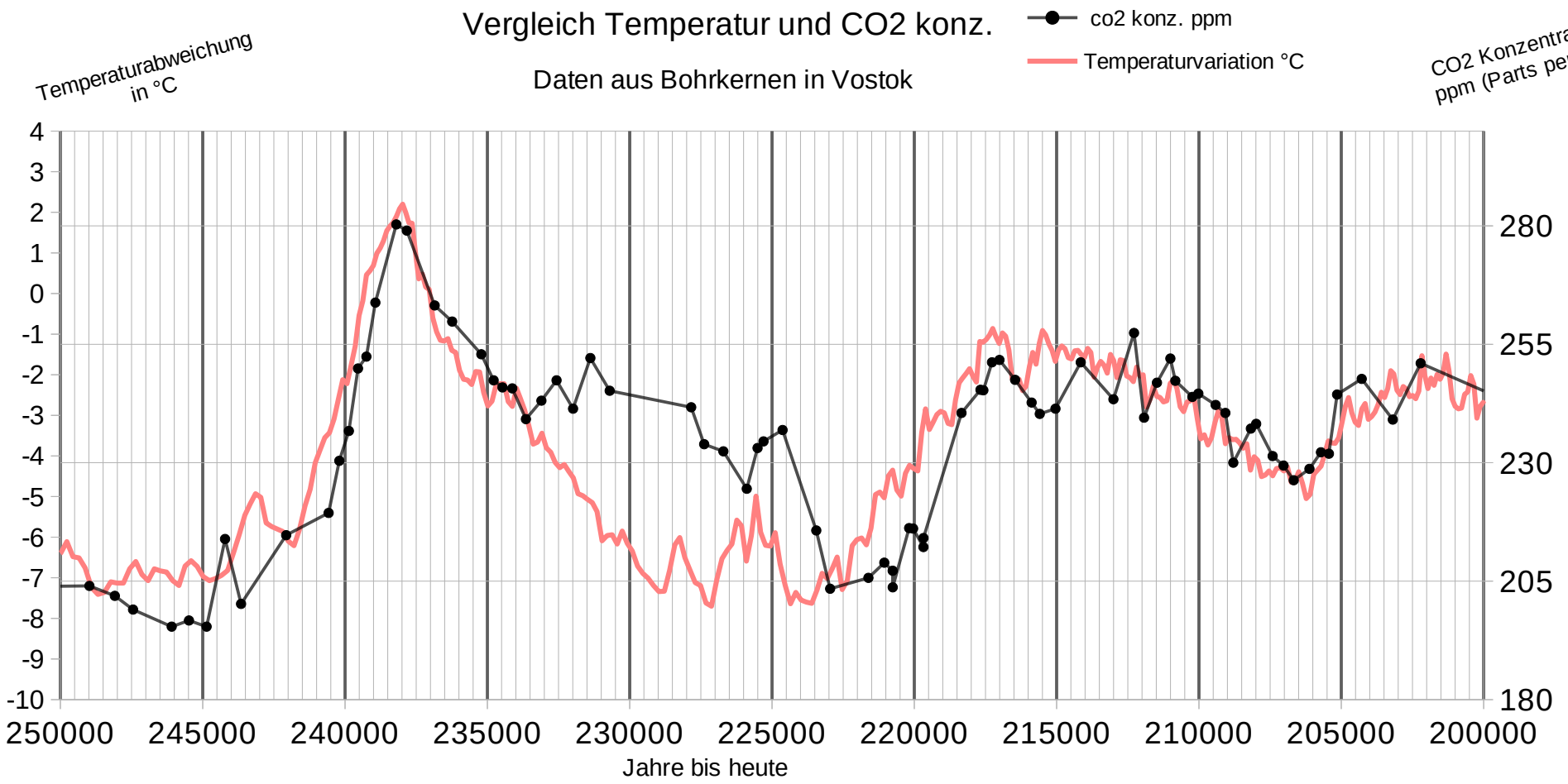


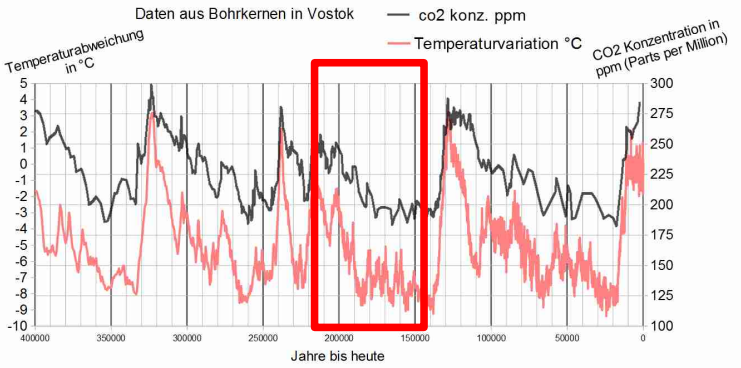
Folie Z 4

# 200.000 bis 250.000 Jahre vor unserer Zeit

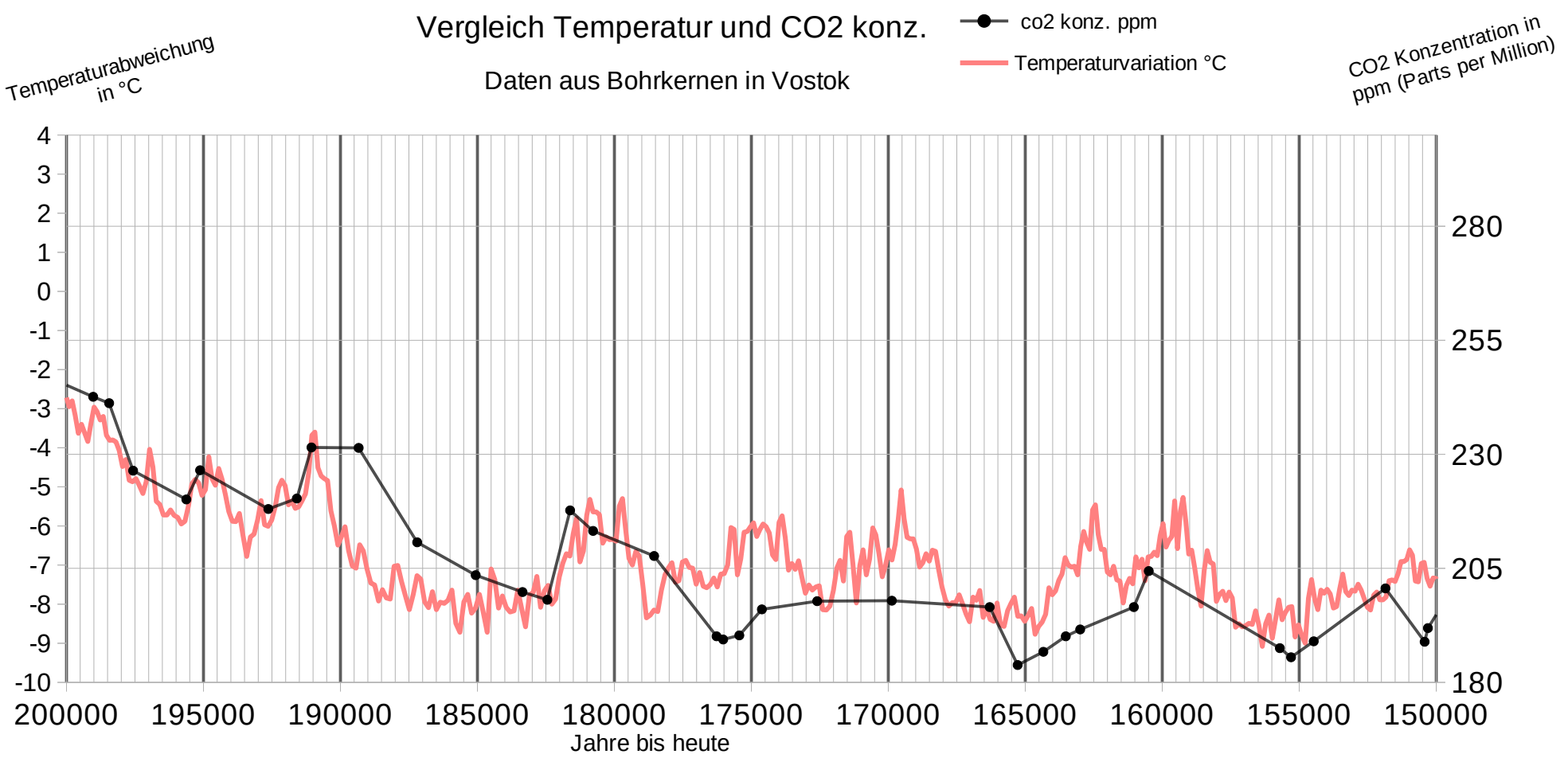


Folie Z 5

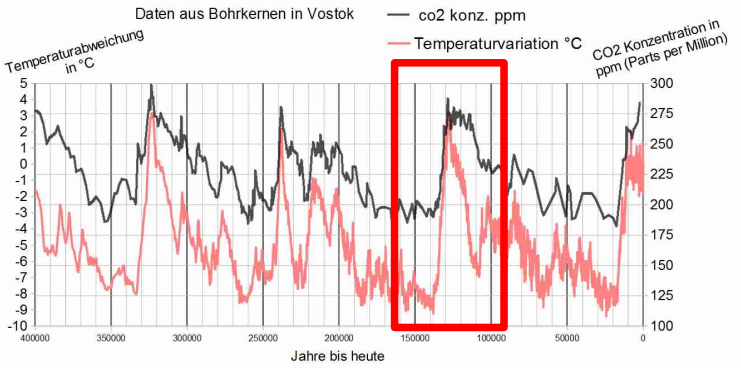


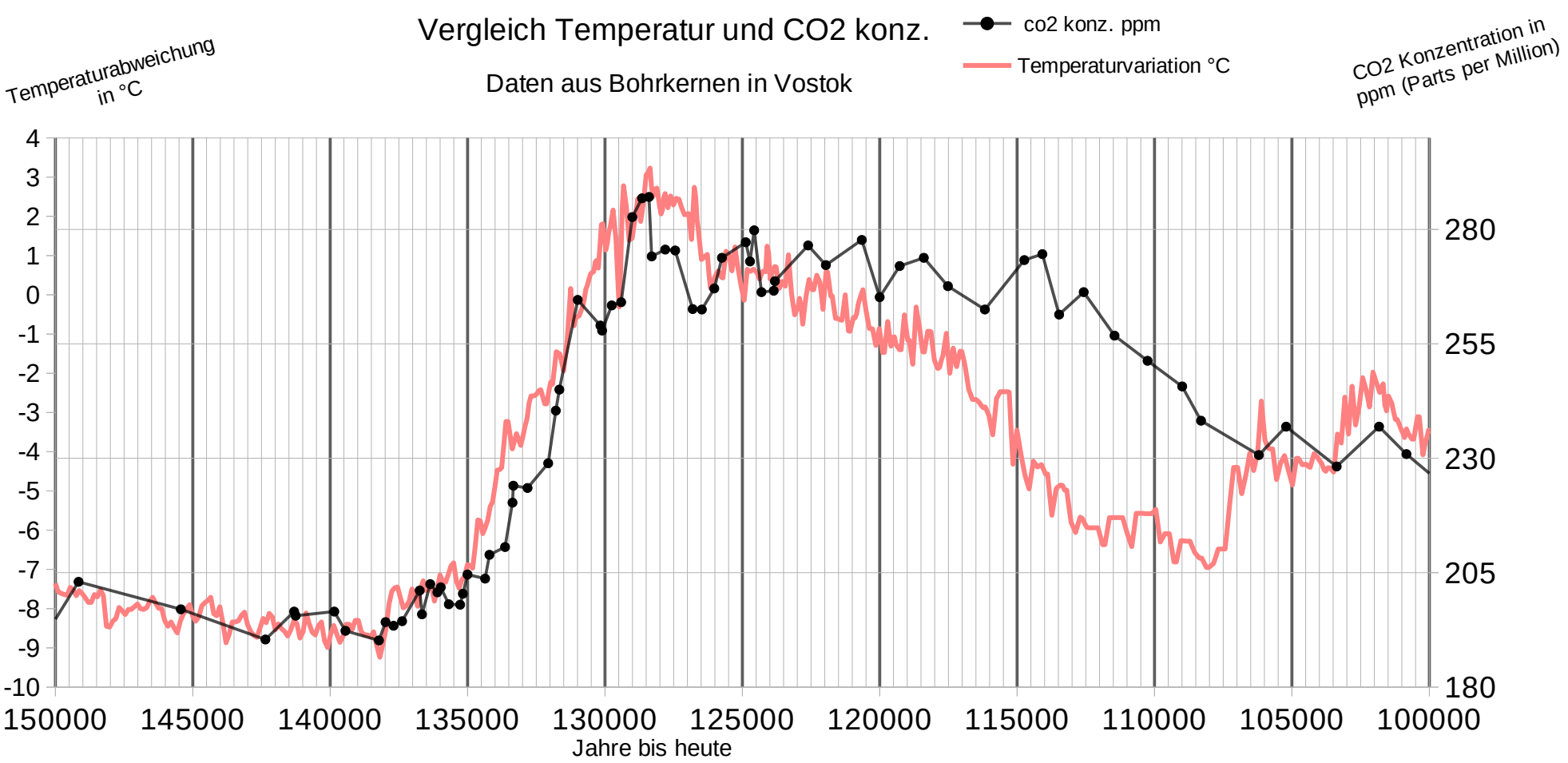

# 150.000 bis 200.000 Jahre vor unserer Zeit



Folie Z 6

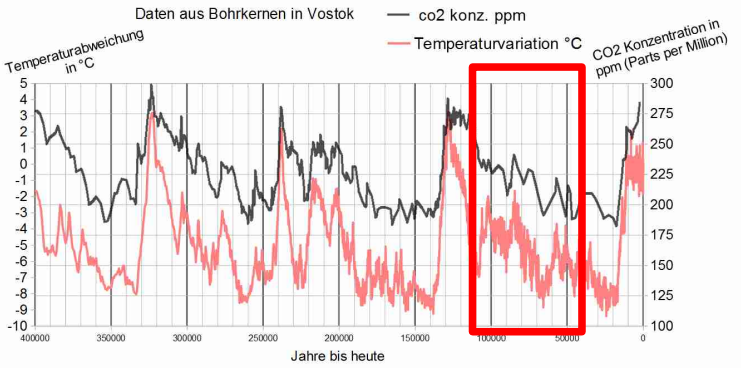
# 100.000 bis 150.000 Jahre vor unserer Zeit



Folie Z 7

50.000 bis 100.000 Jahre vor unserer Zeit




Vergleich Temperatur und CO2 konz.

Daten aus Bohrkernen in Vostok

co2 konz. ppm

Temperaturvariation °C

Temperaturabweichung in °C

CO2 Konzentration in ppm (Parts per Million)

4 3 2 1 0 -1 -2 -3 -4 -5 -6 -7 -8 -9 -10

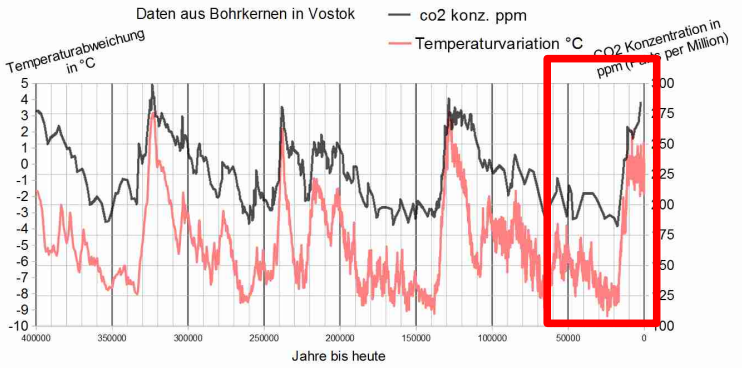
280 255 230 205 180

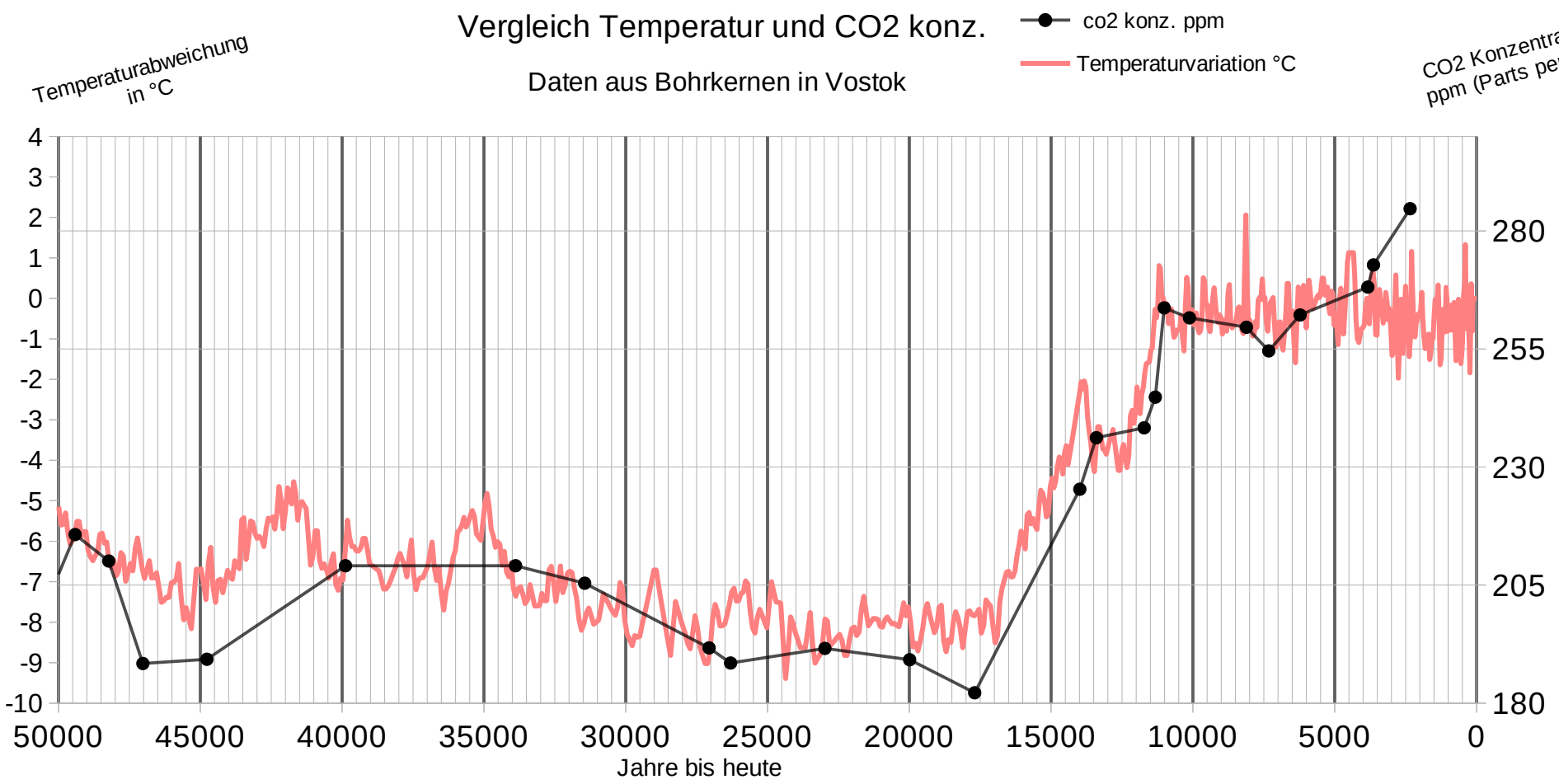
100000 95000 90000 85000 80000 75000 70000 65000 60000 55000 50000

Jahre bis heute

Folie Z 8

# 0 bis 50.000 Jahre vor unserer Zeit



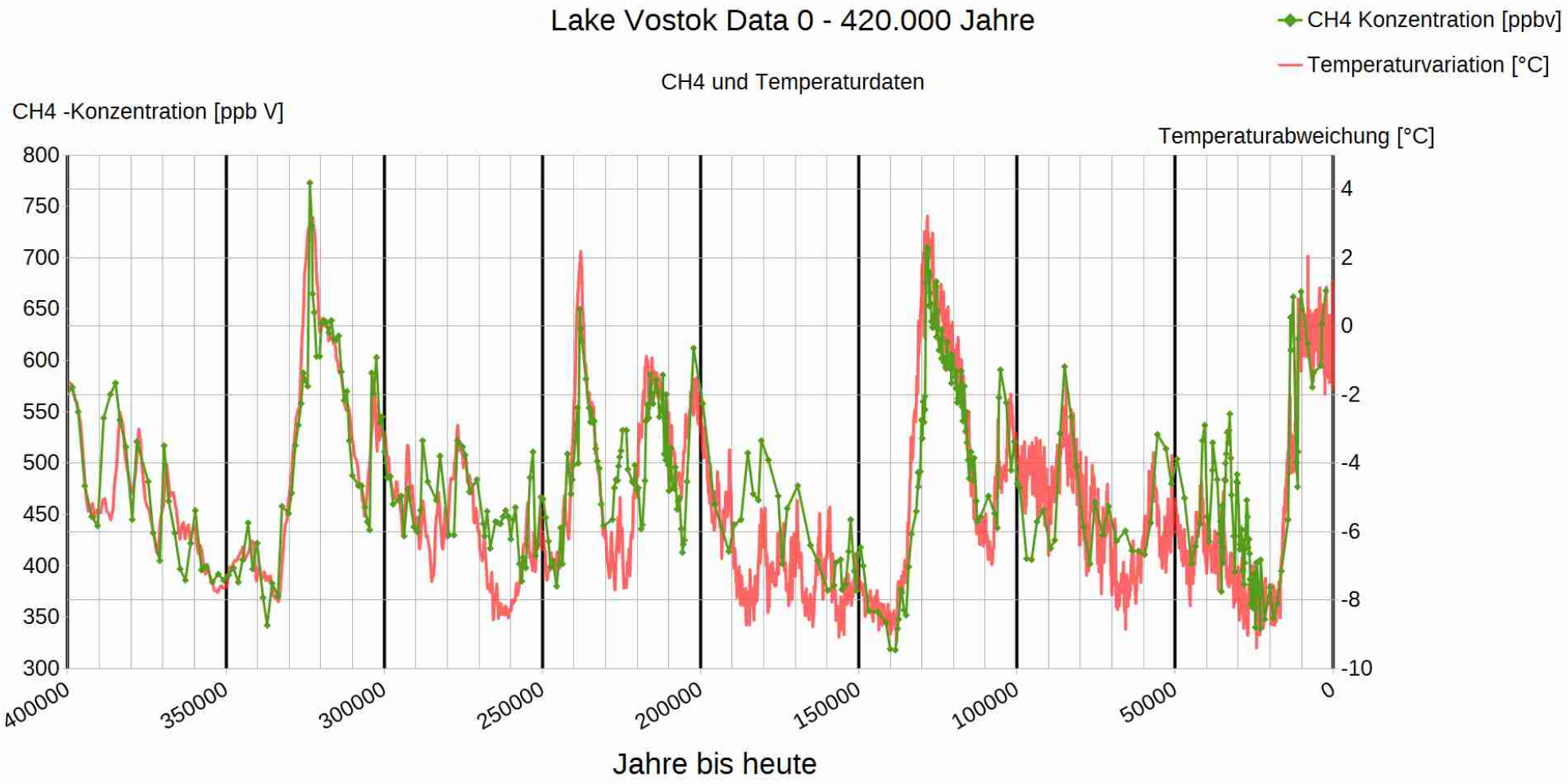



Folie Z 9

# Vostok CH4 + Temp

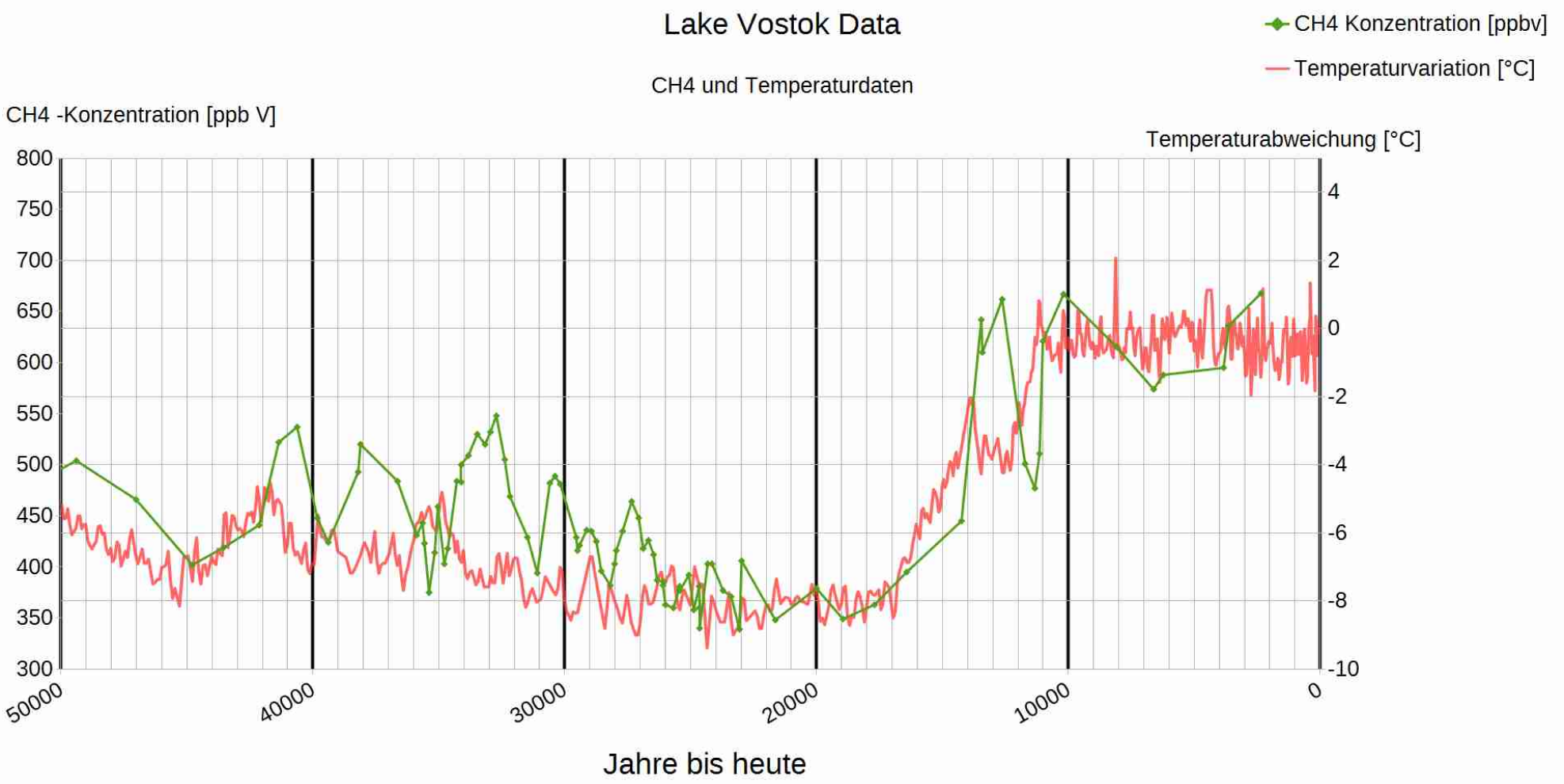
Folie Z 10

# Vostok CH4 (Methan) Daten



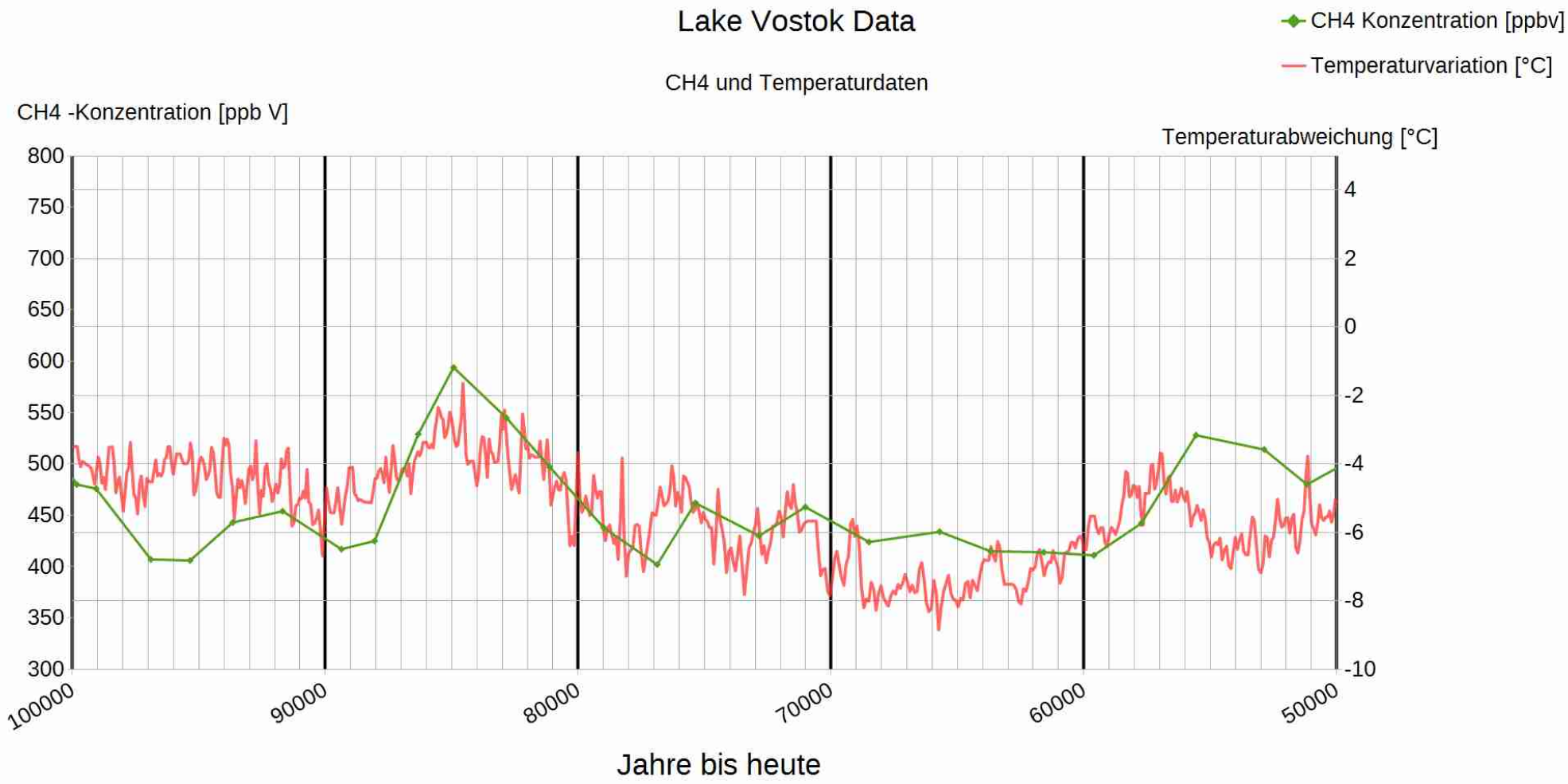
Folie Z 11

# Vostok CH4 (Methan) Daten



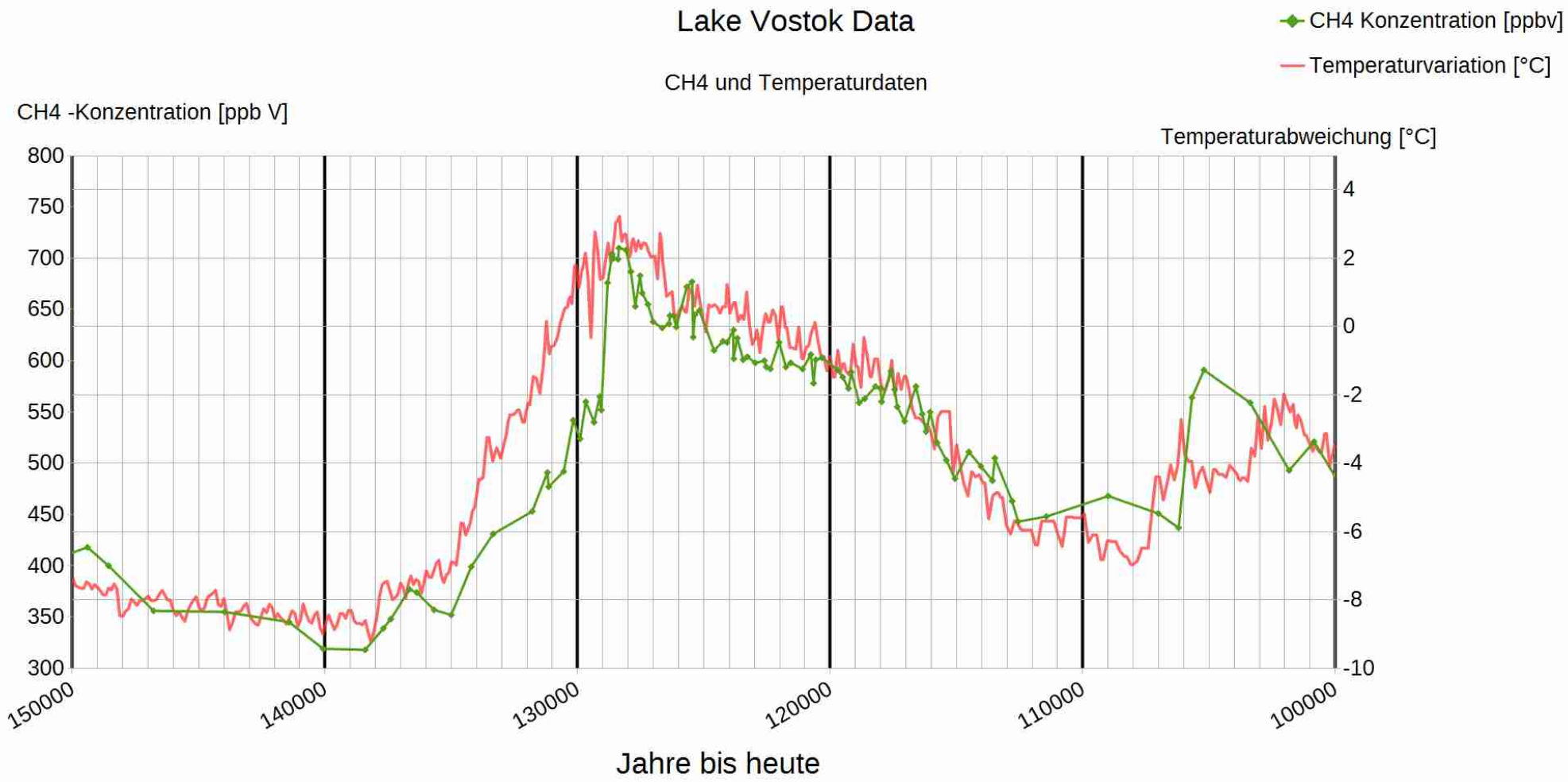
Folie Z 12

# Vostok CH4 (Methan) Daten



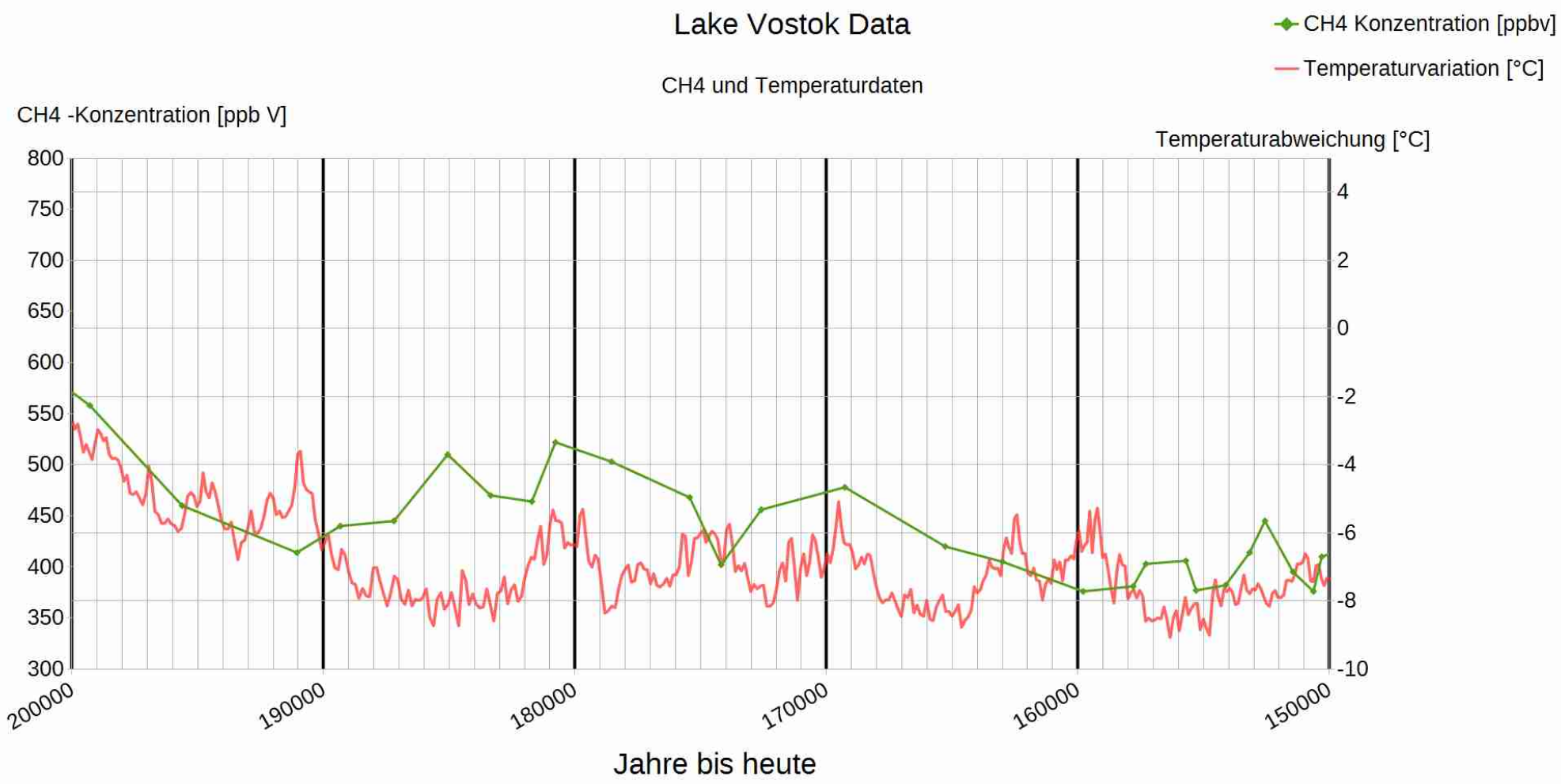
Folie Z 13

# Vostok CH4 (Methan) Daten



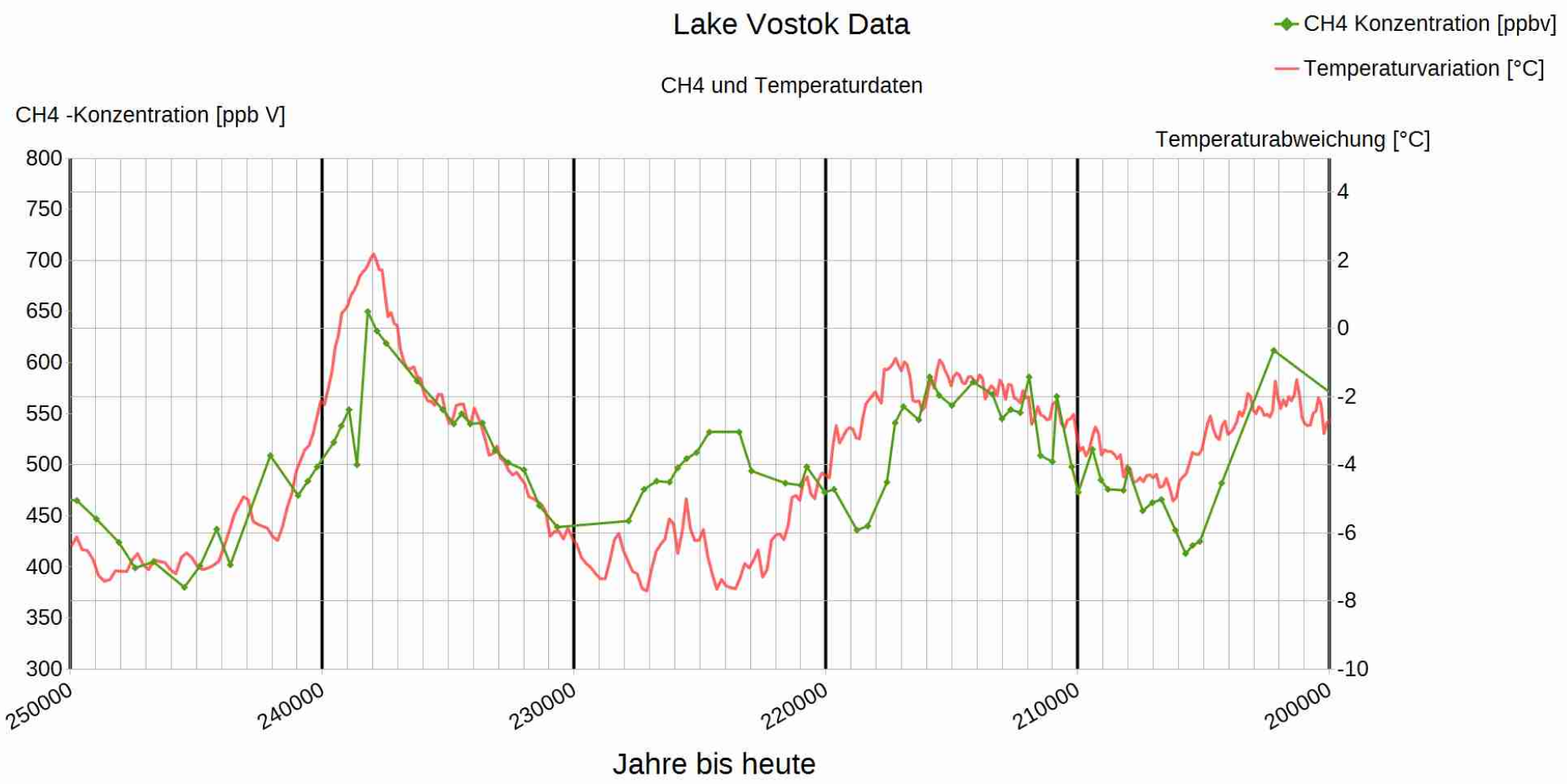
Folie Z 14

# Vostok CH4 (Methan) Daten



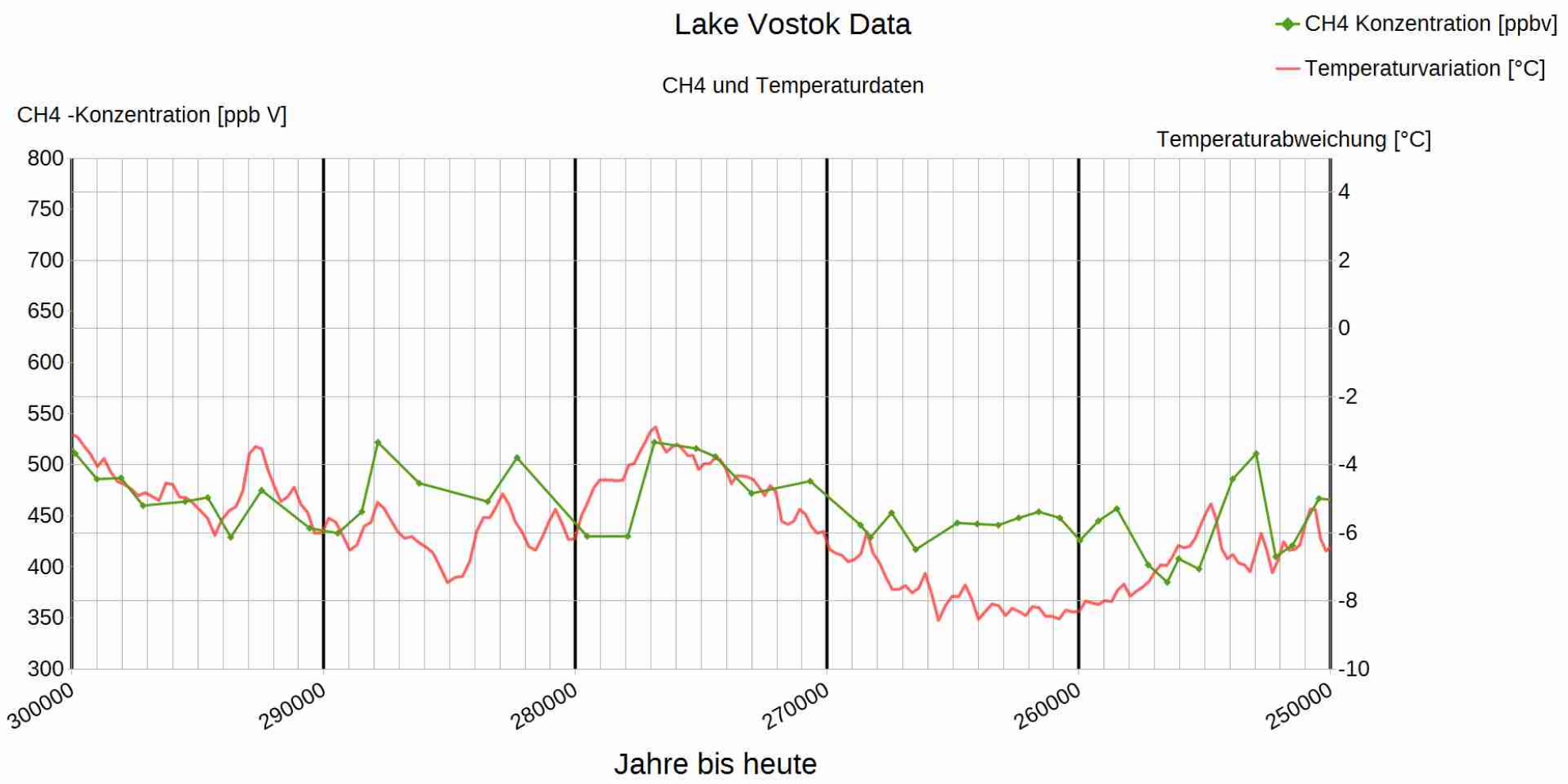
Folie Z 15

# Vostok CH4 (Methan) Daten



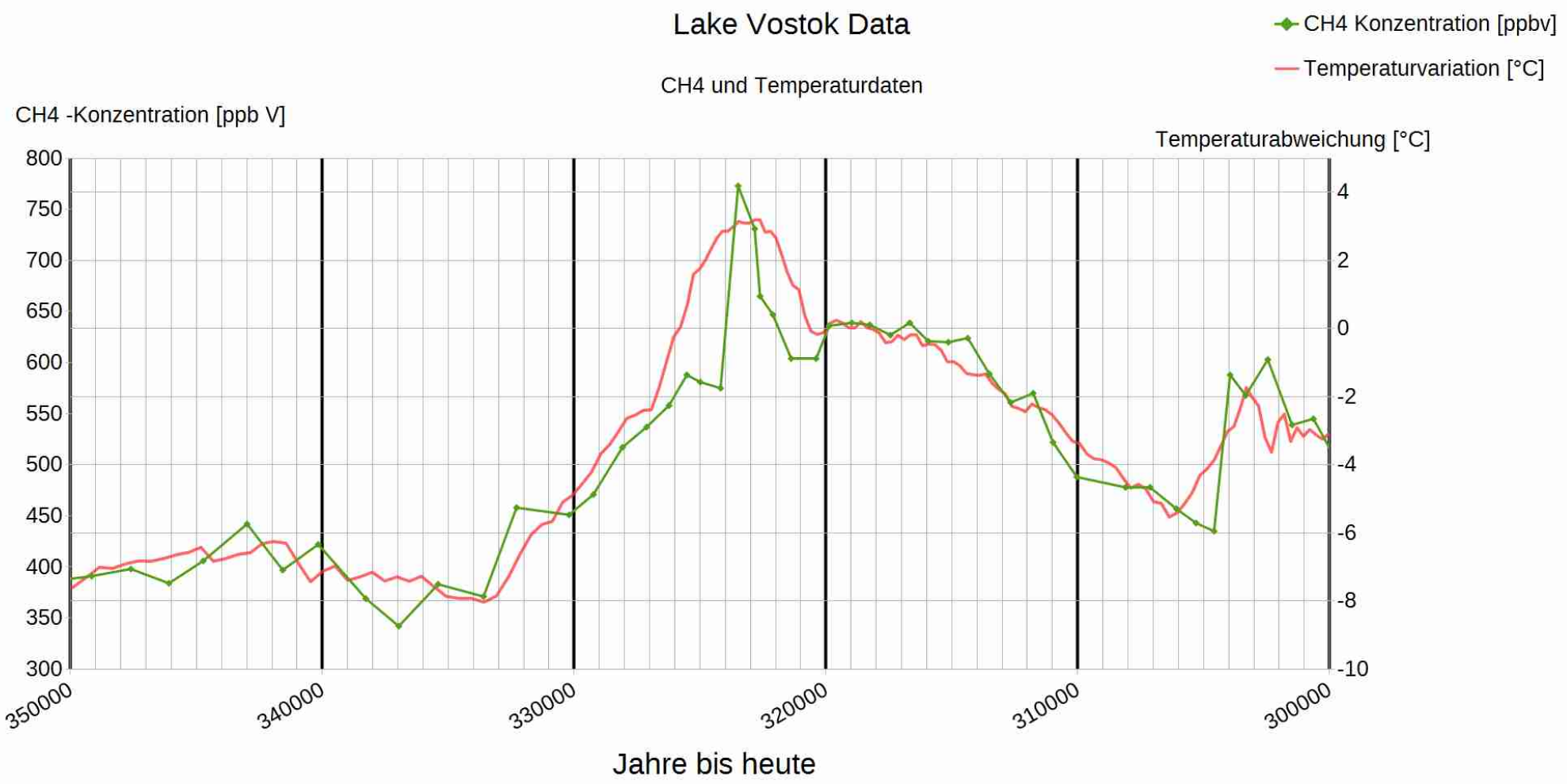
Folie Z 16

# Vostok CH4 (Methan) Daten



Folie Z 17

# Vostok CH4 (Methan) Daten

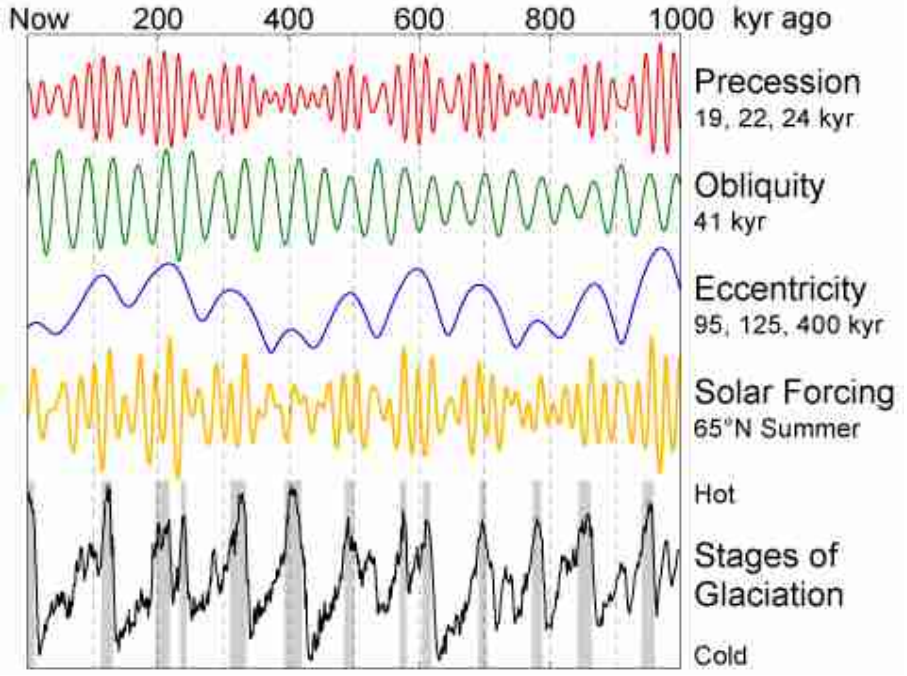


# Milankovich Zyklen

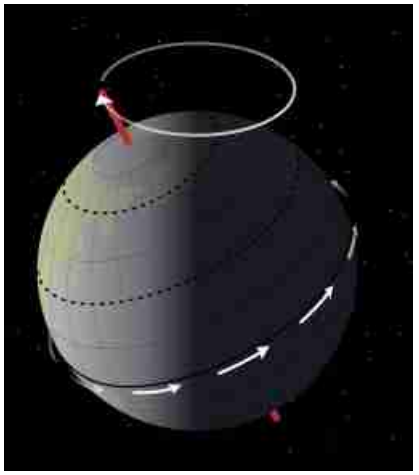
Was könnte der Grund sein für die zyklisch auftretende Erderwärmung?

Folie Z 20

# Milankovitch Zyklen

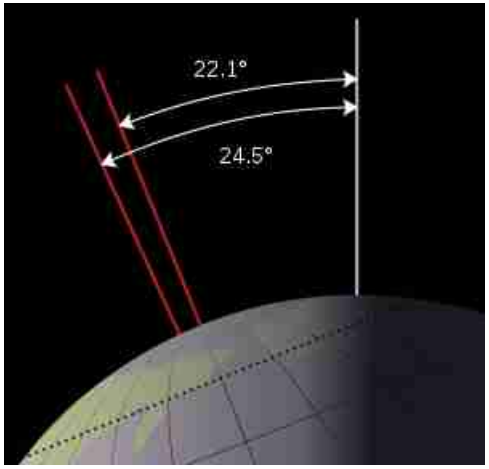



## Präzession



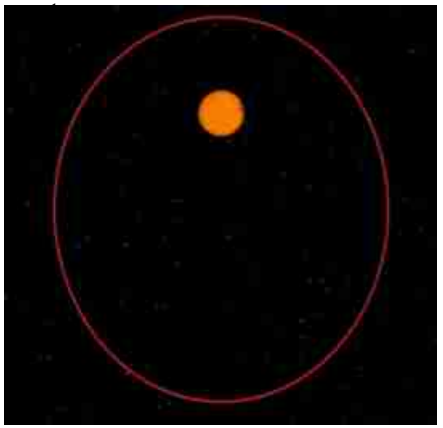
Die Erdachse kreist mit einer Periode von 26.000 Jahren ähnlich der taumelnden Achse eines Kinderkreisels (Präzession) um die Senkrechtstellung.

## Obliquität




Veränderliche Neigung der Erdachse zur Umlaufbahn. Die Schiefe der Erdachse gegen die Senkrechtrichtung der Erdbahn ändert sich periodisch zwischen 22,1° und 24,5°, mit einer Periode von ca. 41.000 Jahren.

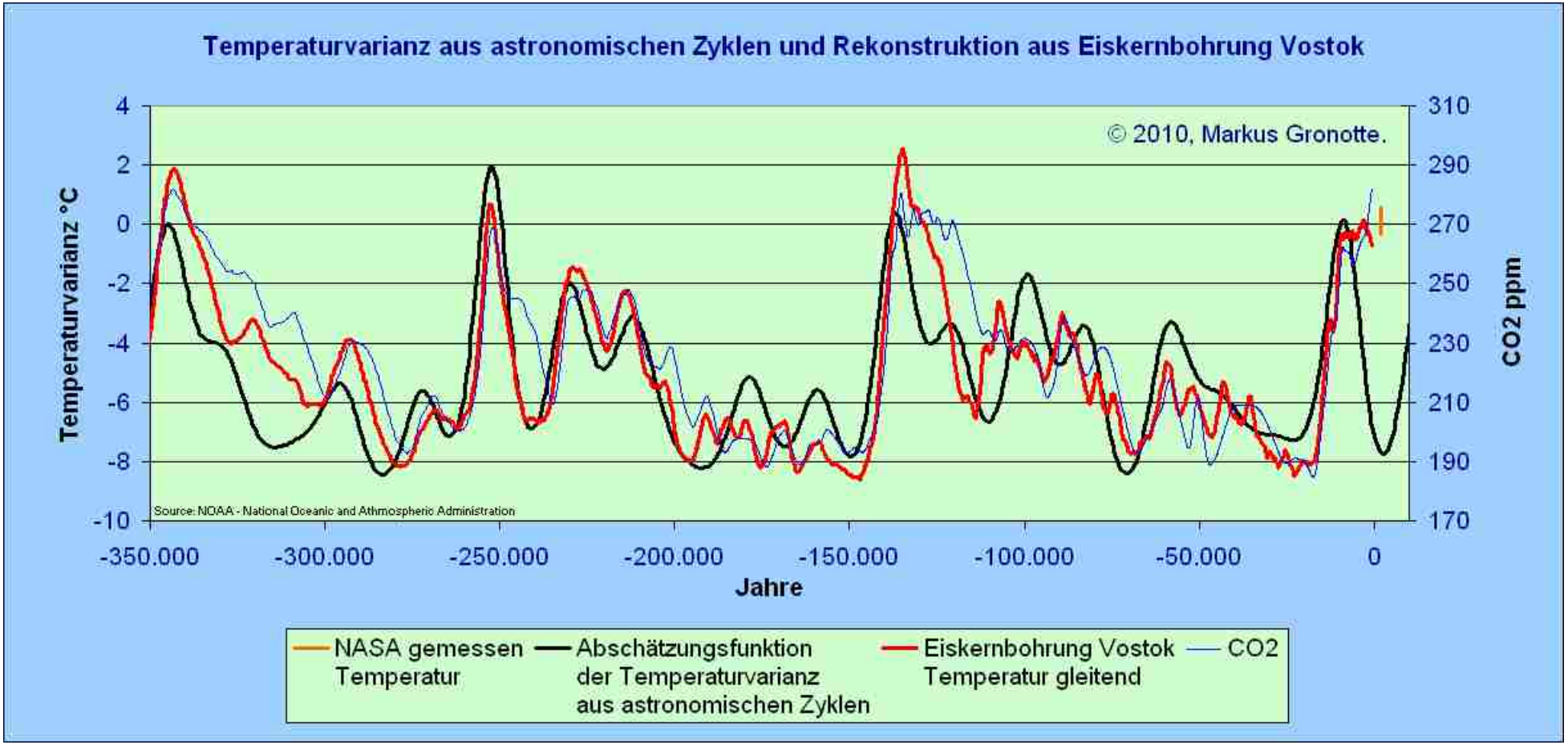
## Exzentrizitä



Die Umlaufbahn der Erde um die Sonne ist eine Ellipse. Die Exzentrizität gibt an, wie stark die ellipsenförmige Umlaufbahn von einer kreisförmigen Bahn abweicht. Die Hauptabweichung tritt in einer Periode von 413.000 Jahren auf.

Quelle: Wikipedia, Milankovitch Zyklen, 01.12.13
https://de.wikipedia.org/wiki/Milankovi%C4%87-Zyklen

Folie Z 21




(Quelle: www.markusgronotte.de)

# Vostok, Dome C, Literatur

Folie Z 23

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Article

*Nature* **399**, 429-436 (3 June 1999) | doi:10.1038/20859; Received 20 January 1999; Accepted 14 April 1999

# Climate and atmospheric history of the past 420,000 years from the Vostok ice core, Antarctica

J. R. Petit[1], J. Jouzel[2], D. Raynaud[1], N. I. Barkov[3], J.-M. Barnola[1], I. Basile[1], M. Bender[4], J. Chappellaz[1], M. Davis[5], G. Delaygue[2], M. Delmotte[1], V. M. Kotlyakov[6], M. Legrand[1], V. Y. Lipenkov[3], C. Lorius[1], L. PÉpin[1,1], C. Ritz[1], E. Saltzman[5] & M. Stievenard[2]

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4. Department of Geosciences, Princeton University, Princeton, New Jersey 08544-1003, USA
5. Rosenstiel School of Marine and Atmospheric Science, University of Miami, 4600 Rickenbacker Causeway, Miami, Florida 33149, USA
6. Institute of Geography, Staromonetny, per 29, 109017, Moscow, Russia

Correspondence to: J. R. Petit[1] Correspondence and requests for materials should be addressed to J.R.P. (e-mail: Email: petit@glaciog.ujf-grenoble.fr.)

**The recent completion of drilling at Vostok station in East Antarctica has allowed the extension of the ice record of atmospheric composition and climate to the past four glacial–interglacial cycles. The succession of changes through each climate cycle and termination was similar, and atmospheric and climate properties oscillated between stable bounds. Interglacial periods differed in temporal evolution and duration. Atmospheric concentrations of carbon dioxide and methane correlate well with Antarctic air-temperature throughout the record. Present-day atmospheric burdens of these two important greenhouse gases seem to have been unprecedented during the past 420,000 years.**

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ABSTRACT
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- J. R. Petit

Petit et al. 1999 Quelle: http://www.nature.com/nature/journal/v399/n6735/abs/399429a0.html

**Petit et al. 1999:**

- Es gibt regelmäßige Interglaziale Zeiten (kurze Wärmephasen) mit einem Intervall von ca. 100.000 Jahren.
(Wir befinden uns in einer solchen kurzen Wärmephase)

- Temperaturunterschied ca. 10 °C.

Folie Z 25

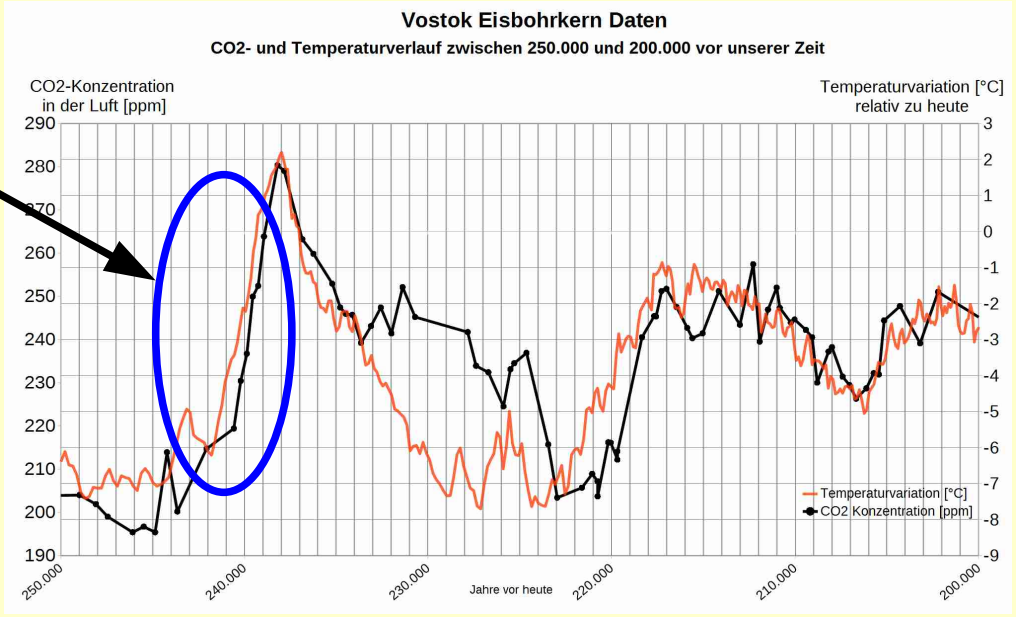
**Petit et al. 1999:**

- Wir sind in einer Eiszeit

- Es gibt regelmäßige Interglaziale Zeiten (kurze Wärmephasen) mit einem Intervall von ca. 100.000 Jahren.
(Wir befinden uns in einer solchen kurzen Wärmephase

- Temperaturunterschied ca. 10 °C.

1. Temperatur führt die CO2 Konzentration in allen 4 sichtbaren Interglazialen Phasen (Phase zwischen den Eiszeiten)



Folie Z 26

**Petit et al. 1999:**

- Wir sind in einer Eiszeit

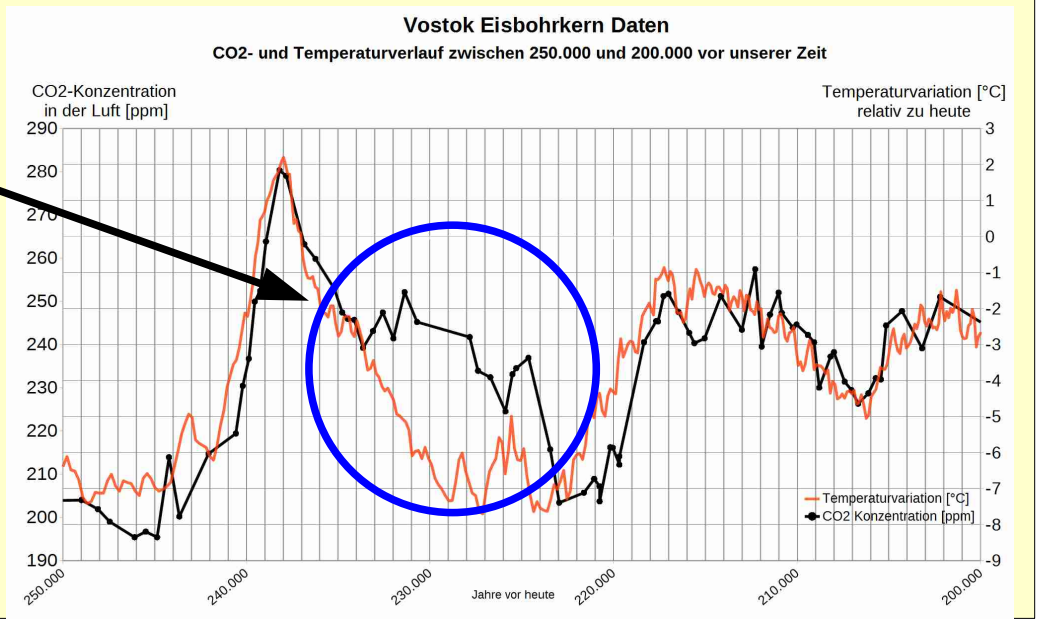
- Es gibt regelmäßige Interglazale Zeiten (kurze Wärmephasen) mit einem Intervall von ca. 100.000 Jahren.
(Wir befinden uns in einer solchen kurzen Wärmephase

- Temperaturunterschied ca. 10 °C.

1. Temperatur führt die CO2 Konzentration in allen 4 sichtbaren interglazialen Phasen (Phase zwischen den Eiszeiten).

2. Am Ende einer interglazialen Phase bei einsetzender Glaziation (Vereisung) gibt es eine deutliche Anomalie der CO2 Konzentration. Sie verbleibt für ca. 8000 Jahre auf relativ hohem Niveau.

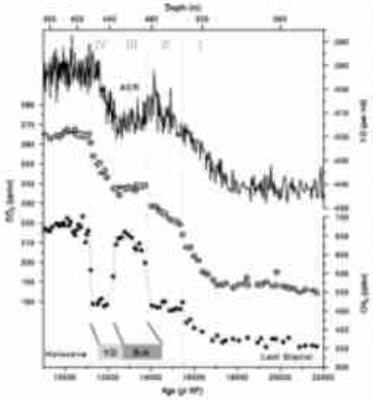
Begründung: Keine.



Folie Z 27

Ansicht Chronik Lesezeichen Extras Hilfe
uk_2002_DA... NOAA Paleoclimatology Pr...
National Climatic Data Center (US) https://www.ncdc.noaa.gov/paleo/pubs/monnin2001/monnin2001.html
Meistbesucht Index von ftp://ftp.ncd... Index von ftp://ftp.ncd... Prof. K.E. Ewert : NASA... Spektralanalyse von Kli... Top-Downloads für A... Kohlendioxi

# *Atmospheric $CO_2$ Concentrations over the Last Glacial Termination*




**Atmospheric $CO_2$ concentrations over the last glacial termination**

*Science*, Volume 291, 112-114, 5 January 2001.

**Eric Monnin, Andreas Indermühle, André Dällenbach, Jacqueline Flückiger, Bernhard Stauffer, Thomas F. Stocker**

Climate and Environmental Physics, Physics Institute, University of Bern, Sidlerstrasse 5, CH-3012 Bern, Switzerland

**Dominique Raynaud and Jean-Marc Barnola**

CNRS Laboratoire de Glaciologie et de Géophysique de l'Environnement, Grenoble, France

**ABSTRACT**:

A record of atmospheric $CO_2$ concentration during the transition from the Last Glacial Maximum to the Holocene, obtained from the Dome Concordia (Antarctica) ice core, reveals that an increase of 76 parts per million by volume (ppmv) occurred over a period of 6 thousand years in four clearly distinguishable intervals. The close correlation between $CO_2$ concentration and Antarctic temperature indicates that the Southern Ocean played an important role in causing the $CO_2$ increase. However, the similarity of changes in $CO_2$ concentration and variations of atmospheric methane concentration suggests that processes in the tropics and in the northern hemisphere, where the main sources for methane are located, also had significant effects on atmospheric $CO_2$ concentrations.

**DATA**:

Download the Dome C $CO_2$ and $CH_4$ data and data description from the WDC Paleo Archive.

Monin et al. 2001 Quelle: https://www.ncdc.noaa.gov/paleo/pubs/monnin2001/monnin2001.html

Folie Z 28

**Monin et al. 2001:**

- $CO_2$ Konzentrationen auf der Südhalbkugel beruhen sehr wahrscheinlich auf den $CO_2$-Ausgasungen der Ozeanen.

- $CO_2$ Hauptverursacher wird aber auf der Nordhalbkugel vermutet.

# Shakun et al

Folie Z 30

ARTICLE

doi:10.1038/nature10915

# Global warming preceded by increasing carbon dioxide concentrations during the last deglaciation

Jeremy D. Shakun[1,2], Peter U. Clark[3], Feng He[4], Shaun A. Marcott[3], Alan C. Mix[3], Zhengyu Liu[4,5,6], Bette Otto-Bliesner[7], Andreas Schmittner[3] & Edouard Bard[8]

The covariation of carbon dioxide ($CO_2$) concentration and temperature in Antarctic ice-core records suggests a close link between $CO_2$ and climate during the Pleistocene ice ages. The role and relative importance of $CO_2$ in producing these climate changes remains unclear, however, in part because the ice-core deuterium record reflects local rather than global temperature. Here we construct a record of global surface temperature from 80 proxy records and show that temperature is correlated with and generally lags $CO_2$ during the last (that is, the most recent) deglaciation. Differences between the respective temperature changes of the Northern Hemisphere and Southern Hemisphere parallel variations in the strength of the Atlantic meridional overturning circulation recorded in marine sediments. These observations, together with transient global climate model simulations, support the conclusion that an antiphased hemispheric temperature response to ocean circulation changes superimposed on globally in-phase warming driven by increasing $CO_2$ concentrations is an explanation for much of the temperature change at the end of the most recent ice age.

„Shakun et al. 2012“ Veröffentlichung = 05.04.2012

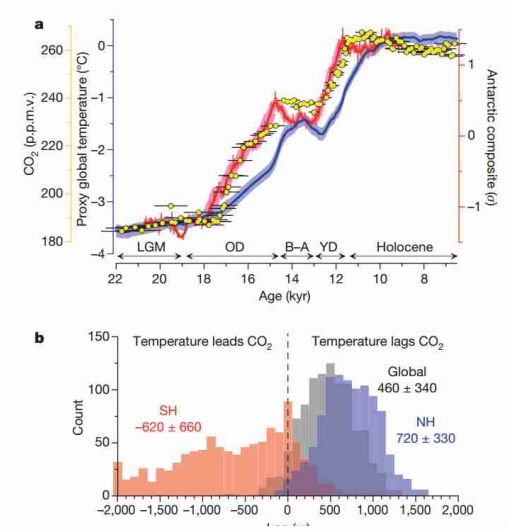
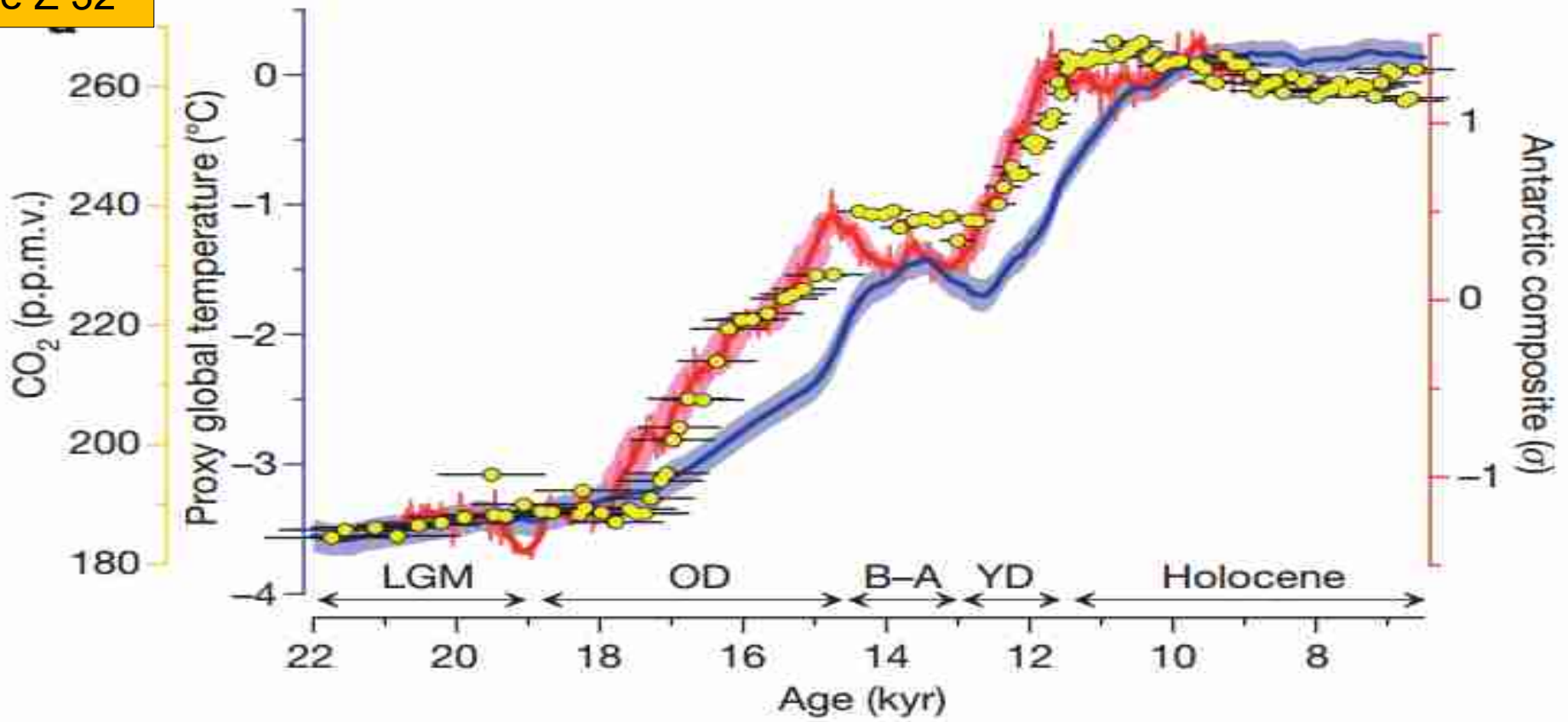
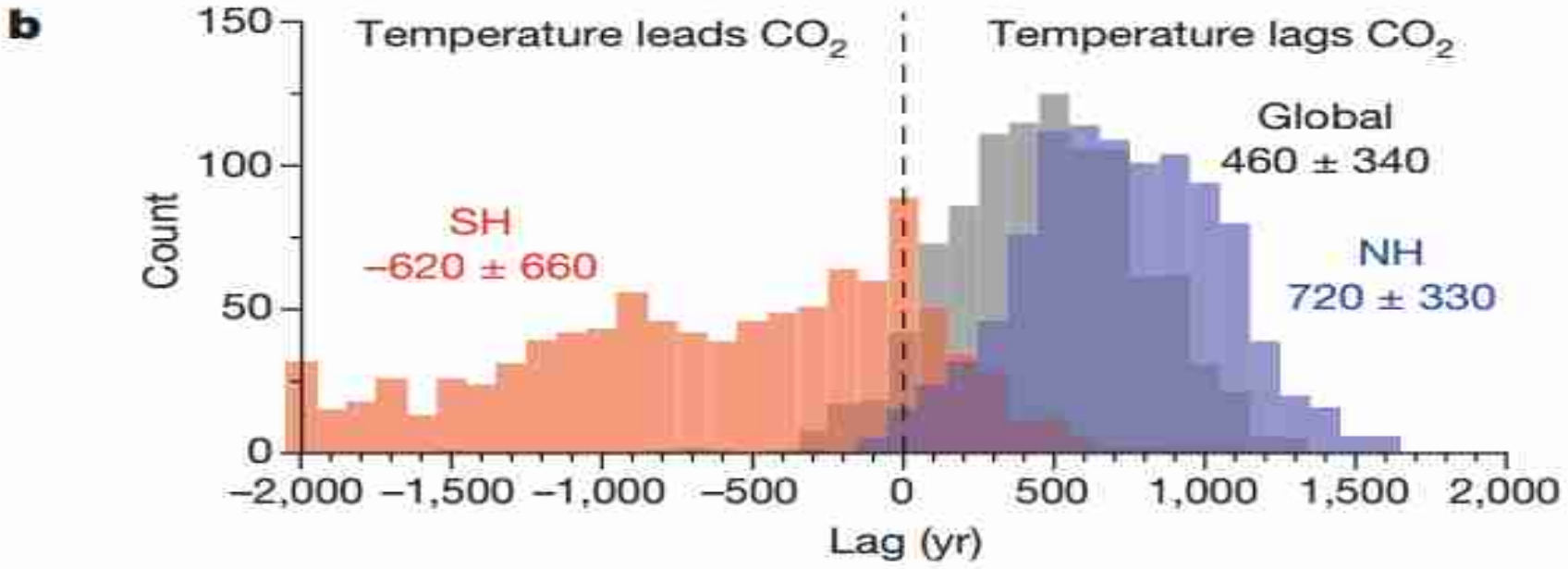



**Figure 2 | $CO_2$ concentration and temperature.** **a**, The global proxy temperature stack (blue) as deviations from the early Holocene (11.5–6.5 kyr ago) mean, an Antarctic ice-core composite temperature record[42] (red), and atmospheric $CO_2$ concentration (refs 12, 13; yellow dots). The Holocene, Younger Dryas (YD), Bølling–Allerød (B–A), Oldest Dryas (OD) and Last Glacial Maximum (LGM) intervals are indicated. Error bars, 1$\sigma$ (Methods); p.p.m.v., parts per million by volume. **b**, The phasing of $CO_2$ concentration and temperature for the global (grey), Northern Hemisphere (NH; blue) and Southern Hemisphere (SH; red) proxy stacks based on lag correlations from 20–10 kyr ago in 1,000 Monte Carlo simulations (Methods). The mean and 1$\sigma$ of the histograms are given. $CO_2$ concentration leads the global temperature stack in 90% of the simulations and lags it in 6%.

Folie Z 32


$CO_2$ (p.p.m.v.)
260
240
220
200
180
Proxy global temperature (°C)
0
−1
−2
−3
−4
Antarctic composite (σ)
1
0
−1
LGM
OD
B–A
YD
Holocene
22
20
18
16
14
12
10
8
Age (kyr)


b
Temperature leads $CO_2$
Temperature lags $CO_2$
Global
460 ± 340
SH
−620 ± 660
NH
720 ± 330
Count
150
100
50
0
−2,000
−1,500
−1,000
−500
0
500
1,000
1,500
2,000
Lag (yr)

Folie Z 33

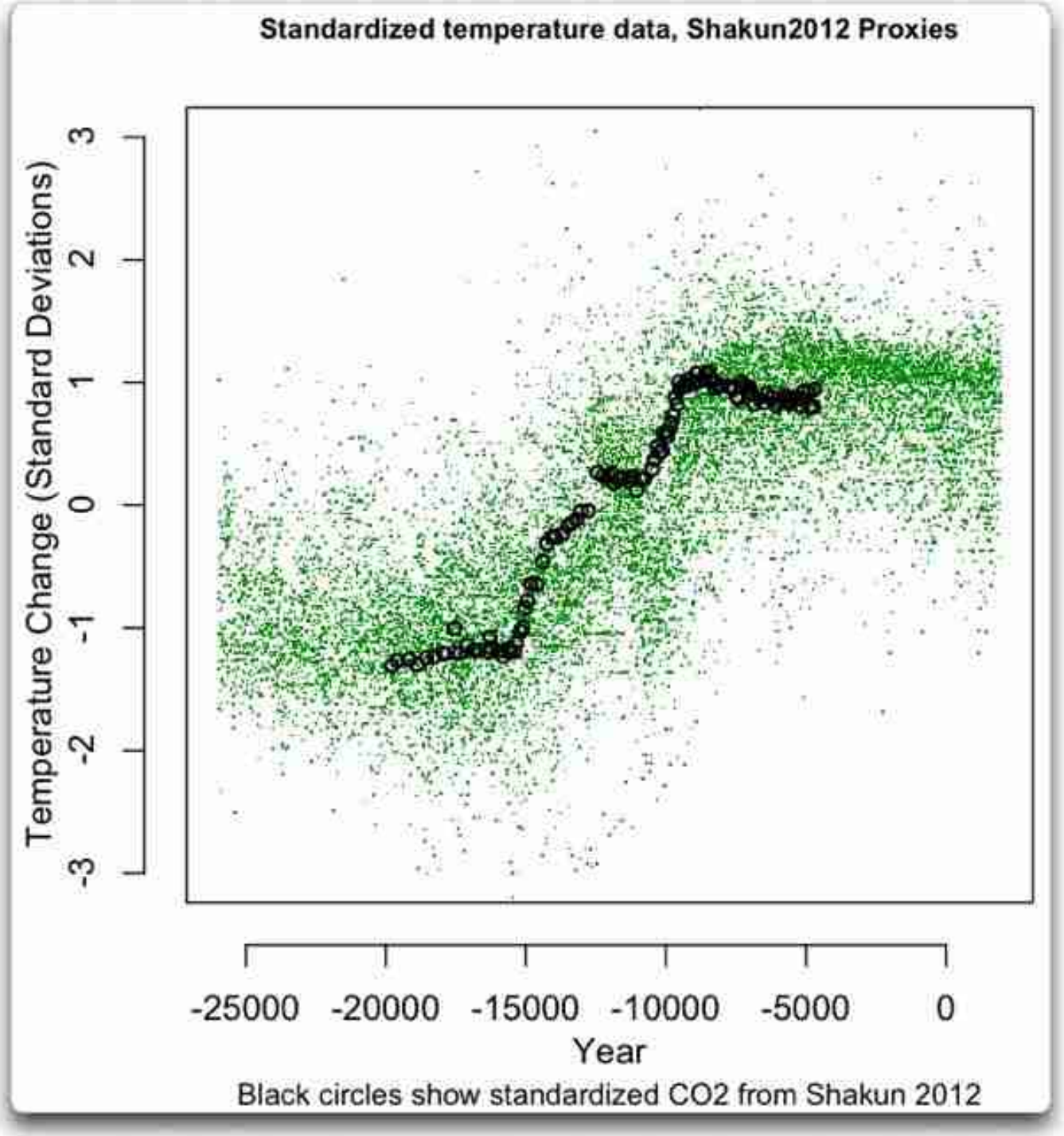
**Shakun et al. 2012:**

- $CO_2$ Konzentrationen hinken den Temperaturkurven auf der Südhalbkugel hinterher.

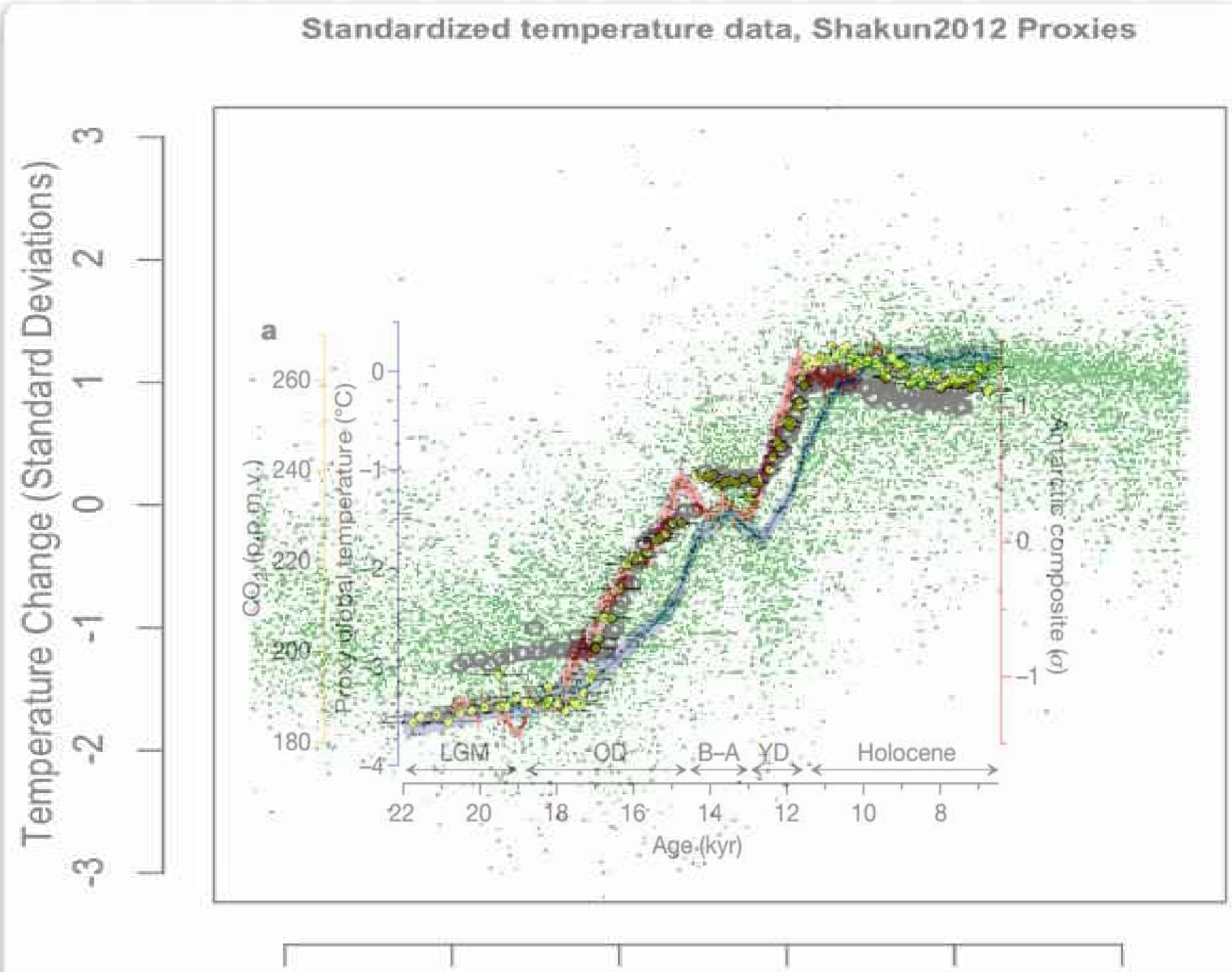
- Auf der Nordhalbkugel sieht das aber anders aus! Dort hinken die Temperaturen der CO2-Konzentration hinterher.

- Global führt auch das $CO_{2,}$ und nicht die Temperatur.

Folie Z 34


Standardized temperature data, Shakun2012 Proxies
Temperature Change (Standard Deviations)
3
2
1
0
-1
-2
-3
-25000
-20000
-15000
-10000
-5000
0
Year
Black circles show standardized CO2 from Shakun 2012

Folie Z 35

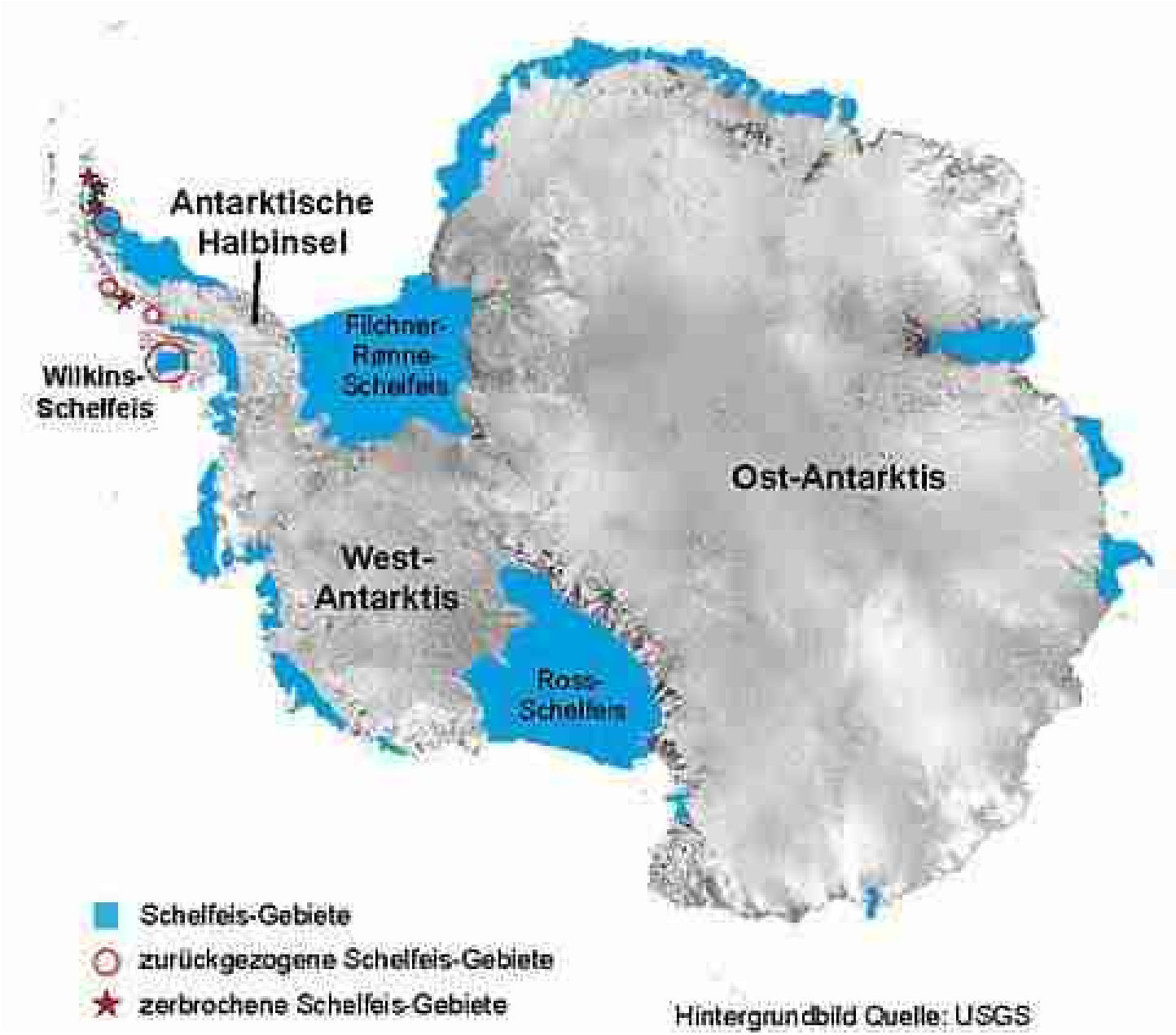

Standardized temperature data, Shakun2012 Proxies
Temperature Change (Standard Deviations)
3
2
1
0
-1
-2
-3
a
260
240
220
200
180
$CO_2$ (p.p.m.v.)
0
−1
−2
−3
−4
Proxy global temperature (°C)
1
0
−1
Antarctic composite (σ)
LGM
OD
B–A
YD
Holocene
22
20
18
16
14
12
10
8
Age (kyr)

Folie Z 36

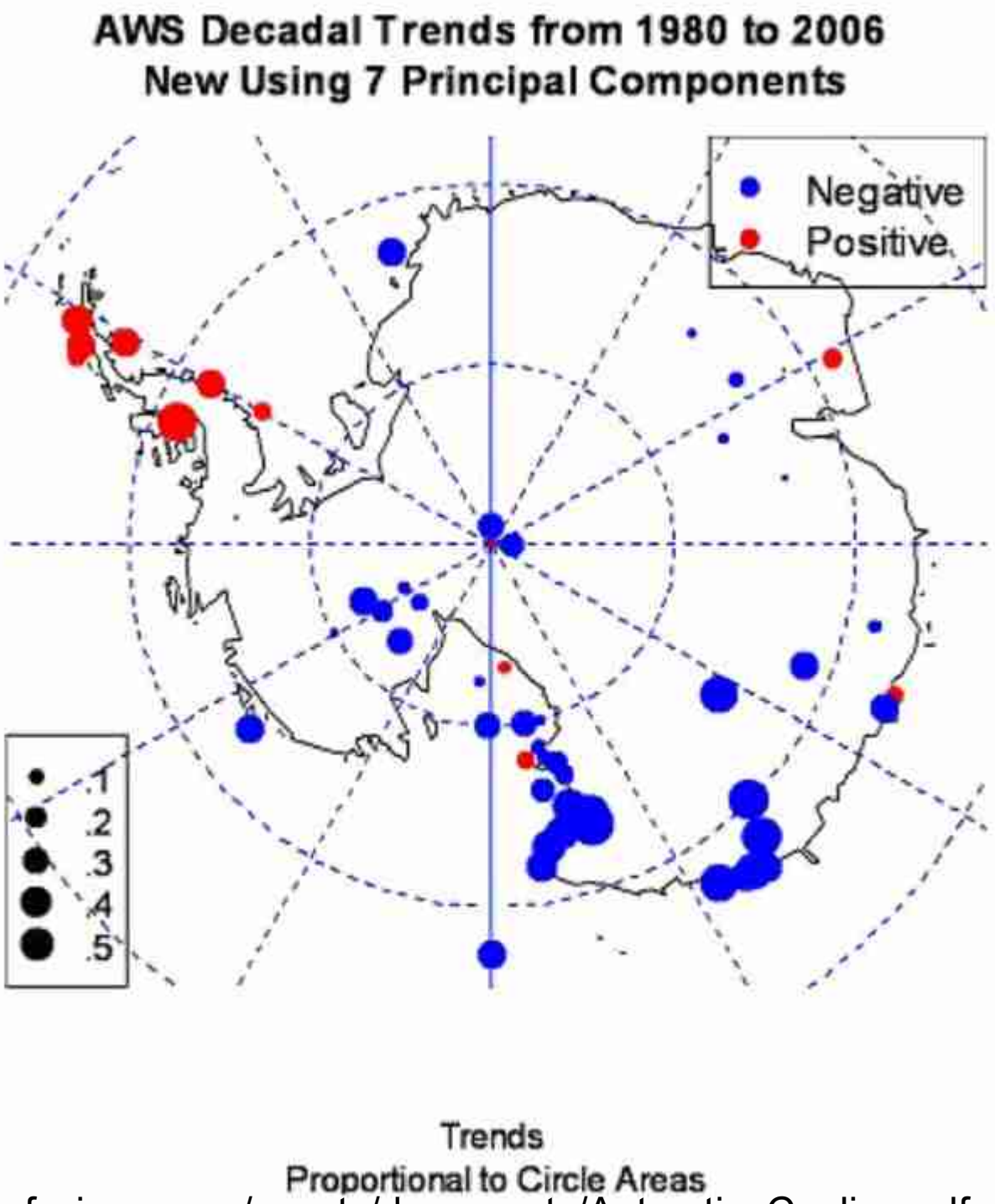
**Figure 2 | $CO_2$ concentration and temperature.** **a**, The global proxy temperature stack (blue) as deviations from the early Holocene (11.5–6.5 kyr ago) mean, an Antarctic ice-core composite temperature record[42] (red), and atmospheric $CO_2$ concentration (refs 12, 13; yellow dots). The Holocene, Younger Dryas (YD), Bølling–Allerød (B–A), Oldest Dryas (OD) and Last Glacial Maximum (LGM) intervals are indicated. Error bars, 1$\sigma$ (Methods); p.p.m.v., parts per million by volume. **b**, The phasing of $CO_2$ concentration and temperature for the global (grey), Northern Hemisphere (NH; blue) and Southern Hemisphere (SH; red) proxy stacks based on lag correlations from 20–10 kyr ago in 1,000 Monte Carlo simulations (Methods). The mean and 1$\sigma$ of the histograms are given. $CO_2$ concentration leads the global temperature stack in 90% of the simulations and lags it in 6%.

# Südpol
# Temperatur & Eisschild

Folie Z 38

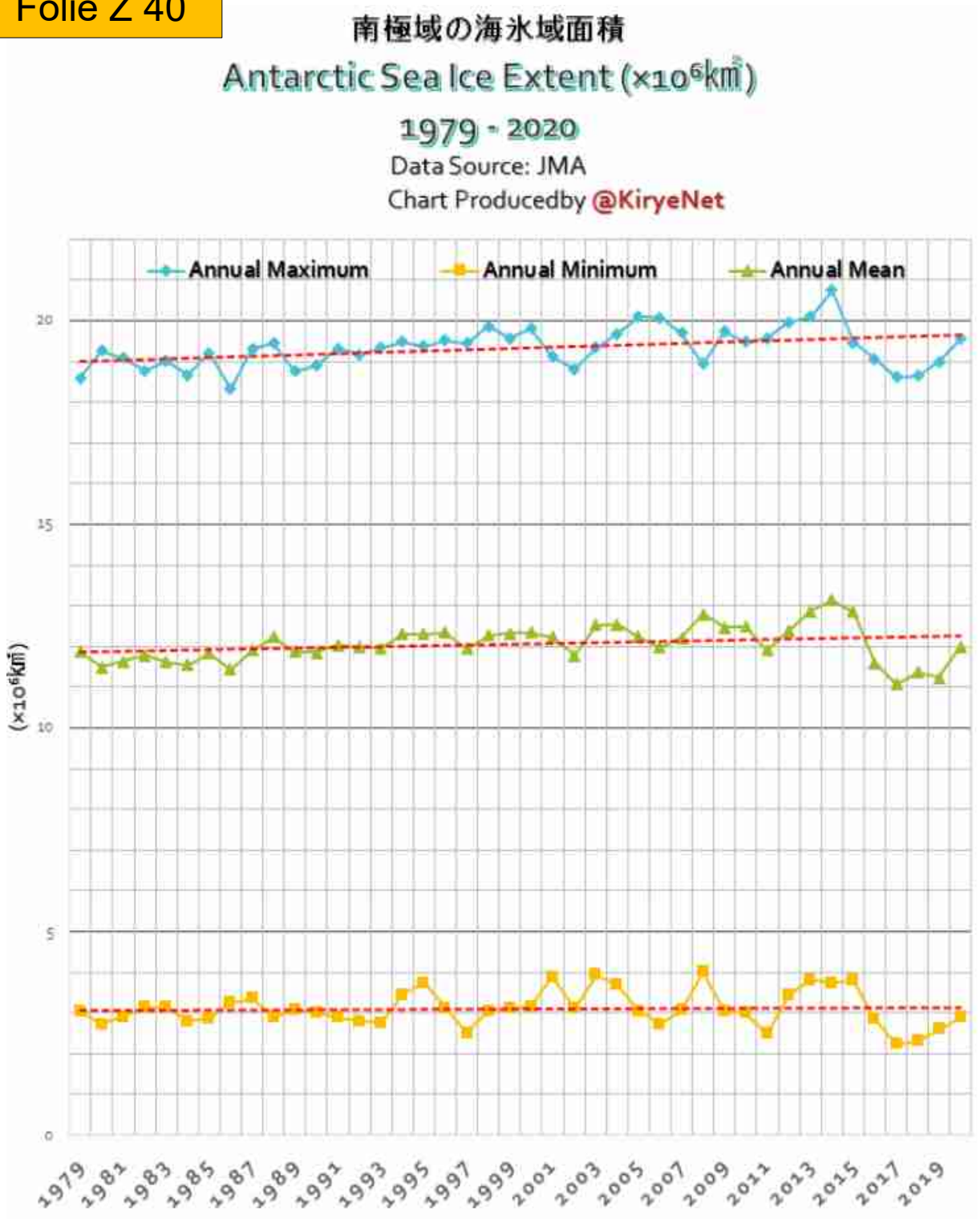

Antarktische Halbinsel
Filchner-Ronne-Schelfeis
Wilkins-Schelfeis
Ost-Antarktis
West-Antarktis
Ross-Schelfeis
Schelfeis-Gebiete
zurückgezogene Schelfeis-Gebiete
zerbrochene Schelfeis-Gebiete
Hintergrundbild Quelle: USGS

Folie Z 39




https://friendsofscience.org/assets/documents/AntarcticaCooling.pdf

Folie Z 40




Quelle:
Japan Meteorological Agency (JMA)
https://www.data.jma.go.jp/gmd/kaiyou/data/shindan/a_1/series_global/longterm_globe_latest.txt

Via Notrickzone:
https://notrickszone.com/2021/08/28/the-most-inconvenient-region-on-the-planet-for-global-warming-alarmists-antarctica-sees-growing-sea-ice/

Folie Z 41

fotostrecke/nasa-bilder-der-rieseneisberg-zerbricht-fotostrecke-150571.html 110%

SPIEGEL Wissenschaft

Nasa-Bilder

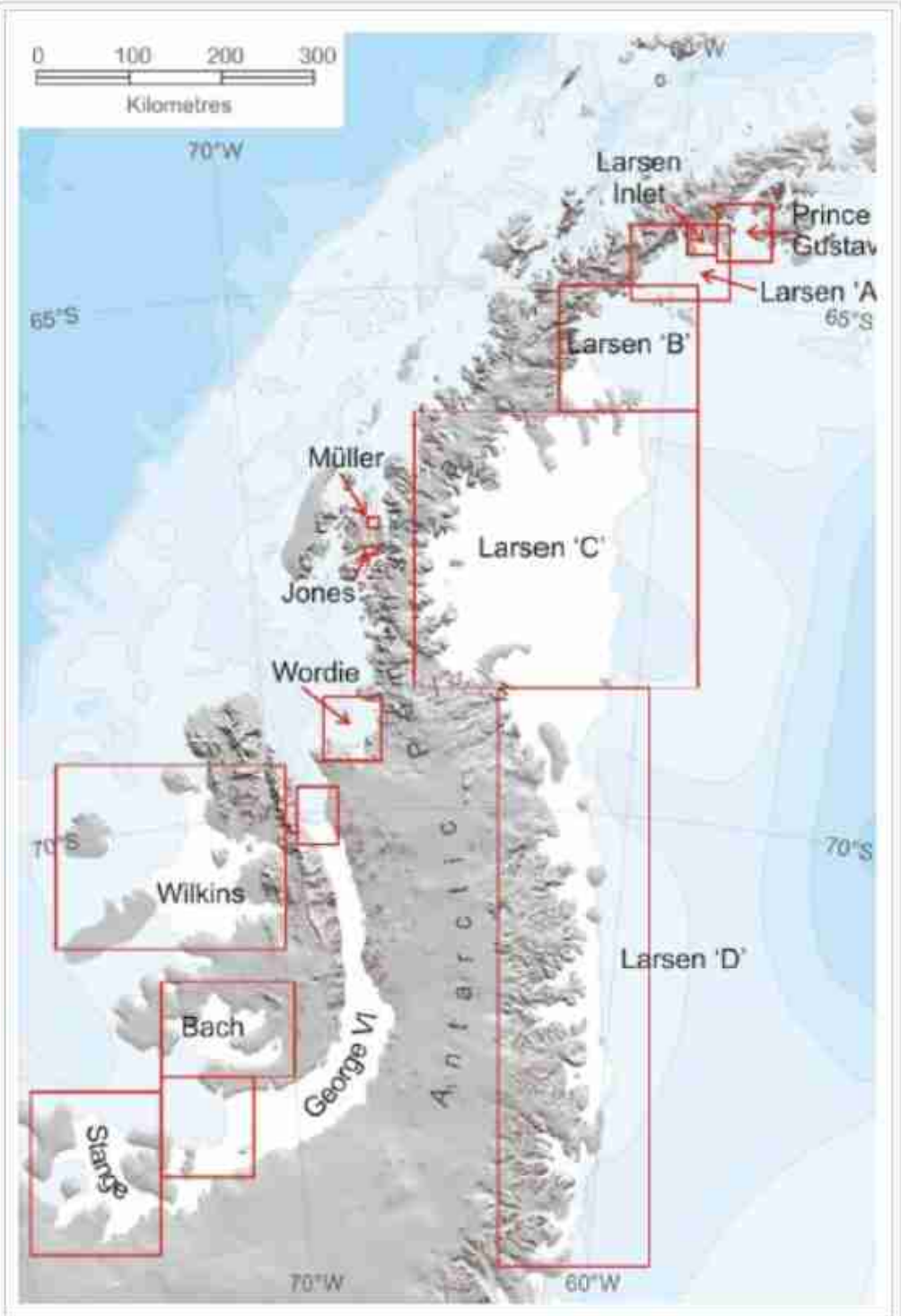
# Bruch im Eisberg

Ein riesiger Eisberg, doppelt so groß wie das Saarland, hat sich vom Larsen-C-Schelfeis am Südpol gelöst. Doch der Koloss schrumpft, mehrere Teile sind bereits abgebrochen, zeigen Bilder der Nasa.

28.07.2017, 18.09 Uhr

1 / 10

Riss im Larsen-C-Schelfeis: Zwischen dem 10. und 14. Juli 2017 ist eine 5800 Quadratkilometer große Eismasse von dem Schelfeis abgebrochen. Entstanden ist einer der größten Eisberge, der jemals dokumentiert wurde.
Foto: AFP/ British Antarctic Survey




Lage des Larsen-Schelfeises an der Ostküste der Antarktischen Halbinsel – von Nord nach Süd die vier Bereiche Larsen 'A' bis Larsen 'D'

https://de.wikipedia.org/wiki/Larsen-Schelfeis

Folie Z 43

Made for minds.

THEMEN MEDIA CENTER TV DEUTSCH LERNEN

PROGRAMMÜBERSICHT TV SENDUNGEN

TV

DW NACHRICHTEN

# Rettung aus dem Packeis

Seit Weihnachten saßen 52 Menschen, Wissenschaftler, Touristen und die Besatzung auf dem Forschungsschiff "Akademik Schokalskij" im Eis der Antarktis fest. Mehrere Eisbrecher hatten es nicht geschafft, zu dem Schiff durchzudringen. Jetzt kommt Hilfe aus der Luft.

https://www.dw.com/de/rettung-aus-dem-packeis/av-17337520

Folie Z 44

Akademik Shokalskiy in Packeis eingeschlossen in Commonwealth-Bucht

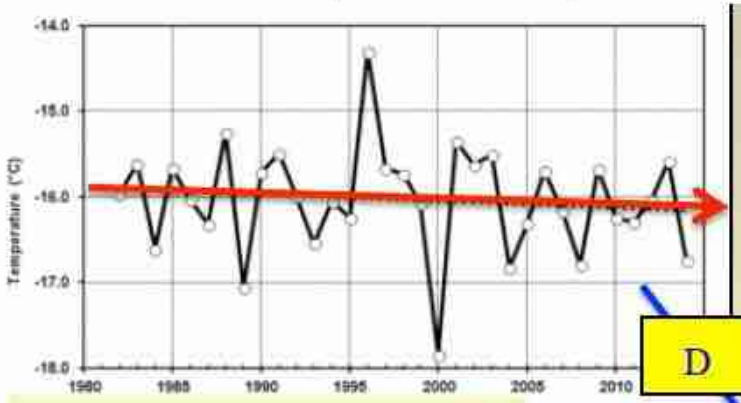
https://de.wikipedia.org/wiki/Commonwealth-Bucht

https://de.wikipedia.org/wiki/Akademik_Shokalskiy

Folie Z 45

KEPuls / V-Folie / 2017

**AWI : Neumayer Station III :** Ekström Shelf Ice, Atka Bay, north-eastern Weddell Sea, Position: **70°40'S**, 008°16'W

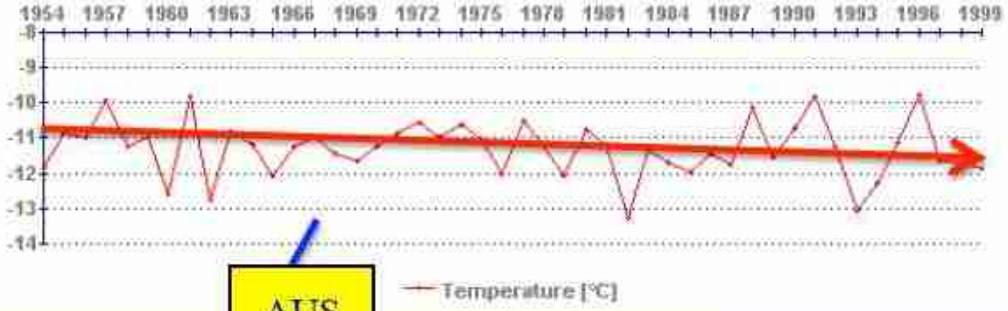



AWI: http://tinyurl.com/q8yecxy

D

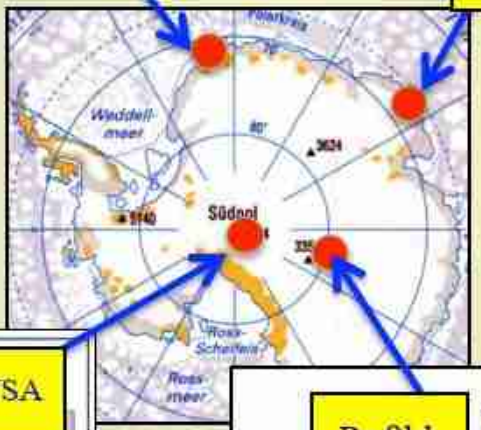
## Mawson Station, Antarctica

Annual Mean Temperature 67° 36'S / 62° 52' E



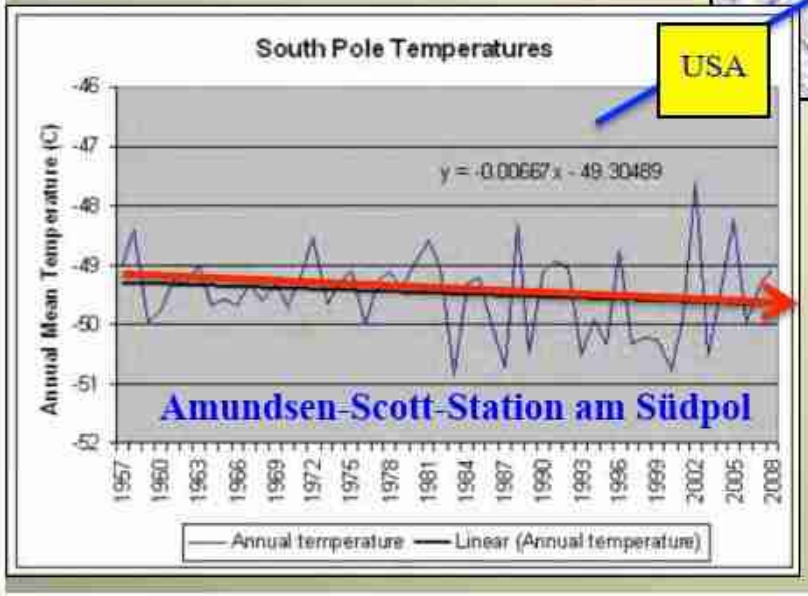

AUS

**Antarctica is Cooling**




USA

## South Pole Temperatures

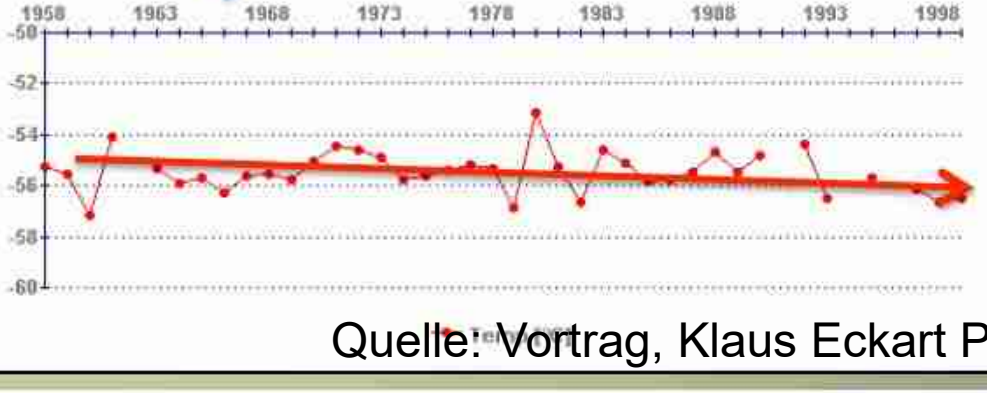



**Amundsen-Scott-Station am Südpol**

Rußld.

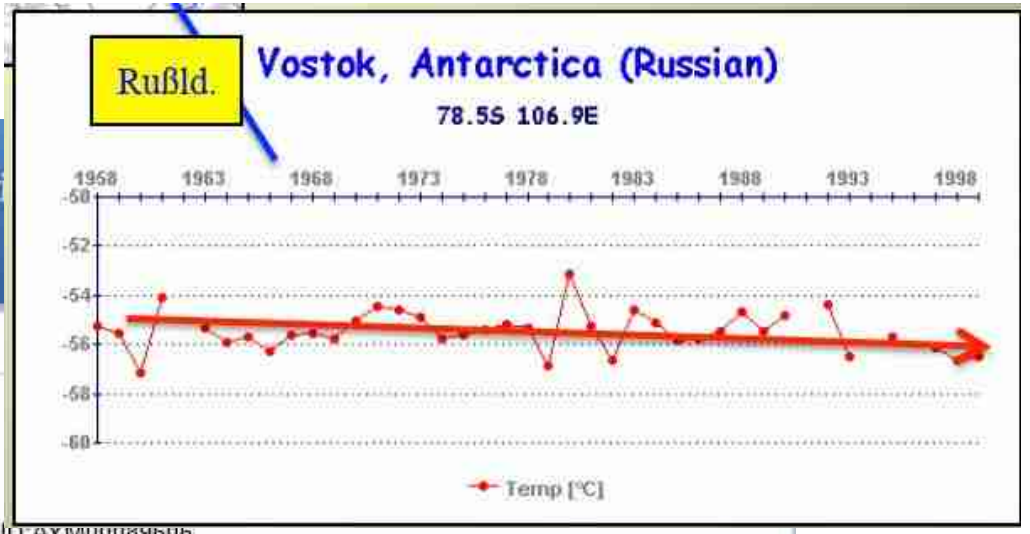
## Vostok, Antarctica (Russian)

78.5S 106.9E




Quelle: Vortrag, Klaus Eckart Puls

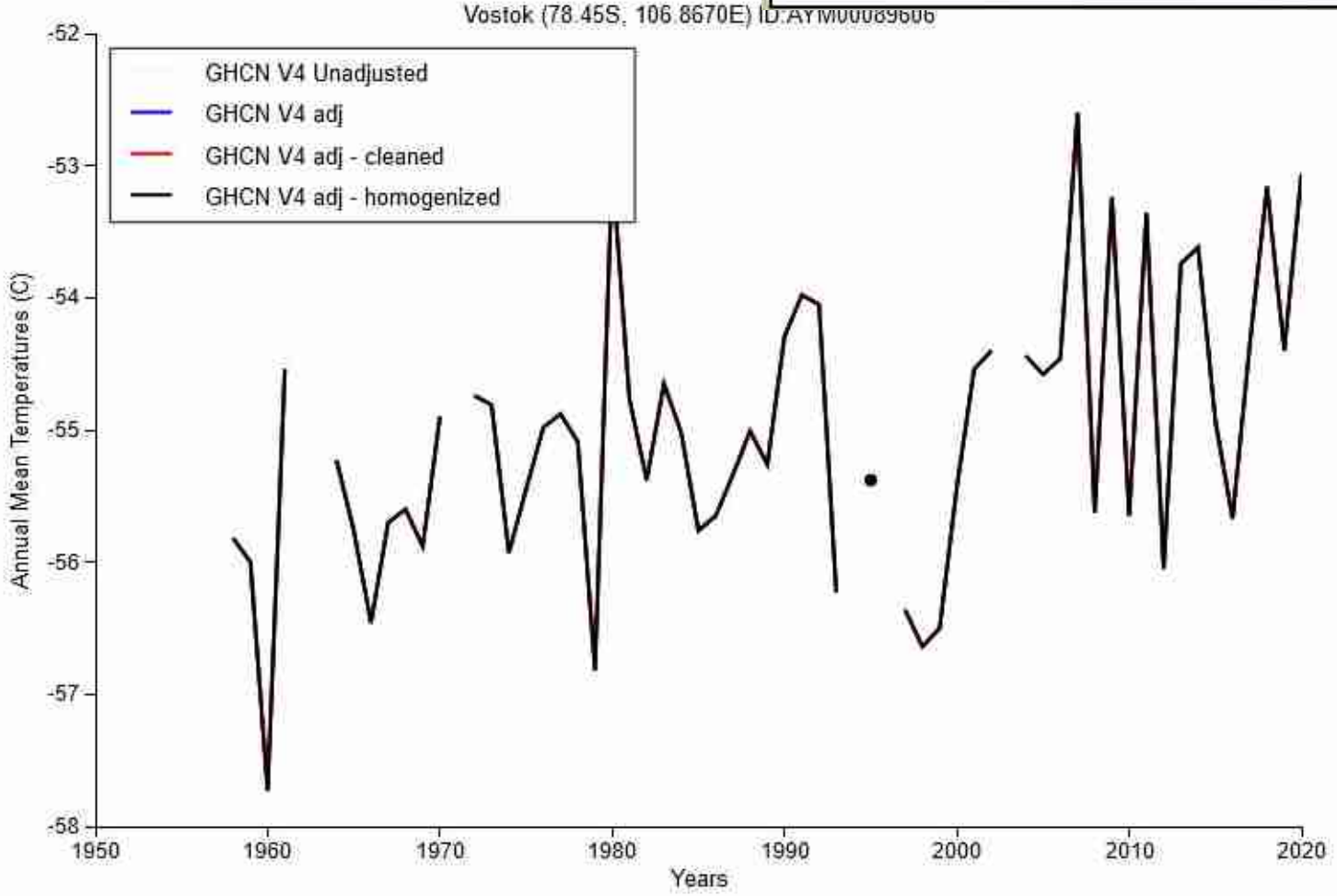
Folie Z 46




National Aeronautics and Space Administrat
Goddard Institute for Space Studies

**GISS Surface Temperature Analysis (v4)**

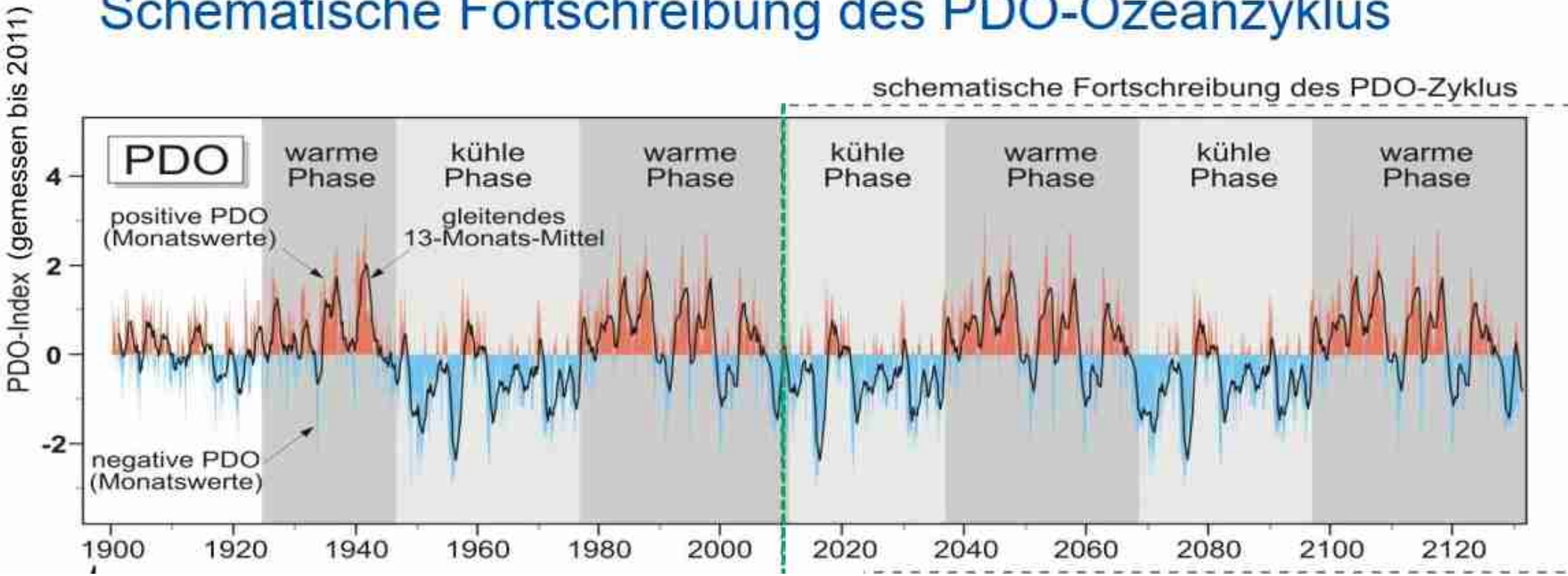
**Station Data: Vostok (78.45S, 106.8670E)**




https://data.giss.nasa.gov/gistemp/station_data_v4_globe/

Folie Z 47

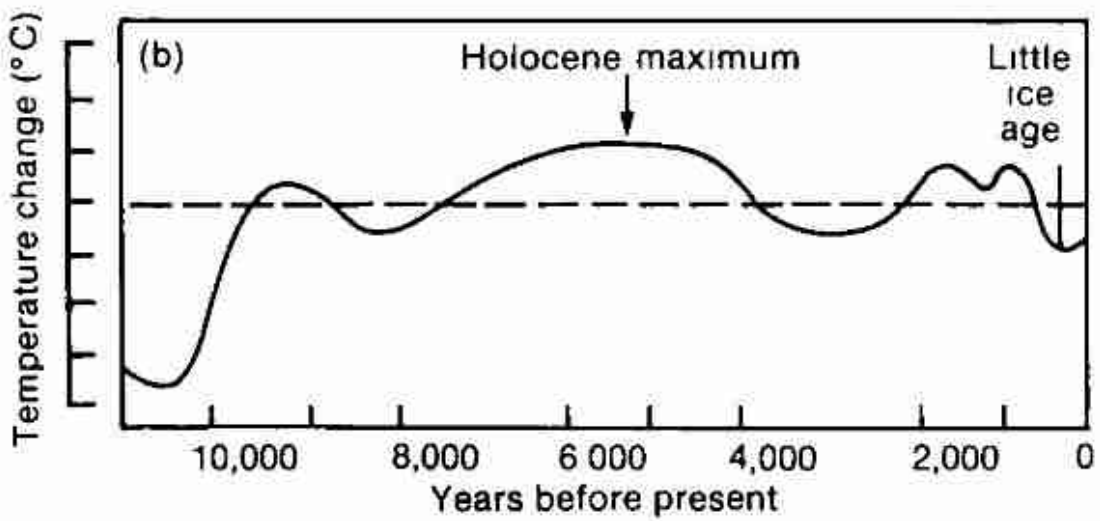
# Schematische Fortschreibung des PDO-Ozeanzyklus

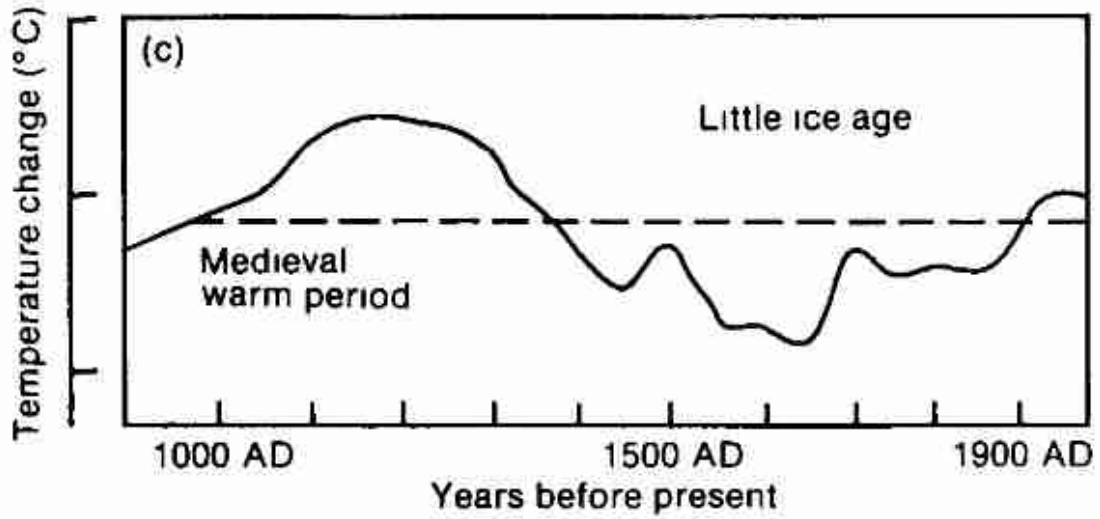



Quelle: Präsentation Dr. Sebastian Lüning

https://www.daculaweather.com/4_pdo_index.php

# Hockeystick




IPCC Report AR 1, 1990

https://www.ipcc.ch/site/assets/uploads/2018/03/ipcc_far_wg_I_full_report.pdf

**Figure 7.1:** Schematic diagrams of global temperature variations since the Pleistocene on three time scales (a) the last million years (b) the last ten thousand years and (c) the last thousand years The dotted line nominally represents conditions near the beginning of the twentieth century

Folie Z 50

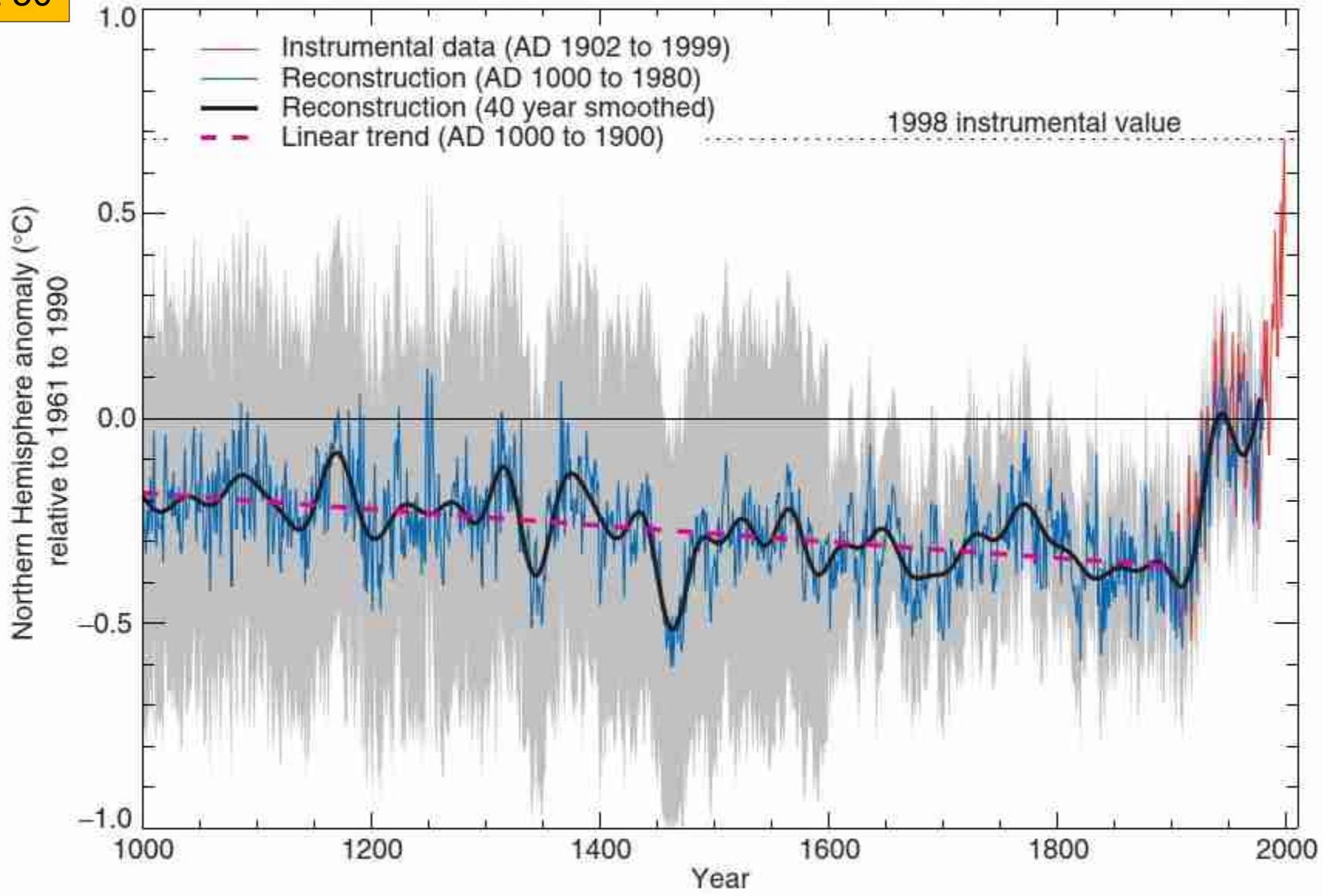
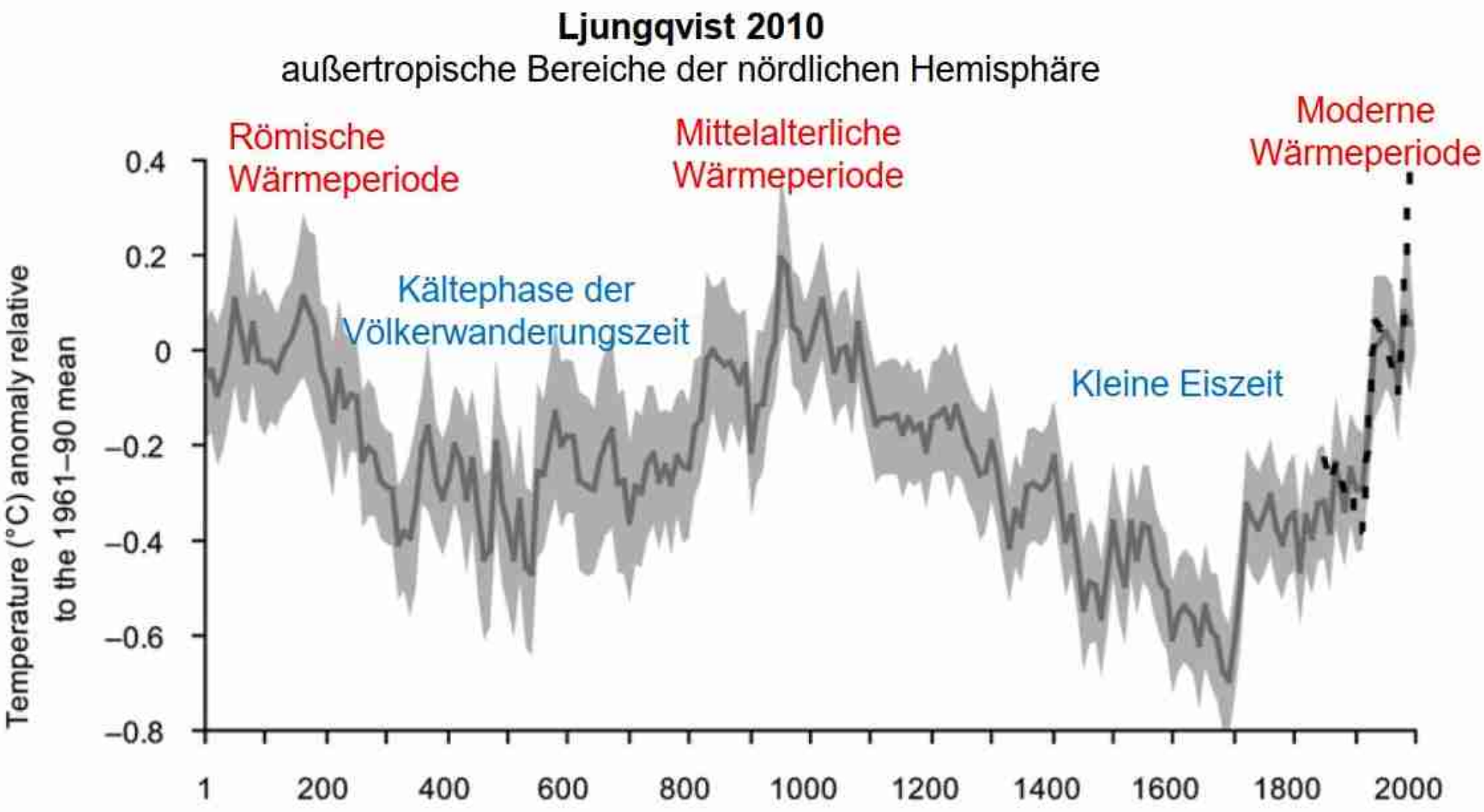



**Figure 2.20:** Millennial Northern Hemisphere (NH) temperature reconstruction (blue) and instrumental data (red) from AD 1000 to 1999, adapted from Mann *et al.* (1999). Smoother version of NH series (black), linear trend from AD 1000 to 1850 (purple-dashed) and two standard error limits (grey shaded) are shown.

Quelle: IPCC Klimabericht 2001, WR3, S.134
https://www.ipcc.ch/site/assets/uploads/2018/03/WGI_TAR_full_report.pdf

Folie Z 51

# Temperaturgeschichte der letzten 2000 Jahre




Quelle: Präsentation Dr. Sebastian Lüning

Folie Z 52

# Mittelalterliche Wärmeperiode in Südamerika

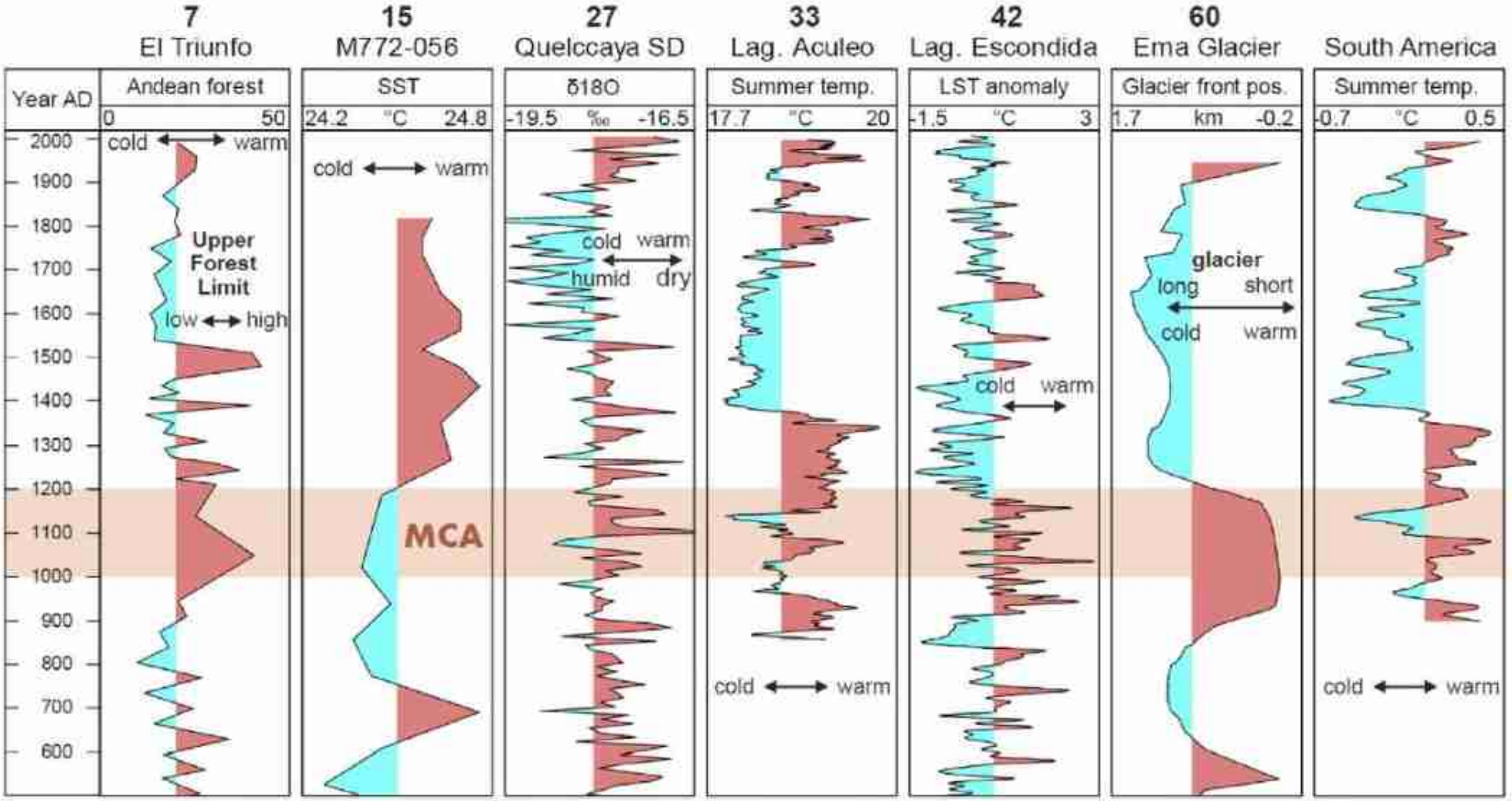



Fig. 3. Temperature development in South America during the past 1500 years based on palaeoclimate proxies of selected study sites (site number stated on top). 8: El Triunfo (Giraldo-Giraldo et al., 2018); 15: M772-056 (Seillès et al., 2016); 27: Quelccaya ice cap, Summit Dome (SD) (Thompson et al., 2013); 33: Laguna Aculeo (von Gunten et al., 2009); 42: Laguna Escondida, LST = lake surface temperature (Elbert et al., 2013b); 60: Ema Glacier (Strelin et al., 2008); southern South America, 30 year LOESS filter (Neukom et al., 2011). Location map in Fig. 2.

Quelle: Präsentation Dr. Sebastian Lüning

Folie Z 53

# Natürliche Klimafaktoren

- MCA ereignete sich während einer Phase starker solarer Aktivität
- SAM+, El Nino häufig, AMO+, PDO-, kein Bezug zu Vulkanismus

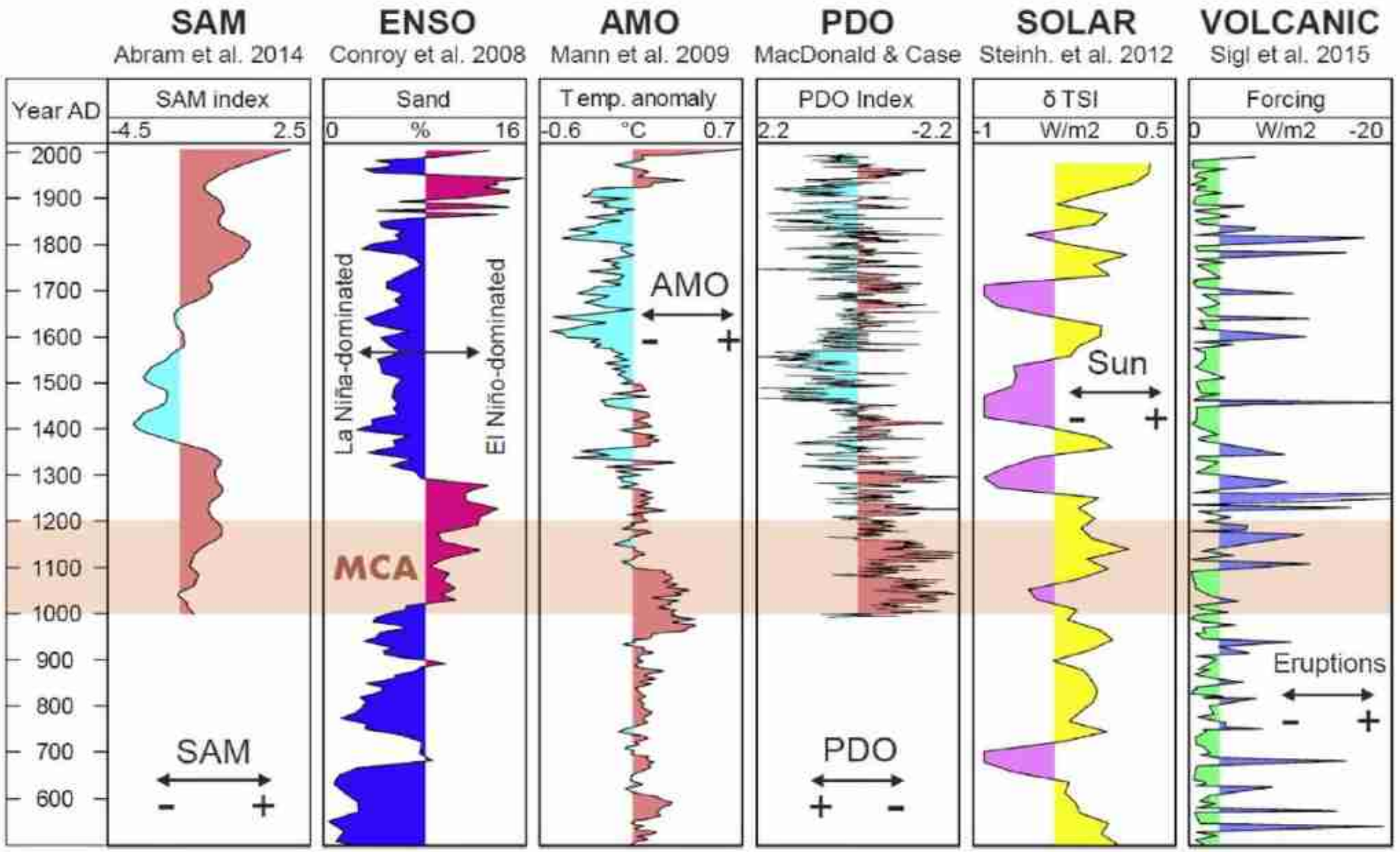



Fig. 5. Reconstructions of key drivers of natural climate variability. Southern Annular Mode, SAM, 70 year loess filter (Abram et al., 2014); El Niño-Southern Oscillation, ENSO (Conroy et al., 2008); Atlantic Multidecadal Oscillation, AMO (Mann et al., 2009); Pacific Decadal Oscillation, PDO (MacDonald and Case, 2005); solar activity changes (Steinhilber et al., 2012); volcanic eruptions (Sigl et al., 2015).

Quelle: Präsentation Dr. Sebastian Lüning

Folie Z 54

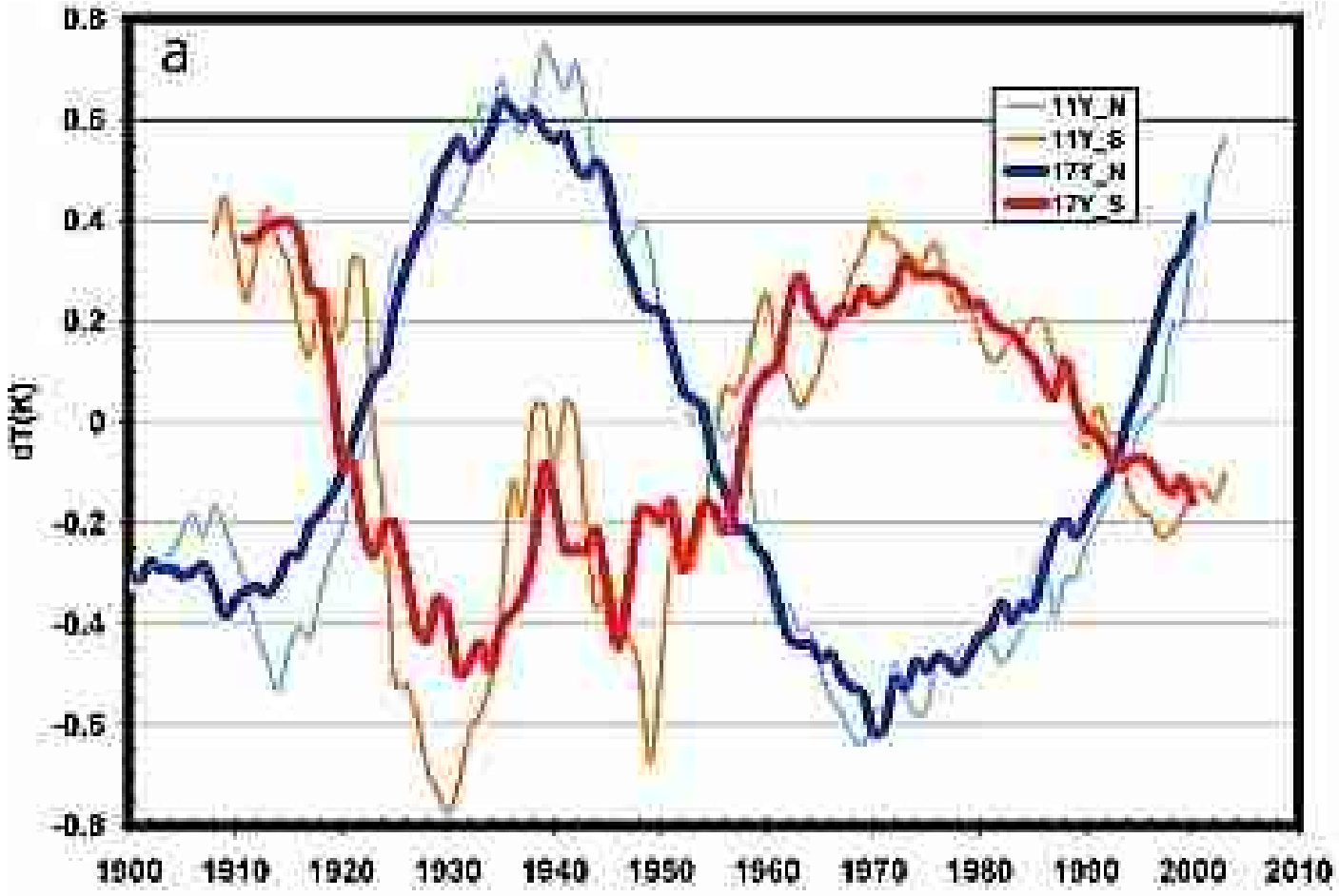



Abbildung 1: Trendbereinigte Temperaturentwicklung der Arktis (blau) und Antarktis (rot), geglättet durch ein laufendes 11-Jahres- (dünne Linien) bzw. 17-Jahres-Mittel (dicke Linien). Quelle: Chylek et al. (2010).

https://kaltesonne.de/eine-unbequeme-klimaschaukel-naturliches-wechselspiel-zwischen-arktis-und-antarktis/

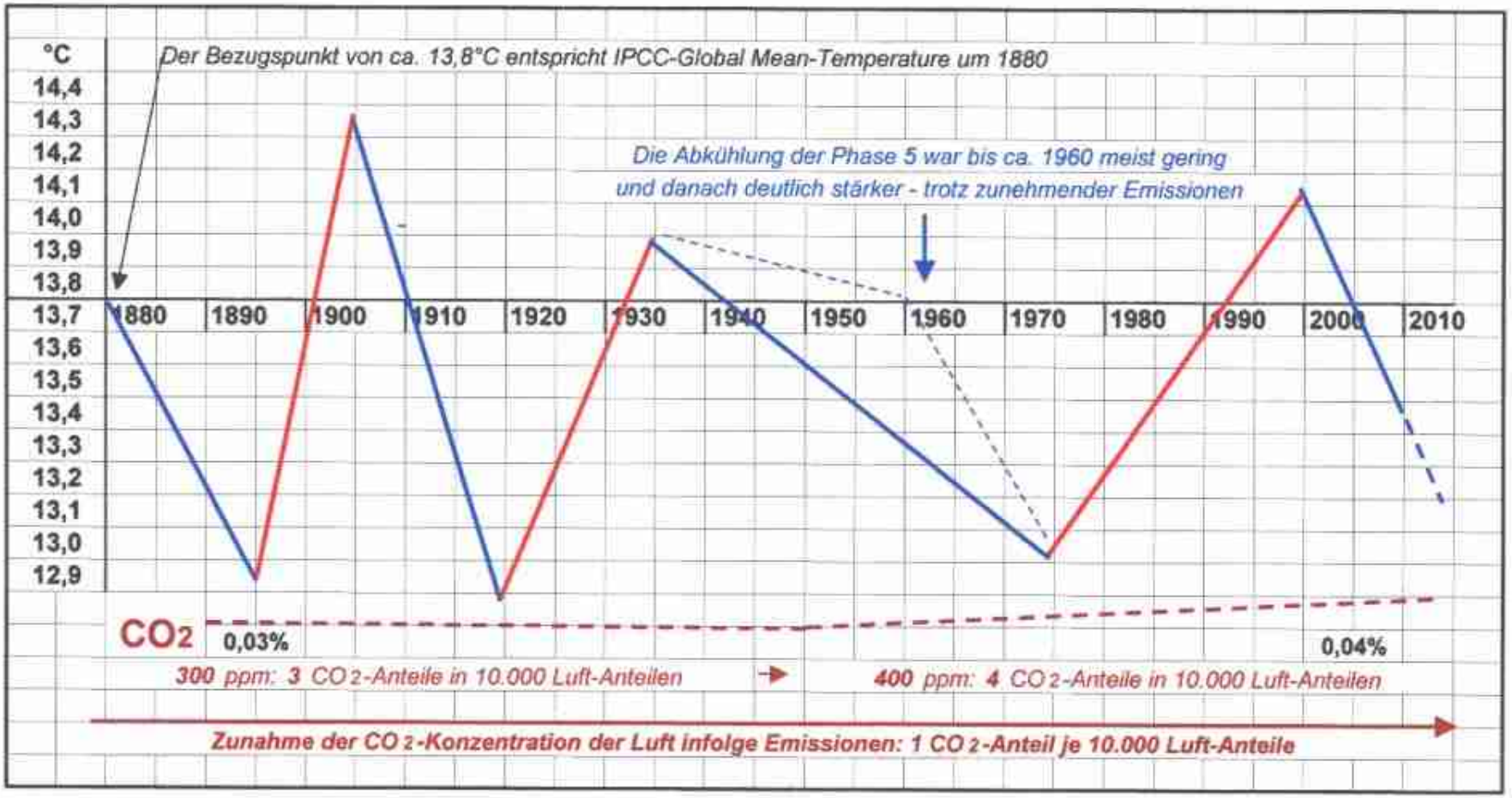
https://www.agu.org/pubs/crossref/2010/2010GL042793.shtml

Folie Z 55

# NASA – GISS DATEN

Folie Z 56

**Abb. 12:** Durchschnittliche Trendlinien aller Phasen ergeben eine mittlere Ganglinie für die Temperaturentwicklung zwischen 1881 und 2010




In Anlage 7 wird dieses Verhalten mit 10 Beispielen belegt. Obwohl die Emissionen zunehmen, verstärkt sich die Abkühlung. Dieser Gegensatz ist keine seltene Ausnahme, sondern eher die Regel: wie ihre ID-Nummern anzeigen – 2809, 2811, 2812 – folgen die drei letzten Stationen in direkt nacheinander.

Quelle: Prof. Ewert - Erderwärmung – was wurde gemessen und wie wurde ausgewertet ?

https://eike-klima-energie.eu/2015/11/24/manipulierte-temperatur-daten-erderwaermung-was-wurde-gemessen-und-wie-wurde-ausgewertet/

Folie Z 57

## Alaska, Grönland, Kanada

| lfd | | Phase 5: Kühler | | | | | Phase 6: wärmer | | | | | Phase 7 | | | | | Summen | | | warm | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ID | von | bis | Jahre | °C/a | °C/Phase | von | bis | Jahre | °C/a | °C/Phase | von | bis | Jahre | °C/a | °C/Phase | ID | 5,6,7 | ohne UHI | kalt | 0 |
| 1 | 5908 | 1934 | 1955 | 21 | -0,0720 | -1,512 | 1955 | 1998 | 43 | 0,0179 | 0,7697 | 1998 | 2010 | 12 | -0,0636 | -0,7632 | 5908 | -1,5055 | -1,5055 | | 0 |
| 2 | 5924 | 1934 | 1955 | 21 | -0,0569 | -1,1949 | 1955 | 1998 | 43 | 0,019 | 0,817 | 1998 | 2010 | 12 | -0,0597 | -0,7164 | 5924 | -1,0943 | -1,0943 | | 0 |
| 3 | 5934 | 1961 | 1978 | 17 | -0,0515 | -0,8755 | 1978 | 1998 | 20 | 0,0871 | 1,742 | 1998 | 2010 | 12 | -0,1247 | -1,4964 | 5934 | -0,6299 | -0,6299 | | 0 |
| 4 | 5950 | 1941 | 1955 | 14 | -0,0960 | -1,344 | 1955 | 1992 | 37 | 0,016 | 0,592 | 1992 | 2010 | 18 | -0,0683 | -1,2294 | 5950 | -1,9814 | -1,9814 | | 0 |
| 5 | 5957 | 1958 | 1972 | 14 | -0,0748 | -1,0472 | 1972 | 1998 | 26 | 0,0382 | 0,9932 | 1998 | 2010 | 12 | -0,19 | -2,28 | 5957 | -2,334 | -2,334 | | 0 |
| 6 | 5995 | 1934 | 1955 | 21 | -0,0564 | -1,1844 | 1955 | 1998 | 43 | 0,022 | 0,946 | 1998 | 2009 | 11 | -0,0496 | -0,5456 | 5995 | -0,784 | -0,784 | | 0 |
| 7 | 5999 | 1931 | 1950 | 19 | -0,0495 | -0,9405 | 1950 | 1987 | 37 | 0,027 | 0,999 | 1987 | 2010 | 23 | -0,0488 | -1,1224 | 5999 | -1,0639 | -1,0639 | | 0 |
| 8 | 6000 | 1953 | 1992 | 39 | -0,0123 | -0,4797 | 1992 | 1999 | 7 | 0,4404 | 3,0828 | 1999 | 2010 | 11 | -0,0135 | -0,1485 | 6000 | 2,4546 | 0 | | 1 |
| 9 | 6004 | 1934 | 1955 | 21 | -0,0588 | -1,2348 | 1955 | 1998 | 43 | 0,013 | 0,559 | 1998 | 2010 | 12 | -0,1046 | -1,2552 | 6004 | -1,931 | -1,931 | | 0 |
| 10 | 6005 | 1940 | 1955 | 15 | -0,0977 | -1,4655 | 1955 | 1998 | 43 | 0,0142 | 0,6106 | 1998 | 2010 | 12 | -0,0692 | -0,8304 | 6005 | -1,6853 | -1,6853 | | 0 |
| 11 | 6027 | 1931 | 1950 | 19 | -0,1382 | -2,6258 | 1950 | 1987 | 37 | 0,0477 | 1,7649 | 1987 | 2010 | 23 | -0,0484 | -1,1132 | 6027 | -1,9741 | -1,9741 | | 0 |
| 12 | 6029 | 1931 | 1950 | 19 | -0,1382 | -2,6258 | 1950 | 1987 | 37 | 0,0477 | 1,7649 | 1987 | 2010 | 23 | -0,0484 | -1,1132 | 6029 | -1,9741 | -1,9741 | | 0 |
| 13 | 6049 | 1931 | 1950 | 19 | -0,0459 | -0,8721 | 1950 | 1987 | 37 | 0,0187 | 0,6919 | 1987 | 2010 | 23 | -0,003 | -0,069 | 6049 | -0,2492 | -0,2492 | | 0 |
| 14 | 6069 | 1953 | 1965 | 12 | -0,0702 | -0,8424 | 1965 | 1998 | 33 | 0,0461 | 1,5213 | 1998 | 2010 | 12 | -0,0139 | -0,1668 | 6069 | 0,5121 | 0 | | 1 |
| 15 | 6108 | 1931 | 1951 | 20 | -0,1262 | -2,524 | 1991 | 1992 | 1 | 0,0419 | 0,0419 | 1992 | 2010 | 18 | -0,0106 | -0,1908 | 6108 | -2,6729 | -2,6729 | | 0 |
| 16 | 6111 | 1934 | 1955 | 21 | -0,0643 | -1,3503 | 1955 | 1998 | 43 | 0,0313 | 1,3459 | 1998 | 2010 | 12 | -0,0129 | -0,1548 | 6111 | -0,1592 | -0,1592 | | 0 |
| 17 | 6114 | 1951 | 1991 | 40 | -0,0279 | -1,116 | 1991 | 2000 | 9 | 0,3519 | 3,1671 | 2000 | 2014 | 14 | -0,0154 | -0,2156 | 6114 | 1,8355 | 0 | | 1 |
| 18 | 6400 | 1958 | 1972 | 14 | -0,0950 | -1,33 | 1972 | 1998 | 26 | 0,0578 | 1,5028 | 1998 | 2010 | 12 | -0,0198 | -0,2376 | 6400 | -0,0648 | -0,0648 | | 0 |
| 19 | 6687 | 1958 | 1972 | 14 | -0,1107 | -1,5498 | 1972 | 1998 | 26 | 0,0585 | 1,521 | 1998 | 2010 | 12 | -0,0887 | -1,0644 | 6687 | -1,0932 | -1,0932 | | 0 |
| 20 | 6699 | 1958 | 1972 | 14 | -0,1282 | -1,7948 | 1972 | 1999 | 27 | 0,0273 | 0,7371 | 1999 | 2009 | 10 | -0,0453 | -0,453 | 6699 | -1,5107 | -1,5107 | | 0 |
| | ↓ | | | | | | | | | | | | | | | | | | | | |
| 34 | 7206 | 1981 | 1990 | 9 | -0,1422 | -1,2798 | 1990 | 1999 | 9 | 0,4189 | 3,7701 | 1999 | 2010 | 11 | -0,0049 | -0,0539 | 7206 | 2,4364 | 0 | | 1 |
| 35 | 7207 | 1991 | 1995 | 4 | -0,3070 | -1,228 | 1995 | 2003 | 8 | 0,1712 | 1,3696 | 2003 | 2010 | 7 | -0,0317 | -0,2219 | 7207 | -0,0803 | -0,0803 | | 0 |
| 36 | 7221 | 1957 | 1965 | 8 | -0,2403 | -1,9224 | 1965 | 1987 | 22 | 0,1301 | 2,8622 | 1987 | 2010 | 23 | -0,0108 | -0,2484 | 7221 | 0,6914 | 0 | | 1 |
| 37 | 7249 | 1967 | 1976 | 9 | -0,3067 | -2,7603 | 1976 | 1996 | 20 | 0,0623 | 1,246 | 1996 | 2010 | 14 | -0,0108 | -0,1512 | 7249 | -1,6855 | -1,6855 | | 0 |
| 38 | 7263 | 1978 | 1992 | 14 | -0,1586 | -2,2204 | 1992 | 2004 | 12 | 0,1929 | 2,3148 | 2004 | 2010 | 6 | -0,2289 | -1,3734 | 7263 | -1,279 | -1,279 | | 0 |
| 39 | 7277 | 1940 | 1972 | 32 | -0,0372 | -1,1904 | 1972 | 1998 | 26 | 0,0782 | 2,0332 | 1998 | 2005 | 7 | -0,6286 | -4,4002 | 7277 | -3,5574 | -3,5574 | | 0 |
| 40 | 7304 | 1970 | 1978 | 8 | -0,0683 | -0,5464 | 1978 | 1998 | 20 | 0,088 | 1,76 | 1998 | 2010 | 12 | -0,7731 | -9,2772 | 7304 | -8,0636 | -8,0636 | | 0 |
| 41 | 7329 | 1960 | 1981 | 21 | -0,0232 | -0,4872 | 1981 | 2002 | 21 | 0,0666 | 1,3986 | 2002 | 2010 | 8 | -0,0298 | -0,2384 | 7329 | 0,673 | 0 | | 1 |
| 42 | 7334 | 1940 | 1975 | 35 | -0,0463 | -1,6205 | 1975 | 1998 | 23 | 0,1108 | 2,5484 | 1998 | 2010 | 12 | 0,0979 | 1,1748 | 7334 | 2,1027 | 0 | | 1 |
| 43 | 7353 | 1976 | 1983 | 7 | -0,1437 | -1,0059 | 1983 | 2005 | 22 | 0,0824 | 1,8128 | 2005 | 2010 | 5 | -0,7731 | -3,8655 | 7353 | -3,0586 | -3,0586 | | 0 |
| 44 | 7361 | 1981 | 1987 | 6 | -0,4200 | -2,52 | 1987 | 1998 | 11 | 0,1677 | 1,8447 | 1998 | 2010 | 12 | -0,7731 | -9,2772 | 7361 | -9,9525 | -9,9525 | | 0 |
| Ergebnisse gelten für alle 44 Stationen: | | | | | | | | | | | | | | | | | | | | warm | 8 |
| | | | | 19 | -0,10 | -1,404 | | | 27 | 0,091 | 1,595 | | | 12 | -0,126 | -1,096 | | -0,9053 | -1,9598 | kalt | 36 |

Auszug von 31 aus 44 Stationen der Auswertungsergebnisse für Alaska, Grönland, Kanada

Anlage 9b

Quelle: Prof. Ewert - Erderwärmung – was wurde gemessen und wie wurde ausgewertet ?

https://eike-klima-energie.eu/2015/11/24/manipulierte-temperatur-daten-erderwaermung-was-wurde-gemessen-und-wie-wurde-ausgewertet/

# Cook et al

# Konsensstudie

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https://climate.nasa.gov/scientific-consensus/ 140%

GLOBAL CLIMATE CHANGE
Vital Signs of the Planet

FACTS ARTICLES

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1. J. Cook, et al, "Consensus on consensus: a synthesis of consensus estimates on human-caused global warming," *Environmental Research Letters* Vol. 11 No. 4, (13 April 2016); DOI:10.1088/1748-9326/11/4/048002

Quotation from page 6: "The number of papers rejecting AGW [Anthropogenic, or human-caused, Global Warming] is a miniscule proportion of the published research, with the percentage slightly decreasing over time. Among papers expressing a position on AGW, an overwhelming percentage (97.2% based on self-ratings, 97.1% based on abstract ratings) endorses the scientific consensus on AGW."

J. Cook, et al, "Quantifying the consensus on anthropogenic global warming in the scientific literature," *Environmental Research Letters* Vol. 8 No. 2, (15 May 2013); DOI:10.1088/1748-9326/8/2/024024

Quotation from page 3: "Among abstracts that expressed a position on AGW, 97.1% endorsed the scientific consensus. Among scientists who expressed a position on AGW in their abstract, 98.4% endorsed the consensus."

W. R. L. Anderegg, "Expert Credibility in Climate Change," *Proceedings of the National Academy of Sciences* Vol. 107 No. 27, 12107-12109 (21 June 2010); DOI: 10.1073/pnas.1003187107.

P. T. Doran & M. K. Zimmerman, "Examining the Scientific Consensus on Climate Change," *Eos Transactions American Geophysical Union* Vol. 90 Issue 3 (2009), 22; DOI: 10.1029/2009EO030002.

N. Oreskes, "Beyond the Ivory Tower: The Scientific Consensus on Climate Change," *Science* Vol. 306 no. 5702, p. 1686 (3 December 2004); DOI: 10.1126/science.1103618.


https://climate.nasa.gov/scientific-consensus/

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# Expert credibility in climate change

William R. L. Anderegg[a,1], James W. Prall[b], Jacob Harold[c], and Stephen H. Schneider[a,d,1]

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Contributed by Stephen H. Schneider, April 9, 2010 (sent for review December 22, 2009)

**Although preliminary estimates from published literature and expert surveys suggest striking agreement among climate scientists on the tenets of anthropogenic climate change (ACC), the American public expresses substantial doubt about both the anthropogenic cause and the level of scientific agreement underpinning ACC. A broad analysis of the climate scientist community itself, the distribution of credibility of dissenting researchers relative to agreeing researchers, and the level of agreement among top climate experts has not been conducted and would inform future ACC discussions. Here, we use an extensive dataset of 1,372 climate researchers and their publication and citation data to show that (*i*) 97–98% of the climate researchers most actively publishing in the field surveyed here support the tenets of ACC outlined by the Intergovernmental Panel on Climate Change, and (*ii*) the relative climate expertise and scientific prominence of the researchers unconvinced of ACC are substantially below that of the convinced researchers.**

citation analyses | climate denier | expertise | publication analysis | scientific prominence

climate change skeptics and contrarians in that we primarily focus on researchers that have published extensively in the climate field, although we consider all skeptics/contrarians that have signed prominent statements concerning ACC (6–8). Such expert analysis can illuminate public and policy discussions about ACC and the extent of consensus in the expert scientific community.

We compiled a database of 1,372 climate researchers based on authorship of scientific assessment reports and membership on multisignatory statements about ACC (*SI Materials and Methods*). We tallied the number of climate-relevant publications authored or coauthored by each researcher (defined here as *expertise*) and counted the number of citations for each of the researcher's four highest-cited papers (defined here as *prominence*) using Google Scholar. We then imposed an a priori criterion that a researcher must have authored a minimum of 20 climate publications to be considered a climate researcher, thus reducing the database to 908 researchers. Varying this minimum publication cutoff did not materially alter results (*Materials and Methods*).

We ranked researchers based on the total number of climate publications authored. Though our compiled researcher list is not

https://www.pnas.org/content/pnas/107/27/12107.full.pdf

# $CO_2$ in Eisbohrkernen
# Nicht korrekt ermittelt

Folie Z 62

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**TELLUS**

# Atmospheric $CO_2$ during the 13th century AD: reconciliation of data from ice core measurements and stomatal frequency analysis

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(Manuscript received 12 November 2004; in final form 22 March 2005)

ABSTRACT

Atmospheric $CO_2$ reconstructions are currently available from direct measurements of air enclosures in Antarctic ice and, alternatively, from stomatal frequency analysis performed on fossil leaves. A period where both methods consistently provide evidence for natural $CO_2$ changes is during the 13th century AD. The results of the two independent methods differ significantly in the amplitude of the estimated $CO_2$ changes (10 ppmv ice versus 34 ppmv stomatal frequency). Here, we compare the stomatal frequency and ice core results by using a firn diffusion model in order to assess the potential influence of smoothing during enclosure on the temporal resolution as well as the amplitude of the $CO_2$ changes. The seemingly large discrepancies between the amplitudes estimated by the contrasting methods diminish when the raw stomatal data are smoothed in an analogous way to the natural smoothing which occurs in the firn.

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# $CO_2$ diffusion in polar ice: observations from naturally formed $CO_2$ spikes in the Siple Dome (Antarctica) ice core

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**ABSTRACT.** **One common assumption in interpreting ice-core $CO_2$ records is that diffusion in the ice does not affect the concentration profile. However, this assumption remains untested because the extremely small $CO_2$ diffusion coefficient in ice has not been accurately determined in the laboratory.** In this study we take advantage of high levels of $CO_2$ associated with refrozen layers in an ice core from Siple Dome, Antarctica, to study $CO_2$ diffusion rates. We use noble gases (Xe/Ar and Kr/Ar), electrical conductivity and $Ca^{2+}$ ion concentrations to show that substantial $CO_2$ diffusion may occur in ice on timescales of thousands of years. We estimate the permeation coefficient for $CO_2$ in ice is $\sim 4 \times 10^{-21}$ mol m$^{-1}$ s$^{-1}$ Pa$^{-1}$ at –23°C in the top 287 m (corresponding to 2.74 kyr). Smoothing of the $CO_2$ record by diffusion at this depth/age is one or two orders of magnitude smaller than the smoothing in the firn. However, simulations for depths of ~930–950 m (~60–70 kyr) indicate that smoothing of the $CO_2$ record by diffusion in deep ice is comparable to smoothing in the firn. Other types of diffusion (e.g. via liquid in ice grain boundaries or veins) may also be important but their influence has not been quantified.

Journal of Glaciology, Vol. 46, No. 152, 2000

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# Reconstructing past atmospheric $CO_2$ concentration based on ice-core analyses: open questions due to in situ production of $CO_2$ in the ice

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ABSTRACT. Analysis of air extracted from bubbles of polar ice showed the anthropogenic increase of atmospheric $CO_2$ concentration during the past few hundred years (pre-industrial concentration 280 ppmv) and, unexpectedly, that the concentration also increased due to natural causes from 200 to 280 ppmv during the transition from the last glacial epoch to the Holocene. However, more detailed reconstructions based on ice-core analyses suggested that some of the additional observed variations were actually due to the modification of $CO_2$ concentration in the bubbles by chemical reactions between impurities in the ice. Detailed analyses of acidity, the carbonate concentration, the concentration of oxidation agents like hydrogen peroxide ($H_2O_2$), and organic compounds (e.g. formaldehyde (HCHO)) along short intervals of ice cores, representing only a few annual layers, allowed us to investigate these chemical reactions. The records are not conclusive but they indicate that the oxidation of organic compounds is at least as important as acid–carbonate reactions. Ice containing a low mean carbonate and a low $H_2O_2$ concentration, as well as a small scattering of $CO_2$ results obtained on several adjacent samples representing a few annual layers at most, is at present the best guarantee for reliable results of the atmospheric $CO_2$ concentration.

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# Stomatal proxy record of $CO_2$ concentrations from the last termination suggests an important role for $CO_2$ at climate change transitions

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*Betula nana*
Sweden

ABSTRACT

A new stomatal proxy-based record of $CO_2$ concentrations ($[CO_2]$), based on *Betula nana* (dwarf birch) leaves from the Hässeldala Port sedimentary sequence in south-eastern Sweden, is presented. The record is of high chronological resolution and spans most of Greenland Interstadial 1 (GI-1a to 1c, Allerød pollen zone), Greenland Stadial 1 (GS-1, Younger Dryas pollen zone) and the very beginning of the Holocene (Preboreal pollen zone). The record clearly demonstrates that i) $[CO_2]$ were significantly higher than usually reported for the Last Termination and ii) the overall pattern of $CO_2$ evolution through the studied time period is fairly dynamic, with significant abrupt fluctuations in $[CO_2]$ when the climate moved from interstadial to stadial state and *vice versa*. A new loss-on-ignition chemical record (used here as a proxy for temperature) lends independent support to the Hässeldala Port $[CO_2]$ record. The large-amplitude fluctuations around the climate change transitions may indicate unstable climates and that "tipping-point" situations were involved in Last Termination climate evolution. The scenario presented here is in contrast to $[CO_2]$ records reconstructed from air bubbles trapped in ice, which indicate lower concentrations and a gradual, linear increase of $[CO_2]$ through time. The prevalent explanation for the main climate forcer during the Last Termination being ocean circulation patterns needs to re-examined, and a

Folie Z 66

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Elsevier Science Publishers B.V., Amsterdam



# Do glaciers tell a true atmospheric $CO_2$ story?

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(Received July 24th, 1991; accepted August 19th, 1991)

## ABSTRACT

Until 1985 most studies of $CO_2$ in gas inclusions in pre-industrial ice indicated that $CO_2$ concentrations (up to 2450 ppm) were higher than the current atmospheric level. After 1985, lower pre-industrial $CO_2$ values were reported, and used as evidence for a recent man-made $CO_2$ increase. The errors in these revised values, however, are of a similar magnitude to the apparent increase in atmospheric $CO_2$ level. The assumptions used in estimating lower $CO_2$ values in past atmospheres have been: no liquid phase in polar ice; younger age of air than of ice due to free gas exchange between deep firn and the atmosphere; and no change in composition of air inclusions. These assumptions are shown to be invalid. Liquid saline water exists in ice at low temperatures, even below –70°C; airtight ice layers are ubiquitous in Antarctic firn; and more than 20 physico-chemical processes operating in situ and in ice cores contribute to the alteration of the chemical composition of air inclusions. The permeable ice

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JOURNAL OF GEOPHYSICAL RESEARCH, VOL. 108 NO. D16, 4492, doi:10.1029/2003JD003562, 2003

# Implications of ice core smoothing for inferring $CO_2$ flux variability

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Received 5 March 2003; revised 15 May 2003; accepted 21 May 2003; published 19 August 2003.

[1] Ice core records are commonly used to infer information about past variability of $CO_2$ fluxes. Because of processes involved in enclosing this air in ice, ice core records are a smoothed representation of the actual past atmospheric variations. As such, there is a limit to how much information ice core measurements can contain about flux variability on short timescales. With a numerical model of the firn processes we quantify this smoothing and describe how it can be reproduced with pulse response functions. We generate and make available pulse response functions for $CO_2$ at the DE08 site on Law Dome, Antarctica. We discuss implications of the smoothing for inferring $CO_2$ flux variability from the Law Dome ice core record. In particular we look at results from an

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ELSEVIER

Quaternary Science Reviews 23 (2004) 1947–1954

QSR

# Reproducibility of Holocene atmospheric $CO_2$ records based on stomatal frequency

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Received 8 January 2004; accepted 3 April 2004

**Abstract**

The majority of the stomatal frequency-based estimates of $CO_2$ for the Holocene do not support the widely accepted concept of comparably stable $CO_2$ concentrations throughout the past 11,500 years. To address the critique that these stomatal frequency variations result from local environmental change or methodological insufficiencies, multiple stomatal frequency records were compared for three climatic key periods during the Holocene, namely the Preboreal oscillation, the 8.2 kyr cooling event and the Little Ice Age. The highly comparable fluctuations in the palaeo-atmospheric $CO_2$ records, which were obtained from different continents and plant species (deciduous angiosperms as well as conifers) using varying calibration approaches, provide strong evidence for the integrity of leaf-based $CO_2$ quantification.

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# Wissenschaft keine Demokratie

Folie Z 70

Alfred Wegener:

„Die Leute, die so recht darauf pochen, auf dem Boden der Tatsachen zu stehen und mit Hypothesen durchaus nichts zu tun haben wollen, sitzen doch allemal selbst mit einer falschen Hypothese drin […]. Hätten sie die Verschiebungstheorie schon auf der Schule gelernt, so würden sie sie mit demselben Unverstand in allen, auch den unrichtigen Einzelheiten, ihr ganzes Leben hindurch vertreten, wie jetzt das Absinken von Kontinenten.“

https://de.wikipedia.org/wiki/Alfred_Wegener

Version vom 6. August 2021 um 16:13 Uhr

https://de.wikipedia.org/w/index.php?title=Alfred_Wegener&oldid=214545240

## Alfred Wegener wurde diskreditiert:

„Wegeners Theorie von der Verschiebung der Kontinente blieb zu seinen Lebzeiten immer umstritten und geriet nach seinem Tod rasch in Vergessenheit. Nur wenige Wissenschaftler, wie der Paläogeograph Edgar Dacqué oder der Belgrader Astronom Milutin **Milanković**, unterstützten Wegener von Anfang an.

Andere Kollegen sprachen eher von „Gedankenspielerei“, „Phantasiegebilden“ oder gar von „Fieberfantasien der von Krustendrehkrankheit und Polschubseuche schwer Befallenen“. Einer der wohlmeinenderen Kritiker, der Direktor des französischen Amtes für geologische Landesaufnahme Pierre-Marie Termier, meinte zumindest: „Seine Theorie ist ein wundervoller Traum der Schönheit und Anmut, der Traum eines großen Poeten.“ “

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