

Neumayer-, Kohnen-Station and 3000 Metres of Ice core – Revealing the Climate of the Past.

Hans Oerter

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**What
will H. Oerter talk about ?**

The AWI at Bremerhaven
The Neumayer-Station in Antarctica
The EPICA drill camp Kohnen-Station
Ice cores: 800,000 years of
climate history

Alfred-Wegener-Institut für Polar- und Meeresforschung

1980: The Institute was founded at Bremerhaven as „Stiftung des öffentlichen Rechts“

Status 2007:

- Budget: 103 Mio. Euro
- 788 employees

Funding:

- 90% Bundesministerium für Bildung und Forschung (BMBF)
- 8% State of Bremen
- 1% each, the states Brandenburg and Schleswig-Holstein
- Soft money



Member of the Helmholtz-Gemeinschaft Deutscher
Forschungszentren

Alfred Wegener



foto: Archive AWI

* 1.11.1880 in Berlin
† November 1930 on Greenland

Geophysicist
Meteorologist
Klimatologist

Standorte (Locations)



Wissenschaftlicher Beirat
(Prof. Dr. Oerlemans)

**Alfred-Wegener-Institut
für Polar- und Meeresforschung**

Kuratorium
(MinDirig'in Brumme-Bothe)

Wissenschaftlicher Rat (Prof. Dr. Bathmann)	Ombudsmann (Prof. Dr. Augstein)	Direktorium Prof. Dr. Lochte · Dr. Wolke Prof. Dr. Miller · Prof. Dr. Wiltshire	Wissenschaftliches Referat (Dr. Reinke)	Presse- und Öffentlichkeitsarbeit (Pauls)
Personalrat und Frauenbeauftragte (Sündermann, Viehoff)	Nutzerbeiräte (Großgeräte)		Justiziar (Ruholl)	Innenrevision (Bernshausen, Kersten)
Wissenschaftlicher Beirat der Bundesregierung Globale Umweltbedingungen (WBGU) (Prof. Dr. Schulz-Baldes)			Sicherheitsingenieur (Marold)	

Wissenschaftliche Fachbereiche, Technologien und allgemeine Dienste

Geowissenschaften (Prof. Dr. R. Tiedemann)	Biowissenschaften (Prof. Dr. Cembella)	Klimawissenschaften (Prof. Dr. Lemke)	Neue Technologien	Infrastruktur/ Verwaltung
Geophysik (Dr. Jokat)	Biologische Ozeanographie (Prof. Dr. Bathmann)	Atmosphärische Zirkulationen (Prof. Dr. Dethloff)	Unterwasserfahrzeuge und Tiefsee-Technologie (Dr. Klages)	Logistik und Forschungsplattformen (Dr. Gernandt)
Glaciologie (Prof. Dr. Wolf-Gladrow)	Marine Biogeologie (Prof. Dr. Wolf-Gladrow)	Meteorologie der Polargebiete (PD Dr. Wacker)	Marine Messsysteme (Dr. Boebel)	Technologietransfer (Dr. Sauter)
Periglazialforschung (Prof. Dr. Hubberten)	Makroalgen-Biologie (Prof. Dr. Wiencke)	Messende Ozeanographie (Dr. Fahrbach)	Flugzeug- und Landtechnik (Dr. Herber)	Rechenzentrum und Datenbanken (Prof. Dr. Hiller)
Marine Geologie und Paläontologie (Prof. Dr. Tiedemann)	Ökologie mariner Tiere (N.N.)	Ozeandynamik (Dr. J. Schröder)	Ice-core drilling (Dr. V. Weaver)	Bibliothek (Brannemann)
Marine Geochemie (Prof. Dr. Schlüter)	Physiologie mariner Tiere (Prof. Dr. Pörtner)	Meereisphysik (Dr. Haas)	Marine Biotechnologien (Prof. Dr. Köhler)	Allgemeine Serviceeinrichtungen (D. Neumann)
	Ökologische Chemie (Prof. Dr. Cembella)	Dynamik des Paläoklimas (Prof. Dr. Lohmann)	Erdbeobachtungssysteme (Prof. Dr. Lemke)	Personalabteilung (Hornke)
	Ökologie der Schelfmeere (Prof. Dr. Buchholz)			Finanzen (Mühlstadt, Kalina)
	Ökologie der Küsten (Dr. R. Asmus)			Einkauf (Siegmond)



Glaciologie

Ice-core drilling

Stand: 31. Oktober 2007

AWI Research bases in the Arctic/Antarctic



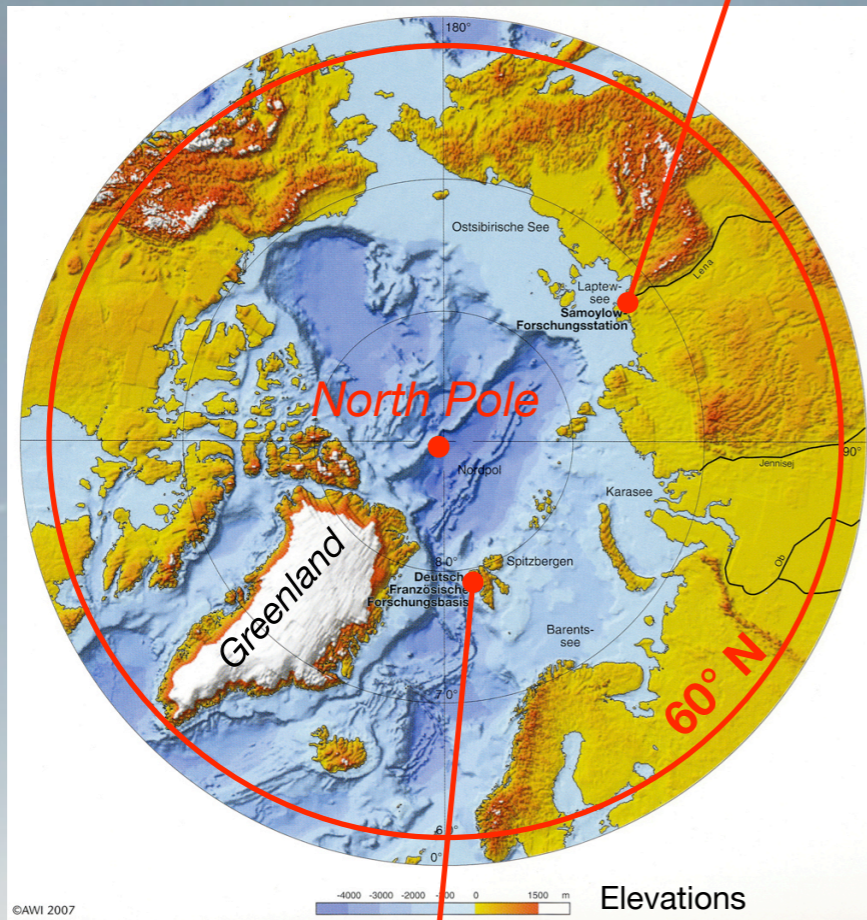
Samoilov-Station



Dallman-Laboratory

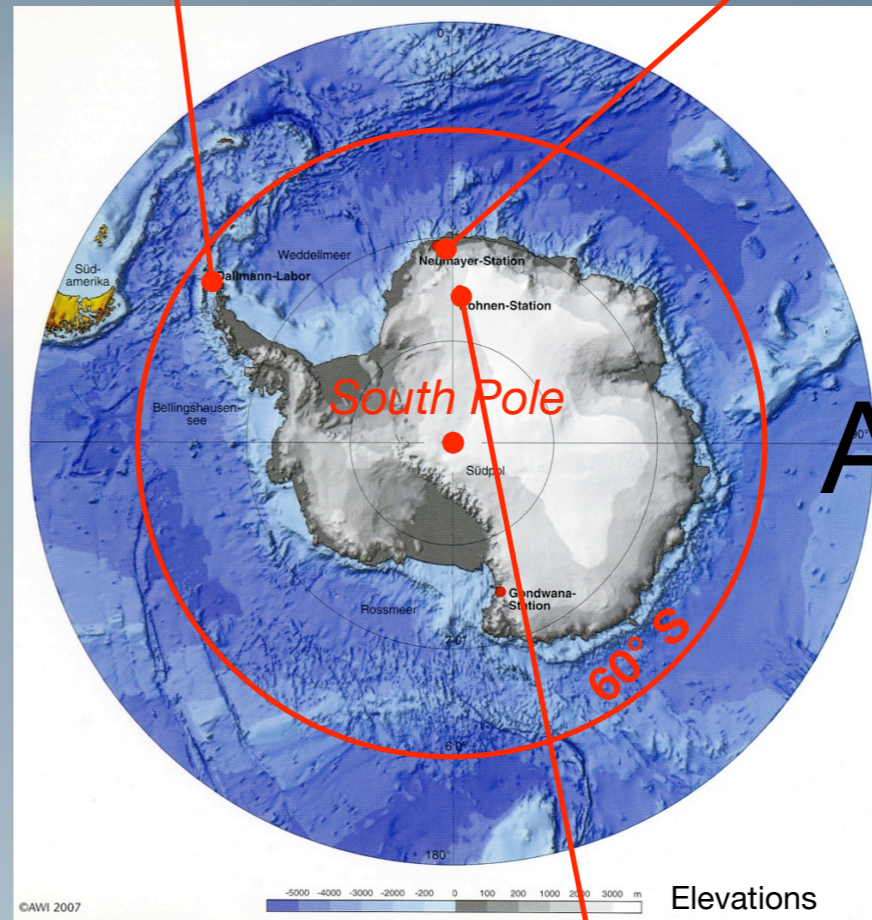


Neumayer-Station



Koldewey-Station

AWIPEV



Kohnen-Station



fotos; AWI

Arctic

Antarctic

German Research Ice Breaker "Polarstern"



Video clip: AWI

German Research Ice Breaker "Polarstern"

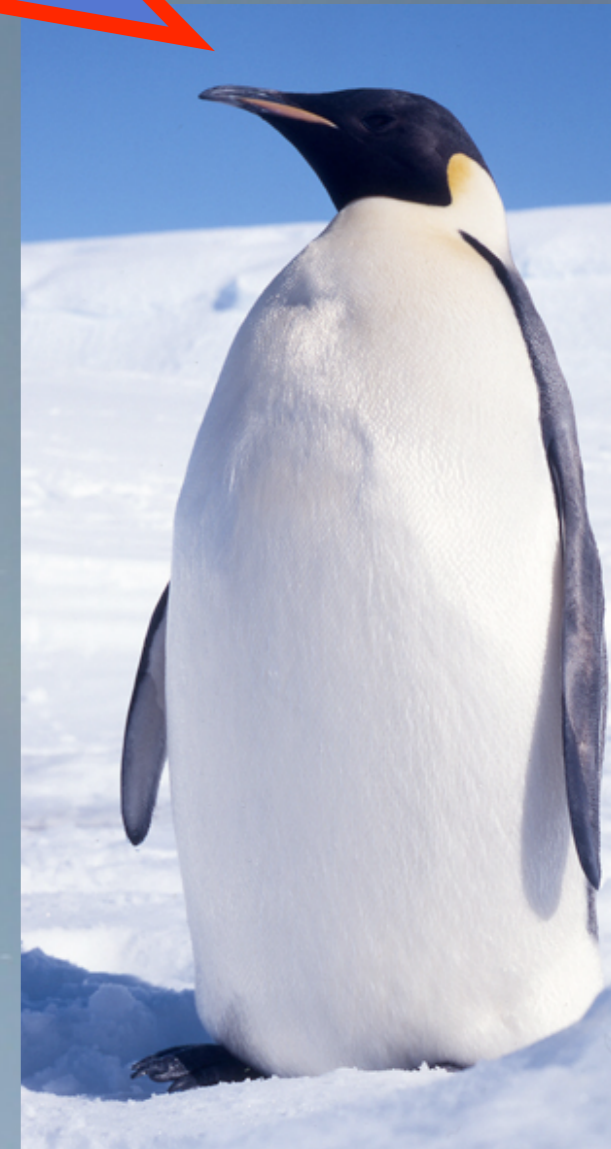
Technical Data:

Overall length:	118 metres
Maximum beam:	25 metres
Height to main deck:	13.6 metres
Draught:	max. 11.20 metres
Displacement at maximum draught:	17,300 tons
Weight of empty ship:	11,820 tons
Engine output:	14,000 kW (20,000HP)
Maximum speed:	16 knots
Economic speed:	10-12 knots
Classification:	Germanischer Lloyd 100A, Arc3. MC Arc3, Aut16724
Crew members:	39-44
Scientific staff:	50
Maiden voyage:	December 1982

at Atka iceport, Ekströmisen

What is Neumayer-Station used for ?

- Wintering over base (9 pers.)
- Geophysical observatory
(Seismic, Magnetic, Gravity)
- Meteorological observatory
(e.g. Synoptic obs., Radiation)
- Air chemistry
(e.g. aerosols, ozone)
- Infrasound station IS27 (CTBTO)
- Logistic base



Neumayer-Station, Antarctica



fotos: hans oerter

In operation since 1992.
It replaced Georg-von-Neumayer-Station (1981-1992)

Georg von Neumayer · an early manager of science

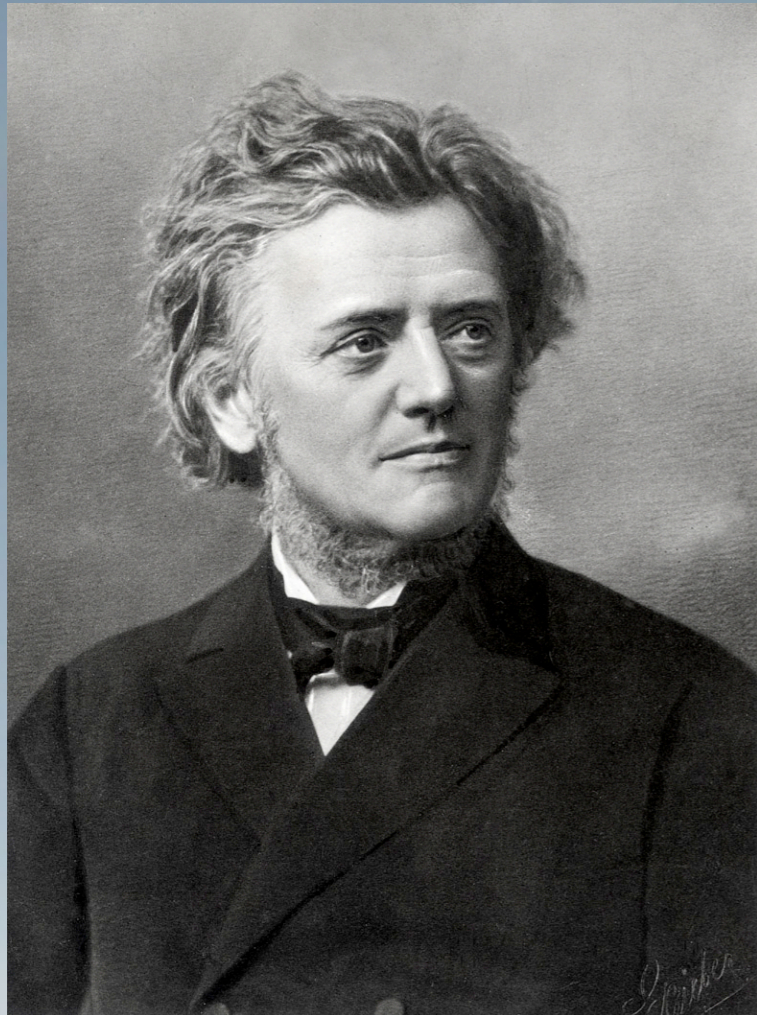


Foto: Archive AWI

* 21.6.1826 in Kirchheimbolanden
† 24.5.1909 in Neustadt an der Weinstraße

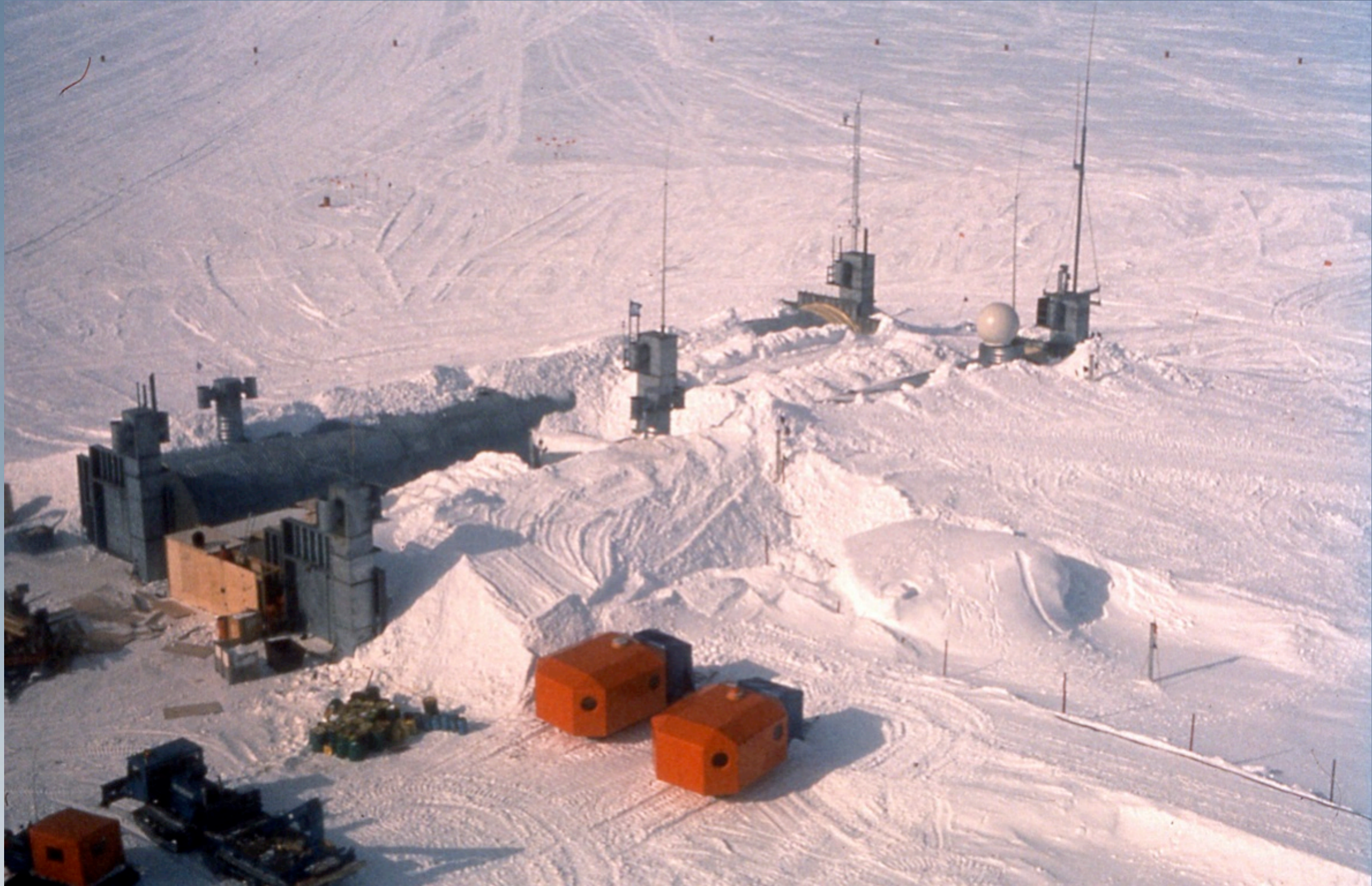
Geophysicist and hydrograph

1857-1864: Founding and Director of Flagstaff
Observatory for Geophysics, Magnetism
and Nautic in Melbourne, Australia

1865: Return to Germany

1876-1903: First Director of Deutschen
Seewarte in Hamburg

1879: Chairman Internationale Polarkommission



fotos: Oskar Reinwarth, 1981

Construction of Georg-von-Neumayer Station | 98 |

Geophysics lab



foto: hans oerter, 1995

The Neumayer-Station III



Model: AWI

Costs of Neumayer III:

Construction of the building:	21.7 Mill. €
Assembly in Antarctica:	6.0 Mill. €
Shipping to Antarctica:	4.4 Mill. €
Total:	32.0 Mill. €

Bremerhaven
September 2007

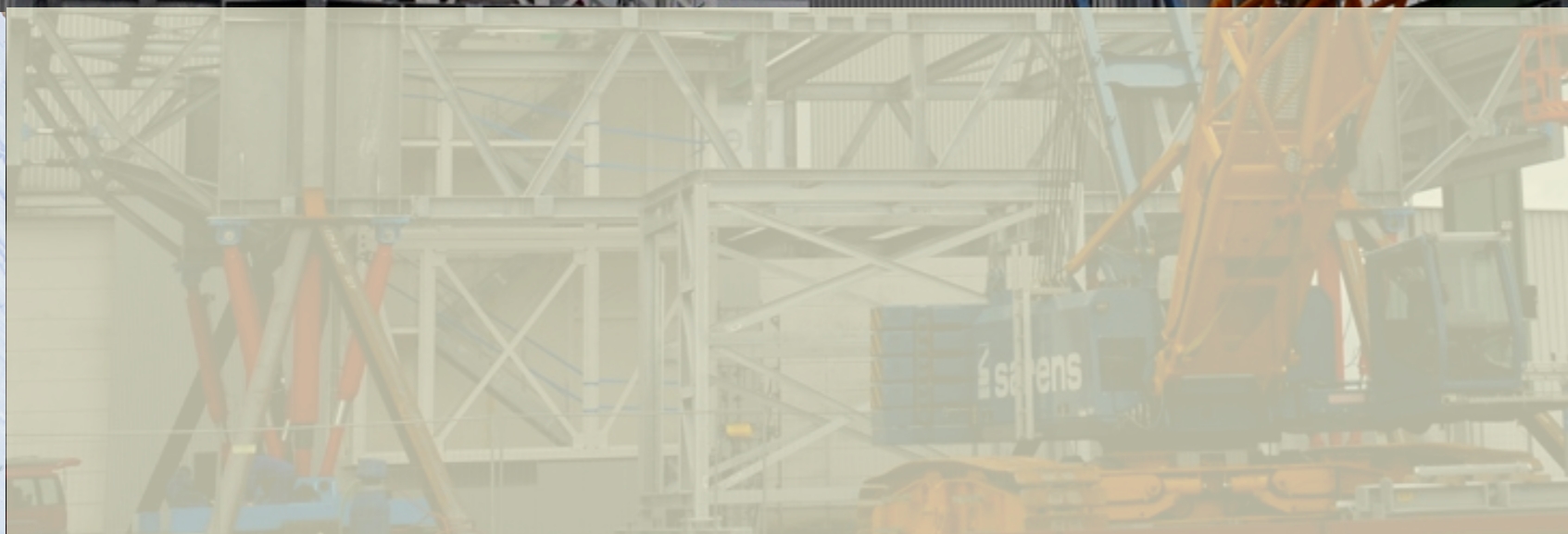


foto: hans oerter, 2007

Bremerhaven
September 2007



foto: hans oerter, 2007



foto: hans oerter, 2007

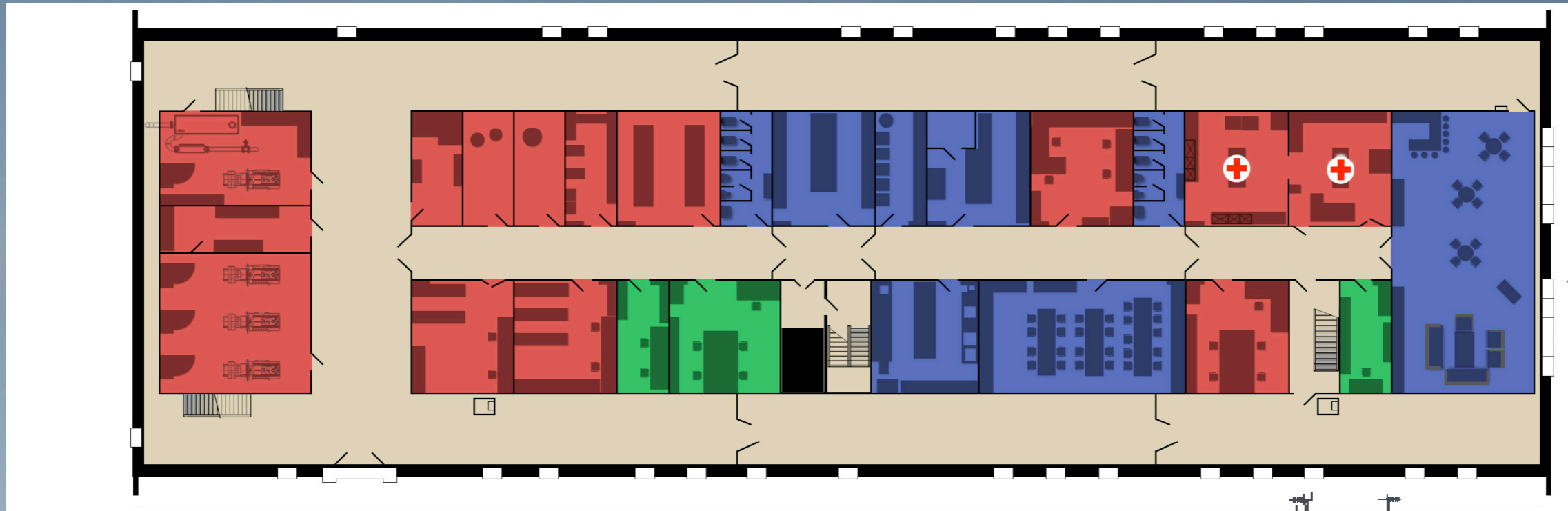








foto: hans oerfer, 2007



foto: hans oerter, 2007

NEUMAYER STATION III



	Scientific laboratories	271 m ²
	Living and bed rooms	210 m ²
	Mess, kitchen, lounge, sanitary	555 m ²
	Station service rooms and hospital	750 m ²
	Offices for station operation	56 m ²
	Corridors, stairs, parking spaces	

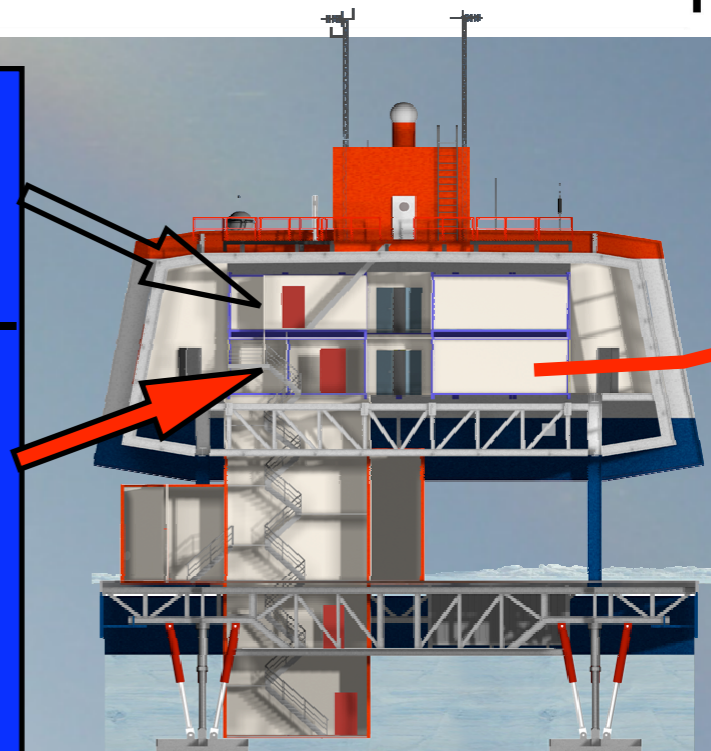




foto: hans oerter, 2007



foto: hans oerter, 2007



Dining room



Kitchen



Personal cabine



Bath room

fotos: hans oerter, 2007



fotos: hans oerter, 1995 -2007

Hospital - old and new



fotos: hans oerter, 1995 -2007

Hospital - old and new

NEUMAYER STATION III

SCHEDULE MS NAJA ARCTICA

05 – 12 November 2007

**loading Bremerhaven
3.500 t, 16.000 m³**

03 – 05 December 2007

Cape Town

16 Decemebr 2007

Arrival Ekström ice shelf

17 December 2007 – 04 January 2008 unloading

05 January 2008

Departure Ekström ice shelf

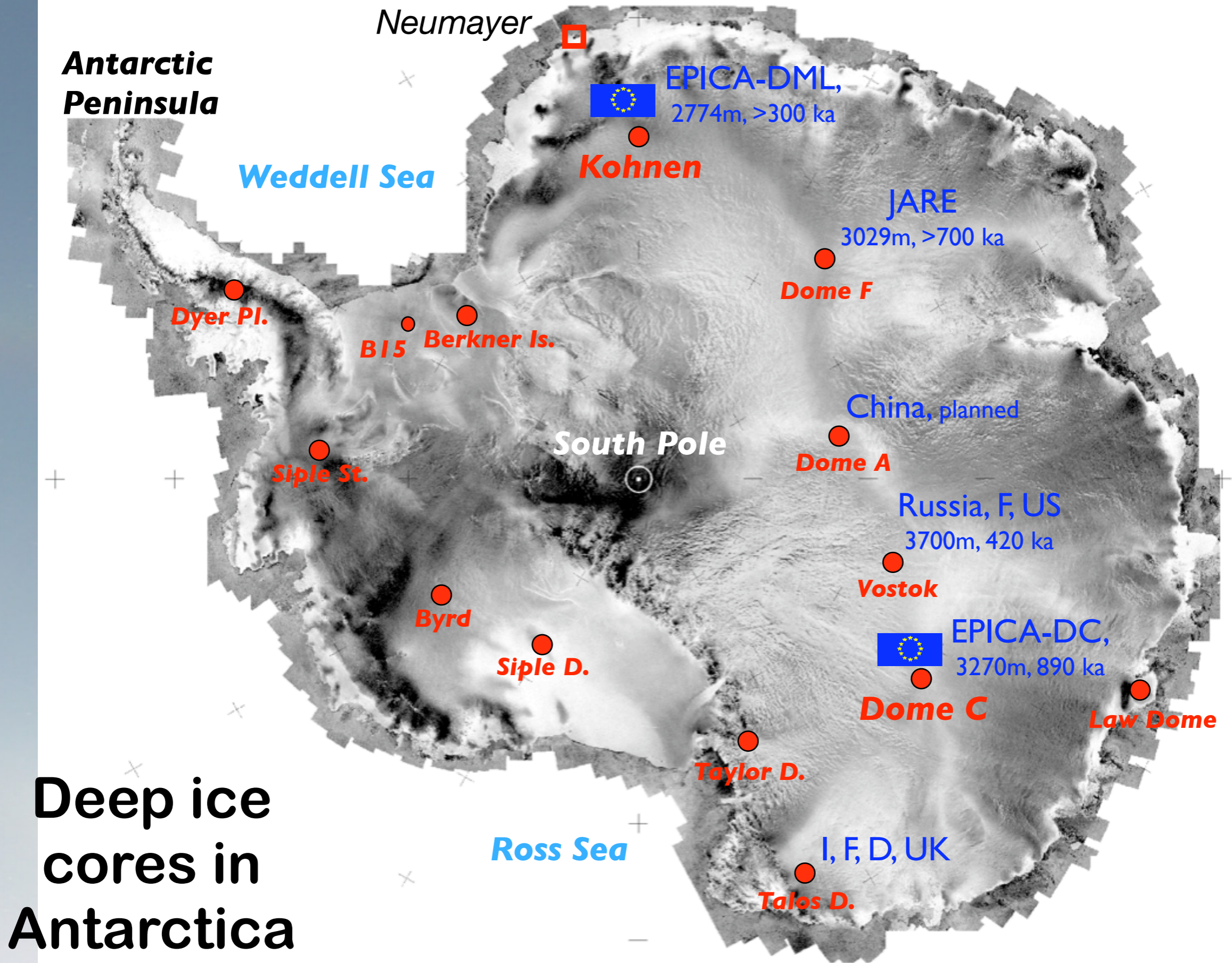
15 January 2008

Cape Town

**Where
can we drill ice
cores ?**



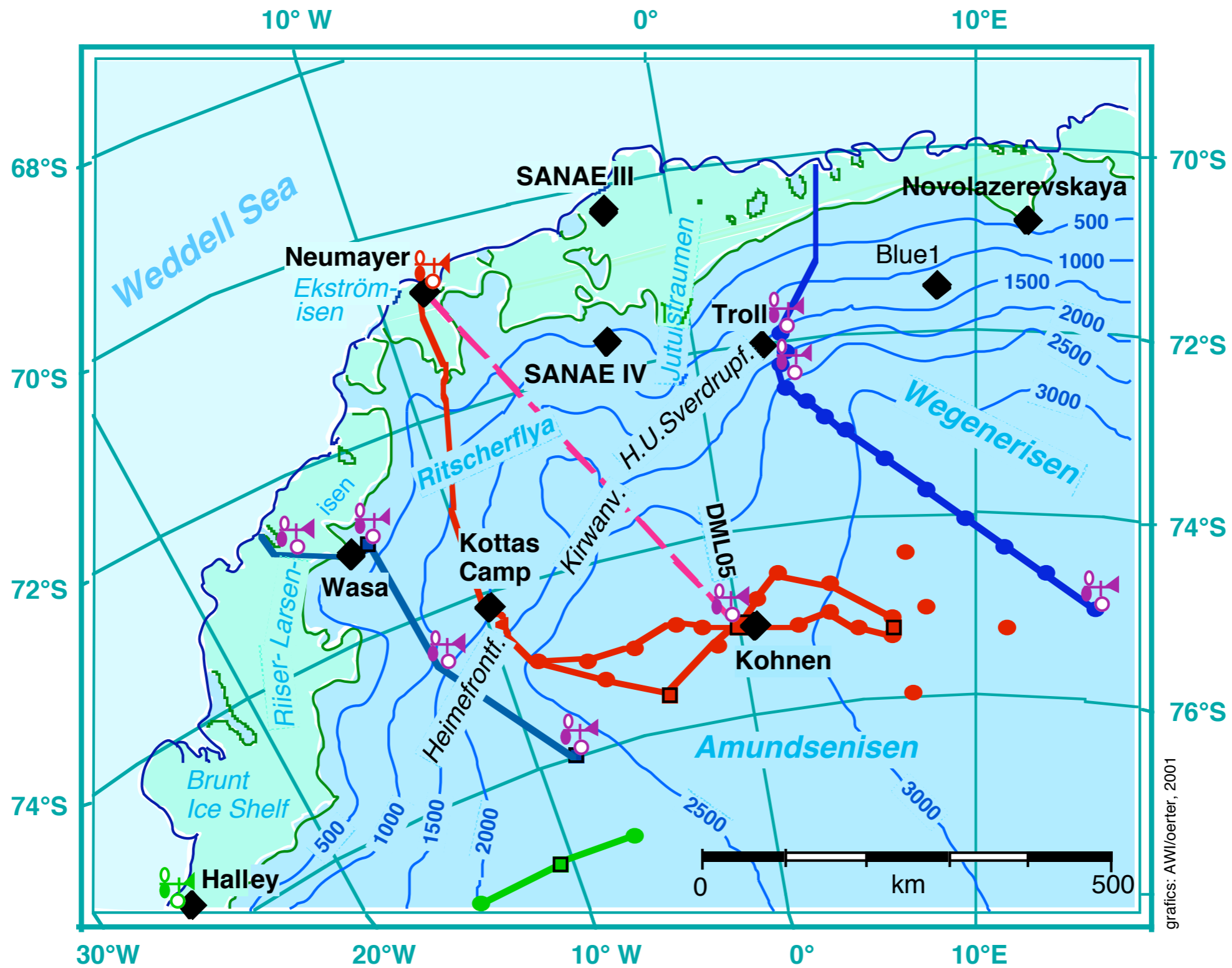
foto: hans oerter



Deep ice cores in Antarctica

layout: w. rack, h. oerter, AWI

Dronning Maud Land, Antarctica



graphics: AWI/oerter, 2001

- Sea
 - Ice shelf
 - Inland ice, grounded ice
 - 2000 contour line
 - hinge line
- Traverse routes: U.K. Sweden Germany Norway AWS Utrecht/AWI/BAS
- Main flight path from Neumayer station to the EPICA drill camp:



foto: j. köhler, 2005

POLAR 5

at regional airport Bremerhaven-Luneort



Basler BT 67

MANUFACTURED BY BASLER LLT,
OSHKOSH, USA in 2006/07
TEST FLIGHTS, CERTIFICATION, OPERATION
BY ENTERPRISE AIRLINE INC., OSHAWA,
CANADA since 2007

foto: AWI/S.Diederich, 2007

Landing at Kohnen-Station, Antarctica



Basler BT67

foto: hans oerter, 2005

Erection of Kohlen-Station 1999/2000



foto: hans oerter, 2000

Heinz Kohnen · Founder of AWI-Logistics



Foto: Archive AWI

* 05.02.1938 in Oberhausen
† 25.07.1997 in Nienberge bei Münster
Geophysiker

Before 1980 precursor of AWI-Logistics
1979/80 Expedition Leader onboard MV
„Polarsirkele“ in search for the location of
the first base of FRG in Antarctica
1982-1997 Head logistics department at
AWI

Drilling

Radio, PC, e-mail

Mess room

Kitchen

Rest rooms

2 Sleeping rooms
à 4 Pers.

Snow melter

Generator

Workshop

Kohnen-Station
75°S, 0 °E, 2882 m

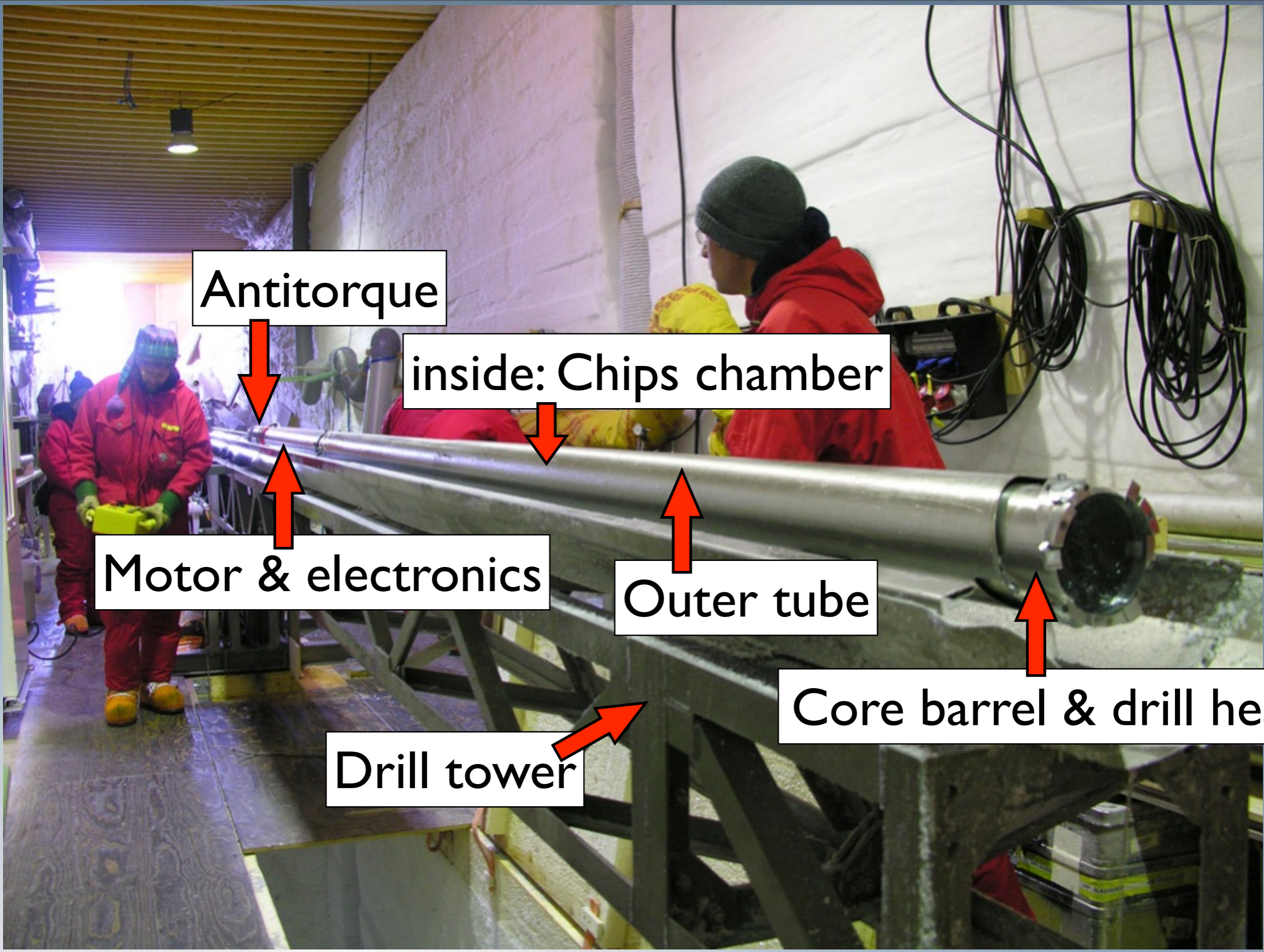
foto: hans oerter, 2006



foto: hans oerter, 2006

Drill Trench: drill tower

DESY Zeuthen, November 07, 2007



Antitorque

inside: Chips chamber

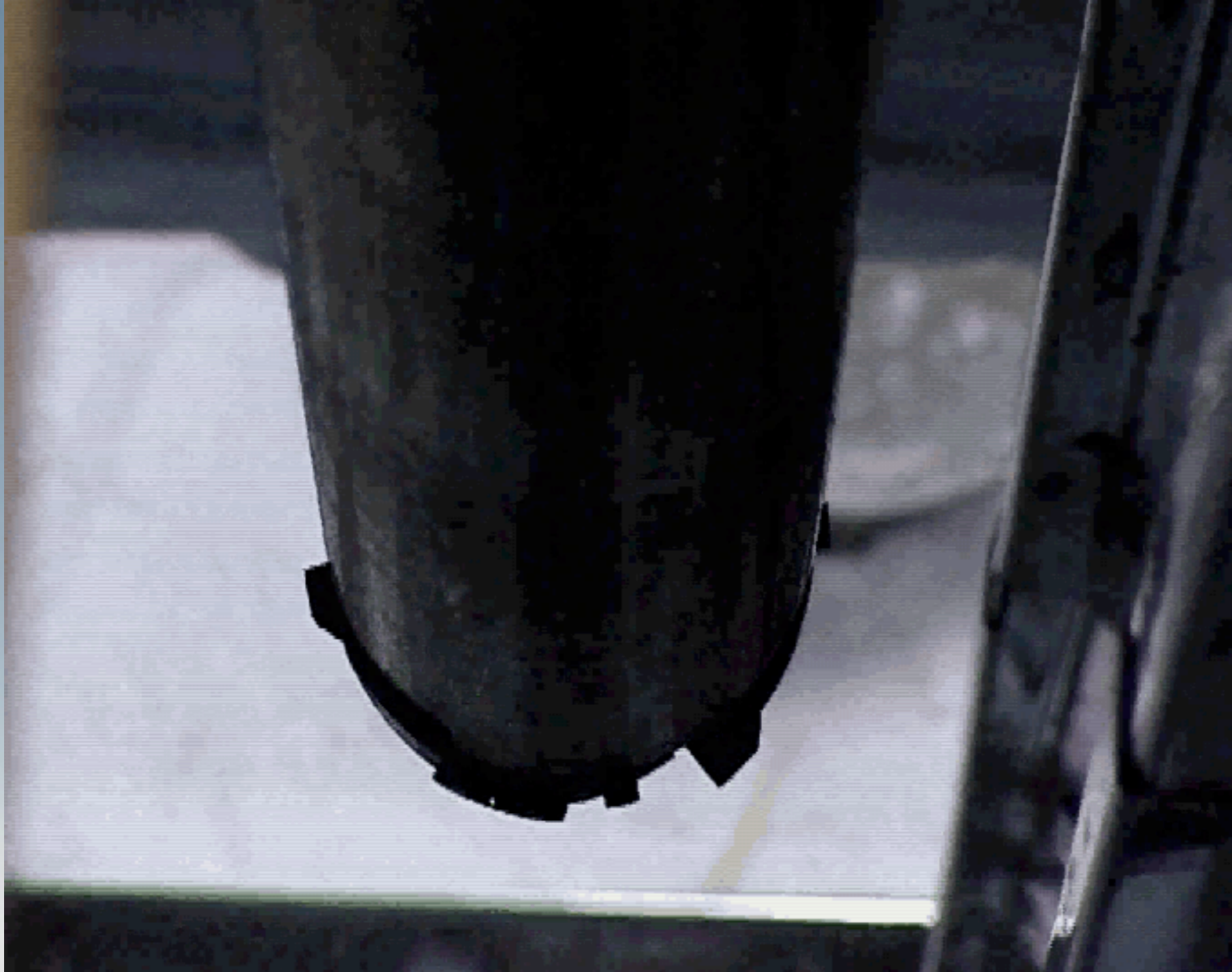
Motor & electronics

Outer tube

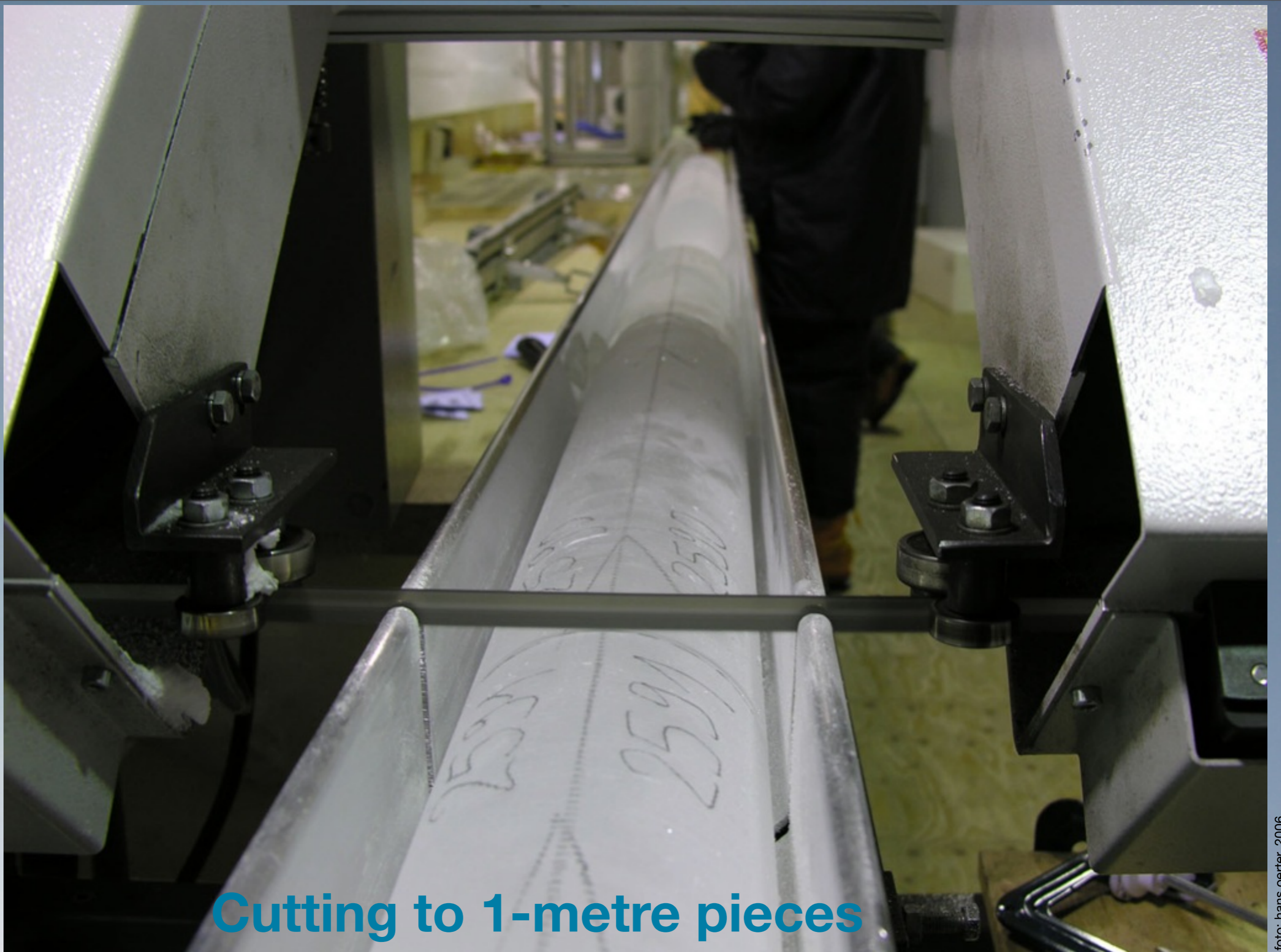
Core barrel & drill head

Drill tower

Drilling an ice core



Video clip: AWI



Cutting to 1-metre pieces

foto: hans oerter, 2006

Di-electric Profiling (DEP)



foto: hans oerter, 2006



Beladen des Flugzeuges

foto: hans oerter, 2006



Twin-Otter von British Antarctic Survey (BAS)

foto: hans oerter, 2006

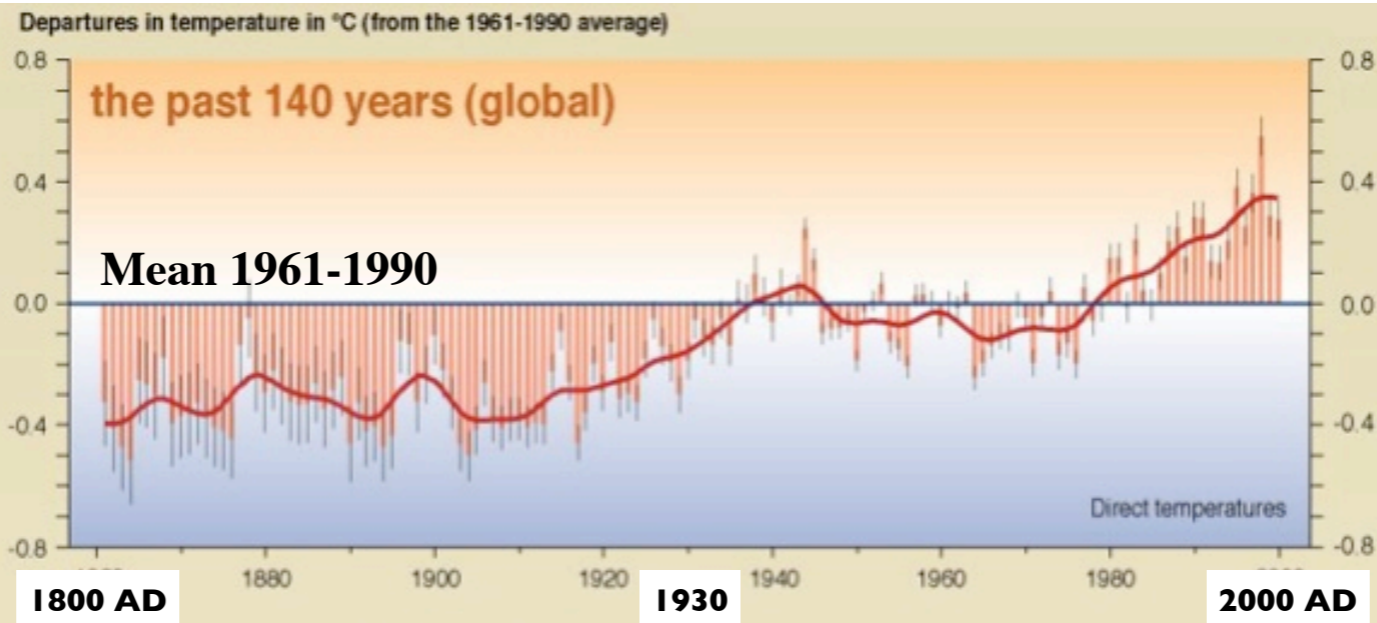
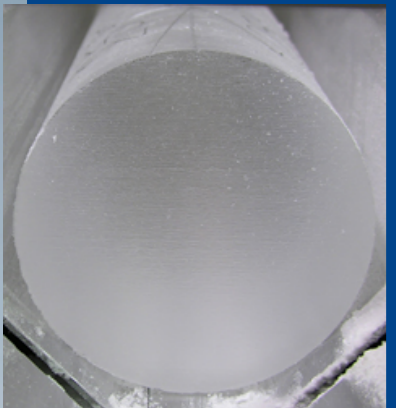


**Why
do we drill ice cores ?**

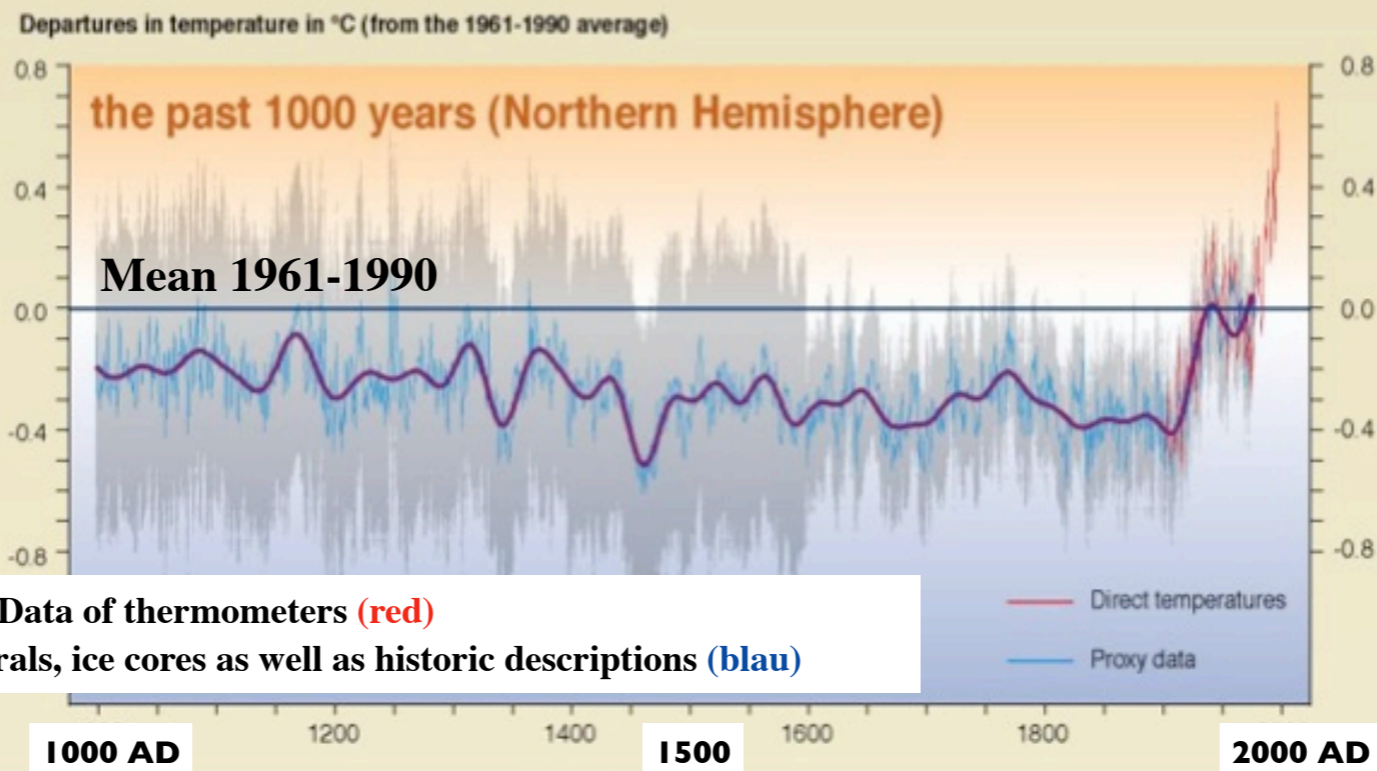
foto: hans oerter

Changing air temperature

Departures in temperature (°C)
from the 1961-1990 average



+ 0.4 °C
global

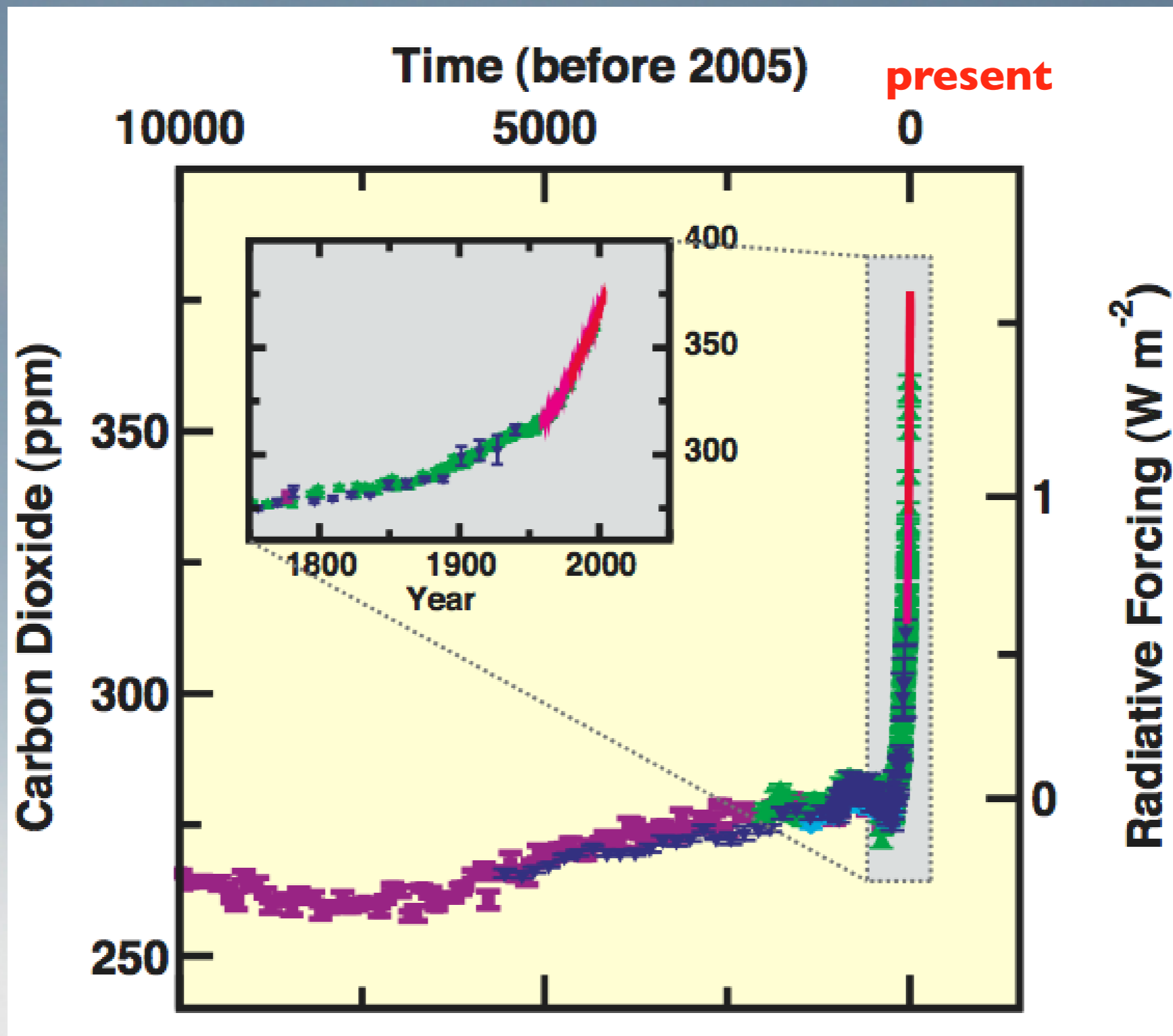


+ 0.7 °C
Northern hem.

Data of thermometers (red)
and from tree rings, corals, ice cores as well as historic descriptions (blau)

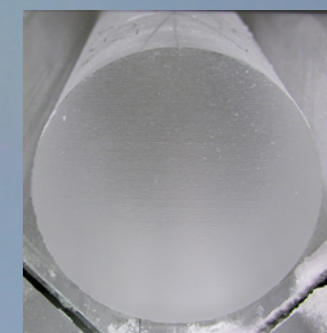
SYR - FIGURE 2-3

Carbon dioxide in the atmosphere



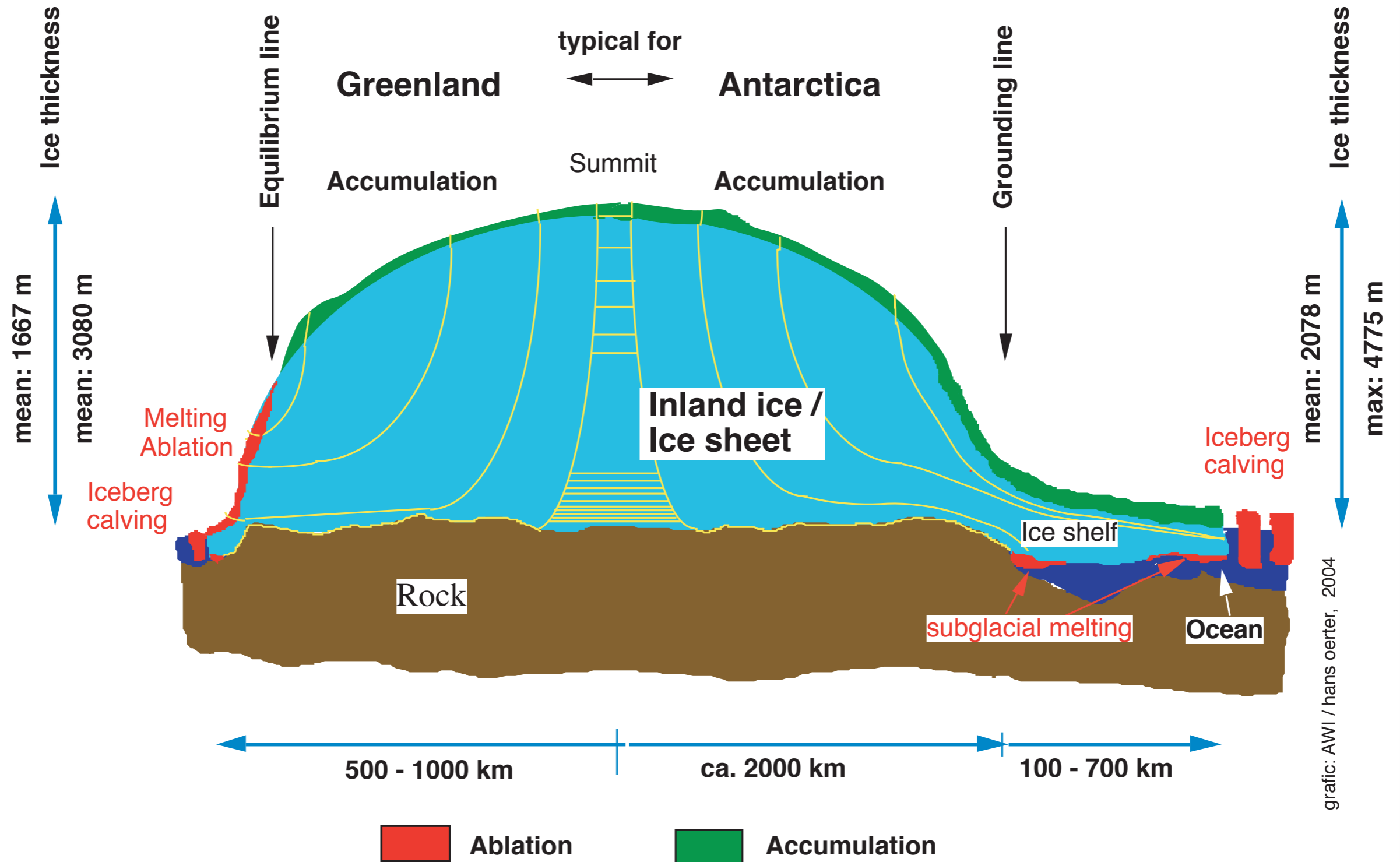
— Data from air samples since 1958

— Ice-core data



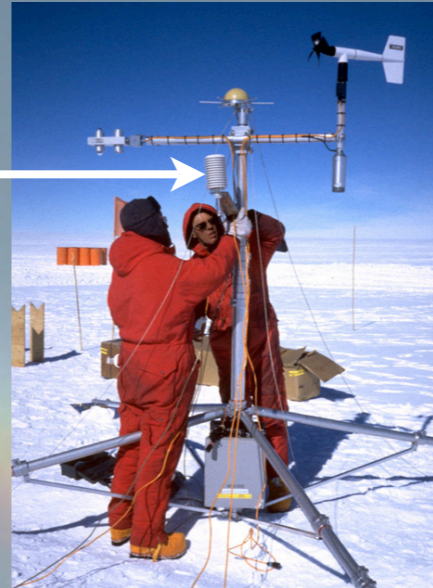
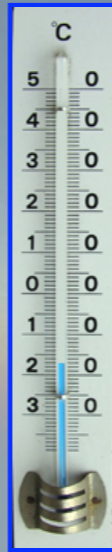
Source: IPCC, Climate Change 2007: The Physical Basis, Summary for Policy Makers

Schematic Cross Section Through an Ice Sheet



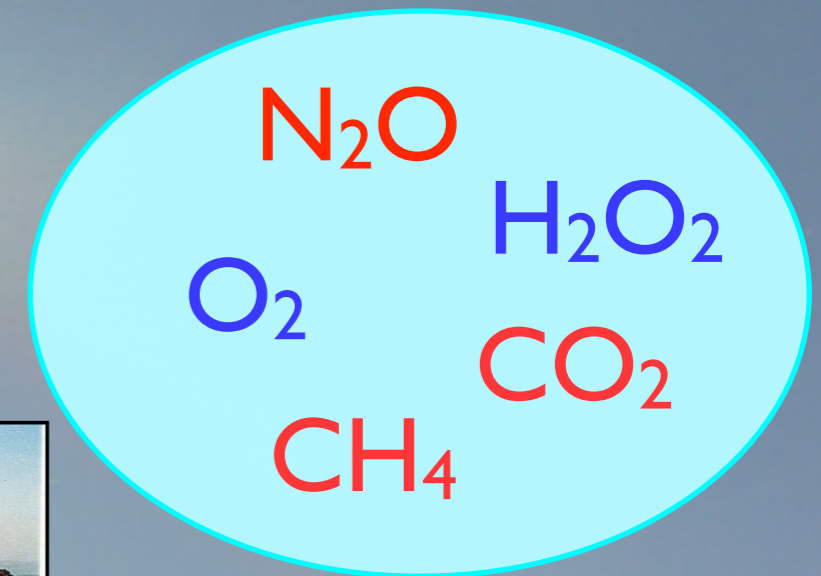
Ice as a climate archive contains information about:

Air temperature



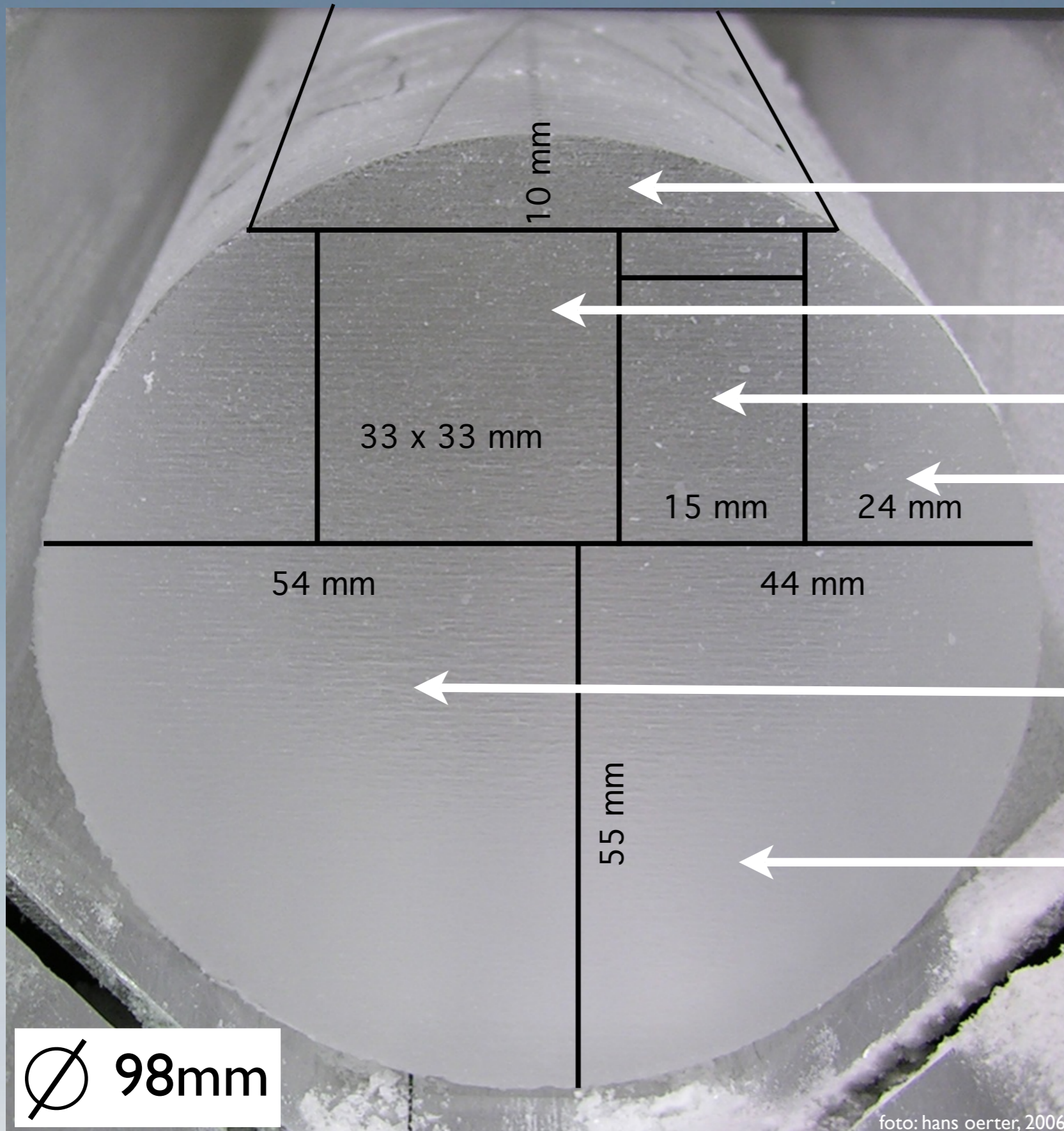
^{18}O , ^2H in ice

Gas content in the atmosphere



Aerosols





Thin section

CFA

$\delta^{18}\text{O}$

^{10}Be

Archive

**Gases,
dust**

\varnothing 98mm

foto: hans oerter, 2006

Cutting plan for EPICA ice cores

**What
did we learn
from ice cores ?**

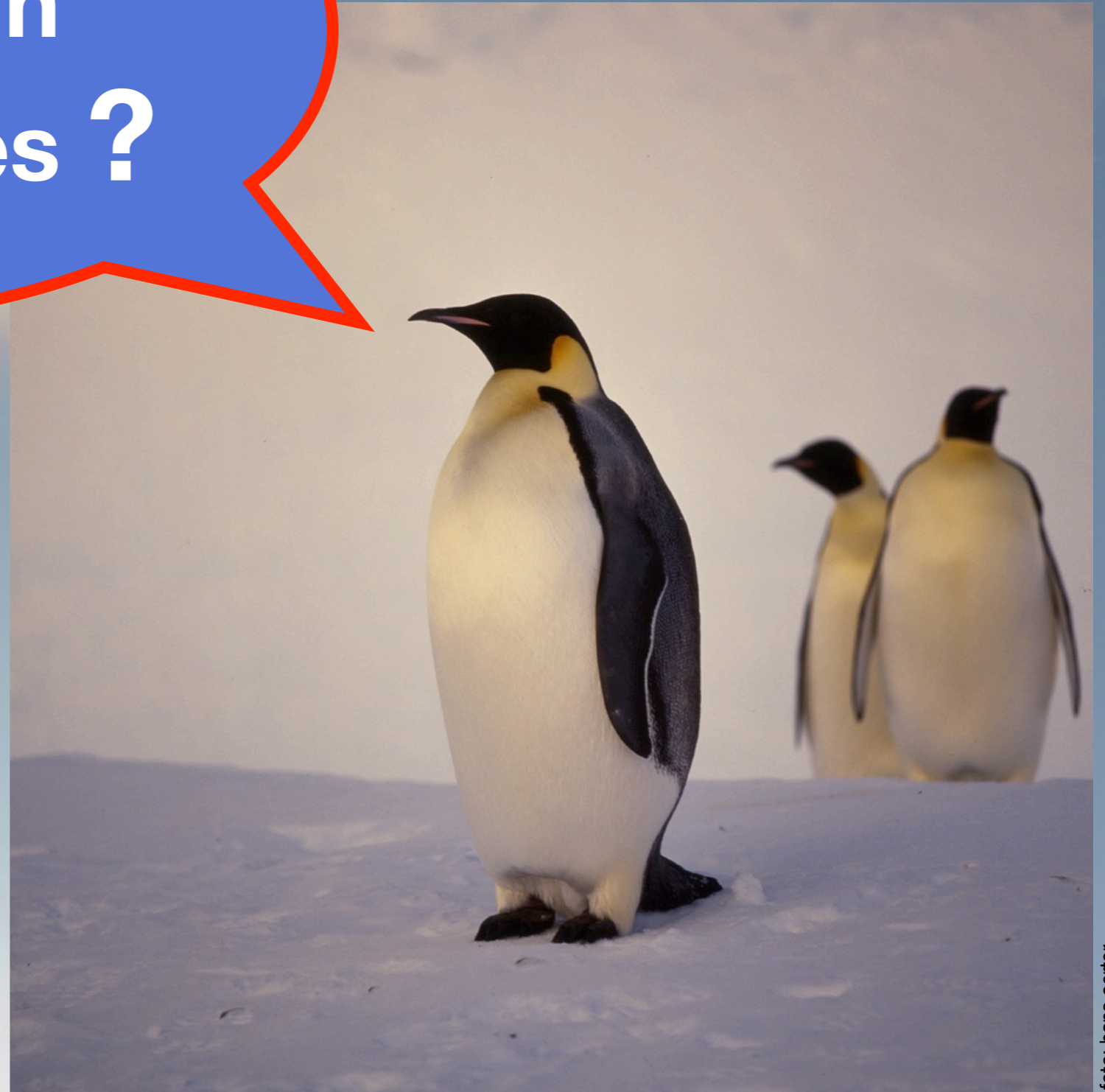
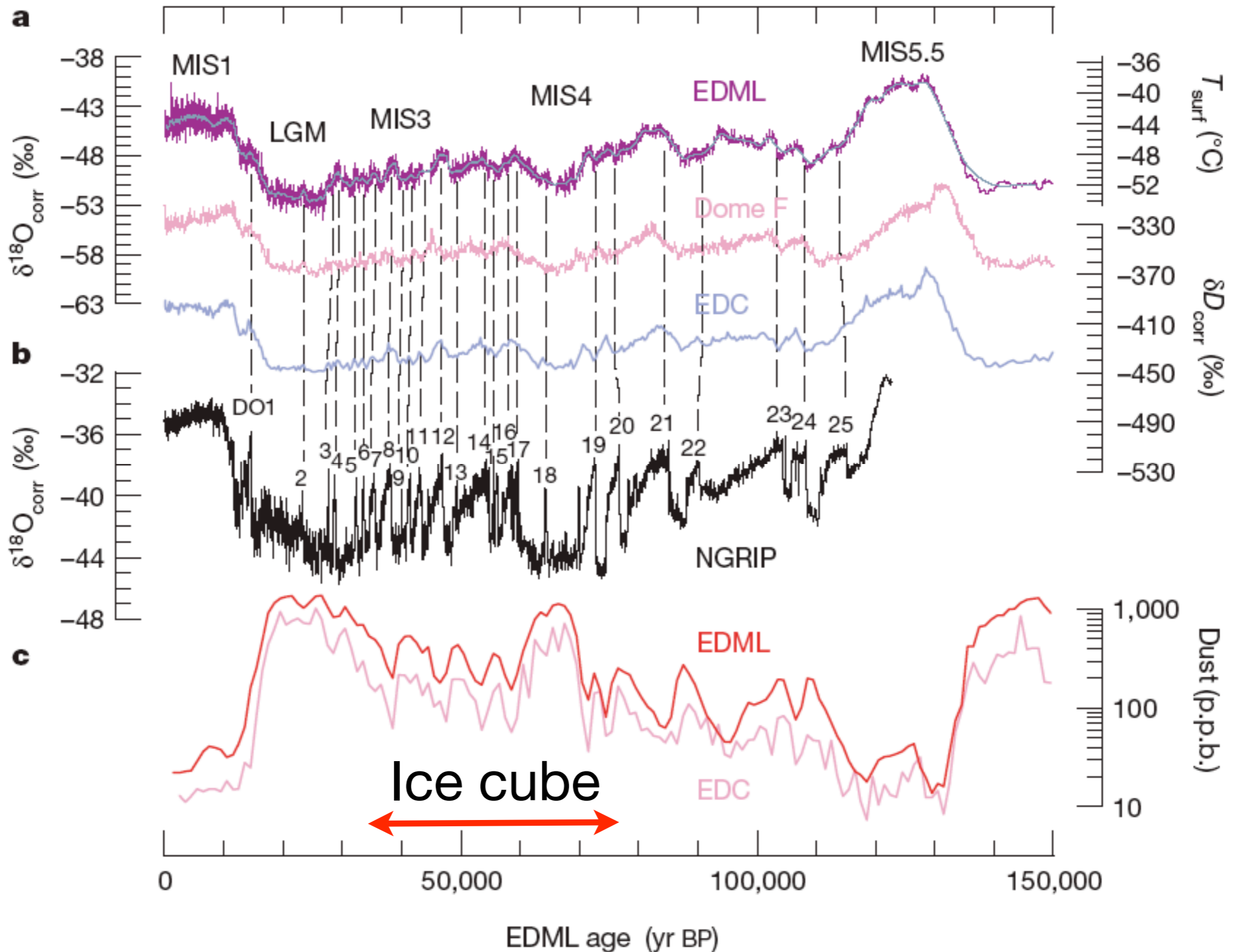


foto: hans oerter

The EPICA EDML-ice core

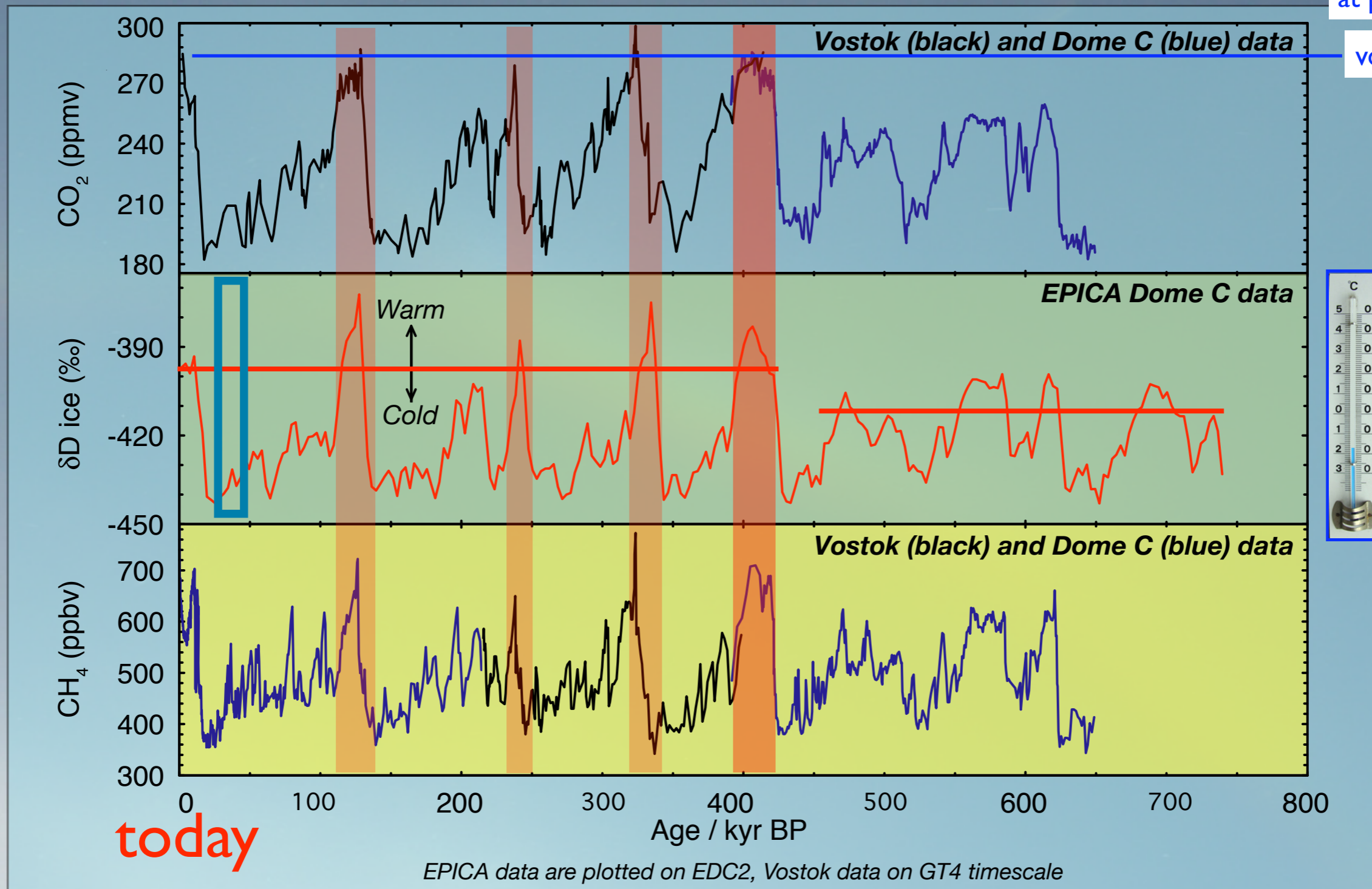


EPICA Community Members: *nature* 444, 9 November 2006. doi:10.038/nature06301

Antarctic ice core records: Vostok and EPICA CO₂, CH₄ and δD

at present 375

vor 1850 AD



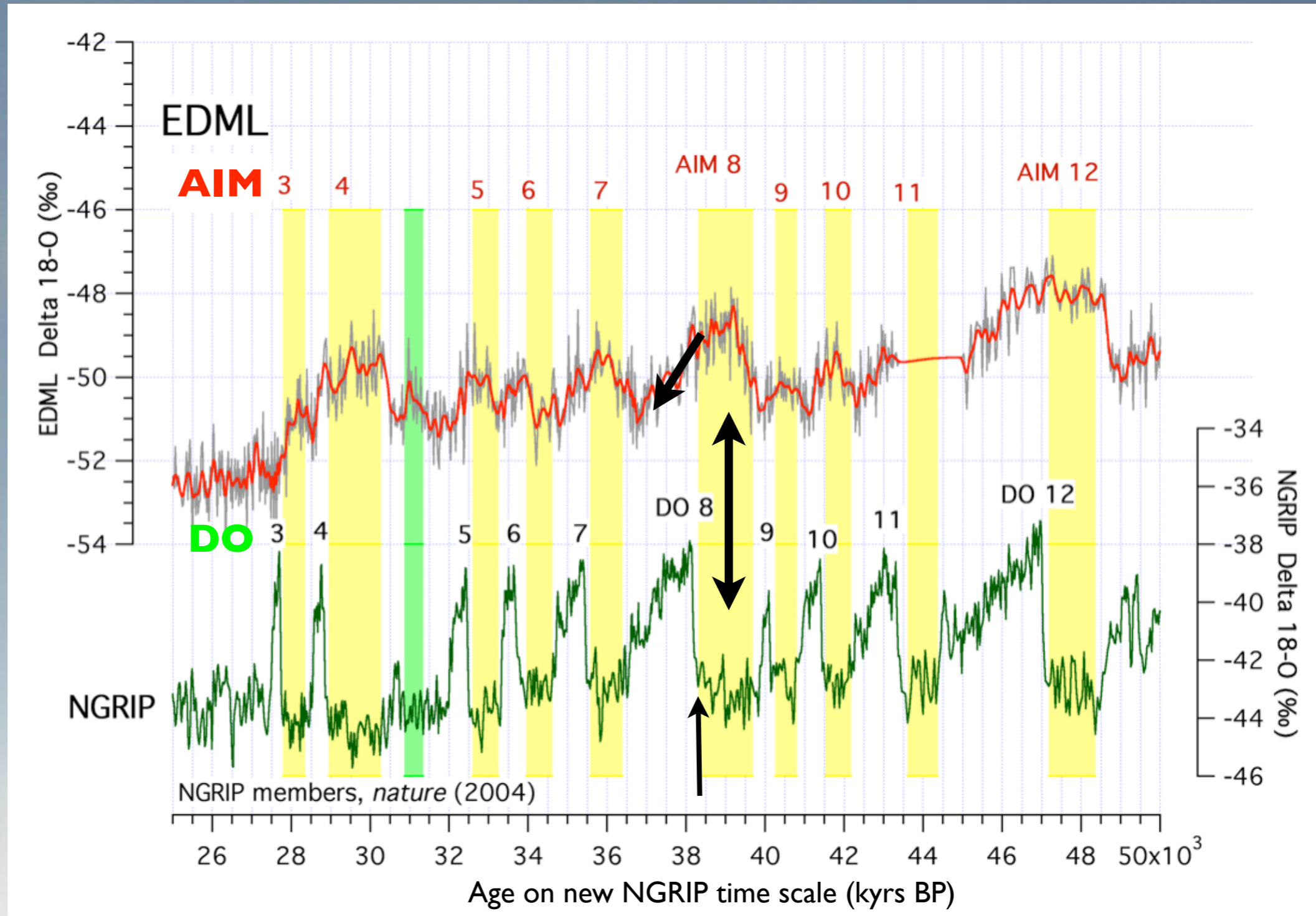
Petit et al., 1999 (Vostok), Siegenthaler et al., 2005 (Dome C - CO₂), Spahni et al., 2005 (Dome C - CH₄), EPICA community members, 2004 (δD)



Comparison Antarctica (EDML) - Greenland (NGRIP)

Each Antarctic Isotope Maximum (AIM) in the EDML-ice core corresponds to a DO event in Greenland (NGRIP)

Warming in Antarctica starts in a cold phase (Stadial) of the North, Cooling in a warm phase (Interstadial)



Source: EPICA community members: *Nature*, Vol. 444, November 9, 2006)

The End

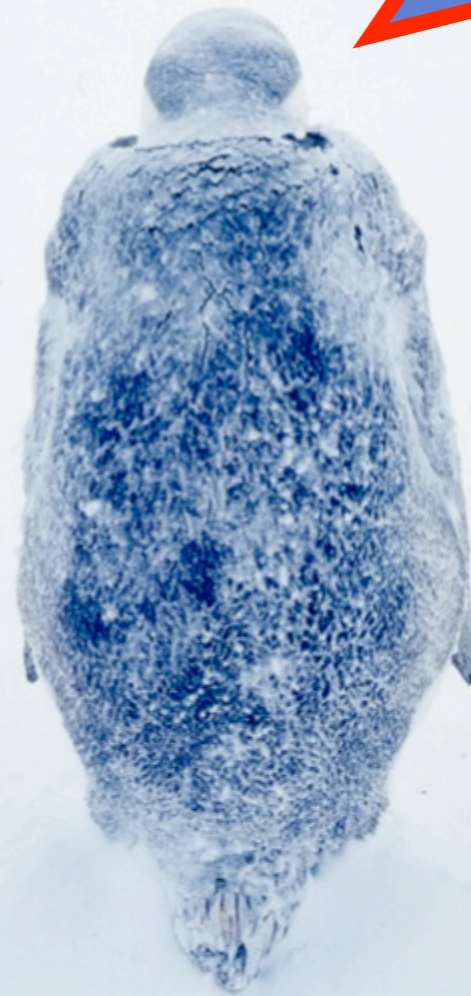


foto: hans oerter