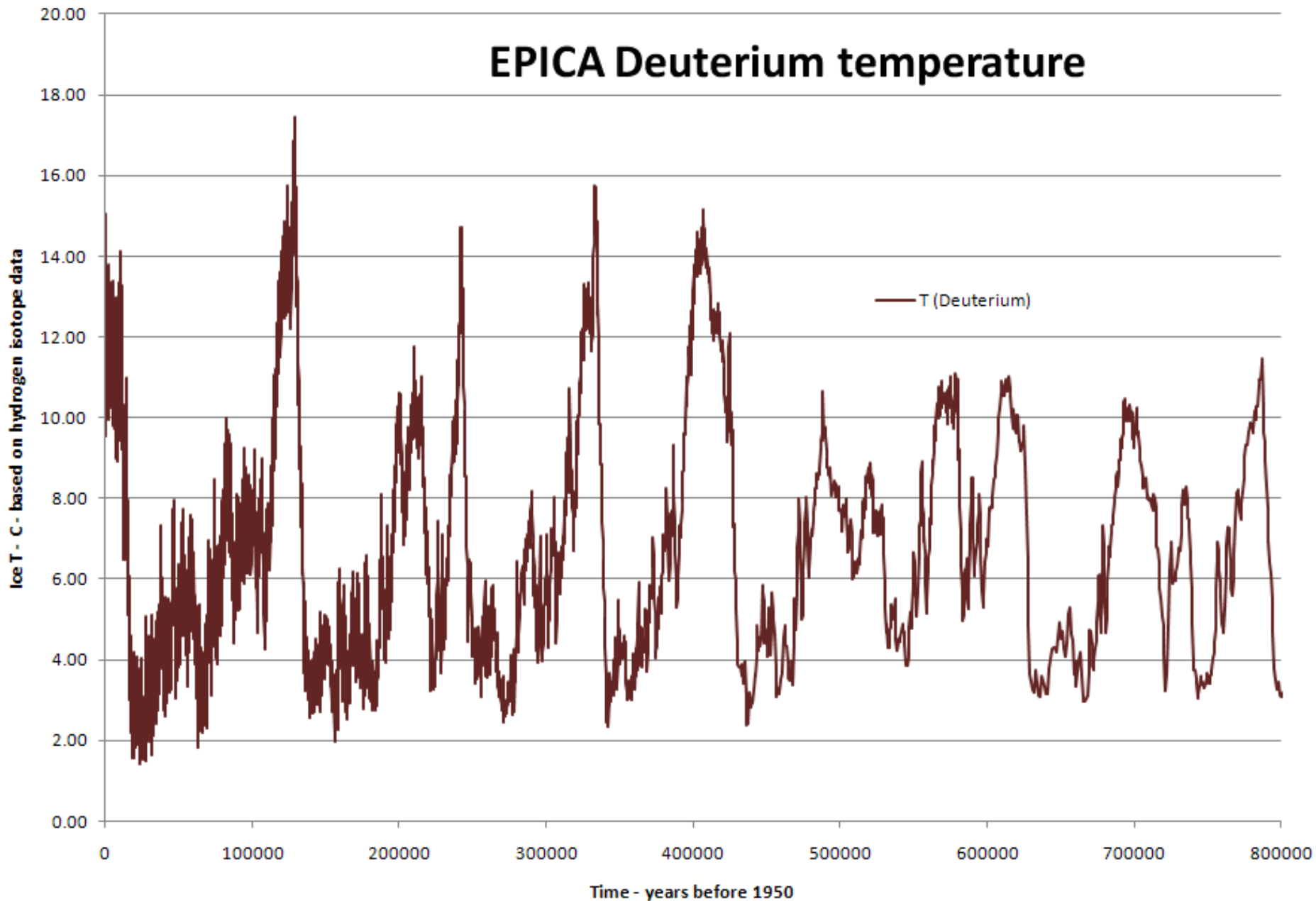


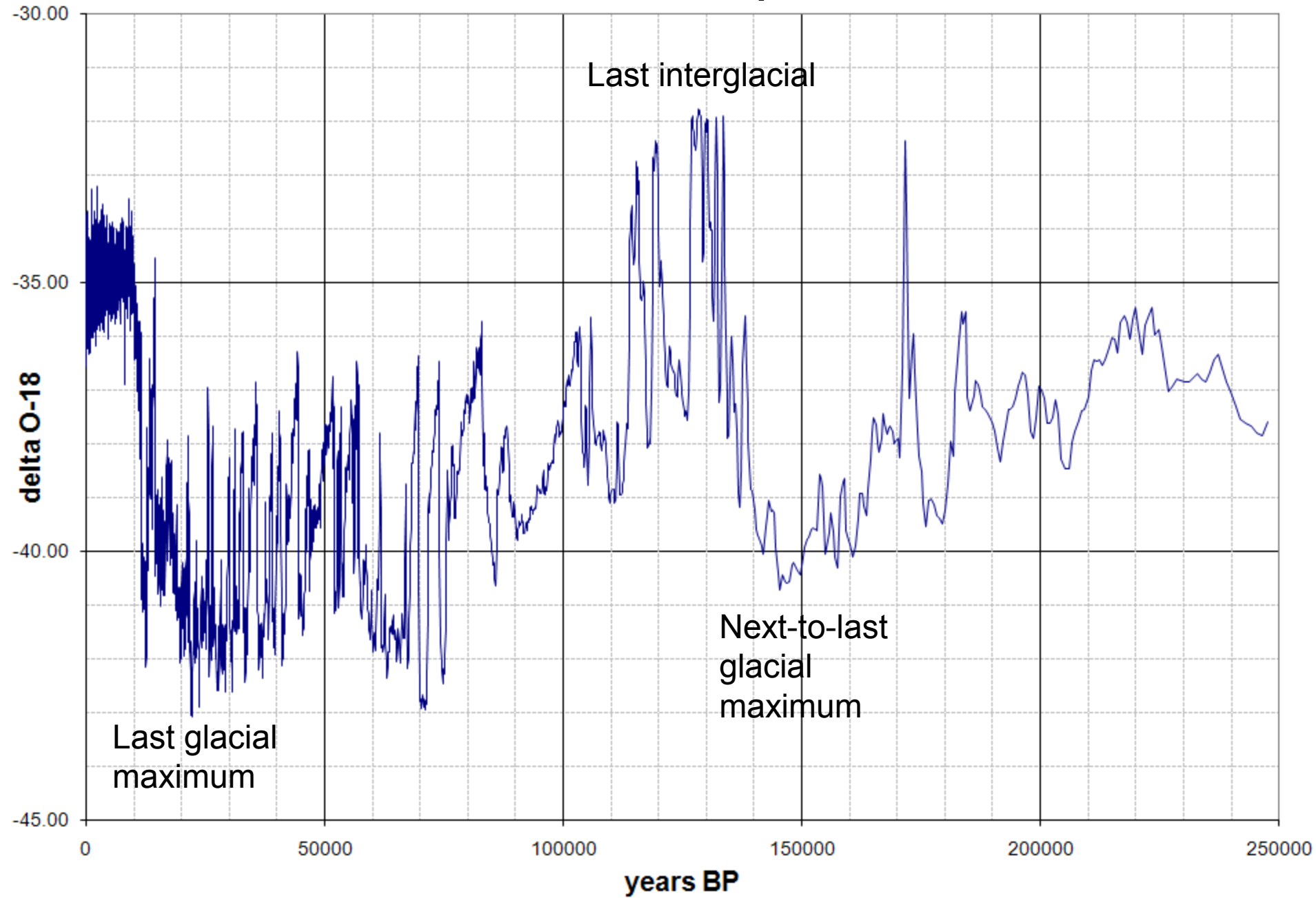
# Dansgaard-Oeschger cycles

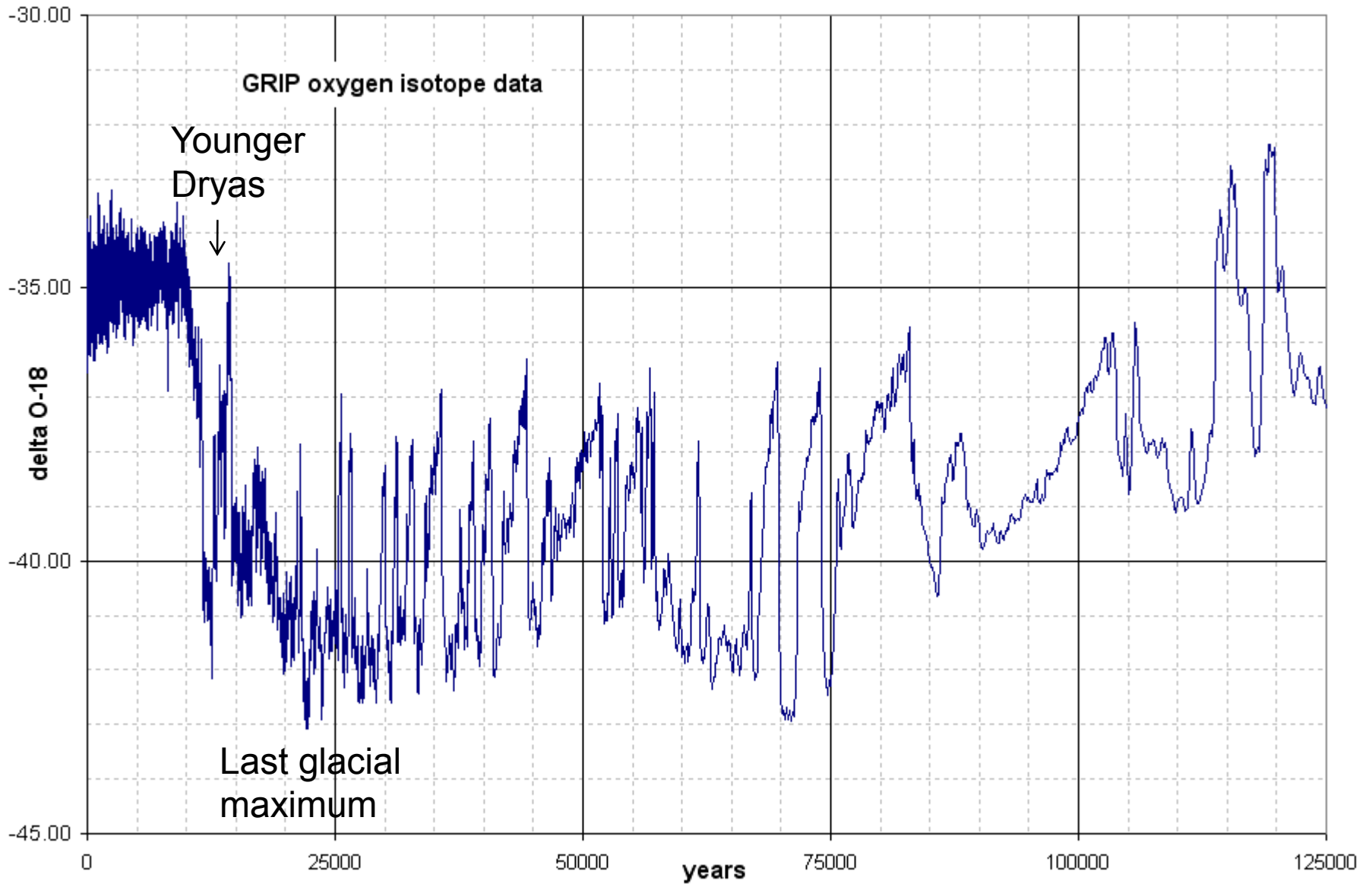


# EPICA Deuterium temperature



# GRIP O-18 temperature





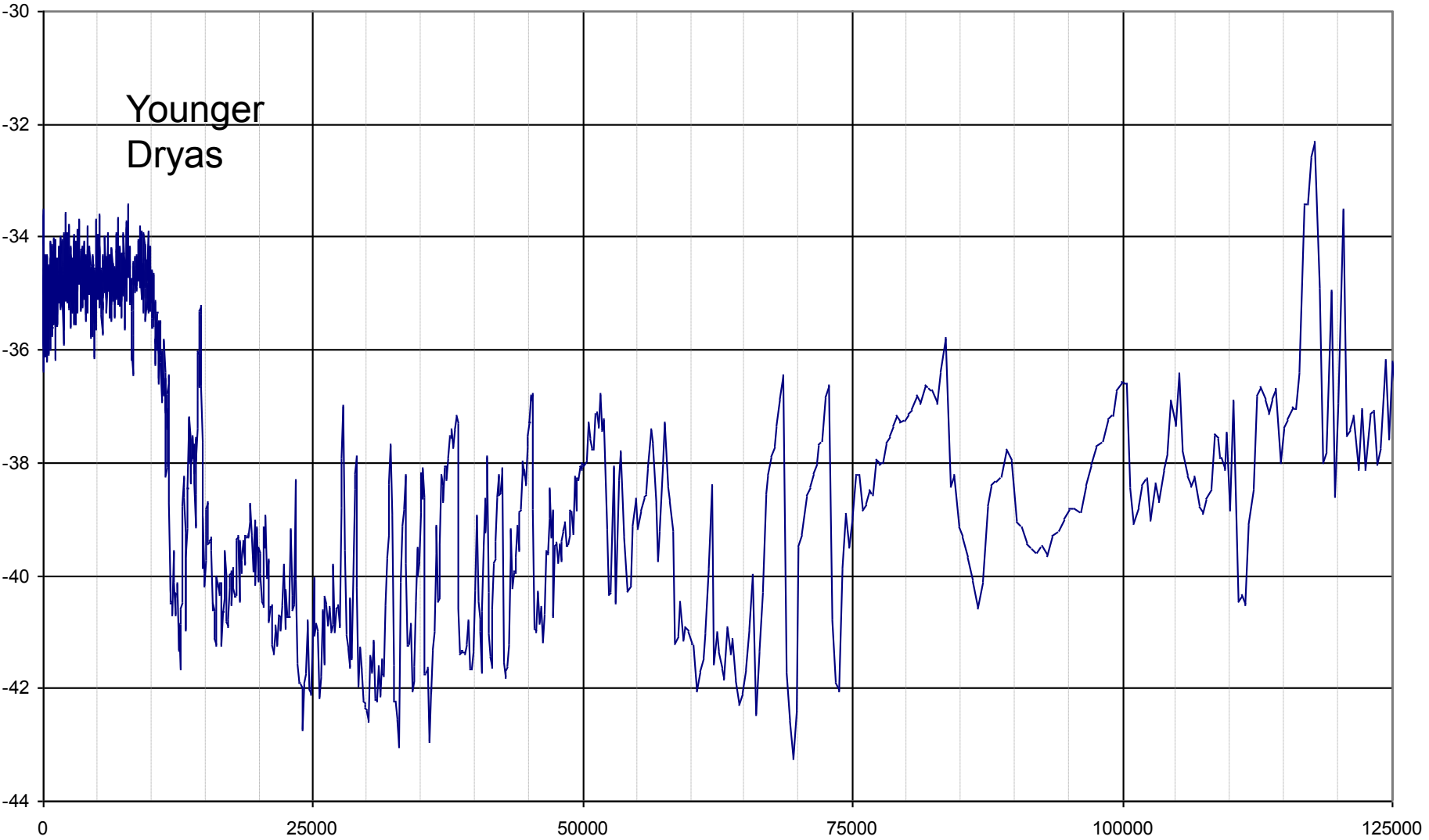
*Dryas*  
*octopetala*



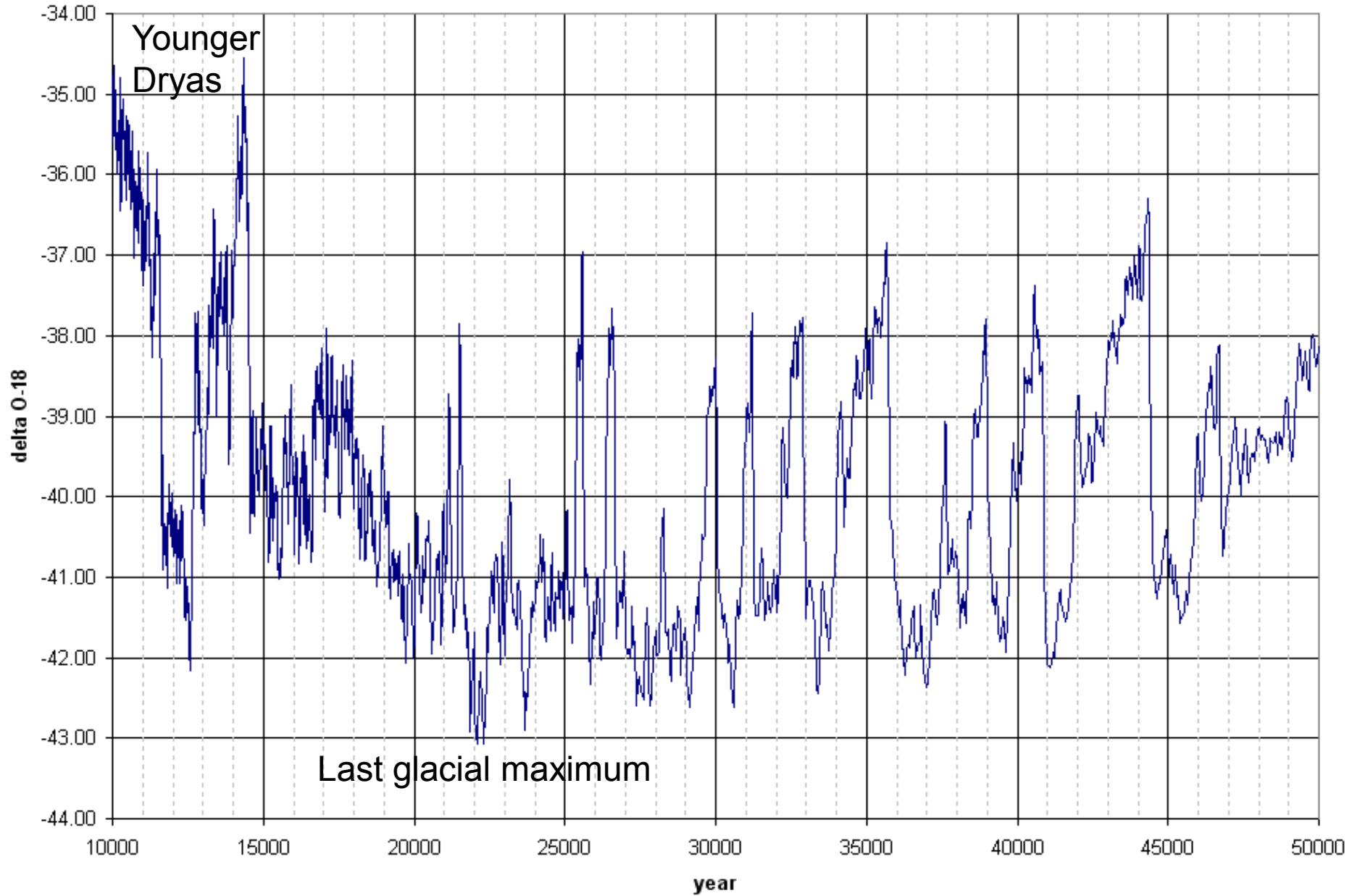
© -josef hlasek  
www.hlasek.com  
Dryas octopetala 4740



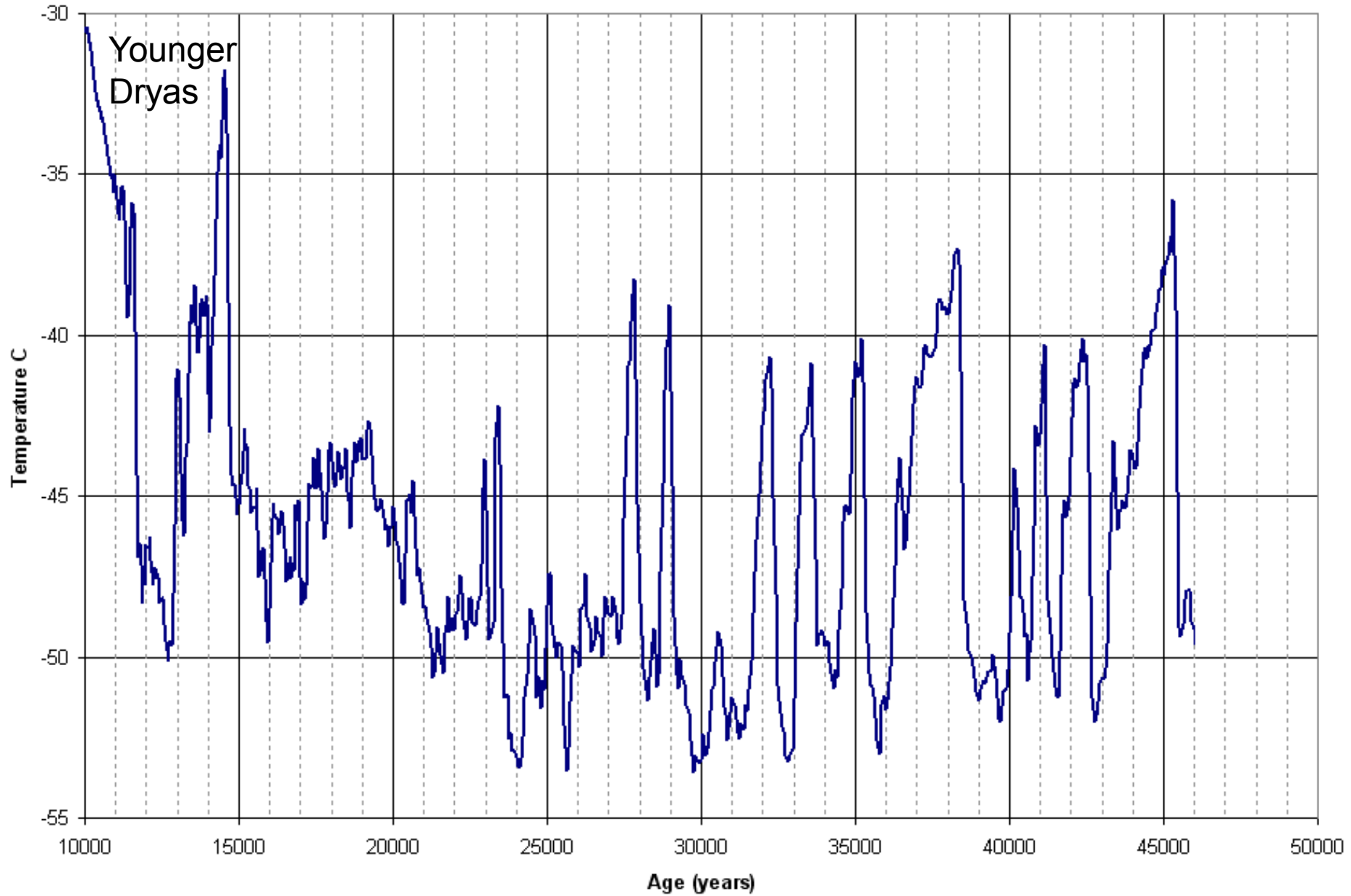
# GISP2 O-18 data



# GRIP delta O-18 10,000 to 50,000 y

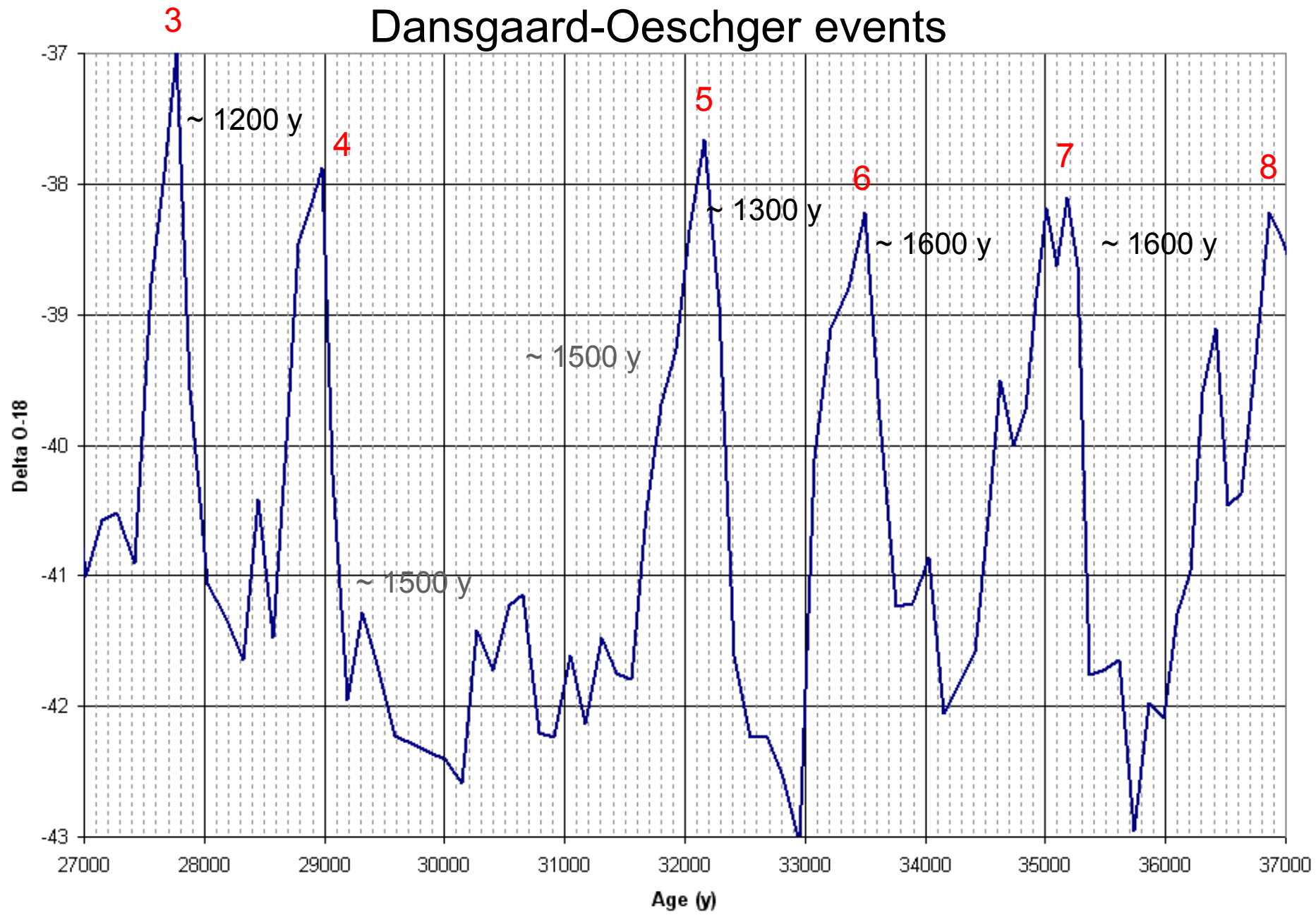


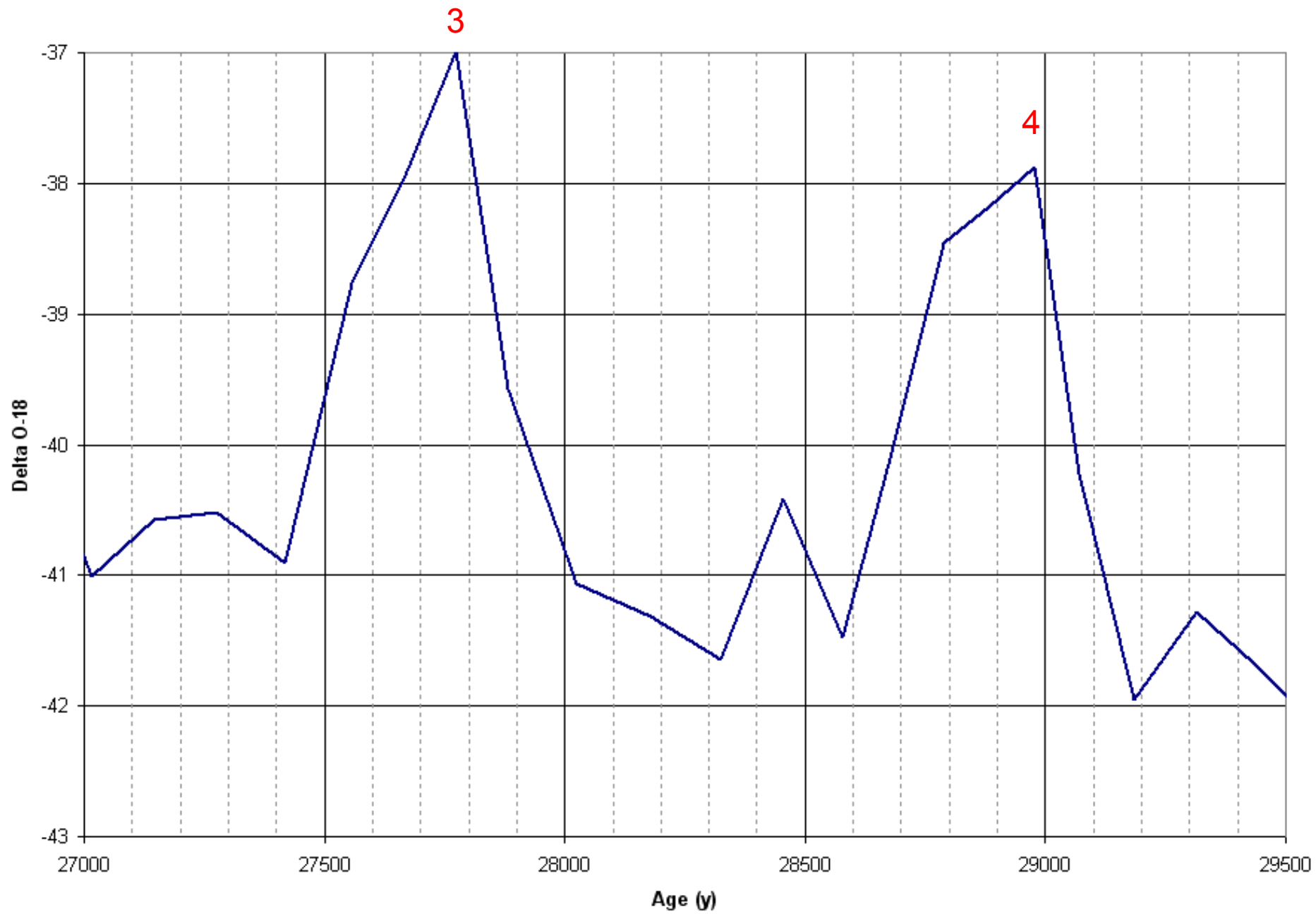
# GISP2 – T 10-50ka





# GISP2 delta O-18 27,000 to 37,000 y showing Dansgaard-Oeschger events





# Heinrich Events





“The Toby Formation has been ascribed a ‘Sturtian age’ (approx. 750-700 Ma) based on correlation with the Rapitan Group to the North but is also broadly correlative with successions to the South which were deposited between 709 and 667 Ma.”





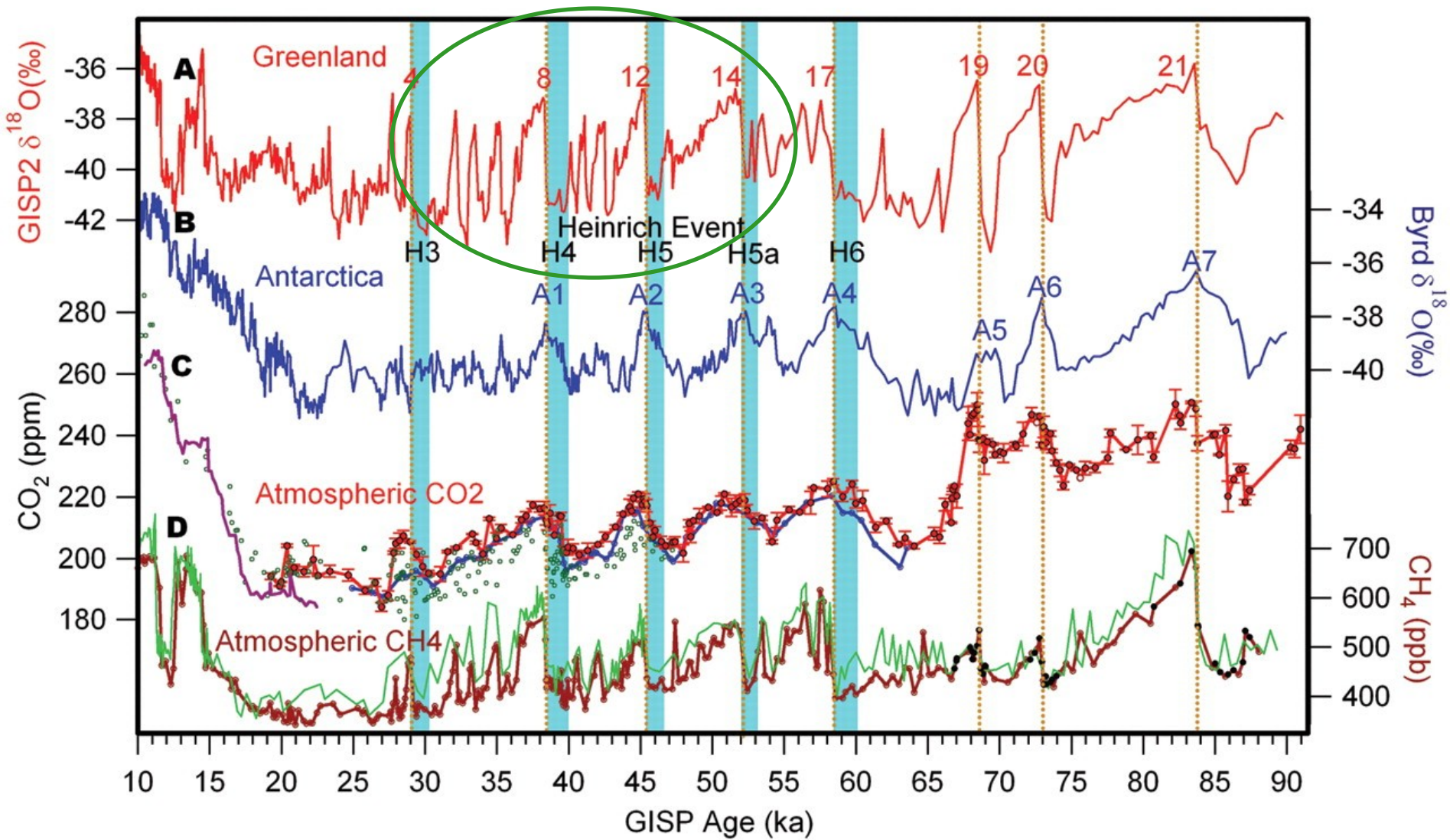












Red numbers are D-O cycle events

## NOAA slide set on Heinrich events

<http://www.ncdc.noaa.gov/paleo/slides/slideset/index19.htm>

Alley paper on Bond, Heinrich and DO

[Palaeoclimatology: Icing the North Atlantic](#)

Richard B. Alley

Nature 392, 335-337(26 March 1998)

doi:10.1038/32781

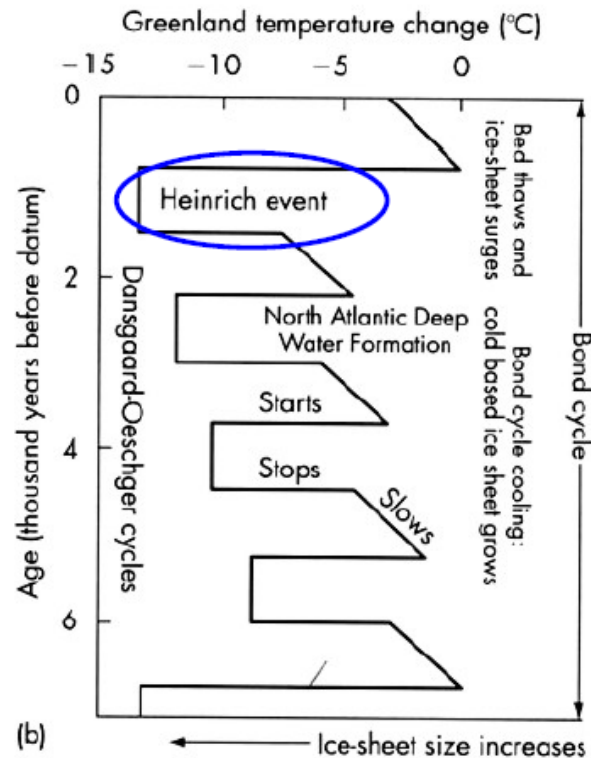
[One-to-one coupling of glacial climate variability in Greenland and Antarctica](#)

EPICA Community Members

Nature 444, 195-198(9 November 2006)

# Dansgaard-Oeschger and Bond cycles

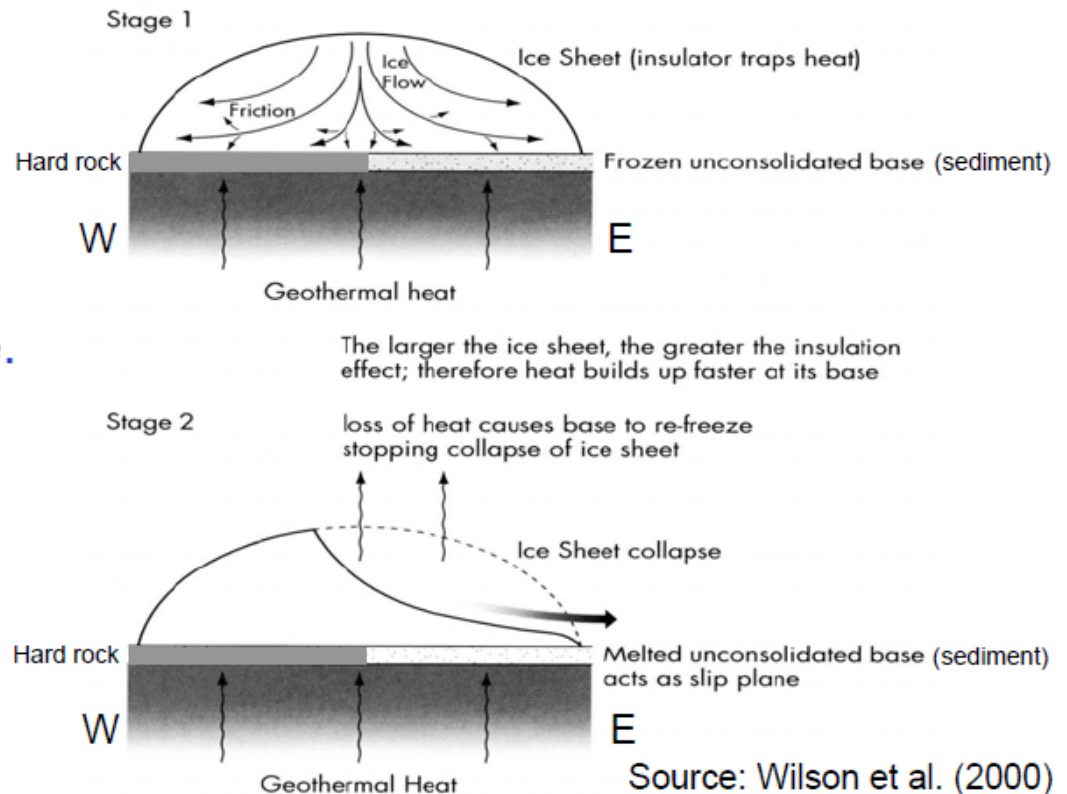
## Schematic course of Bond and D-O cycles



Source: Wilson et al. (2000)

# Heinrich events

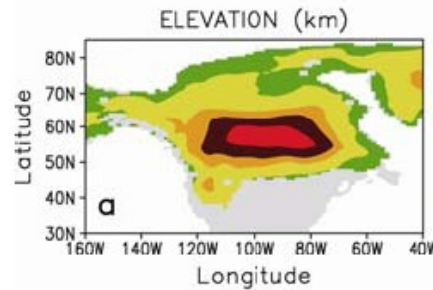
- Most Bond cycles culminate in a **partial collapse of the North American ice sheet** (“Heinrich event”).
- Massive release of icebergs into the North Atlantic, leads to 5-10 m global sea-level rise.
- Goes along with strong cooling, followed by rapid warming.



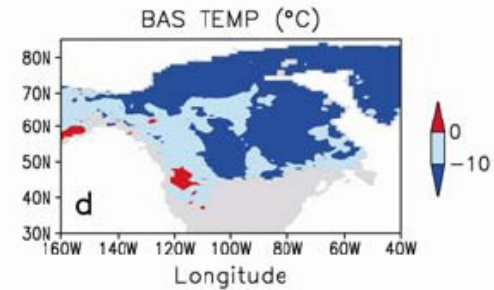
# Heinrich events

## Simulation of a Heinrich event

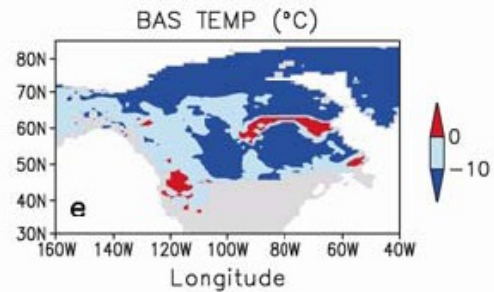
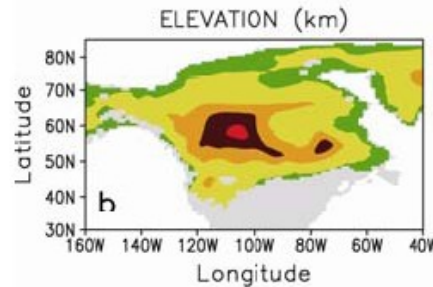
Before event:



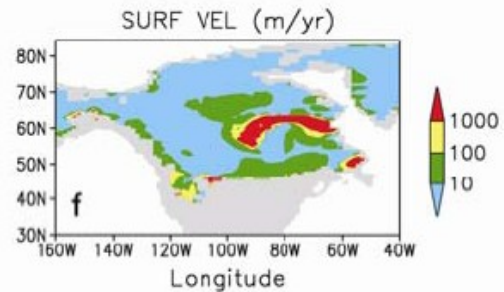
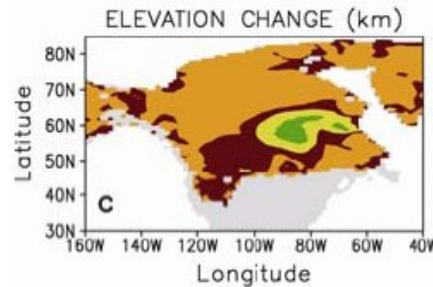
Source: Calov et al. (2002)



After event:



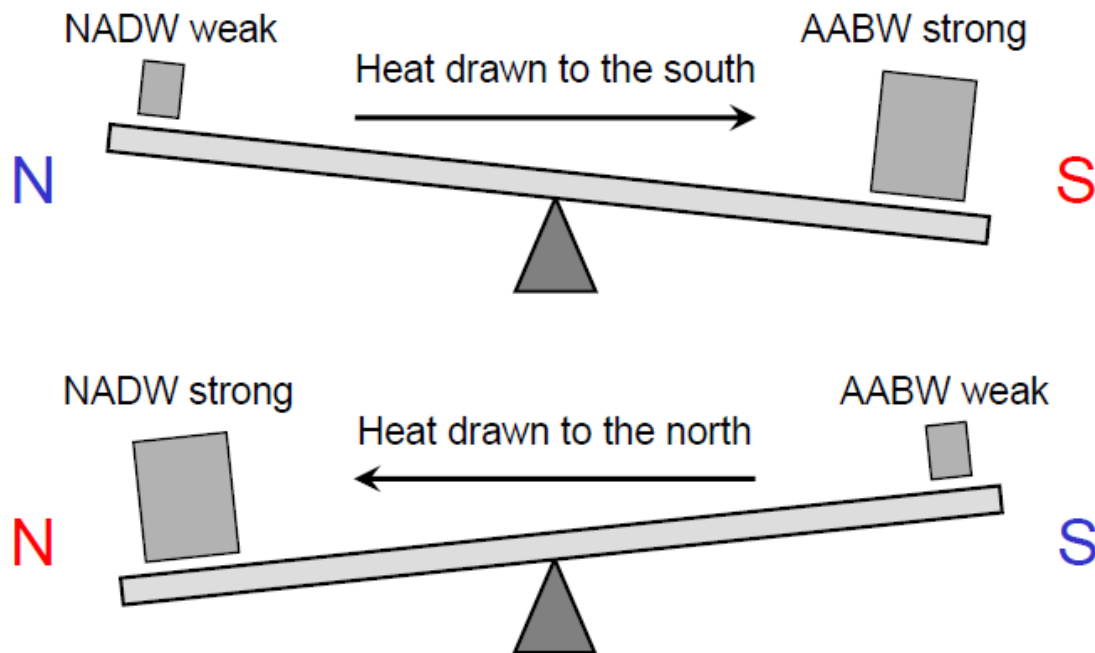
During event:





## Inter-hemispheric coupling

- Possible explanation of anti-phase behaviour:  
“Bipolar seesaw” of the thermohaline circulation.

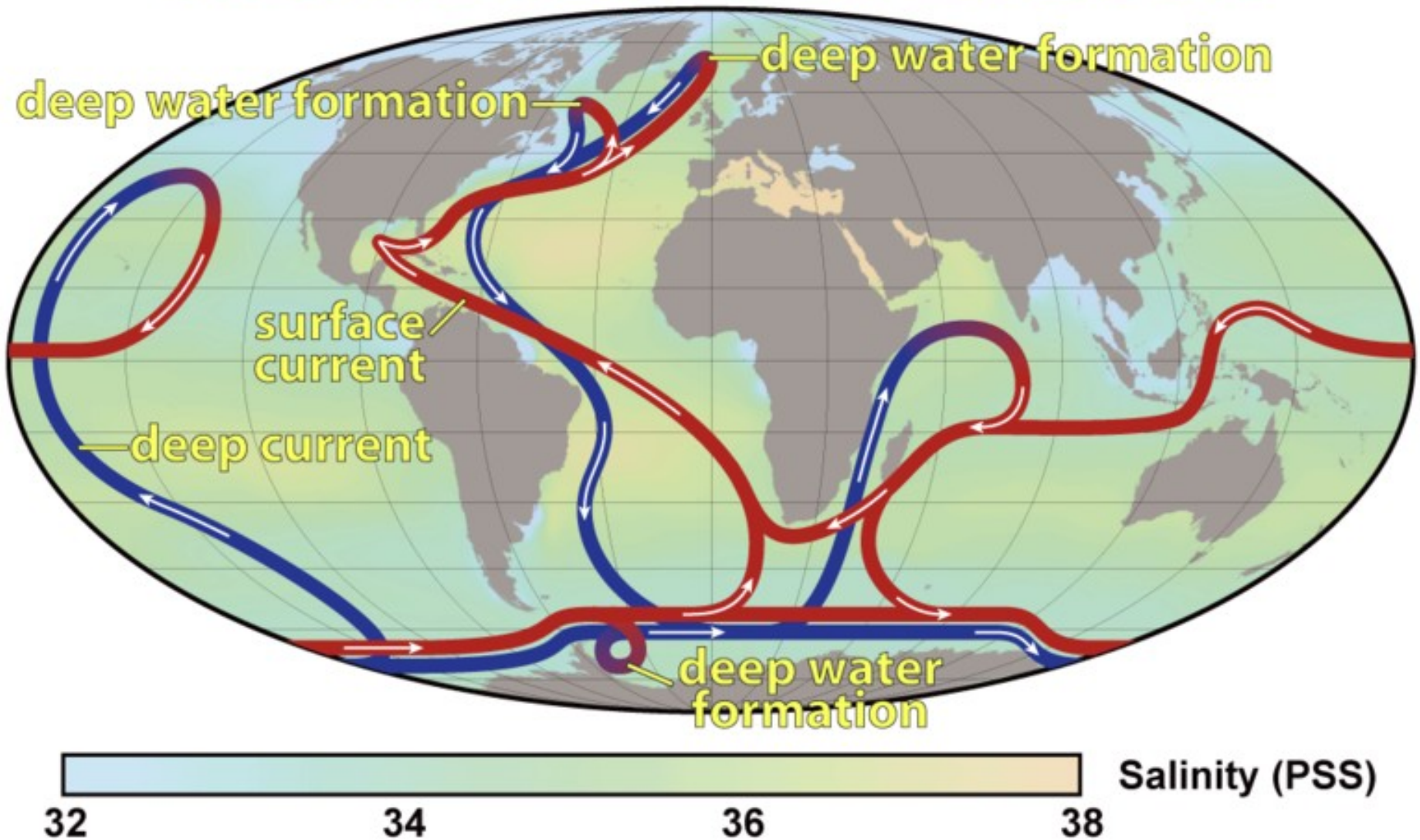


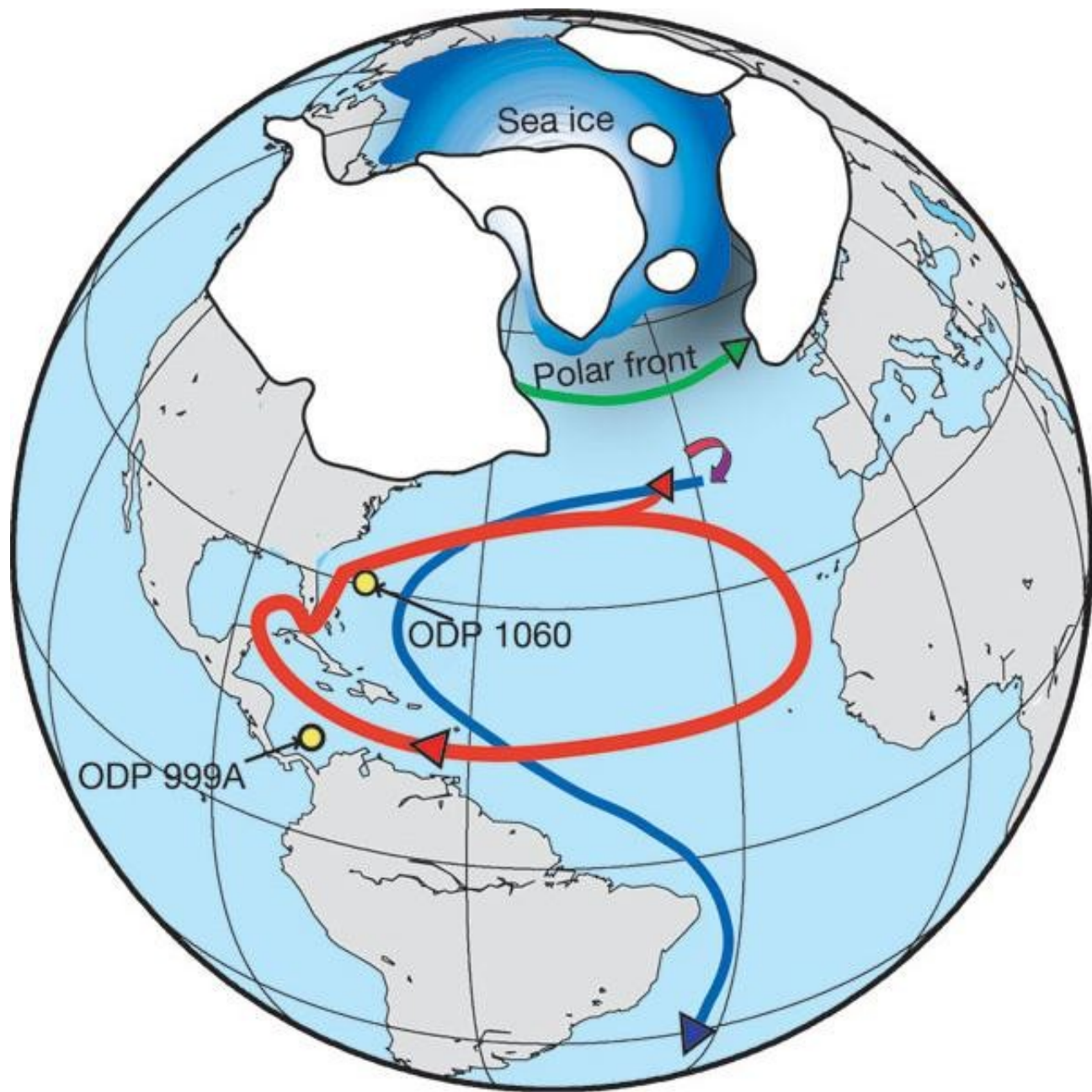
# Two EPICA ice cores revealing 800,000 years of climate history: An overview.

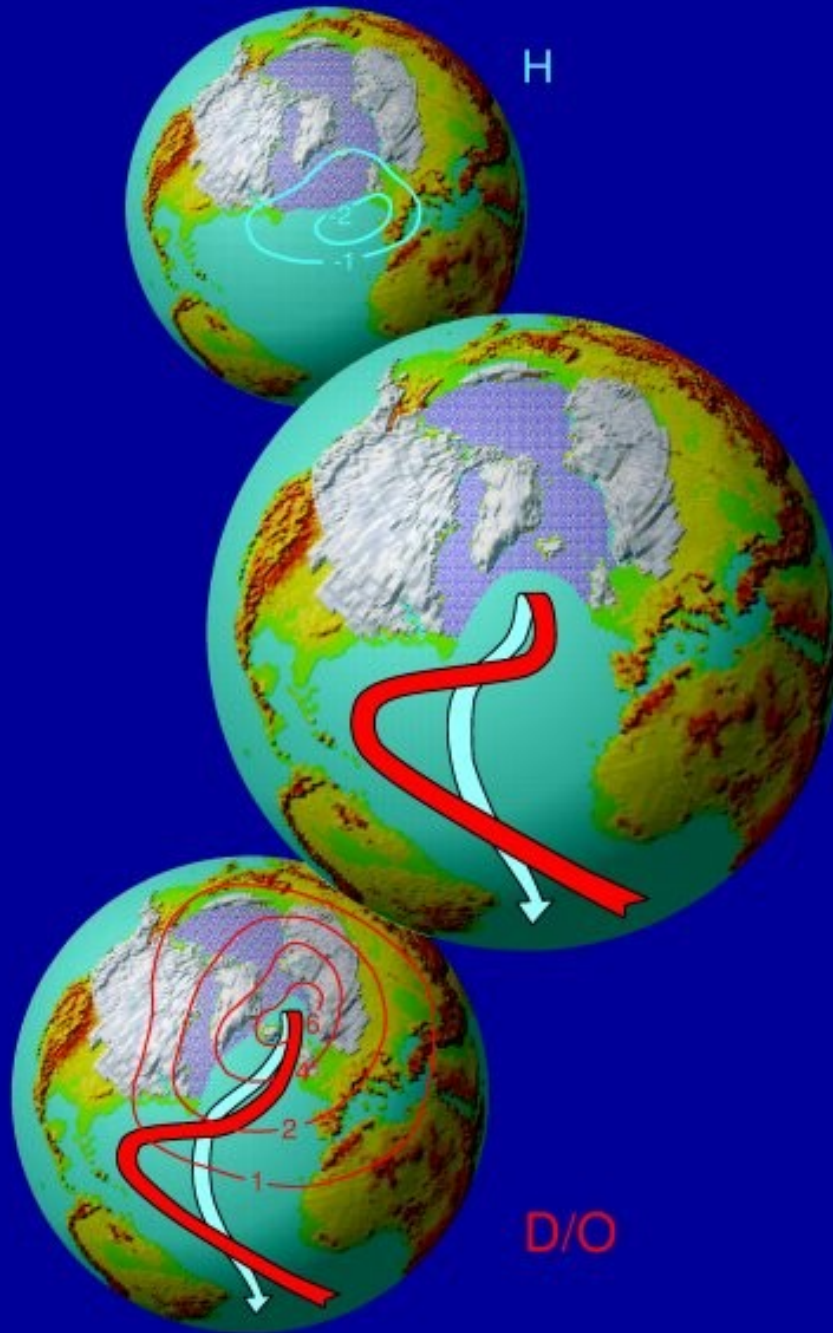
Hans Oerter & EPICA team

Alfred-Wegener-Institut für Polar- und Meeresforschung in der  
Helmholtz-Gemeinschaft, Bremerhaven

# Thermohaline Circulation





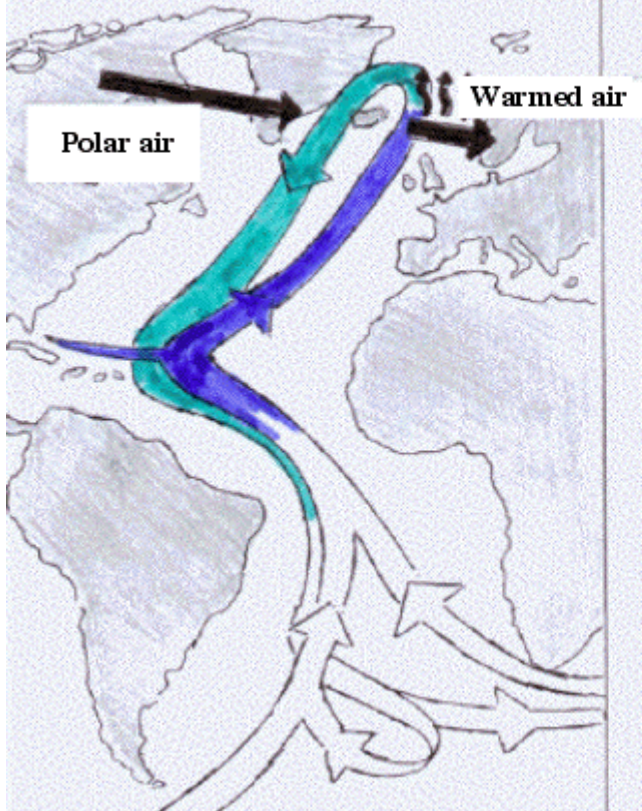


The upper globe shows climate during a Heinrich event, with collapsed conveyor belt and a cold anomaly over the mid-latitude Atlantic.

The large Earth in the centre shows the stable cold (or "stadial") climate state prevailing during most of the Ice Age.

Below it is the situation during a warm Dansgaard-Oeschger (D/O) event, in which the Atlantic conveyor belt temporarily advances into the Nordic Seas and a strong warm anomaly develops there (contours).

The Gulf Stream today



Consequences of its deviation

