

# 650,000 Years of Greenhouse Gas Concentrations from an Antarctic Ice Core

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and the Bern and LGGE Teams

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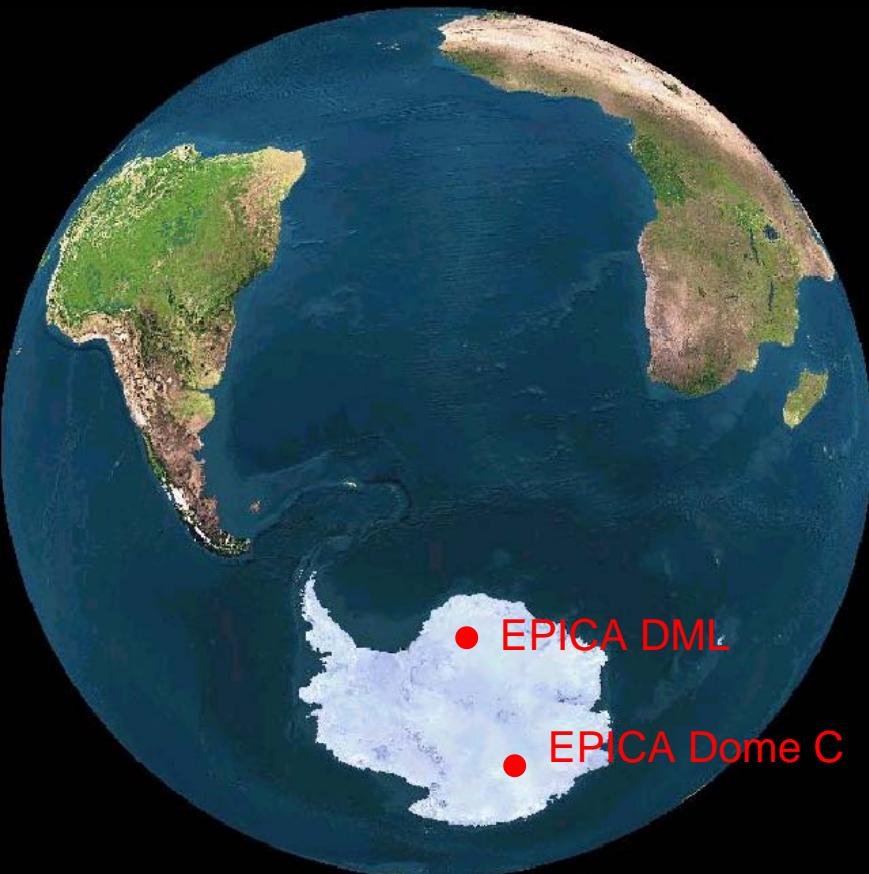


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# GRIP

Greenland Ice Sheet Project (1989 - 1993)



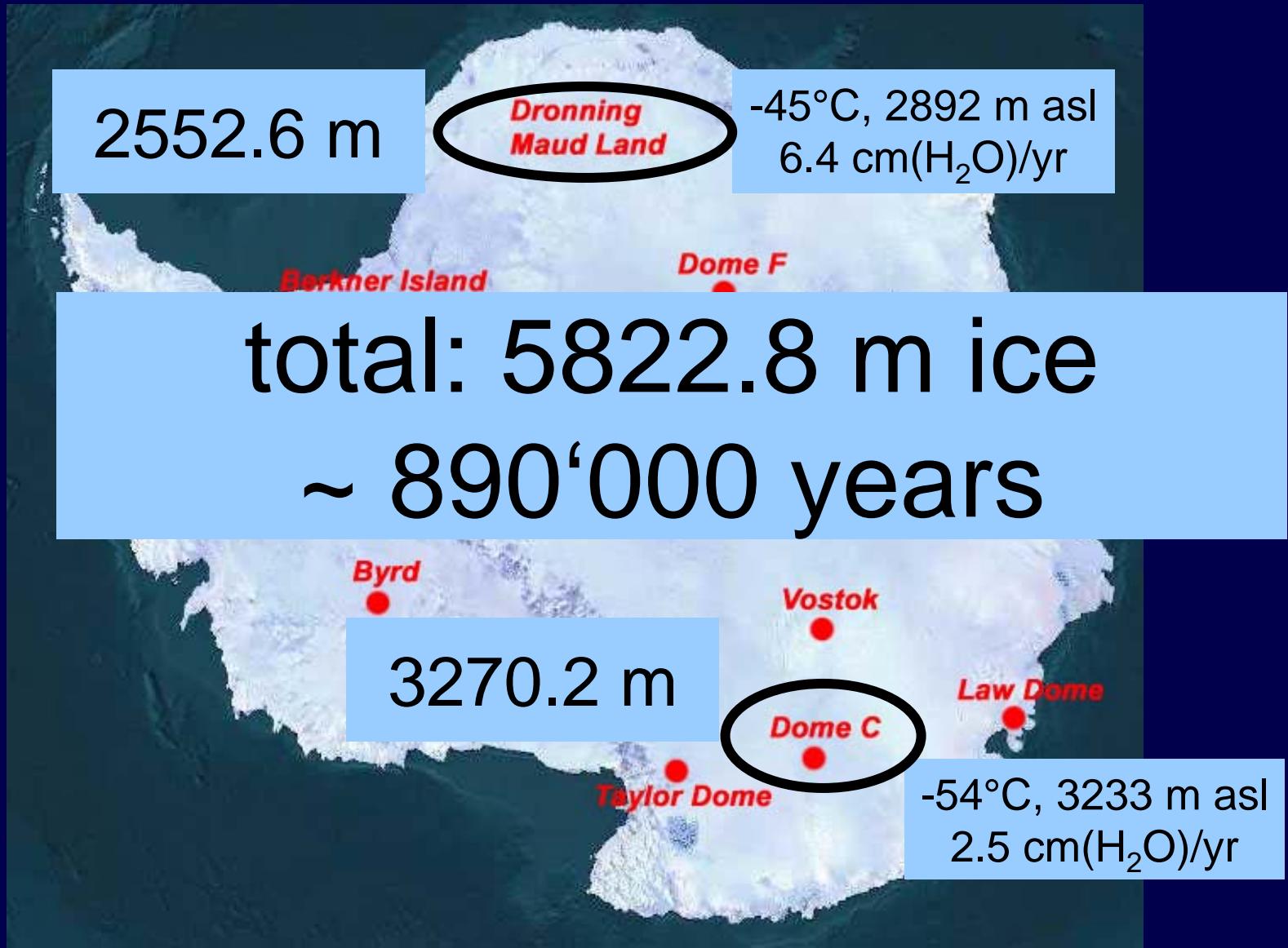
# EPICA

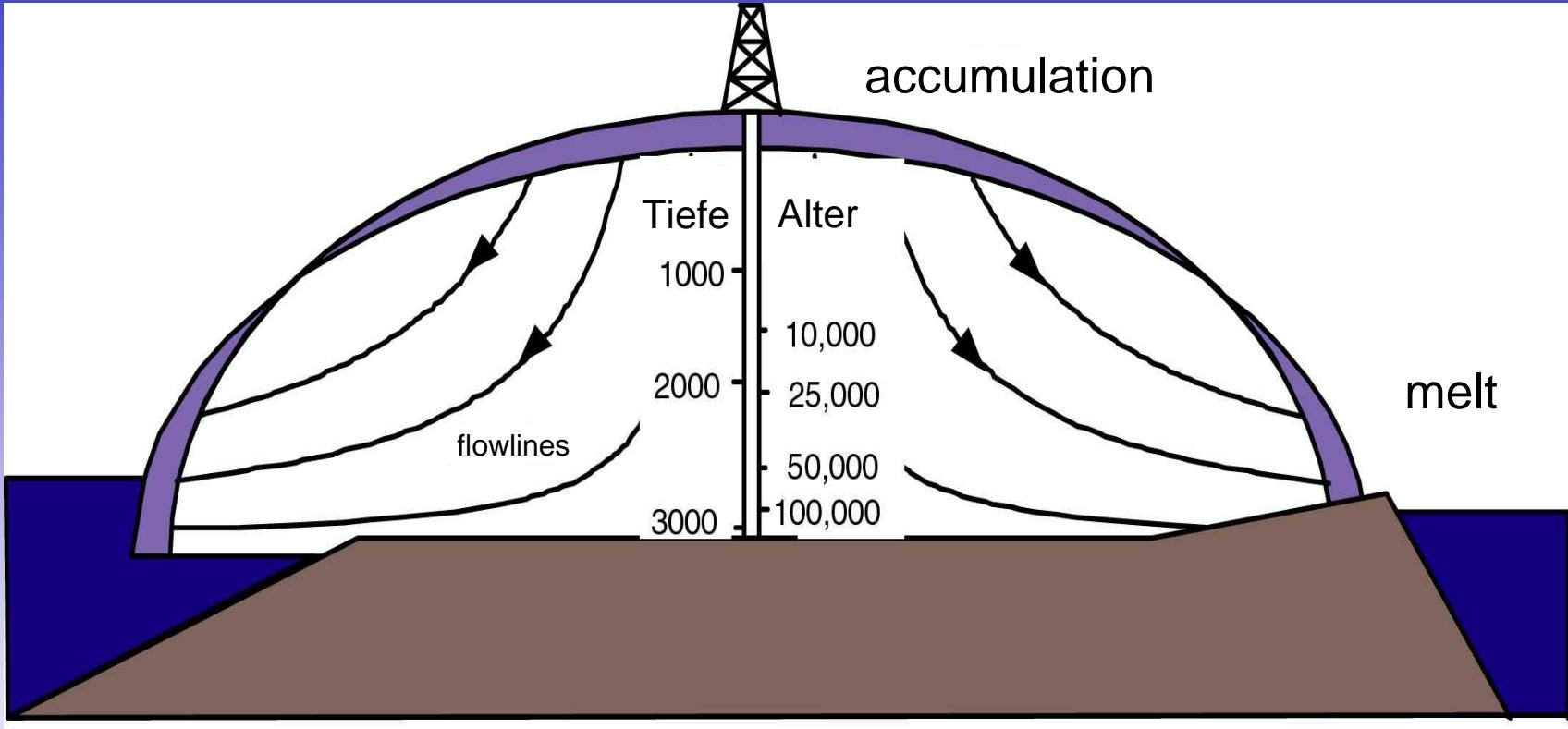
European Project for Ice Coring in Antarctica (1996 - 2007)



# Deep drillings on polar ice sheets:



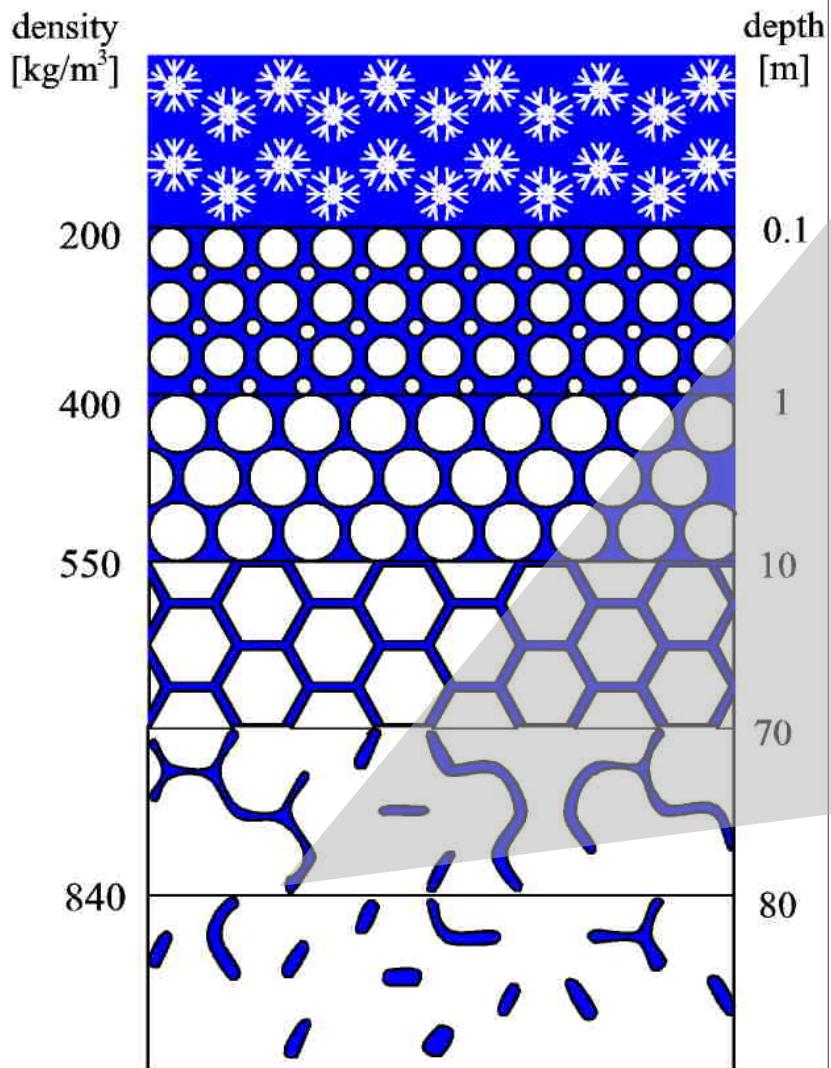




Greenland: ~120,000 years

Antarctica: ~890,000 years

## Sintering of snow into ice



bubbles in the ice contain air  
samples at time of closure



10 June 2004

International weekly journal of science

# nature

£10.00

[www.nature.com/nature](http://www.nature.com/nature)

## EPICA adventure

# Eight glacial cycles from an Antarctic ice core

EPICA community members\*

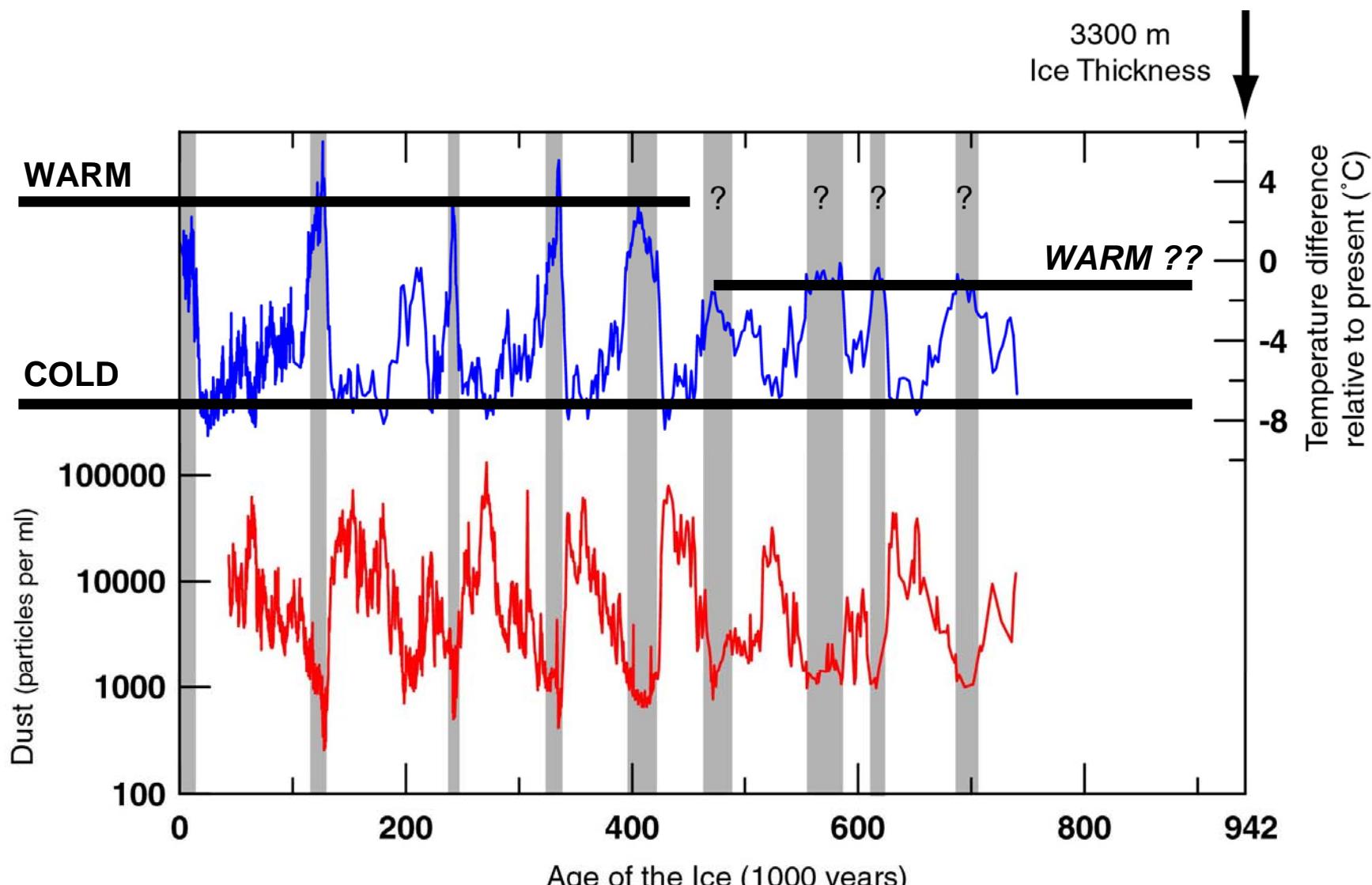
New mass for top quark  
raises bar for Higgs boson

naturejobs diagnostics

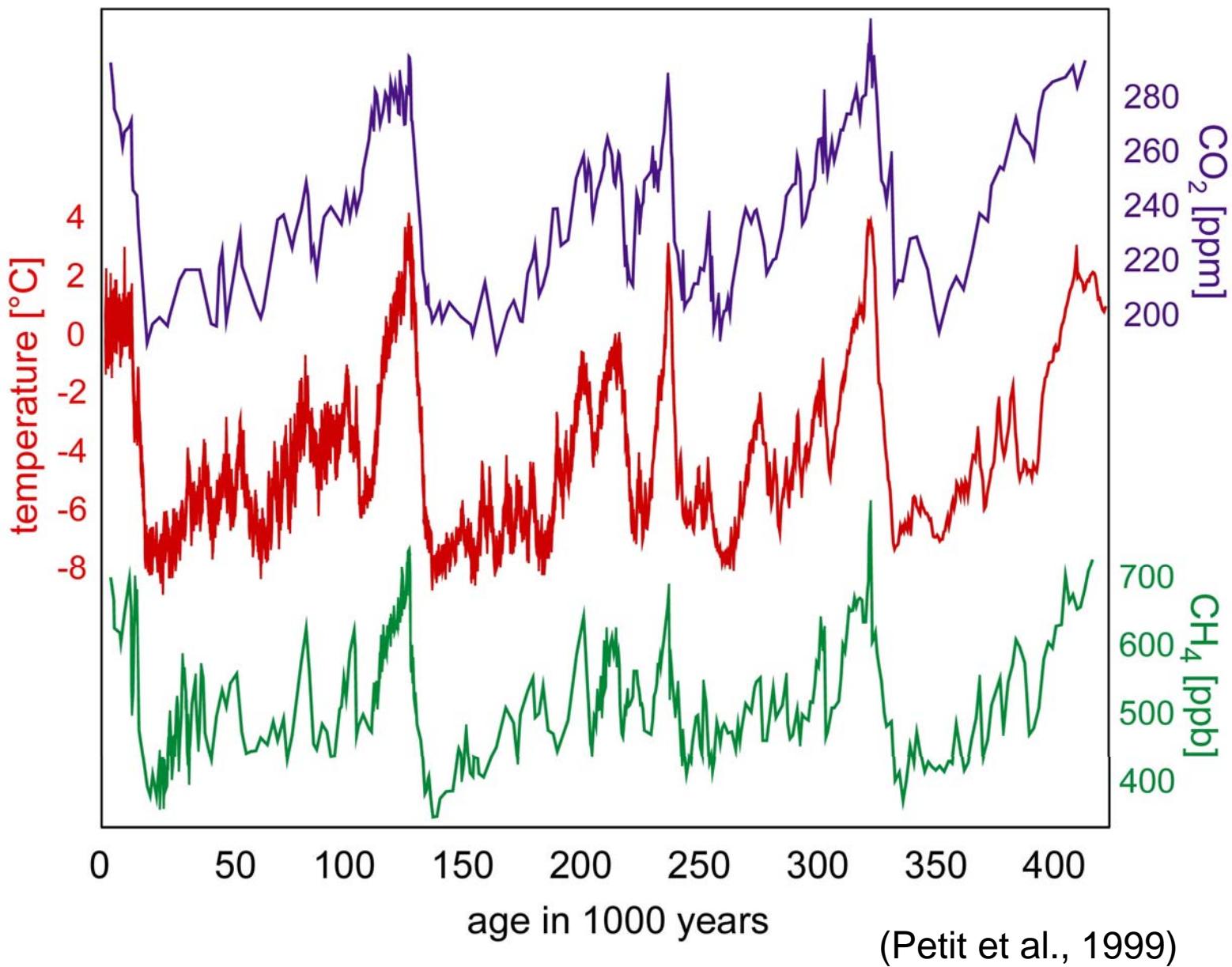


**articles**

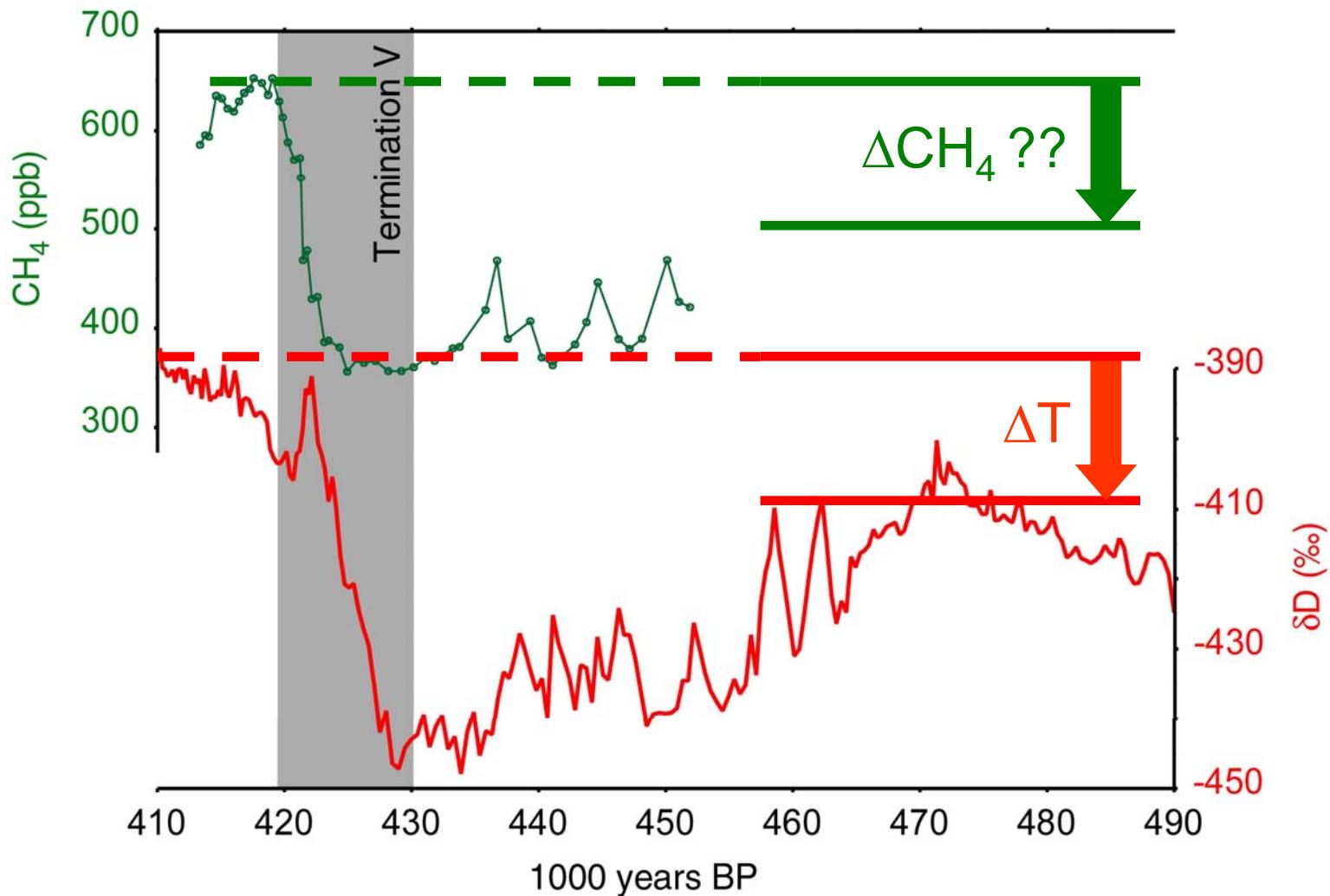
# Dome Concordia (Antarctica): 740,000 years of climate change



(EPICA Members, 2004)

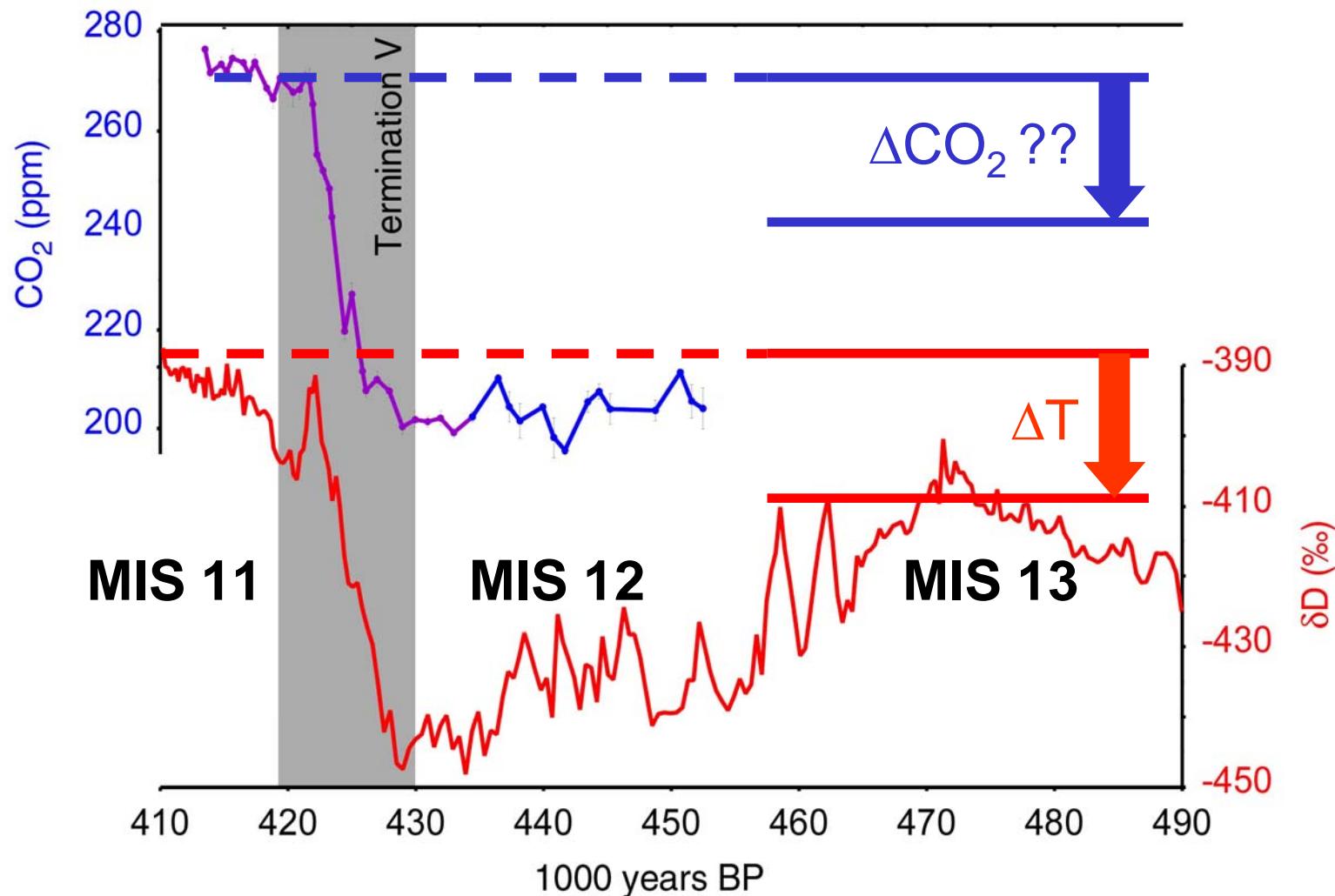


## $\text{CH}_4$ and temperature 450'000 years ago



(Spahni et al., unpub.)

## $\text{CO}_2$ and temperature 450'000 years ago



(Siegenthaler et al., unpub.)

## The EPICA Challenge to the Earth System Modeling Community

given  $S_0(t)$ ,  $T_{Ant}$ , dust,  $h(t)$  , marine sediments, ...

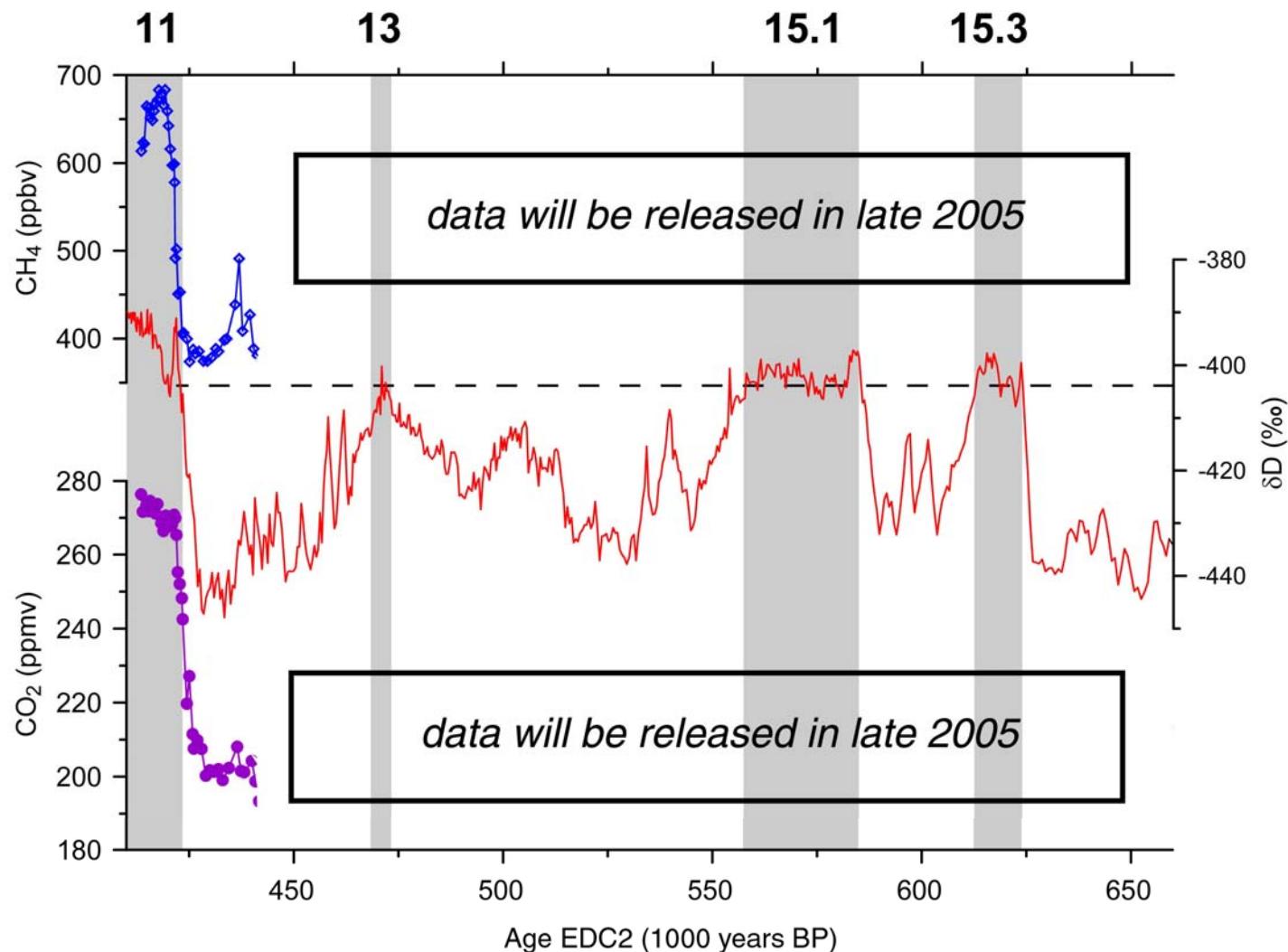
PREDICT

$pCO_2(t)$  ,  $pCH_4(t)$  before 420 kyr BP



Wolff et al., 2004, EOS 85, 363

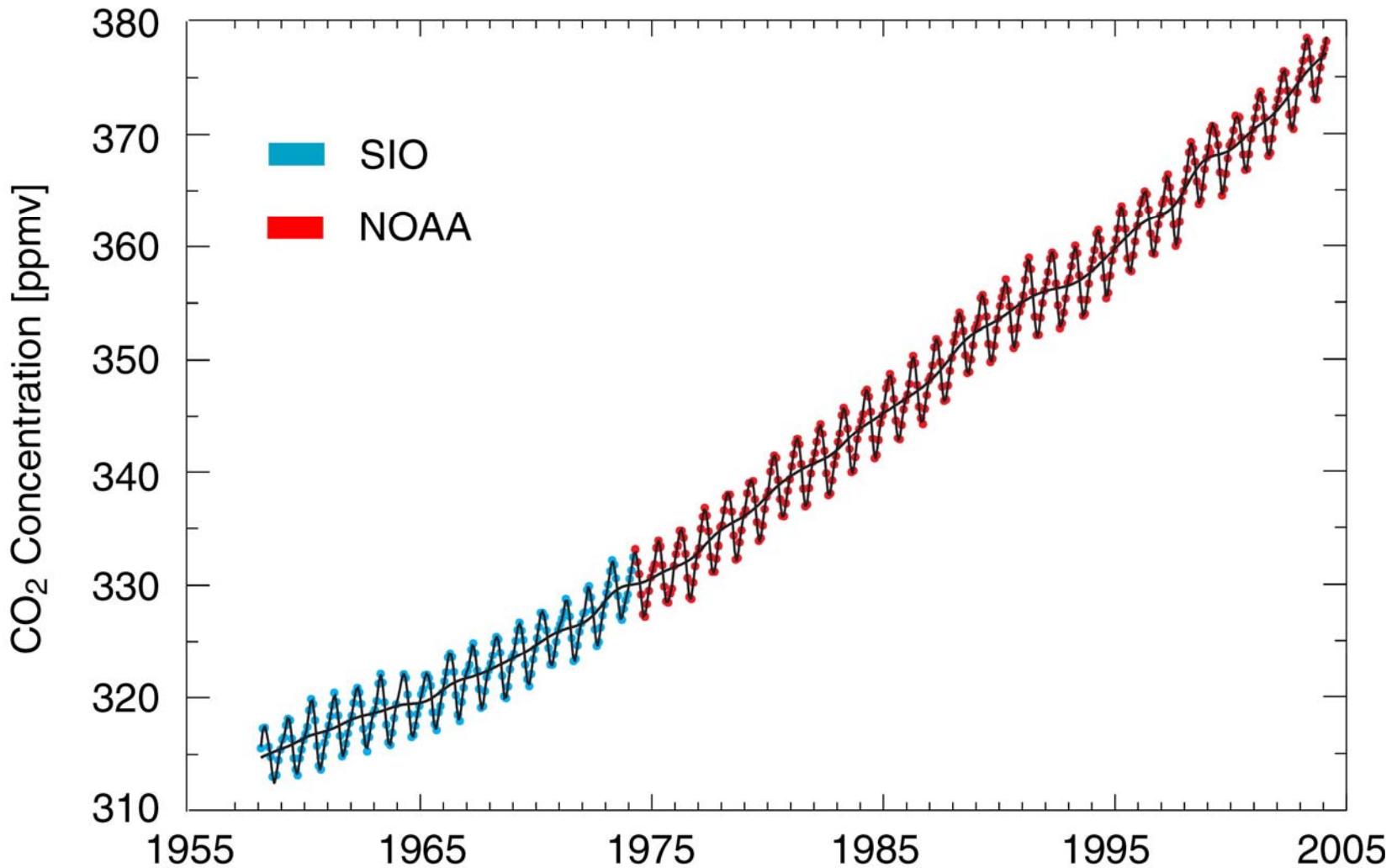
## pre-Vostok CO<sub>2</sub> and CH<sub>4</sub>



Siegenthaler et al., (in prep.)  
Spahni et al. (in prep.)

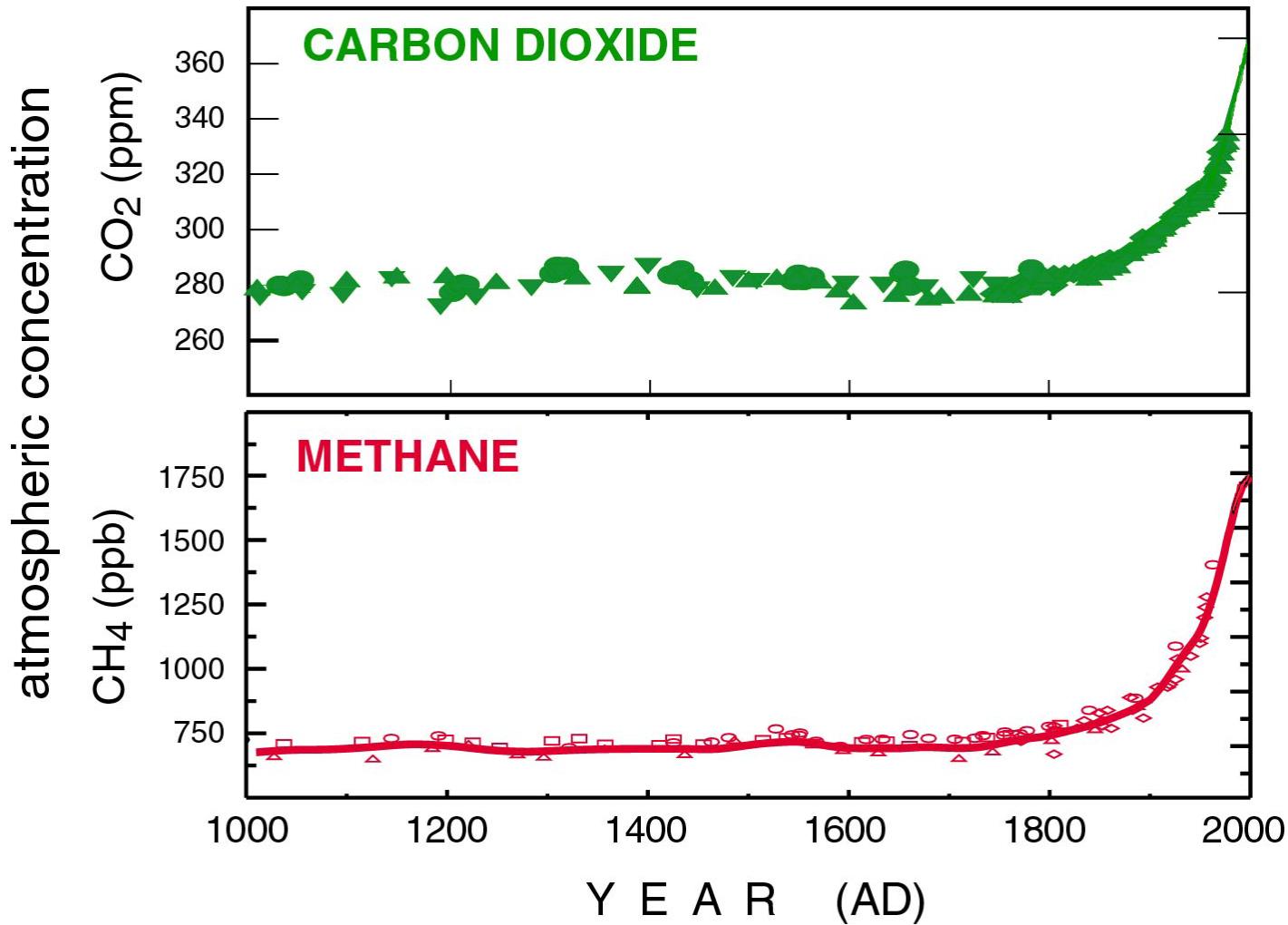
Implications of ice core measurements  
for the current debate on greenhouse  
gas concentrations ?

## CO<sub>2</sub> during the last 50 years



(NOAA 2004)

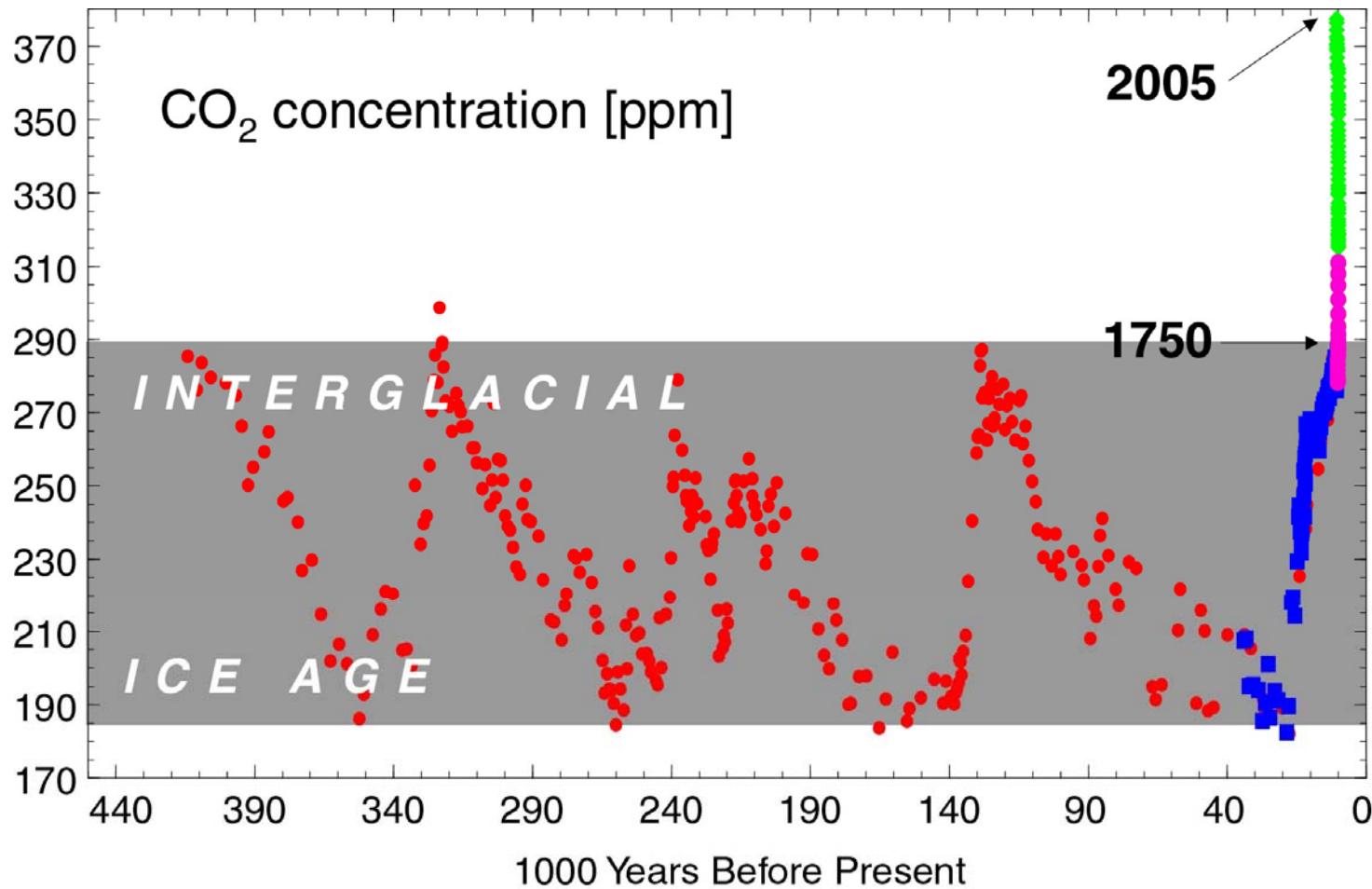
# $\text{CO}_2$ and $\text{CH}_4$ during the last 1000 years



(NOAA 2004)

$\text{CO}_2$  higher than ever during the last 650,000 years

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(Petit et al, 1999, Bern, NOAA)

The atmospheric CO<sub>2</sub> concentration is 27%  
higher than ever during the last 650,000  
years — and continues to increase