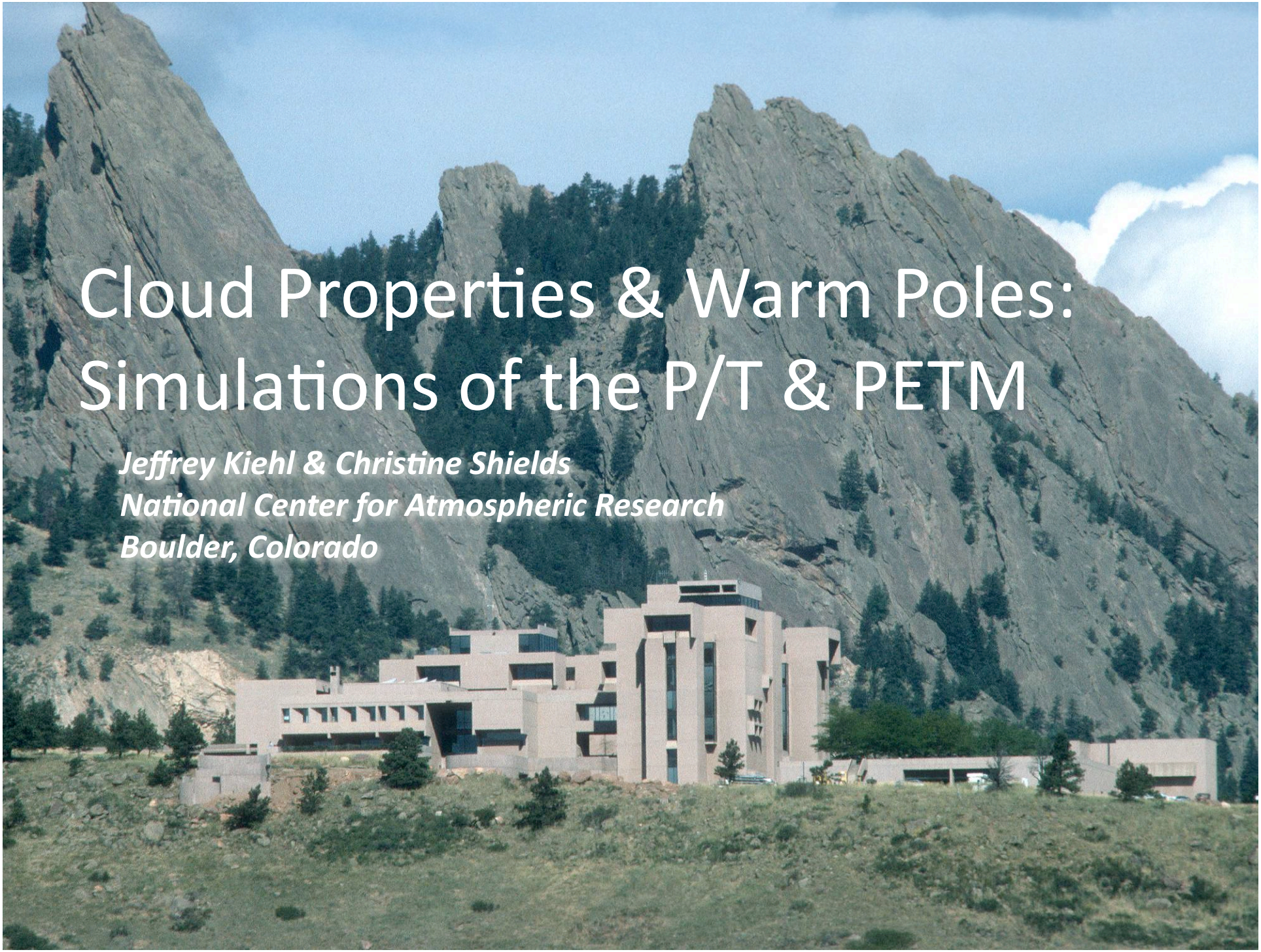
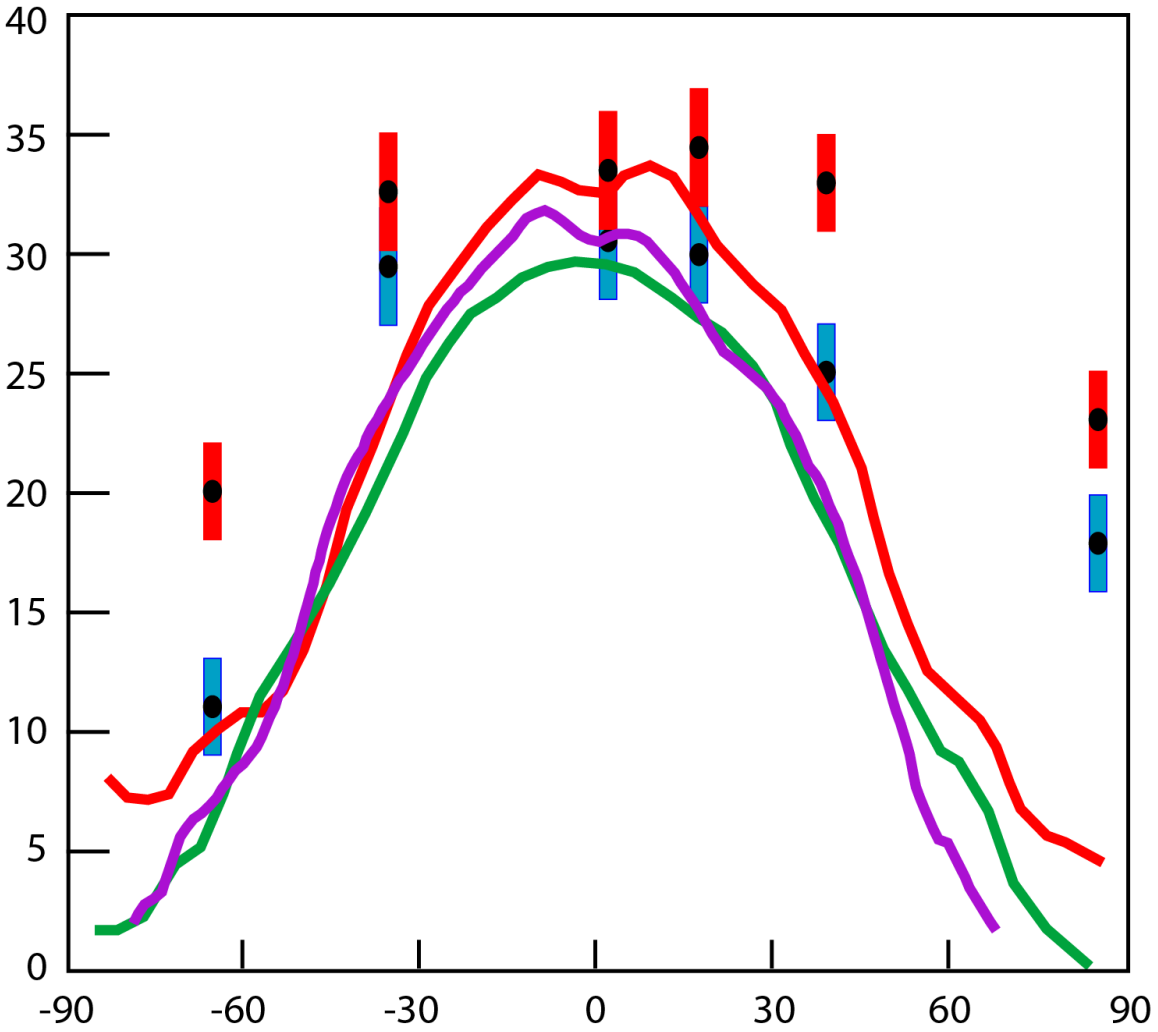


Cloud Properties & Warm Poles: Simulations of the P/T & PETM

Jeffrey Kiehl & Christine Shields
National Center for Atmospheric Research
Boulder, Colorado

Model intercomparison at 560 ppm



All models:

Eocene geography

560 ppm CO_2

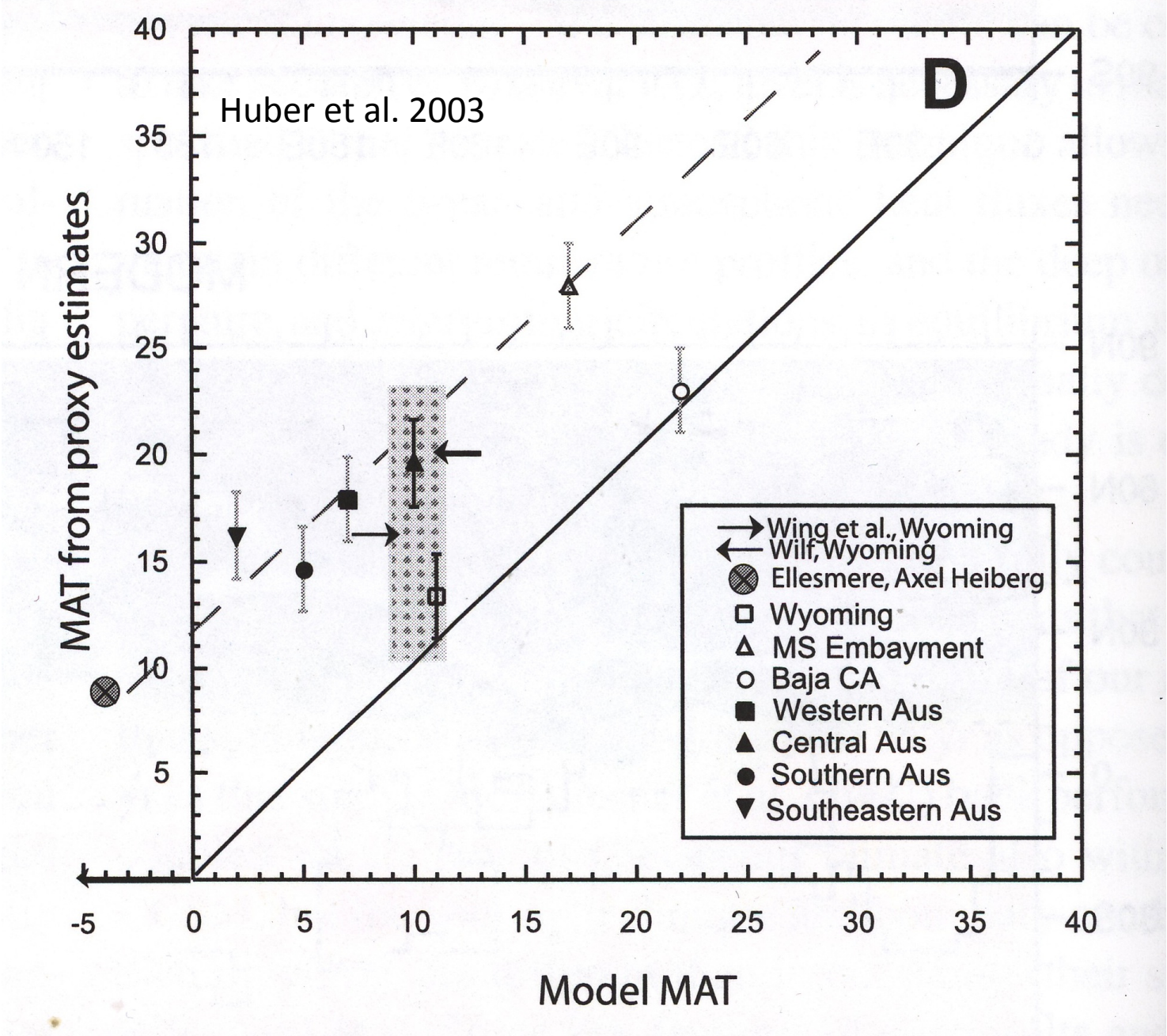
700 ppm CH_4

MPI ECHAM5/OM

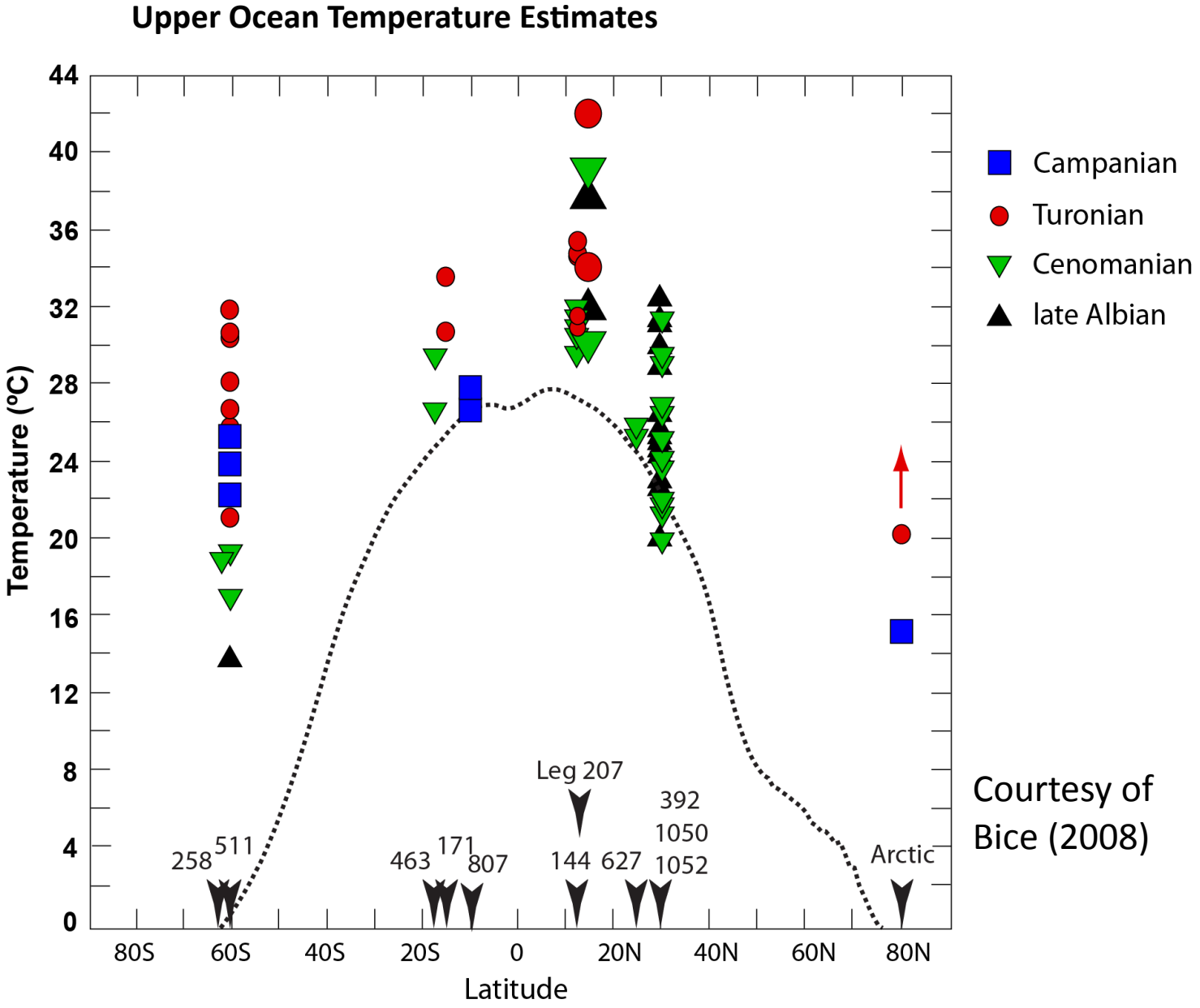
GENESIS

NCAR CSM (Huber 2001)

Courtesy of Karen Bice

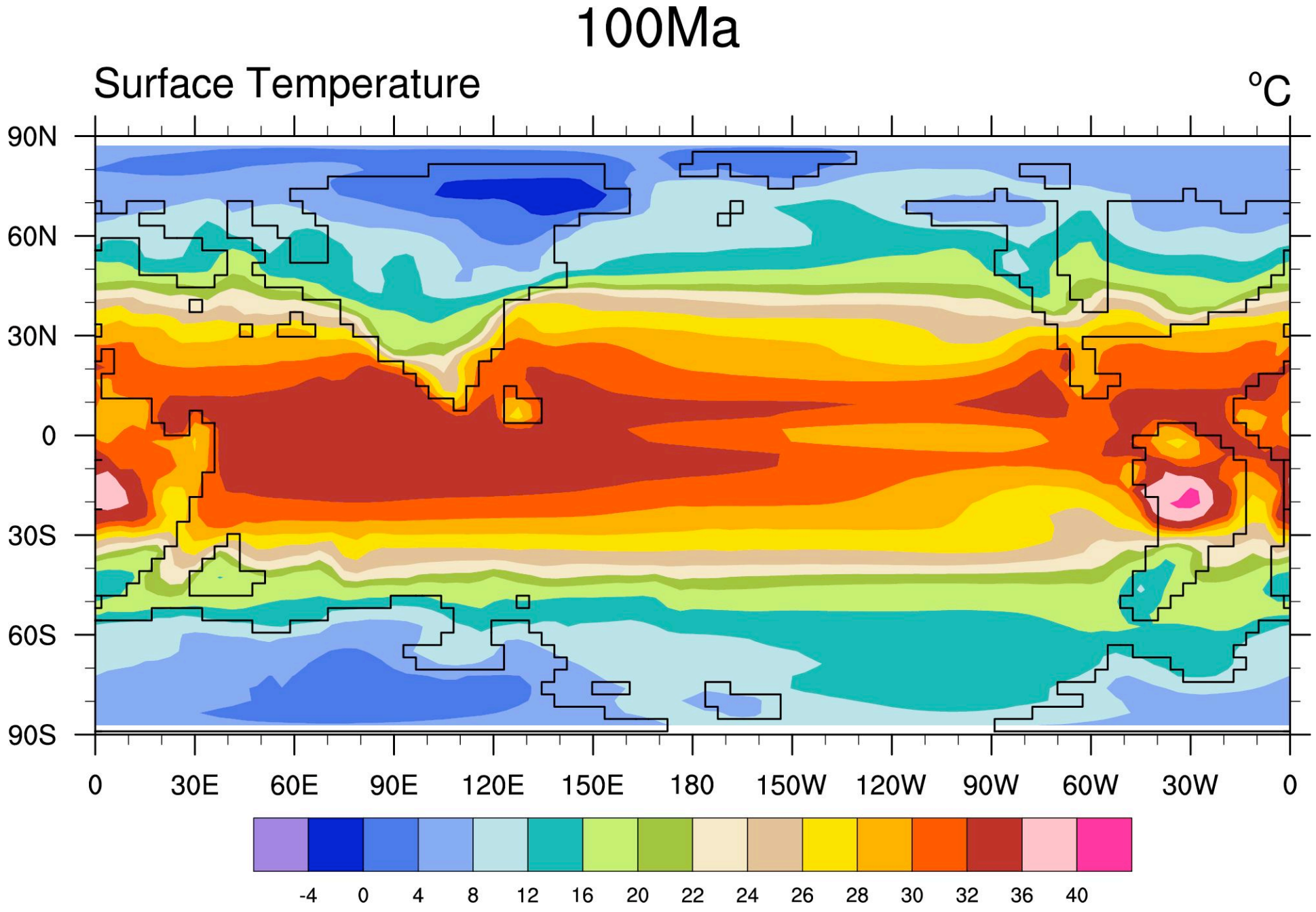

Huber et al. 2003
D
MAT from proxy estimates
Model MAT
40
35
30
25
20
15
10
5
-5
0
5
10
15
20
25
30
35
40
Wing et al., Wyoming
Wilf, Wyoming
Ellesmere, Axel Heiberg
Wyoming
MS Embayment
Baja CA
Western Aus
Central Aus
Southern Aus
Southeastern Aus

Cretaceous



Courtesy of Bice (2008)

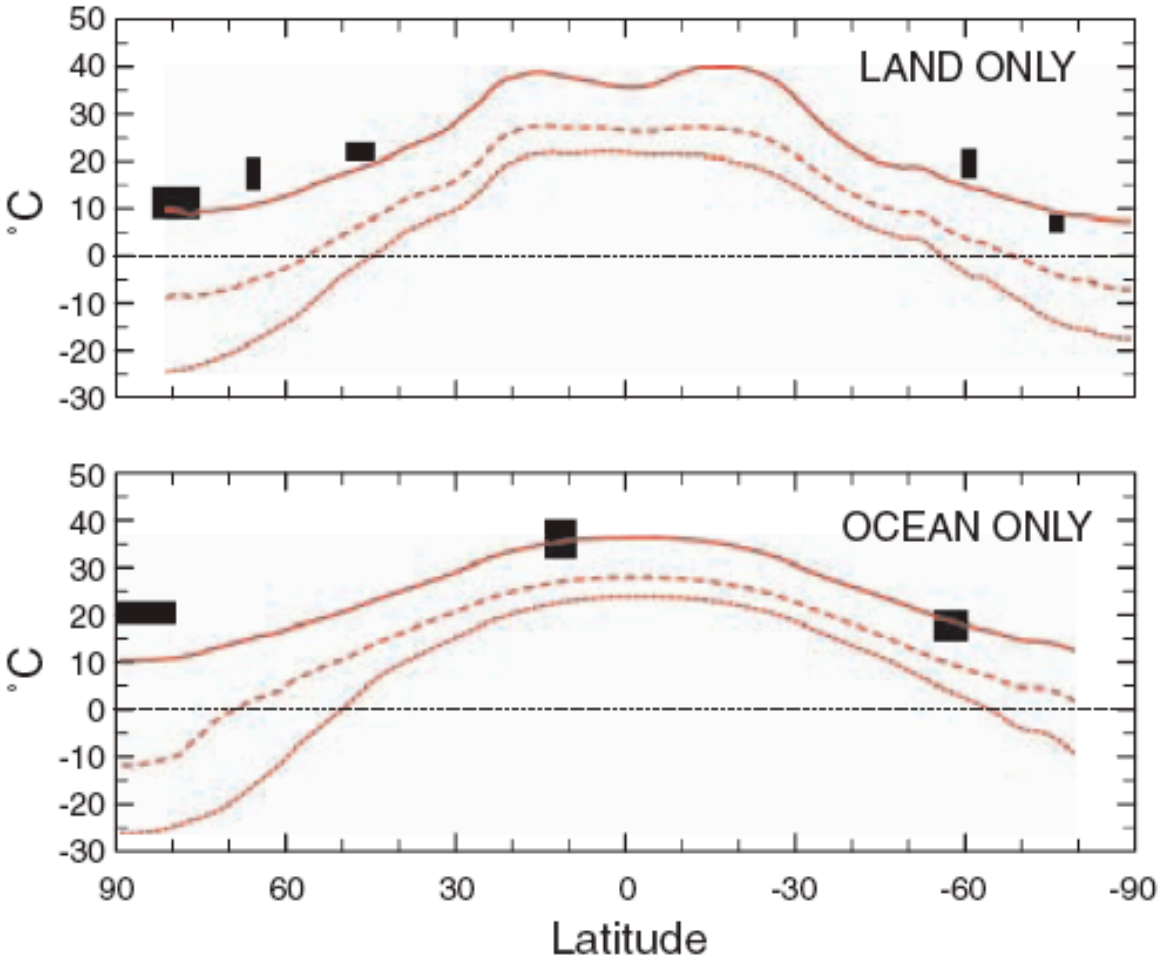
CCSM3 10XCO_2



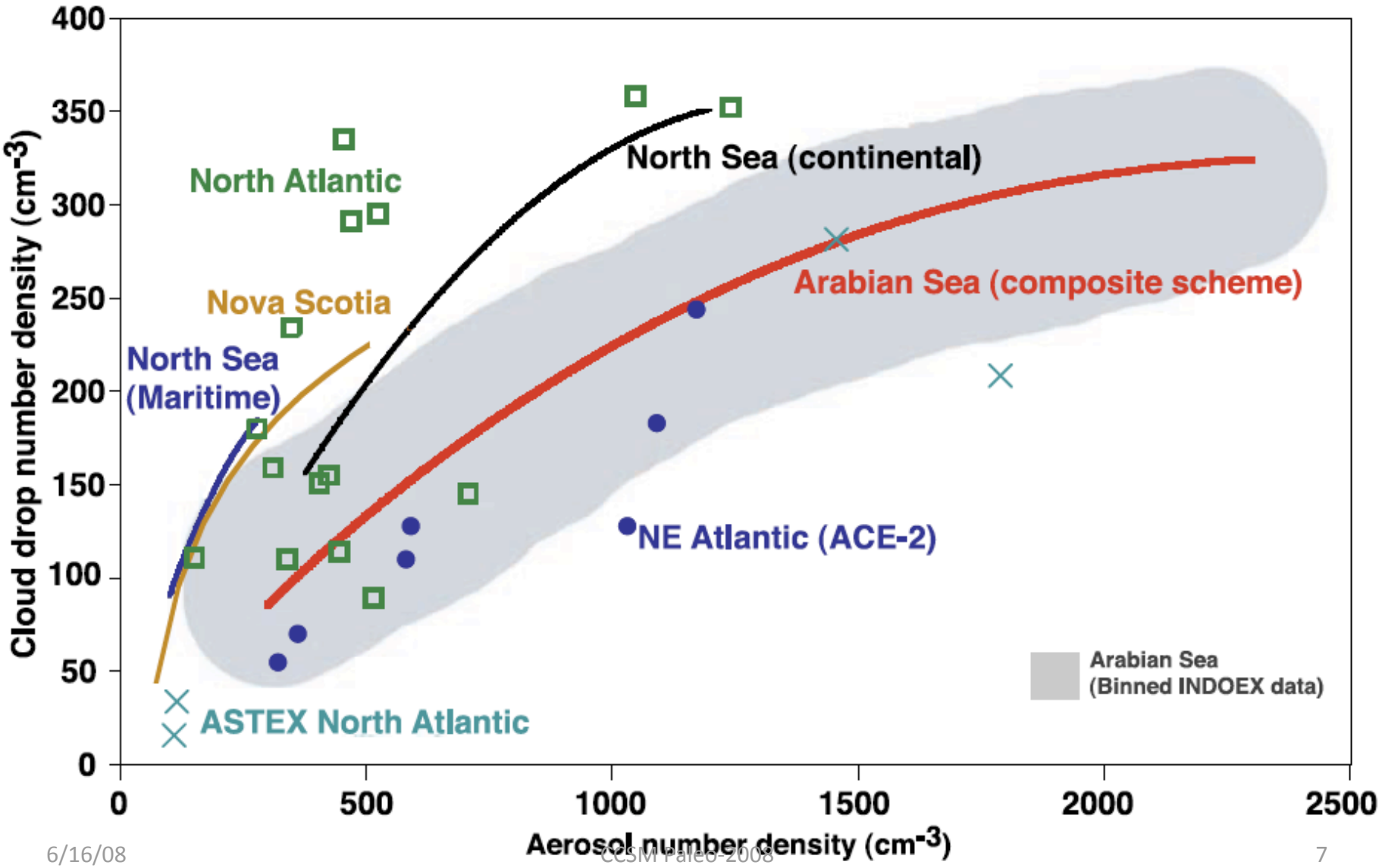
www.sciencemag.org SCIENCE VOL 320 11 APRIL 2008

Amplification of Cretaceous Warmth by Biological Cloud Feedbacks

Lee R. Kump[1]* and David Pollard[2]



Cloud Drop Concentration vs Aerosol Concentration



Lower CCN means larger cloud drops:

- Lower Optical Depth, More Solar Absorbed
- Higher Precipitation Rate, Lower Cloud Amount, More Solar Absorbed

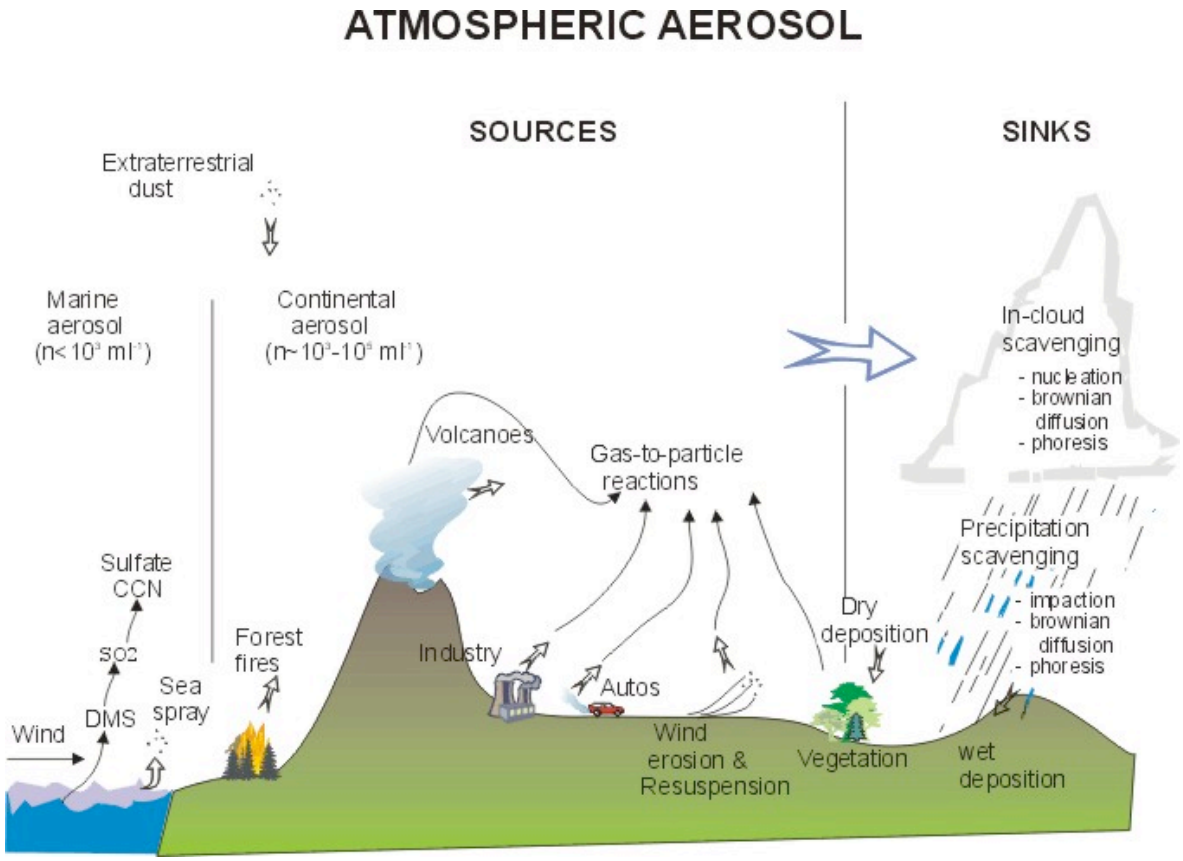
All of these imply a warmer surface

Experiment is to set :

$N_D = 50\ cm^{-3}$

$r_e = 17\ \mu m$

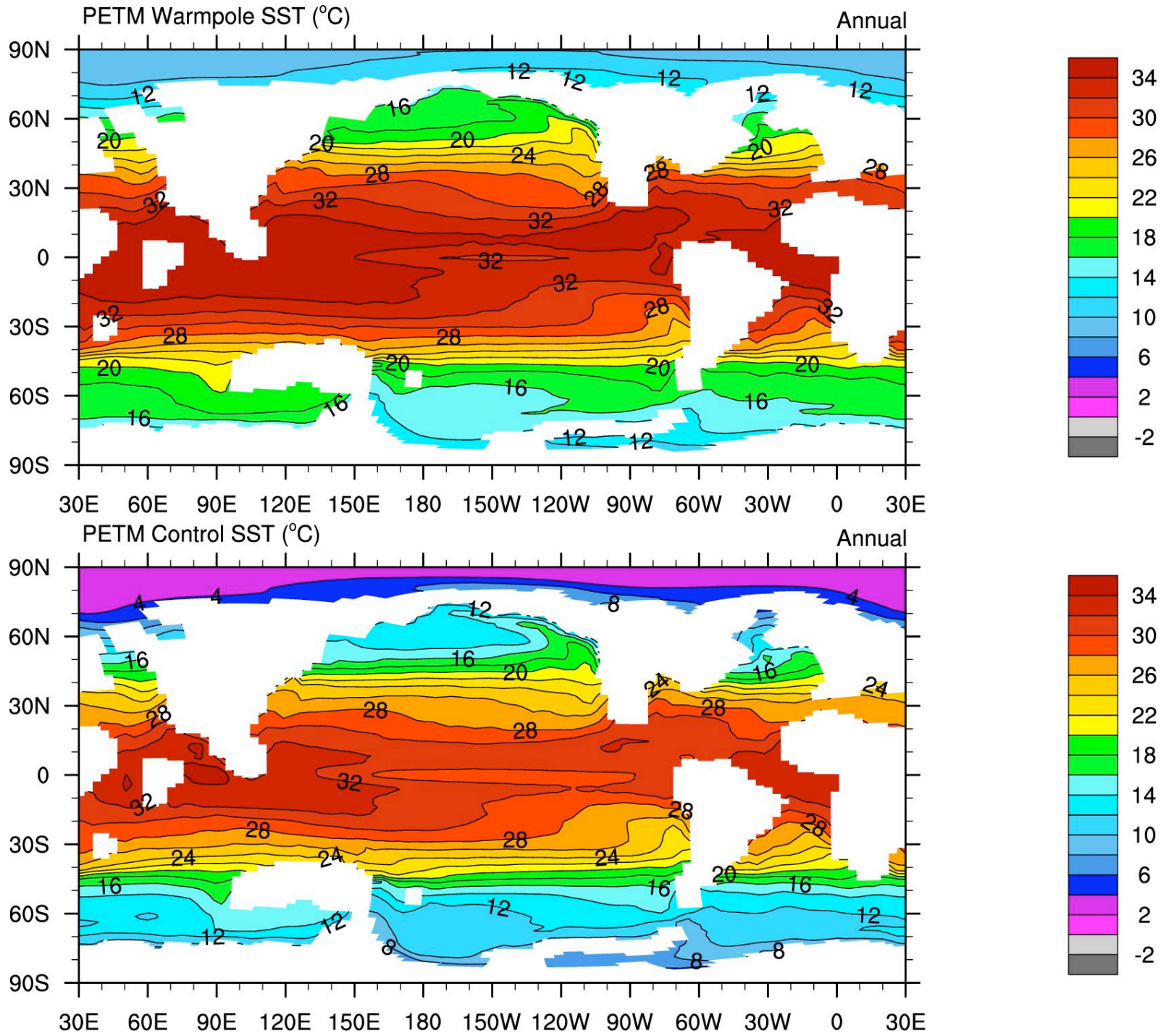
for all liquid clouds



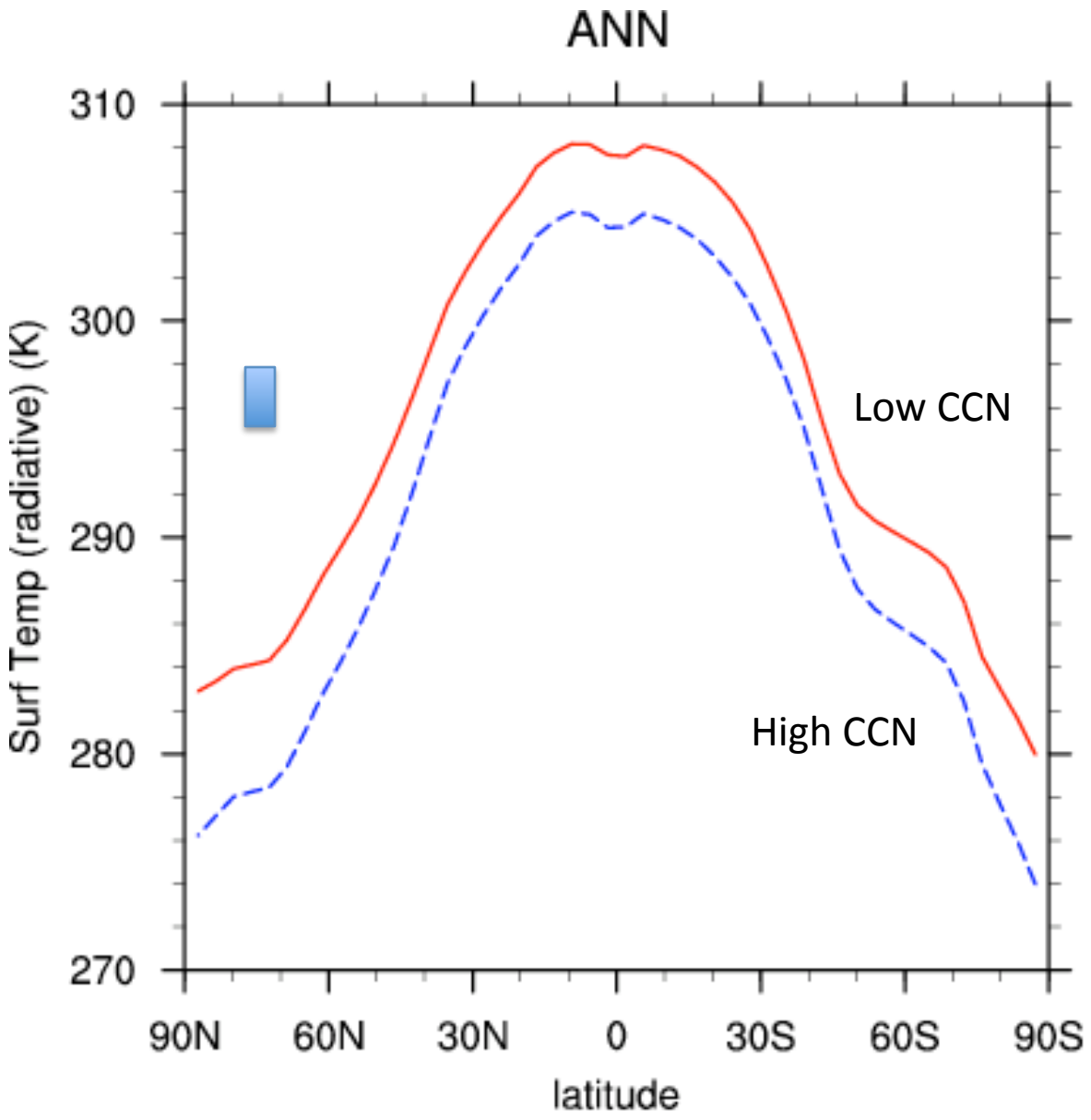
www.ems.psu.edu/~lno/Meteo437/

CCSM3

$8XCO_2$


PETM Warmpole SST (°C)
Annual
PETM Control SST (°C)
Annual
90N
60N
30N
0
30S
60S
90S
30E 60E 90E 120E 150E 180 150W 120W 90W 60W 30W 0 30E
34
30
26
22
18
14
10
6
2
-2

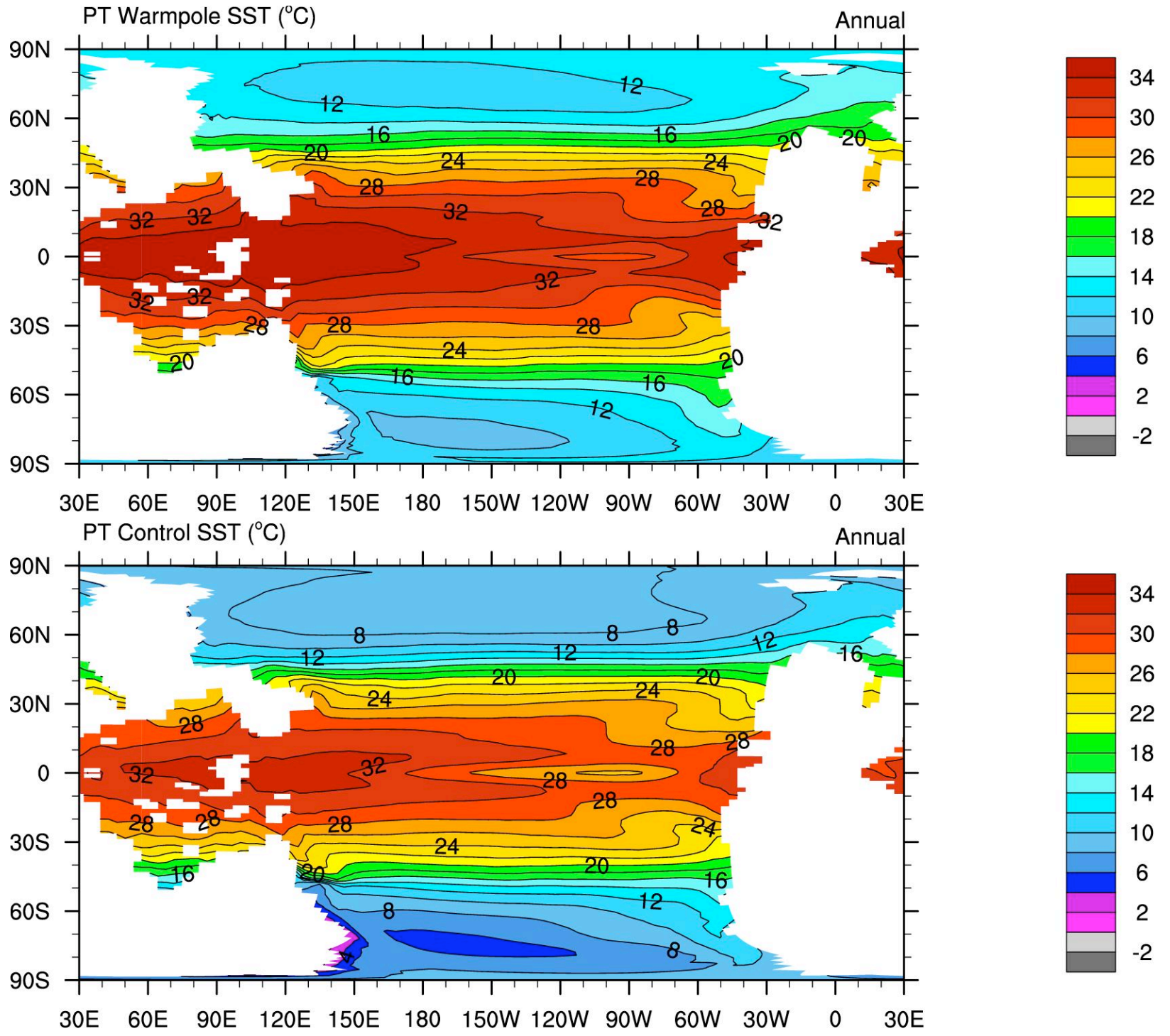
PETM



Weijers et al. (2007)

CCSM3

$10XCO_2$



Ideal Age

$10XCO_2$