The Science of Global Climate Change
General Assembly of North Carolina
Legislative Commission on Global Climate Change
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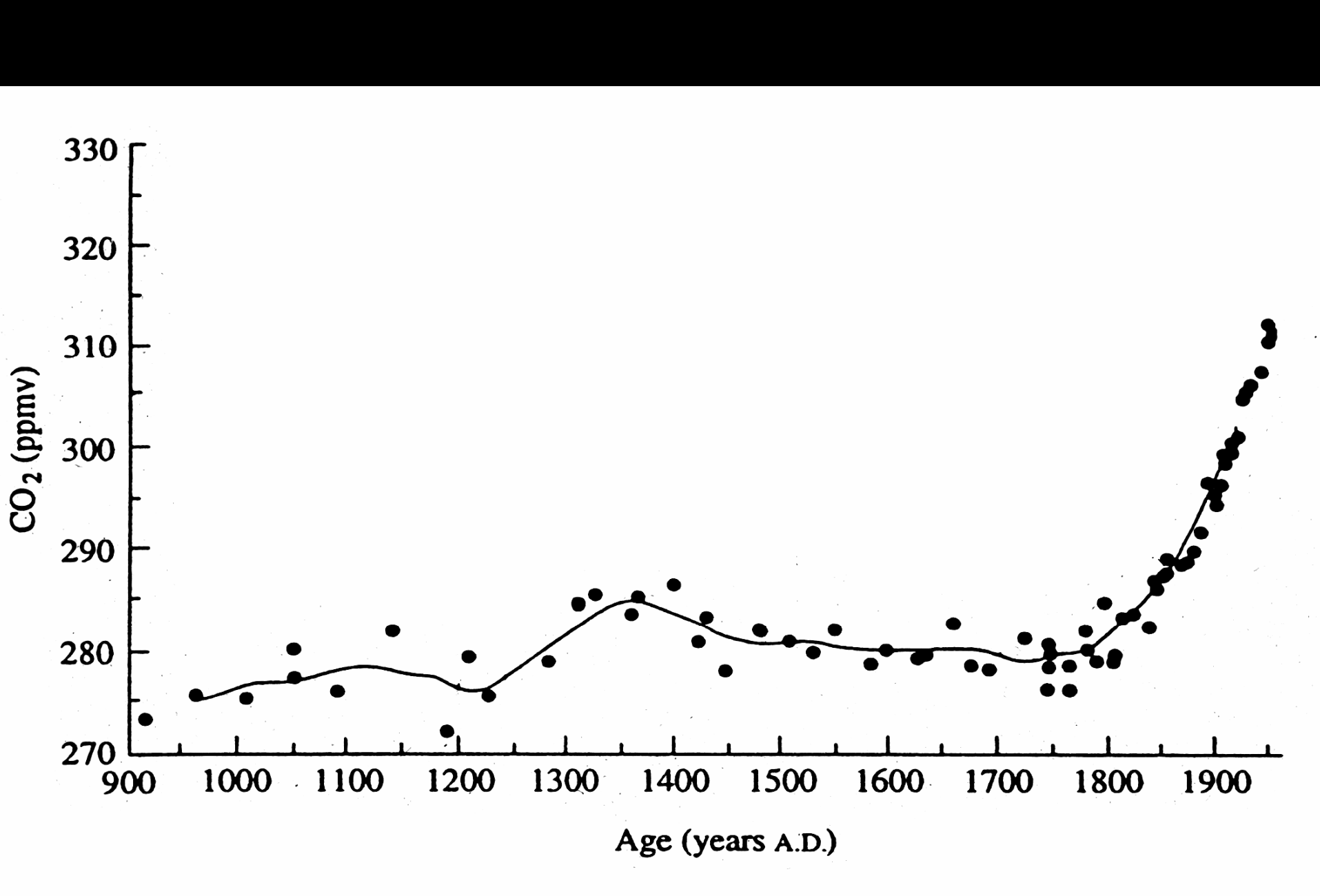
William H. Schlesinger

NICHOLAS SCHOOL OF THE ENVIRONMENT AND EARTH SCIENCES

DUKE UNIVERSITY


330
320
310
300
290
280
270
CO_2 (ppmv)
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
Age (years A.D.)

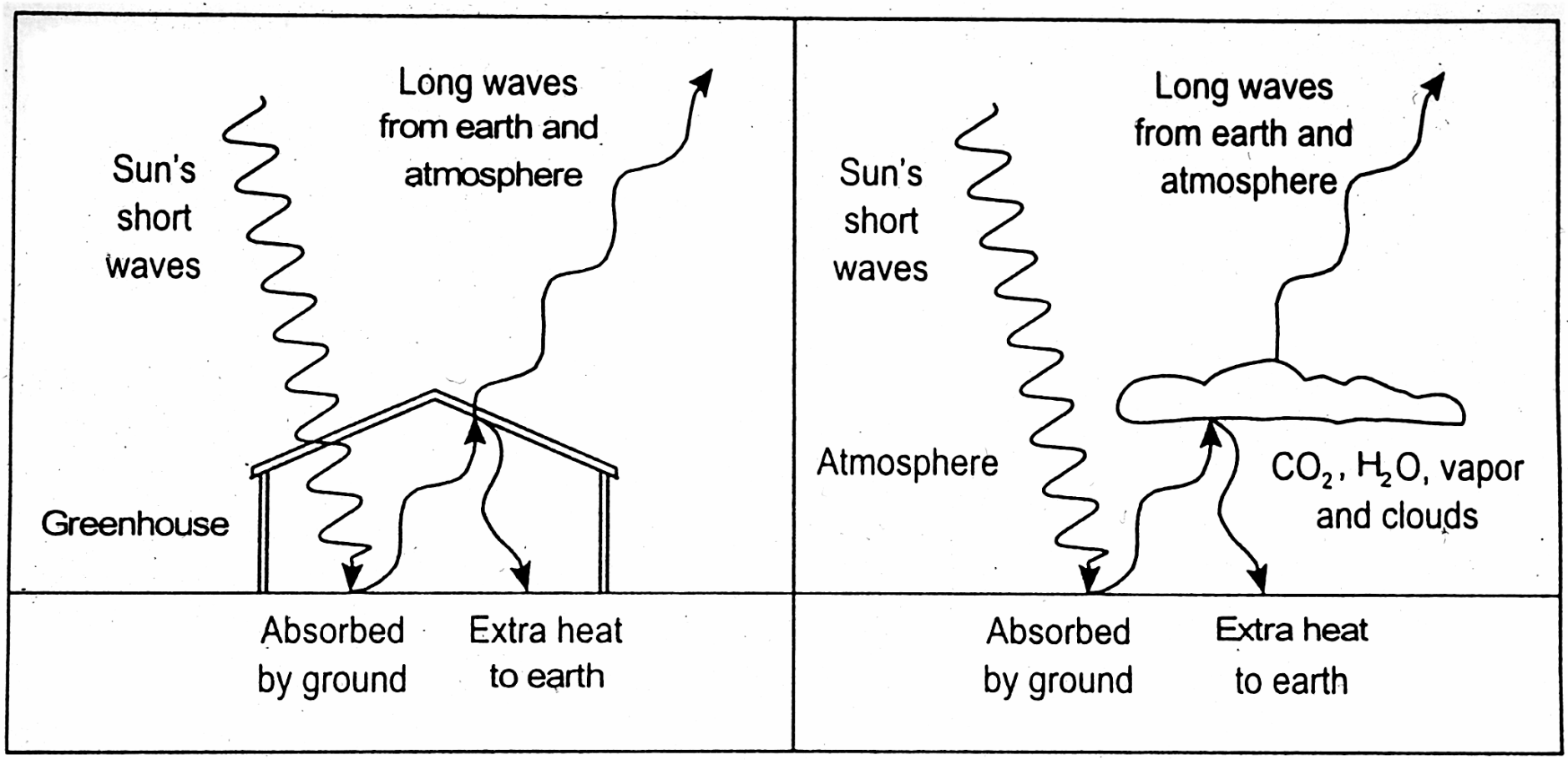
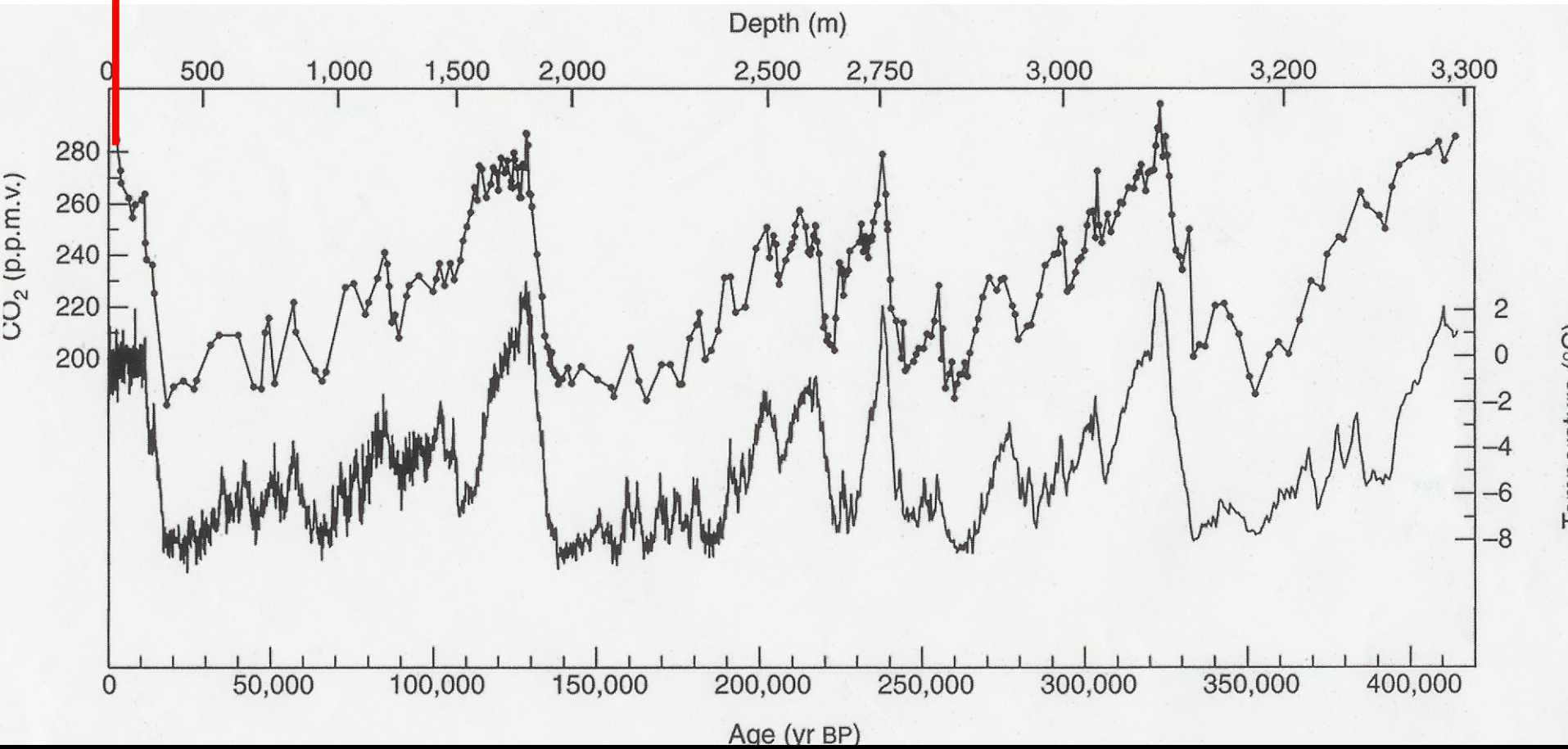
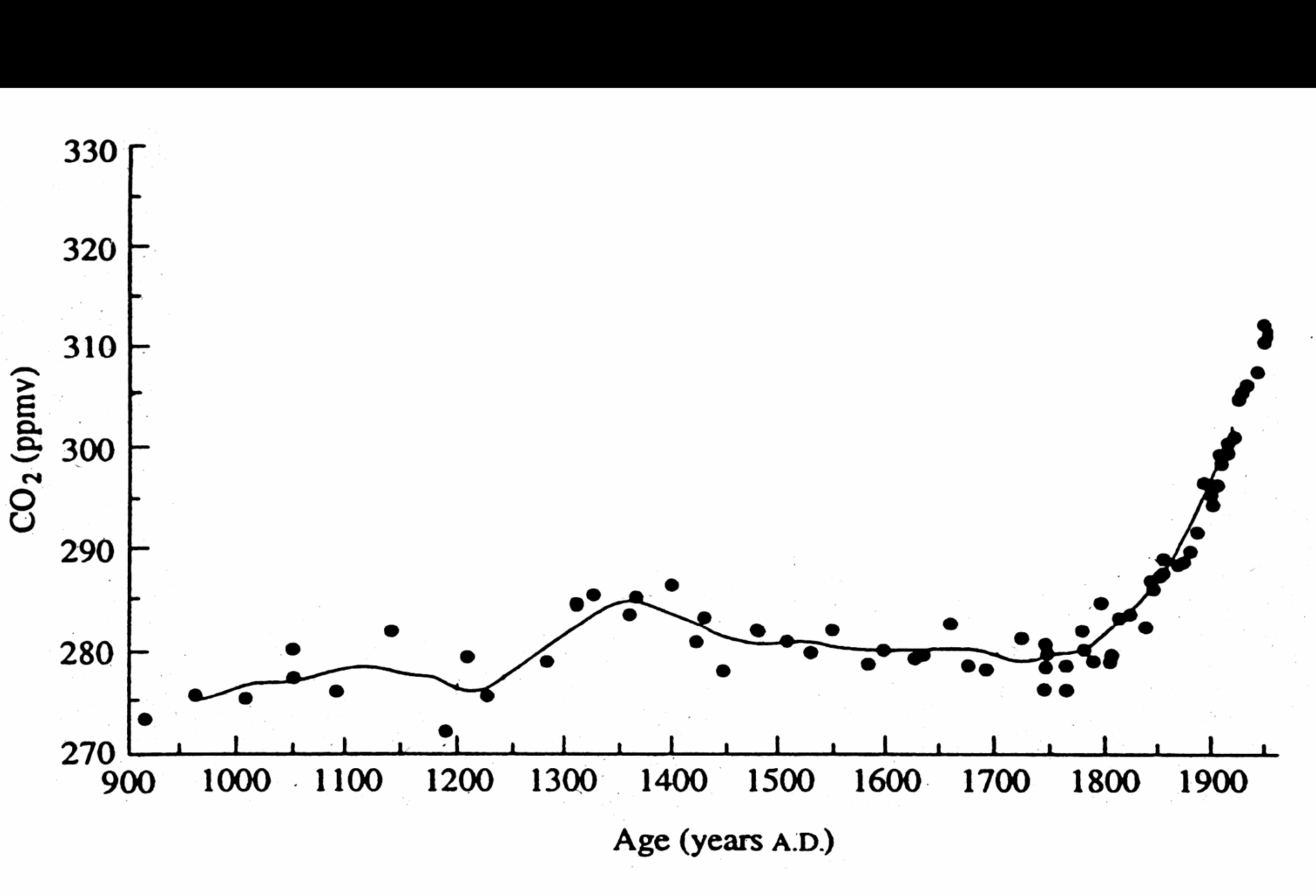


Figure 1.2 The greenhouse analogy (Gedzelman, 1980).

380 — Yesterday




330
320
310
300
290
280
270
CO_2 (ppmv)
900
1000
1100
1200
1300
1400
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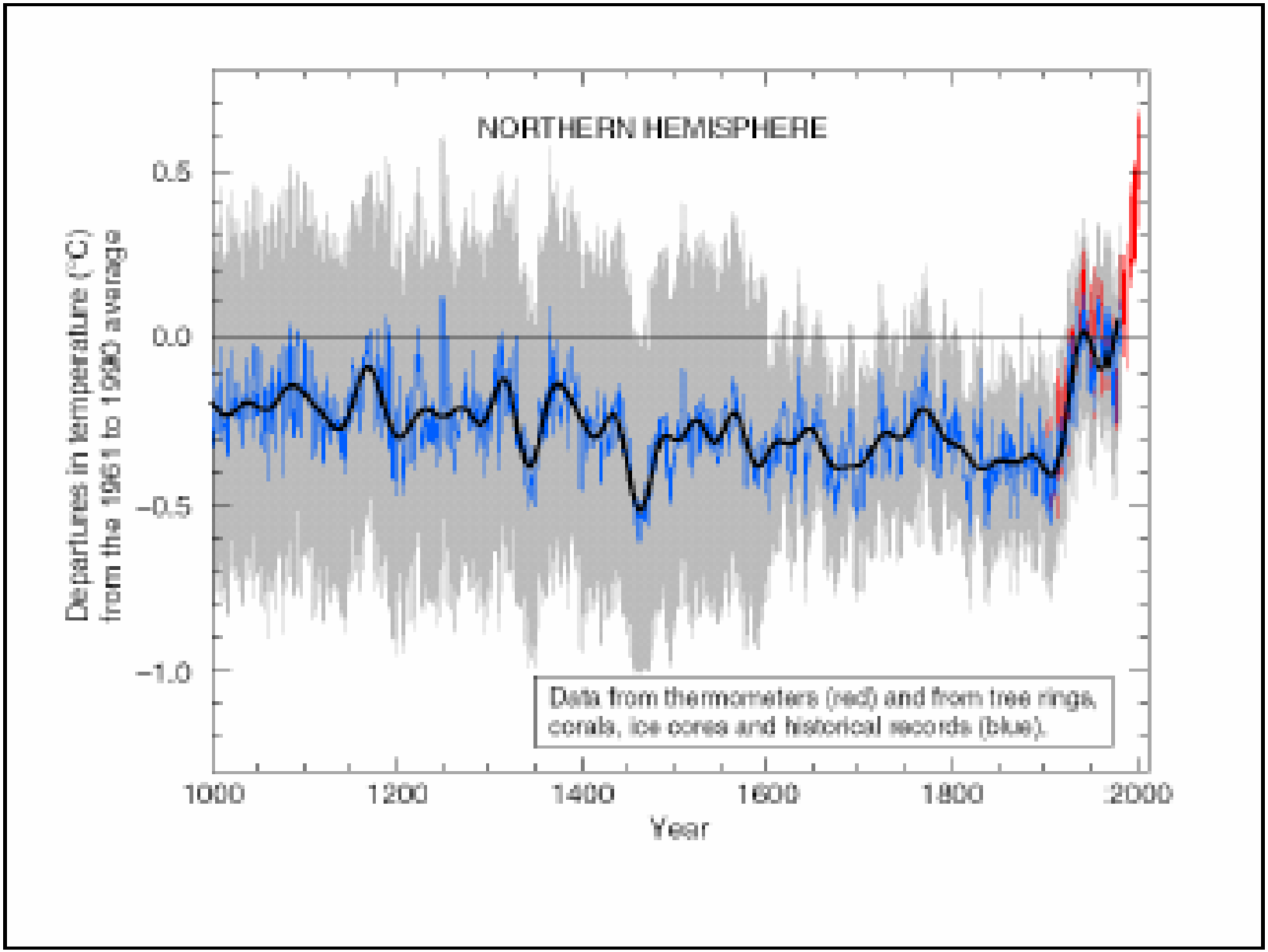
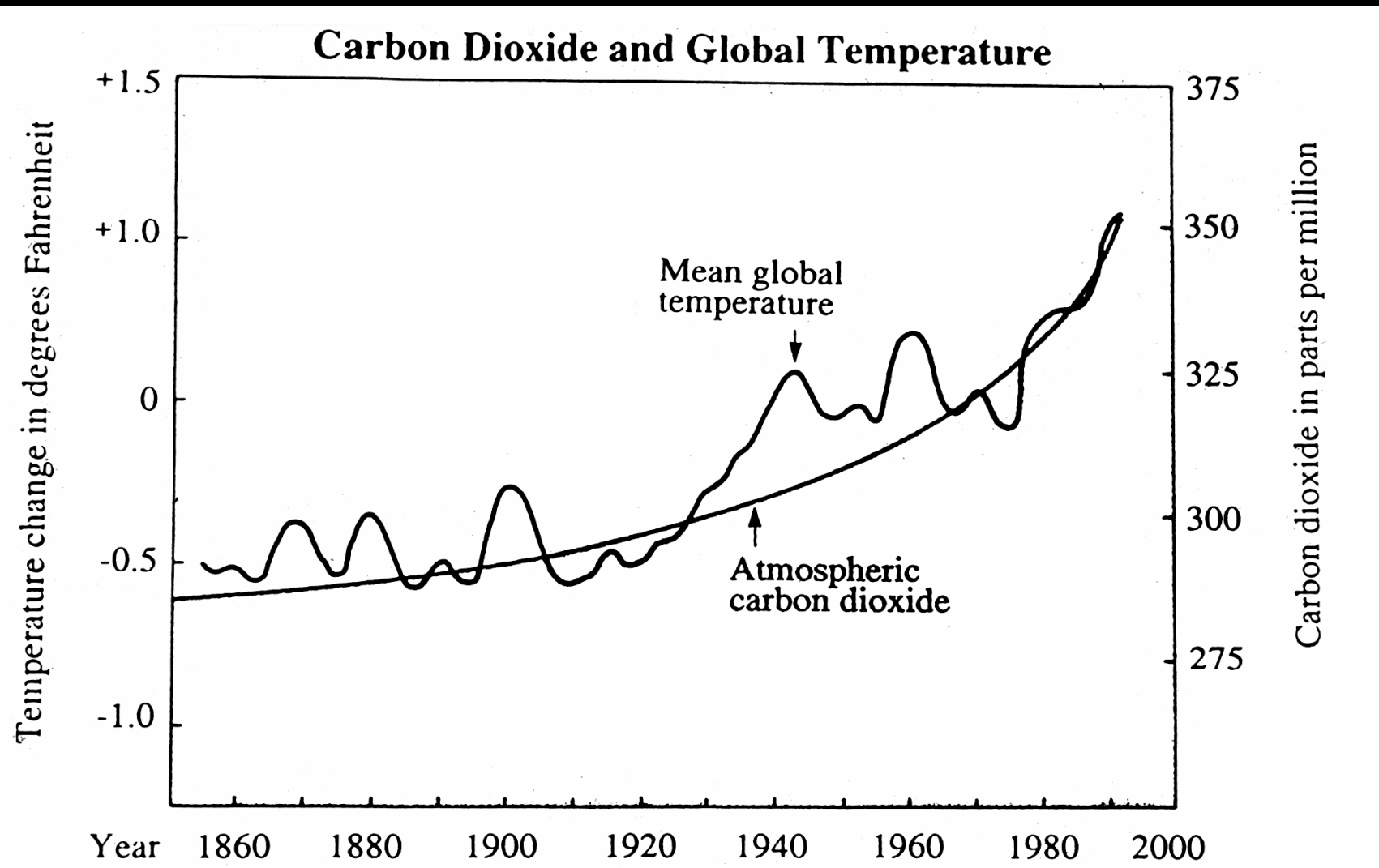
1600
1700
1800
1900
Age (years A.D.)


NORTHERN HEMISPHERE
Departures in temperature (°C)
from the 1961 to 1990 average
0.5
0.0
−0.5
−1.0
1000
1200
1400
1600
1800
2000
Year
Data from thermometers (red) and from tree rings,
corals, ice cores and historical records (blue).

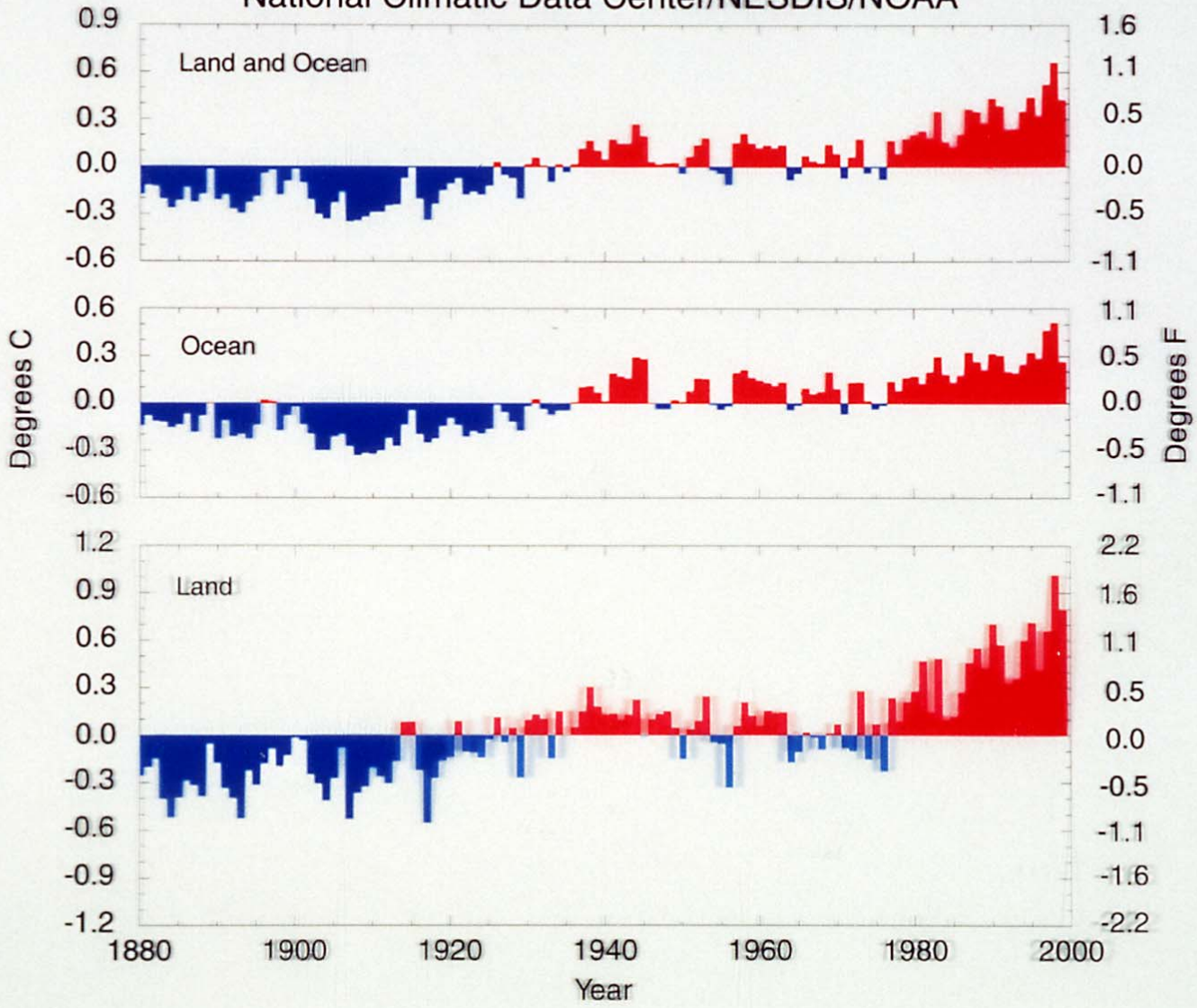


While atmospheric carbon dioxide has climbed steadily for more than a century, the earth's temperature shows a more erratic upward trend.

Annual Global Surface Mean Temperature Anomalies

(1880-1998 base period)

National Climatic Data Center/NESDIS/NOAA



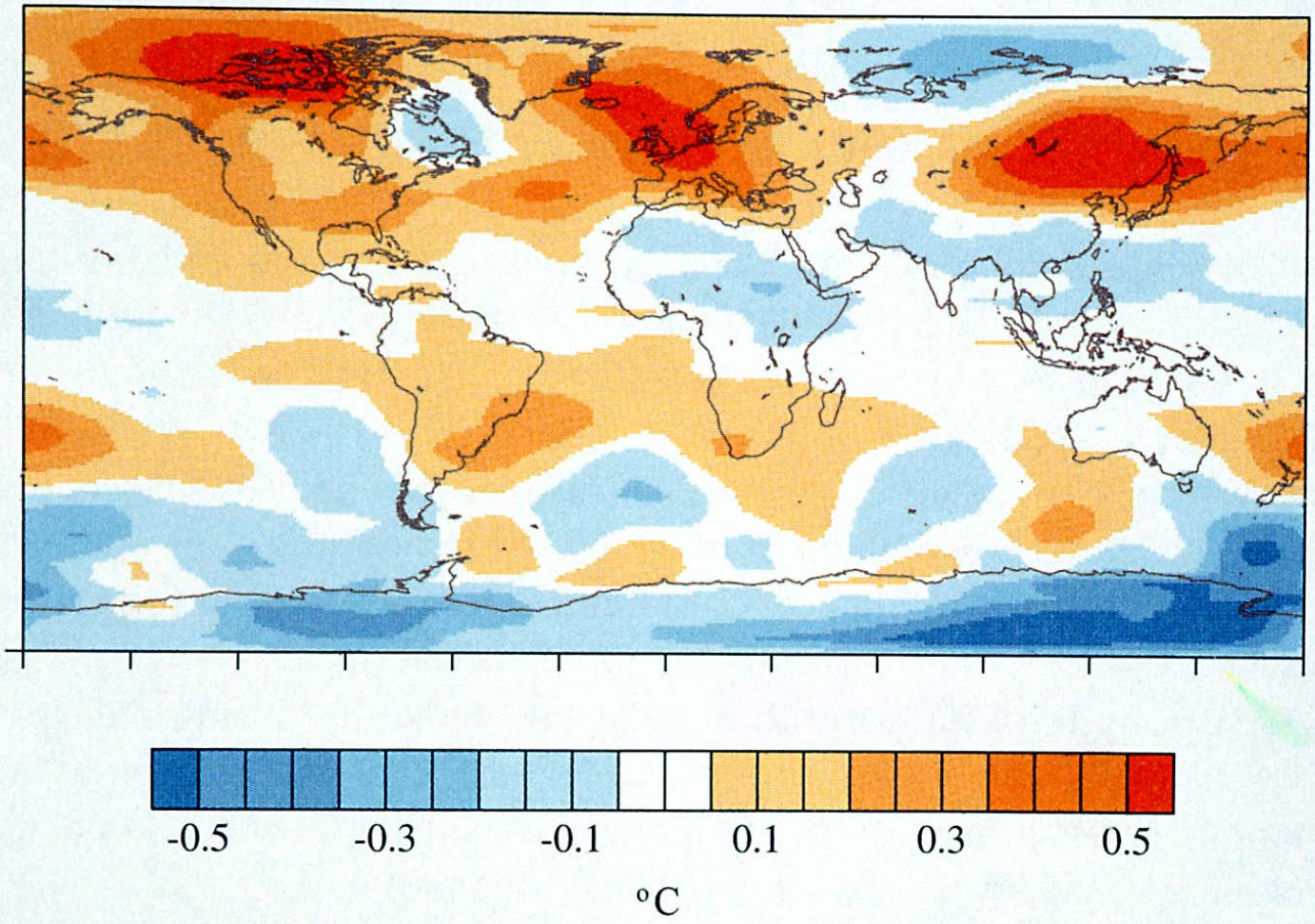
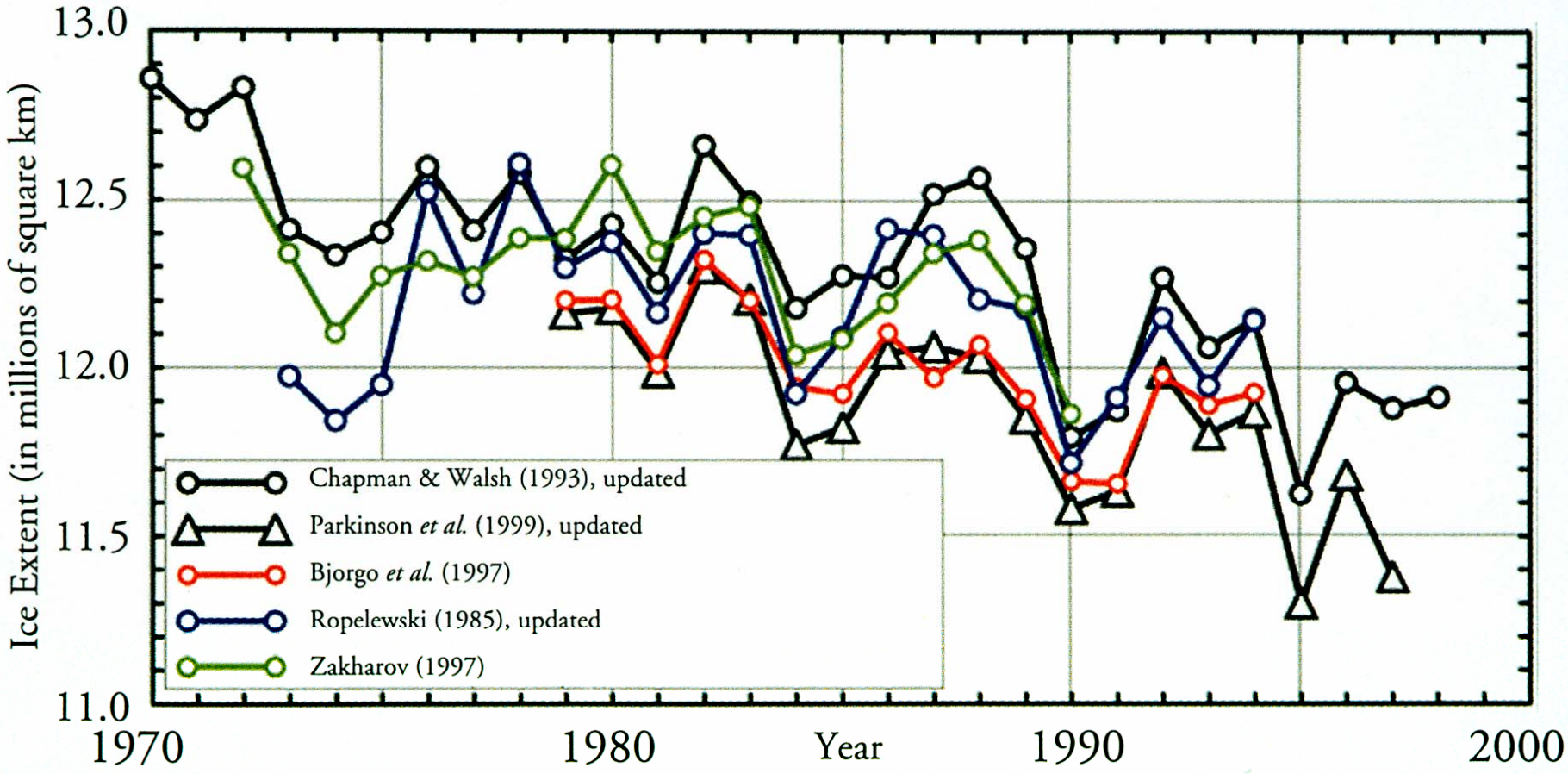
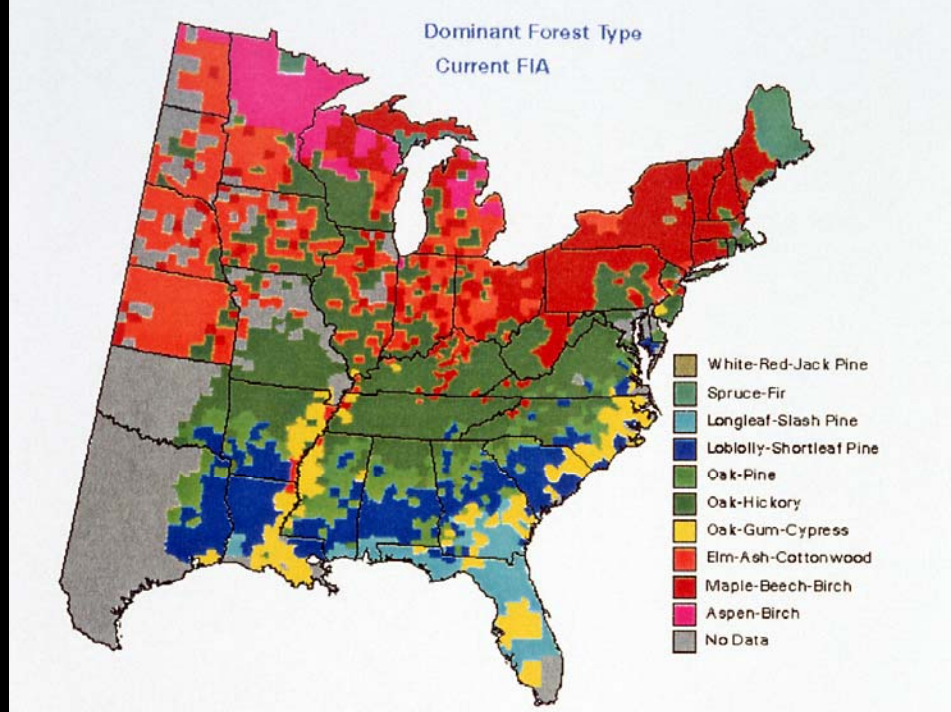
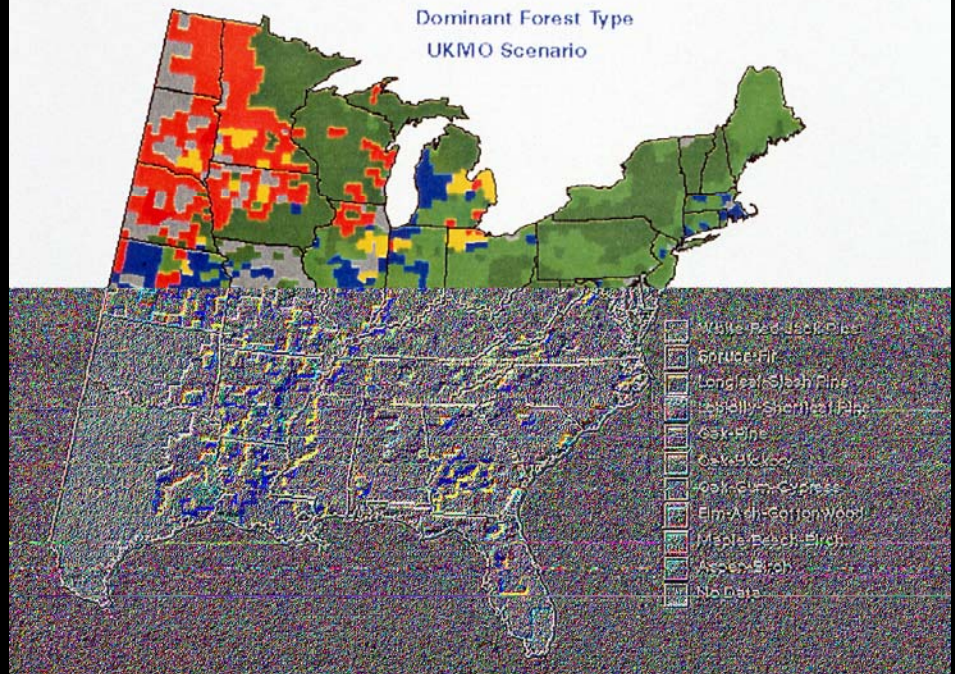


FIGURE 7.1 Global lower to mid-tropospheric temperature trends (°C/decade) from the MSU version D over the 20-year period 1979-98. These ordinary least square trends are computed from data from Christy et al. (2000).

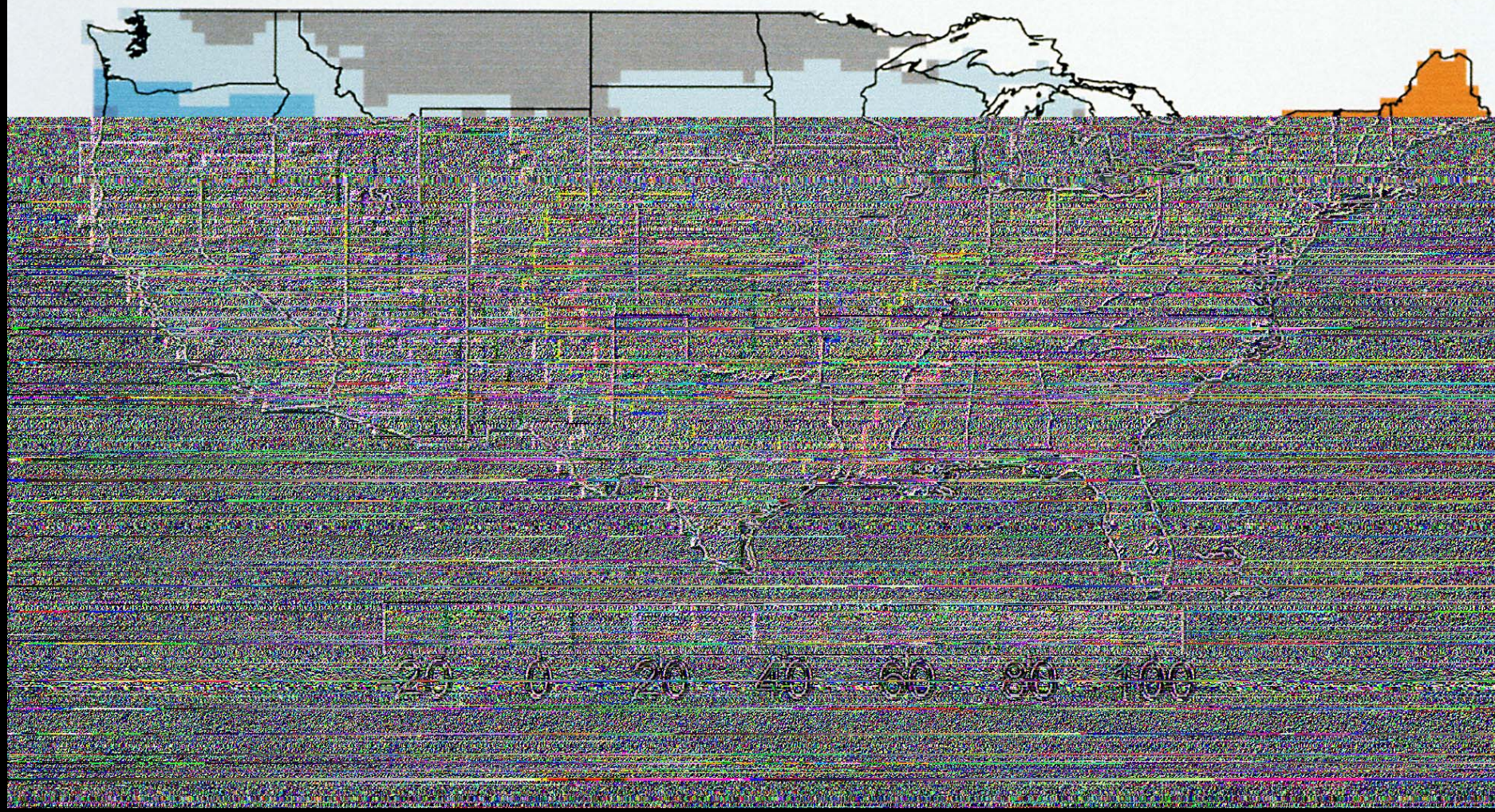


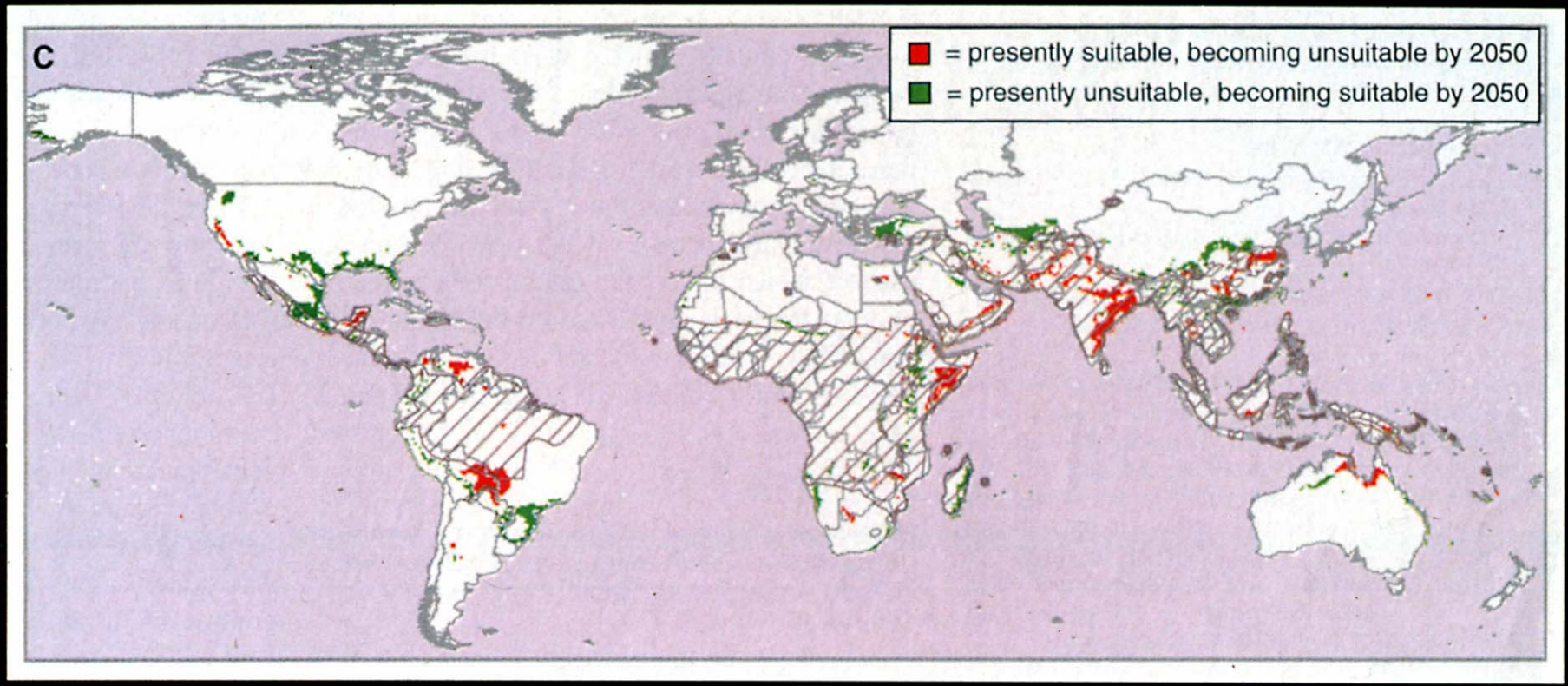
Several studies have documented a decrease in the extent of sea ice in the northern hemisphere over the past 25 years (Vinnikov et al. *1999*[1]*).*

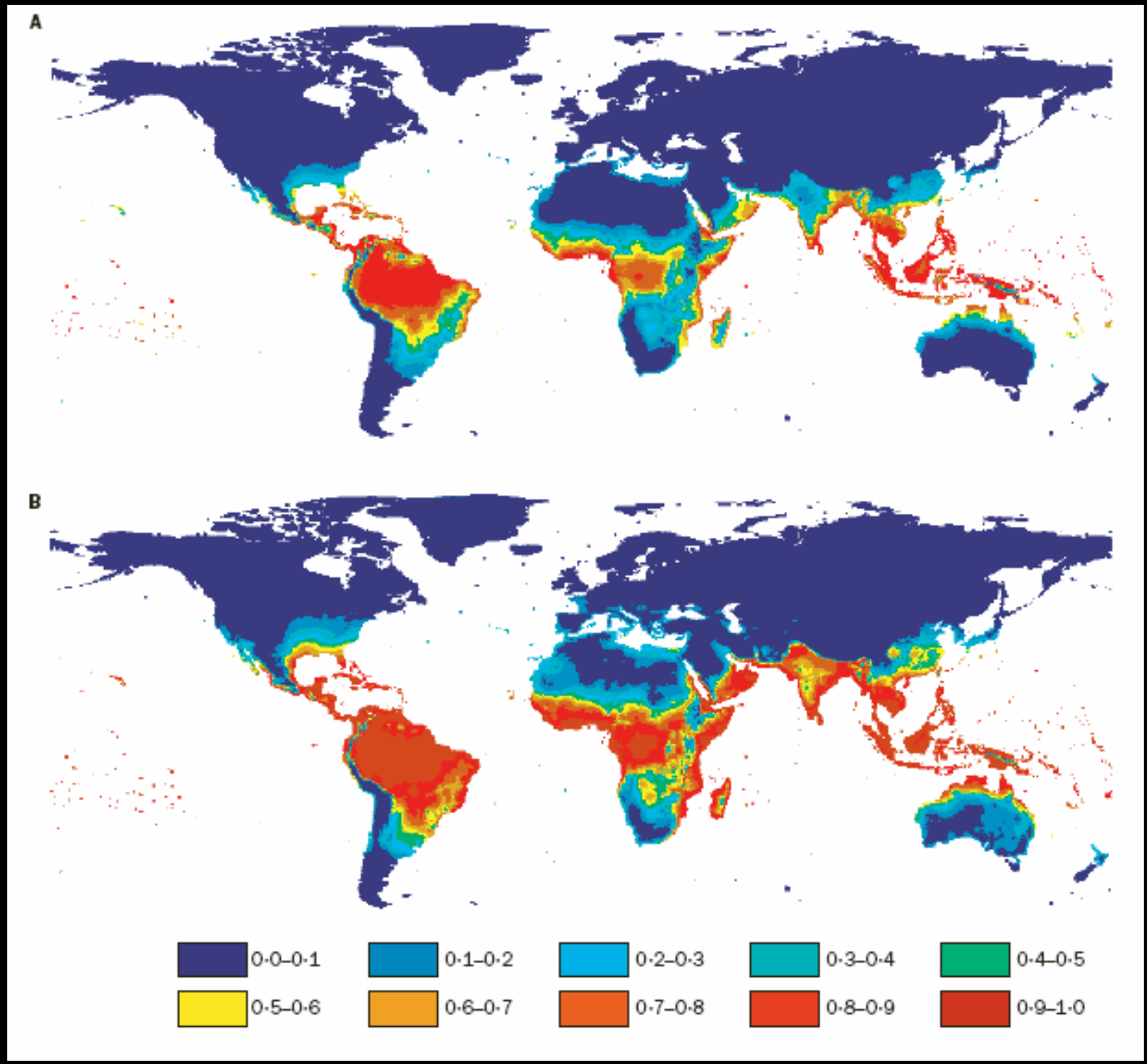

Dominant Forest Type
Current FIA
White-Red-Jack Pine
Spruce-Fir
Longleaf-Slash Pine
Loblolly-Shortleaf Pine
Oak-Pine
Oak-Hickory
Oak-Gum-Cypress
Elm-Ash-Cottonwood
Maple-Beech-Birch
Aspen-Birch
No Data

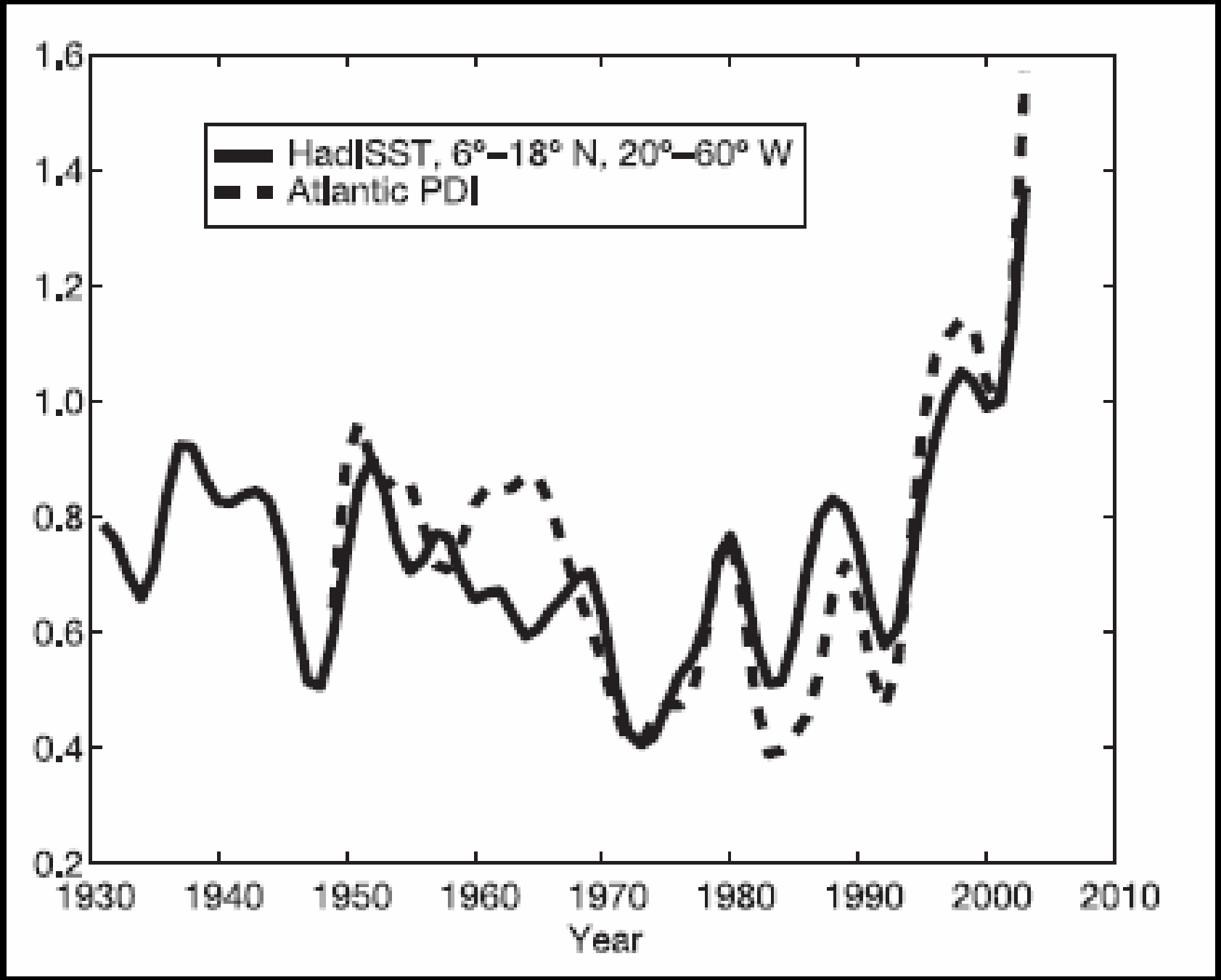

Dominant Forest Type
UKMO Scenario

Projected Future Changes in PRCP
% change from 1961-1990 baseline to 2061-2090 scenario climate




C
= presently suitable, becoming unsuitable by 2050
= presently unsuitable, becoming suitable by 2050


A
B
0·0–0·1
0·1–0·2
0·2–0·3
0·3–0·4
0·4–0·5
0·5–0·6
0·6–0·7
0·7–0·8
0·8–0·9
0·9–1·0


HadISST, 6°–18° N, 20°–60° W
Atlantic PDI
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
1930
1940
1950
1960
1970
1980
1990
2000
2010
Year

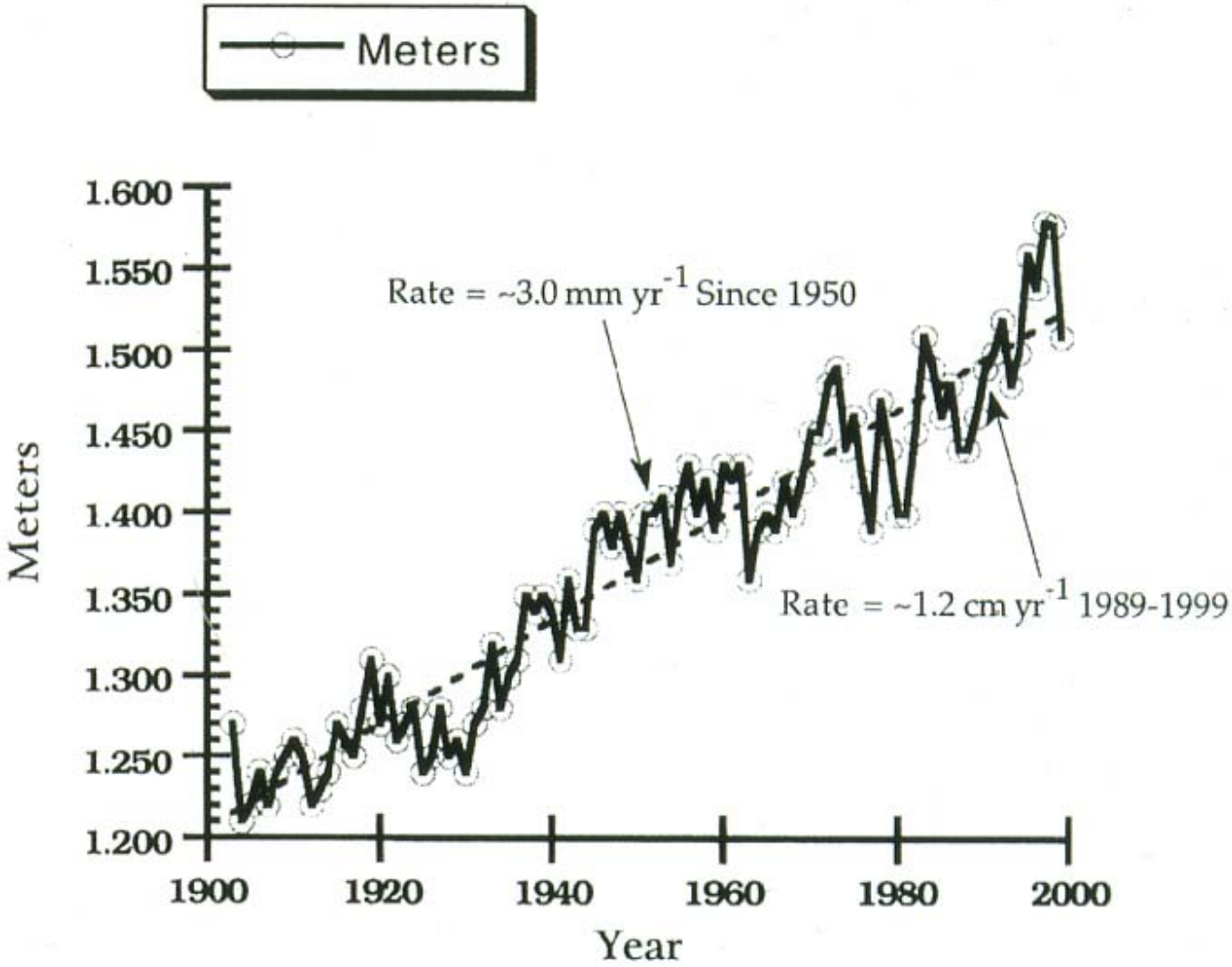
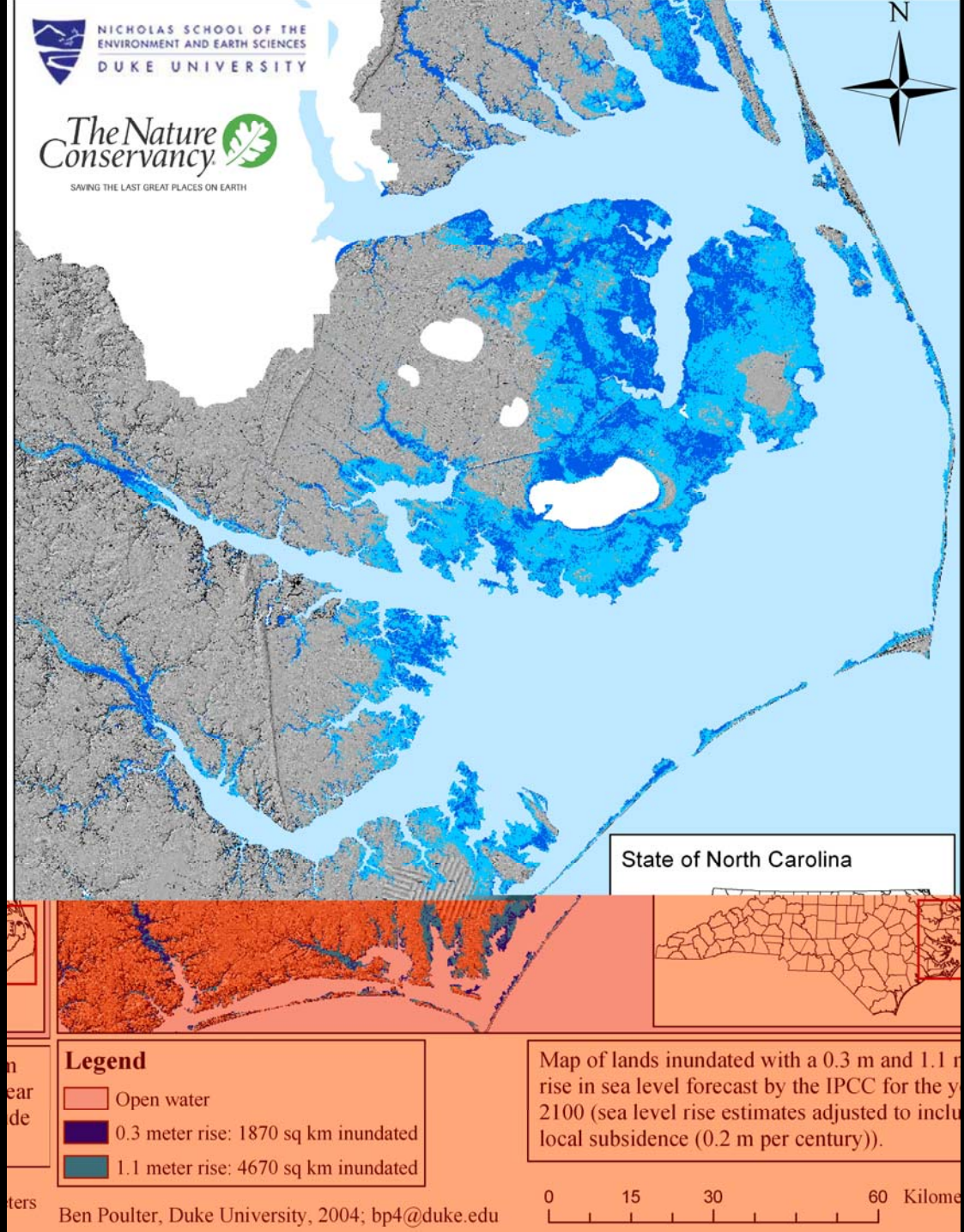


Fig. 1. Graphed here is the tide gauge record for Baltimore, Maryland, since 1900.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DUKE UNIVERSITY
The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH
N
State of North Carolina
Legend
Open water
0.3 meter rise: 1870 sq km inundated
1.1 meter rise: 4670 sq km inundated
Map of lands inundated with a 0.3 m and 1.1 m rise in sea level forecast by the IPCC for the year 2100 (sea level rise estimates adjusted to include local subsidence (0.2 m per century)).
0
15
30
60
Kilometers
Ben Poulter, Duke University, 2004; bp4@duke.edu

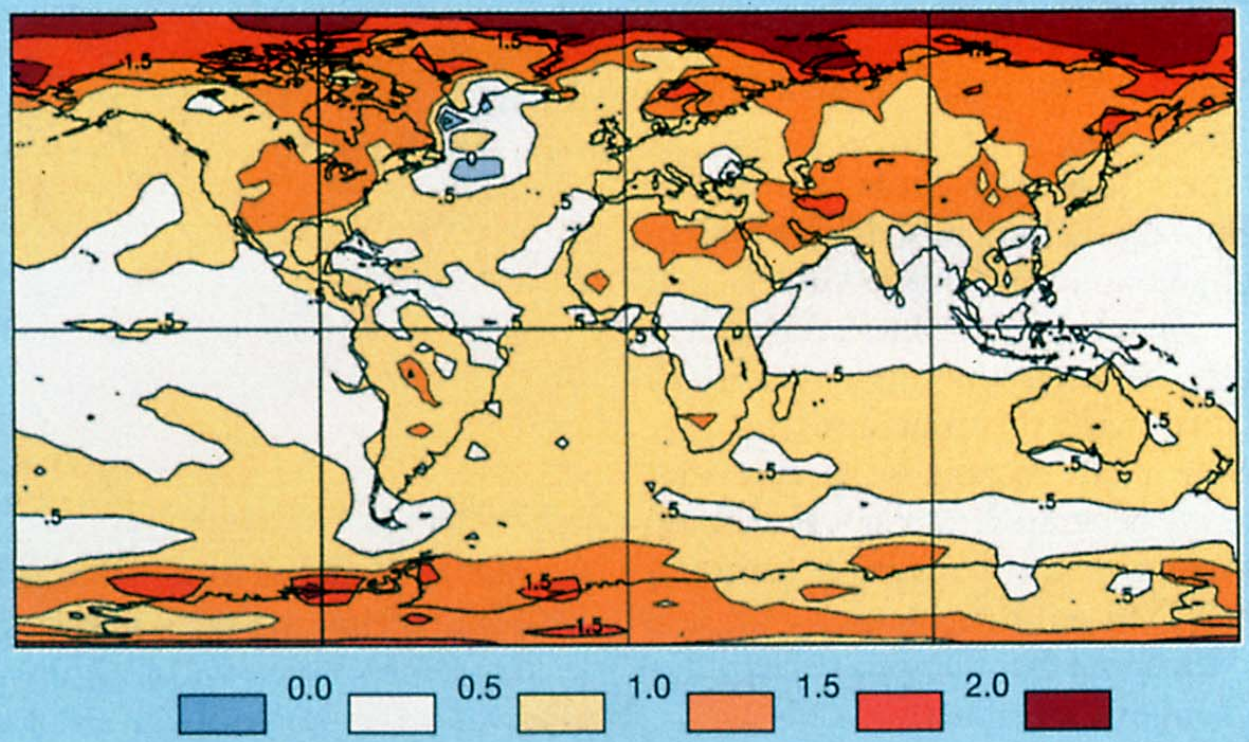
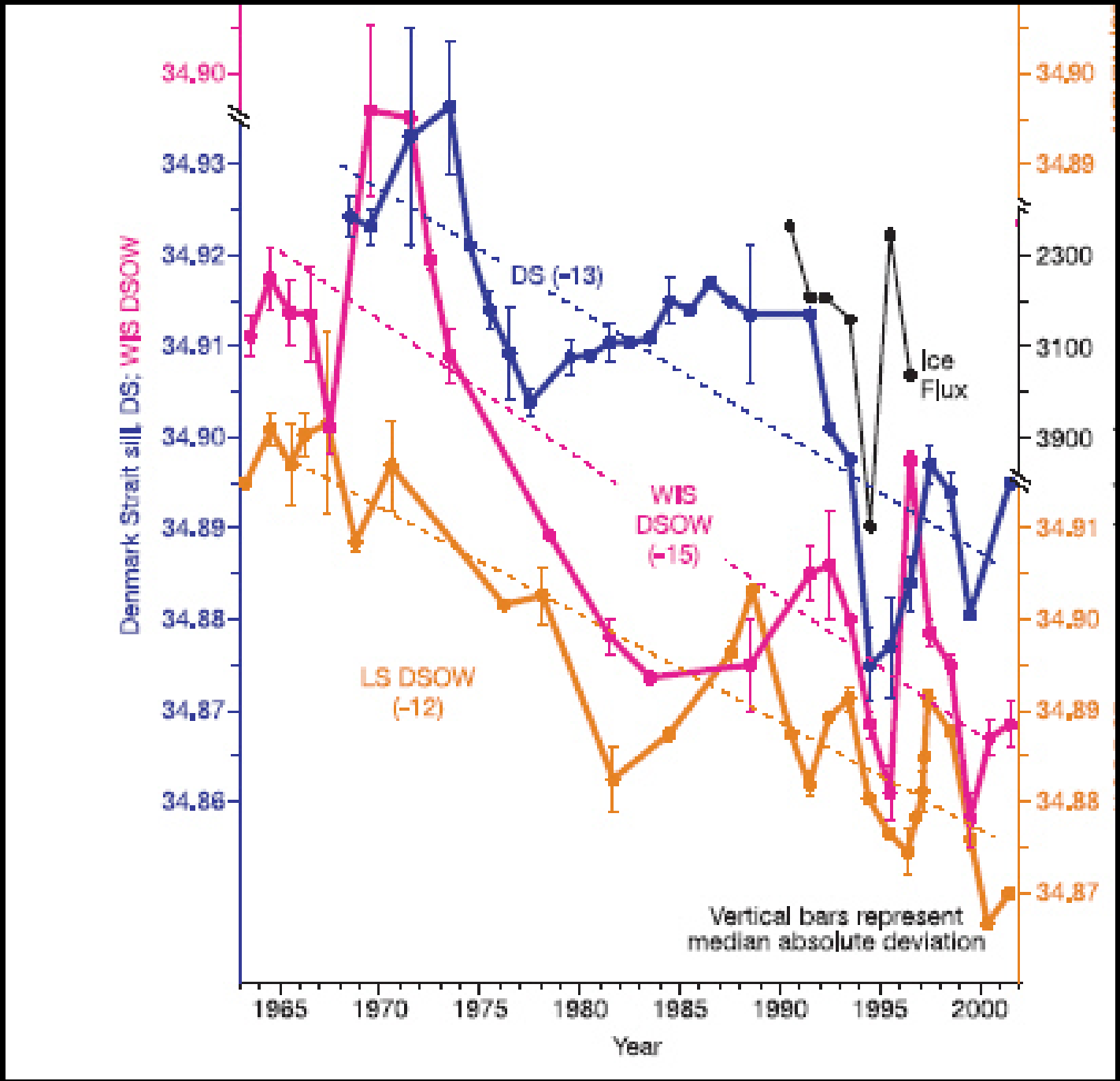
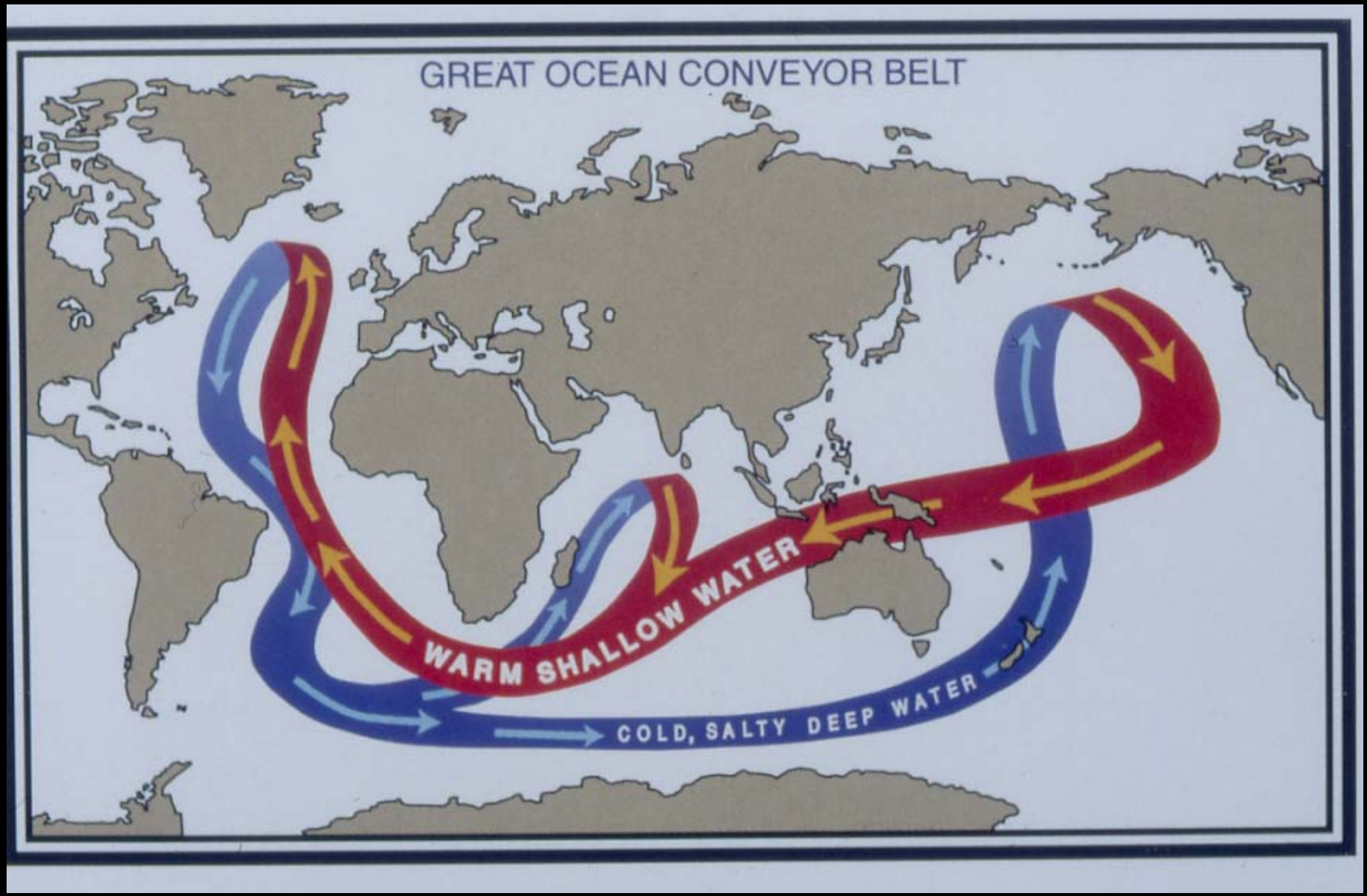
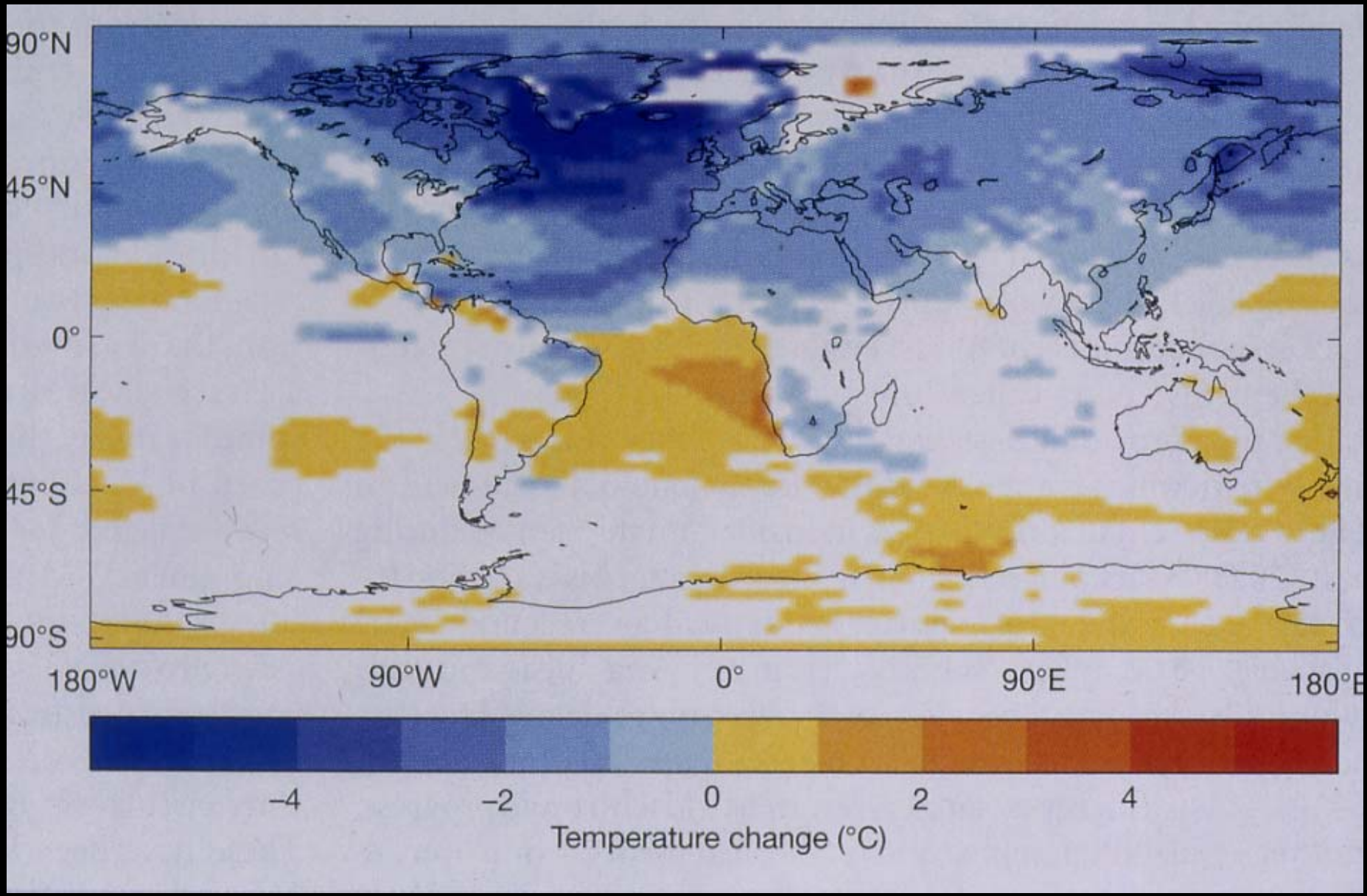
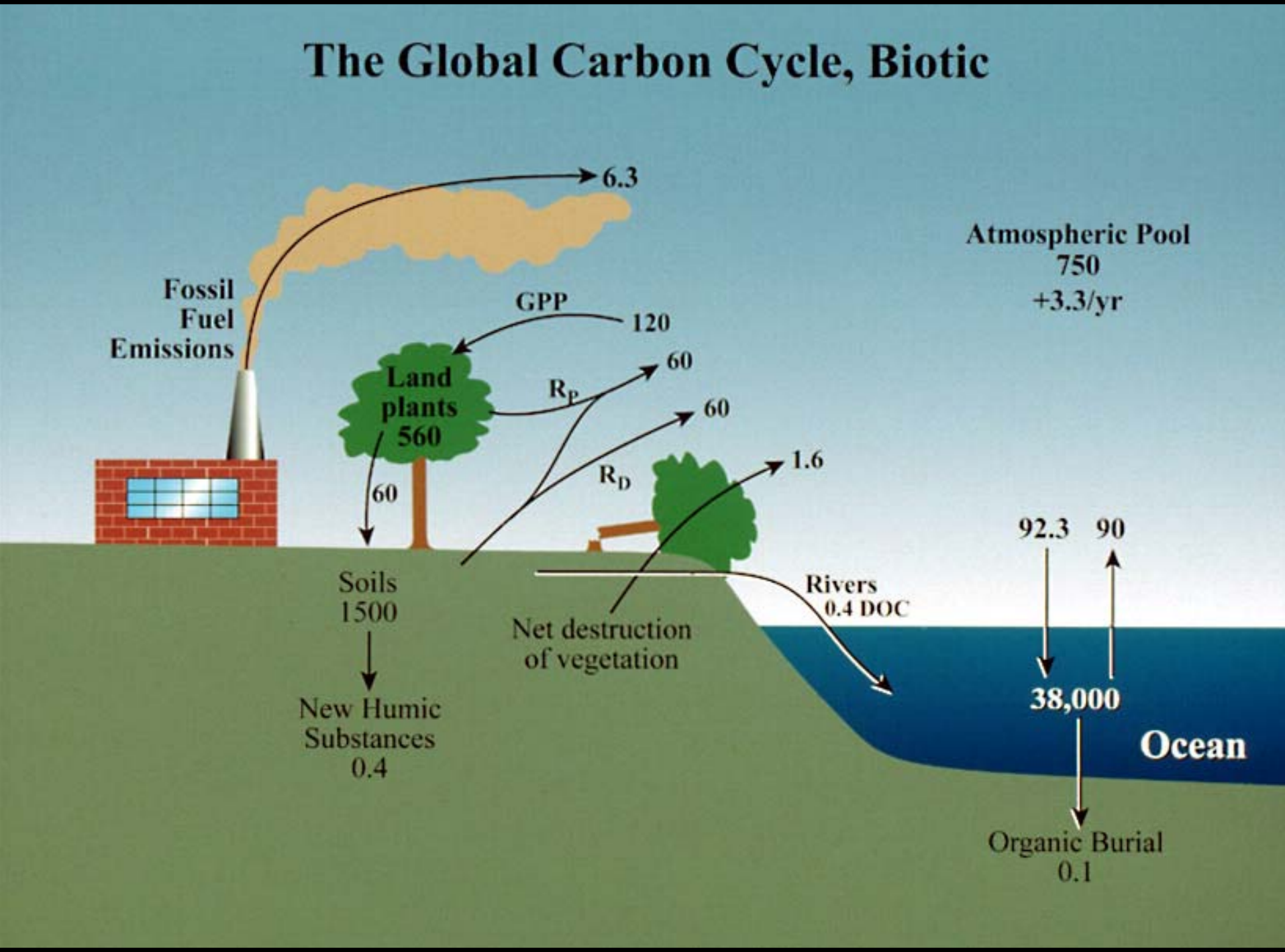


Figure 1 A warmer world. Shown here are projected changes in surface air temperature, relative to 1990–2000, for the decade 2020–30. The global change in mean temperature estimated by this model[15], the Canadian Centre for Climate Modelling and Analysis CGCM2, is 0.68 K. This result is similar to that obtained by other atmosphere–ocean global climate models, such as that used by Stott and Kettleborough[4]. It is also similar to the conclusions drawn by Knutti *et al.*[3] from a model of intermediate complexity. The change projected by CGCM2 falls well within the approximate 5–95% uncertainty ranges estimated by Stott and Kettleborough (0.3–1.3 K) and by Knutti *et al.* (0.5–1.1 K). The global change in mean temperature is expected to have an uneven distribution geographically, with generally greater warming over land and at high latitudes than elsewhere. So local effects of climate change may be greater than one might infer from global mean projections.


Denmark Strait sill DS; WIS DSOW
34.90
34.93
34.92
34.91
34.90
34.89
34.88
34.87
34.86
34.90
34.89
2300
3100
3900
34.91
34.90
34.89
34.88
34.87
DS (–13)
WIS
DSOW
(–15)
LS DSOW
(–12)
Ice
Flux
Vertical bars represent
median absolute deviation
1965
1970
1975
1980
1985
1990
1995
2000
Year


GREAT OCEAN CONVEYOR BELT
WARM SHALLOW WATER
COLD, SALTY DEEP WATER


90°N
45°N
0°
45°S
90°S
180°W
90°W
0°
90°E
180°E
−4
−2
0
2
4
Temperature change (°C)


The Global Carbon Cycle, Biotic
6.3
Fossil
Fuel
Emissions
GPP
120
Land
plants
560
60
R_P
60
R_D
1.6
60
Atmospheric Pool
750
+3.3/yr
92.3
90
Soils
1500
New Humic
Substances
0.4
Net destruction
of vegetation
Rivers
0.4 DOC
38,000
Ocean
Organic Burial
0.1