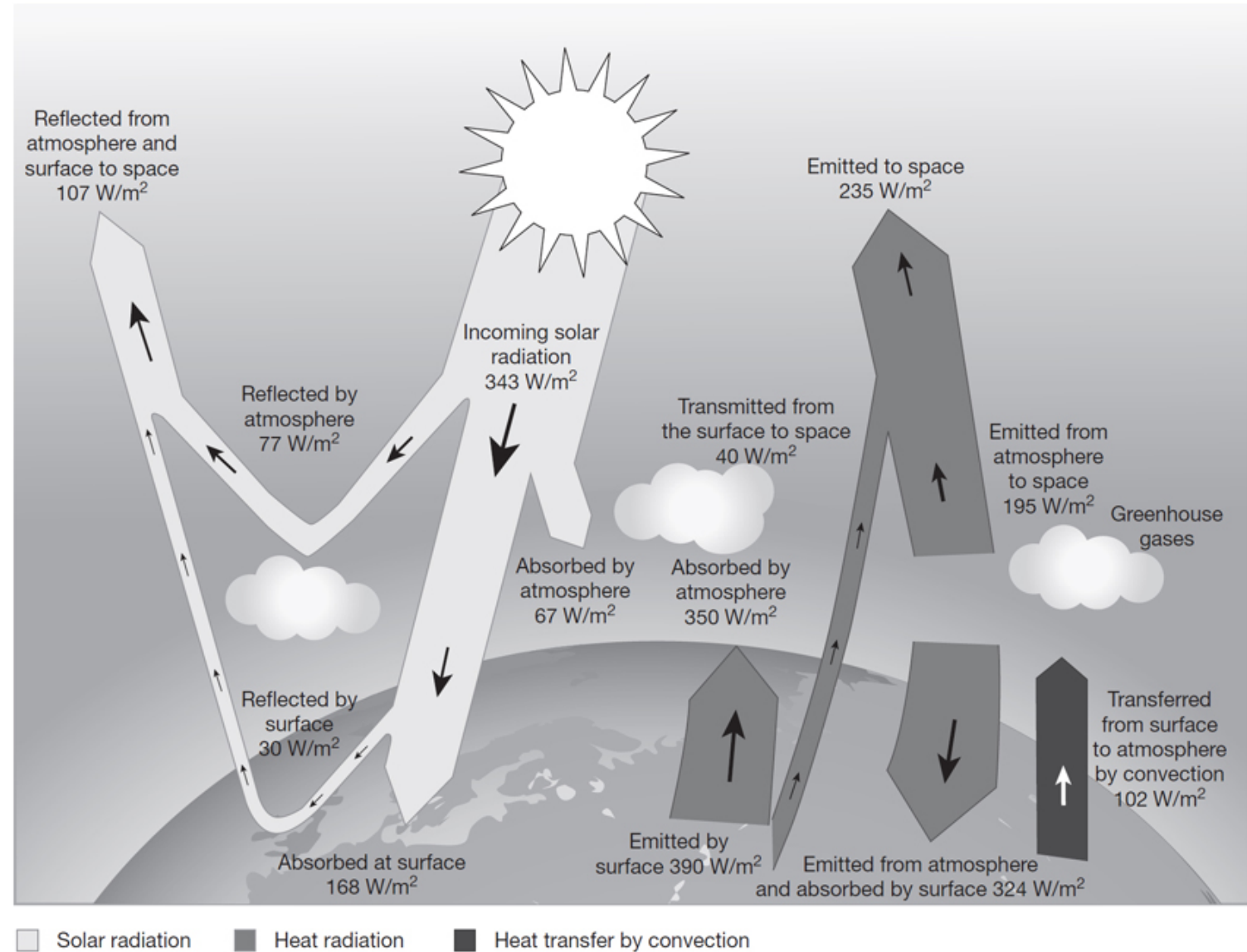
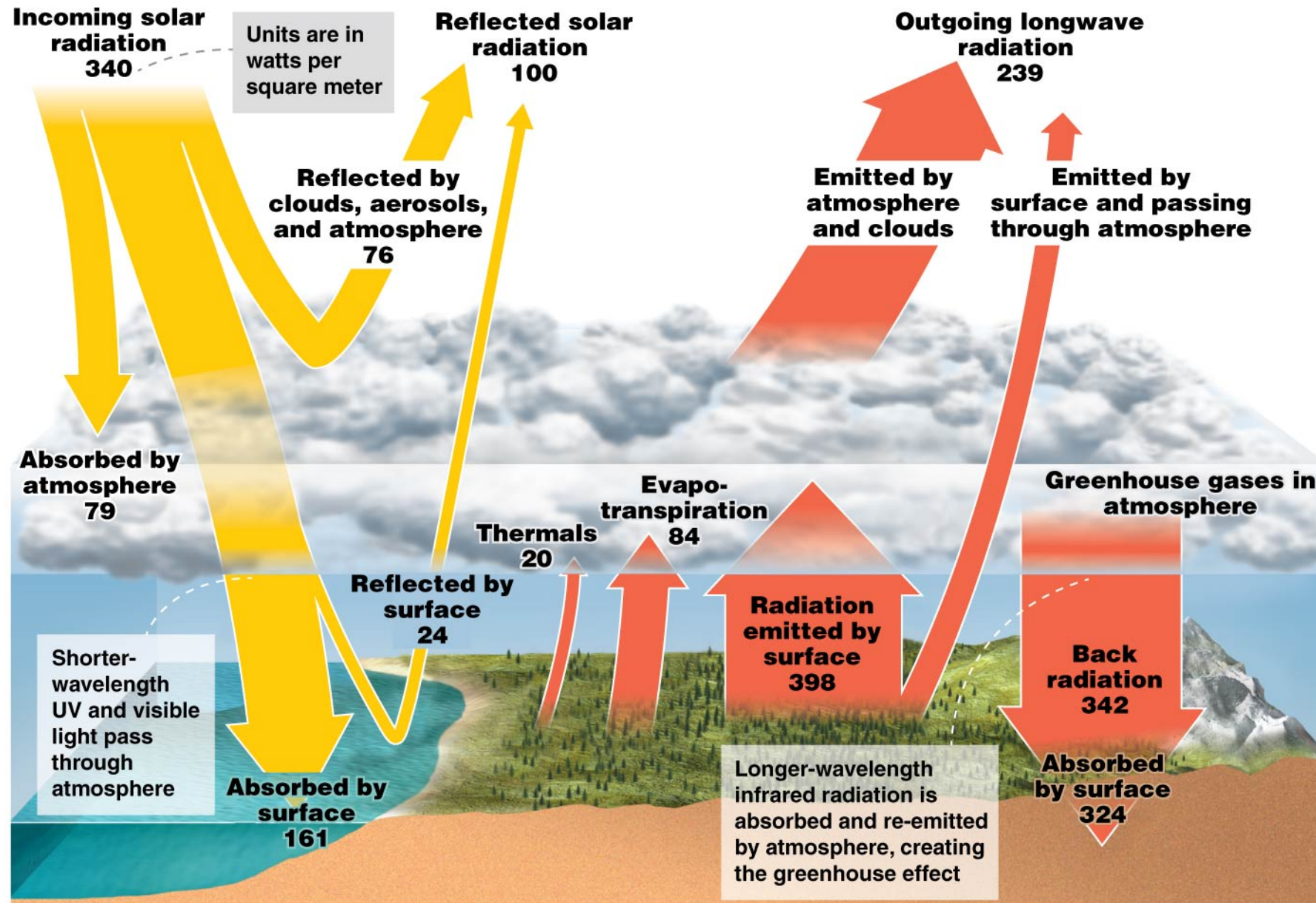


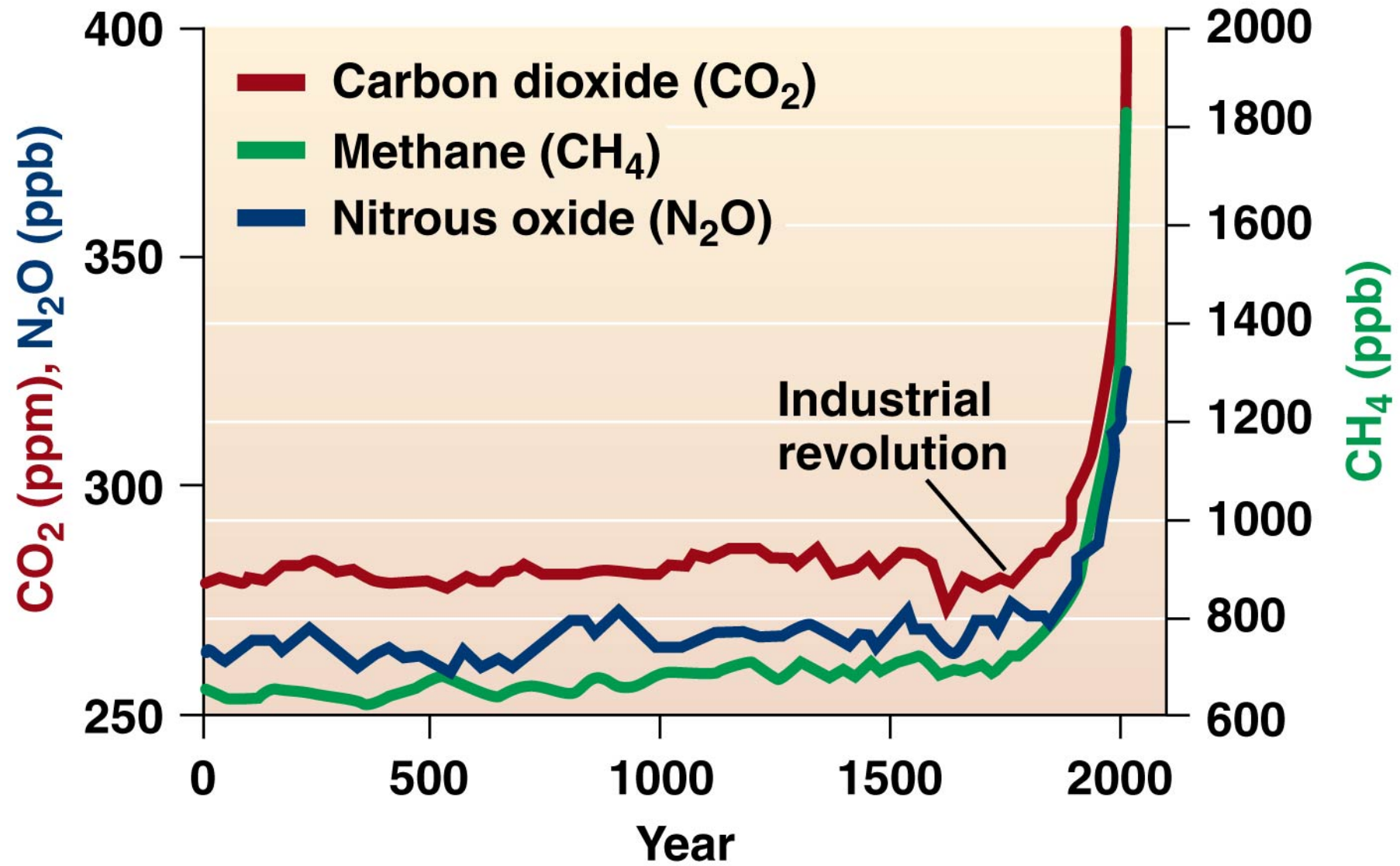
ES7/Geog 7

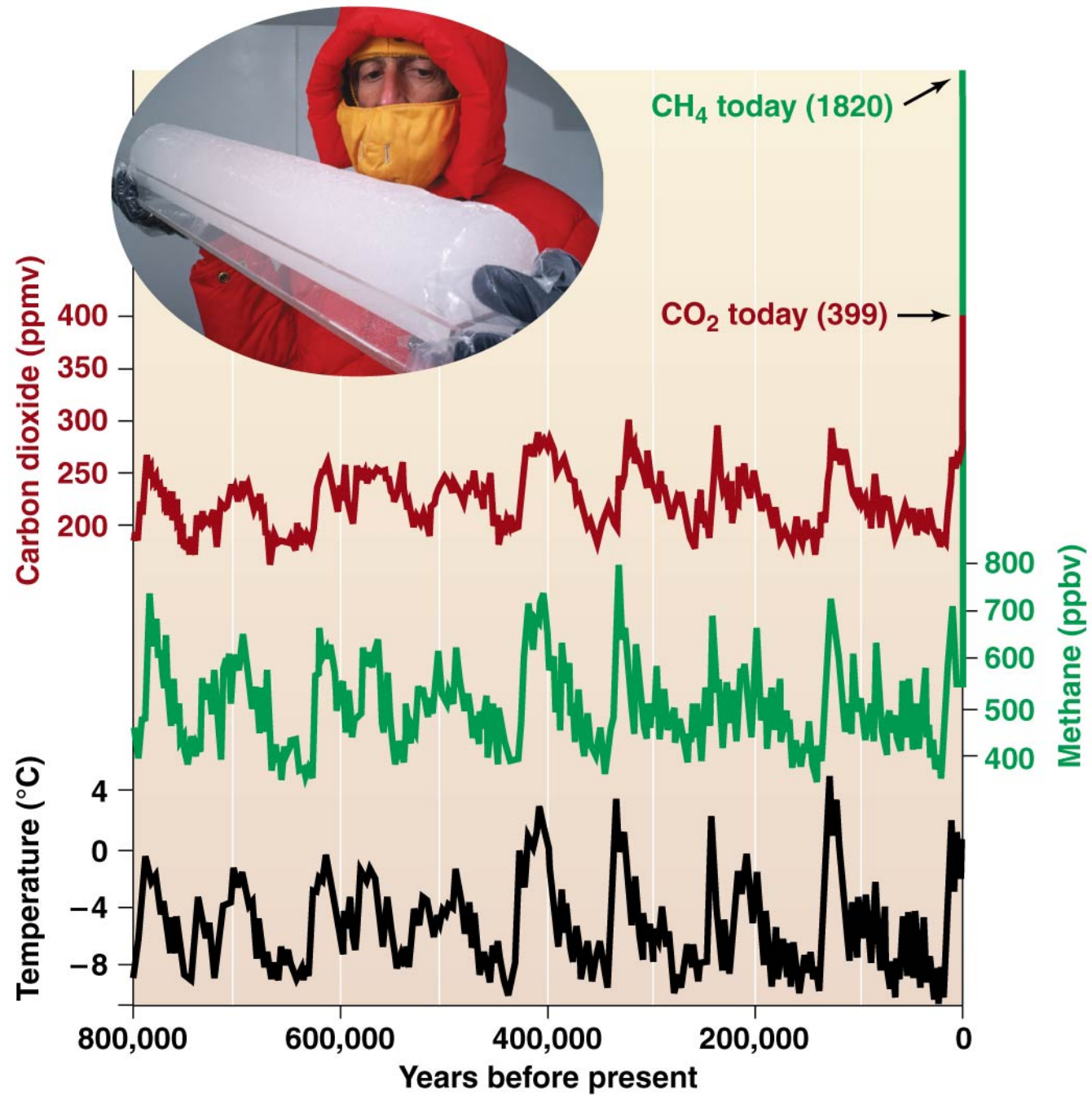
Lecture 7
Climate Change

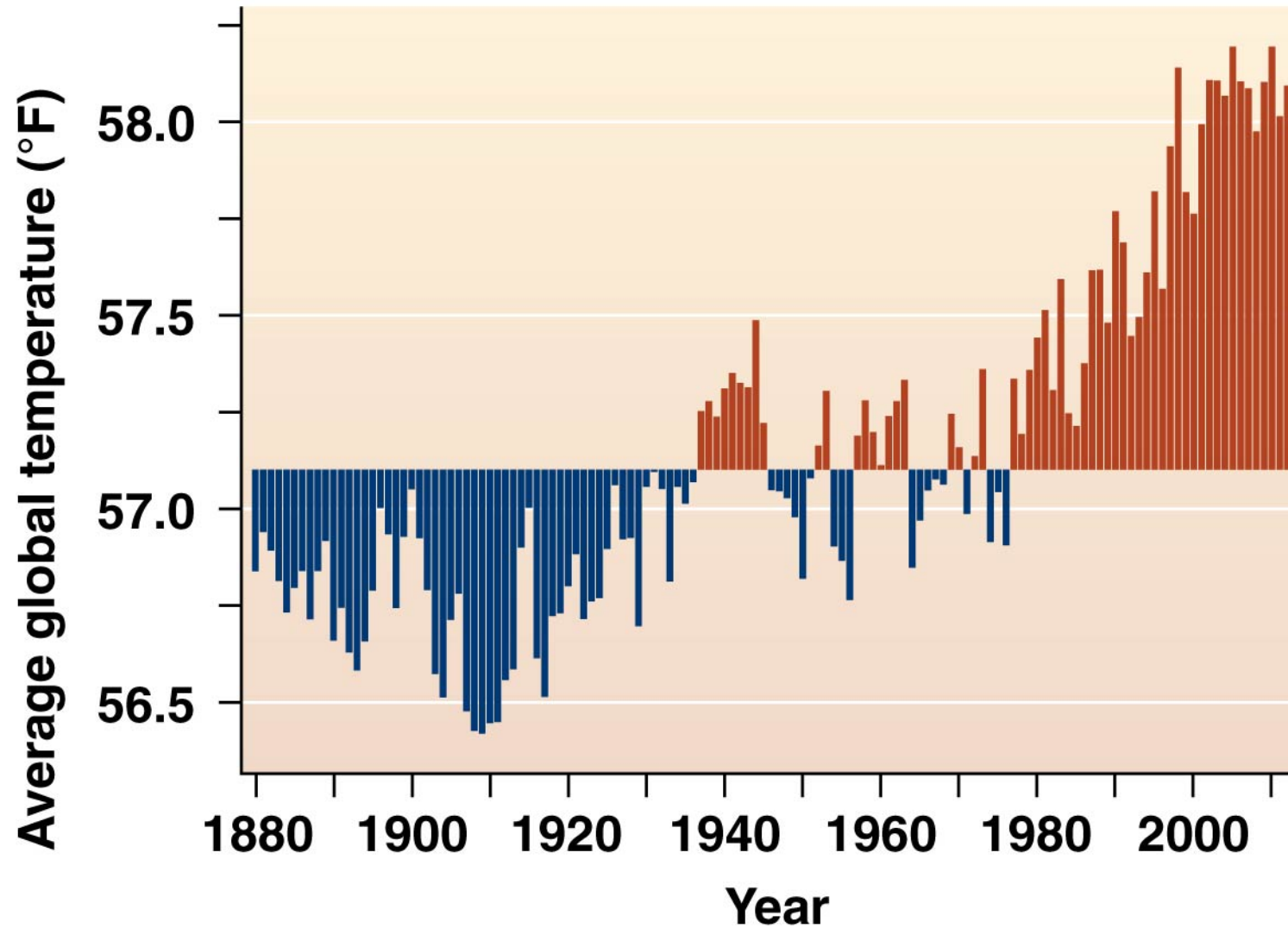
The “Greenhouse Effect”



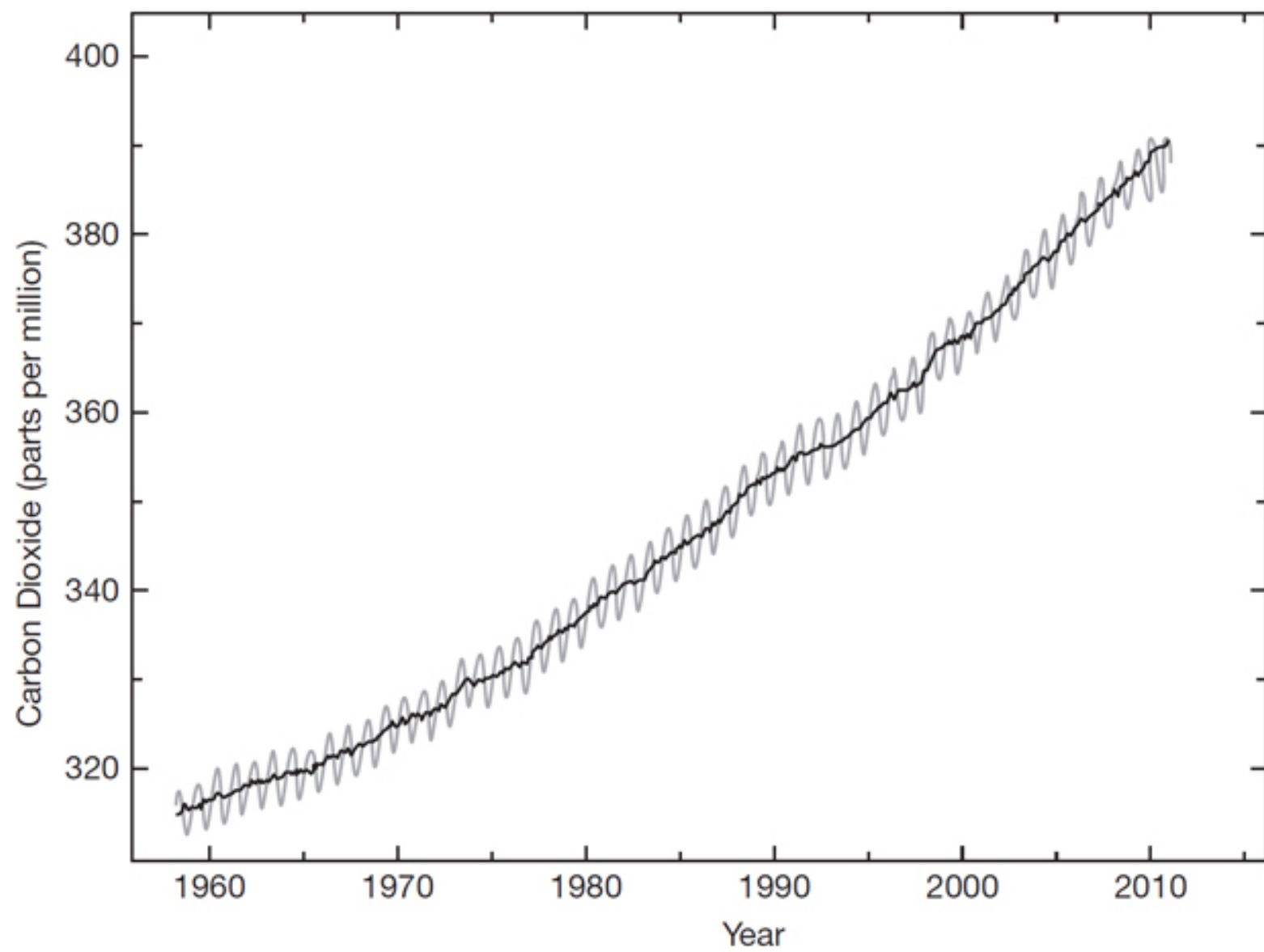


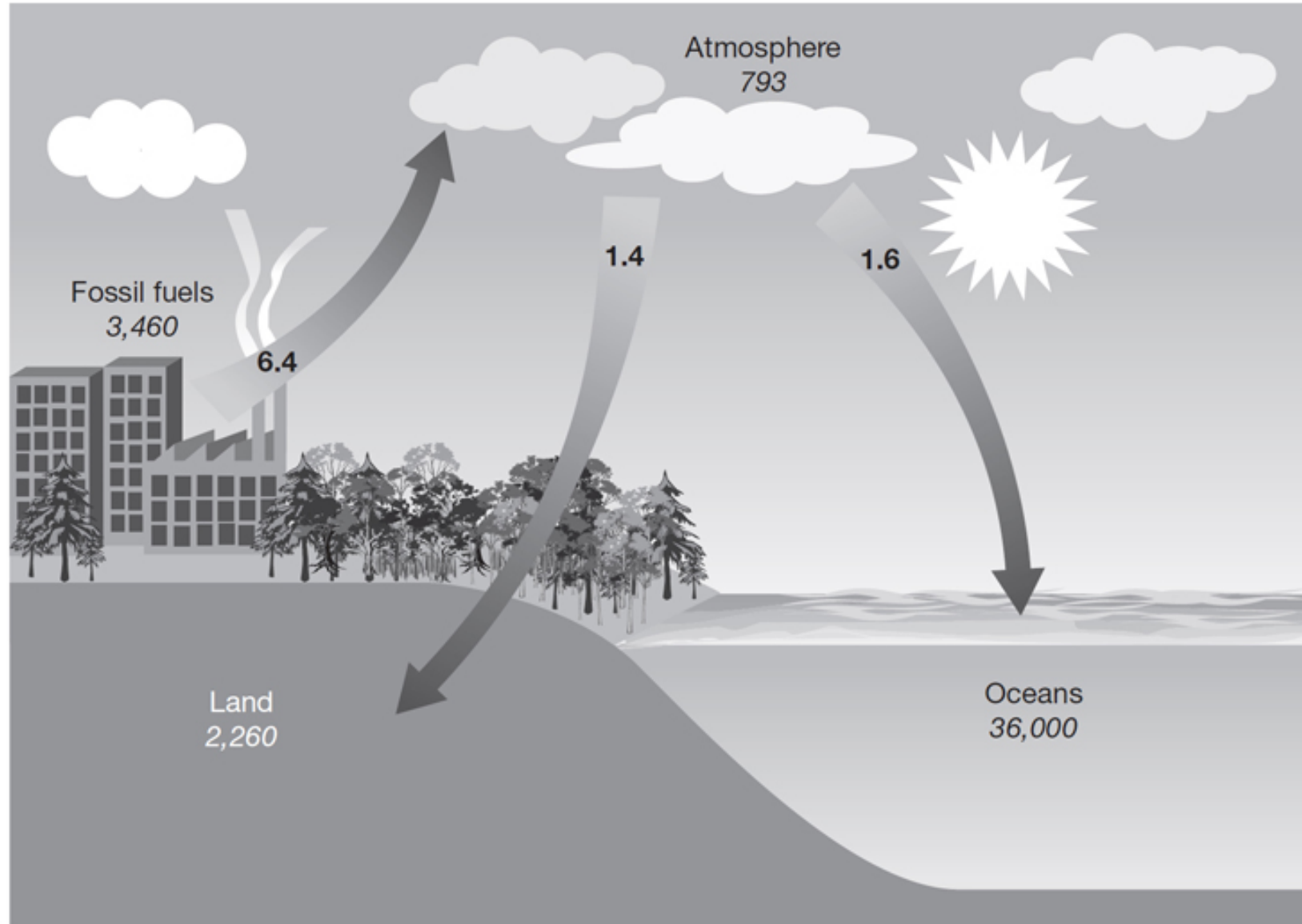






(a) Global temperature measured since 1880





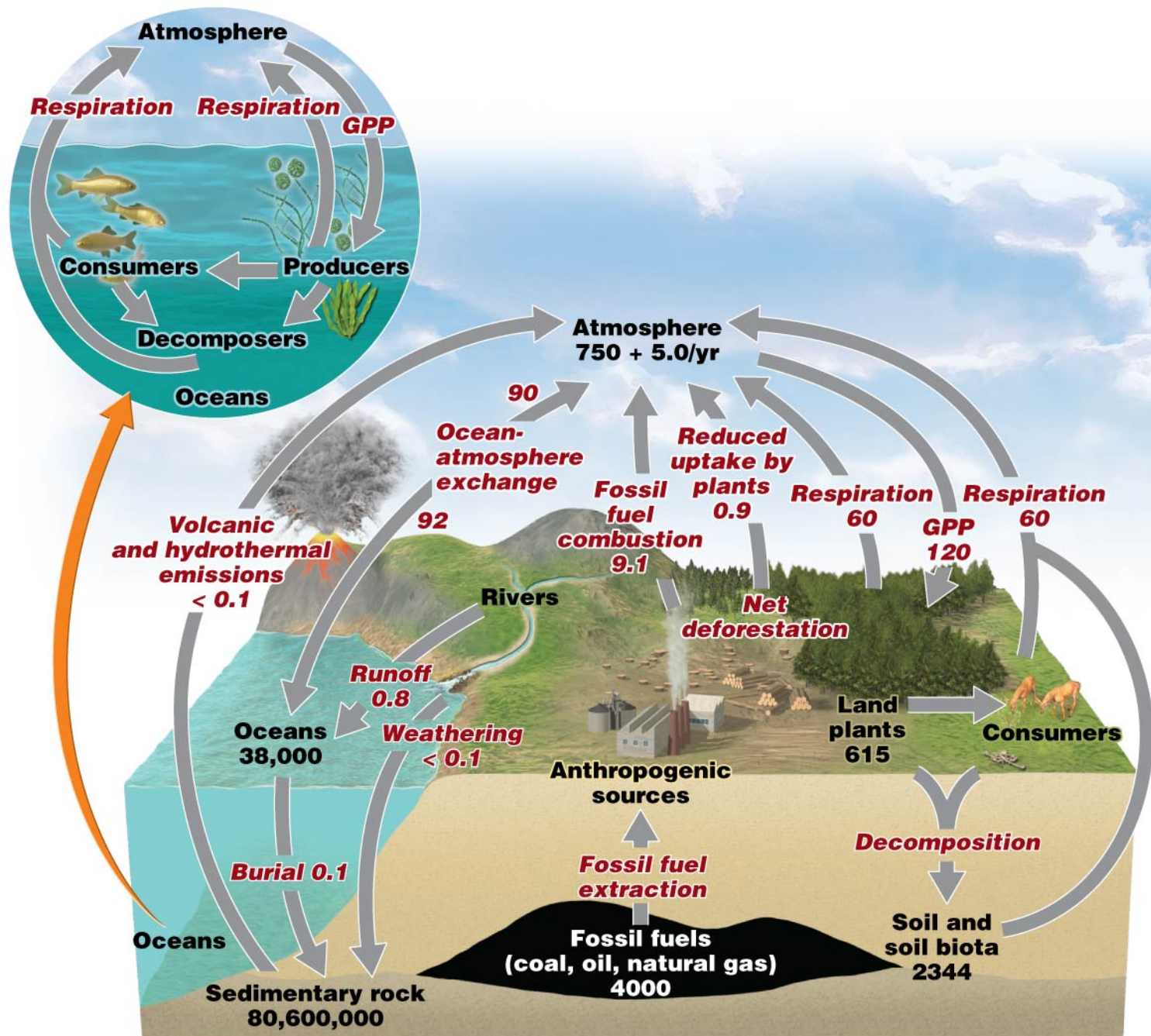
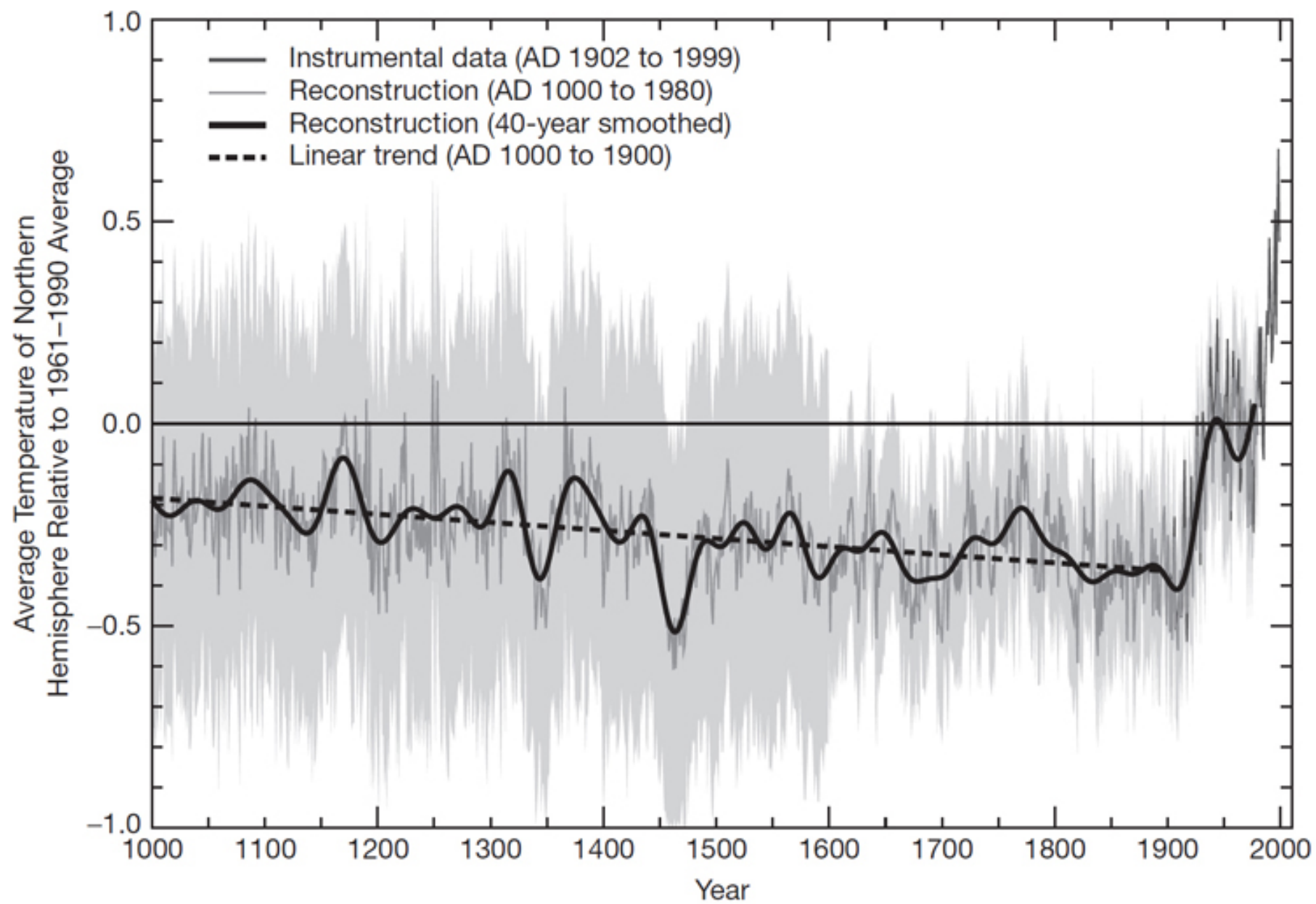
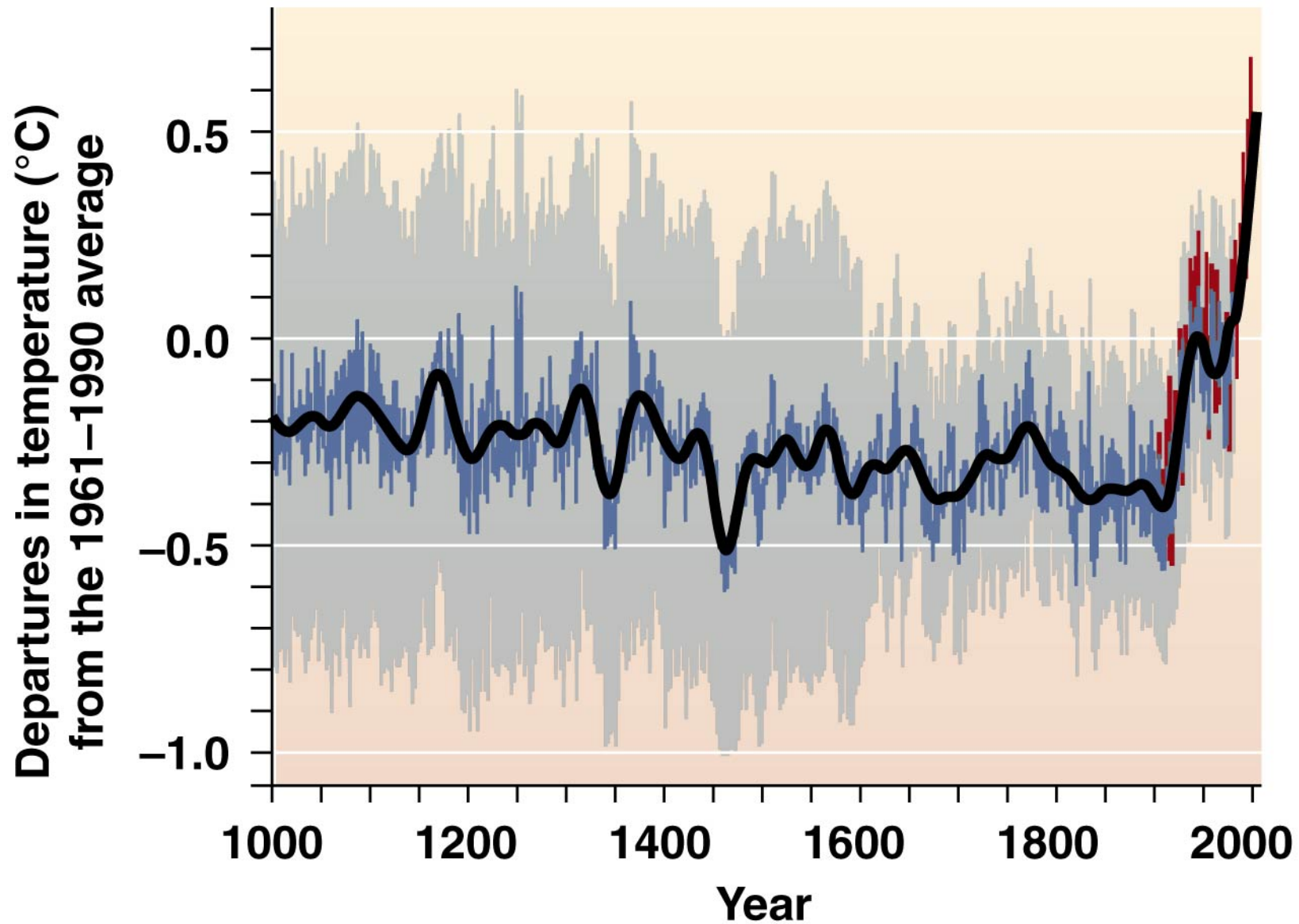


TABLE 14.1 Global Warming Potentials of Four Greenhouse Gases

GREENHOUSE GAS	RELATIVE HEAT-TRAPPING ABILITY (IN CO₂ EQUIVALENTS)	
	Over 20 years	Over 100 years
Carbon dioxide	1	1
Methane	84	28
Nitrous oxide	264	265
Hydrochlorofluorocarbon HFC-23	10,800	12,400

Data are for 20-year and 100-year time horizons, from IPCC, 2013. Climate change 2013: The physical science basis. Contribution of Working Group I to the Fifth assessment report.

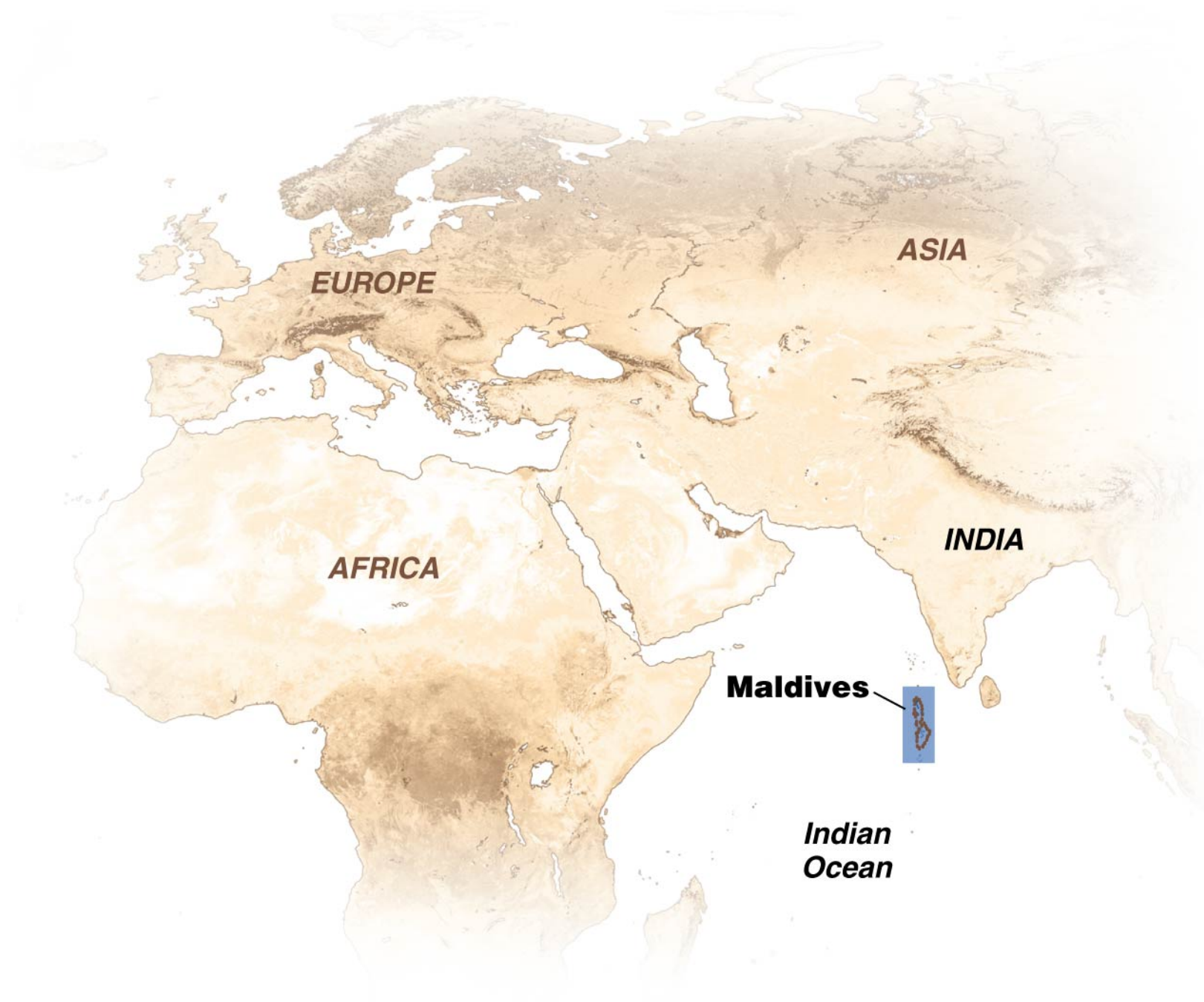




(b) Northern Hemisphere temperature over the past 1000 years





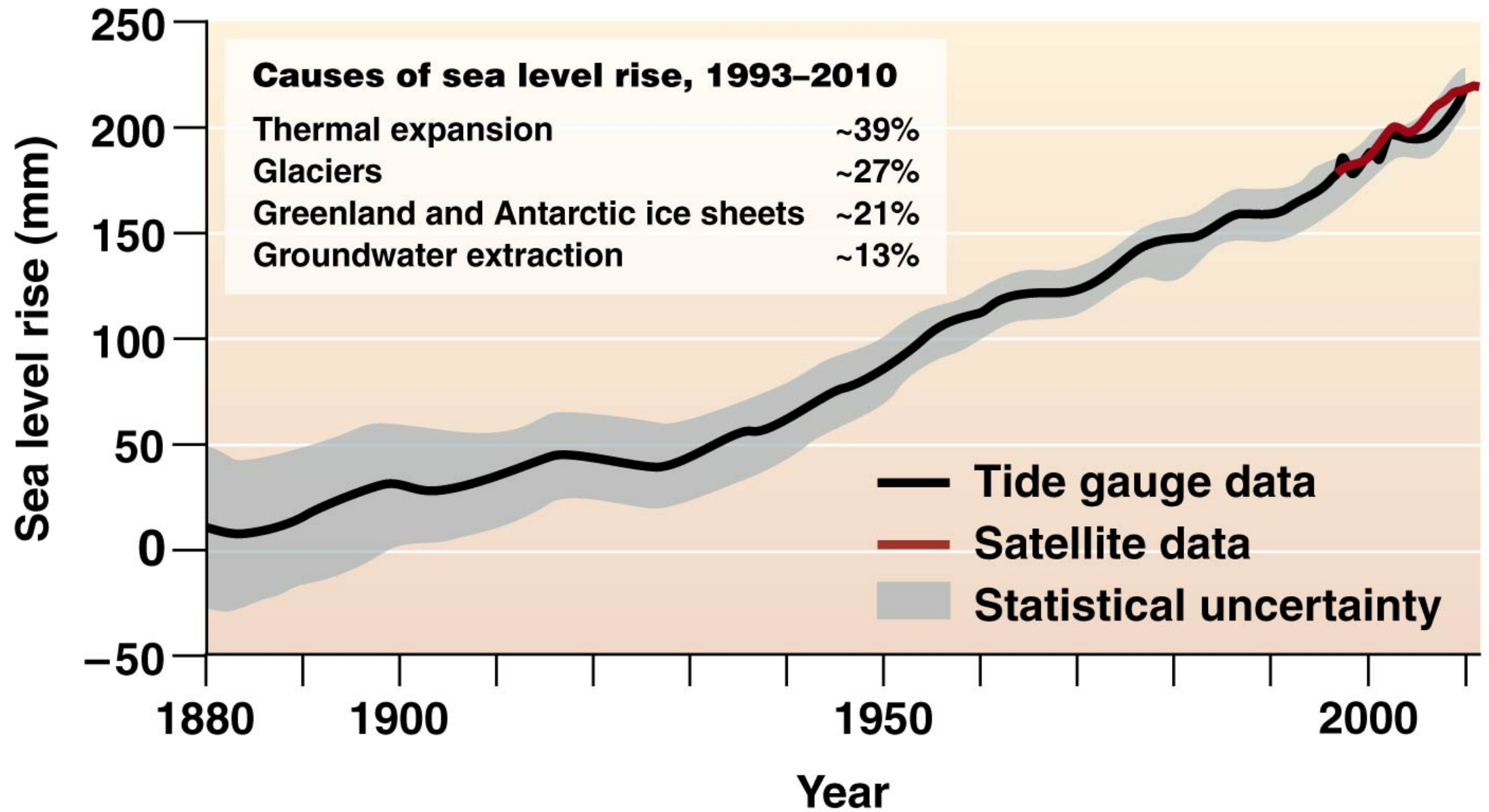


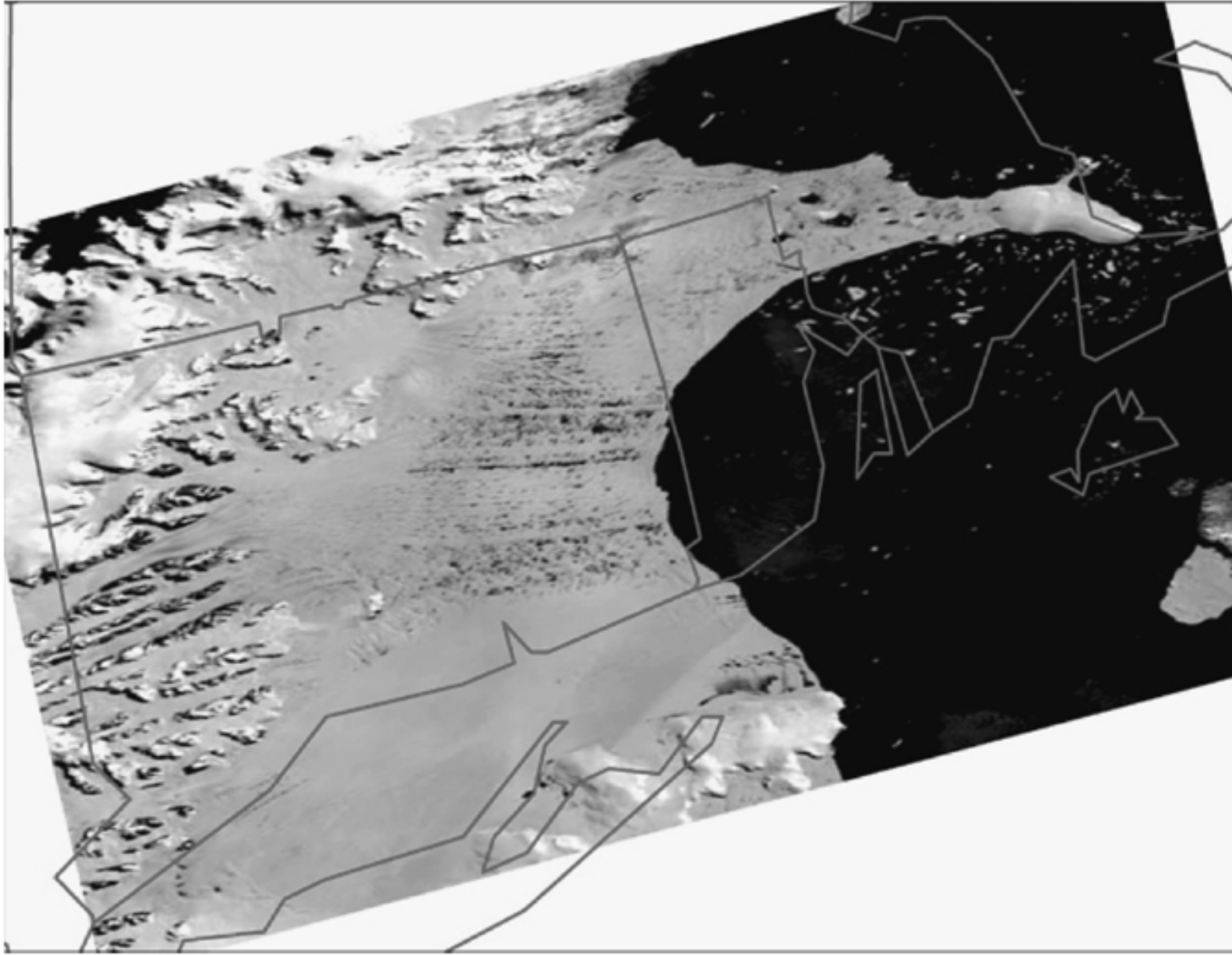


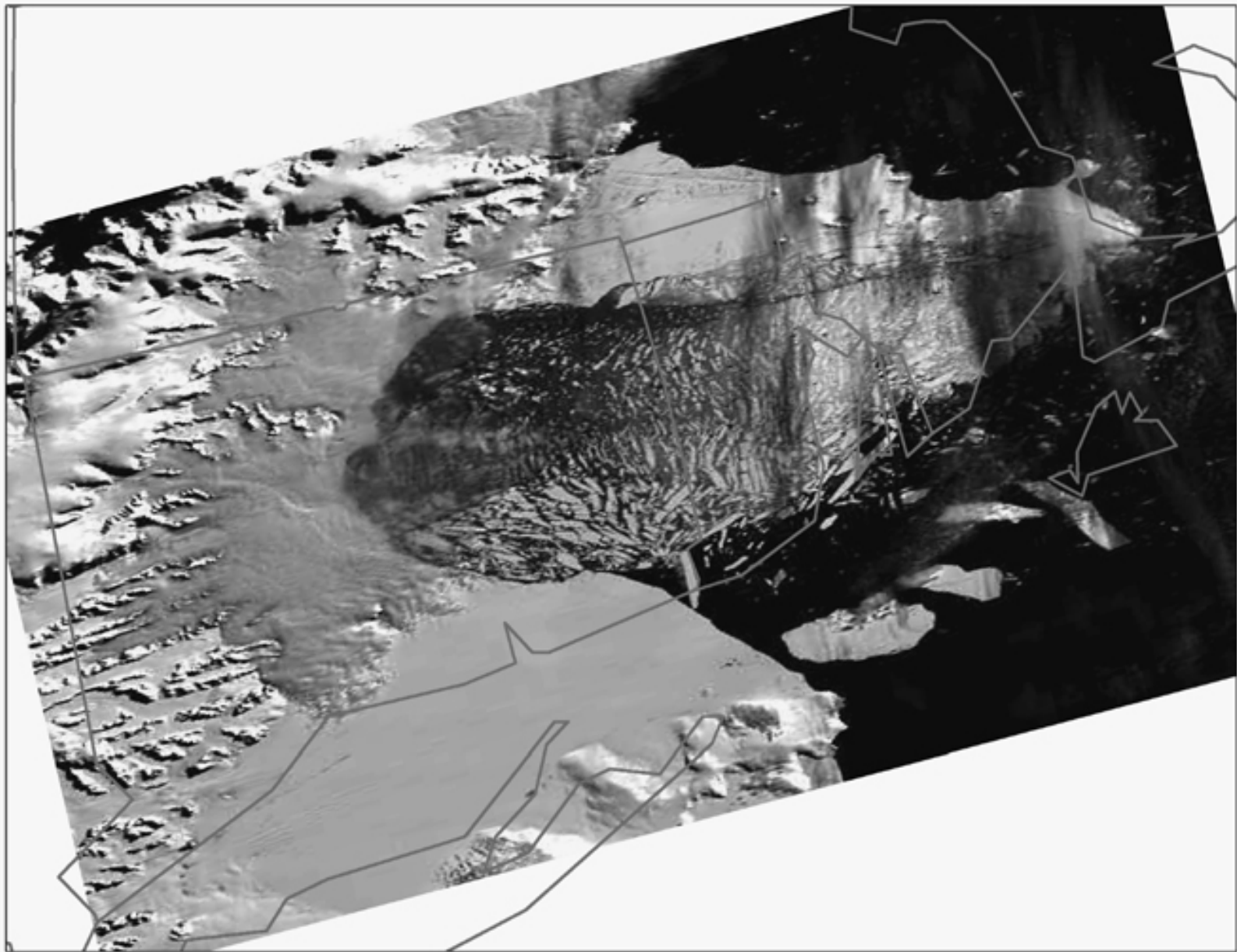
(a) Malé, capital of the Maldives

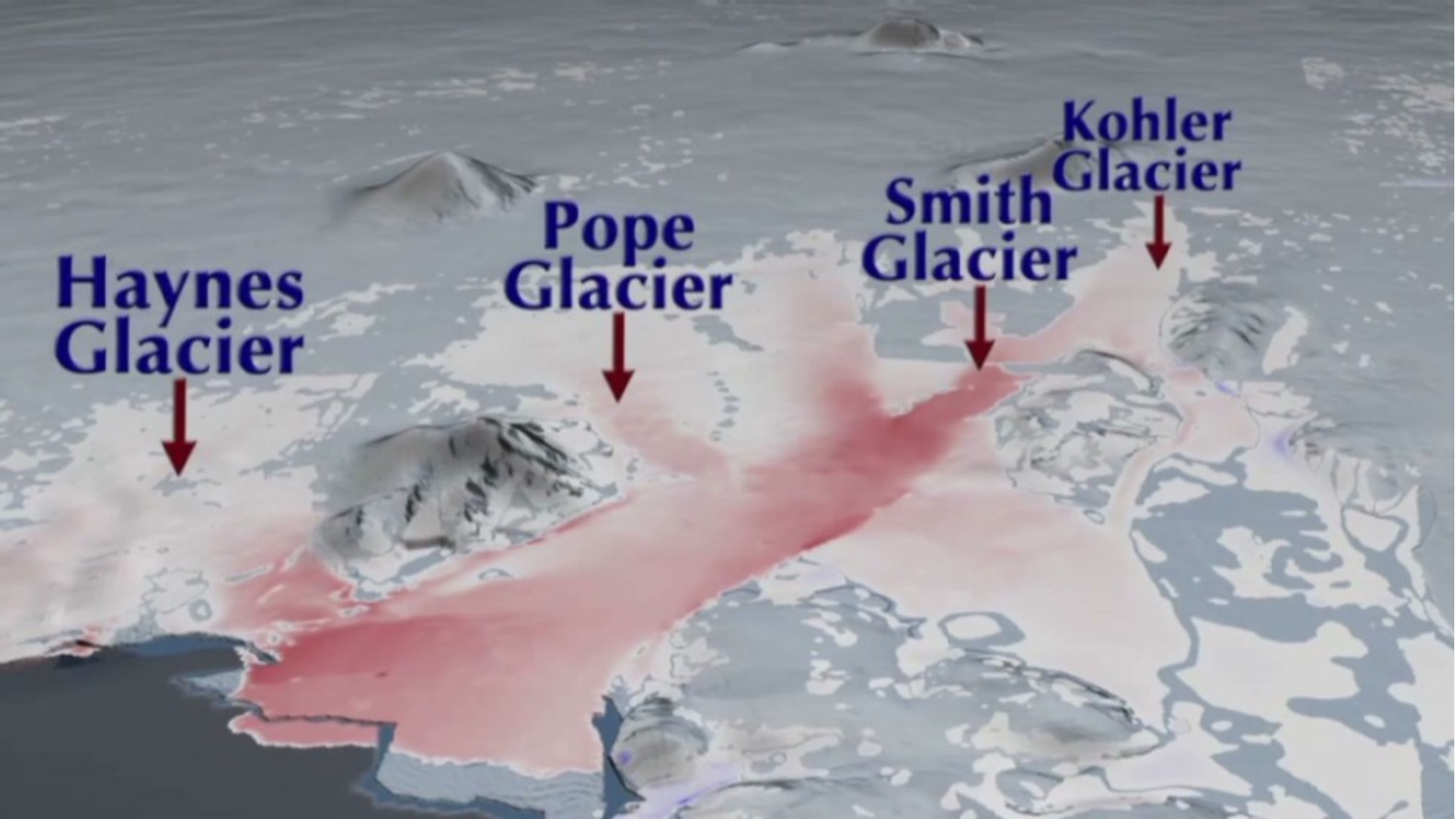


(b) Miami, on the Florida coast









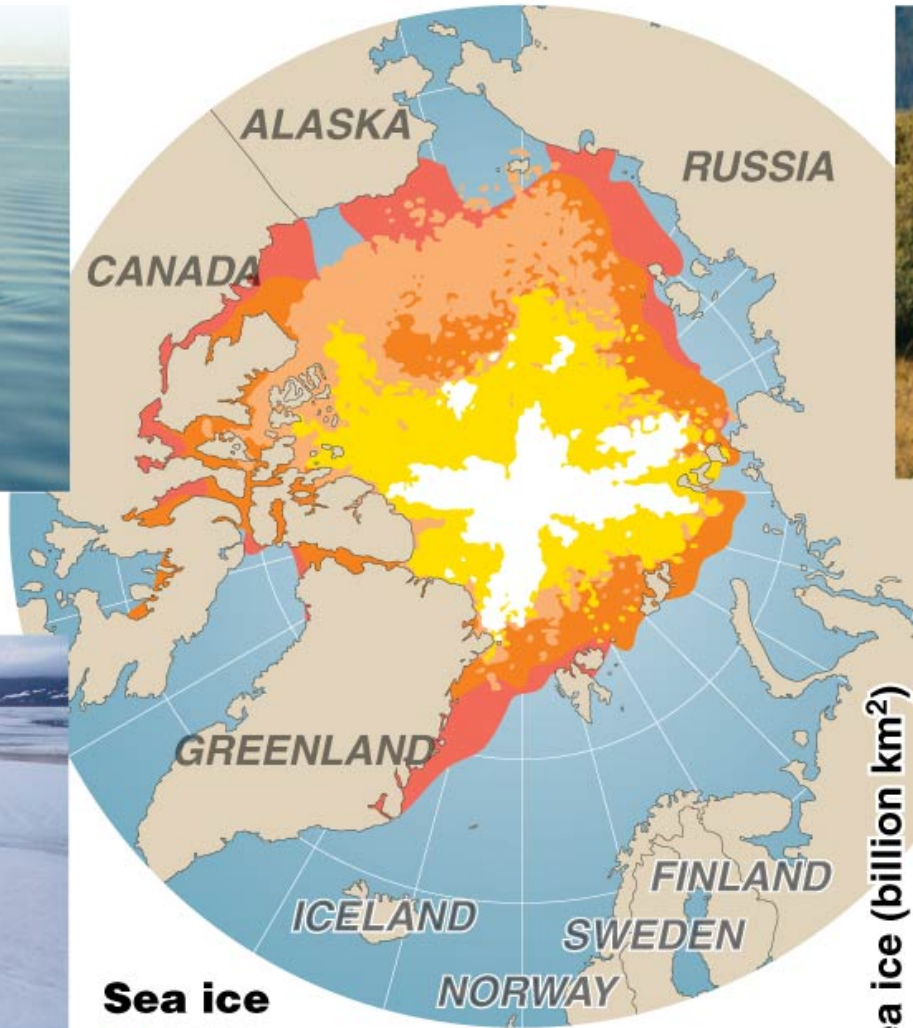
**Haynes
Glacier**

**Pope
Glacier**

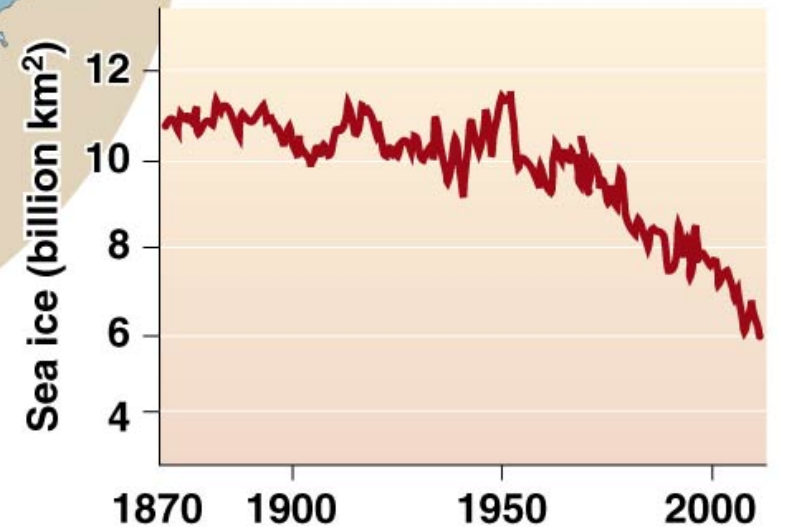
**Smith
Glacier**

**Kohler
Glacier**

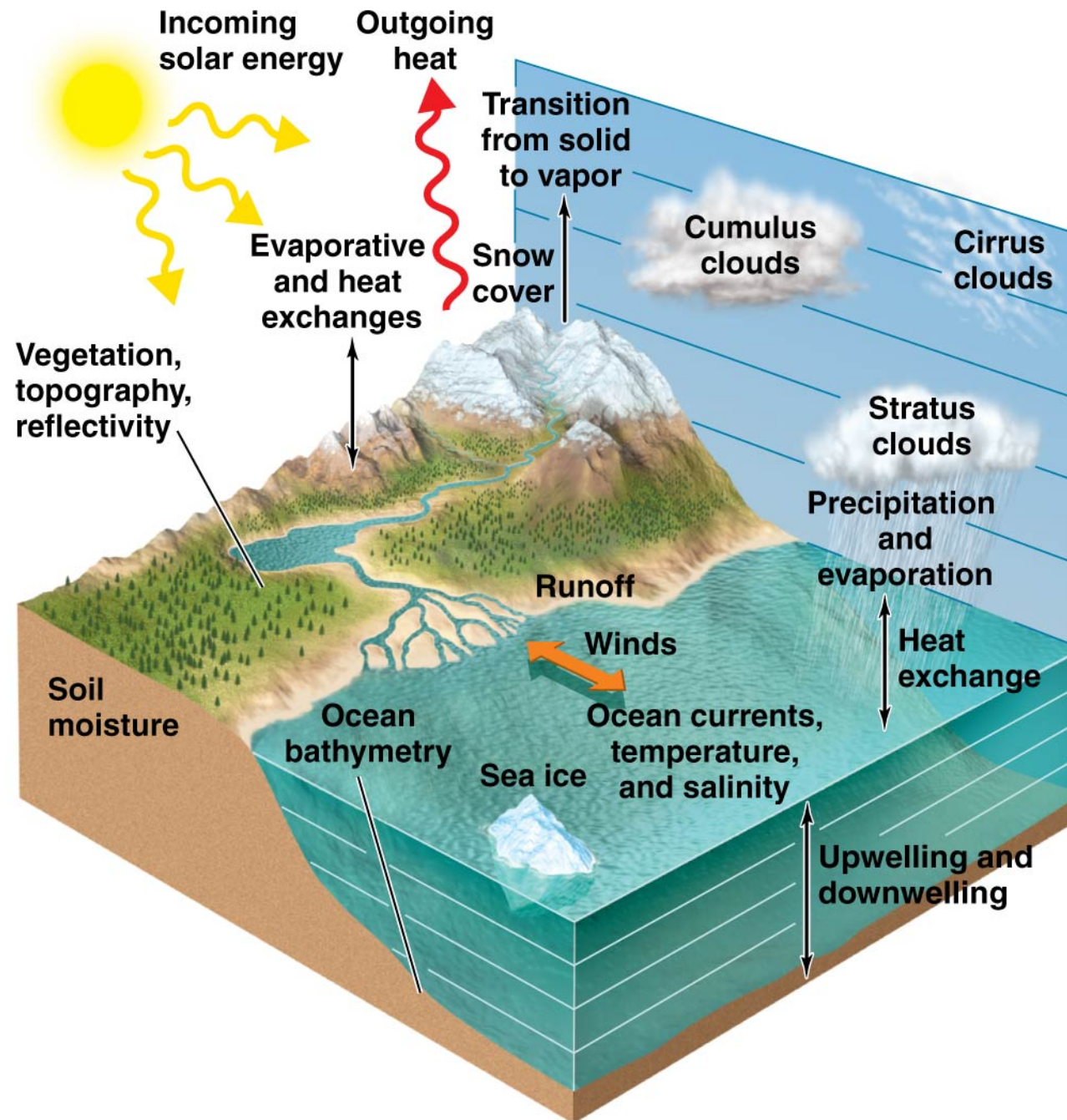


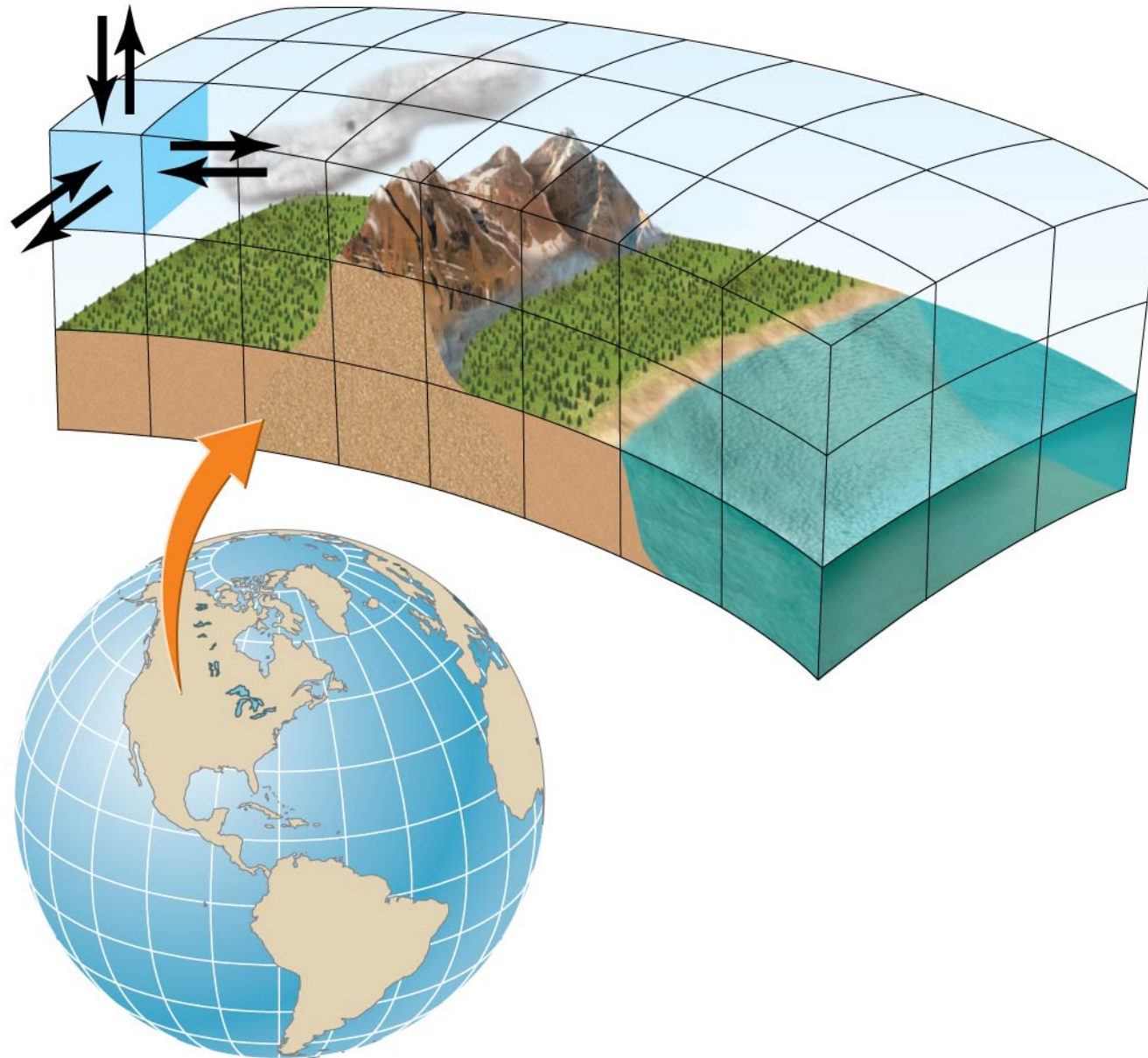


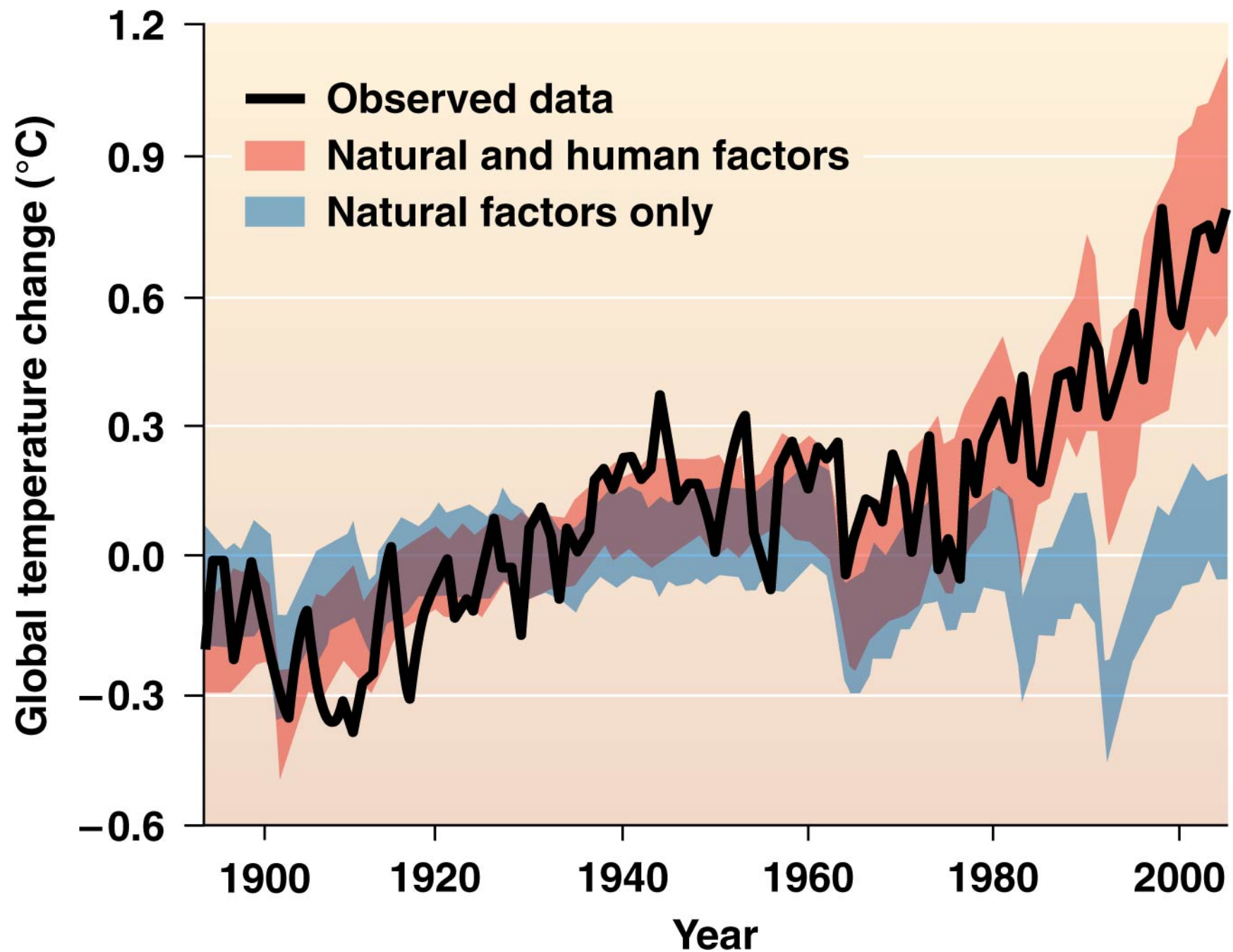
Sea ice

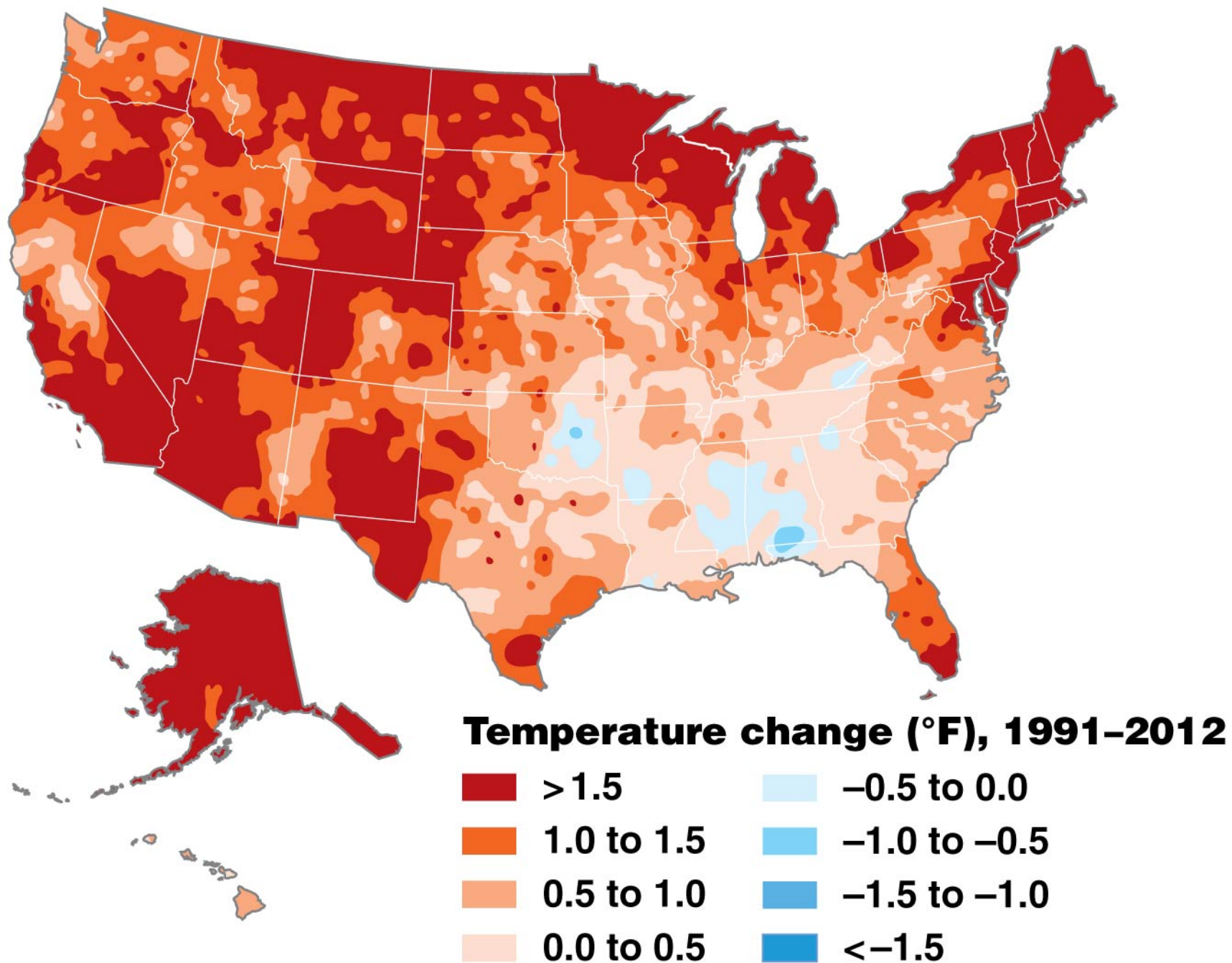


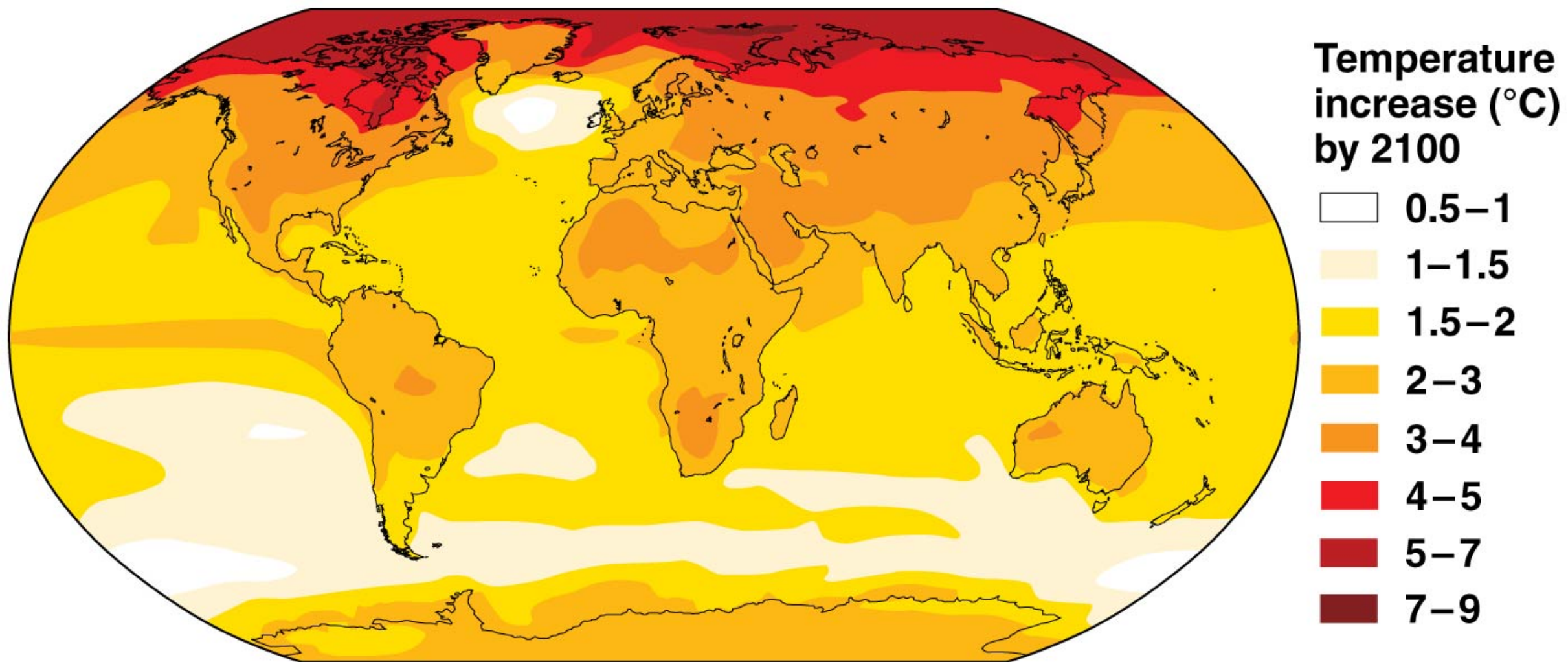


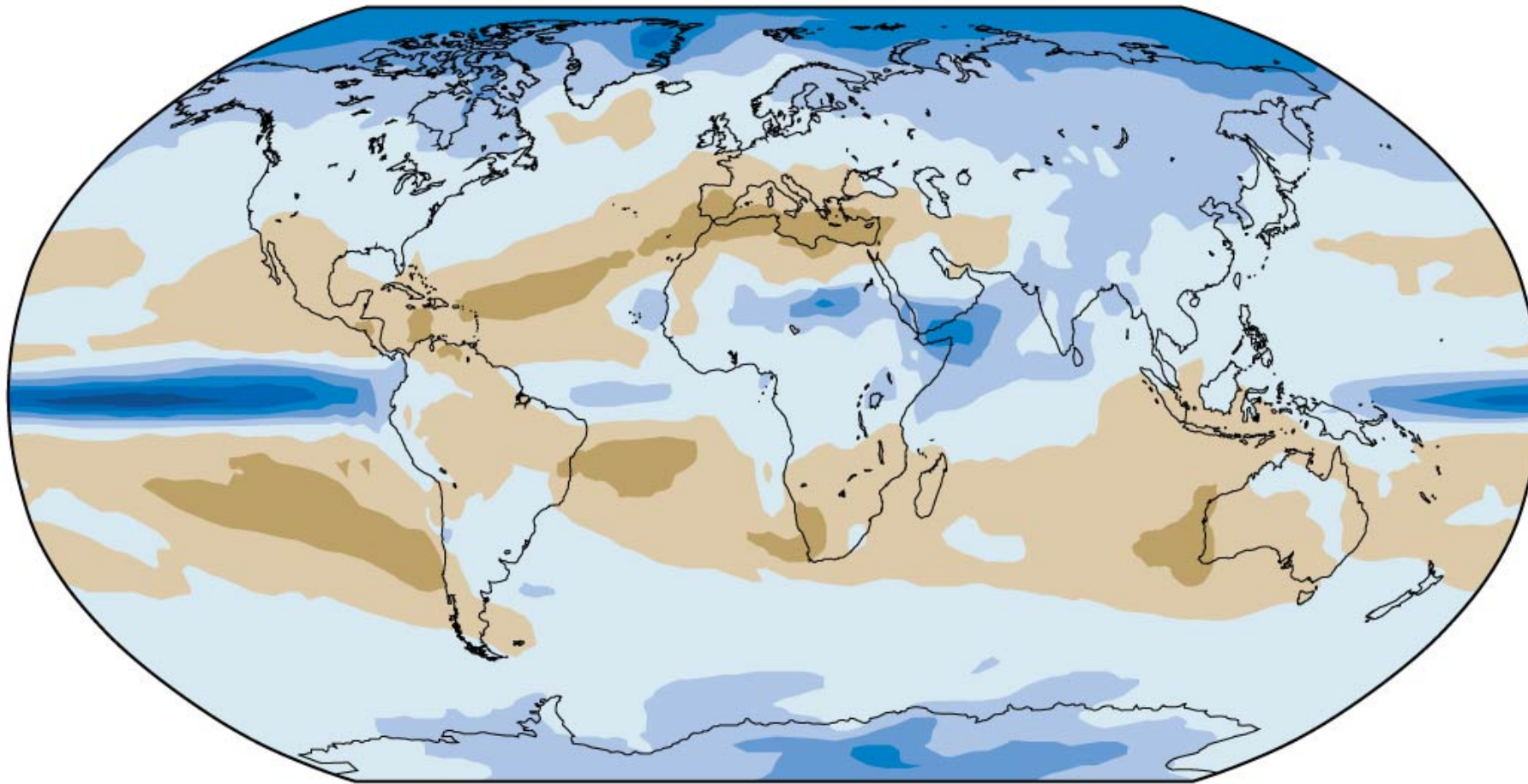














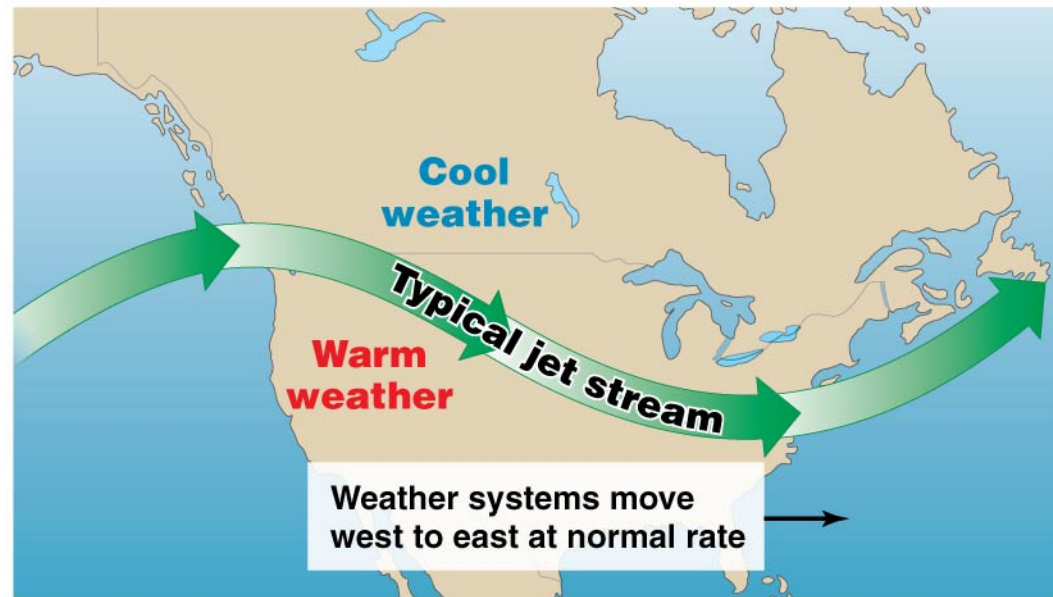




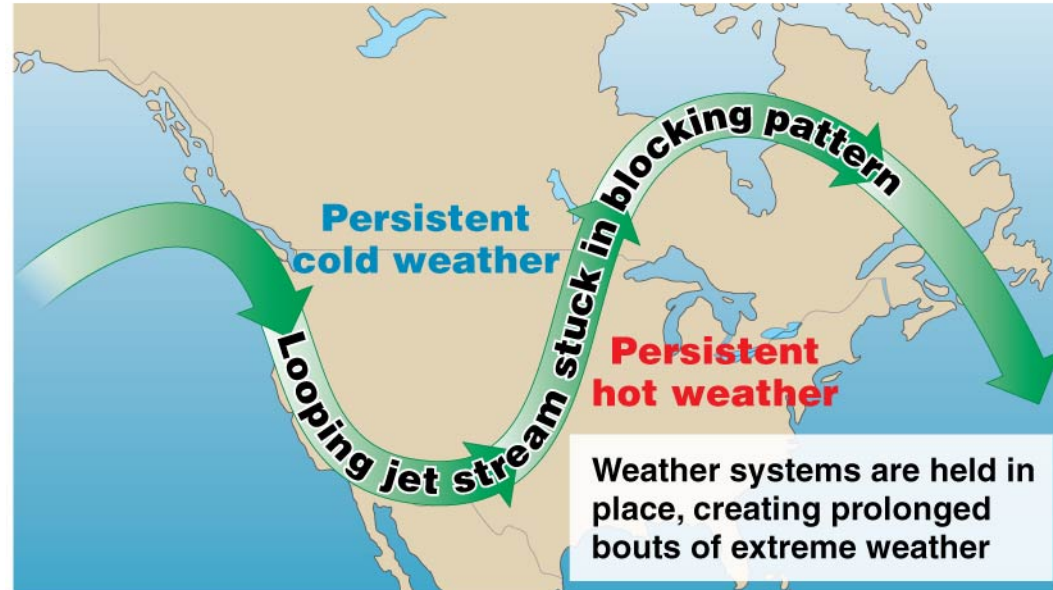


**Percent change in
precipitation by 2100**

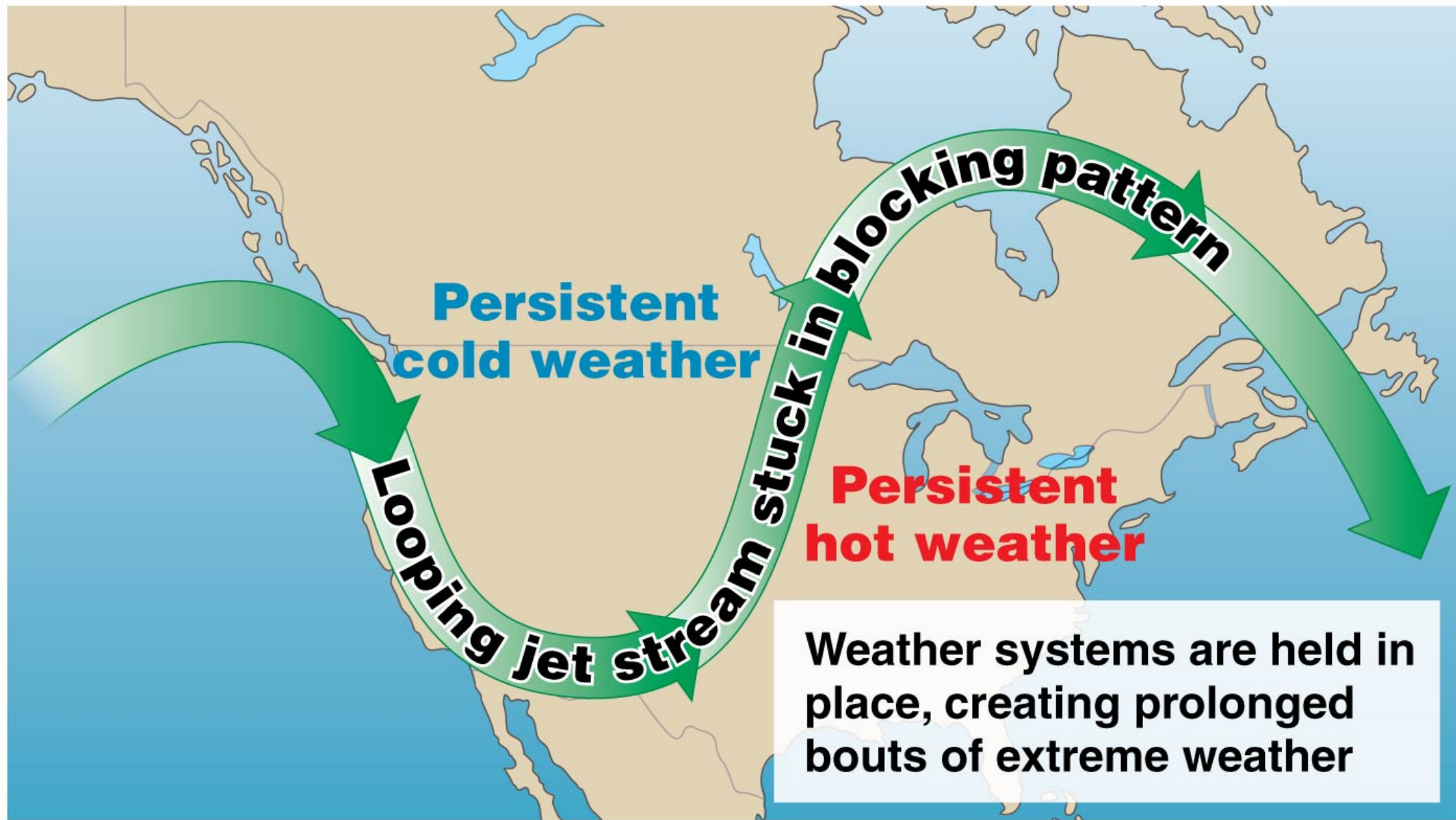
-  **10–20% decrease**
-  **0–10% decrease**
-  **0–10% increase**
-  **10–20% increase**
-  **20–30% increase**
-  **30–40% increase**
-  **40–50% increase**
-  **>50% increase**



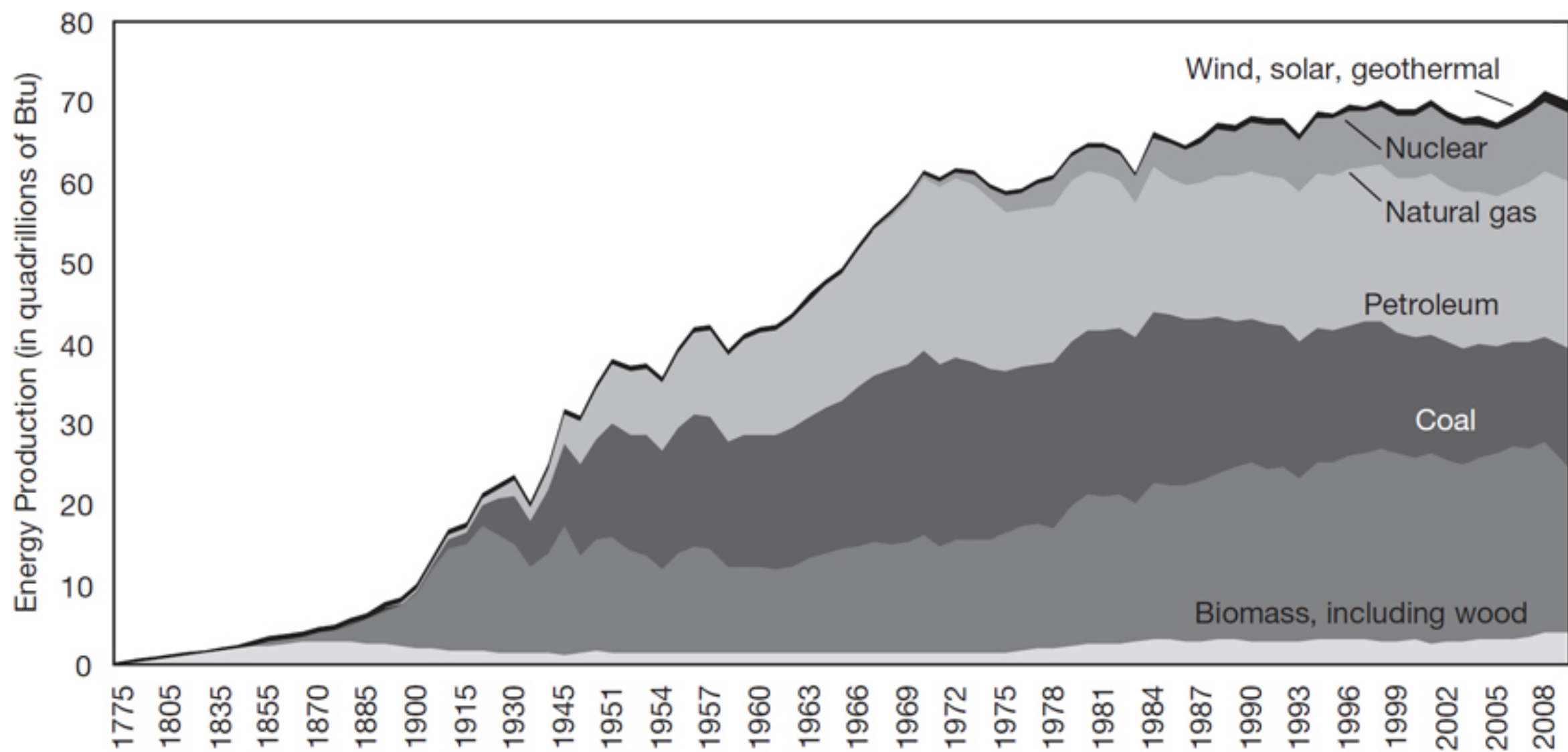
(a) Normal jet stream

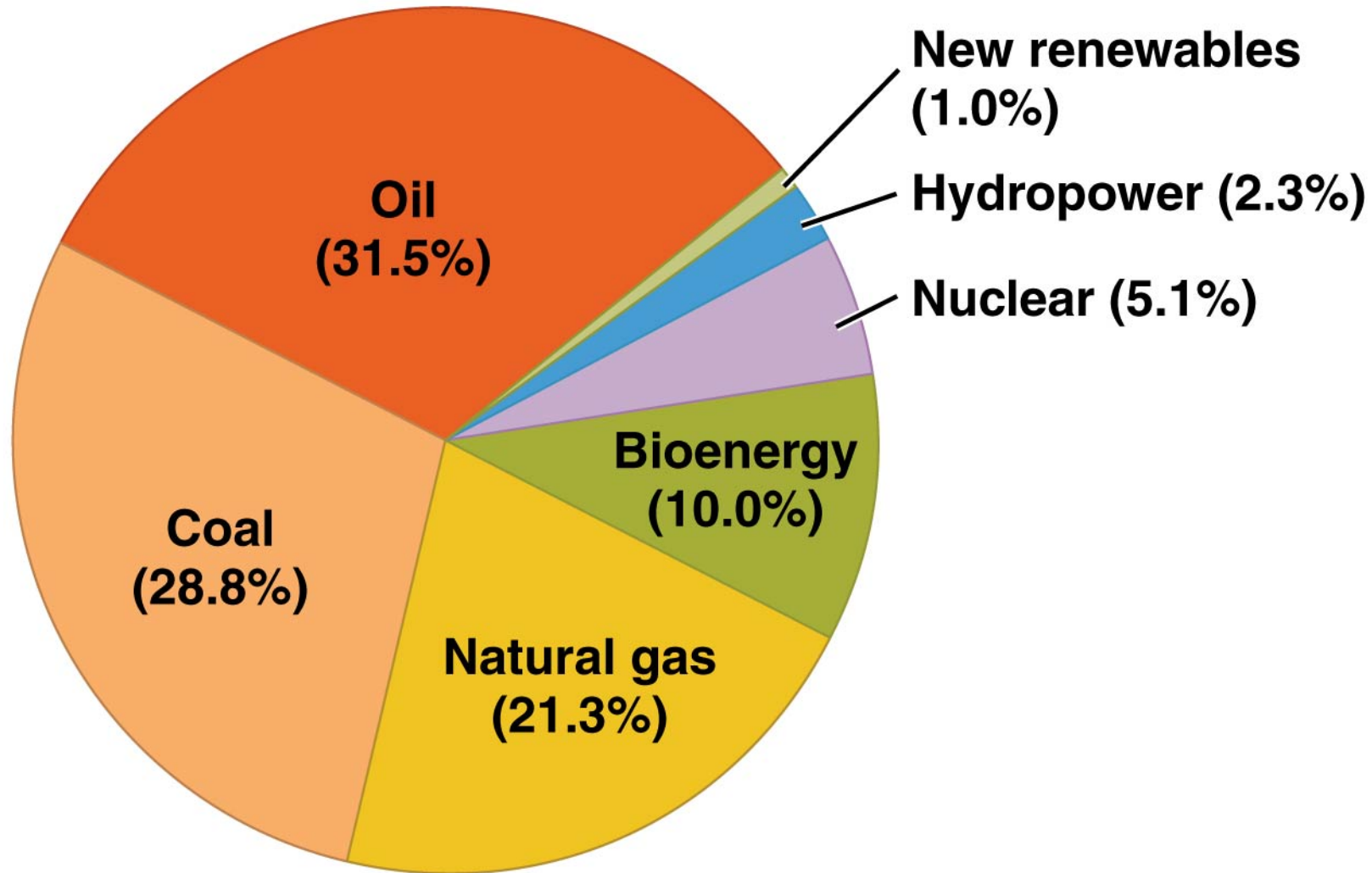


(b) Jet stream in March 2012

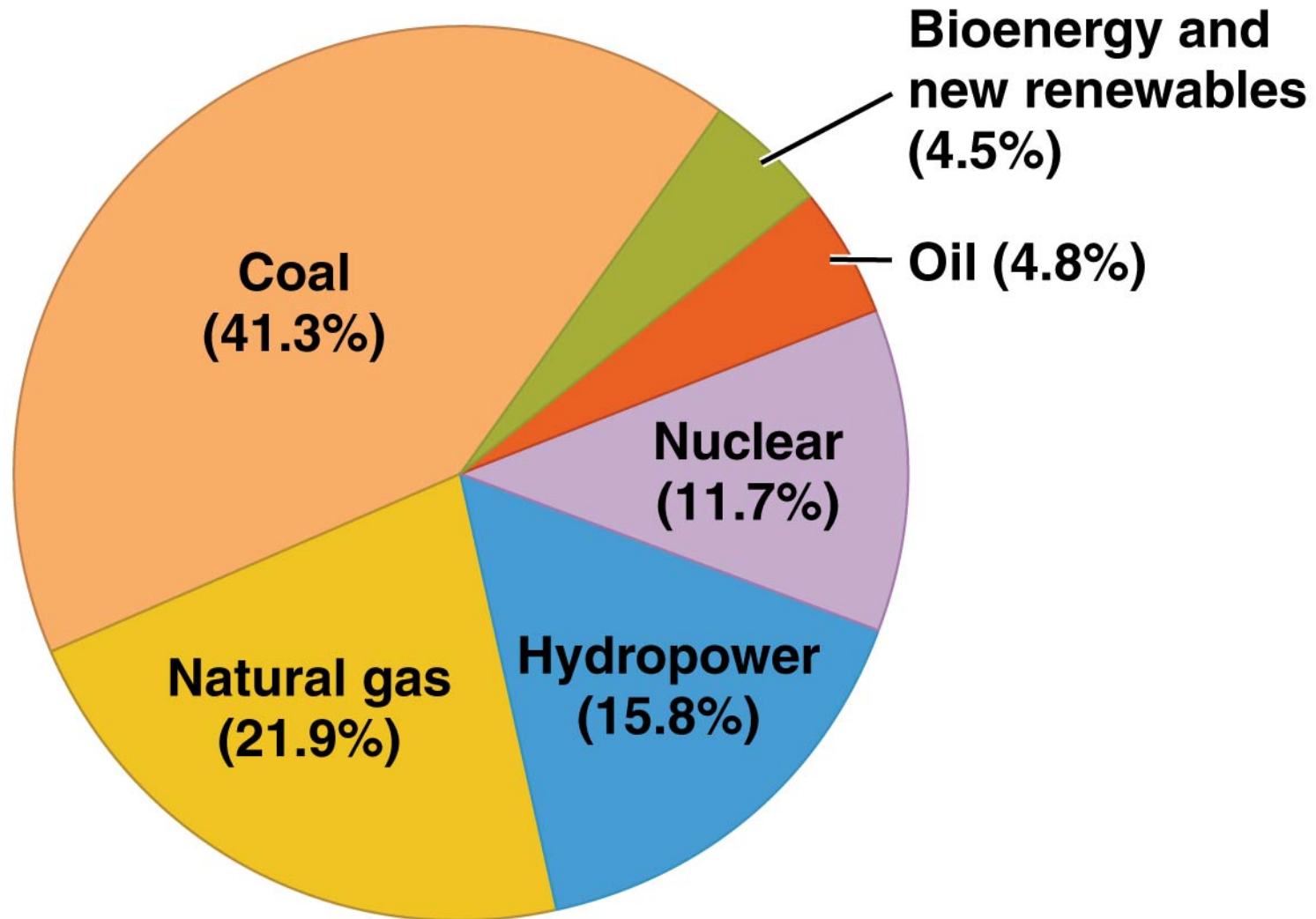


(b) Jet stream in March 2012

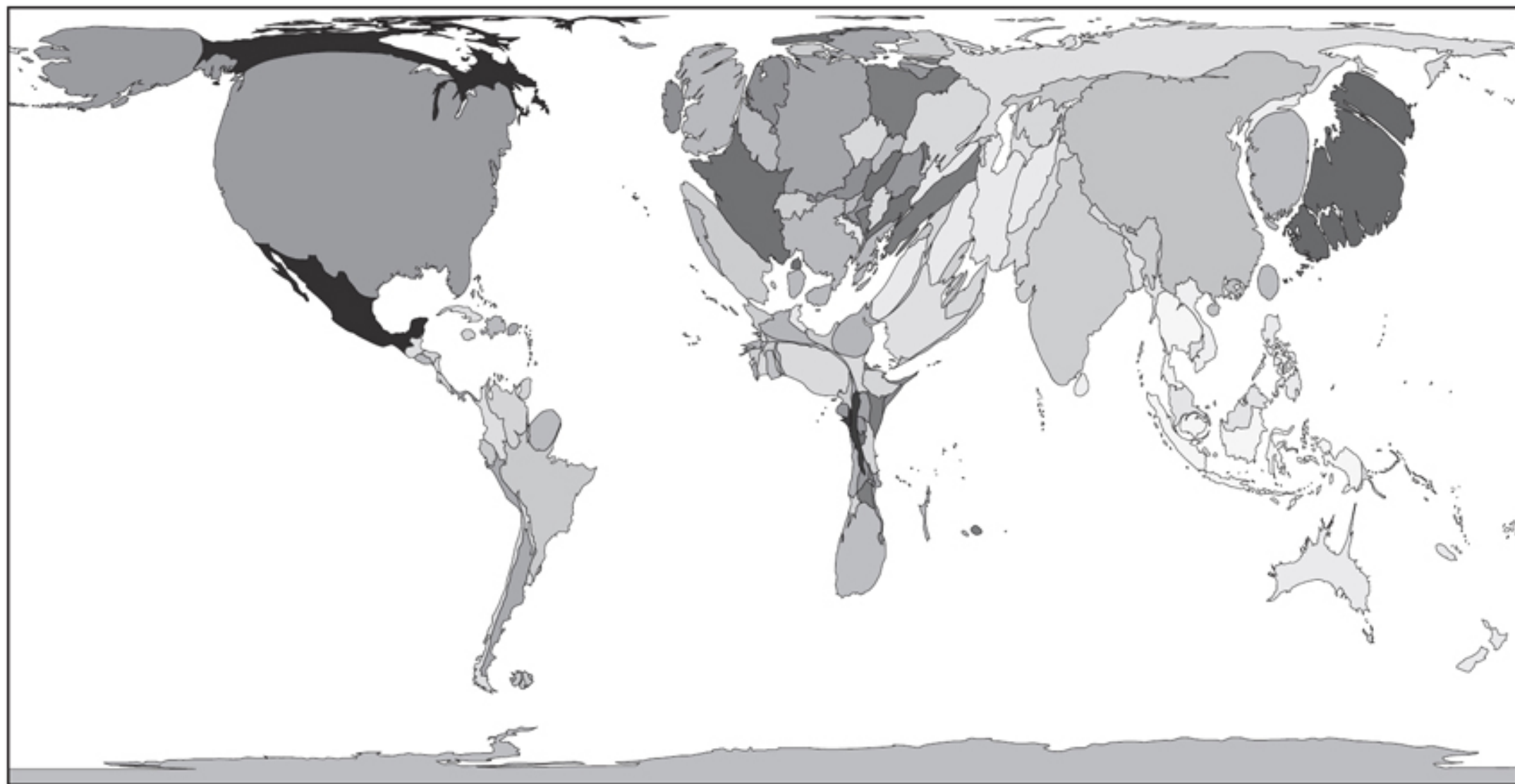


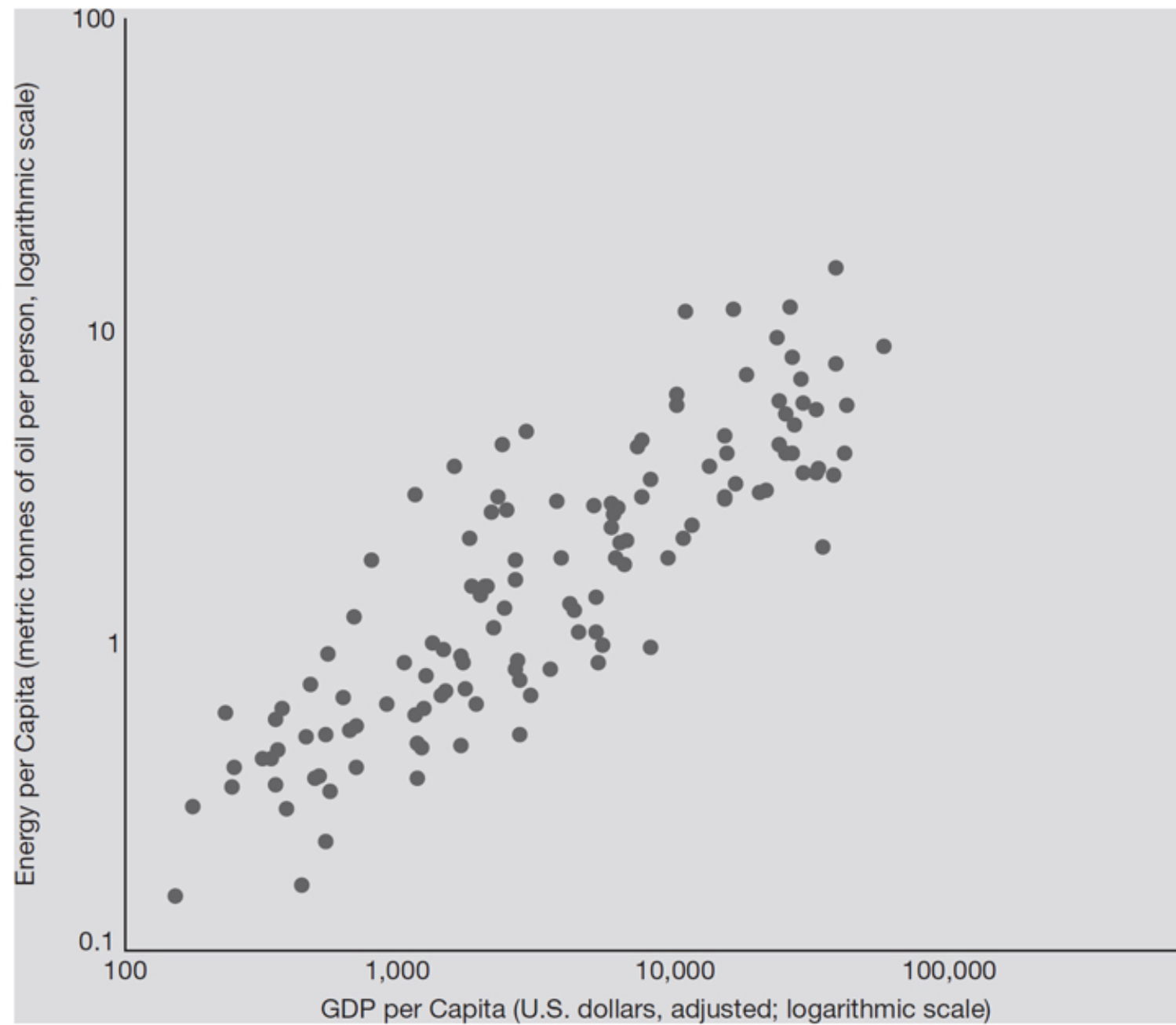


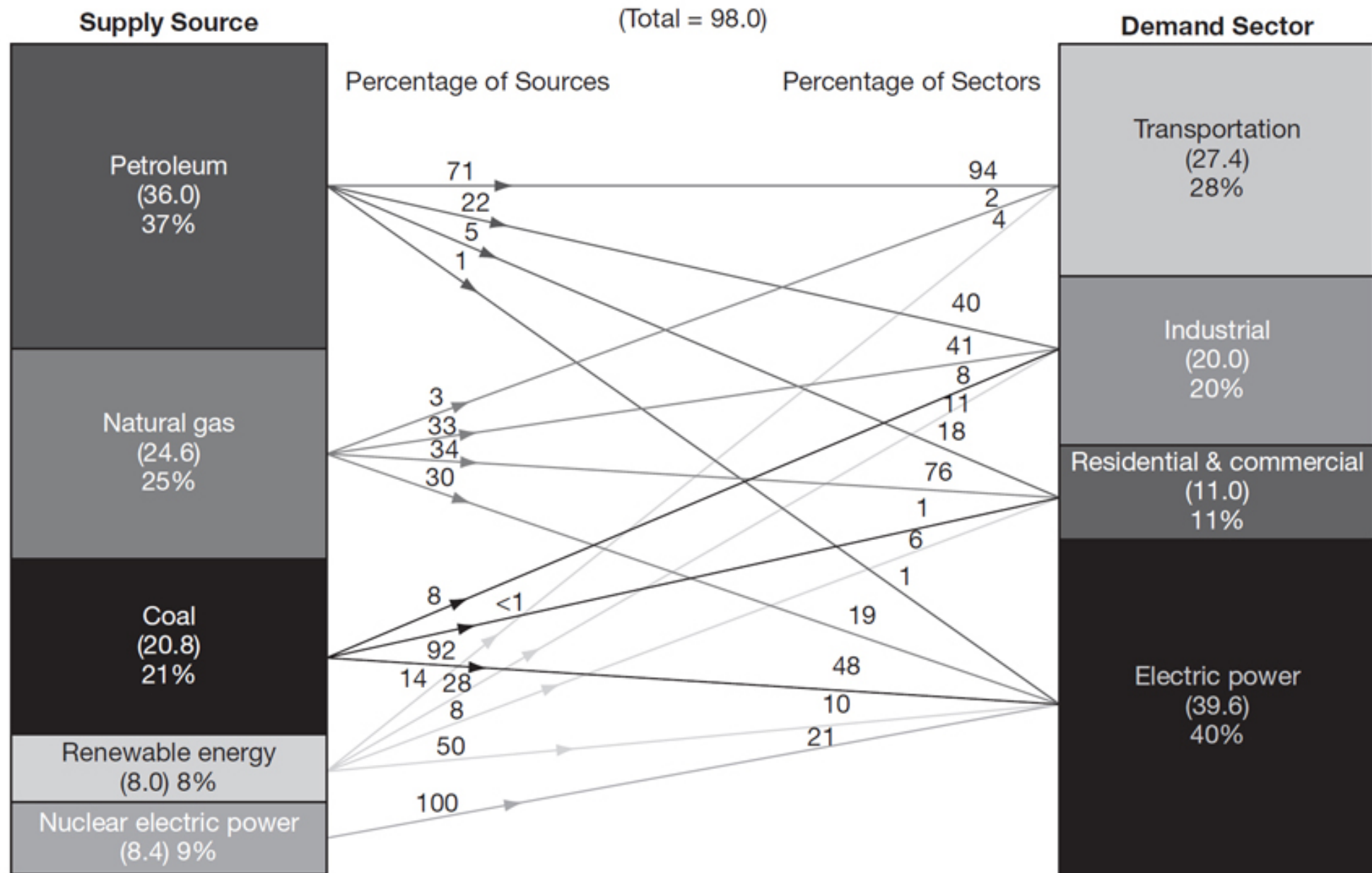
(a) World energy production, by source

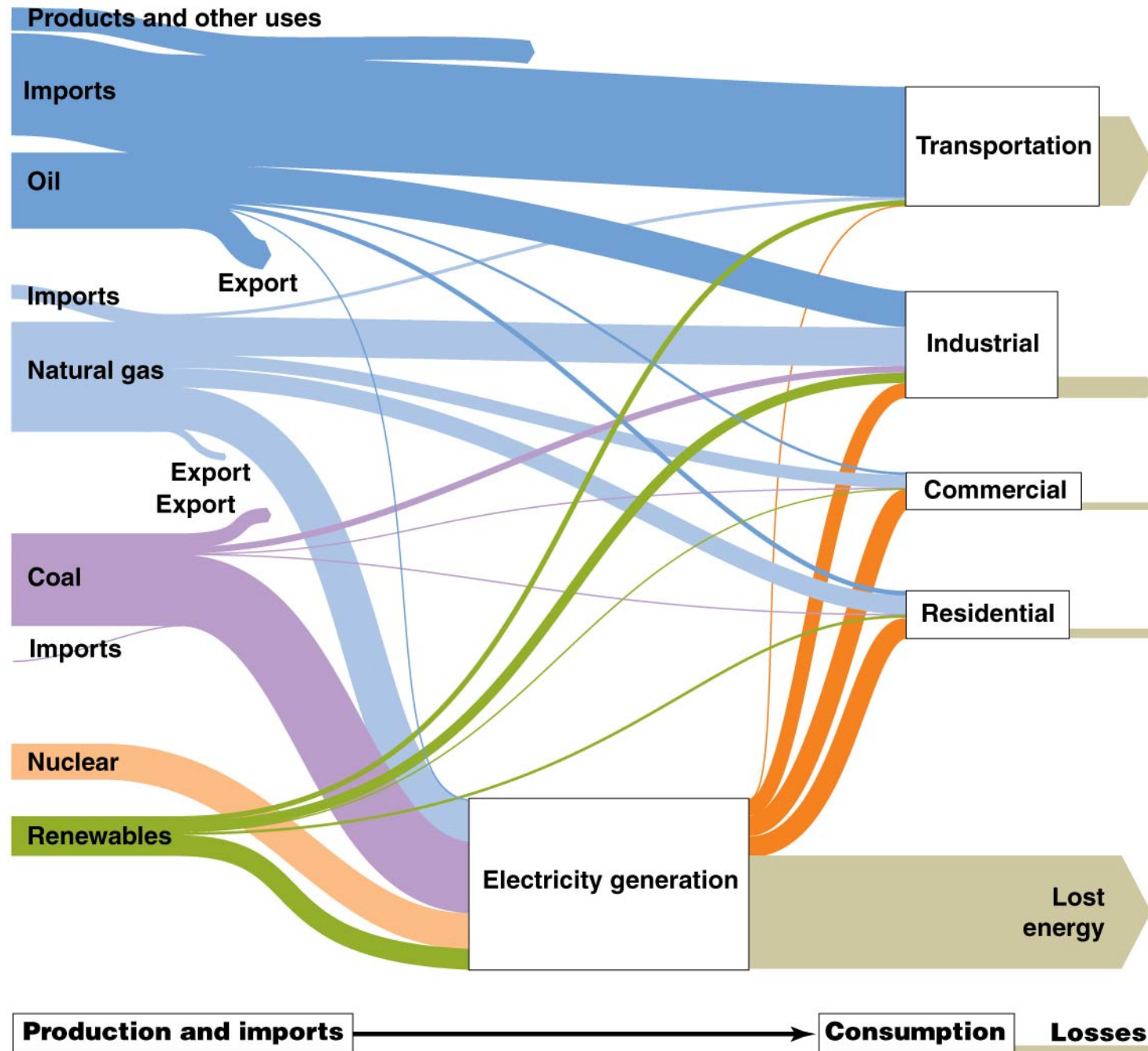


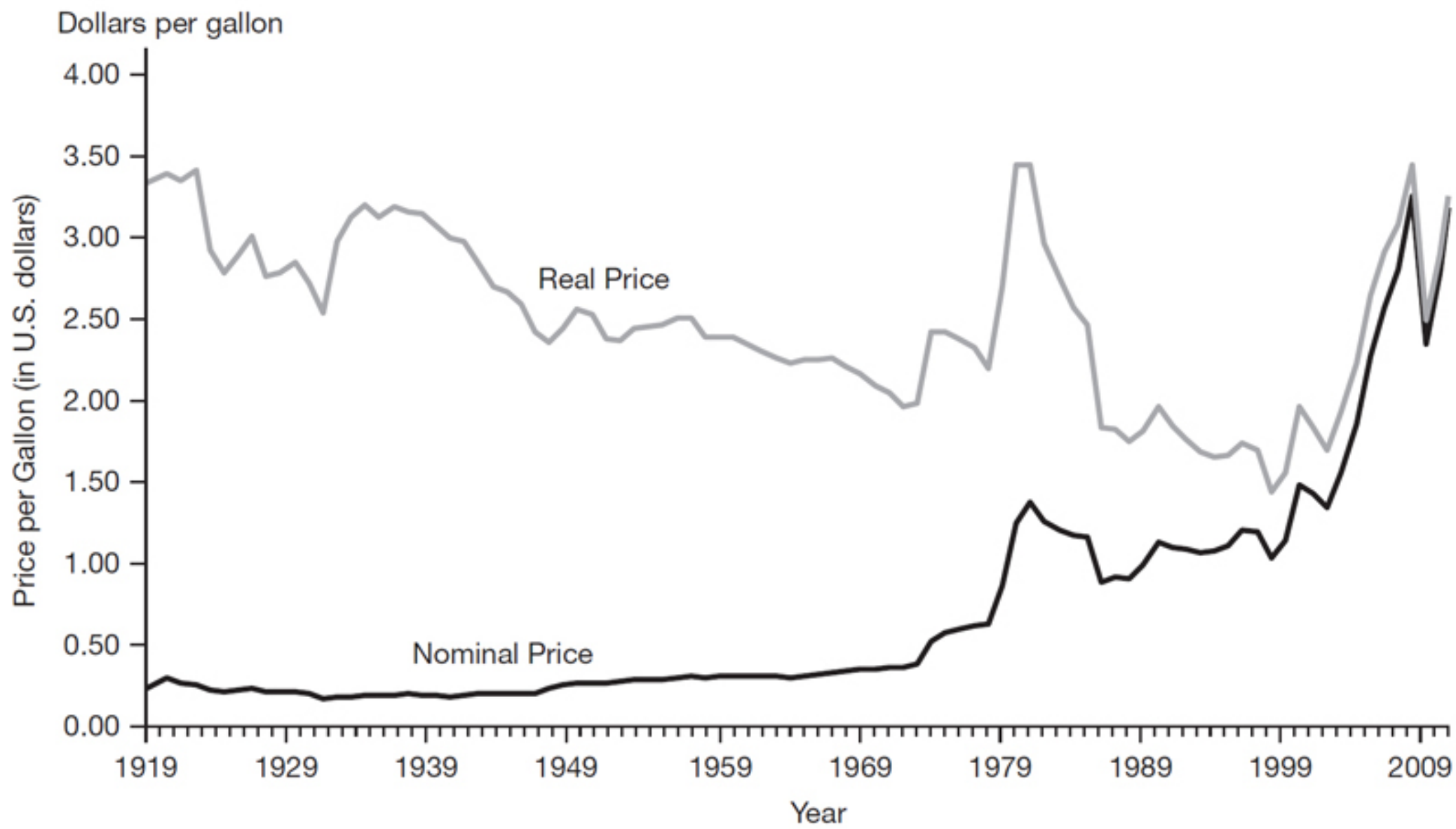
(b) World electricity generation, by source











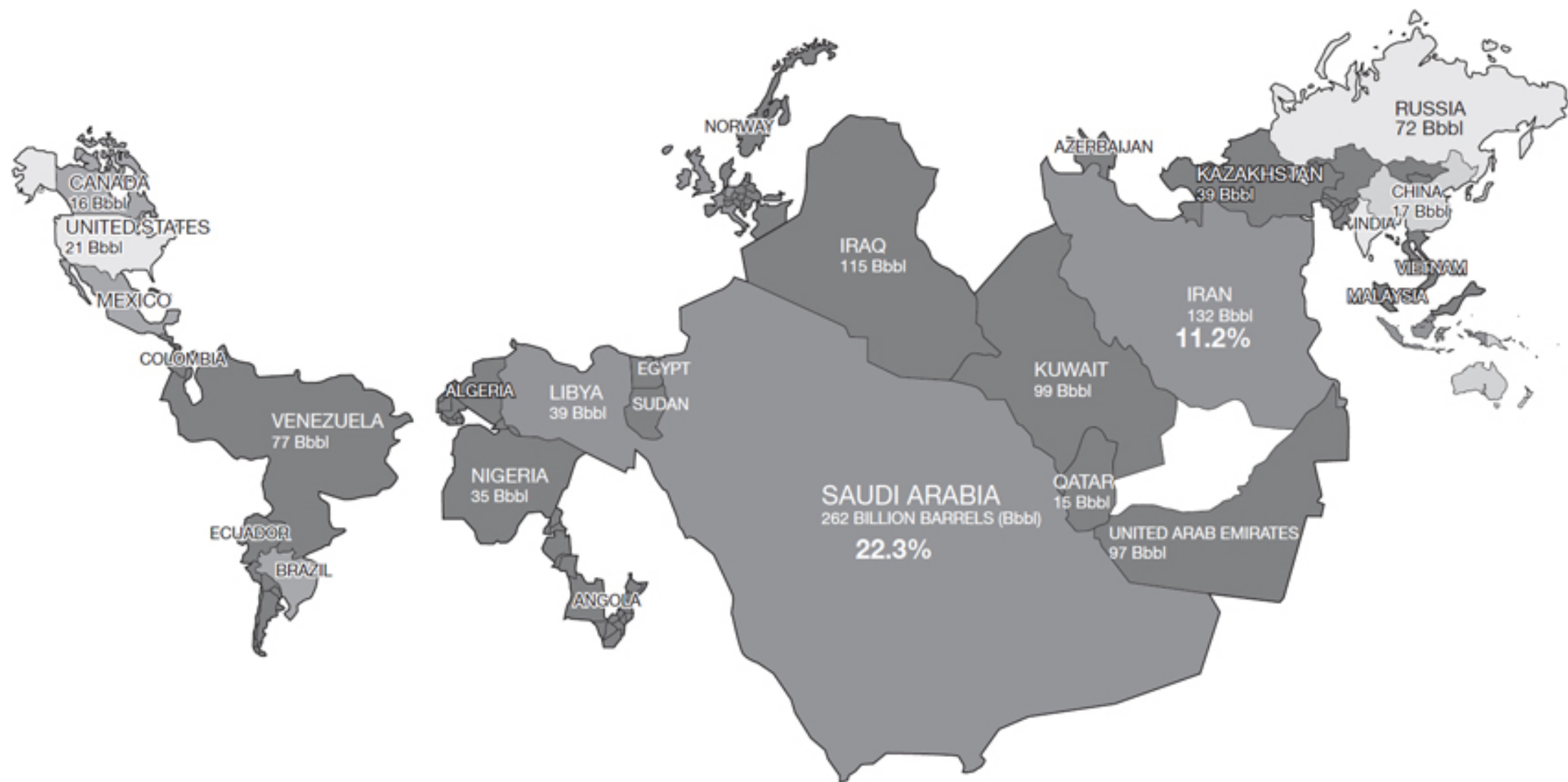
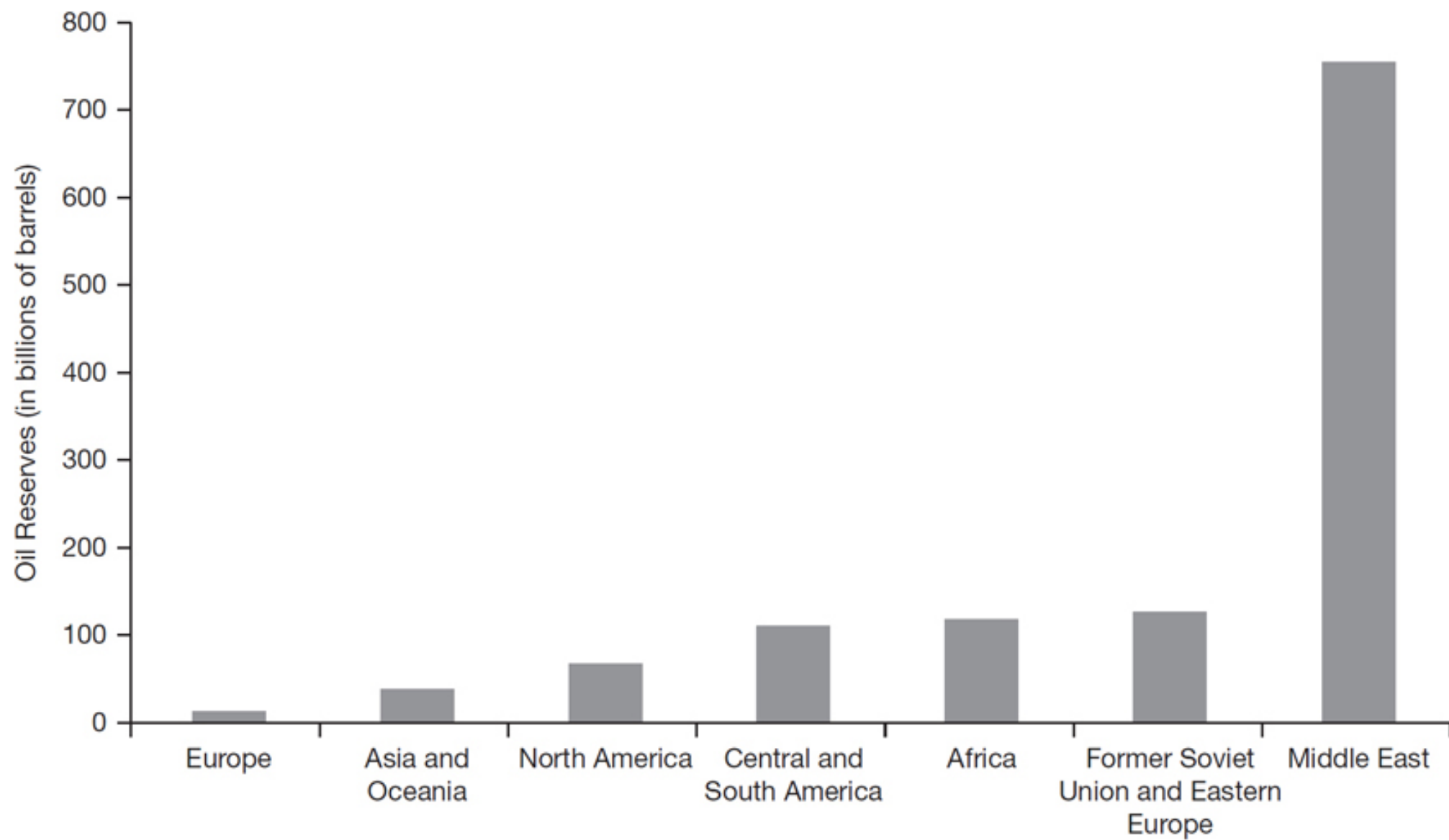


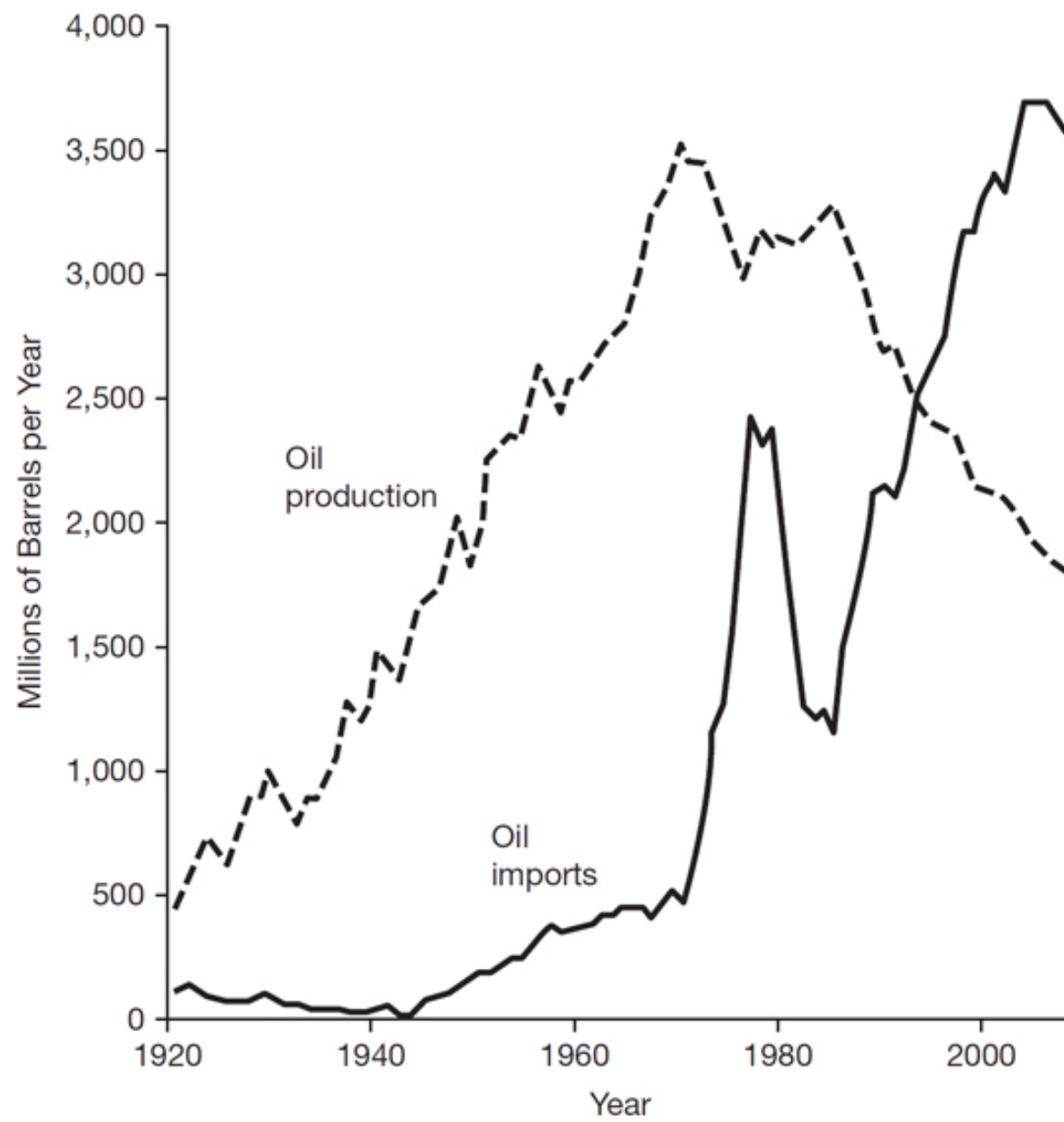
TABLE 15.3 Top Producers and Consumers of Fossil Fuels

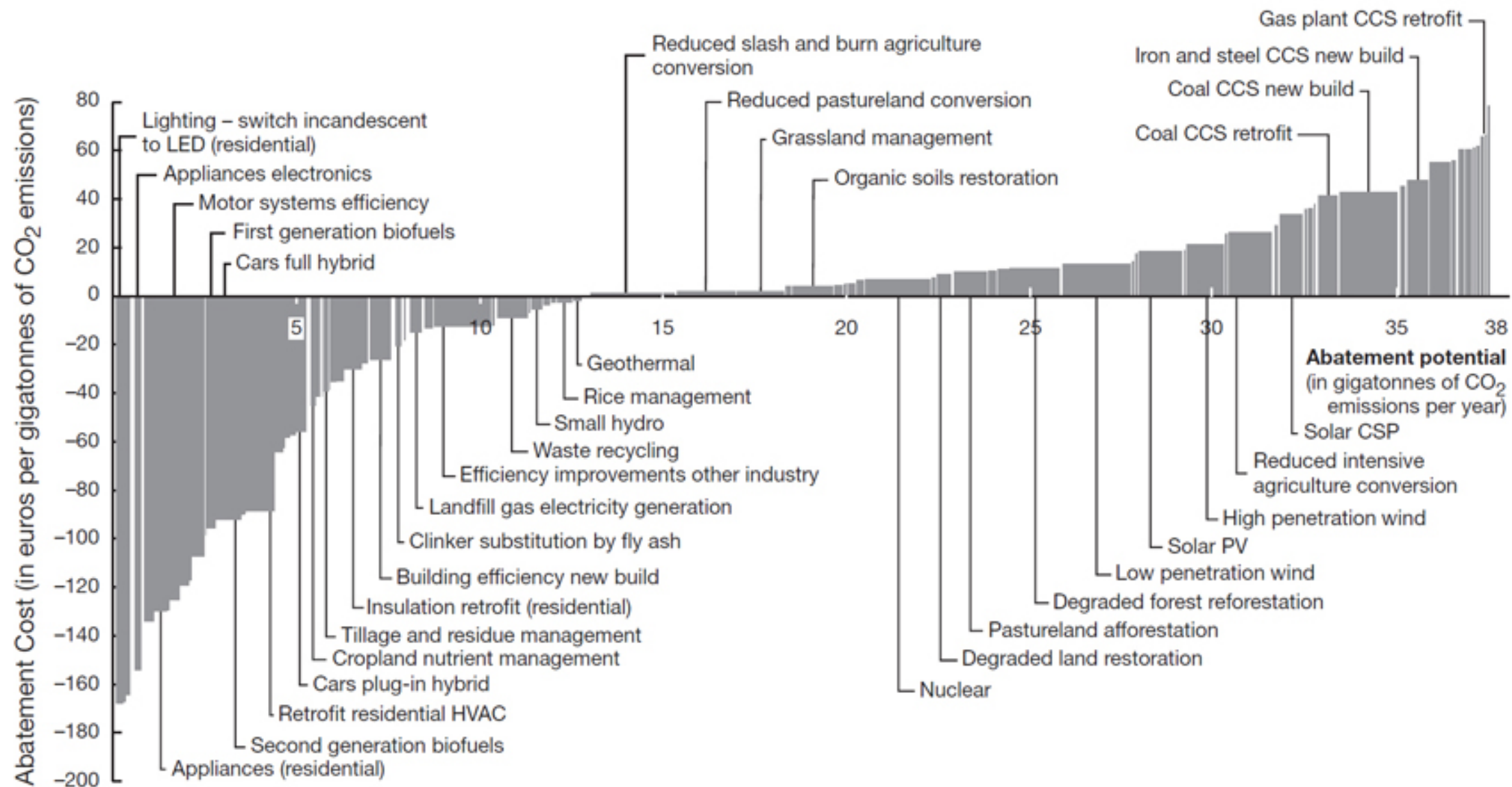
PRODUCTION (% world production)		CONSUMPTION (% world consumption)	
COAL			
China	47.4	China	50.3
United States	12.9	United States	11.9
Australia	6.9	India	8.5
Indonesia	6.7	Japan	3.4
India	5.9	Russia	2.4
OIL			
Saudi Arabia	13.1	United States	19.9
Russia	12.9	China	12.1
United States	10.8	Japan	5.0
China	5.0	India	4.2
Canada	4.7	Russia	3.7
NATURAL GAS			
United States	20.6	United States	22.2
Russia	17.9	Russia	12.3
Iran	4.9	Iran	4.8
Qatar	4.7	China	4.8
Canada	4.6	Japan	3.5

Data from BP p.l.c., 2014. Statistical review of world energy 2014.

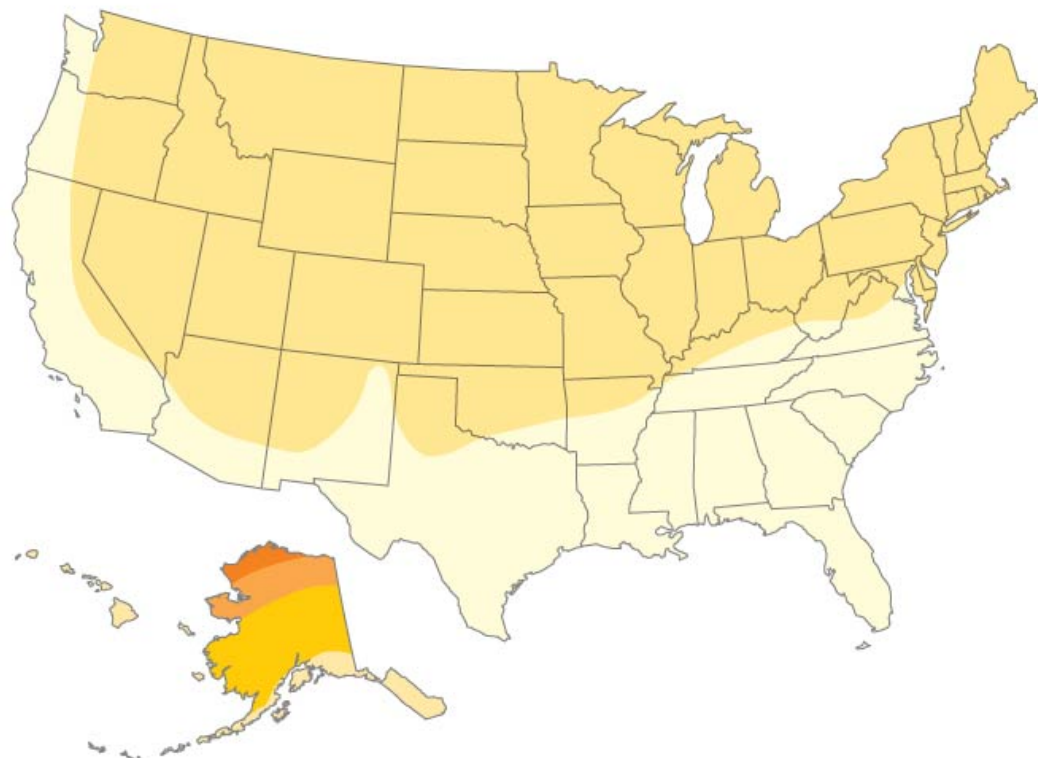




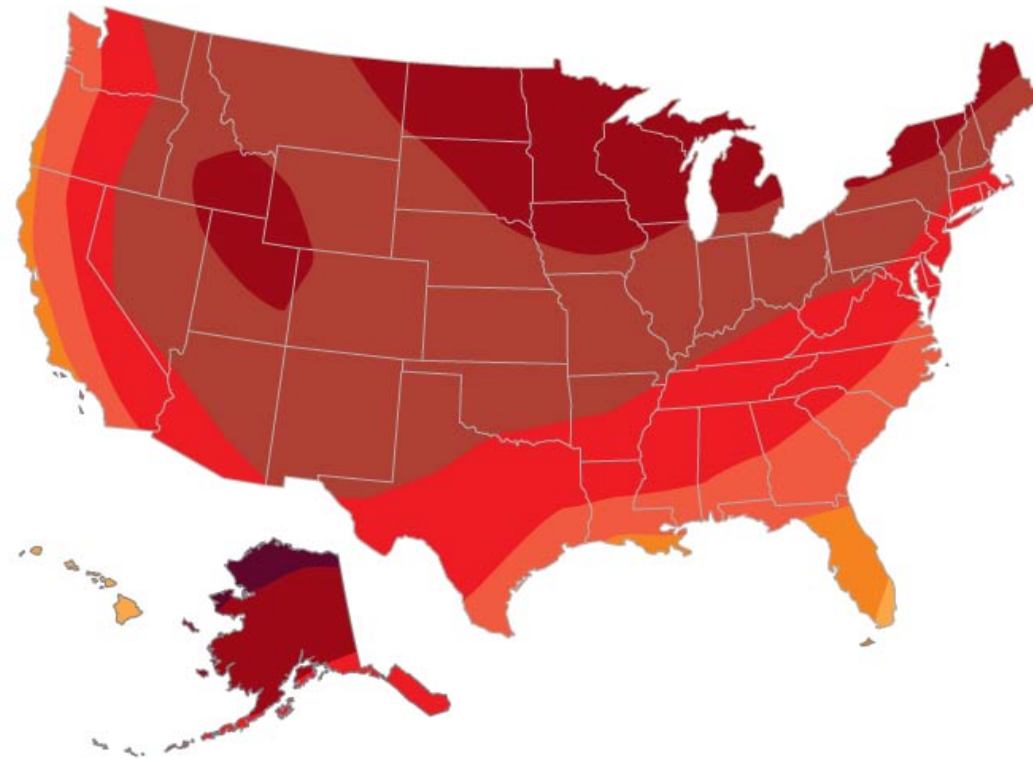




Reduced Emissions Scenario
Projected Temperature Change (°F)
End-of-Century (2071–2099 average)

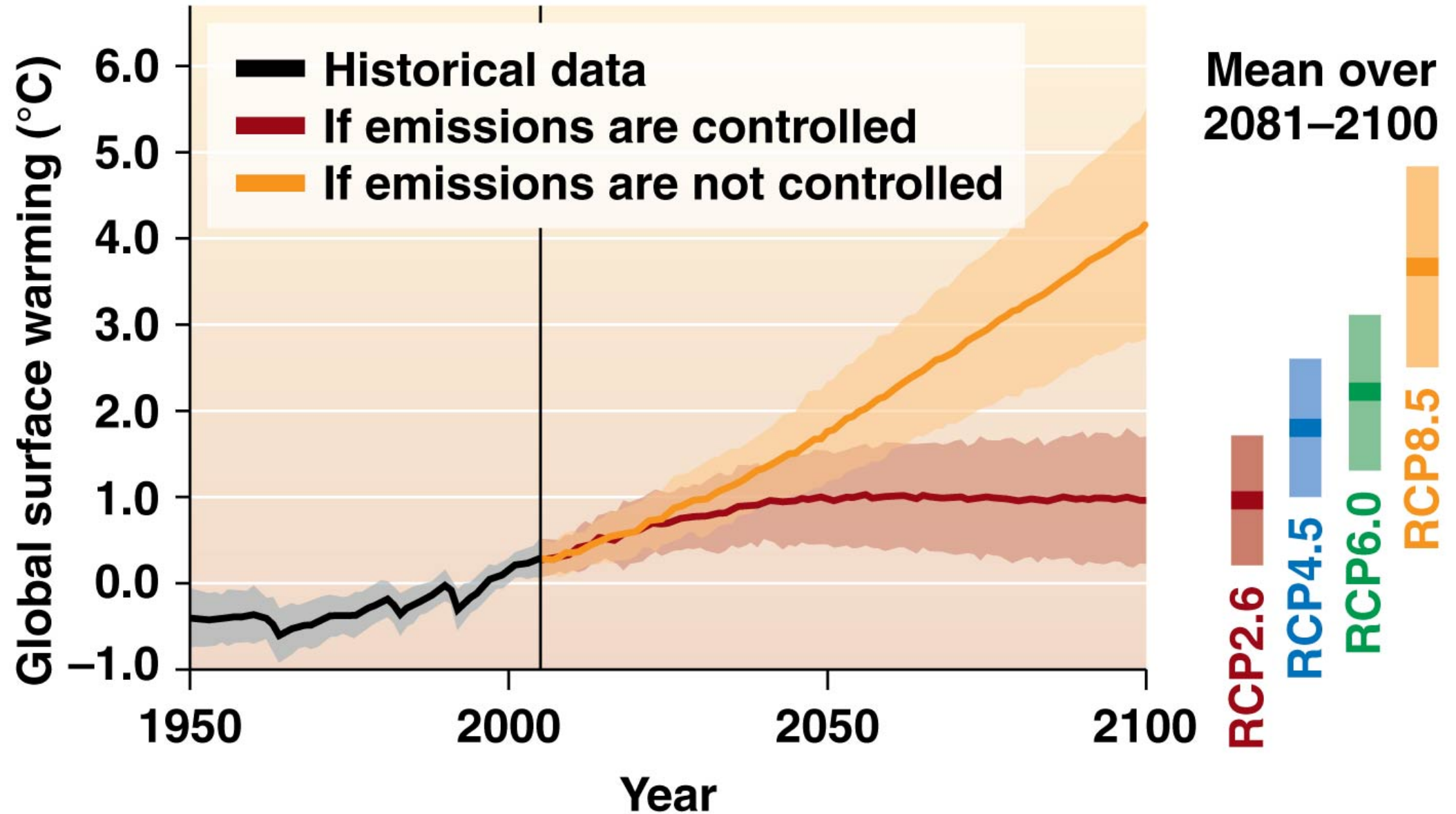


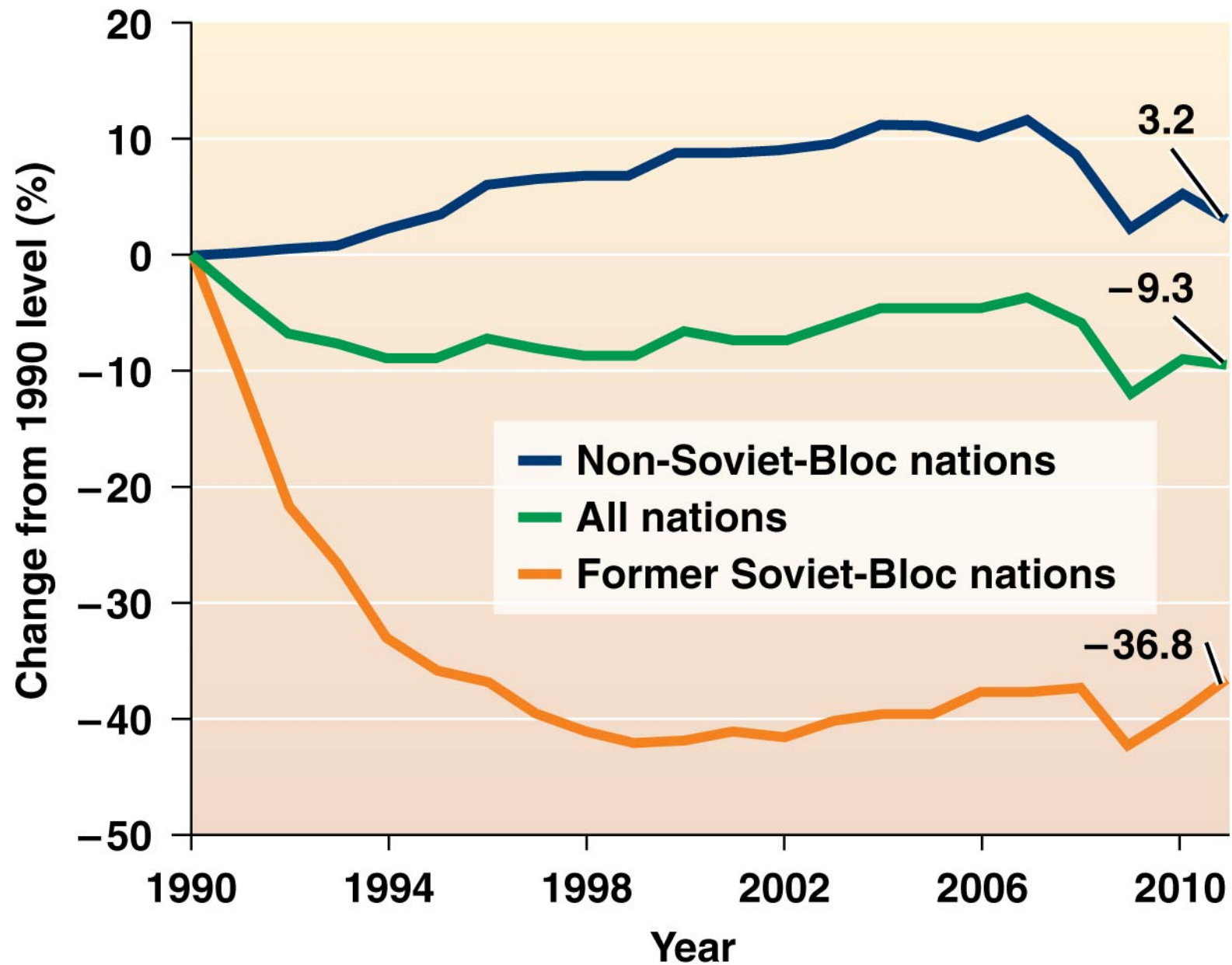
Continued Emissions Scenario
Projected Temperature Change (°F)
End-of-Century (2071–2099 average)



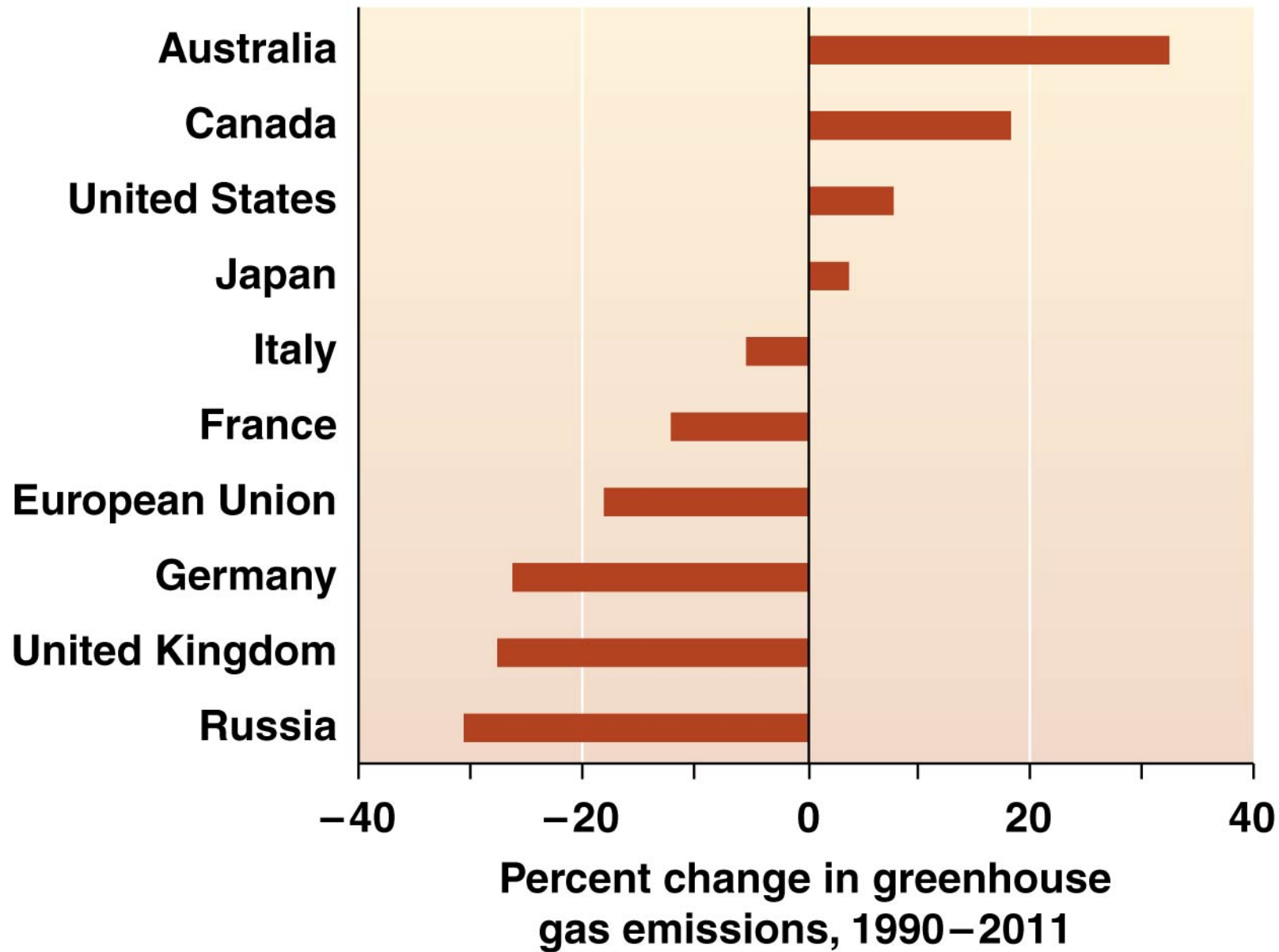
Temperature change (°F)







(a) Emissions through time since the Kyoto Protocol



(b) Changes in emissions since the Kyoto Protocol



