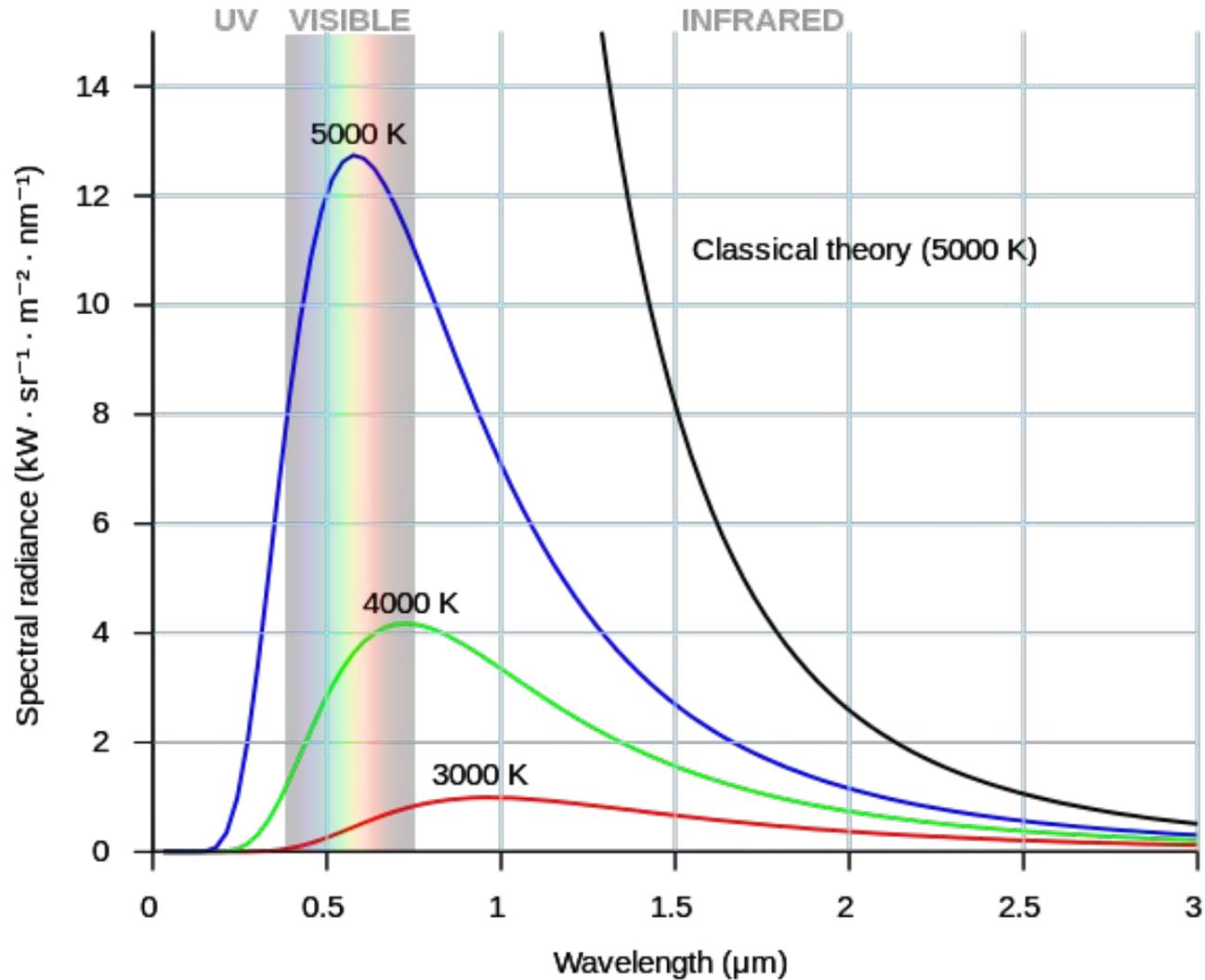


# Climate

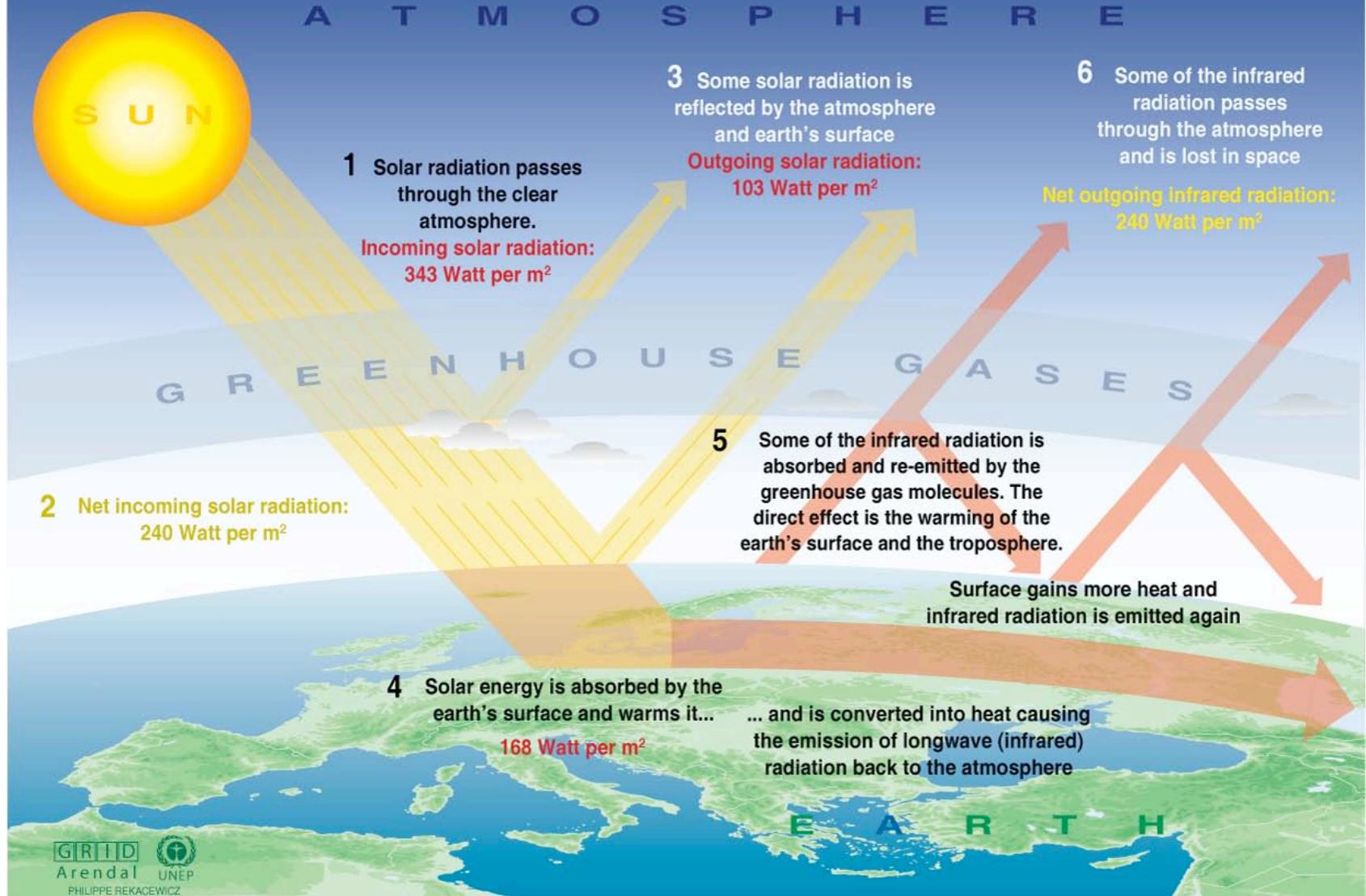
12.001 – 28 November 2012

# Black body curve



Courtesy of [Darth Kule](#). Figure in the public domain.

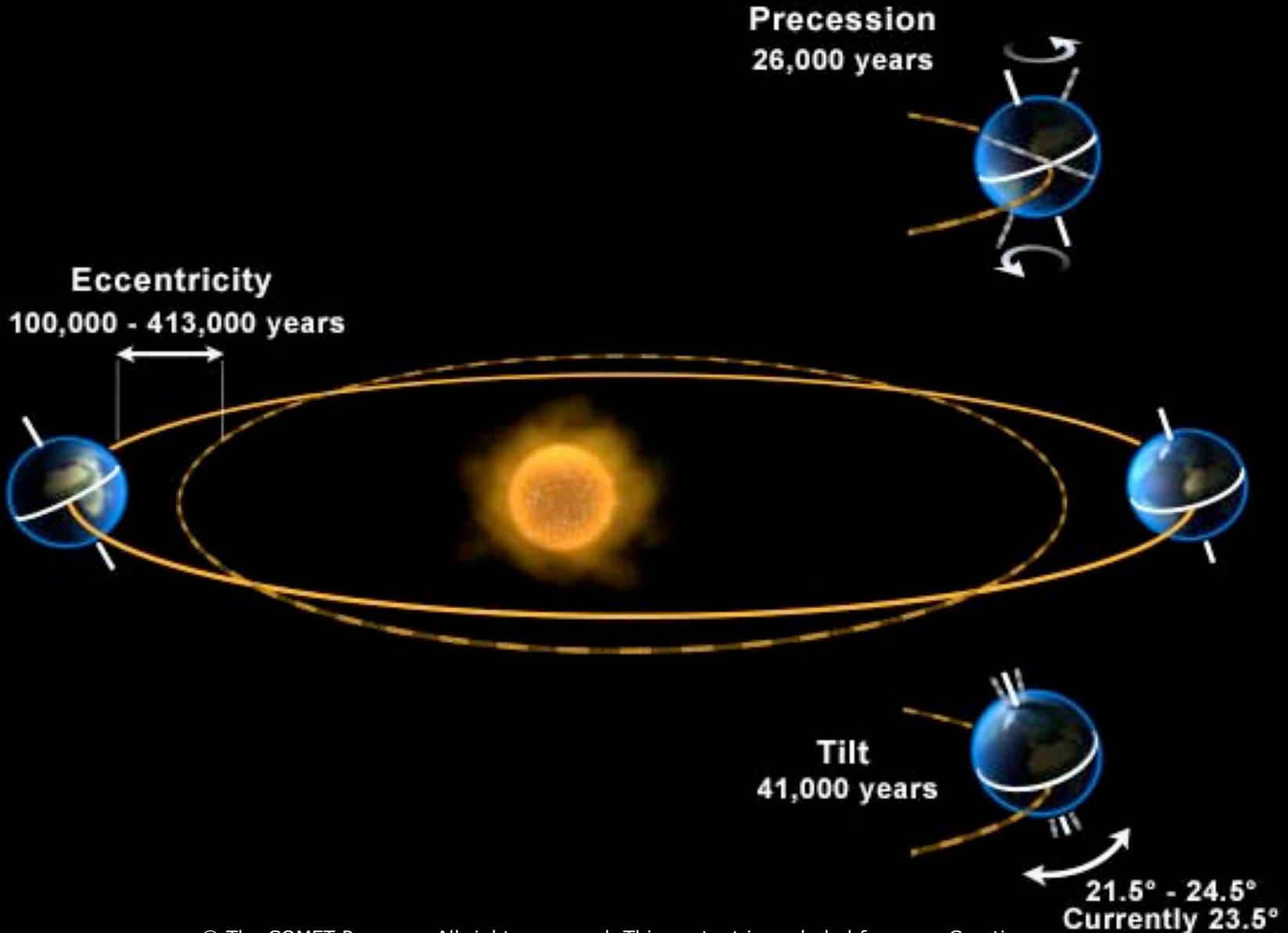
# The Greenhouse effect



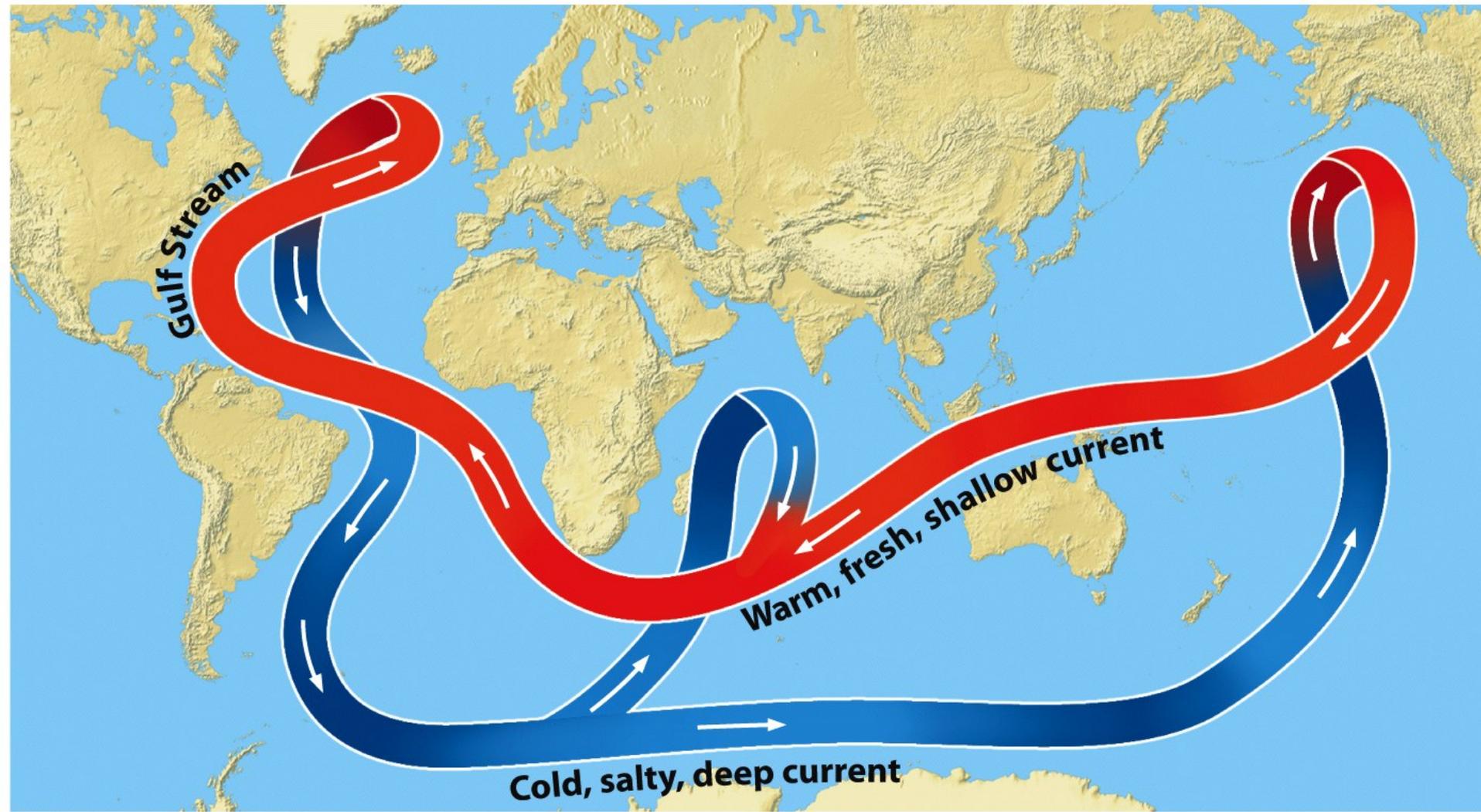
Sources: Okanagan university college in Canada, Department of geography, University of Oxford, school of geography; United States Environmental Protection Agency (EPA), Washington; Climate change 1995, The science of climate change, contribution of working group 1 to the second assessment report of the intergovernmental panel on climate change, UNEP and WMO, Cambridge university press, 1996.

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# Milankovitch Cycles



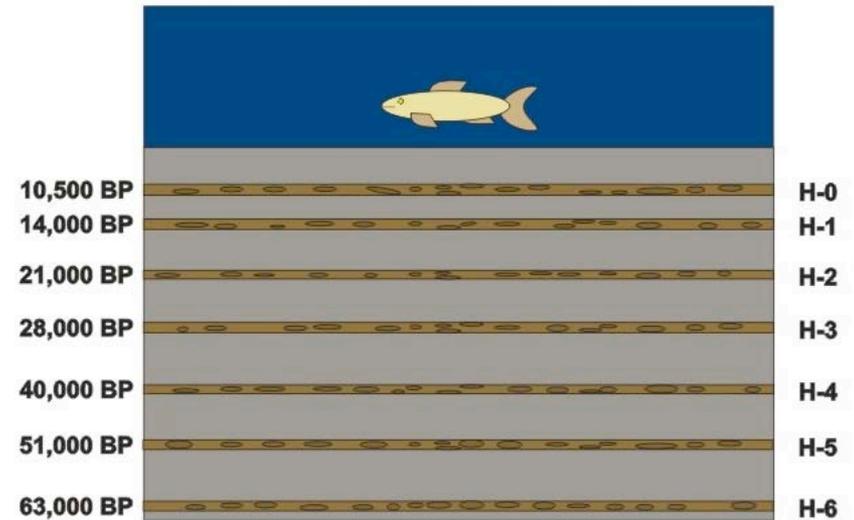
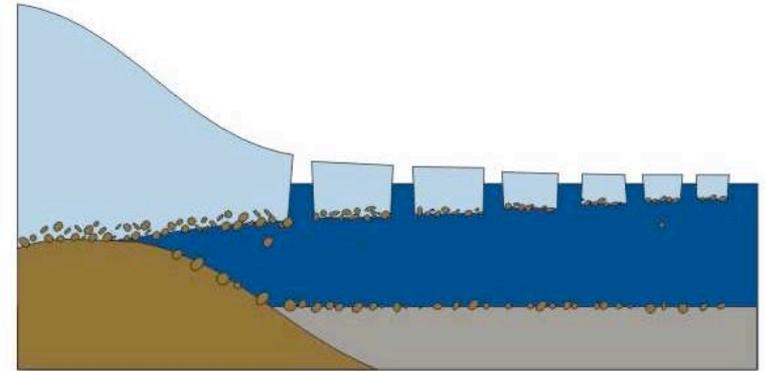
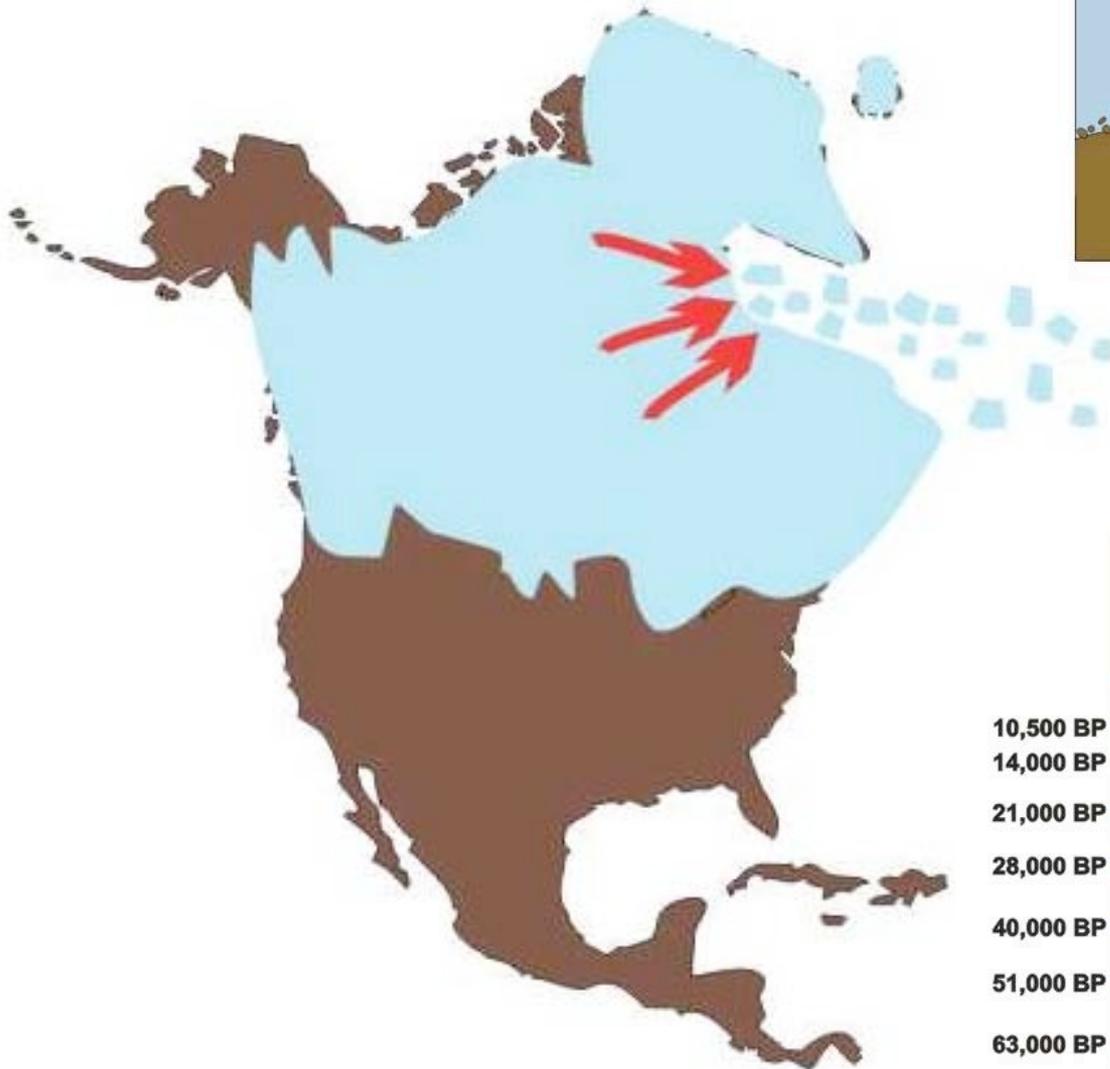
# Thermohaline Circulation



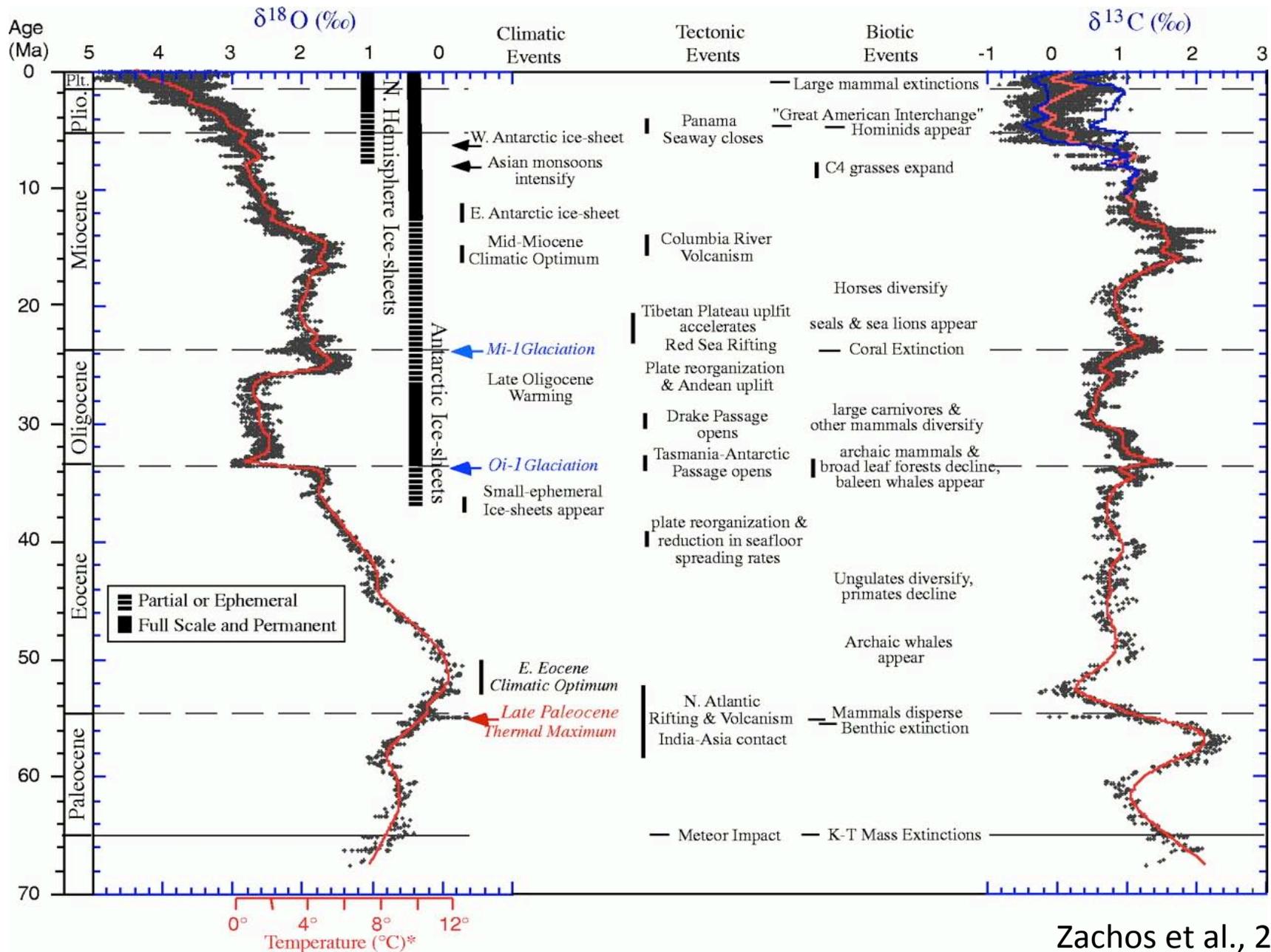
**Figure 15.3b**  
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# Heinrich events

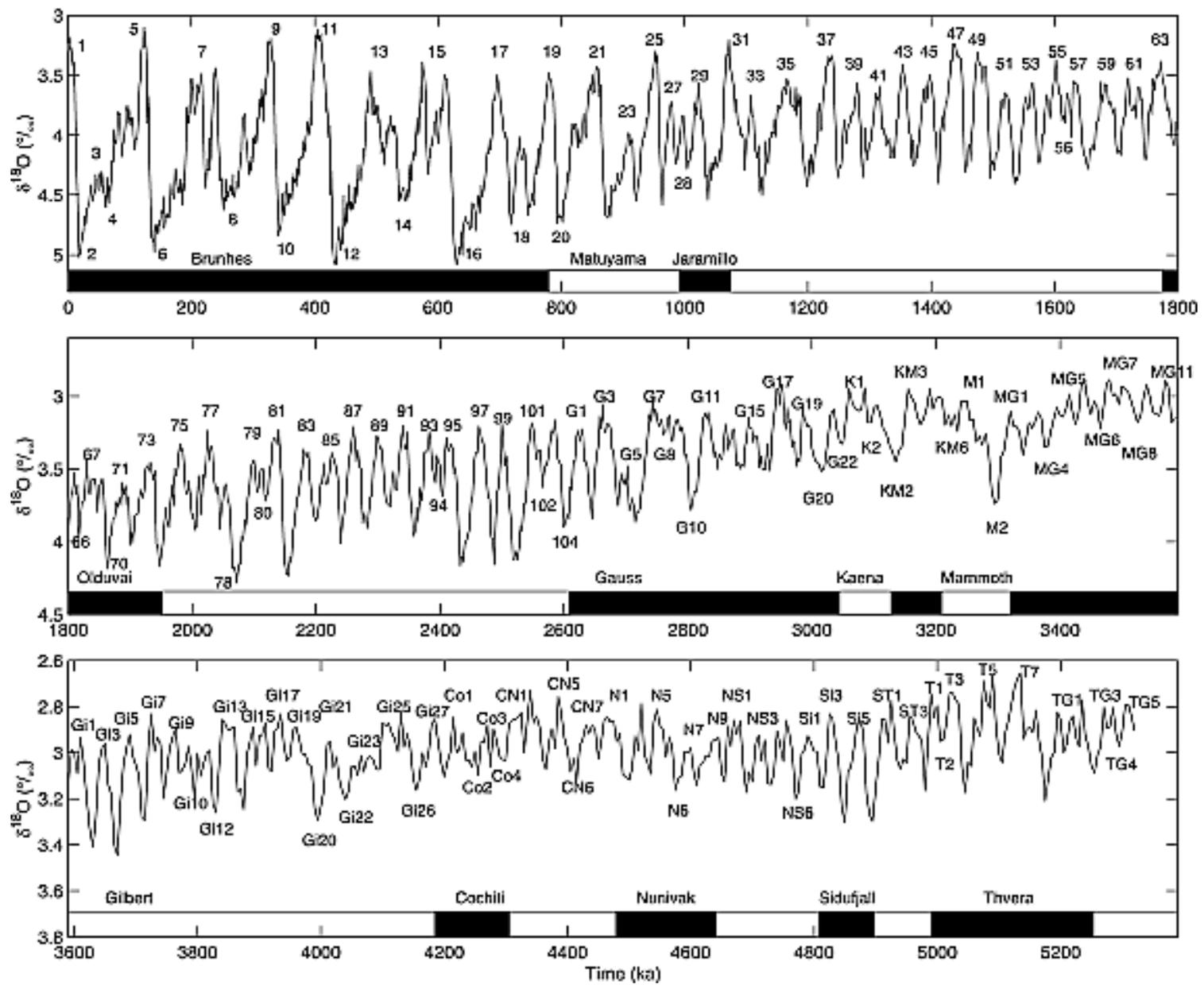


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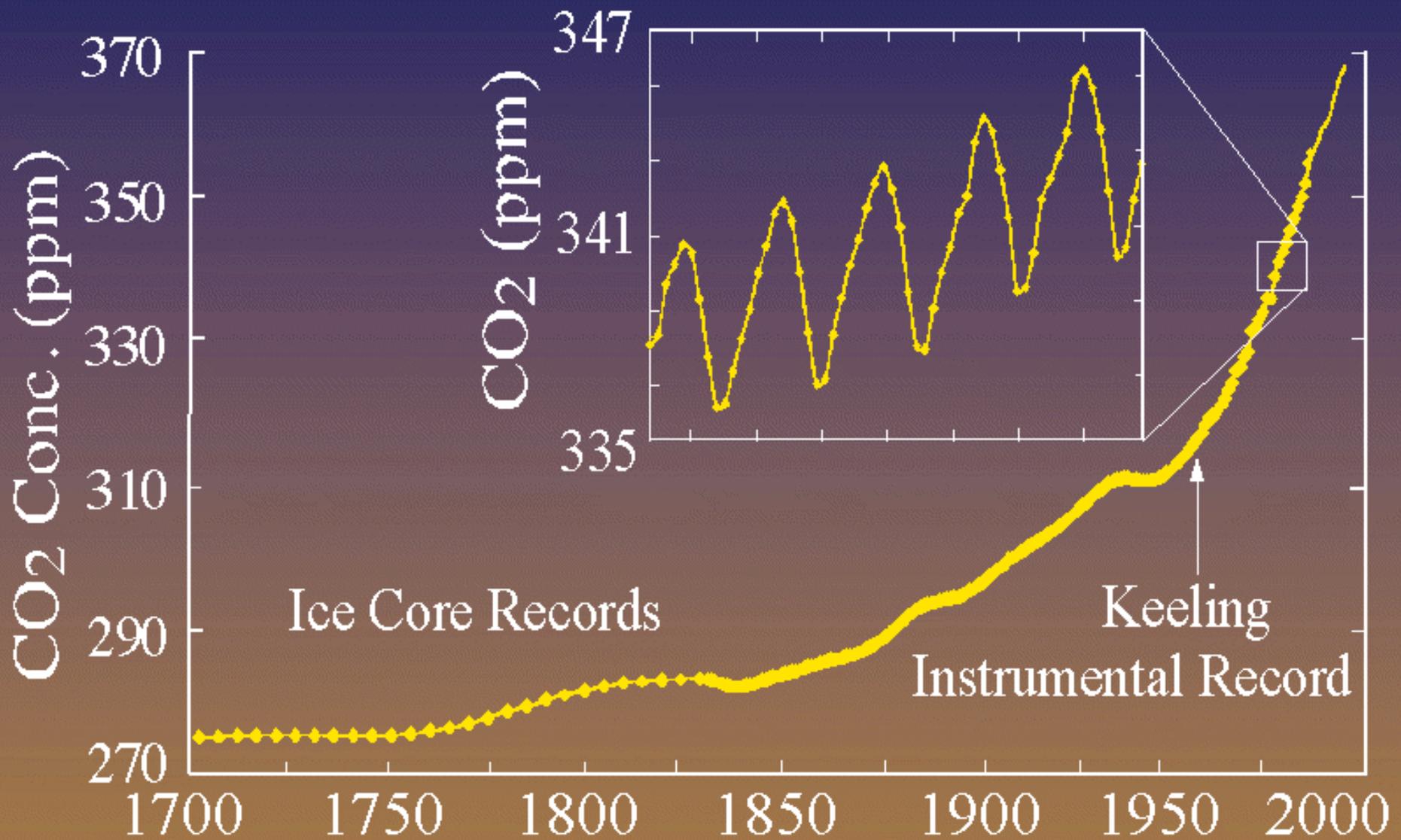


Zachos et al., 2001

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 Source: Lisiecki, Lorraine E., and Maureen E. Raymo. "A Pliocene-Pleistocene stack of 57 Globally Distributed Benthic  $\delta^{18}\text{O}$  Records." *Paleoceanography* 20, no. 1 (2005).



1850–2000

The twentieth-century warming is correlated with the increase in atmospheric CO<sub>2</sub> concentrations since the industrial revolution.

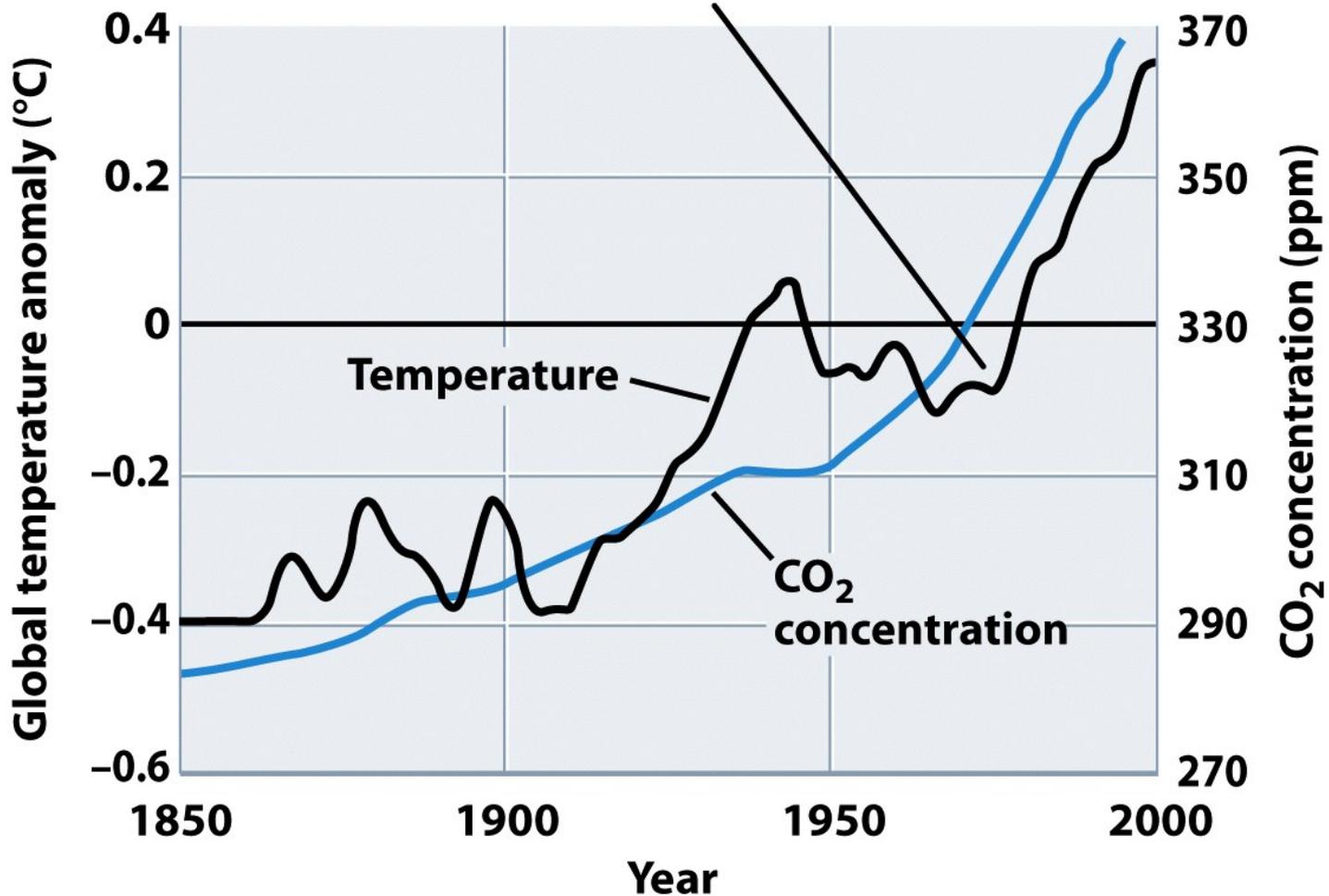


Figure 15.19a  
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1000–2000

The twentieth-century warming is clearly anomalous when compared with climate variation over the last millennium.

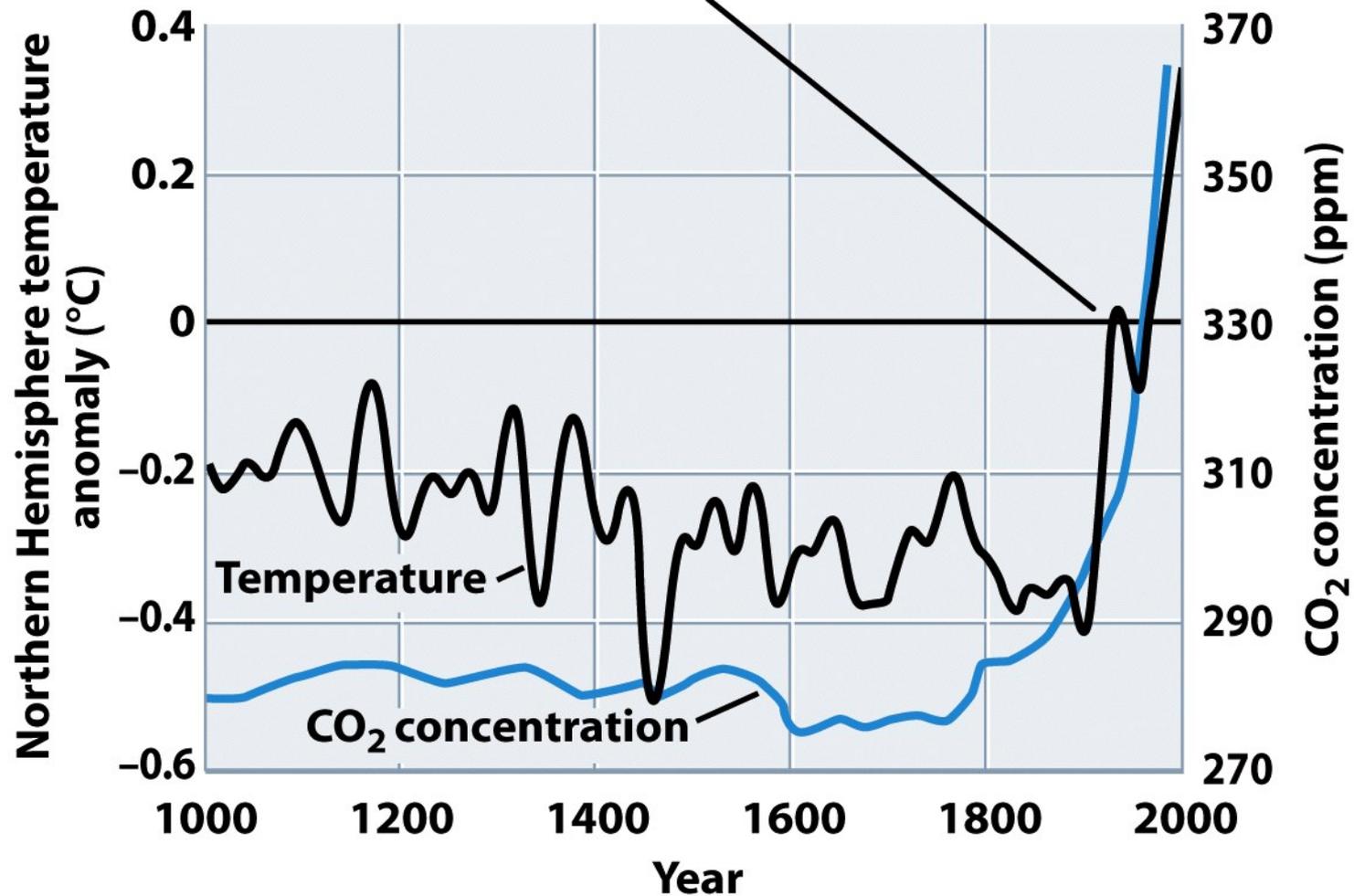
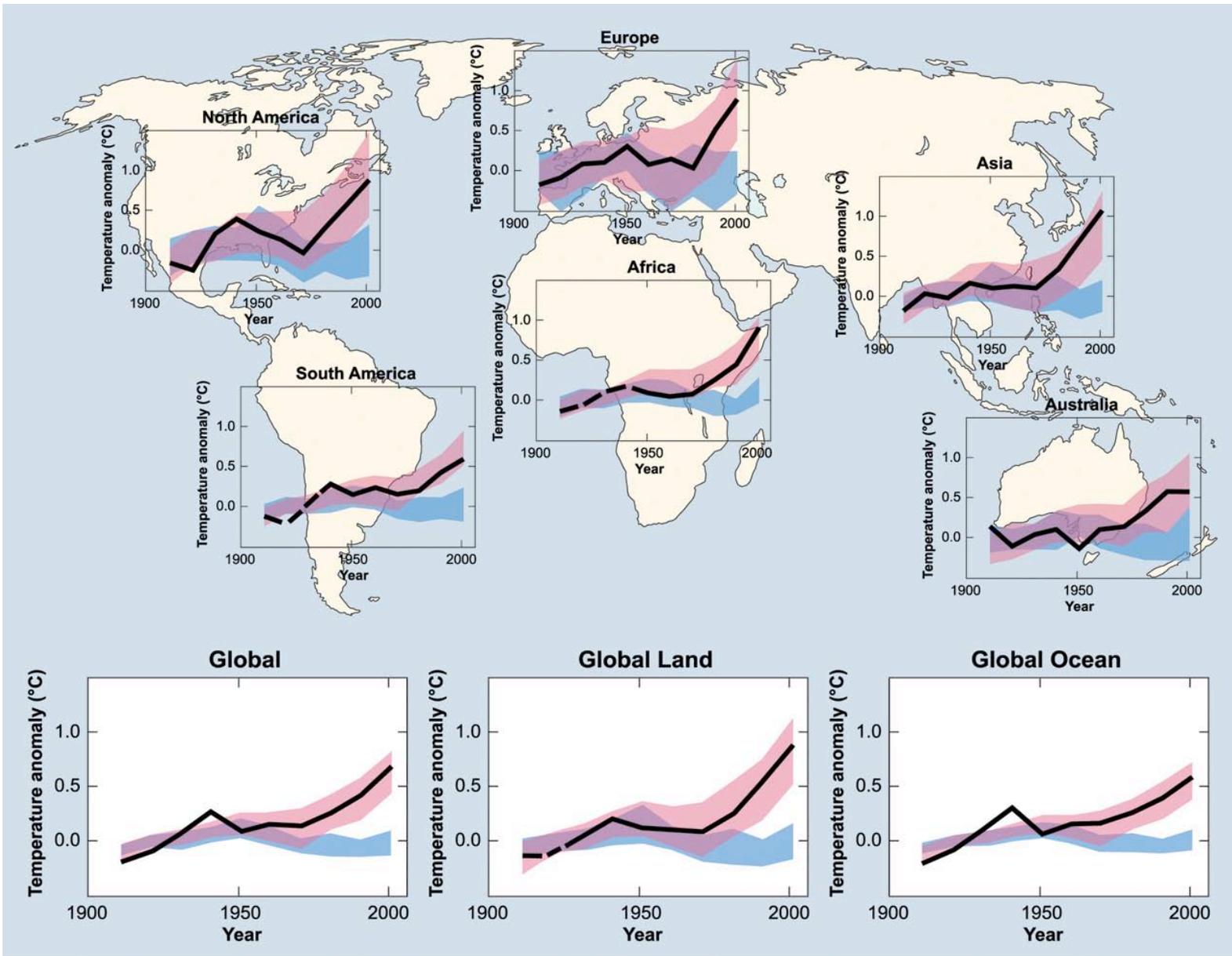


Figure 15.19b  
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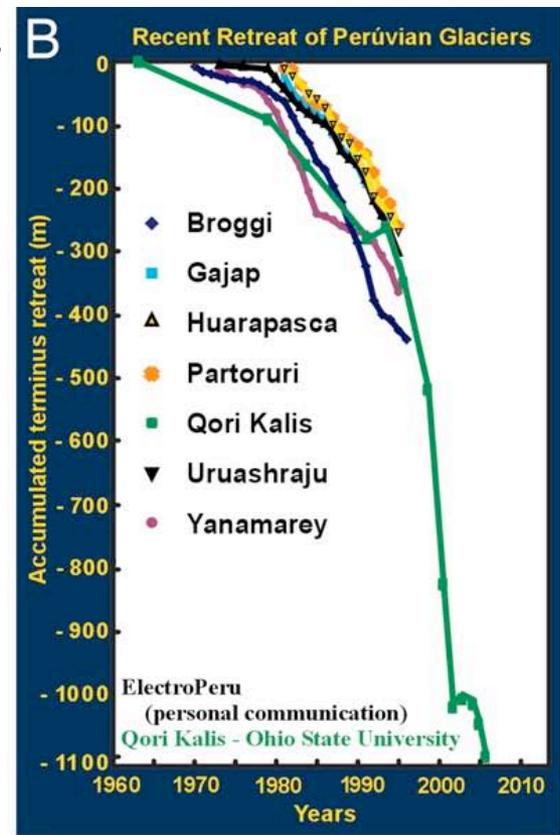
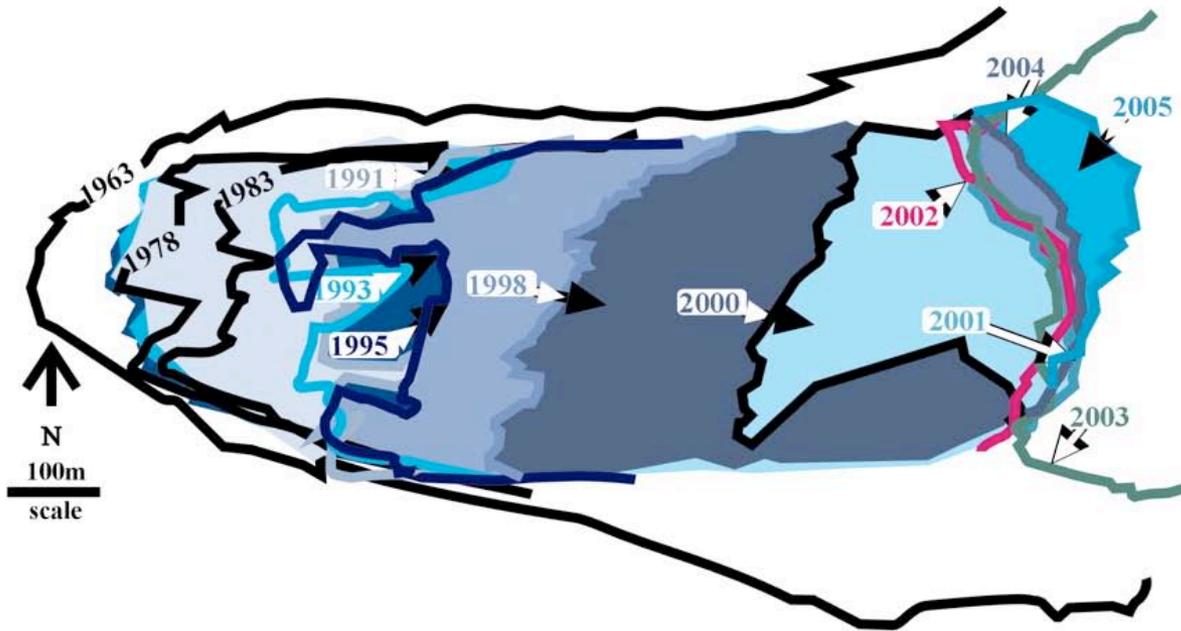
models using only natural forcings  
 models using both natural and anthropogenic forcings

observations

IPCC AR4 Report (2007)

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# A Retreat of Qori Kalis glacier, Peruvian Andes

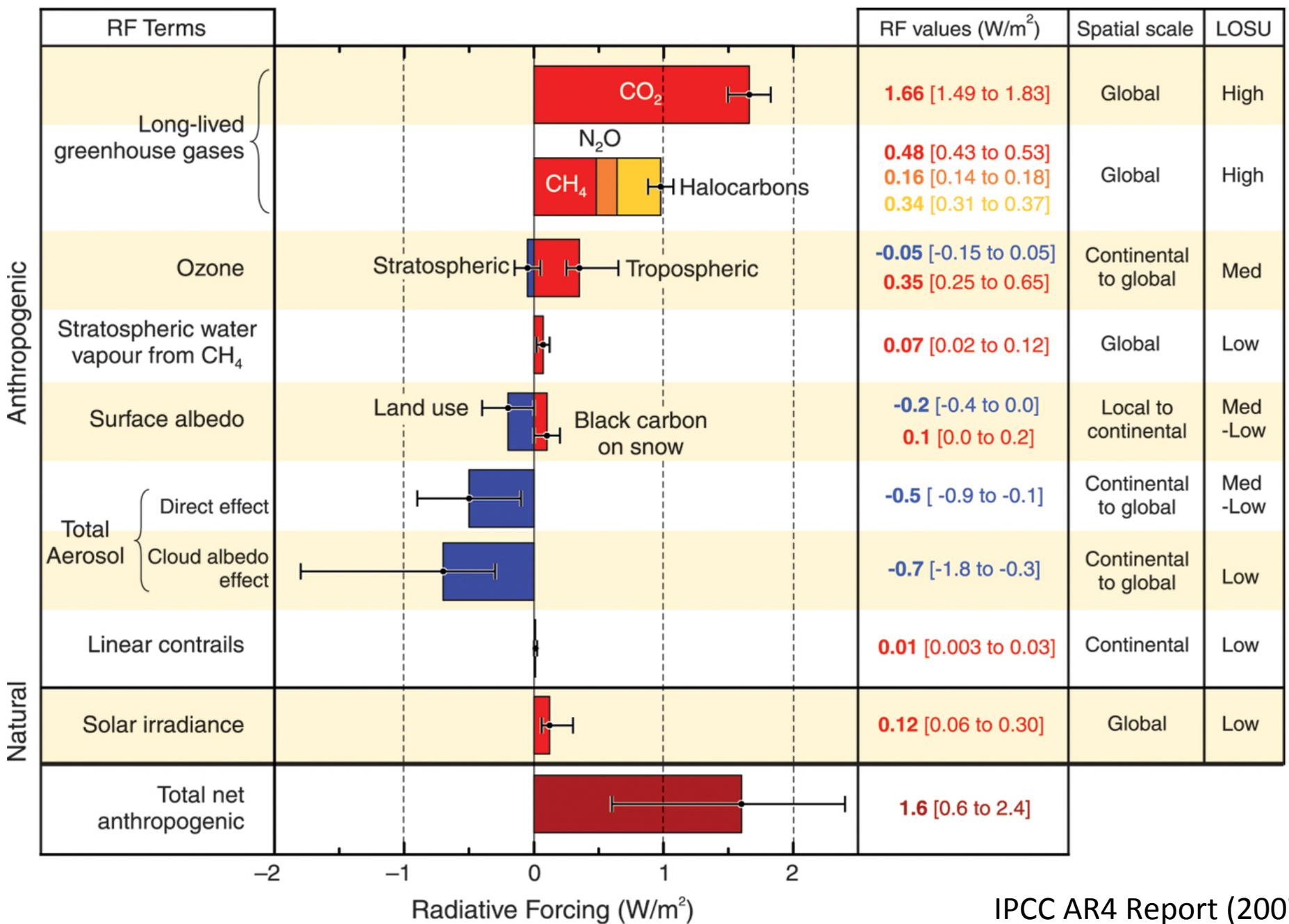


L. Thompson, Ohio State



Courtesy of [U.S. Geological Survey](http://pubs.usgs.gov/). Figure in the public domain.

Source: Williams, R. S., Jr., and Ferrigno, J. G., eds., 2012, State of the Earth's cryosphere at the beginning of the 21st century—Glaciers, global snow cover, floating ice, and permafrost and periglacial environments: U.S. Geological Survey Professional Paper 1386-A, 546 p. (Also available at <http://pubs.usgs.gov/pp/p1386a/>.)



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