Hot Science Cool Talks

UT Environmental Science Institute

14

Global Warming: Impacts on Wildlife and Society

Dr. Camille Parmesan

January 25, 2002

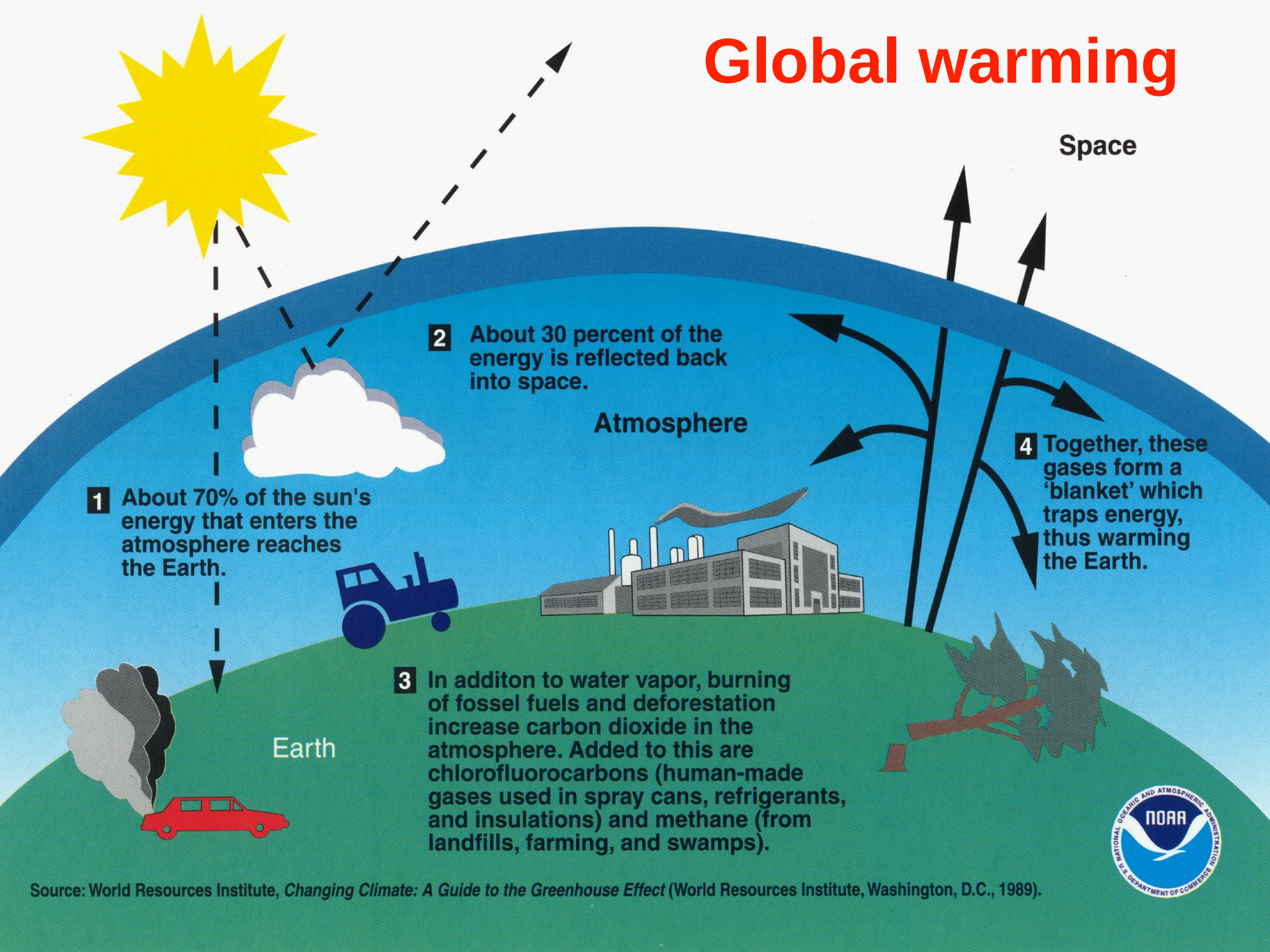
Global Warming:

Impacts on Wildlife and Society

by Dr. Camille Parmesan

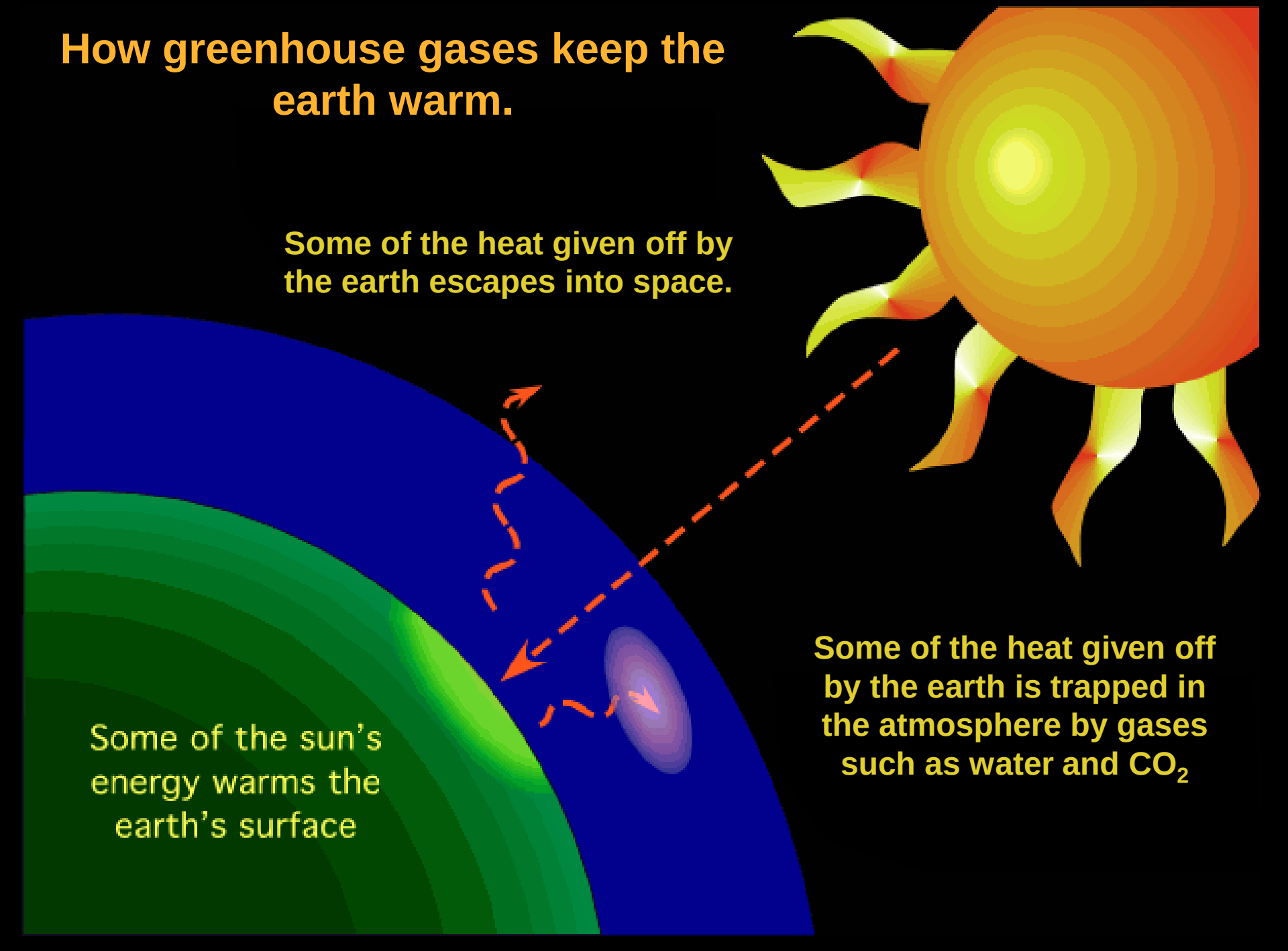

Human activities are changing the weather

Global warming



Source: World Resources Institute, *Changing Climate: A Guide to the Greenhouse Effect* (World Resources Institute, Washington, D.C., 1989).

How greenhouse gases keep the earth warm.



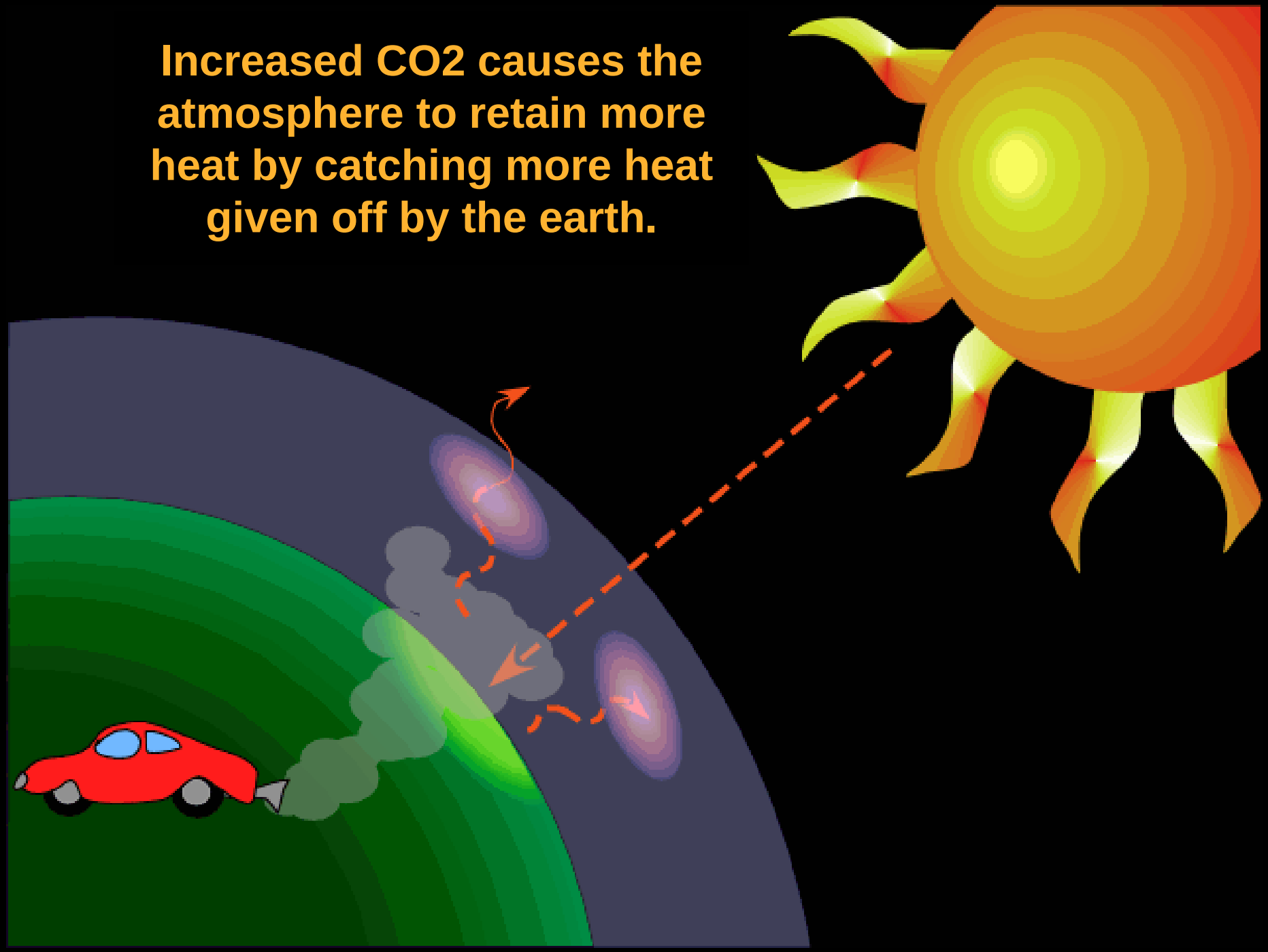
Animation of the Greenhouse Effect

Movie for Mac: **click once with cursor on image**

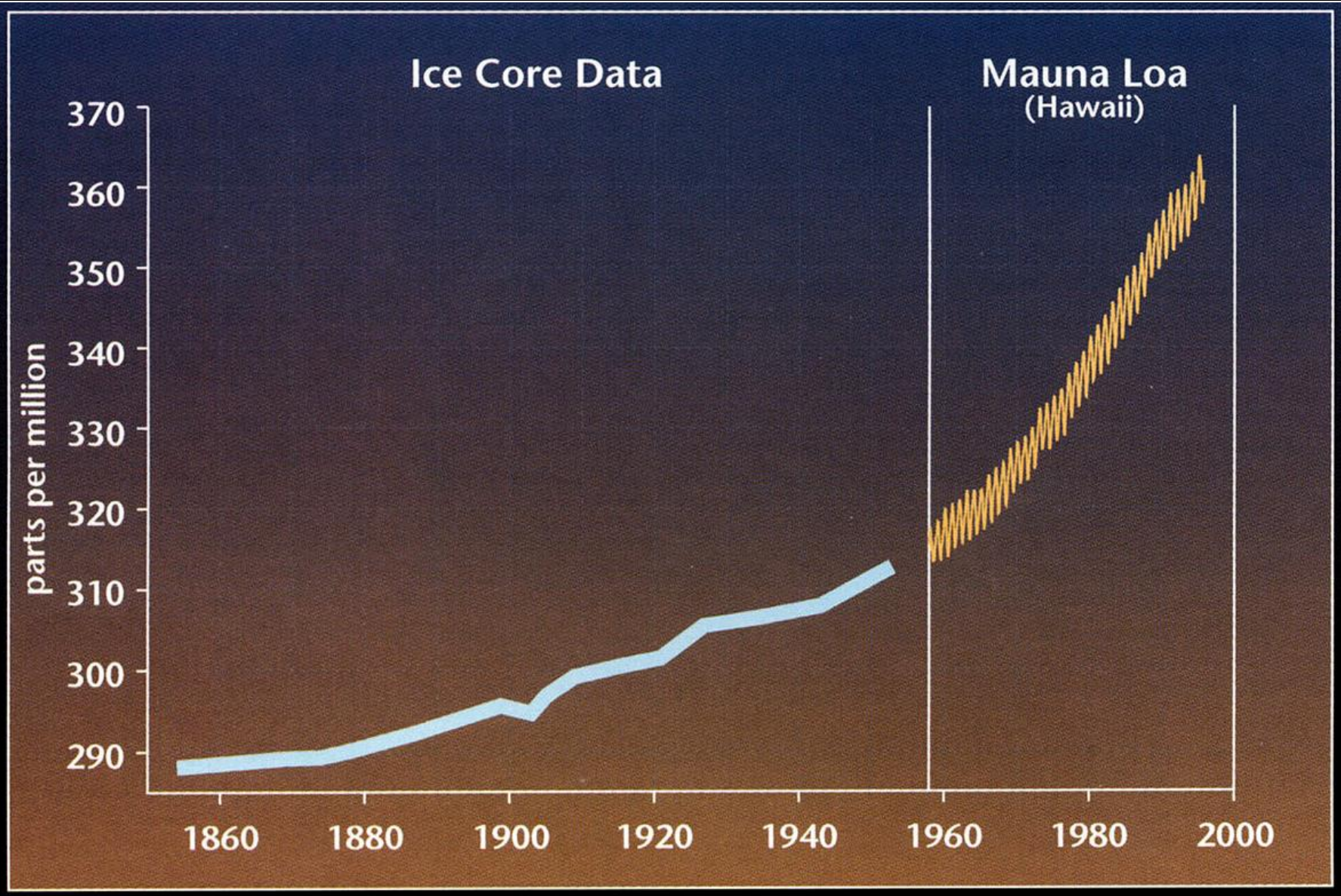
Movie for PC: Double click here

A warning may come Up about viruses.
Just click OK.

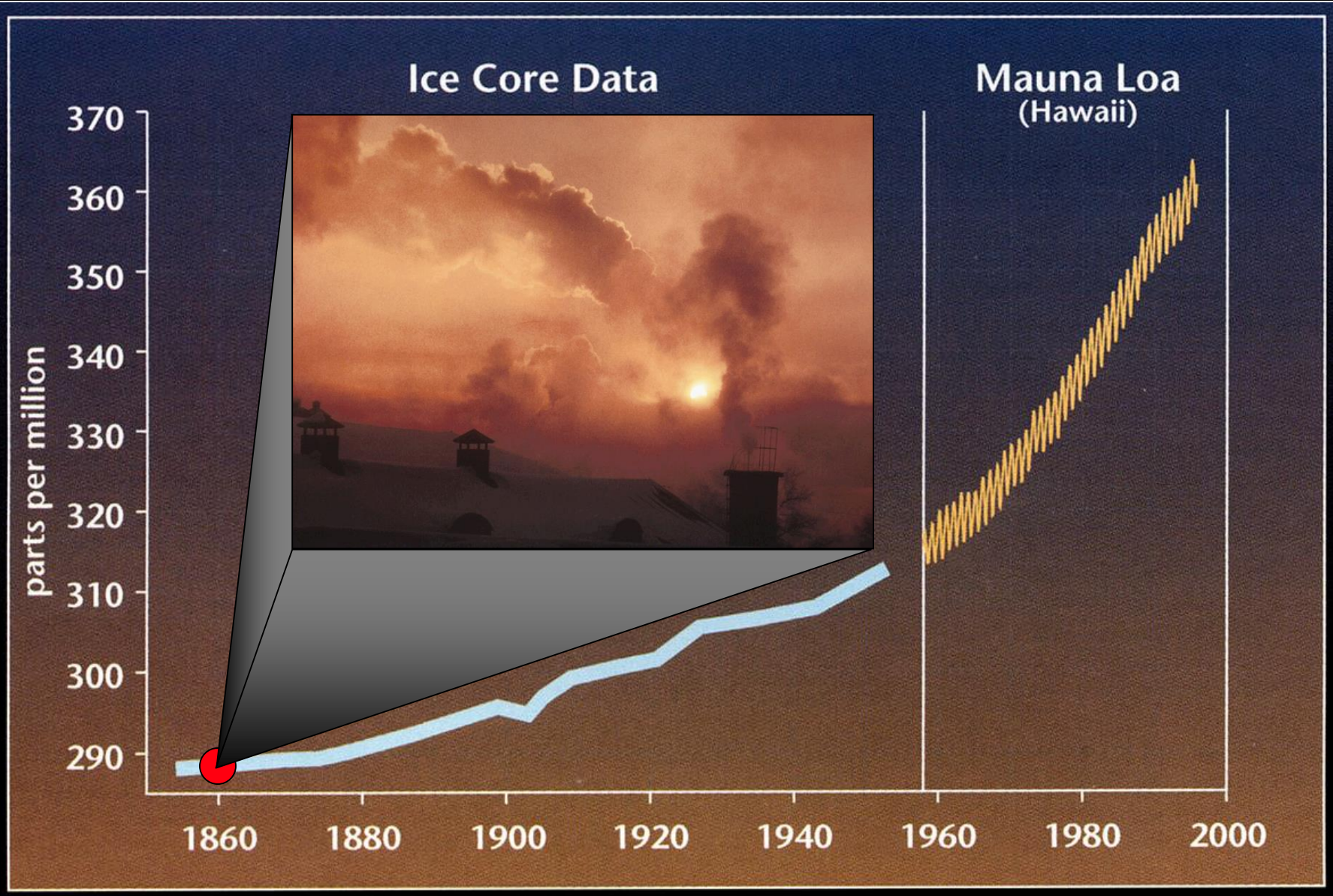
Increased CO_2 causes the atmosphere to retain more heat by catching more heat given off by the earth.



Atmospheric CO2 Concentrations Are Increasing as a Result of of Human Emissions

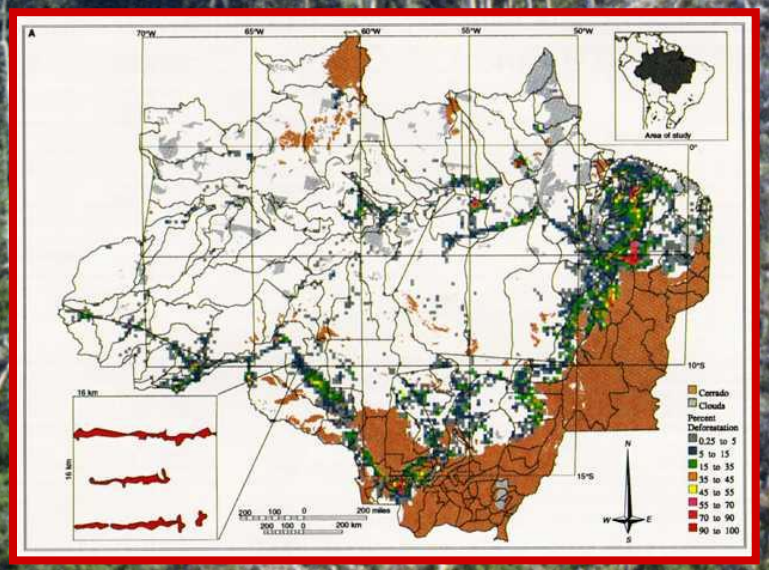


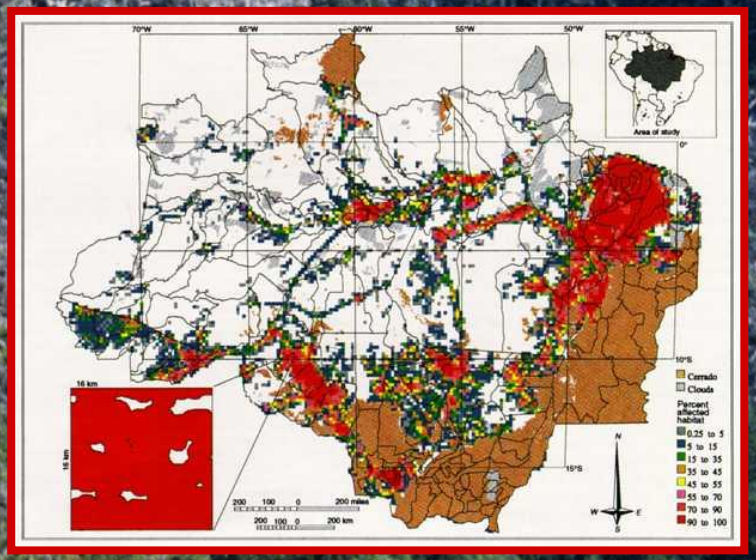
Increases in atmospheric CO2 concentrations began with the industrial revolution.



Deforestation also increases atmospheric CO_2 concentrations.

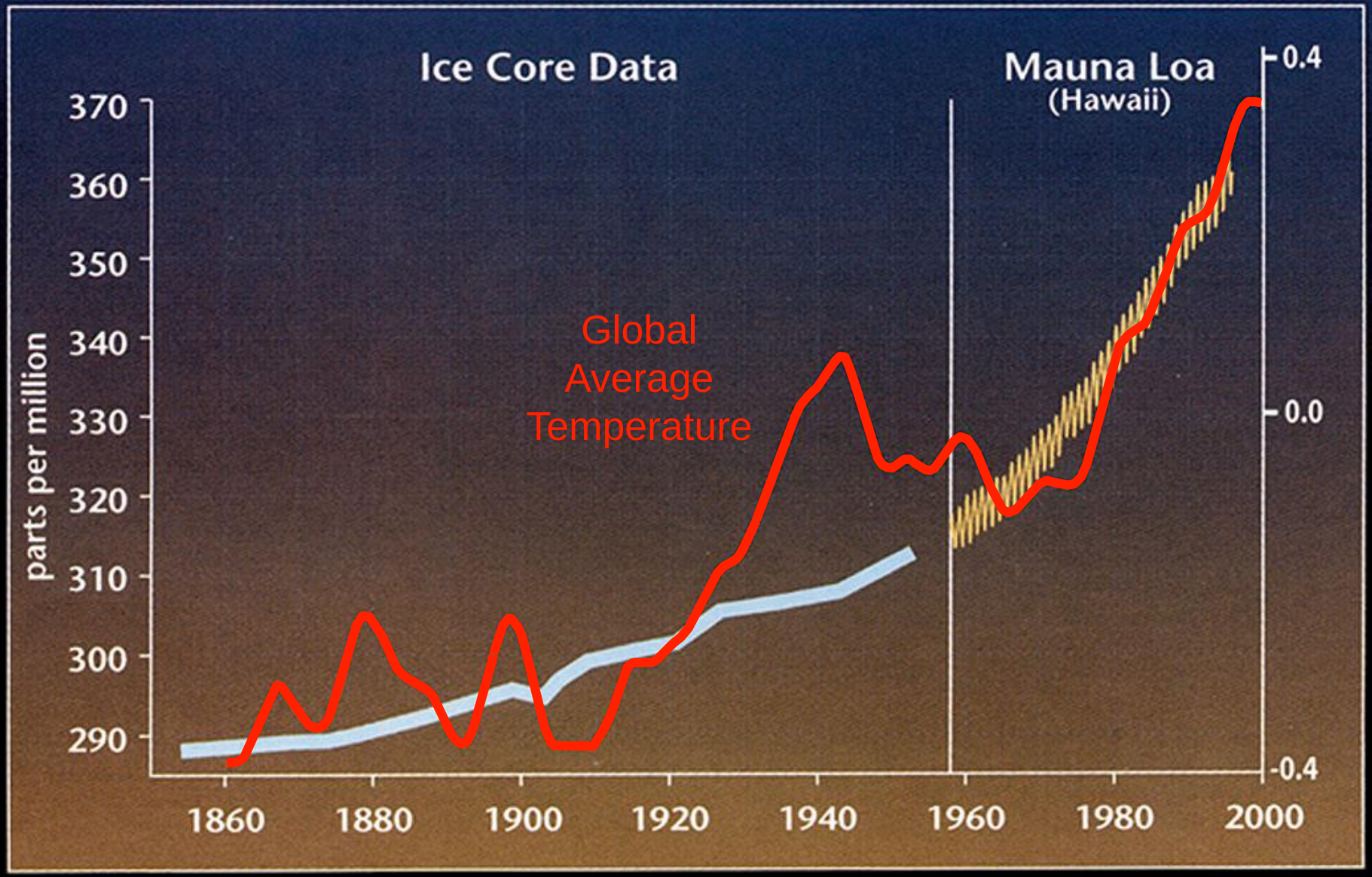
1978 Deforestation in Brazil 1988



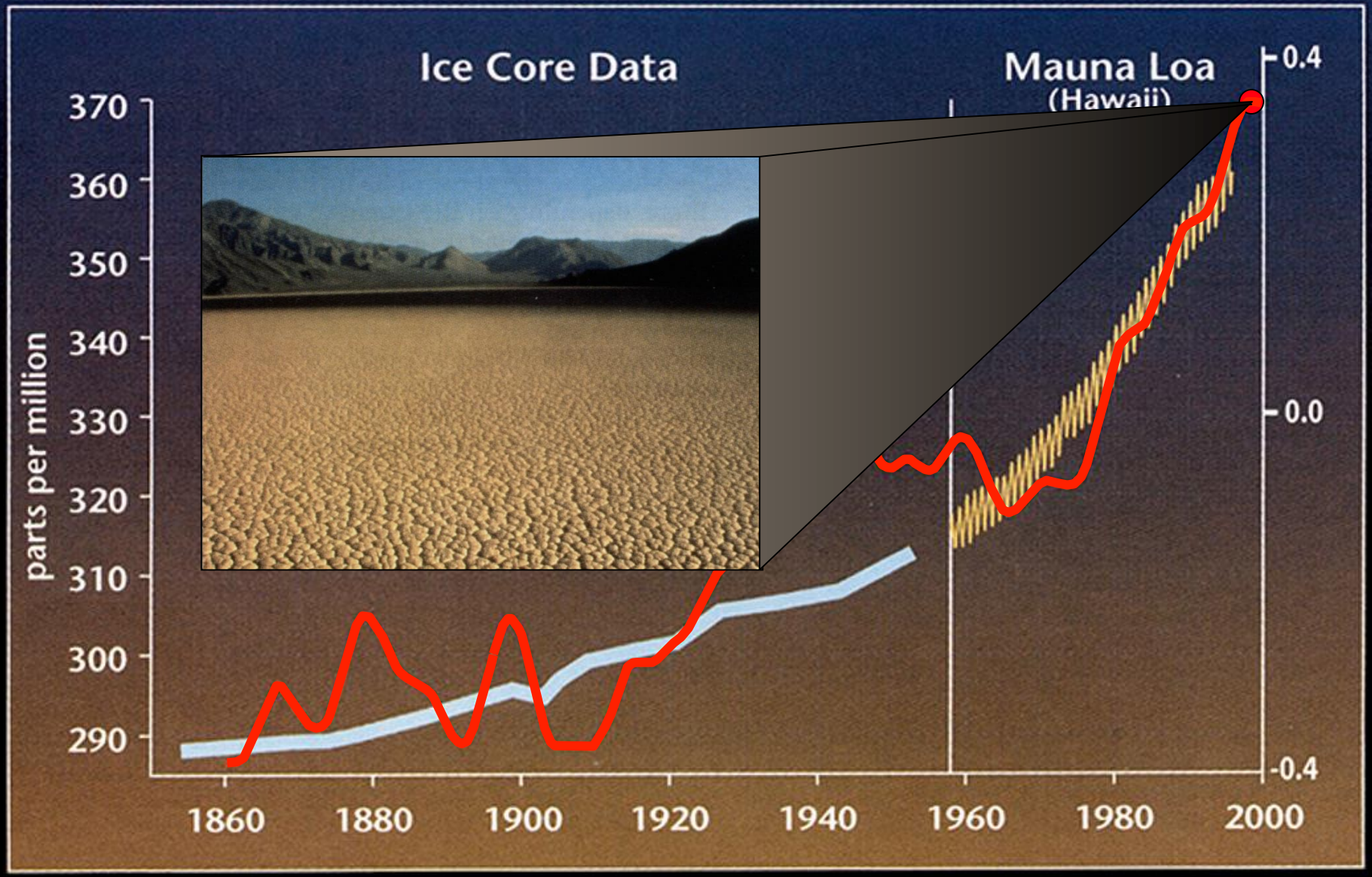


Source: OSTP

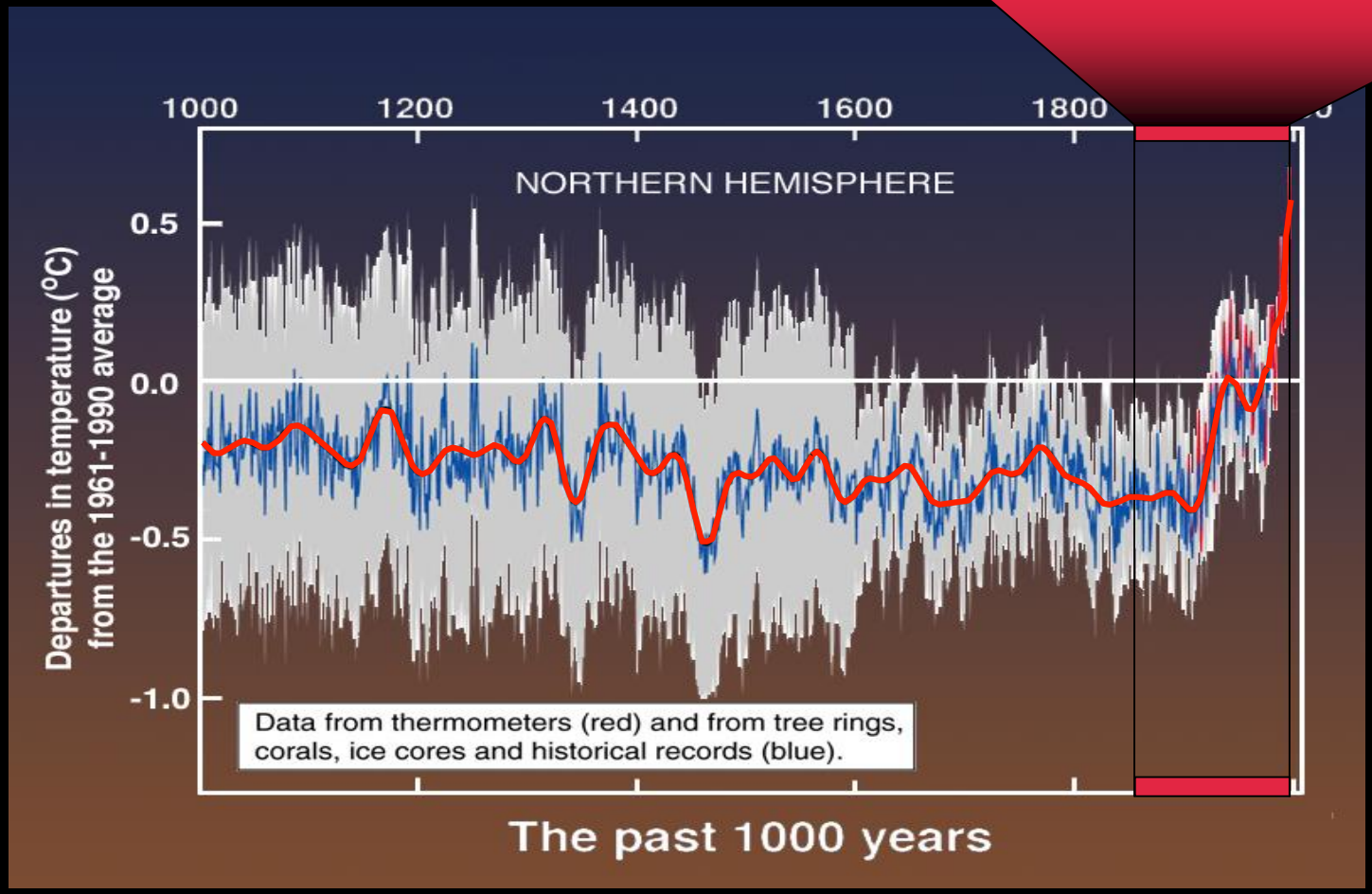
Global average temperatures are increasing with increases in CO_2.



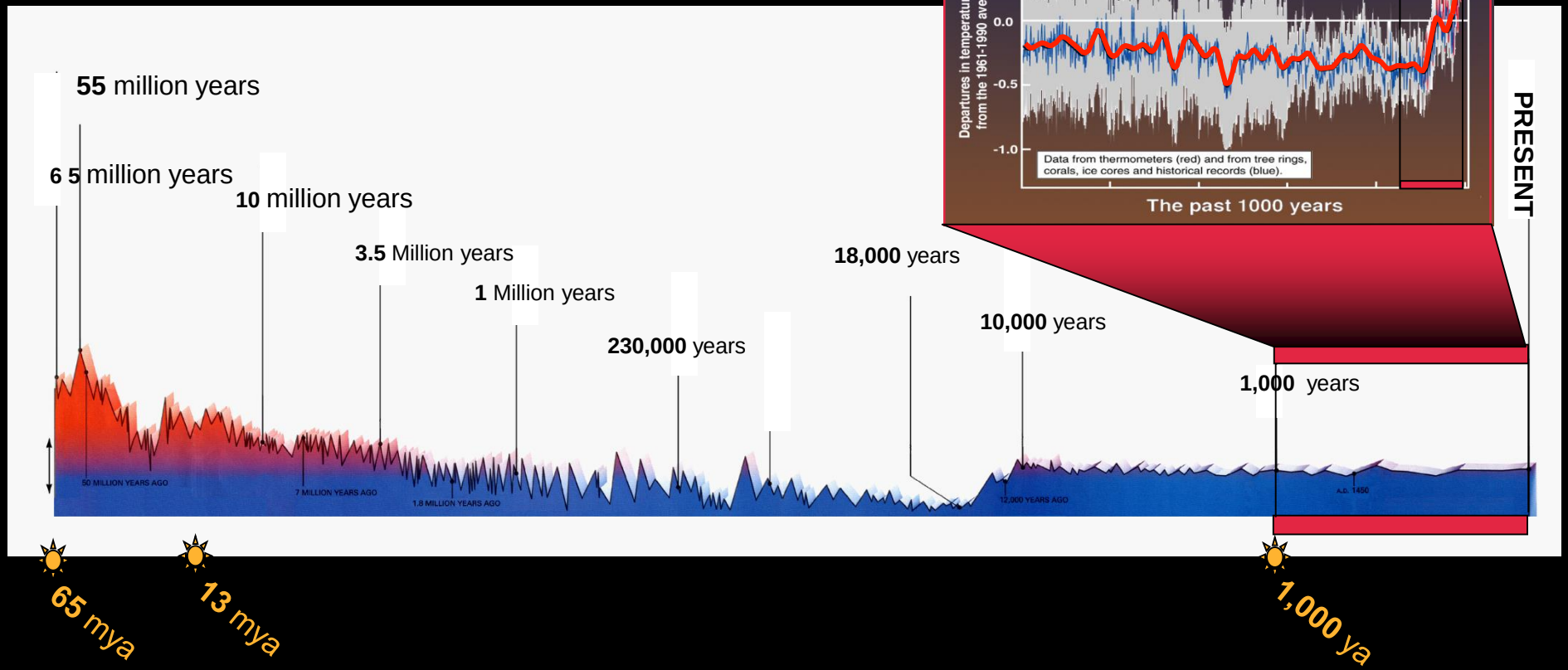
1998 was the warmest year on record since 1910.

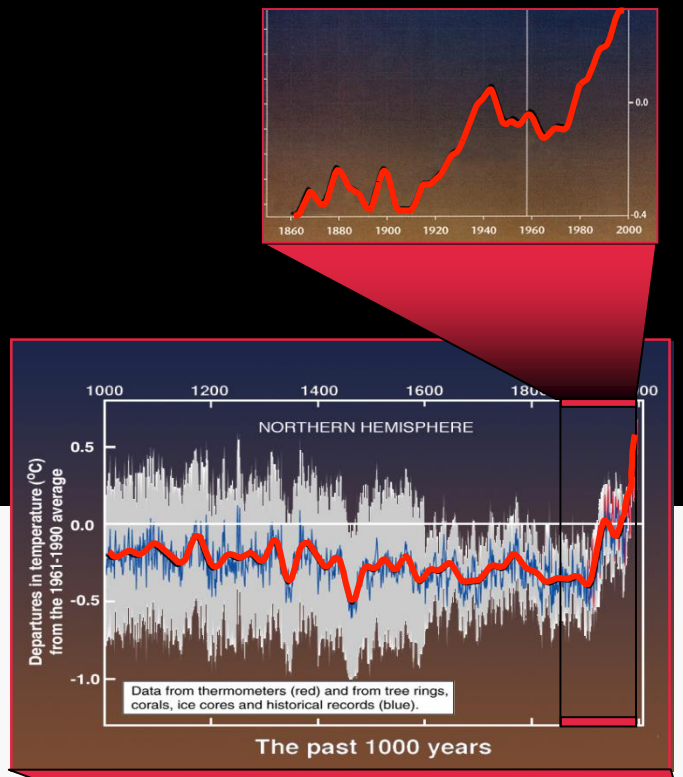


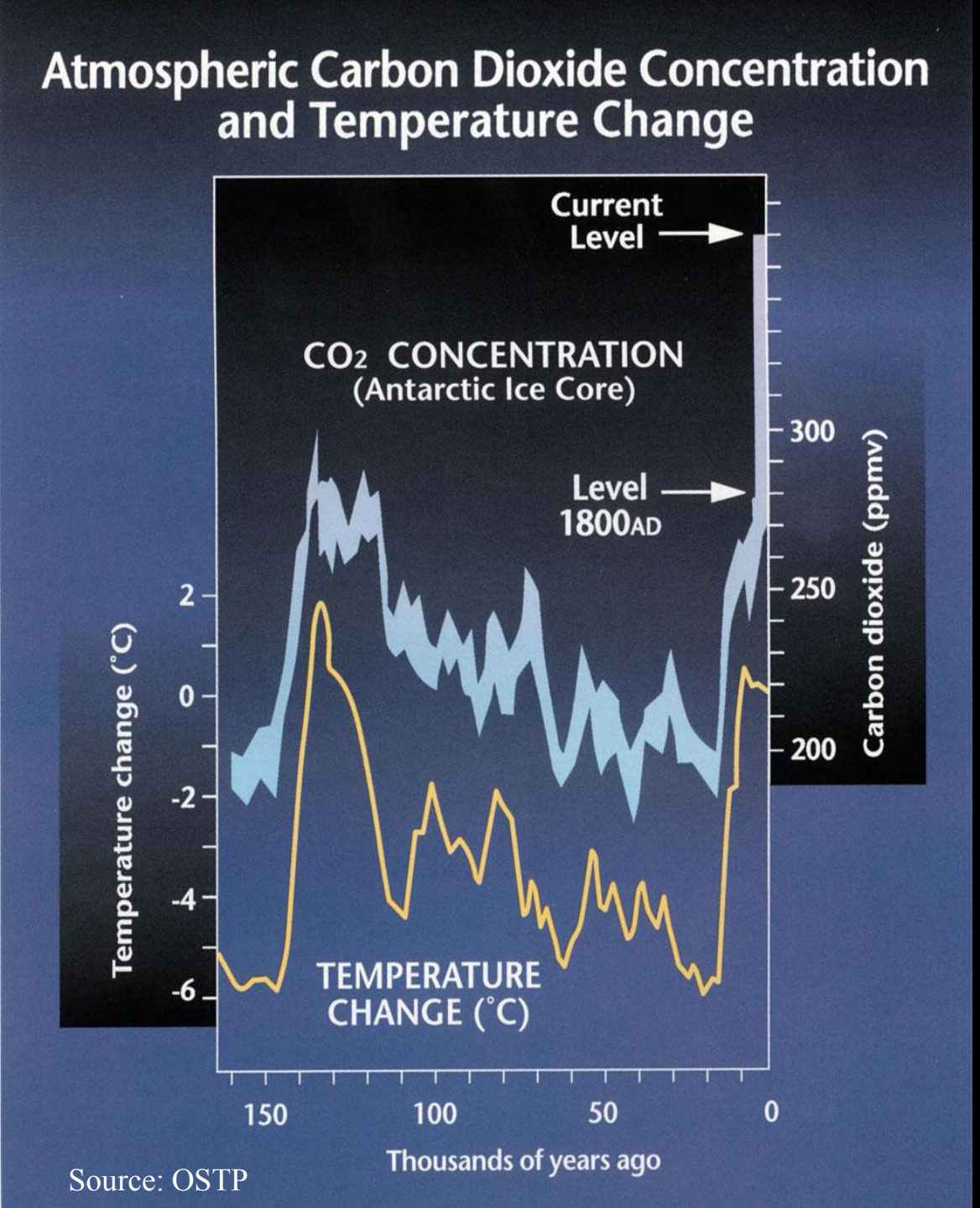
Global temperature over the past 1000 years.



Global temperature over the past 65 million years.





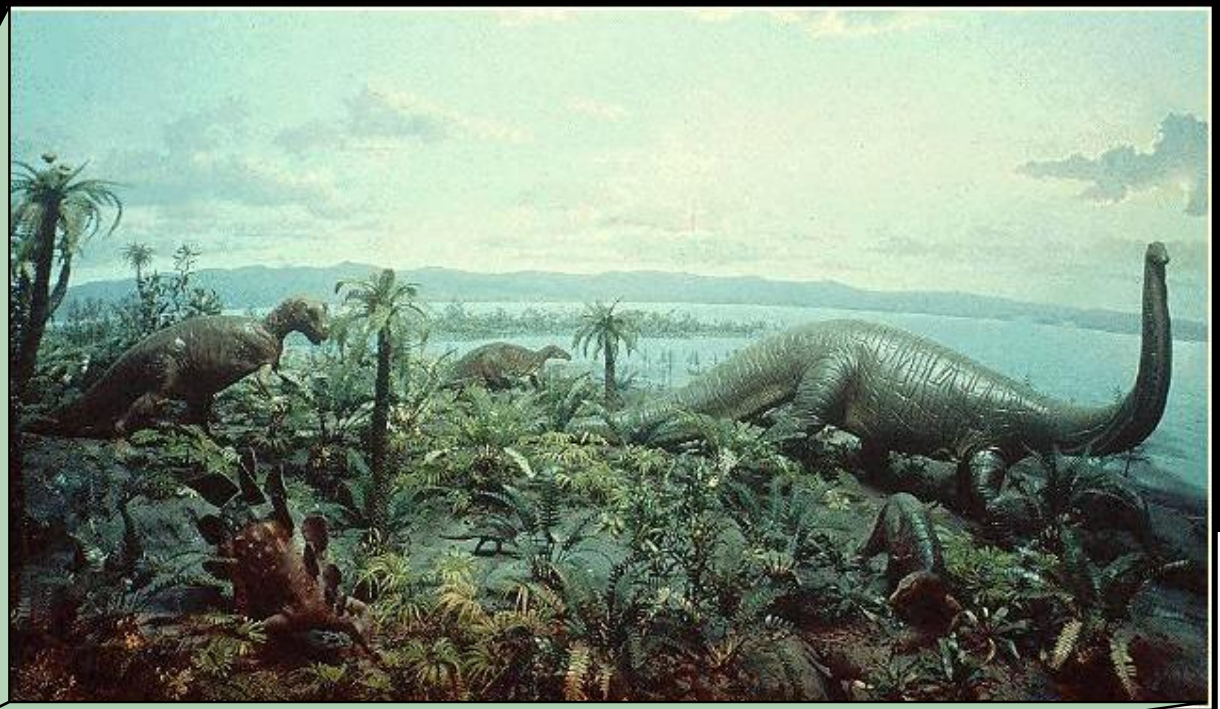


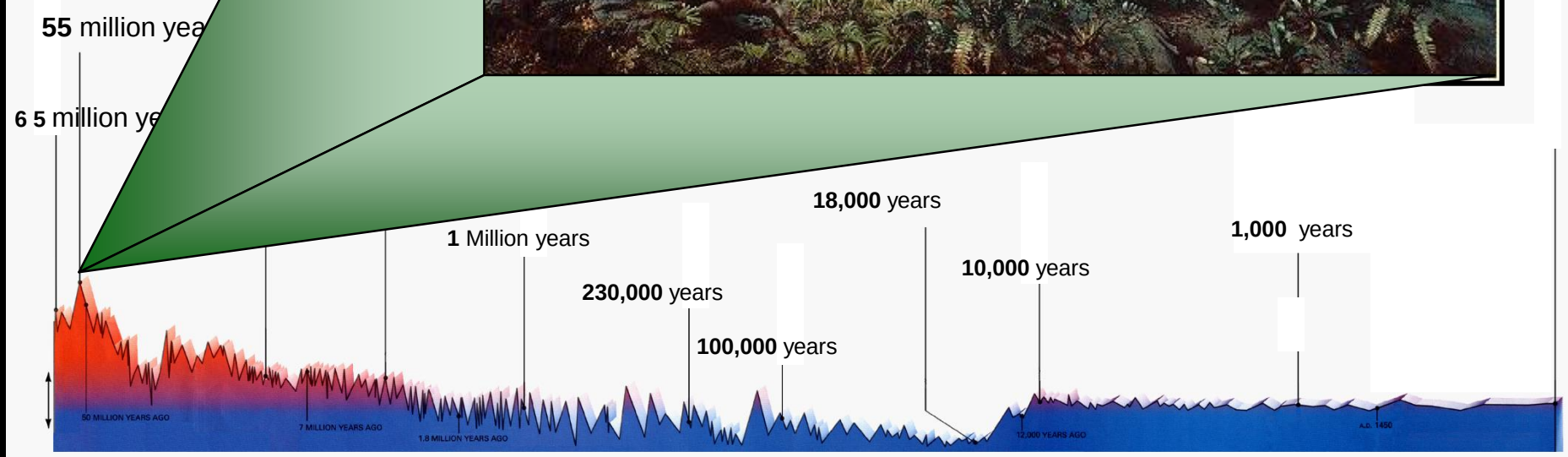
- Clear correlation between atmospheric CO_2 and temperature over last 160,000 years

- Current level of CO_2 is outside bounds of natural variability

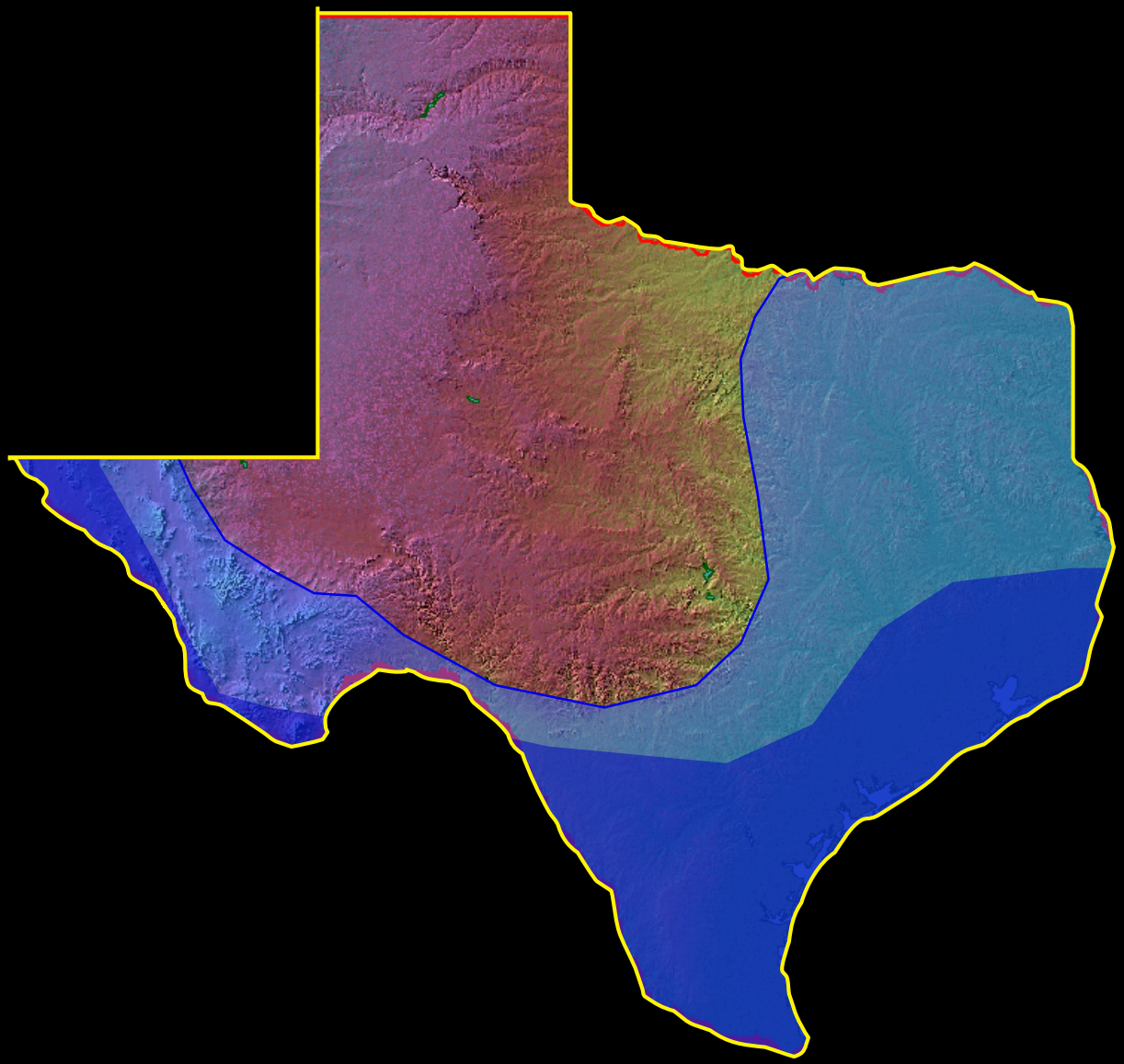
- Rate of change of CO_2 is also unprecedented

In the age of dinosaurs atmospheric CO2 concentrations and temperatures were much higher than today.

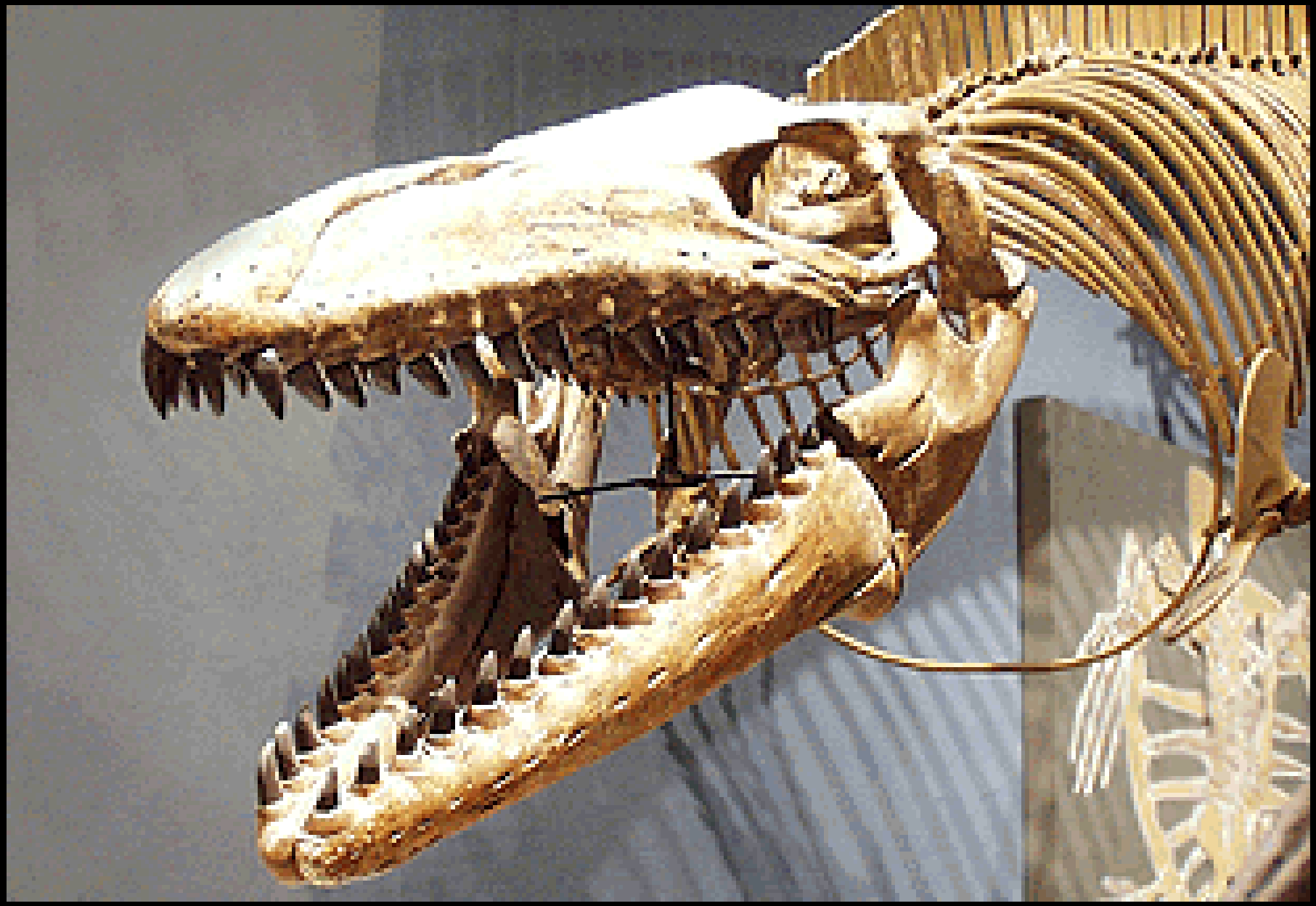




The only mammals living at this time were small rodents.



Sea levels were much higher than today, and Texas was mostly under water



Climate change was one important reason that the dinosaurs disappeared.

All animals and plants are adapted to the local climate

Even humans have evolved to match the climate in which they live.

Climate change has already affected many animals such as this butterfly, the Edith's Checkerspot.

Edith's Checkerspot butterfly lives in a wide range of habitats from coastal meadows …


… to the highest peaks of the Sierra Nevada Mountains

Movie of a butterfly looking for food in a dried field.

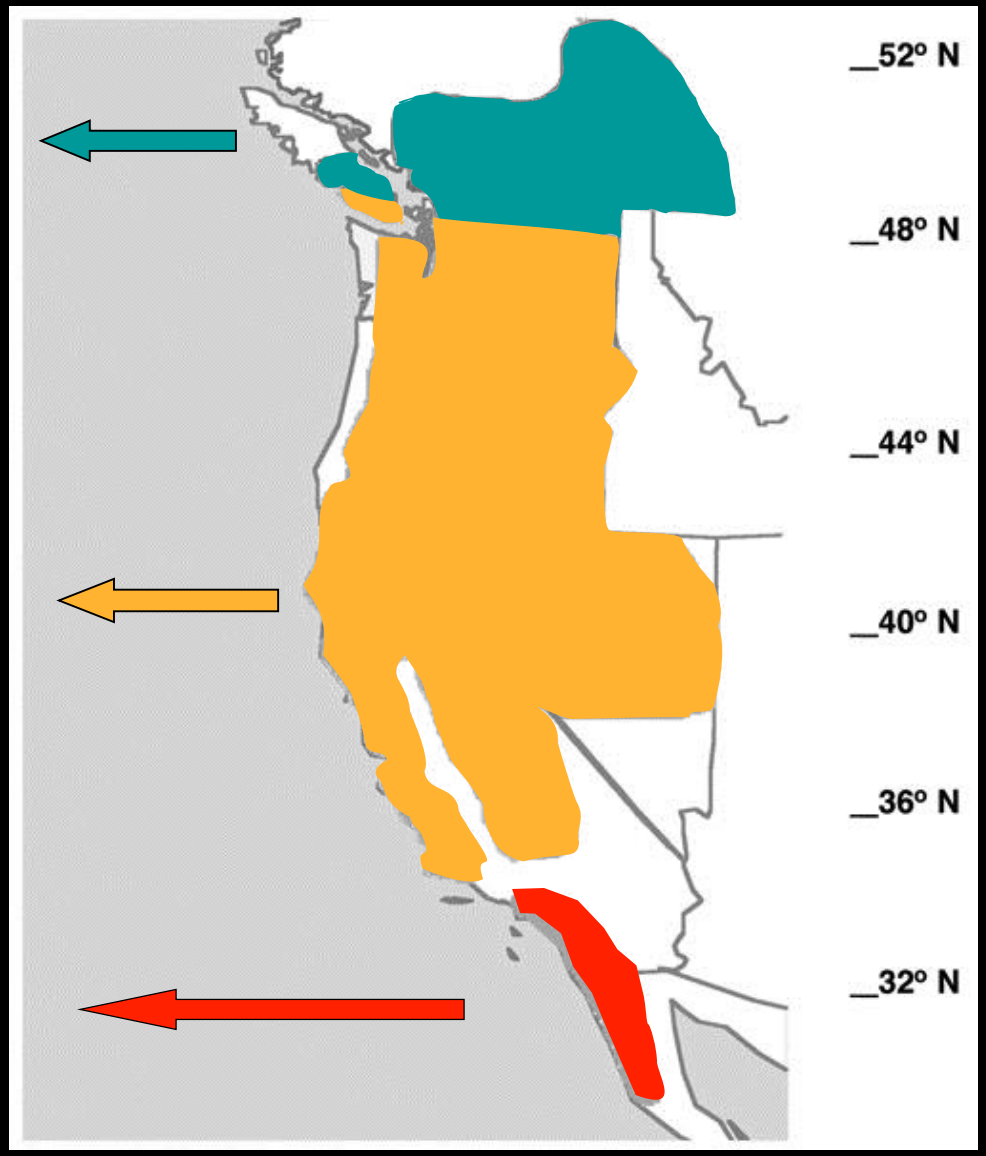
The movie shown here in the lecture is not available for public distribution.

Patterns of population extinctions of Edith's Checkerspot Butterfly

Few extinctions
~20%

Some extinctions
~40%

Many extinctions
~75%

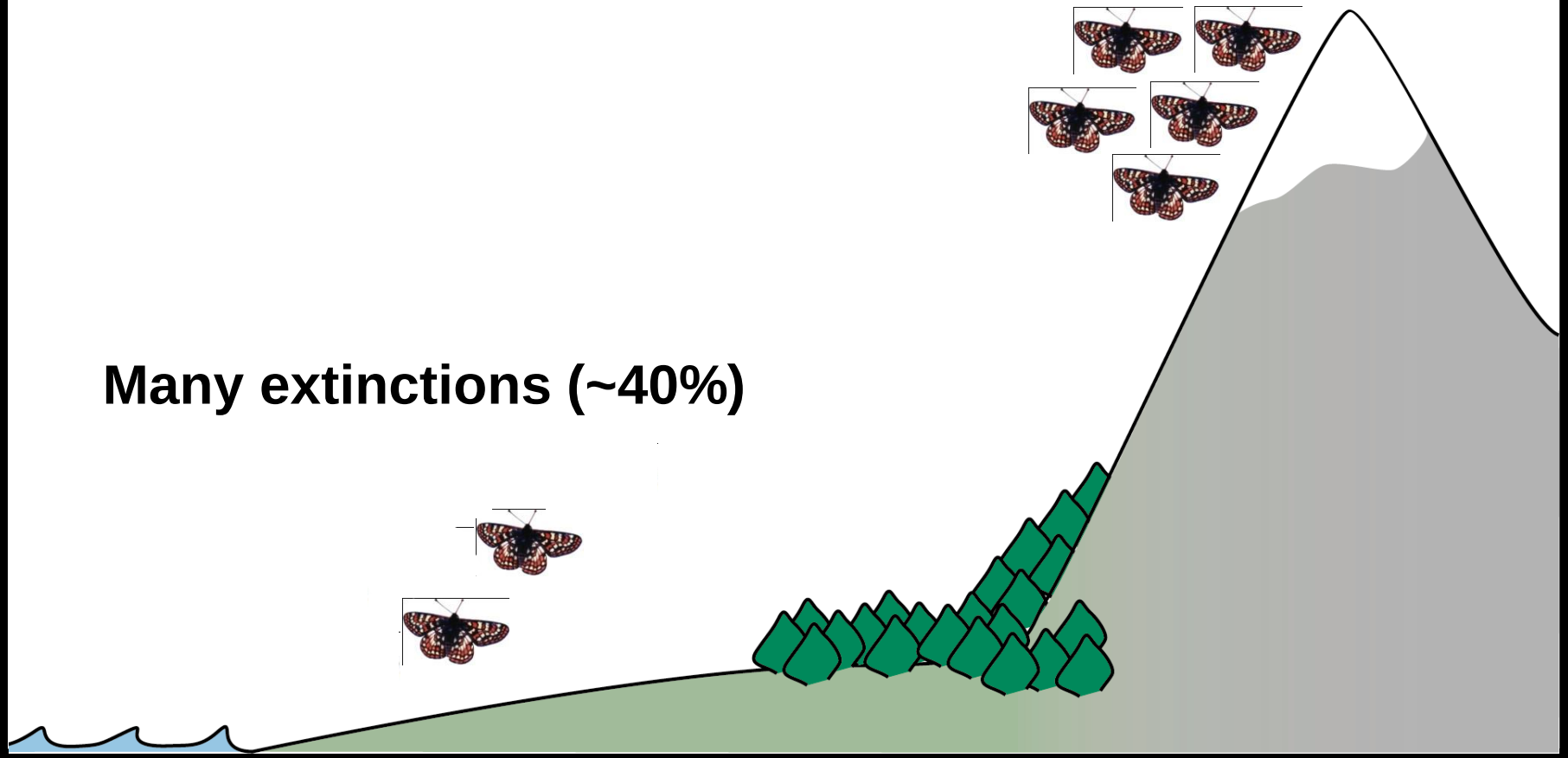


From 1860 to 1996. Each colored area represents multiple populations. Shades of red represent the proportion of populations extinct in a given area during the period 1992-1996 that were previously recorded as present during the period 1860-1983.

More populations of Edith's Checkerspot butterfly have gone extinct at low elevations than at high elevations.

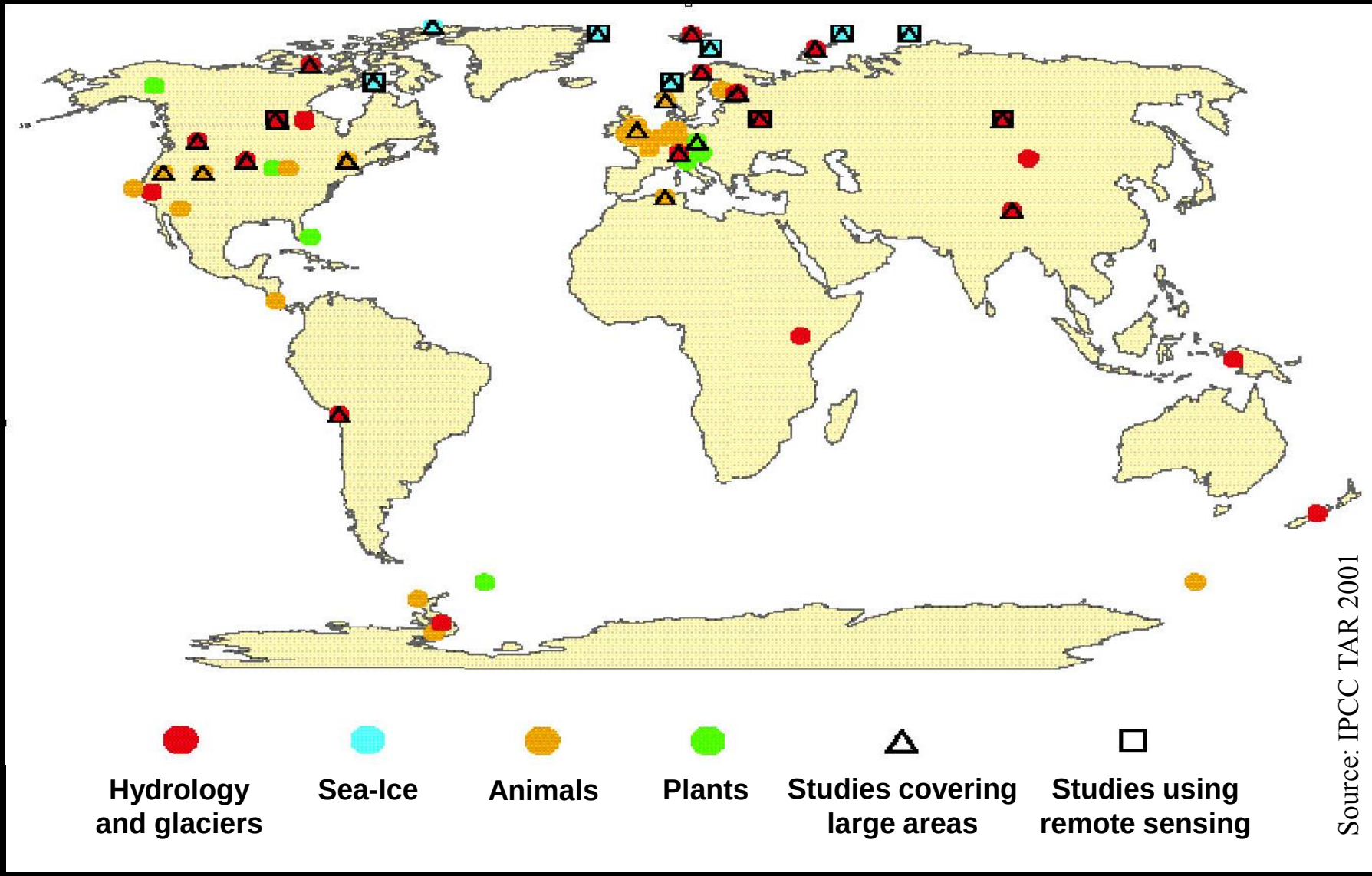
Few extinctions (~15%)

Many extinctions (~40%)

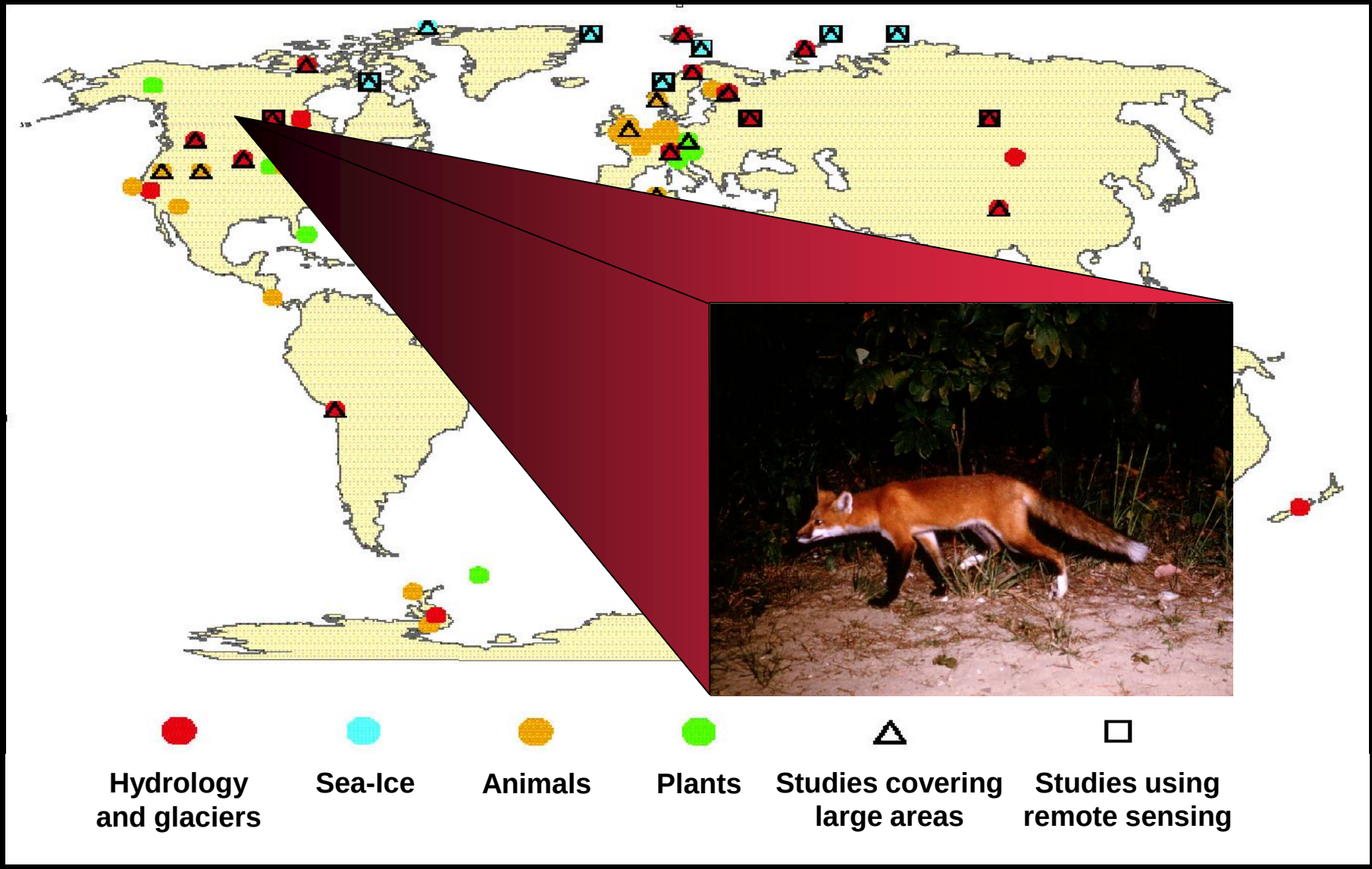


Other insects, such as this mosquito, will have range changes that will effect you more directly.

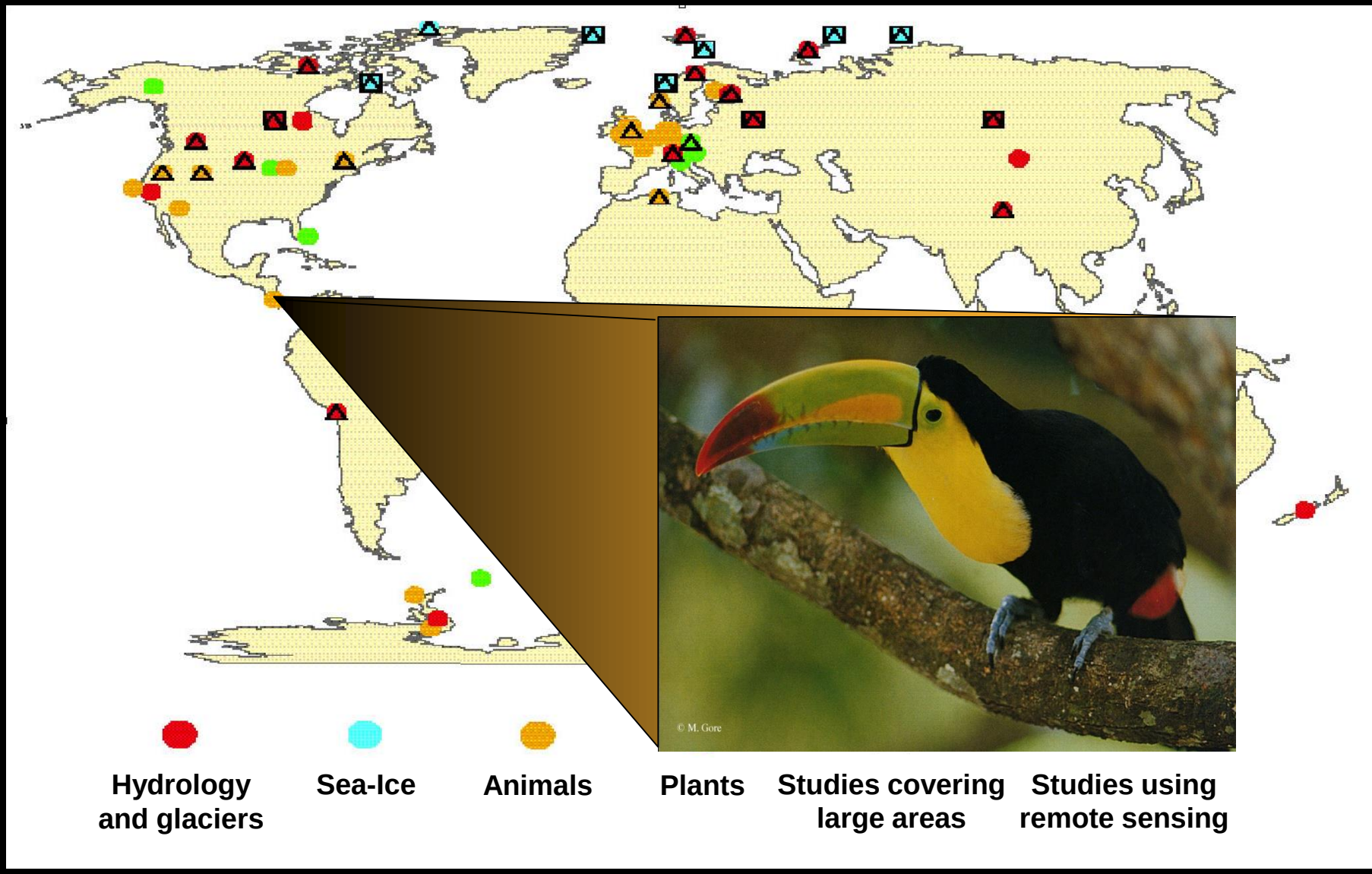
Observed Changes in Physical and Ecological Systems



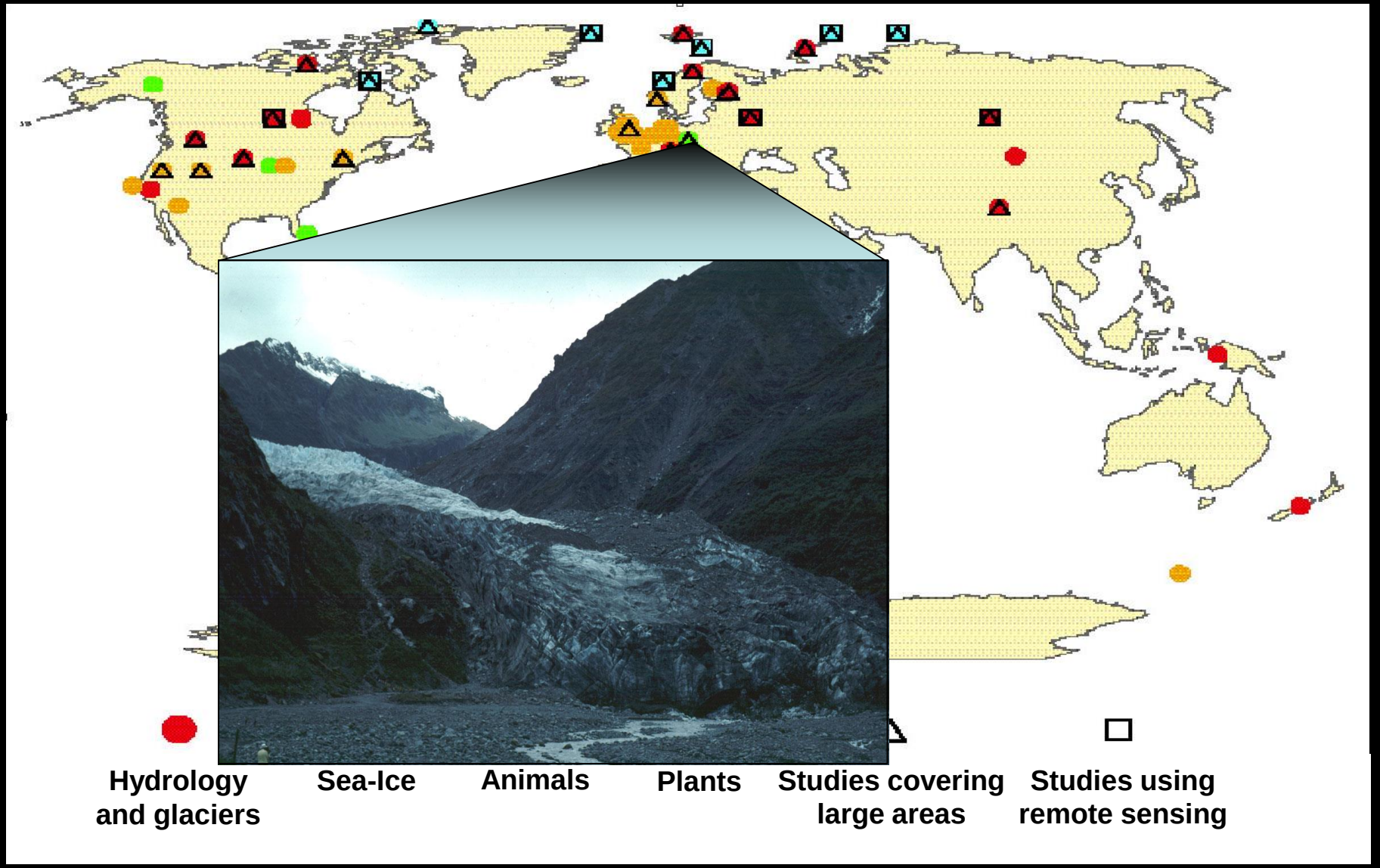
The red fox has shifted its range north, threatening the artic fox.

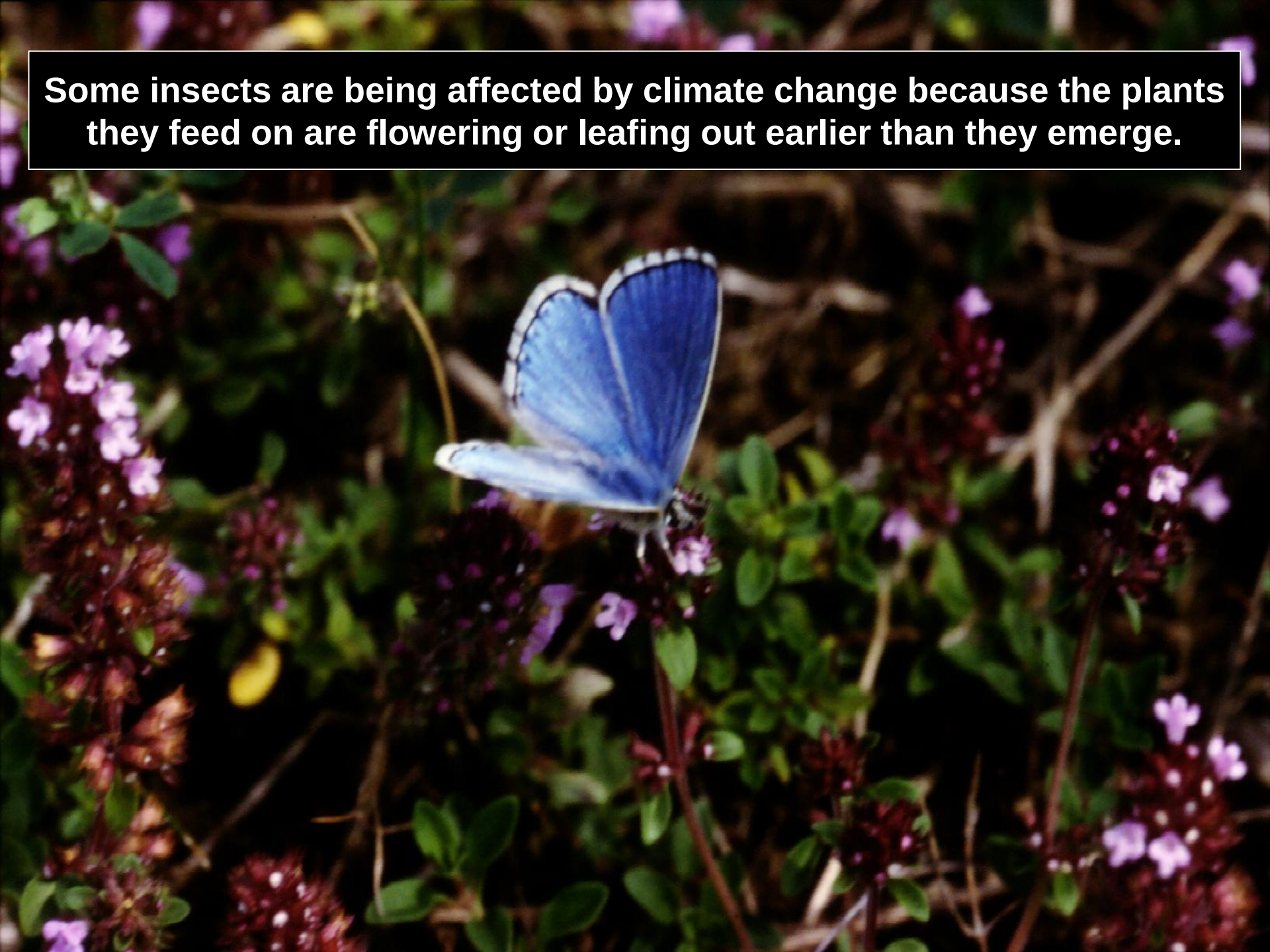


The toucan and other lowland tropical birds have moved uphill, threatening high elevation birds.



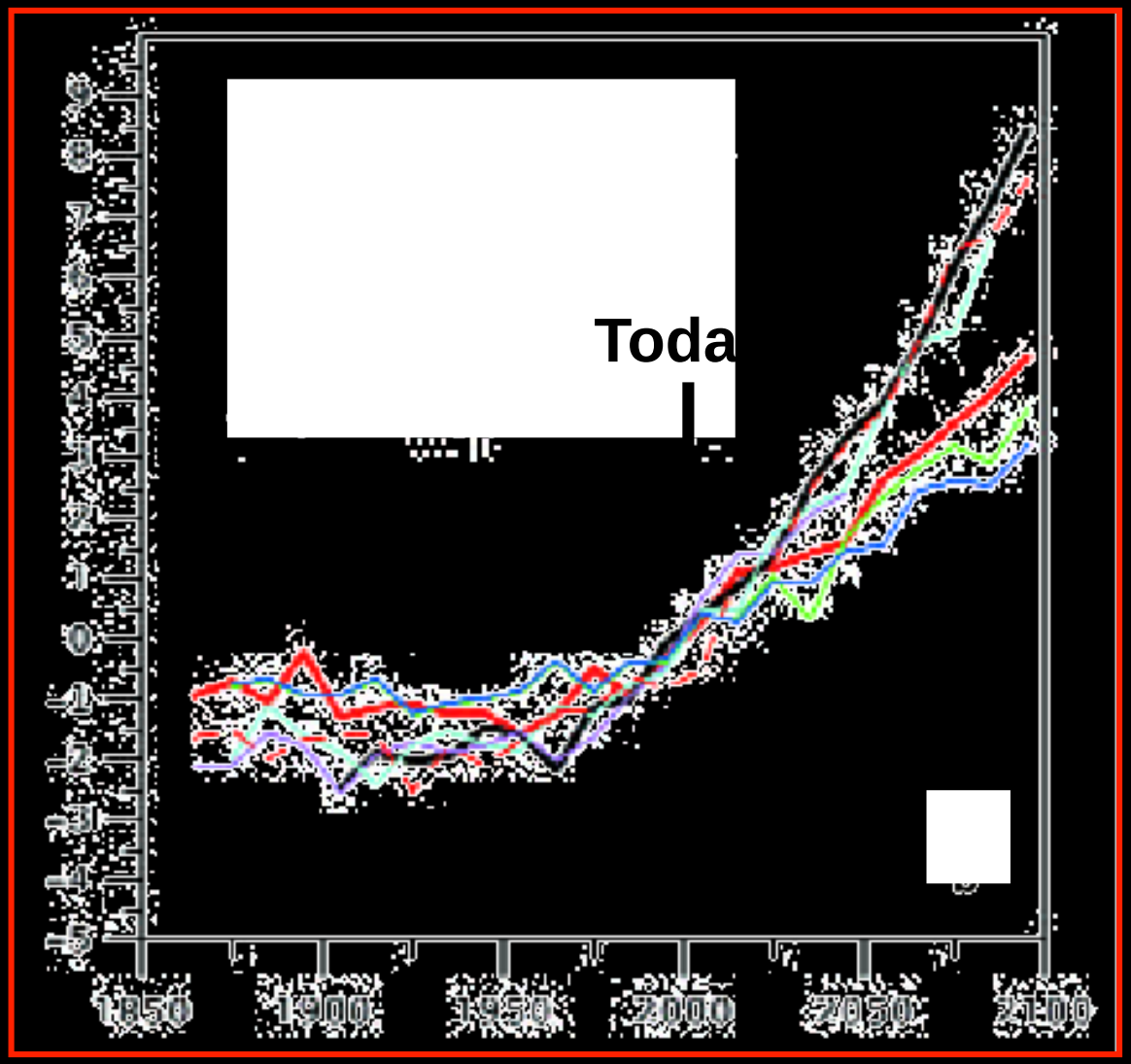
Snow cover and ice extent have decreased all around the world.




Some insects are being affected by climate change because the plants they feed on are flowering or leafing out earlier than they emerge.

Prairies may decline in a high CO_2 environment

Projected temperature increases for the USA over the next century.



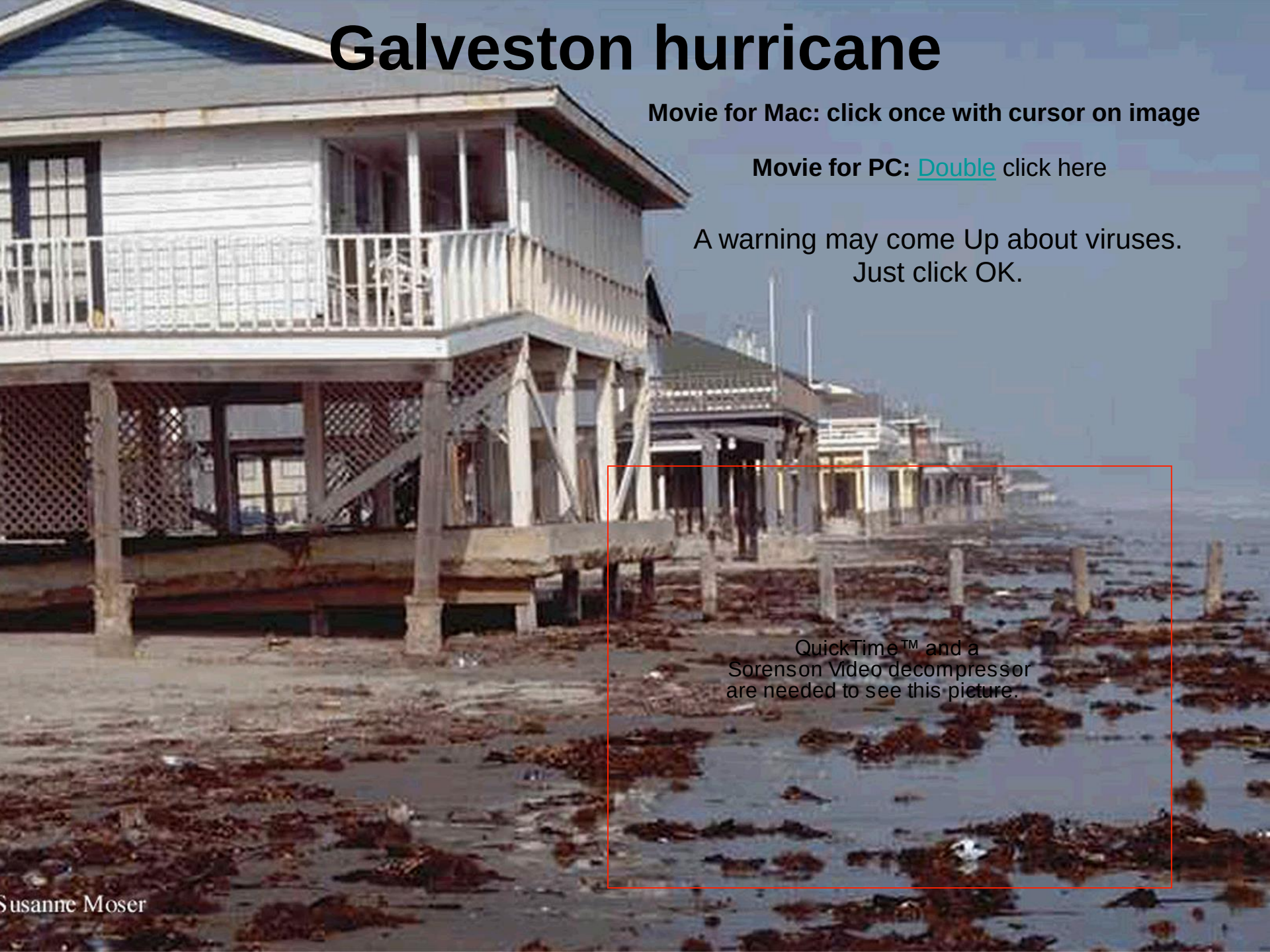
Galveston hurricane

Movie for Mac: click once with cursor on image

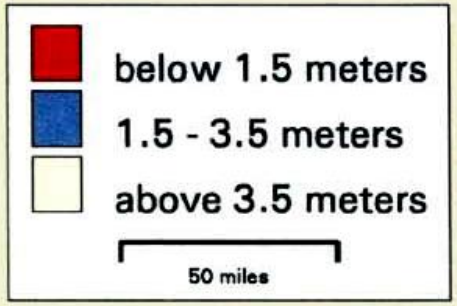
Movie for PC: Double click here

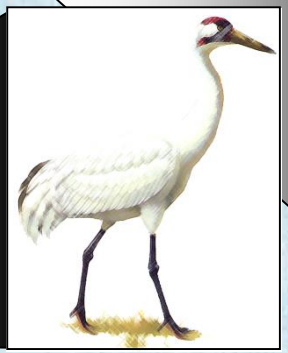
A warning may come Up about viruses.
Just click OK.

QuickTime™ and a
Sorenson Video decompressor
are needed to see this picture.



Sea Level Rise in the Next 100 Years



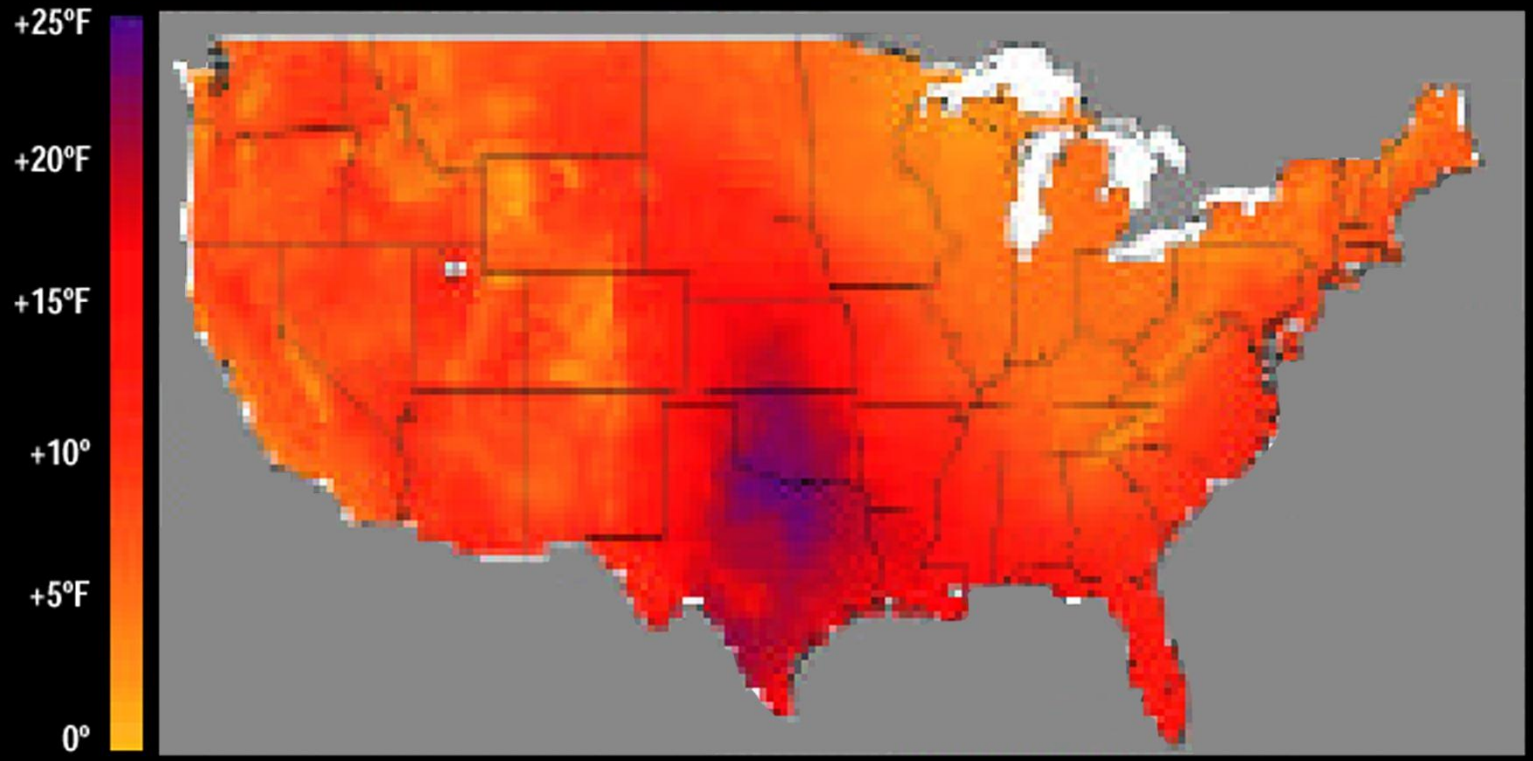


Whooping Crane breeding habitat

Many important places on the Texas Coast will disappear

Where in the United States will it get the hottest?

Much Hotter



A Little Hotter

Change in the July Heat Index over the next 100 years
(Hadley Model, VEMAP).


The Hill Country will still be the best place to live in Texas.

Acknowledgements:

Material and Images:

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Jay Banner, Department of Geological Sciences, UT
Texas Memorial Museum

Dr. Camille Parmesan

Assistant Professor, Section of Integrative Biology, the University of Texas at Austin

Dr. Camille Parmesan's early research focused on multiple aspects of population biology, including the ecology, evolution and behaviors of insect/plant interactions. For the past several years, the focus of her work has been on current impacts of climate change in the 20th century on wildlife. Her work on butterfly range shifts has been highlighted in many scientific and popular press reports, such as in *Science, Science News,* New York Times, London Times, National Public Radio, and the recent BBC film series "State of the Planet" with David Attenborough. The intensification of global warming as an international issue led her into the interface of policy and science. Parmesan has given seminars in DC for the White House, government agencies, and NGOs (e.g., IUCN and WWF). As a lead author, she was involved in multiple aspects of the Third Assessment Report of the IPCC.