

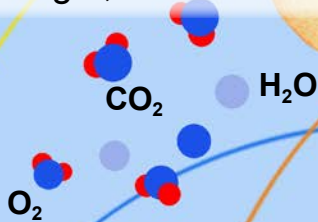
# VA #1 California 18,000 Years Ago



# VA #2 Earth's Climate System

## Atmosphere

Weather, gases, incoming sunlight, air currents



## Biosphere

All living things

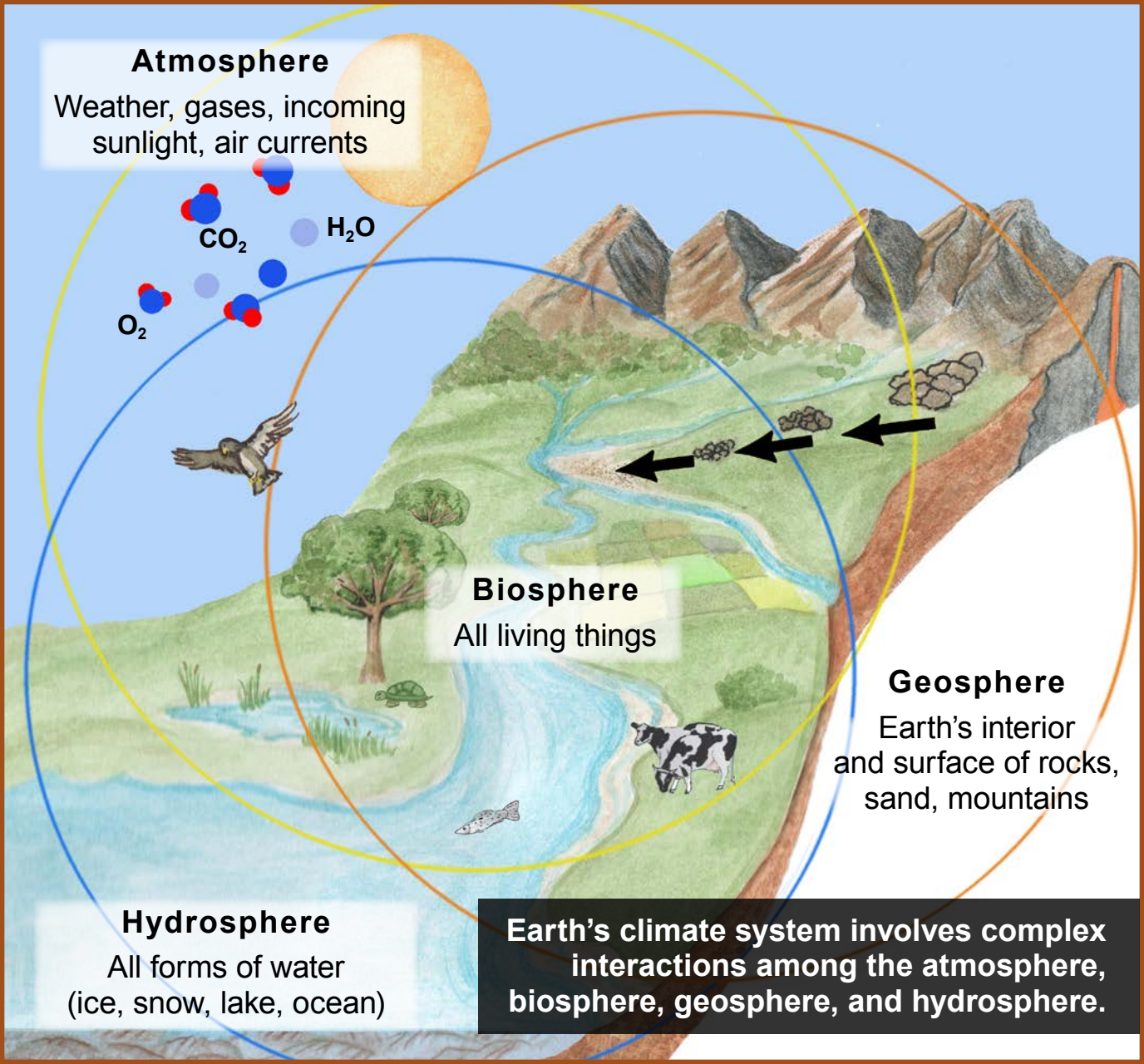
## Geosphere

Earth's interior and surface of rocks, sand, mountains


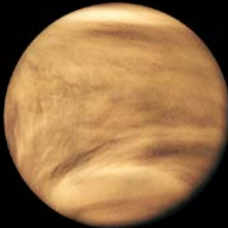
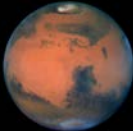
## Hydrosphere

All forms of water (ice, snow, lake, ocean)

Earth's climate system involves complex interactions among the atmosphere, biosphere, geosphere, and hydrosphere.



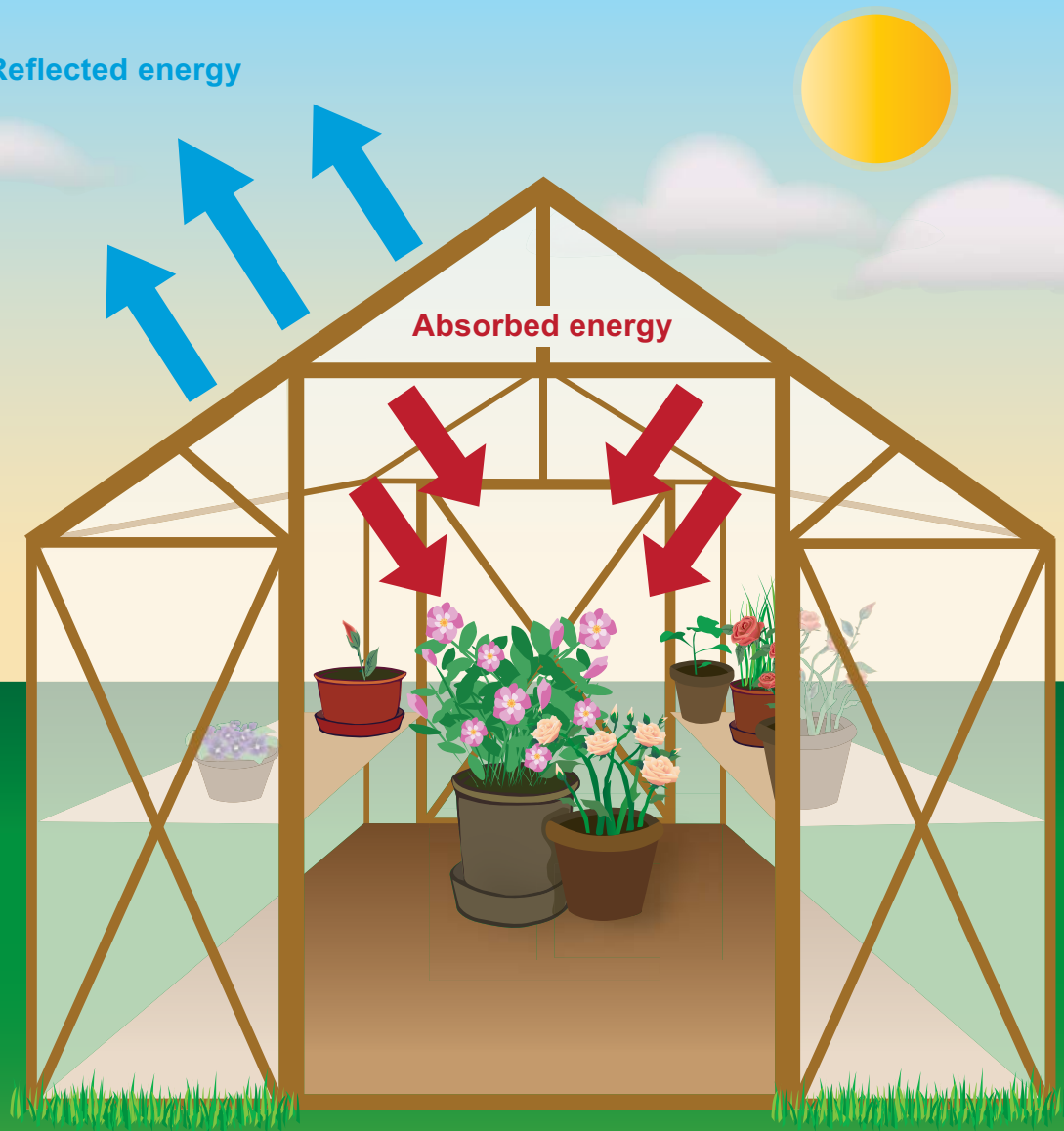
# VA #3 Atmospheres of Earth, Venus, and Mars

	Earth	Venus	Mars
			
<b>Carbon Dioxide (CO<sub>2</sub>)</b>	0.030 %	96.500 %	95.000 %
<b>Nitrogen (N<sub>2</sub>)</b>	78.000 %	3.500 %	2.700 %
<b>Oxygen (O<sub>2</sub>)</b>	21.000 %	Trace	0.130 %
<b>Argon (Ar)</b>	0.900 %	0.007 %	1.600 %
<b>Methane (CH<sub>4</sub>)</b>	0.002 %	0 %	0 %
<b>Nitrous Oxide (NO<sub>2</sub>)</b>	Yes	No	Yes
<b>Water Vapor</b>	Yes	No	No

# VA #4 A Greenhouse

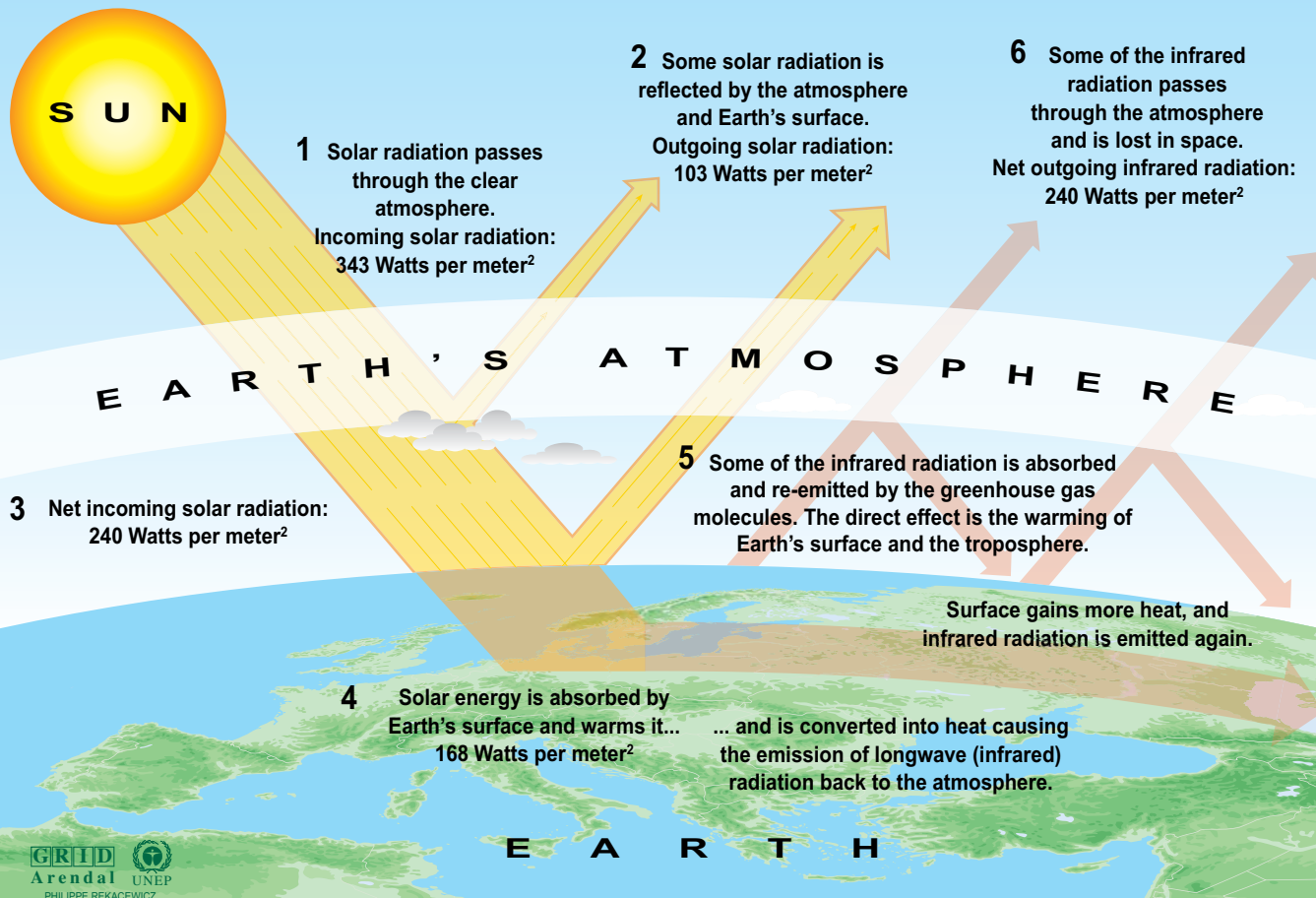
Reflected energy

Absorbed energy



# VA #5 Earth's Greenhouse

## The Greenhouse Effect



## VA #6 San Luis Reservoir, California



# VA #7 Other Greenhouse Gases

**Chlorofluorocarbons (CFCs, HCFCs)**  
**Hydrofluorocarbons (HFCs)**  
**Perfluorocarbons (PFCs)**



Found in aerosol sprays (spray paint, cooking spray), dry cleaning fluids, air conditioning, refrigeration, and medical supplies.

**Sulfur hexafluoride ( $\text{SF}_6$ )**  
**Nitrogen trifluoride ( $\text{NF}_3$ )**

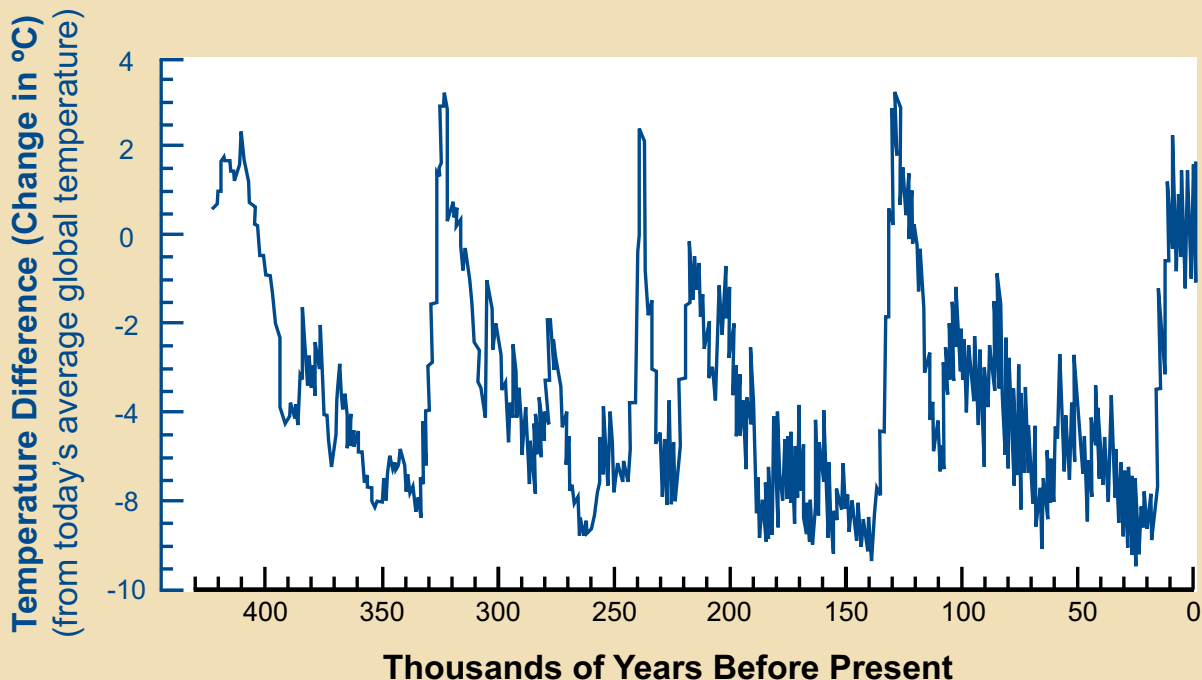


Used in electronics, as well as processing and manufacturing of semiconductors, like solar panels.

**Sources of these GHGs: Human activity (only)**

**Sinks of these GHGs: The atmosphere (only)**

# VA #8 Temperature Change on Earth Over Time

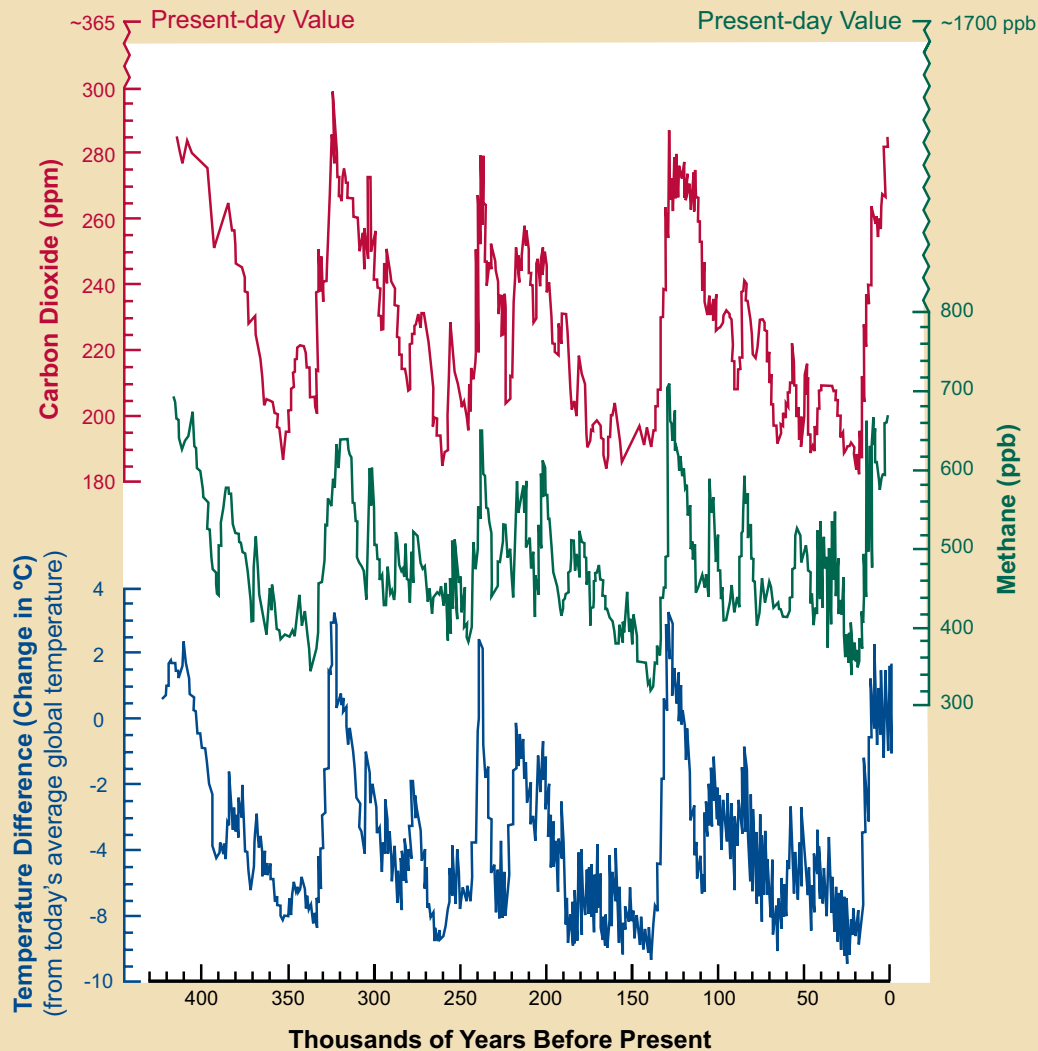


Notes: These are the values measured in the ice cores.

0 on the Y-axis indicates the average temperature over time, not the actual temperature.

Other numbers on the Y-axis indicate the difference from the average temperature.

# VA #9 Vostok Ice Core Data

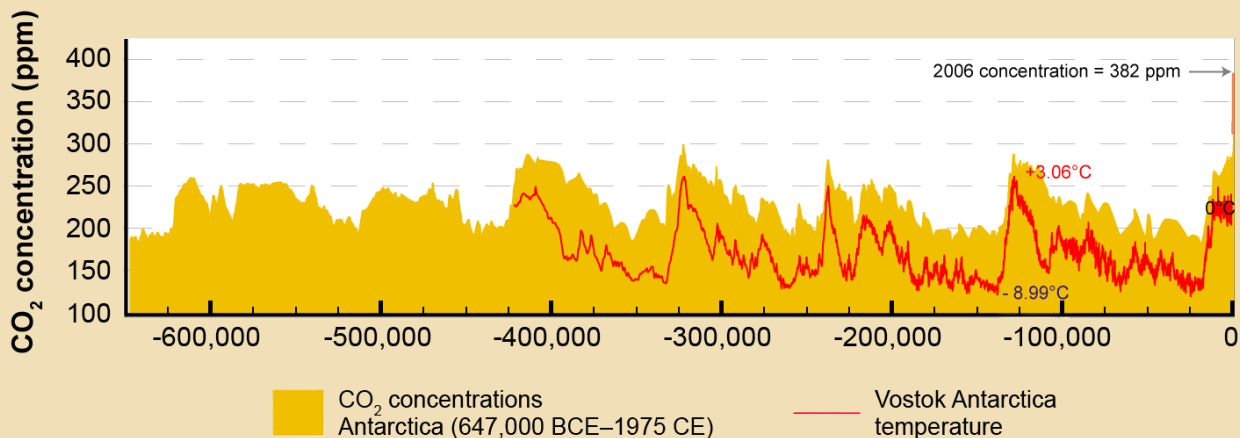


Notes: These are the values measured in the ice cores.

0 on the Y-axis indicates the average temperature over time, not the actual temperature.  
Other numbers on the Y-axis indicate the difference from the average temperature.

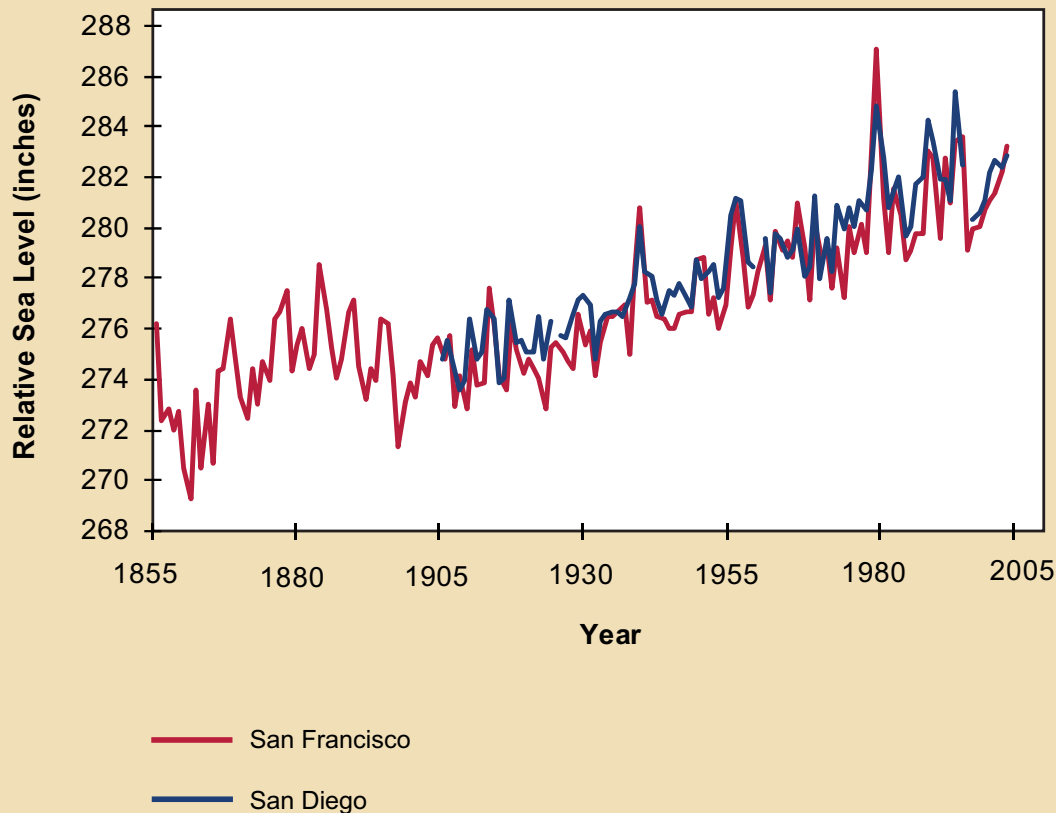
# VA #10 Antarctic Temperatures and Atmospheric CO<sub>2</sub>

**CO<sub>2</sub> concentrations 647,000 BCE to 2006 CE**  
**Antarctic temperature 421,000 BCE to 2000 CE\***



*\*Antarctic temperature is measured as the change from the average conditions for the period 1850 CE–2000 CE*

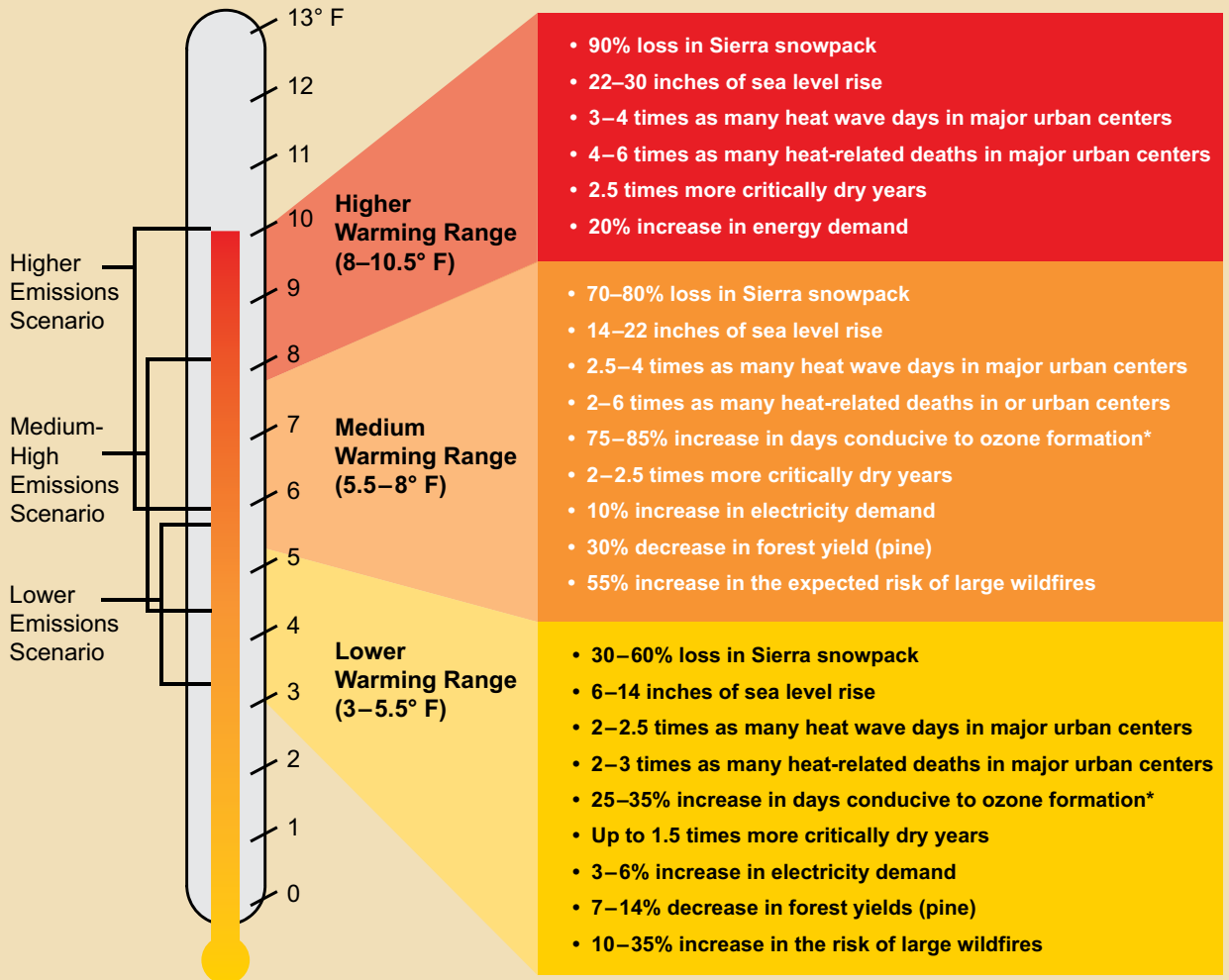
# VA #11 Historical Sea-Level for San Francisco and San Diego



Source: Susie Moser, Guido Franco, Sarah Pittiglio, Wendy Chou, Dan Cayan, 2009. *The Future Is Now: An Update on Climate Change Science Impacts and Response Options for California*. (California Energy Commission, PIER Energy-Related Program, CEC-500-2008-071)

# VA #12 Projected Global Warming Effects in California

## Summary of Projected Global Warming Effects, 2070–2099 (as compared with 1961–1990)



\*For high ozone locations in Los Angeles (Riverside) and the San Joaquin Valley (Visalia)