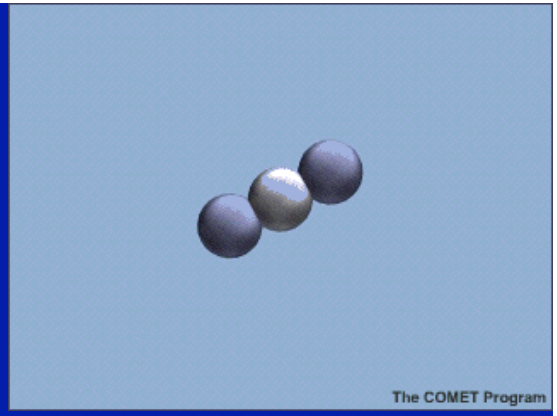

Our Climate: A Global Challenge

Academy of Lifelong Learning
Denver, CO

Finish Oct. 22, 2014

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Questions

~~Denier arguments~~

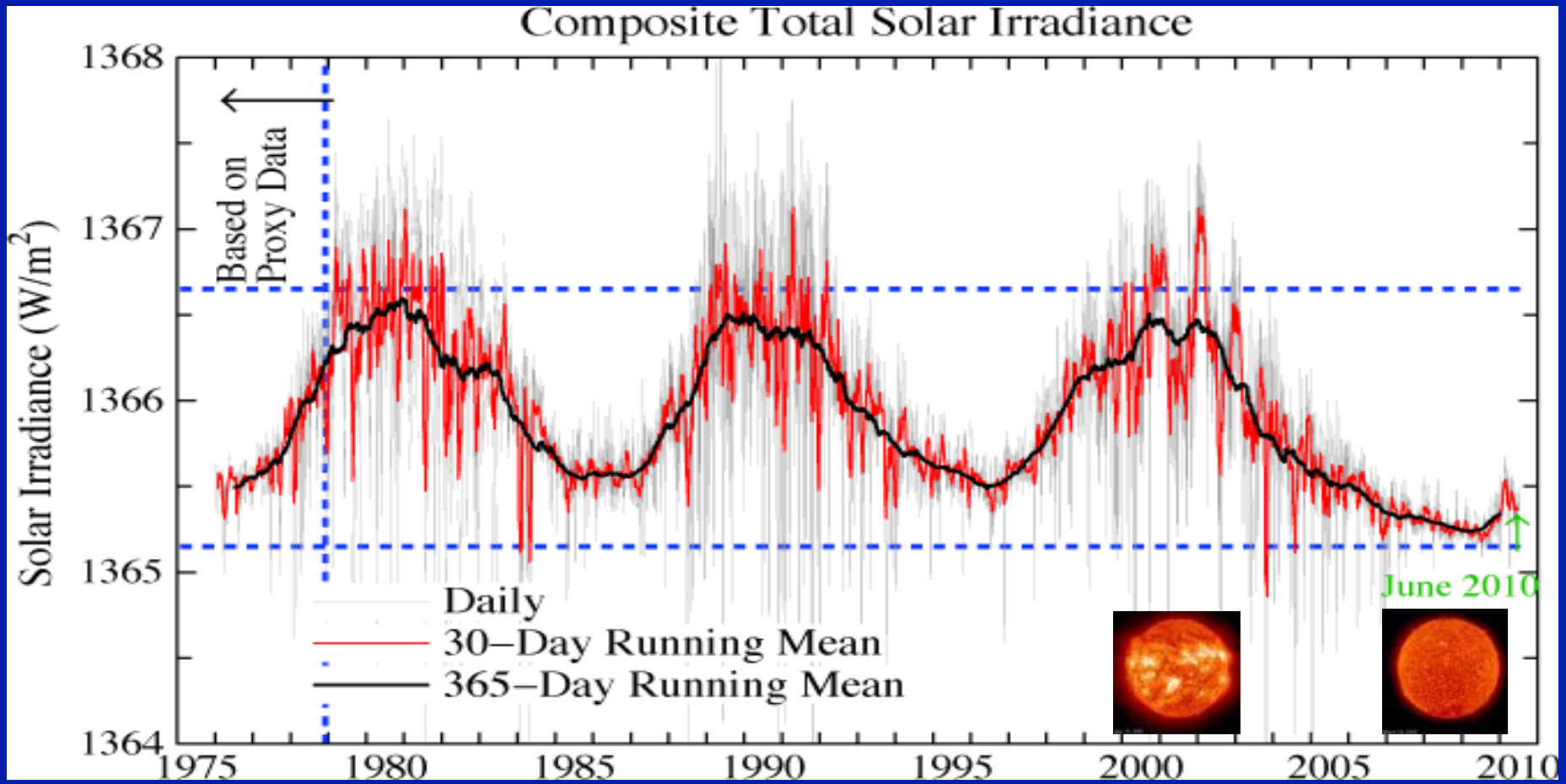
Questions and Answers

Can't cover all the questions.

See http://skepticalscience.com/argument.php
or http://www.realclimate.org/

- What about the sun?
- Why isn't the warming caused by water?
- Where does the CO_2 come from?
- Why is Antarctica is gaining ice?
- Why did the temperature quit going up?
- How do we know the warming is caused by human activities?

Solar irradiance

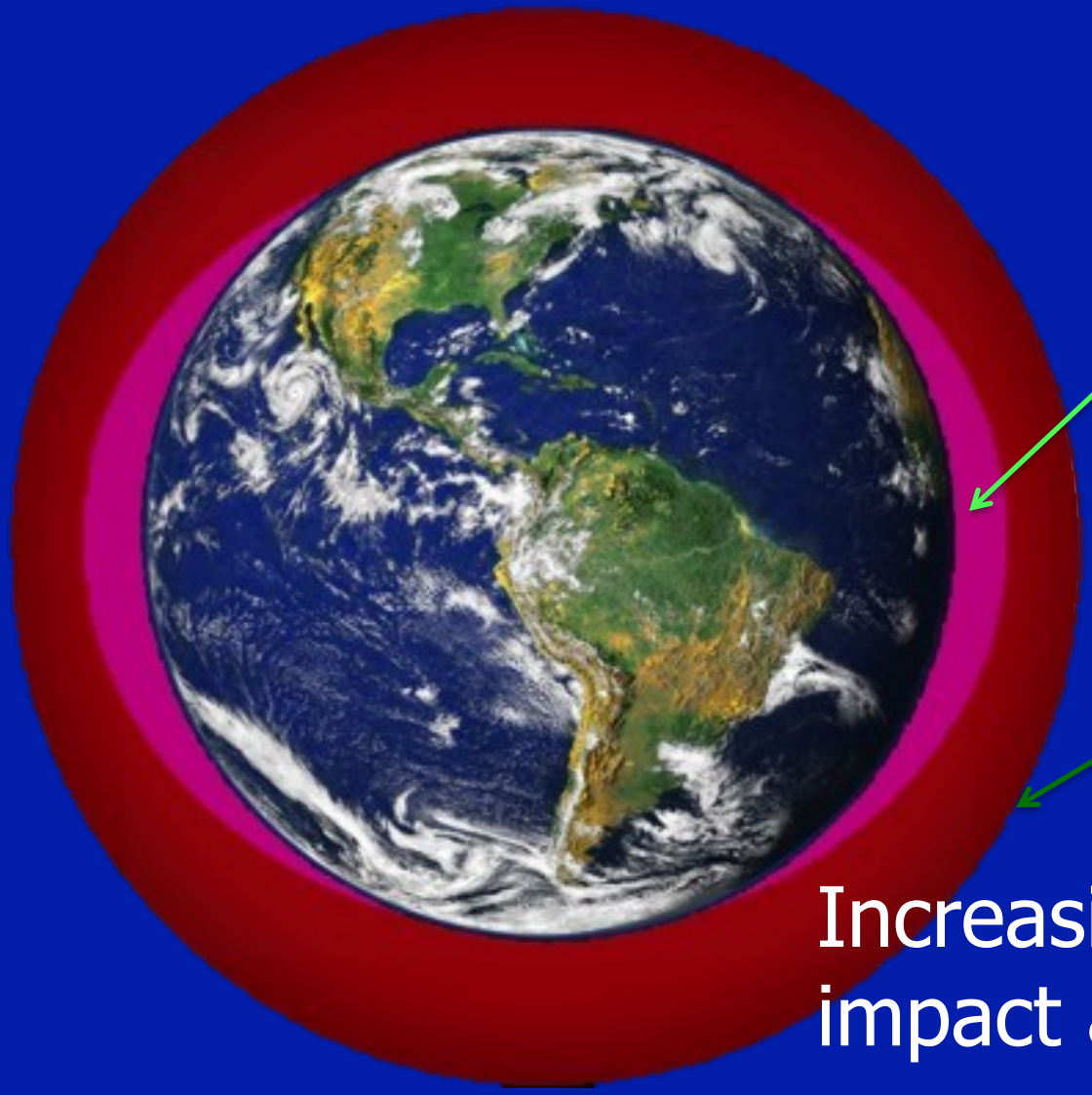


The drop of 1.2 Wm^{-2} since 2001 is equivalent to -0.2 Wm^{-2} in radiative forcing (CO_2 is +1.7 +/- 0.2)

Water is a greenhouse gas

- Water stays in atmosphere only a few days.
- When CO_2 goes up, atmosphere gets hotter and holds more water. The water vapor does not cause the rise in T, but it amplifies the effect of the CO_2.
- Water in atmosphere is least abundant and most variable in cold dry polar and high altitude climates.

The Earth and its atmosphere



Water vapor

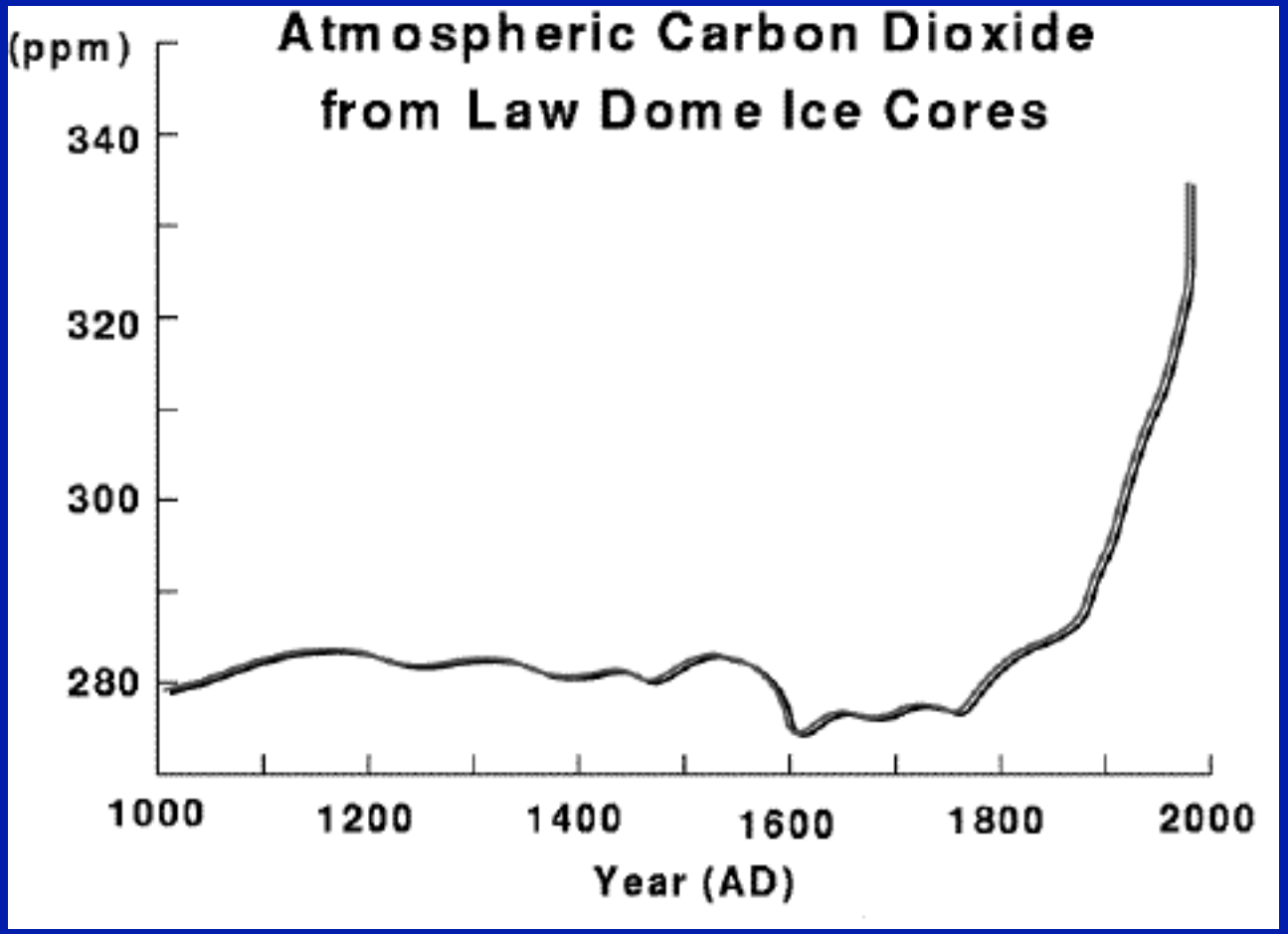
CO_2

Increasing CO_2 has biggest impact at the poles

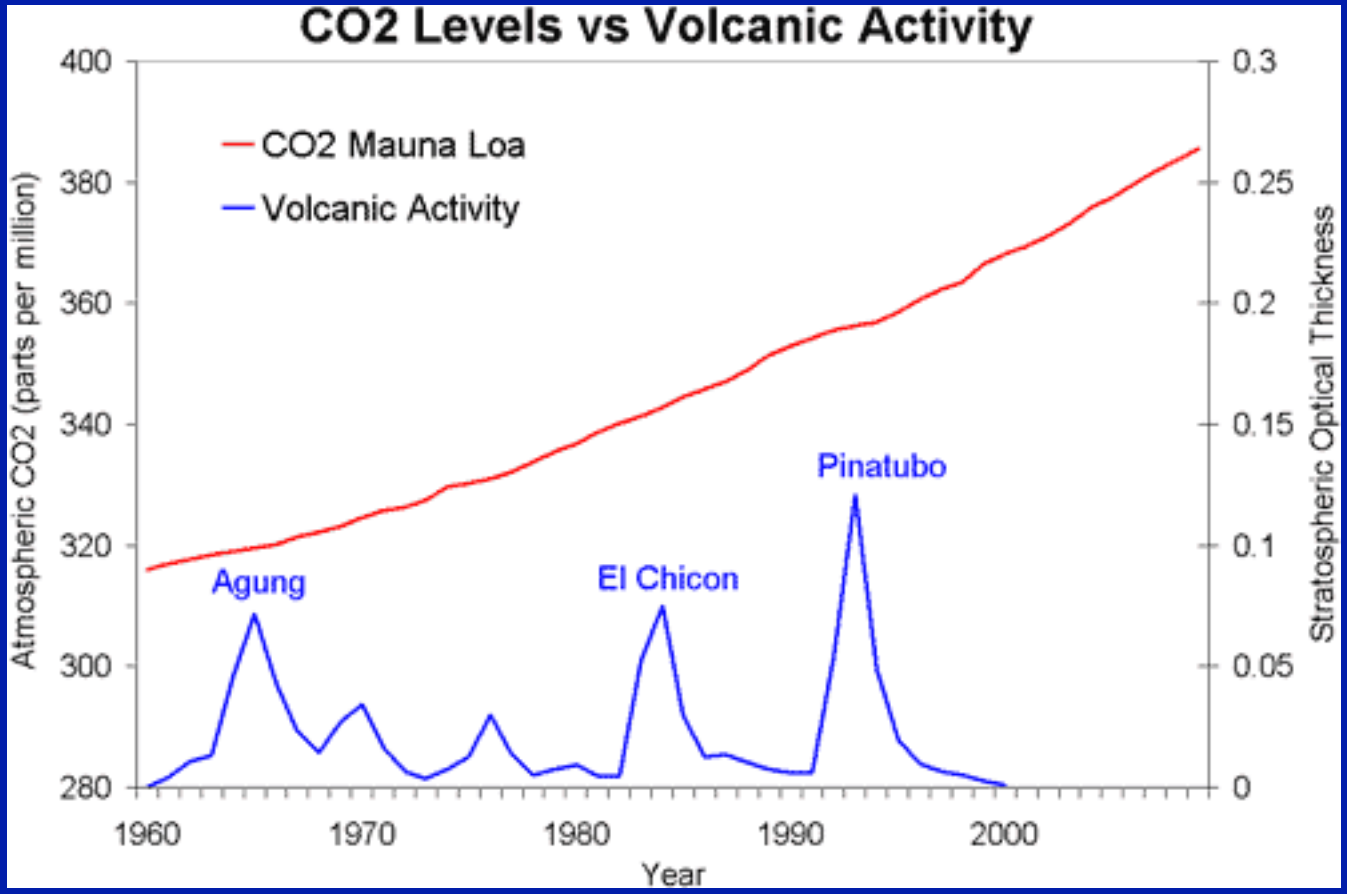
Where does the CO_2 really come from?

Non human sources of CO_2 are causing the global warming; e.g. undersea volcanoes.

No increase from volcanoes before 1750



Compare CO_2 with Volcanoes



No evidence of volcanic bumps in the recent CO_2 record.
CO_2 constant before industrial revolution. Why did it start increasing then?

Volcanic production of CO_2

- Before humans, volcanoes were the source of CO_2
  - Varies on geologic timescales as ice ages come and go and as plates move around and volcanic activity changes
  - Estimates 100-600 M metric tons
- Fossil fuel burning -> 30 B metric tons/ year
  - $(300 \times 10^6)/(30 \times 10^9) = 1\%$