

Is It Getting

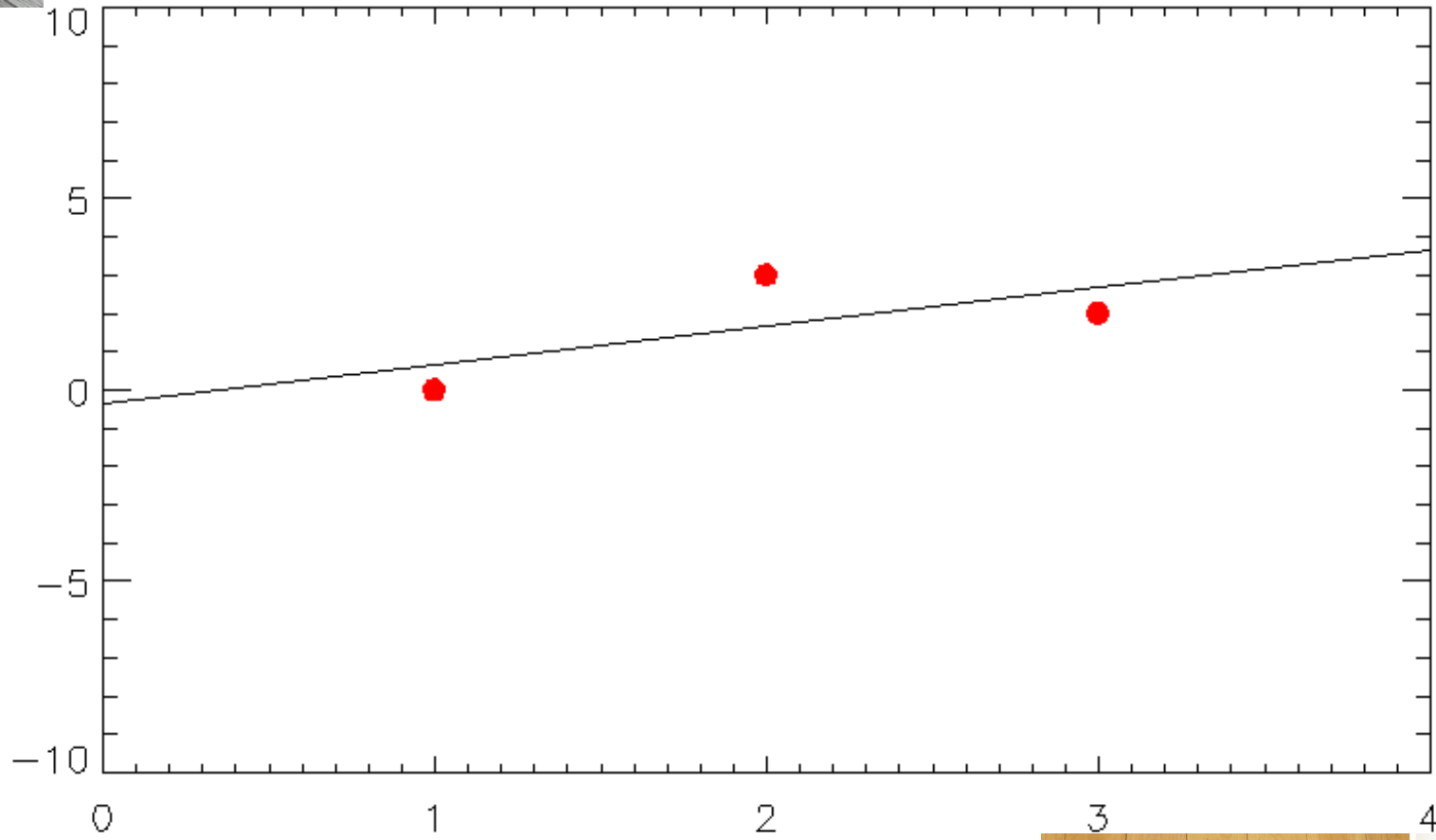
HOT

in here?

Ankur Desai

Atmospheric and Oceanic Sciences, UW-Madison

Soundwaves



THE GREAT ACCELERATION

SOCIO-ECONOMIC TRENDS



EARTH SYSTEM TRENDS



REFERENCE: Steffen, W., W. Broadgate, L. Deutsch, O. Gaffney and C. Ludwig (2015), The Trajectory of the Anthropocene: the Great Acceleration, Submitted to *The Anthropocene Review*.

MAP & DESIGN: Félix Pharand-Deschênes / Globaia

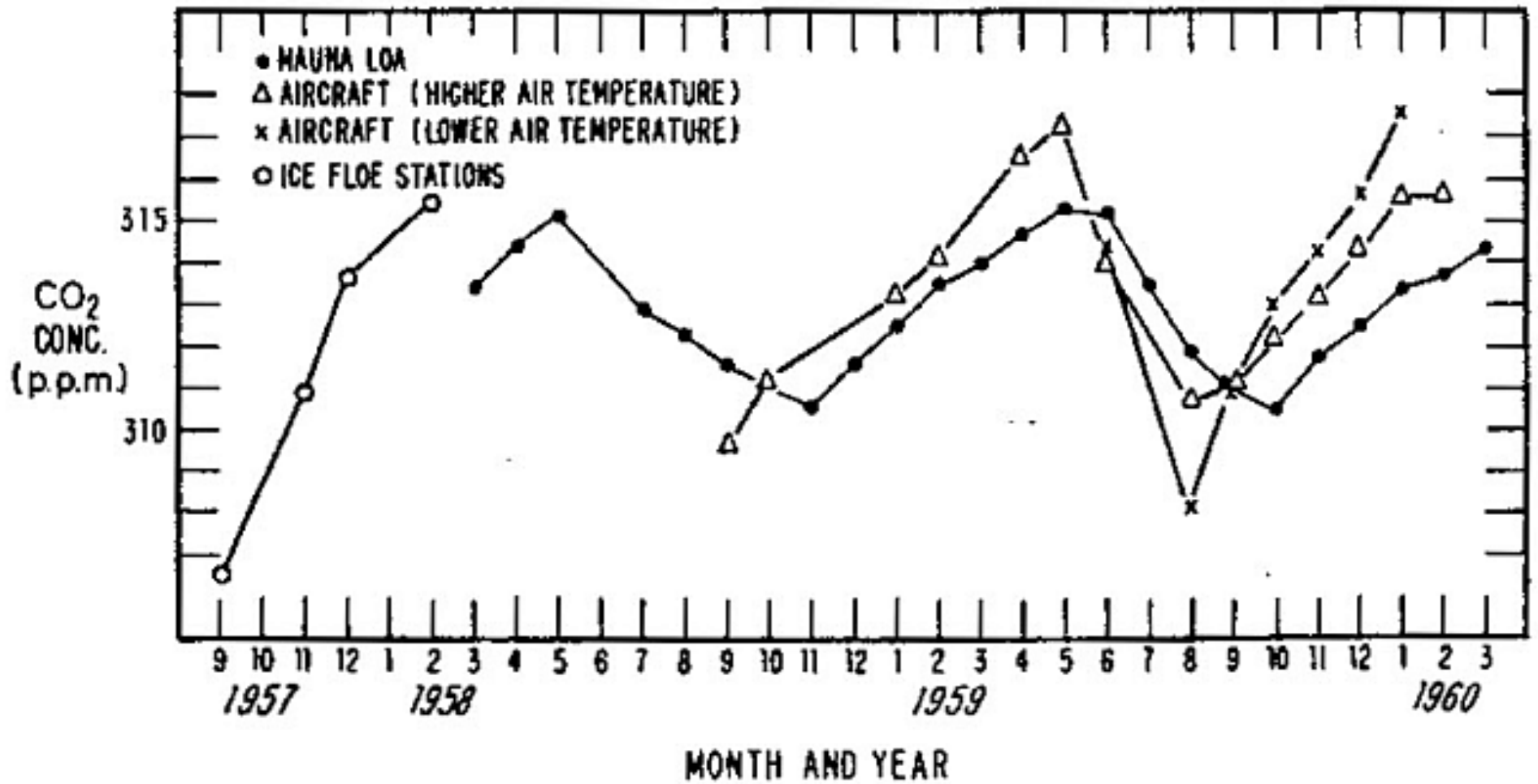


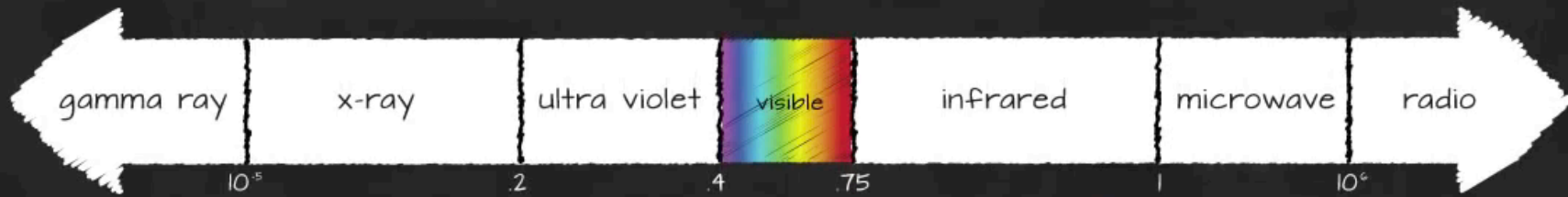
Fig. 1. Variation in concentration of atmospheric carbon dioxide in the Northern Hemisphere.

Tellus XII (1960), 2



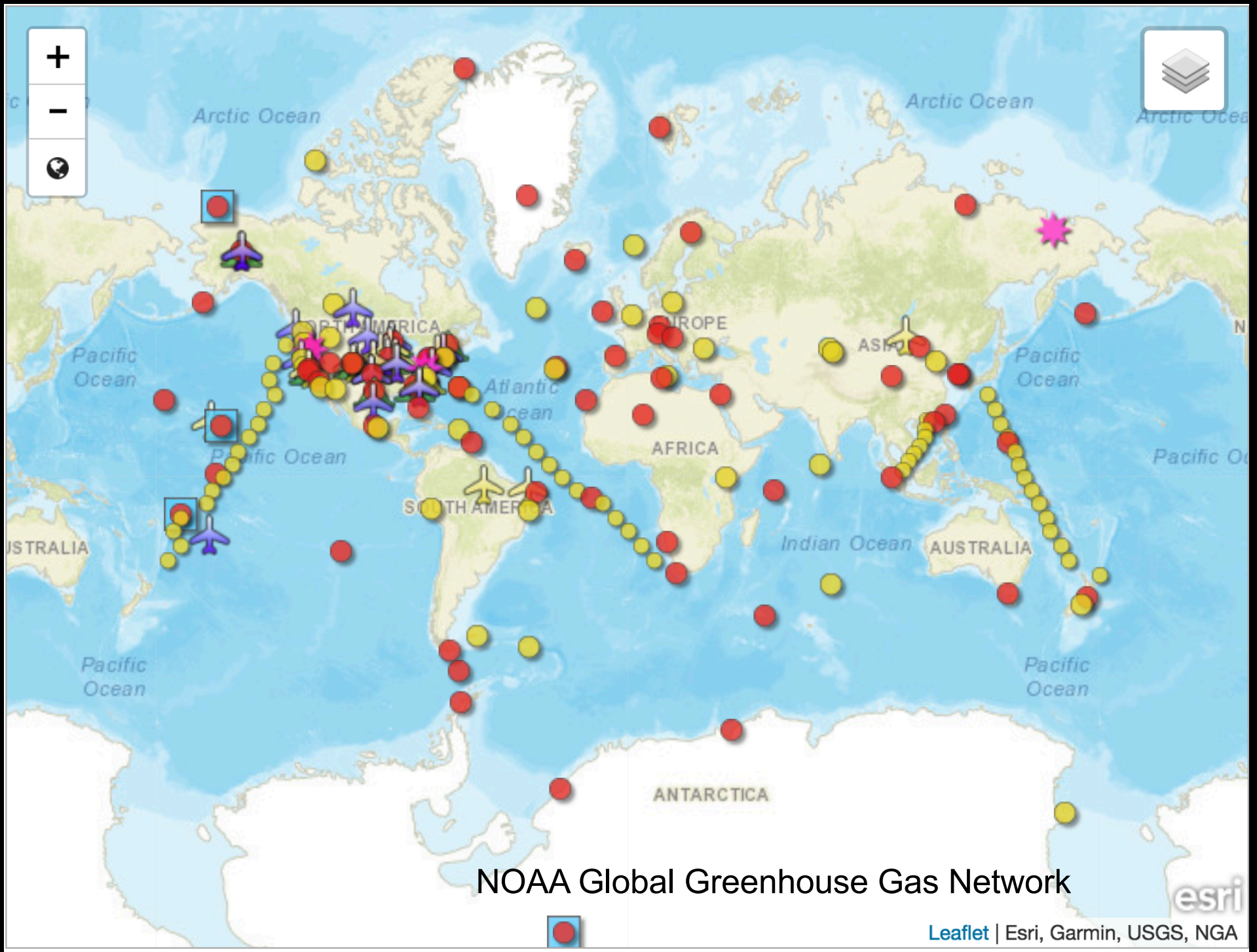
Charles David Keeling, Scripps, UCSD

Using light to measure CO₂



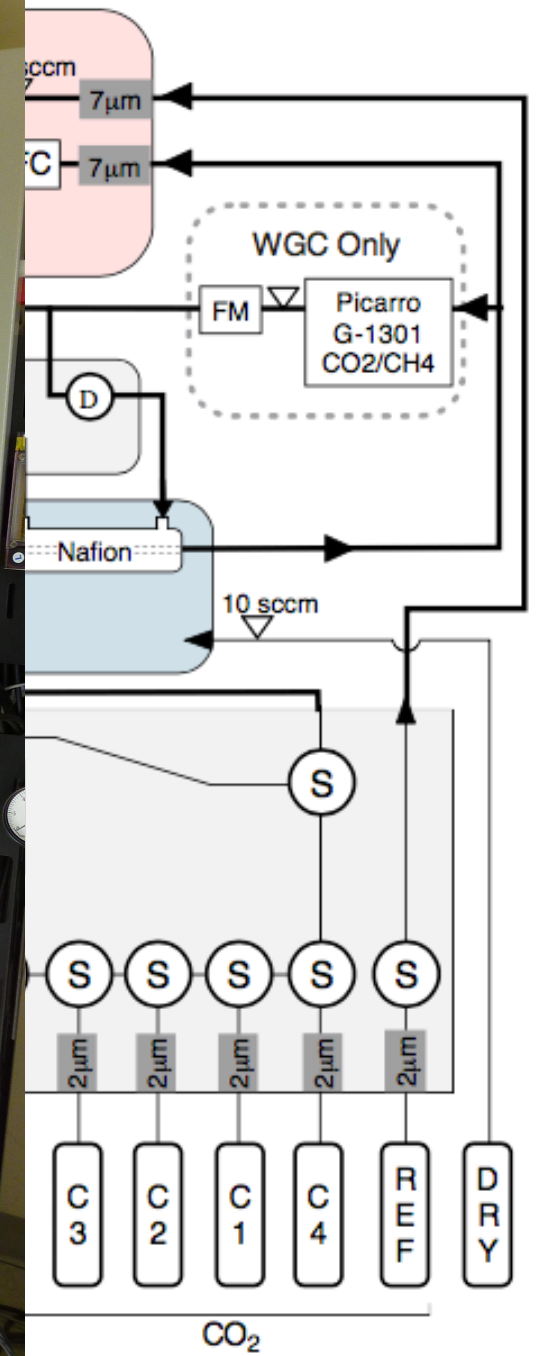
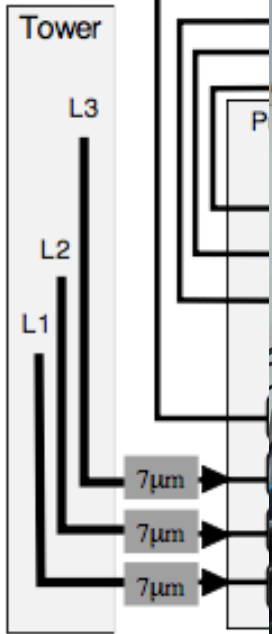
SPECTROSCOPY

-method of measuring something using light. 

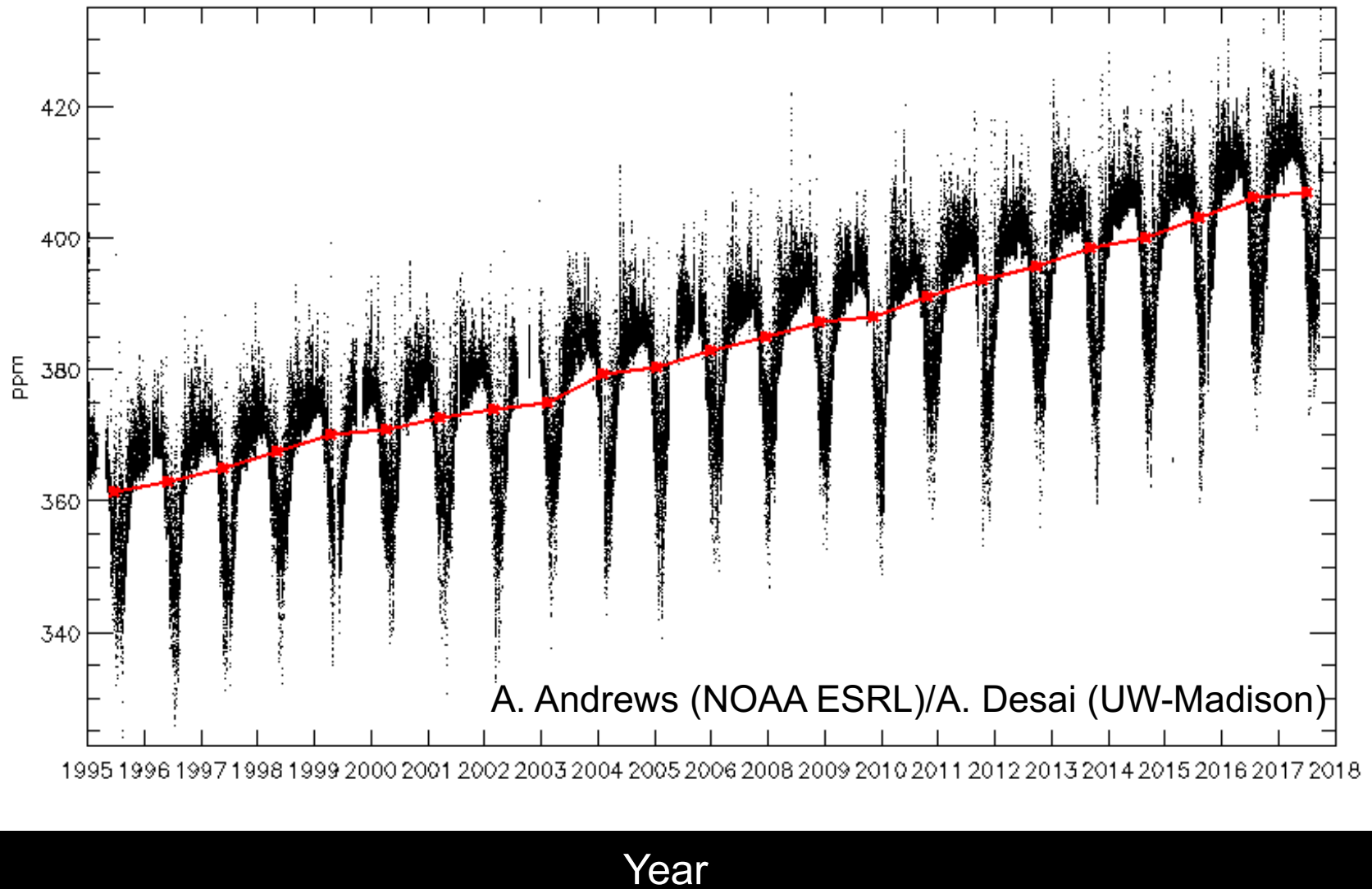


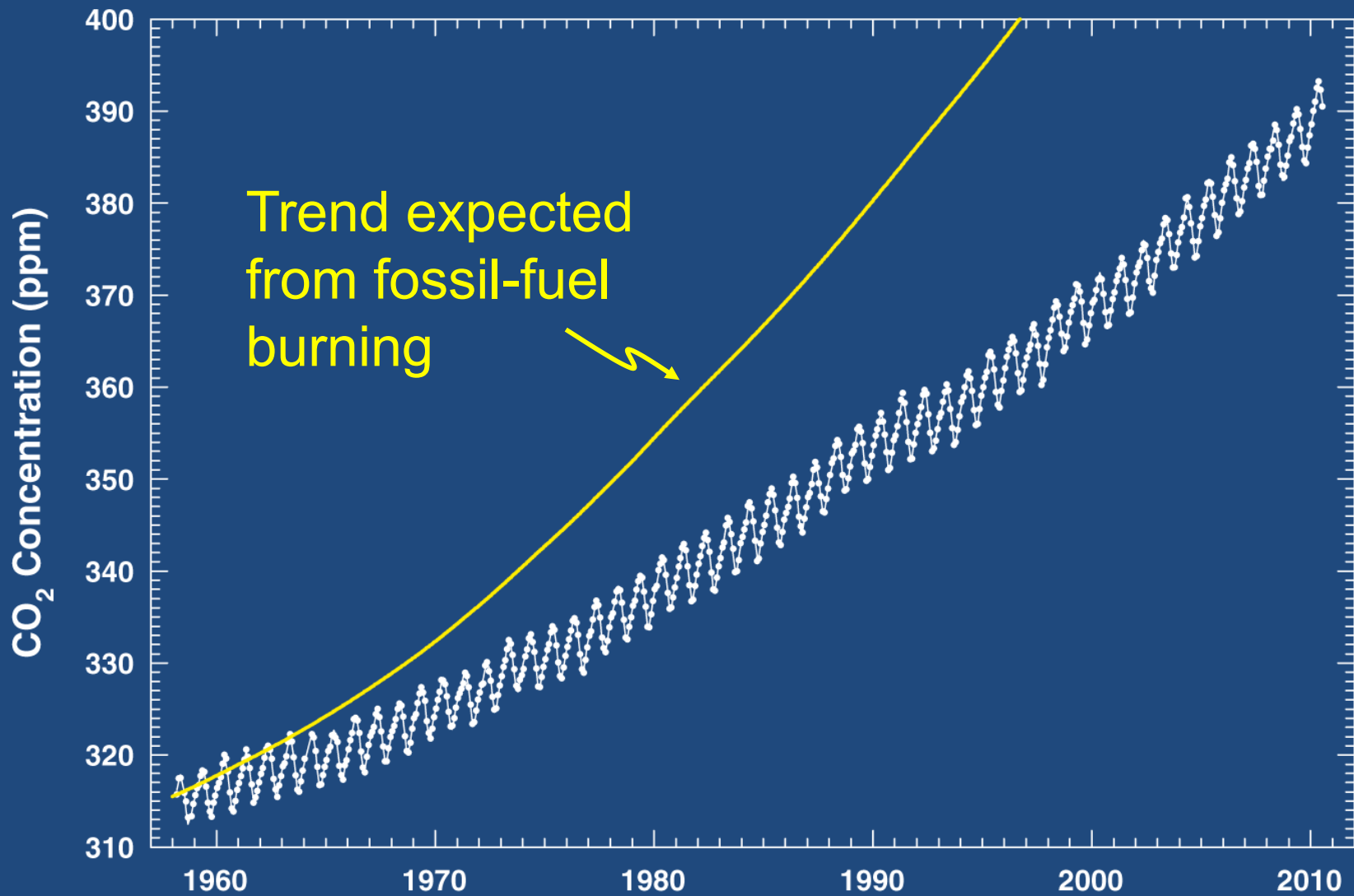


- PC Pressure Control
- DP Dewpoint Sensor
- MFC Mass Flow Controller
- PT Pressure Transducer



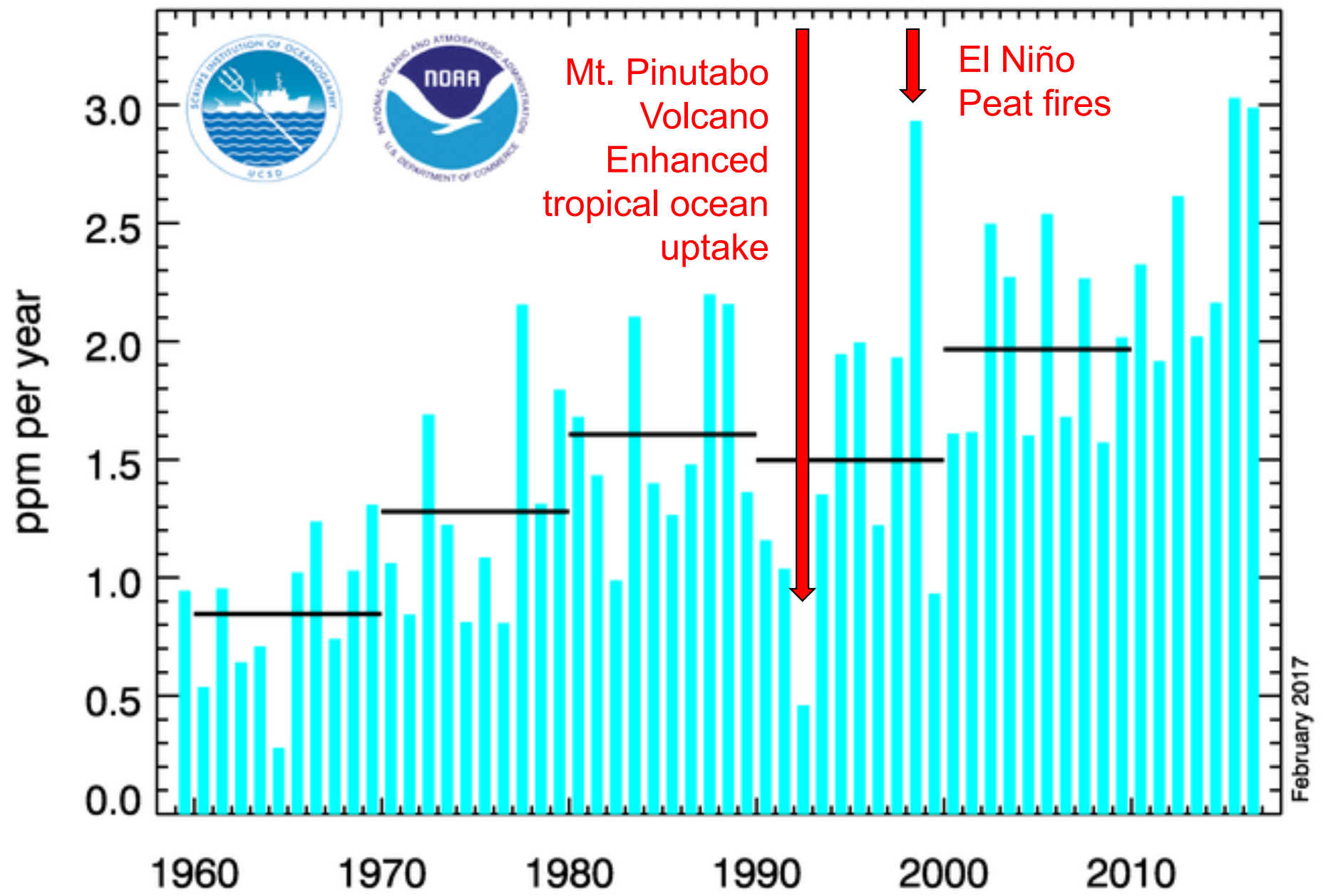
CO₂ Concentration in Air at 396 m Park Falls, Wisconsin WLEF tower

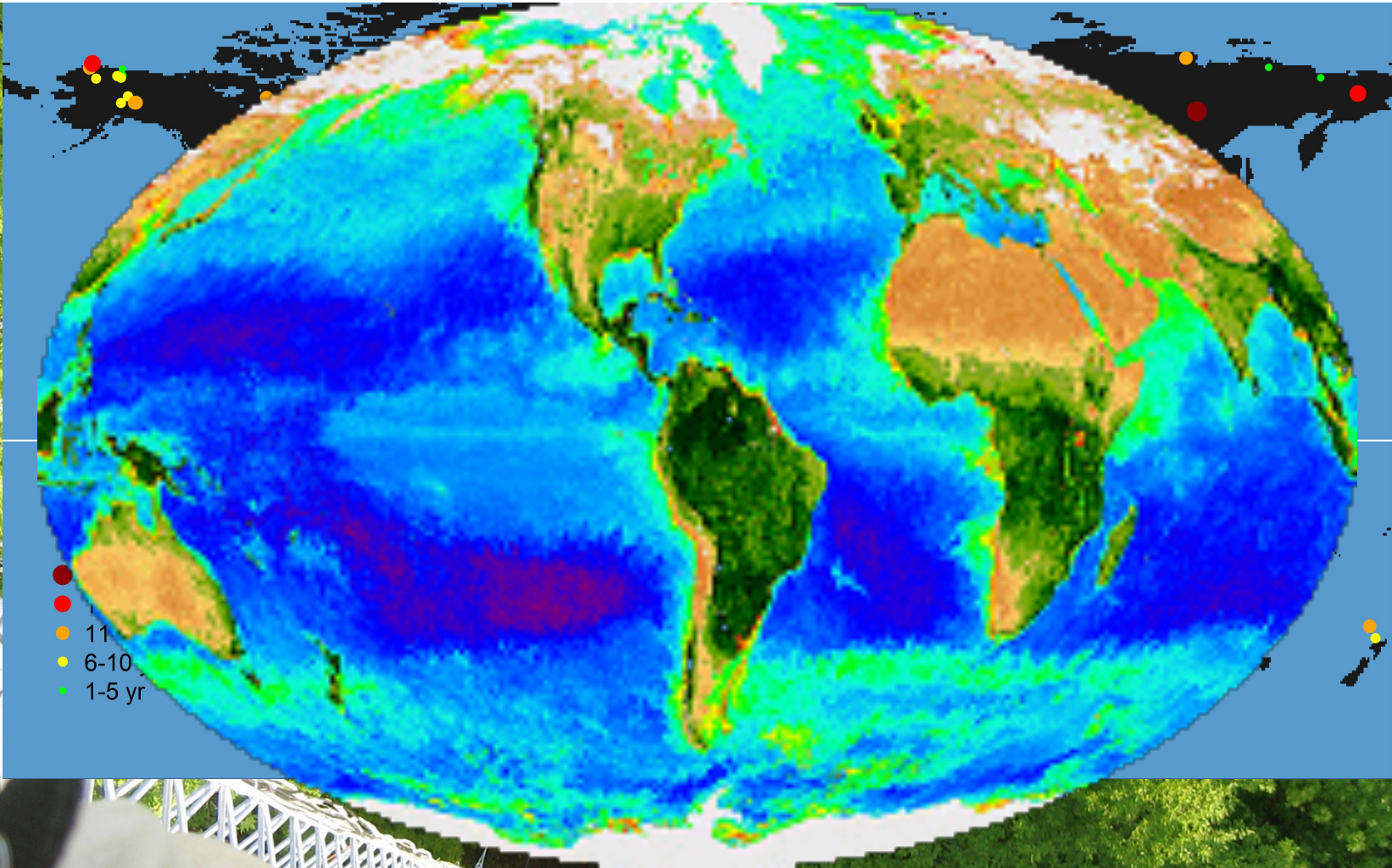




R. Keeling

annual mean growth rate of CO₂



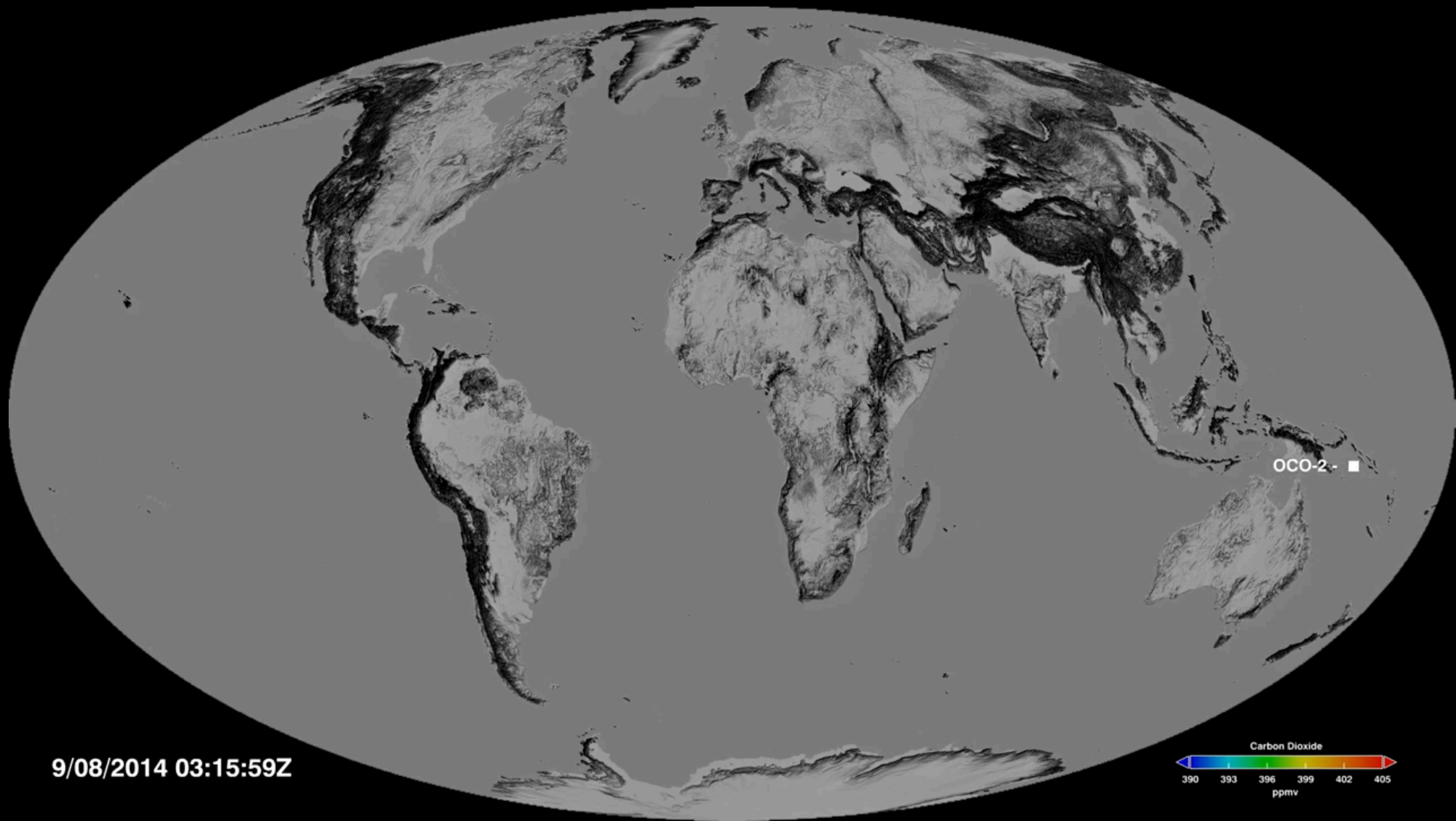


- 11-15 yr
- 6-10 yr
- 6-10 yr
- 1-5 yr

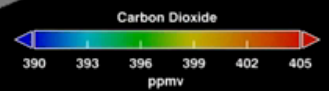
Credits:
Ankur Desai
Fluxnet
NASA SeaWiFS

OCO-2: Orbiting Carbon Observatory

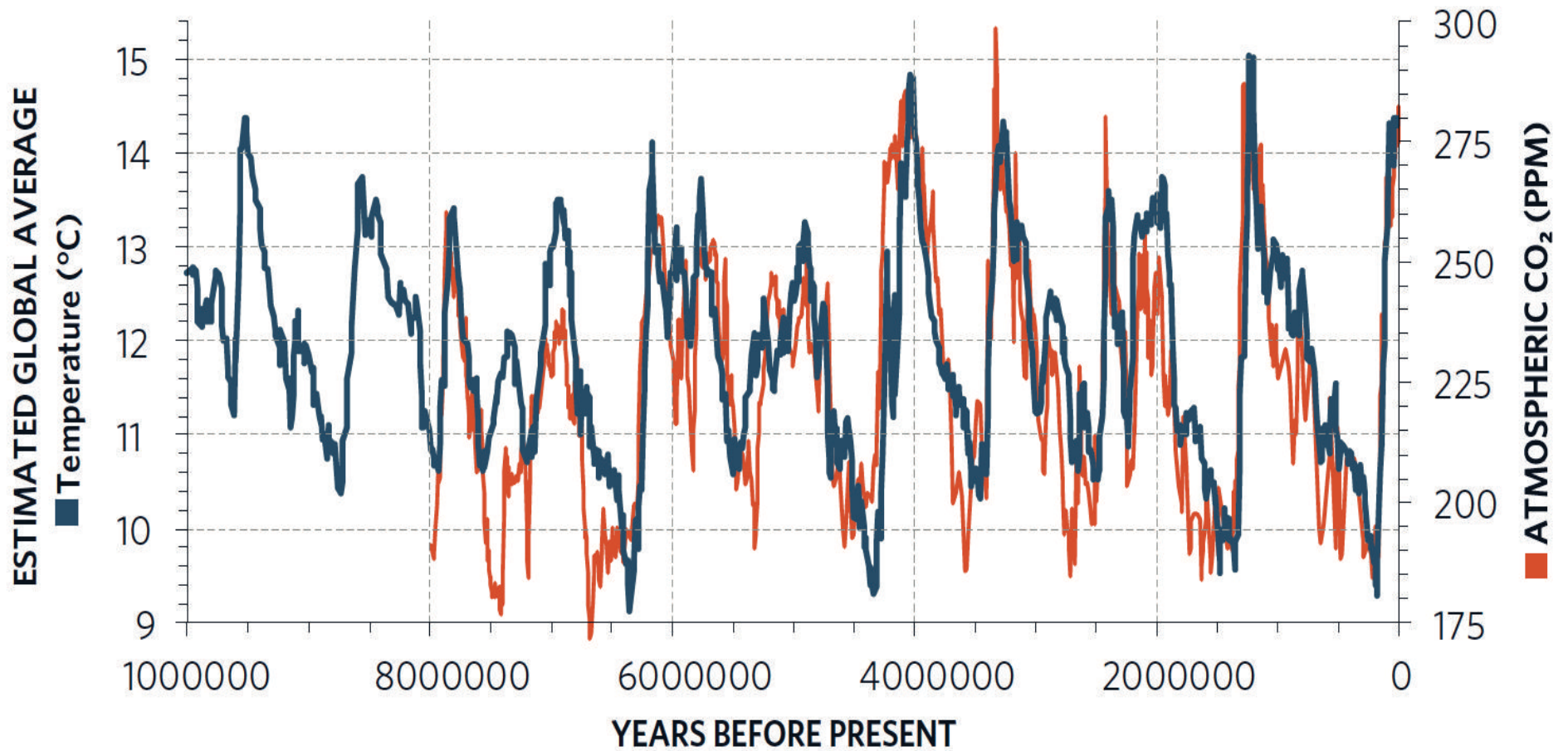




9/08/2014 03:15:59Z



AVERAGE GLOBAL SURFACE TEMPERATURE AND ATMOSPHERIC CO₂



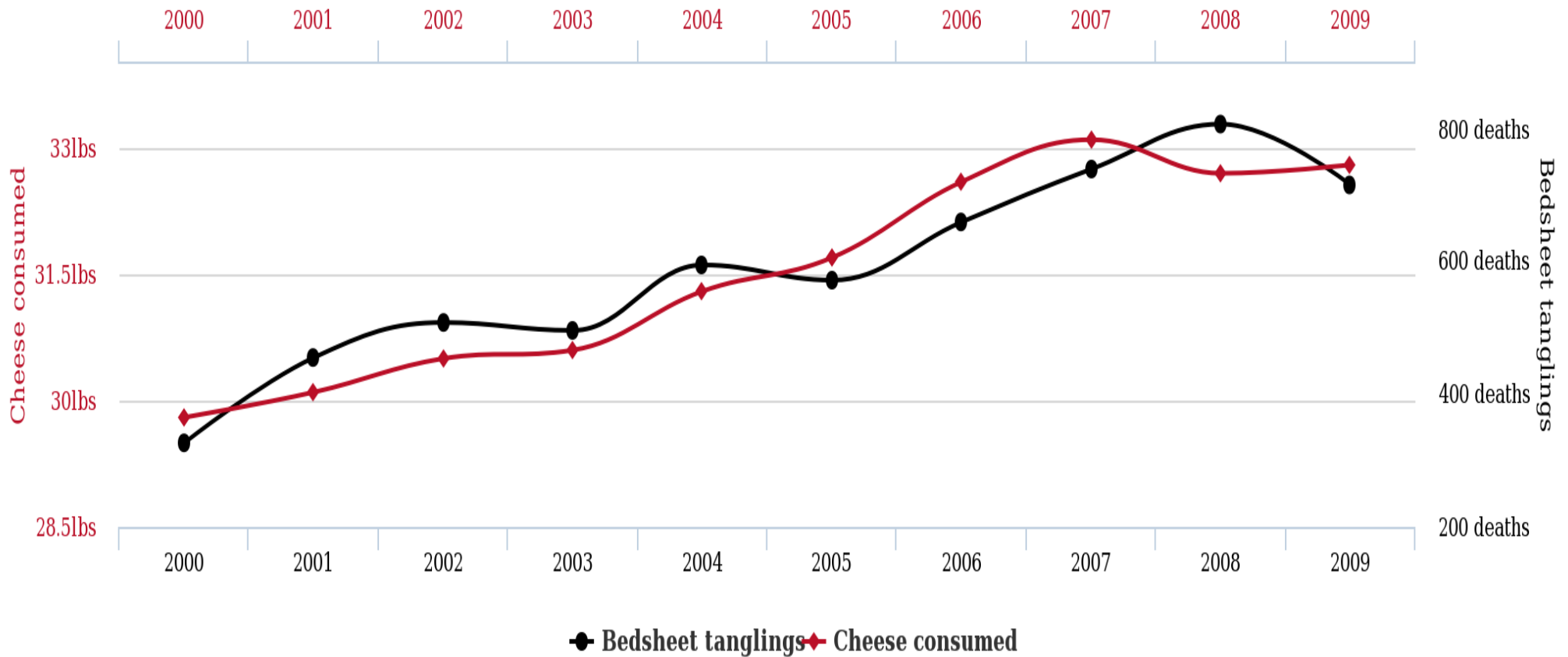
TEMPERATURE DATA: ZACHOS ET AL., 2001 TRANSFORMED AS IN HANSEN & SATO, 2012; CO₂ DATA: LUTHI ET AL., 2008

Mann et al., 2003, EOS

Per capita cheese consumption

correlates with

Number of people who died by becoming tangled in their bedsheets



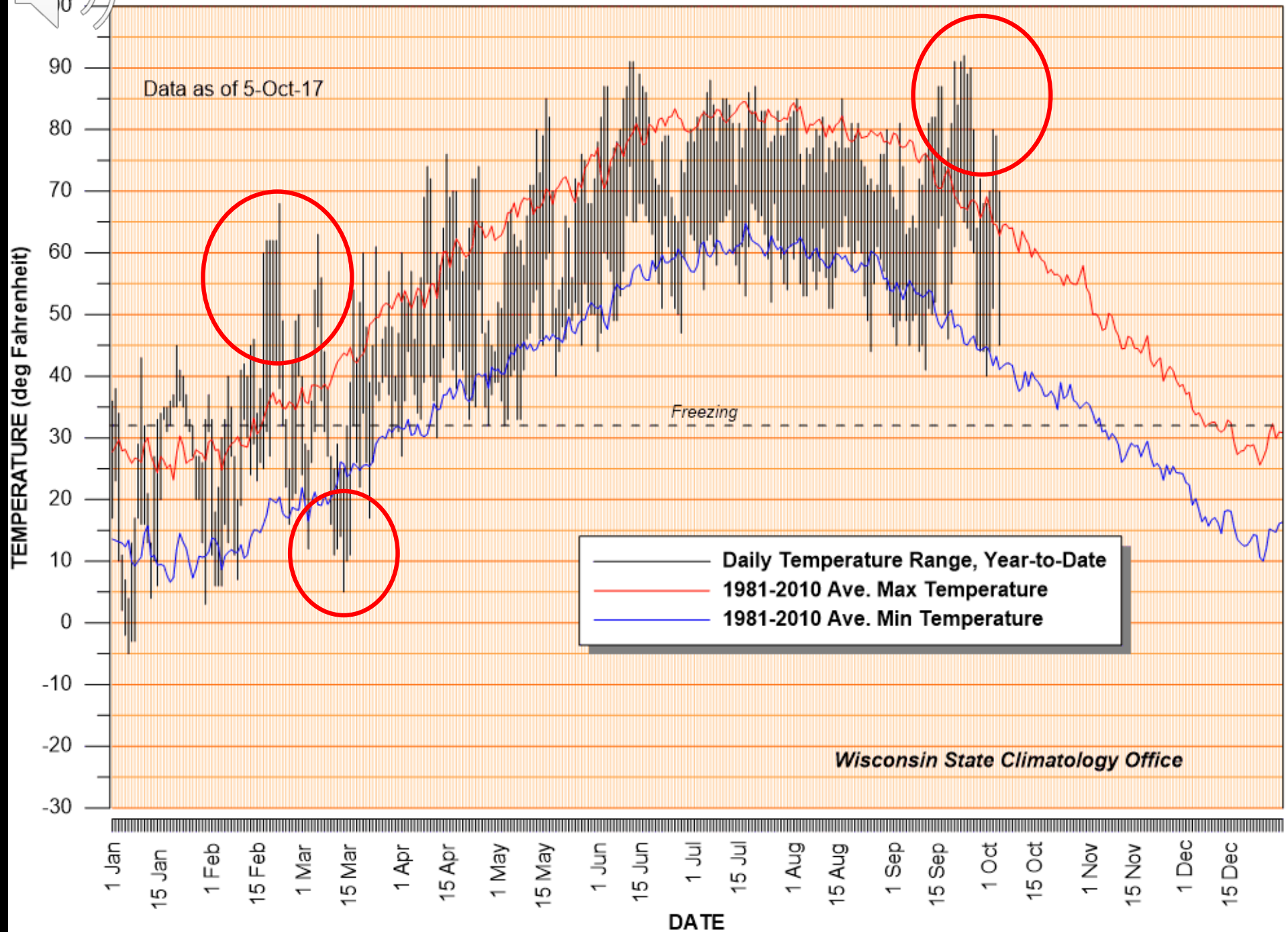
tylervigen.com

<http://www.tylervigen.com/spurious-correlations>

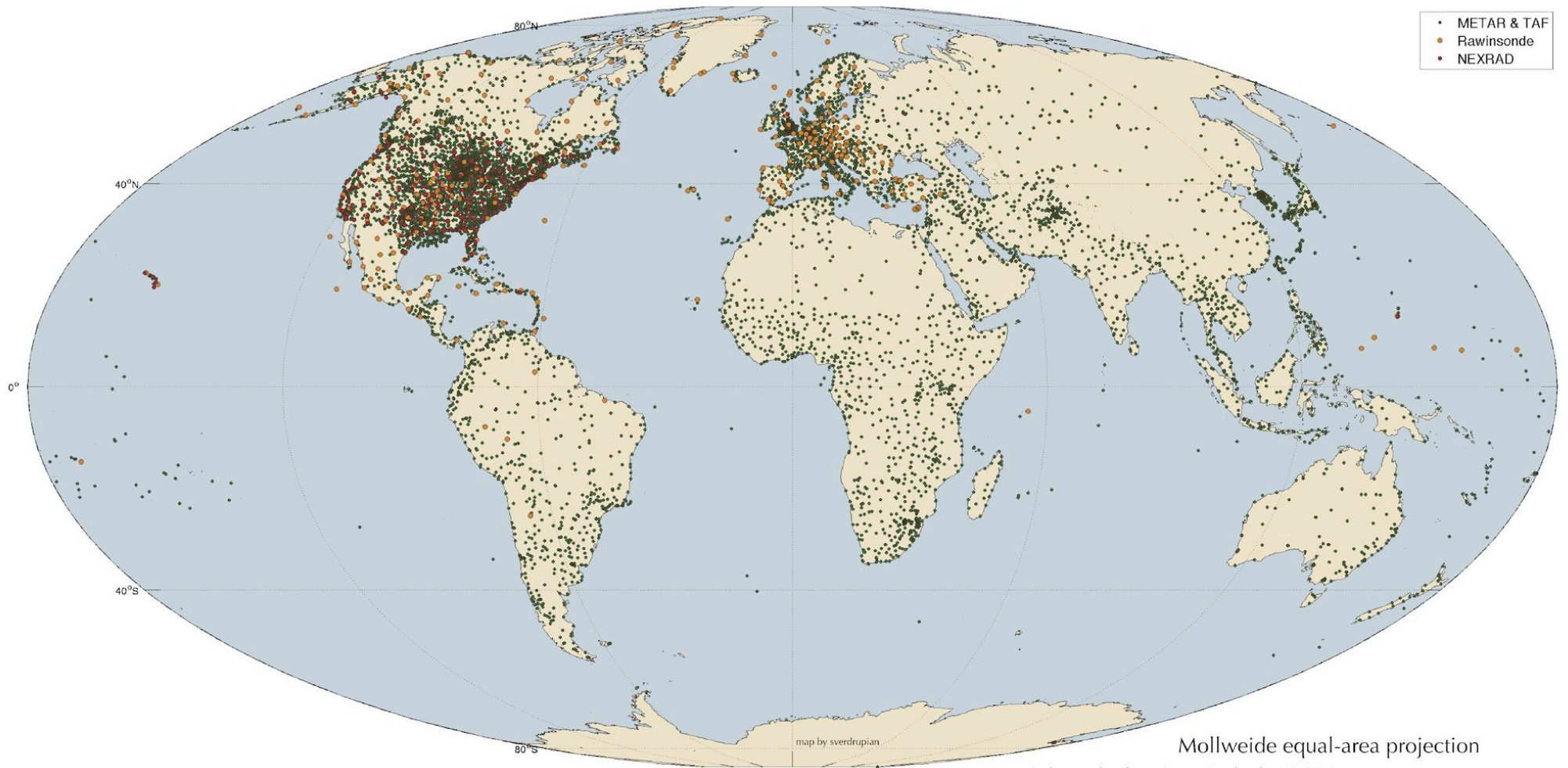


**Atmospheric & Oceanic Sciences 404:
Meteorological Measurements**

Daily Temperatures: MADISON 2017

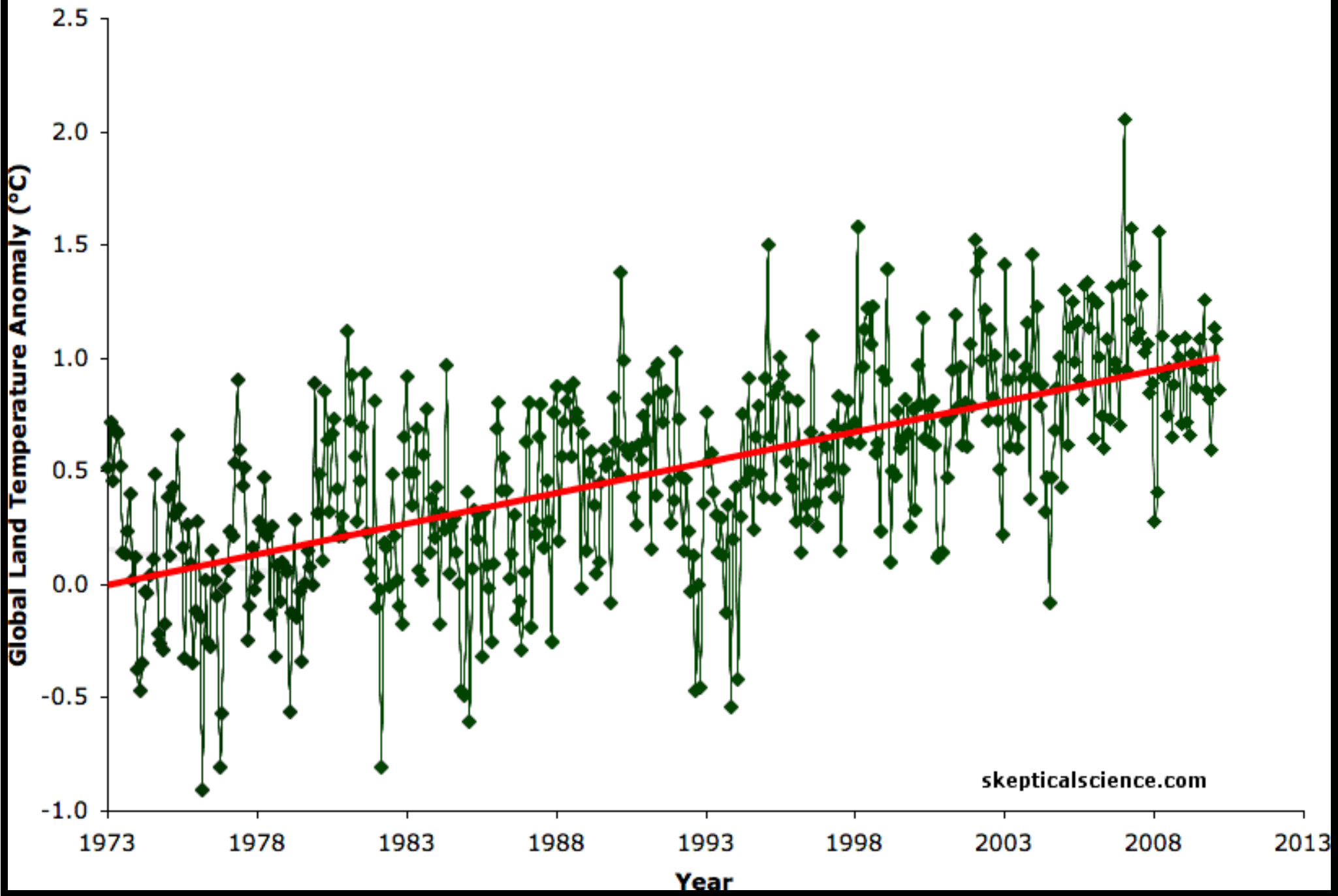


Global Weather Observation Network: Surface Stations



Mollweide equal-area projection

Surface weather observations stations listed at NCAR RAL
<http://weather.rap.ucar.edu/surface/stations.txt>



Hotter

What's Really Warming the World?

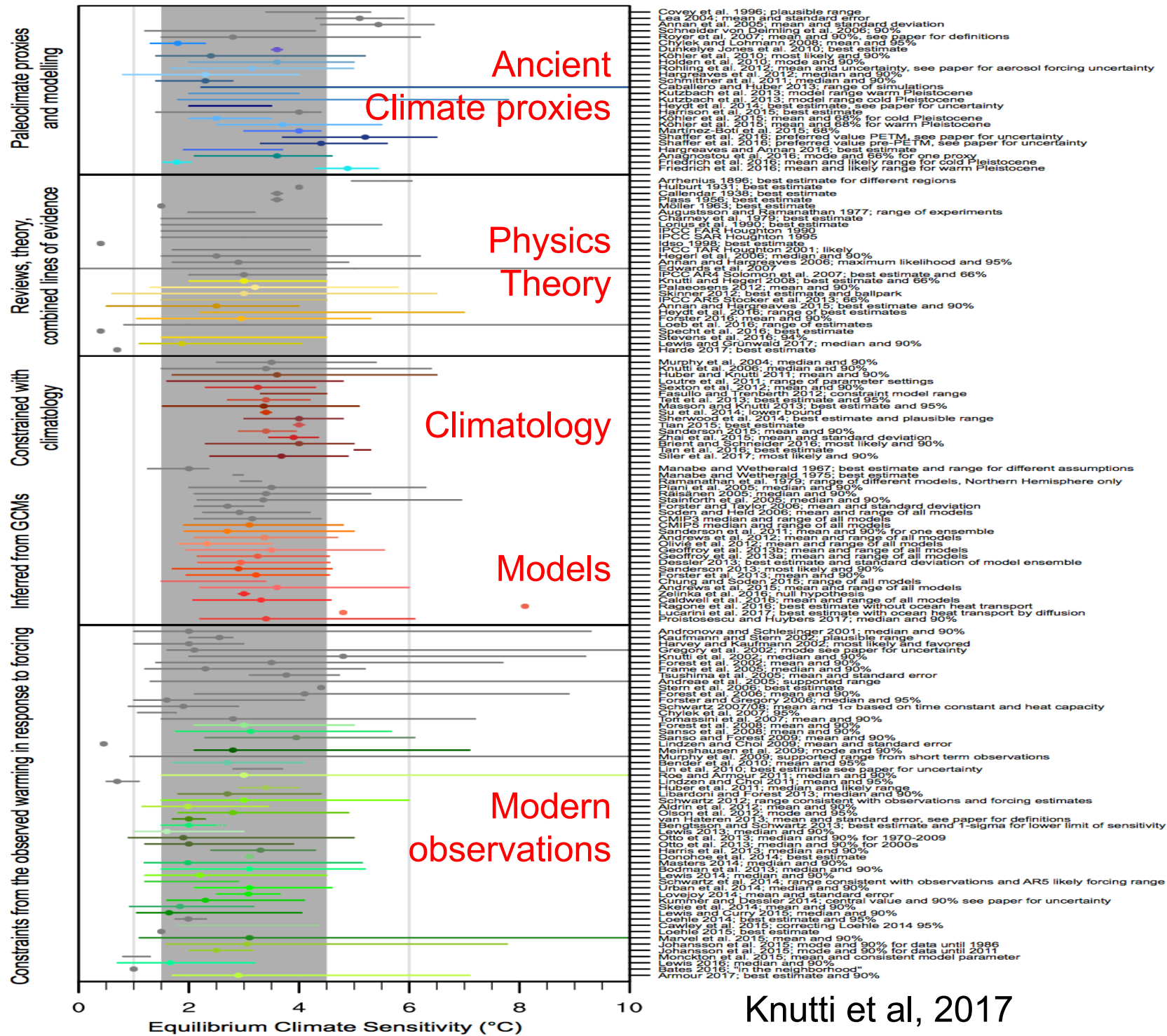
Skeptics of manmade climate change offer various natural causes to explain why the Earth has warmed 1.4 degrees Fahrenheit since 1880. But can these account for the planet's rising temperature? Watch to see how much different factors, both natural and industrial, contribute to global warming, based on findings from NASA's Goddard Institute for Space Studies.

Colder

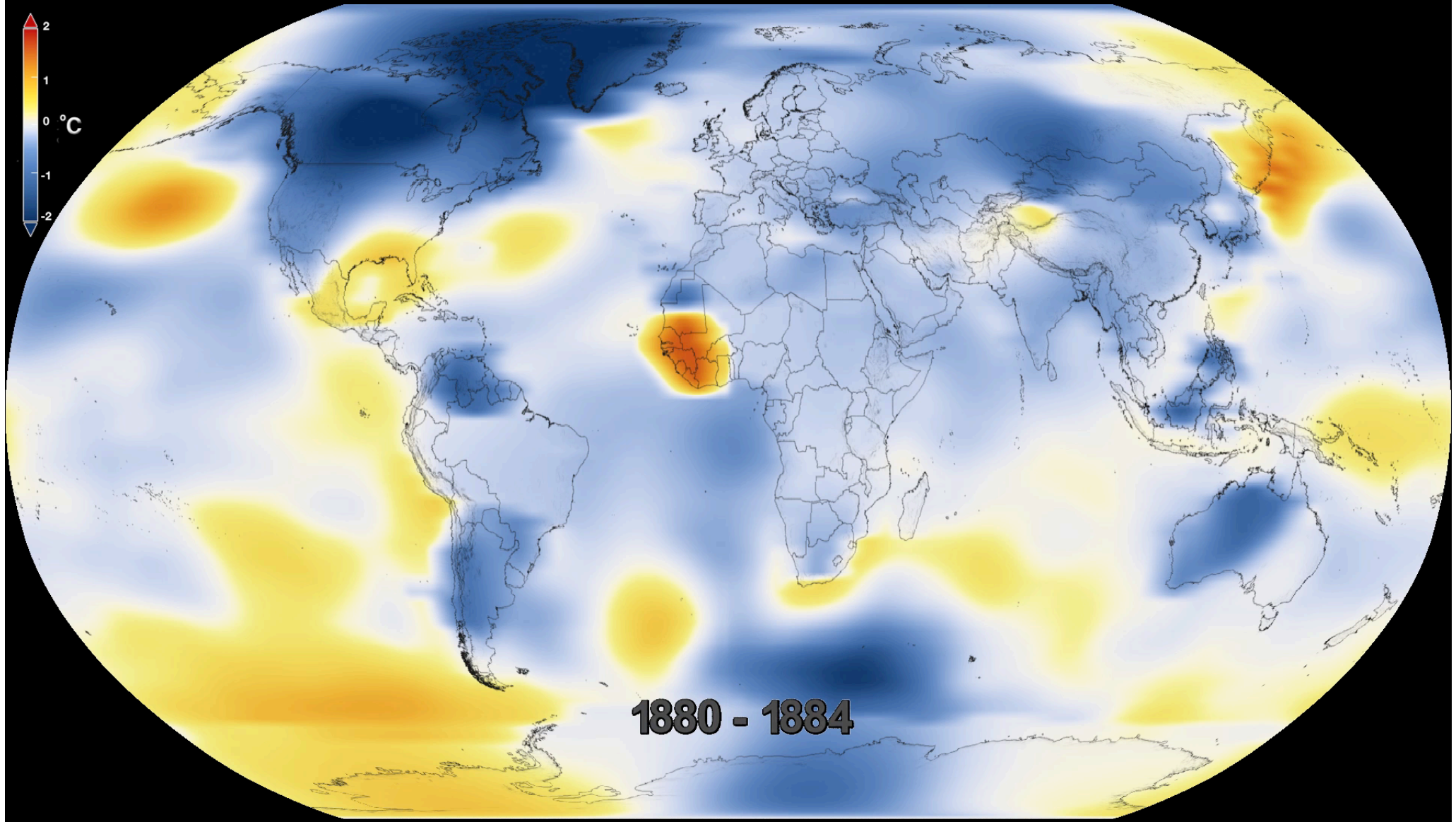


Based on an interactive by Bloomberg

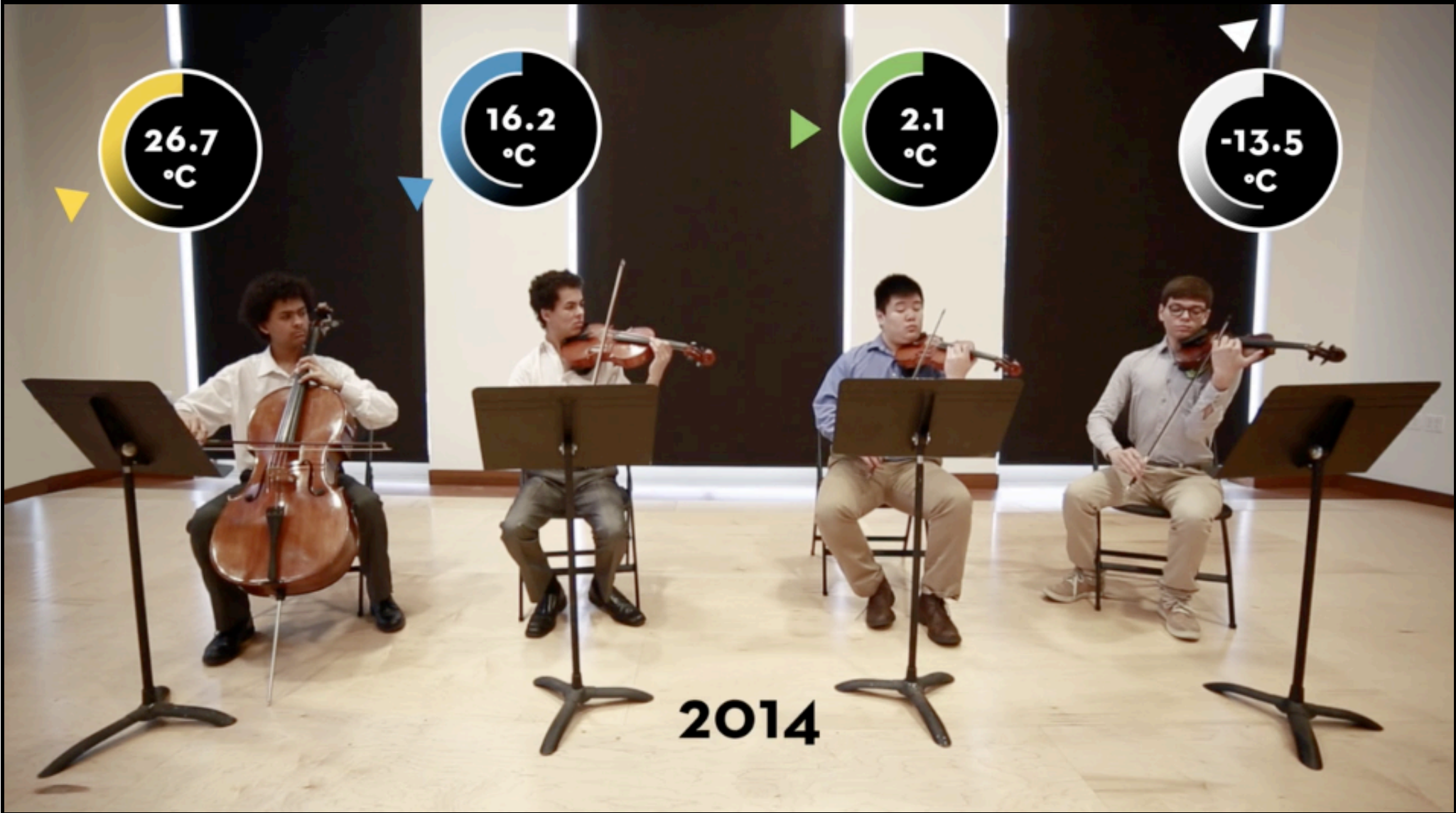
Bloomberg



Knutti et al, 2017



1880 - 1884



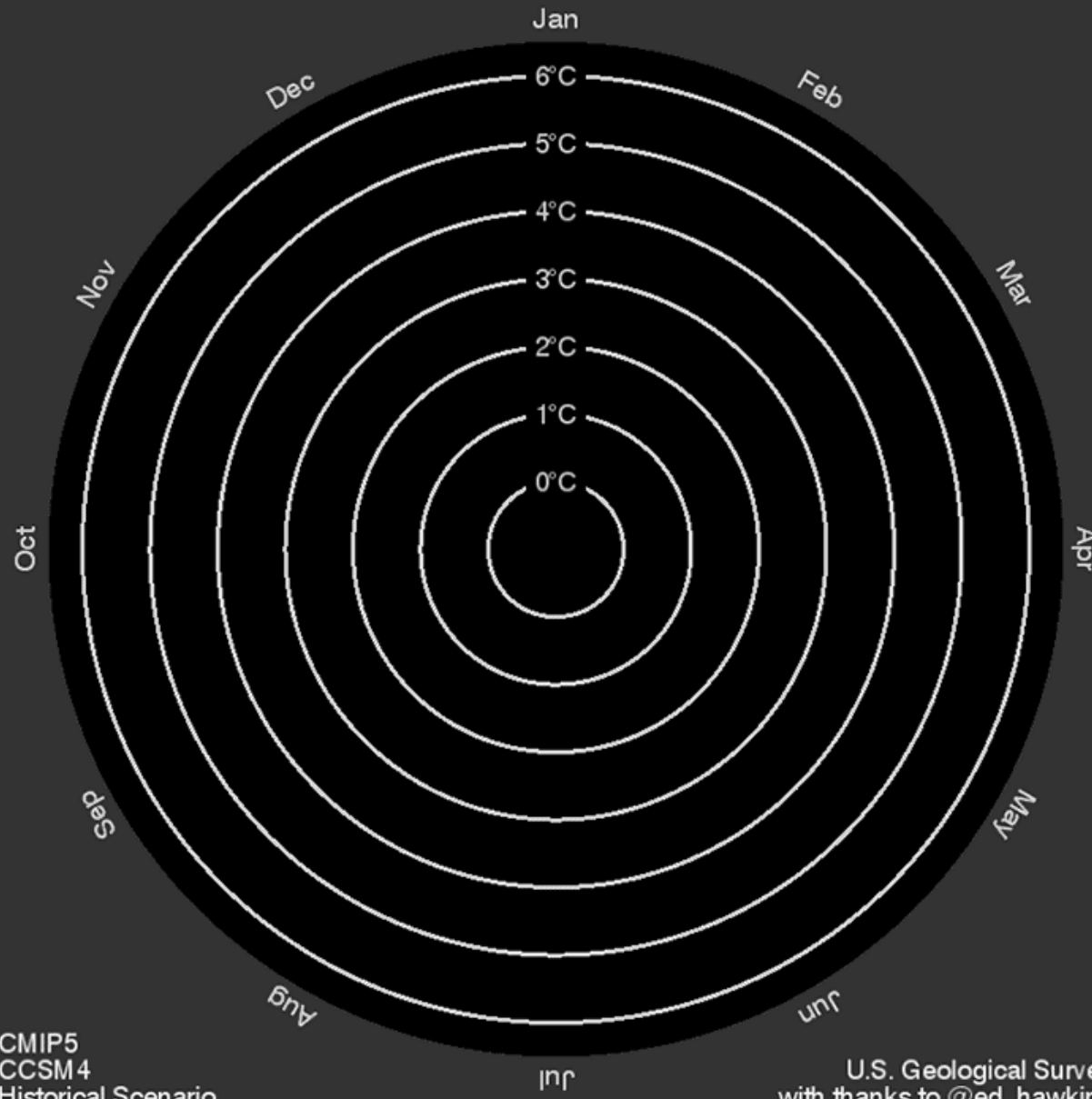
Planetary Bands, Warming Worlds

<http://planetbands.strikingly.com/>

What makes a real UPWARD trend?

- Real trends are persistent over long periods of time, even if not over shorter periods
- Real trends can be predicted by causal factors, not spurious correlations
- Real trends have multiple consistent lines of evidence

Simulated global temperature change (1850-2100)



THANKS! -Ankur Desai desai@nos.wisc.edu