

# Slides for Climate Class 1

# Climate change occurs when either side of energy balance is perturbed.

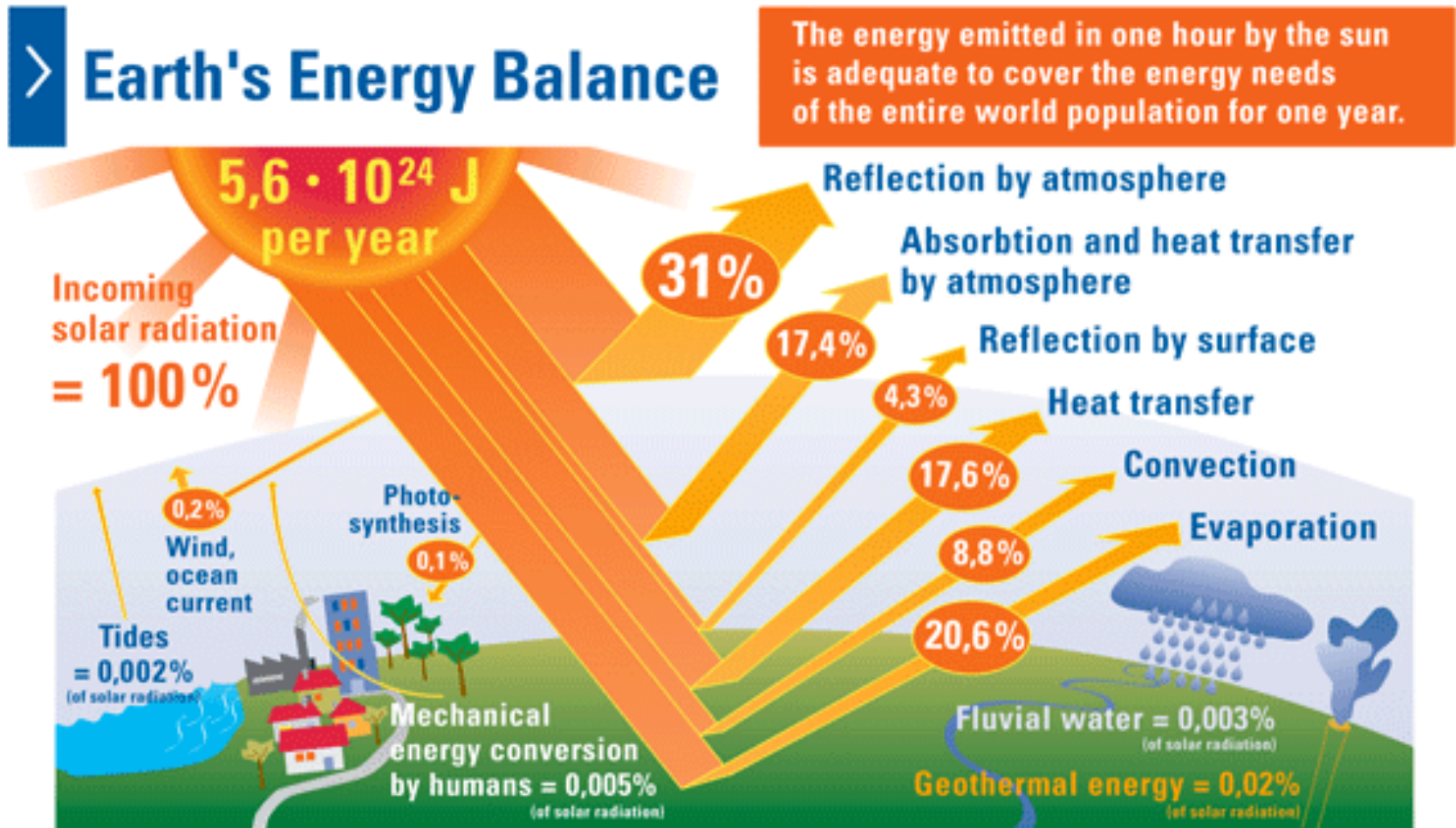


Figure: Hydrogen Ambassadors

# Greenhouse Effect

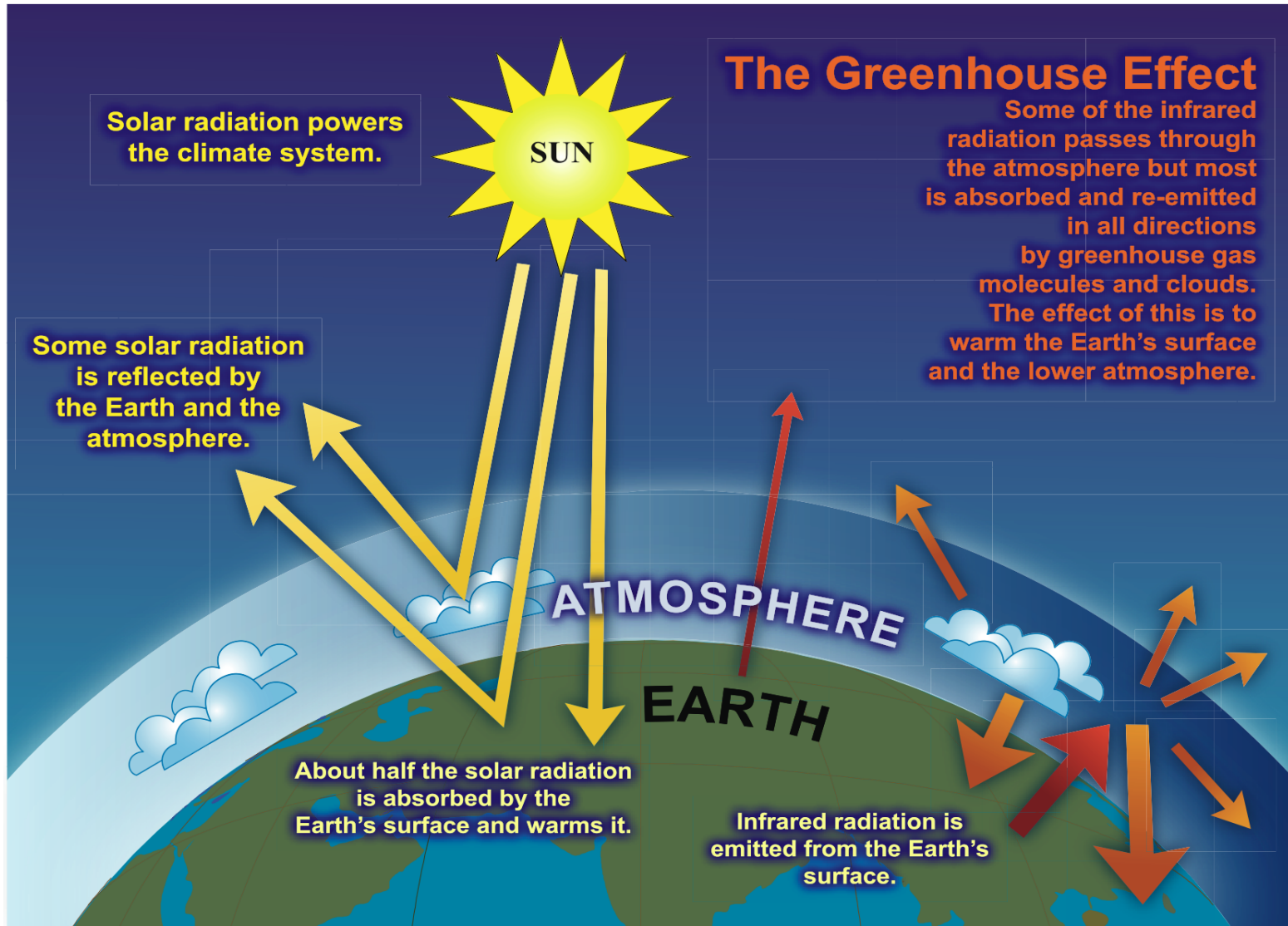


Figure: Penn State University

# What are the Greenhouse Gases?

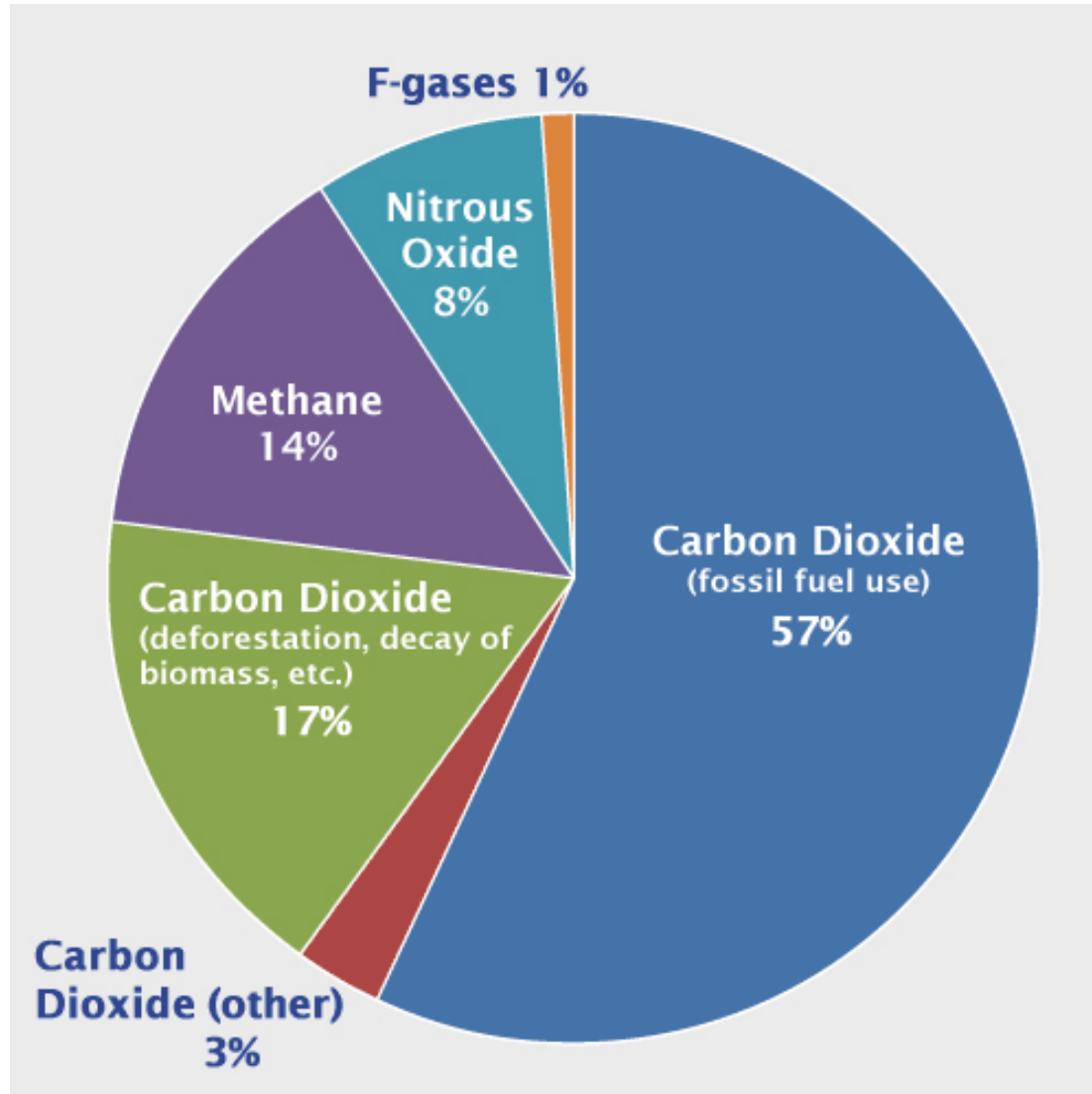


Figure: Environmental Protection Agency

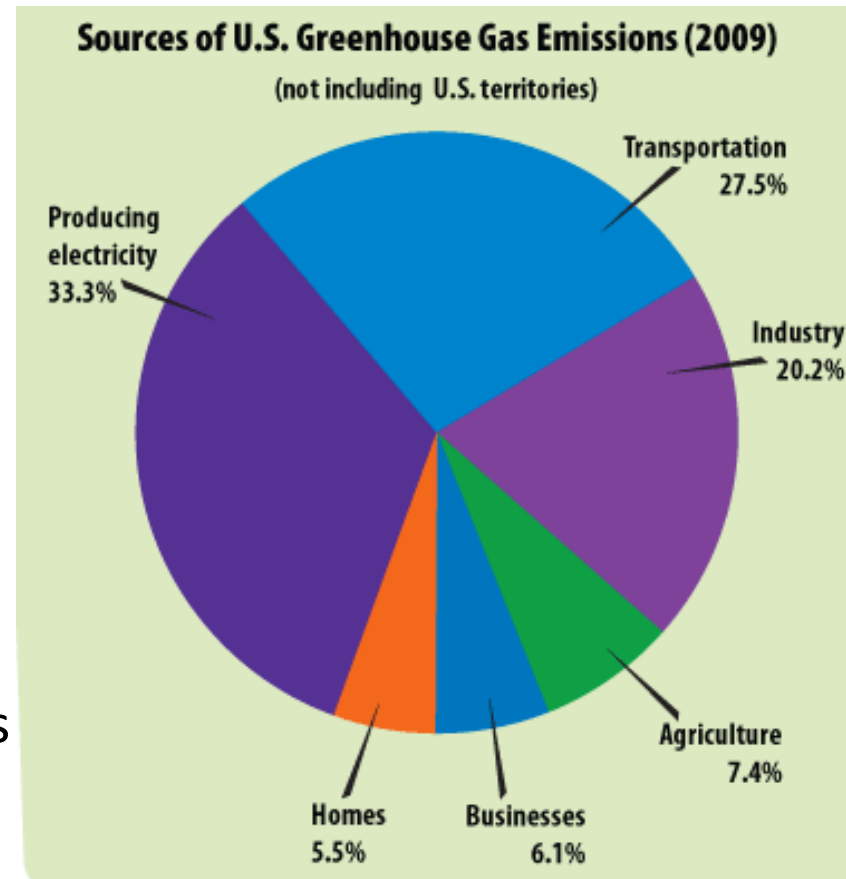
# Sources of US Greenhouse Gases

- **Emissions**

- Greenhouse Gases & Aerosols
  - Fossil fuels (Personal & Industry)
  - Land use

- **Land use changes**

- Agriculture
- Deforestation
- Urbanization
- Water management & reservoirs



# The Carbon Cycle

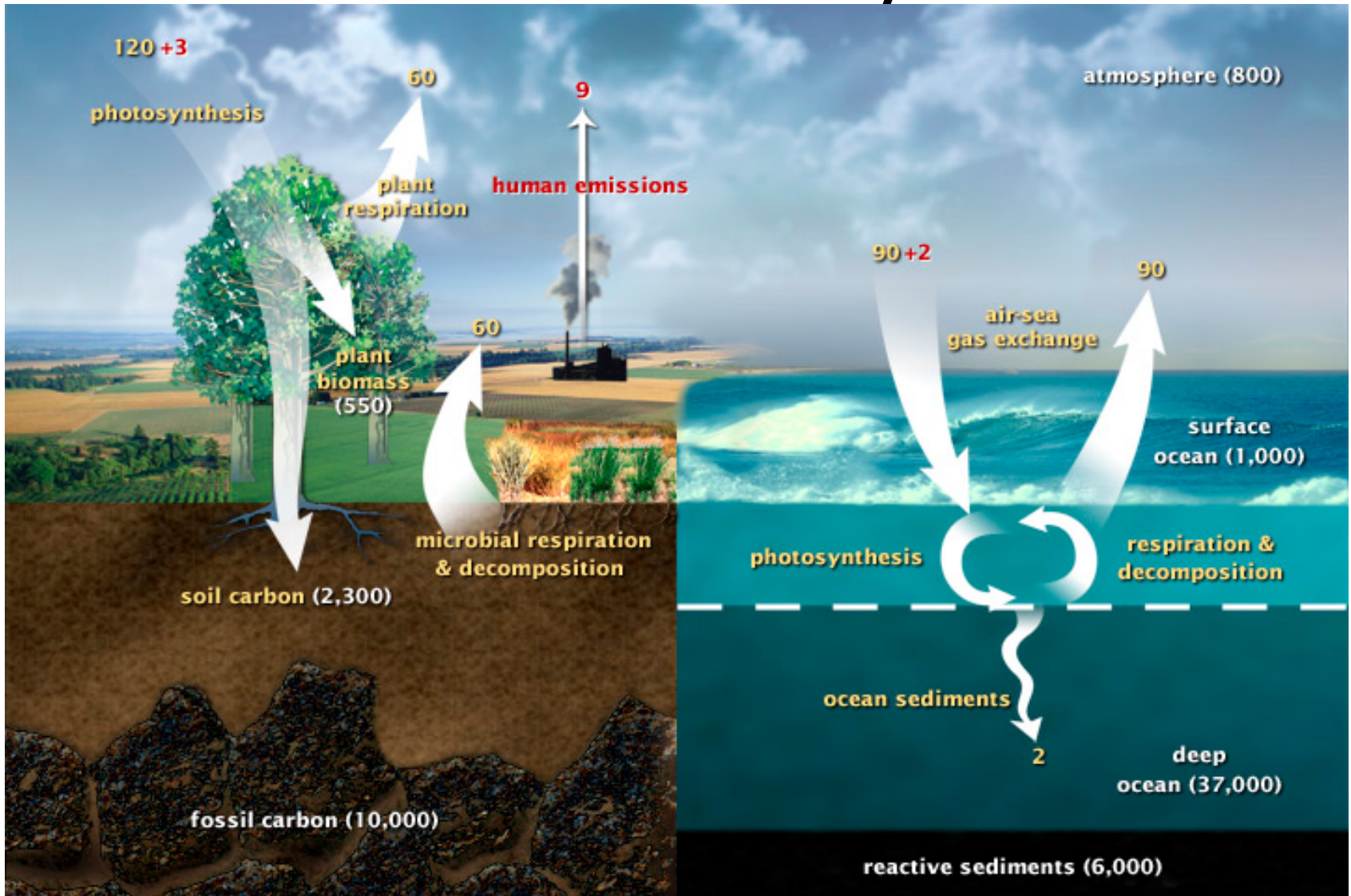


Figure: National Aeronautics and Space Administration

# The Keeling Curve

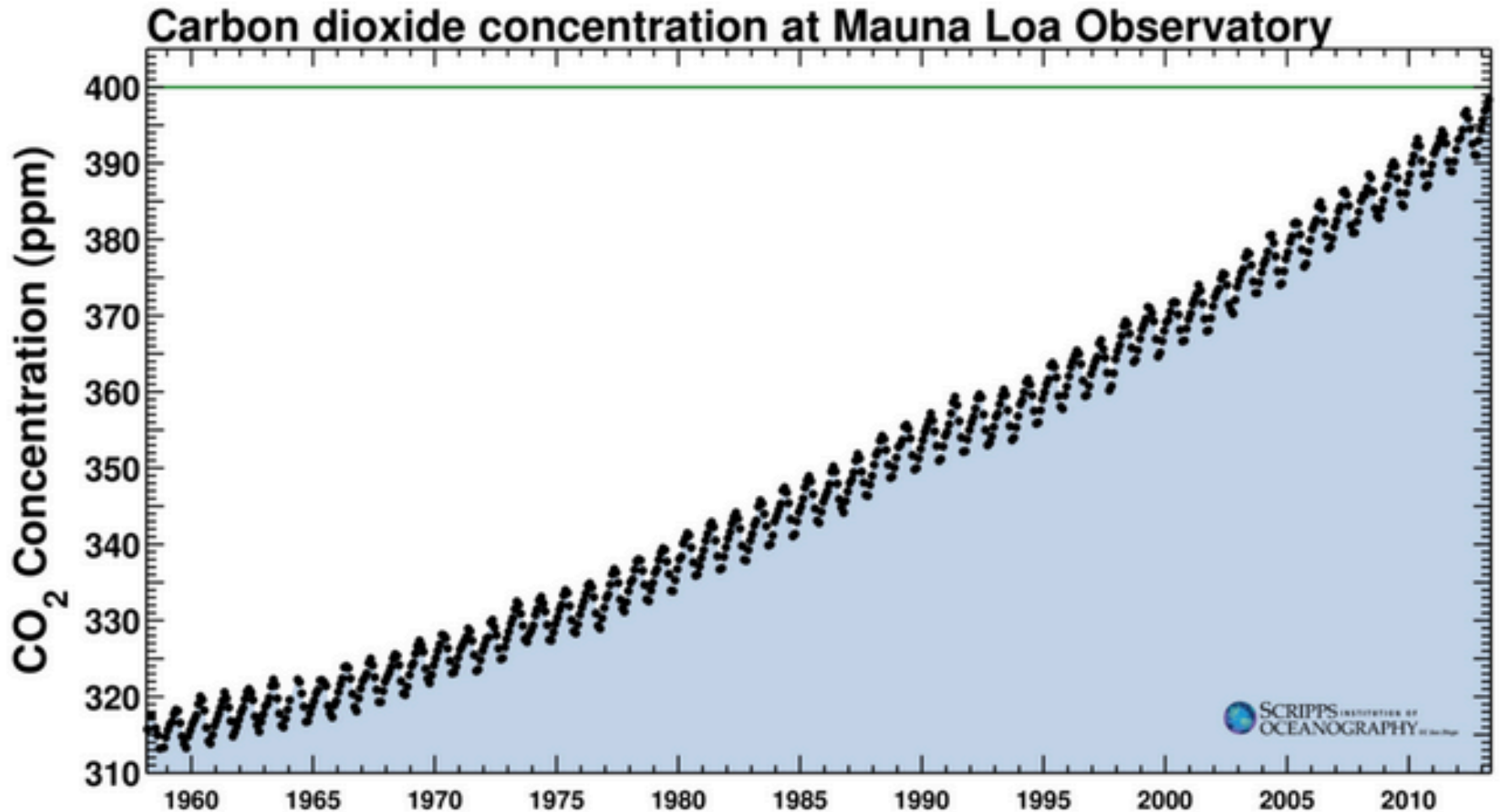


Figure: Scripps Institution of Oceanography

# The Keeling Curve

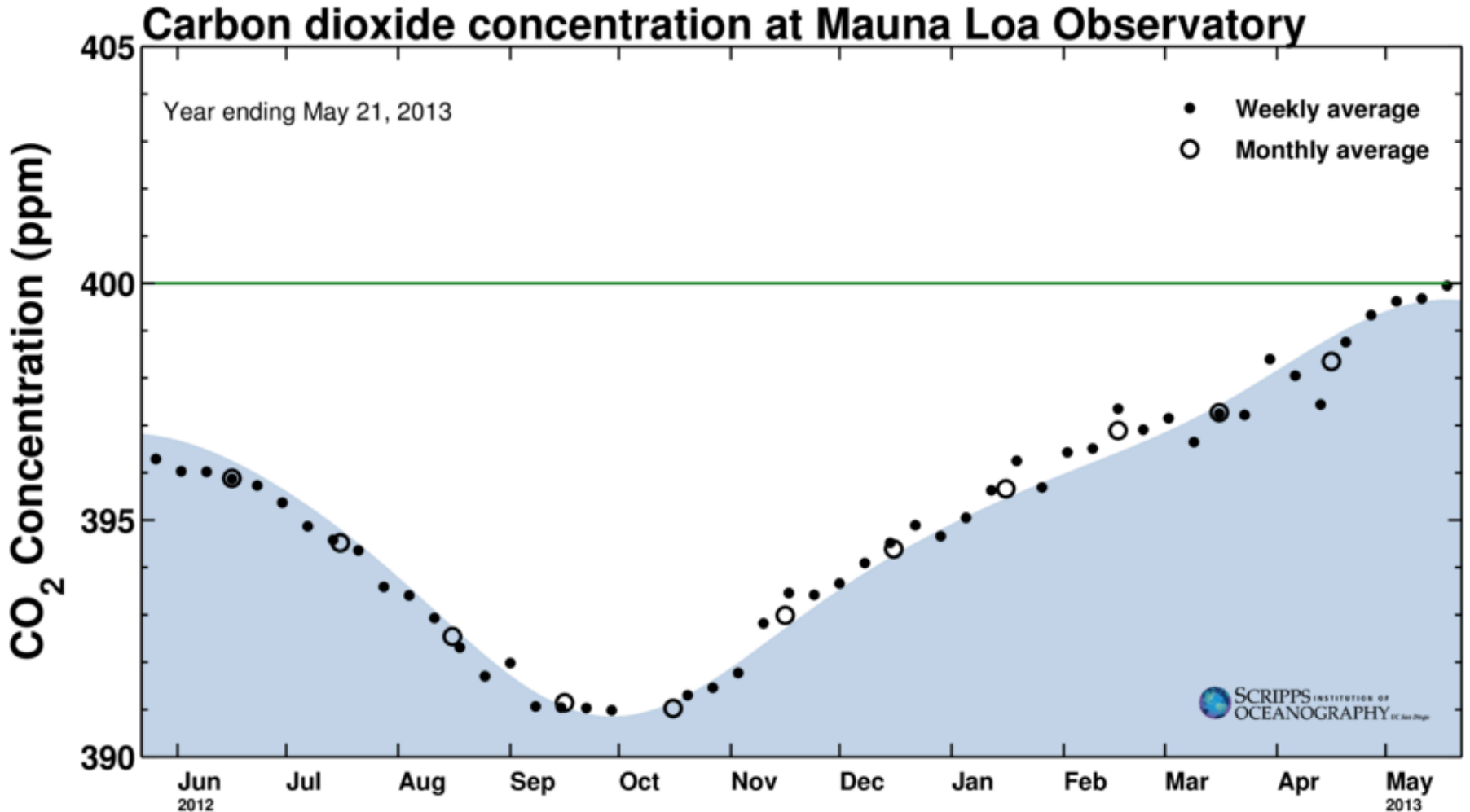


Figure: Scripps Institution of Oceanography



# Climate Impacts

- A couple good sites to use as a jumping off point-
- <http://climate.nasa.gov/effects>
- <http://www.nature.org/ourinitiatives/urgentissues/global-warming-climate-change/threats-impacts/index.htm>

# What causes sea level to change?

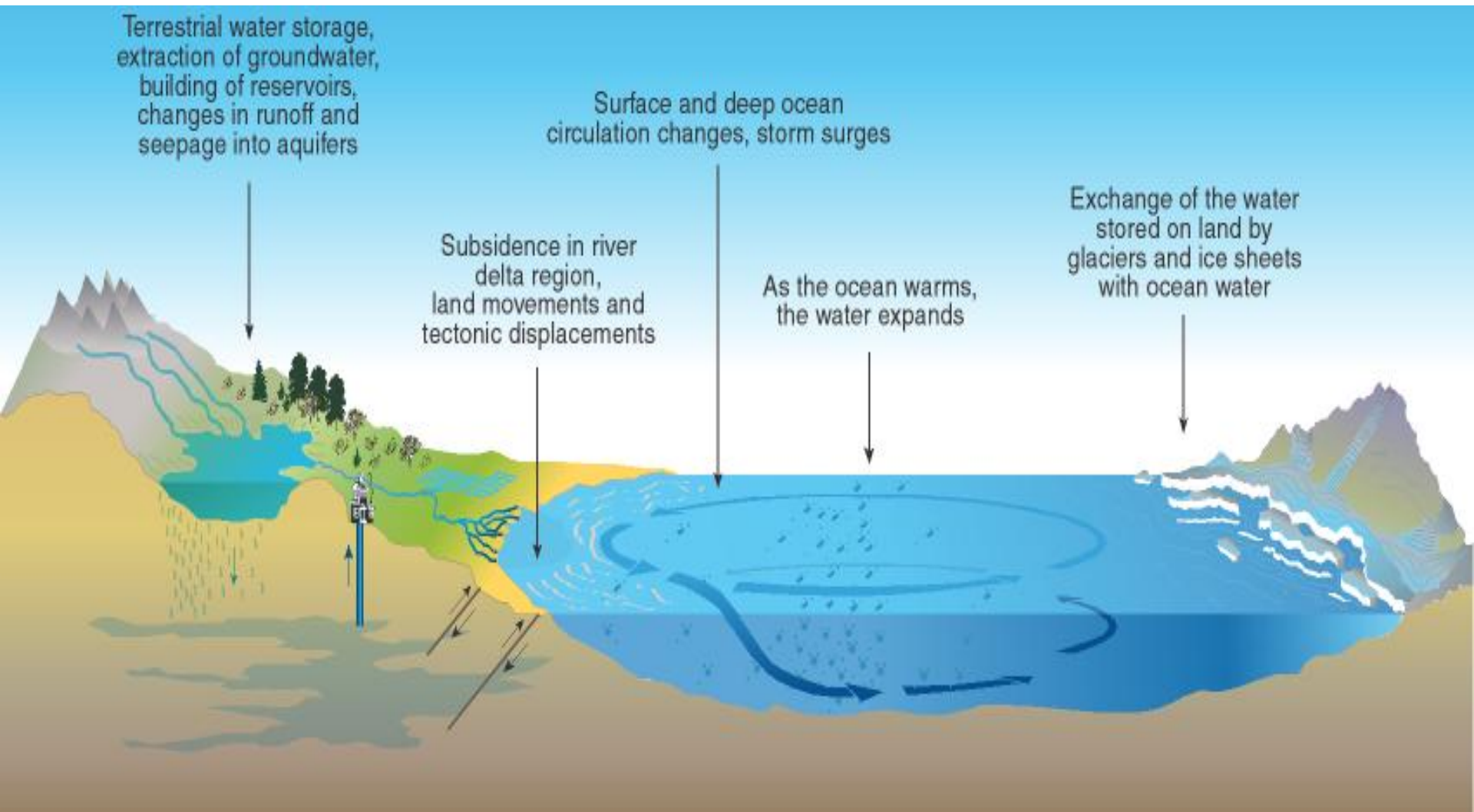


Figure: Climate.org

# Climate Change Impacts: Real Time

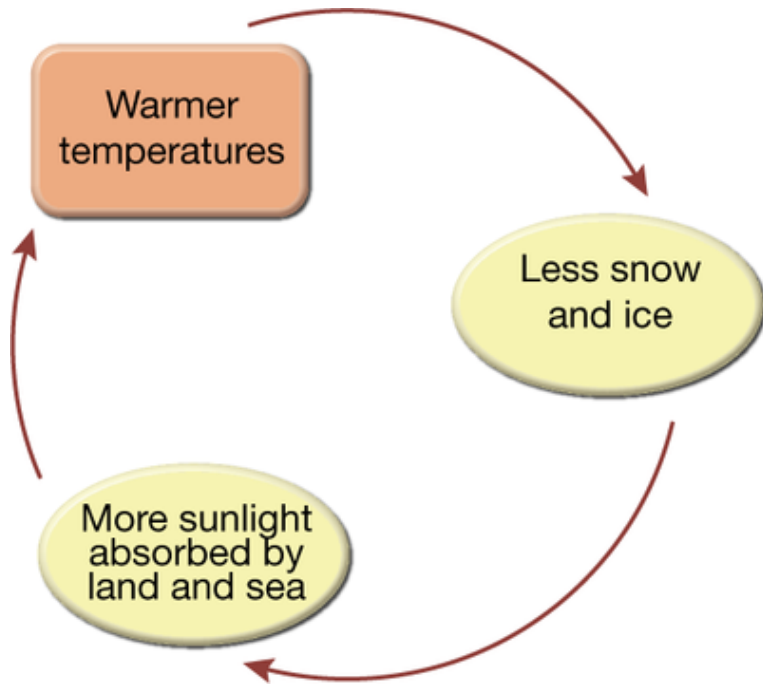
- Sea Level Trends: <http://tidesandcurrents.noaa.gov/sltrends/sltrends.shtml>
- Ice Trends: [http://nsidc.org/cgi-bin/bist/bist.pl?config=seaice\\_index](http://nsidc.org/cgi-bin/bist/bist.pl?config=seaice_index)

# Adaptation, Case Study of The Northwest

- Adaptation in general - <http://www.epa.gov/climatechange/impacts-adaptation/>
- NE Specific - <http://www.epa.gov/climatechange/impacts-adaptation/northeast.html>

# Feedback Loop Examples

## Albedo Feedback



## Permafrost Feedback

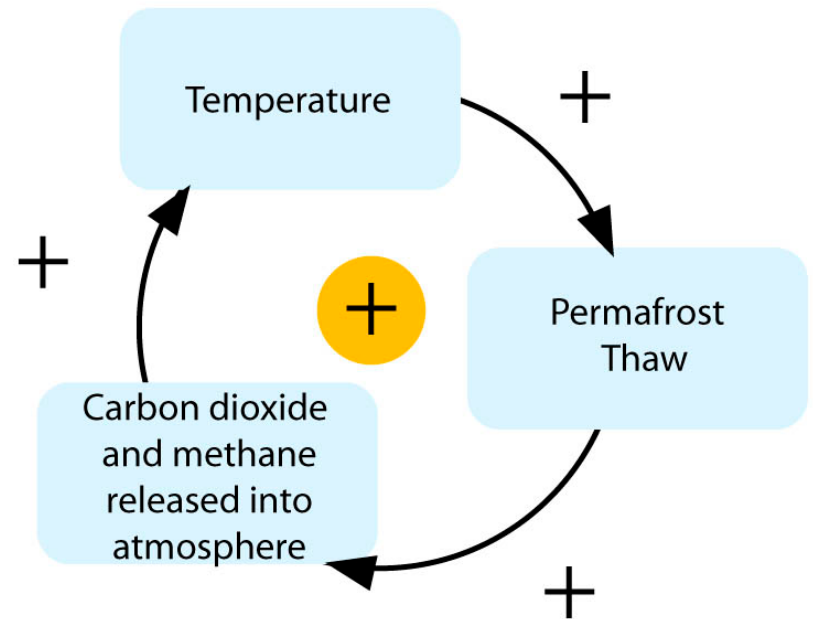


Figure: Carlton College

# Experiment Discussion

- <http://www.epa.gov/climatestudents/impacts/signs/glaciers.html>