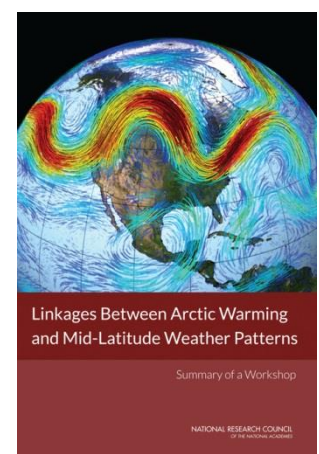
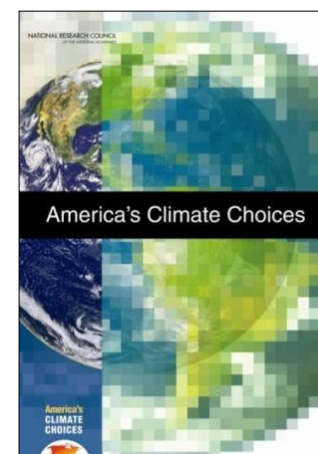
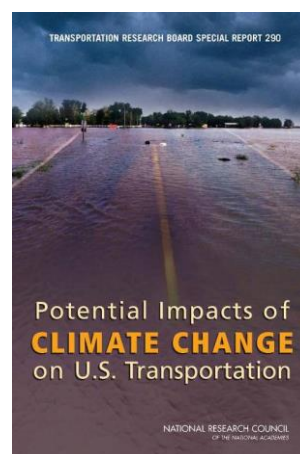
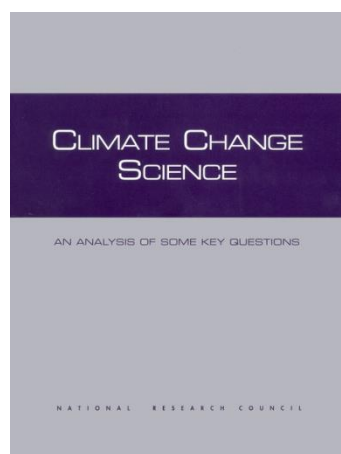
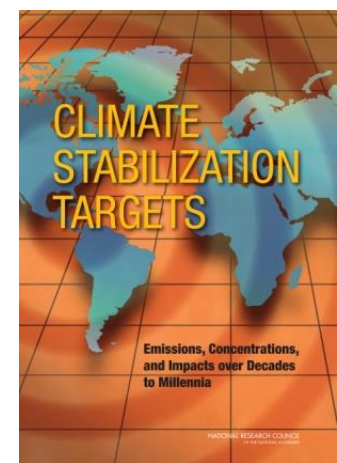
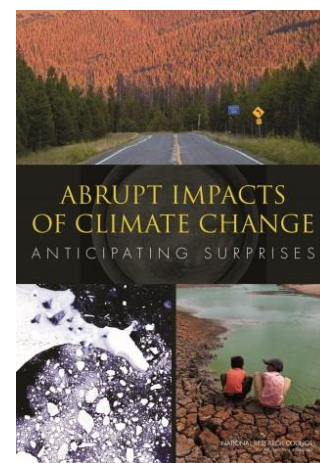
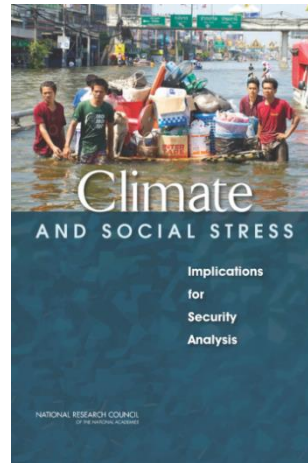
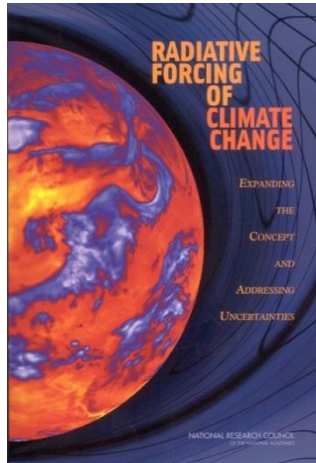
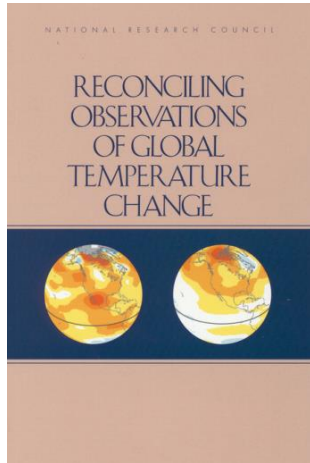




CLIMATE CHANGE AND METHANE: WHAT WE KNOW

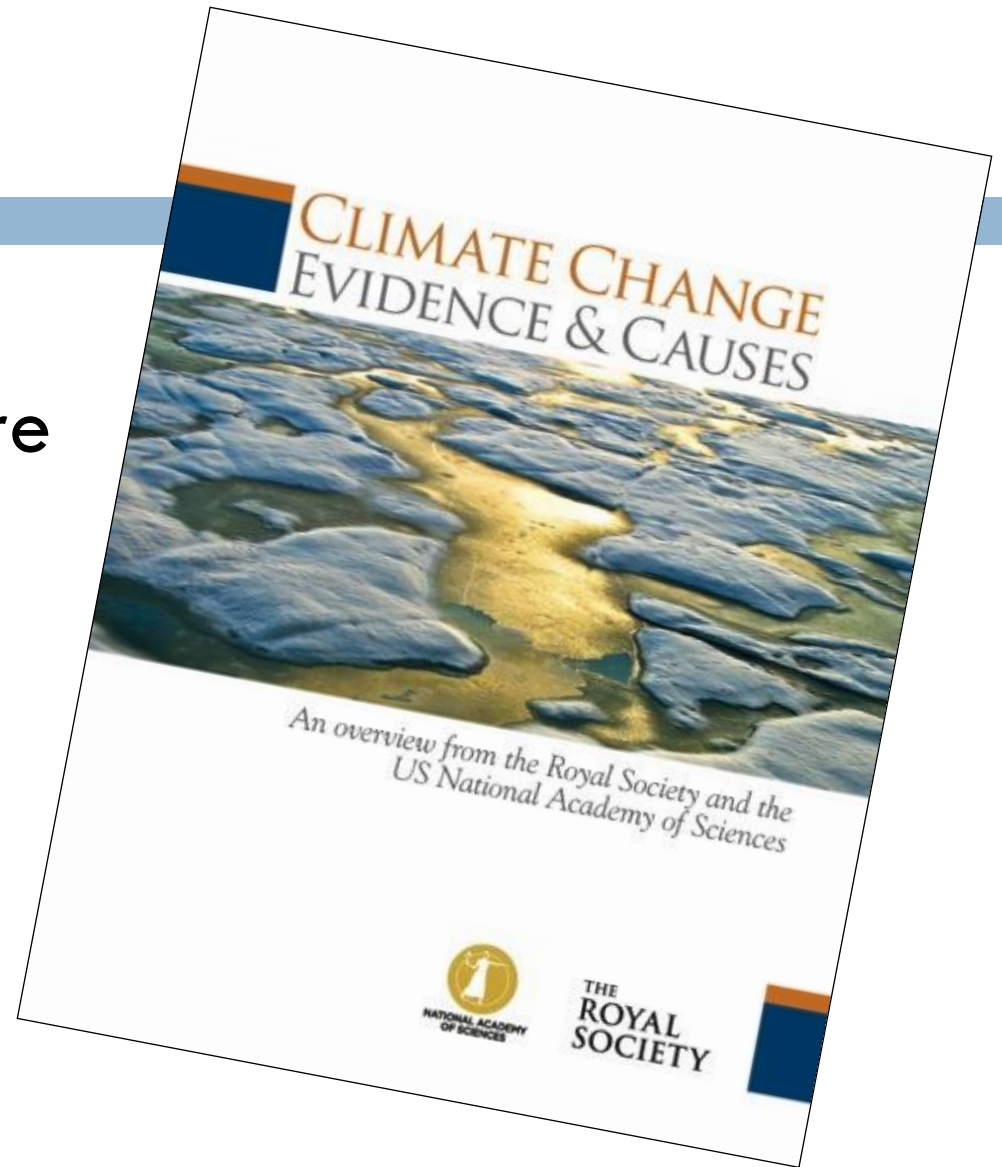
AMANDA STAUDT, Ph.D., Director
Board on Atmospheric Sciences and Climate
Polar Research Board
National Research Council (NRC)
National Academy Of Sciences (NAS)

NAS has published dozens of reports on climate change since the 1970s



We know that...

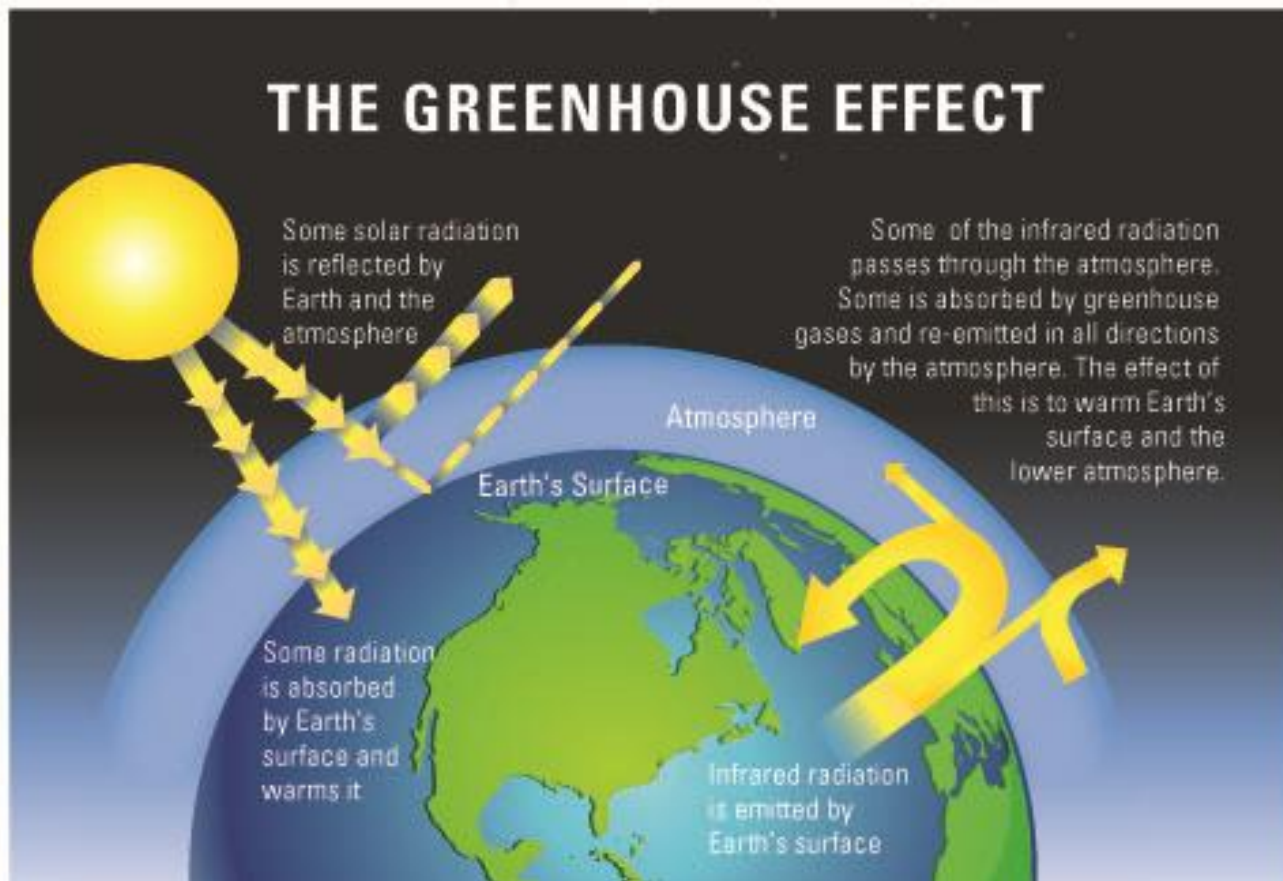
- Human activities are changing climate



Find it at: americasclimatechoices.org

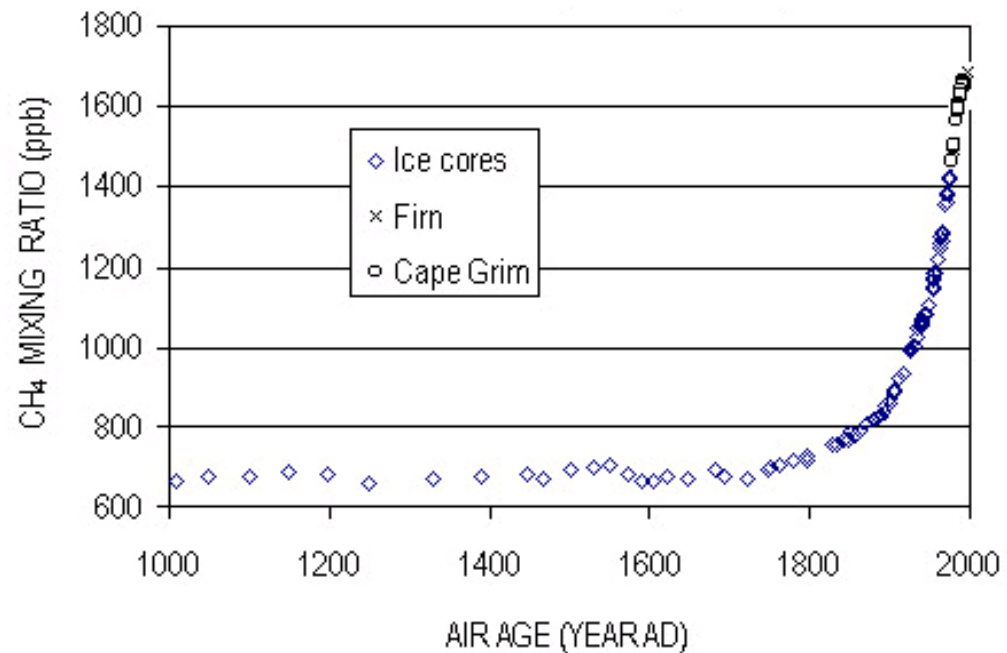
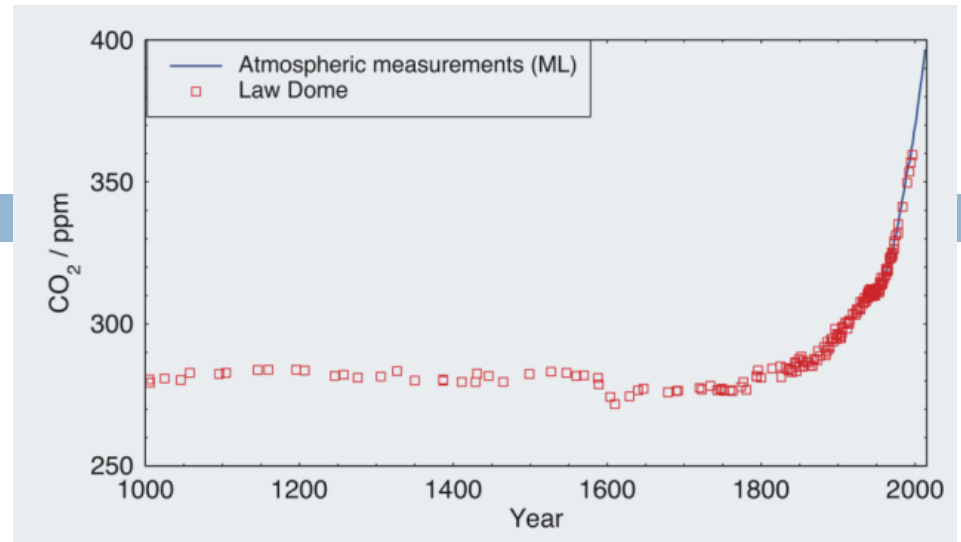
We know...

- why CO₂ and other greenhouse gases cause warming



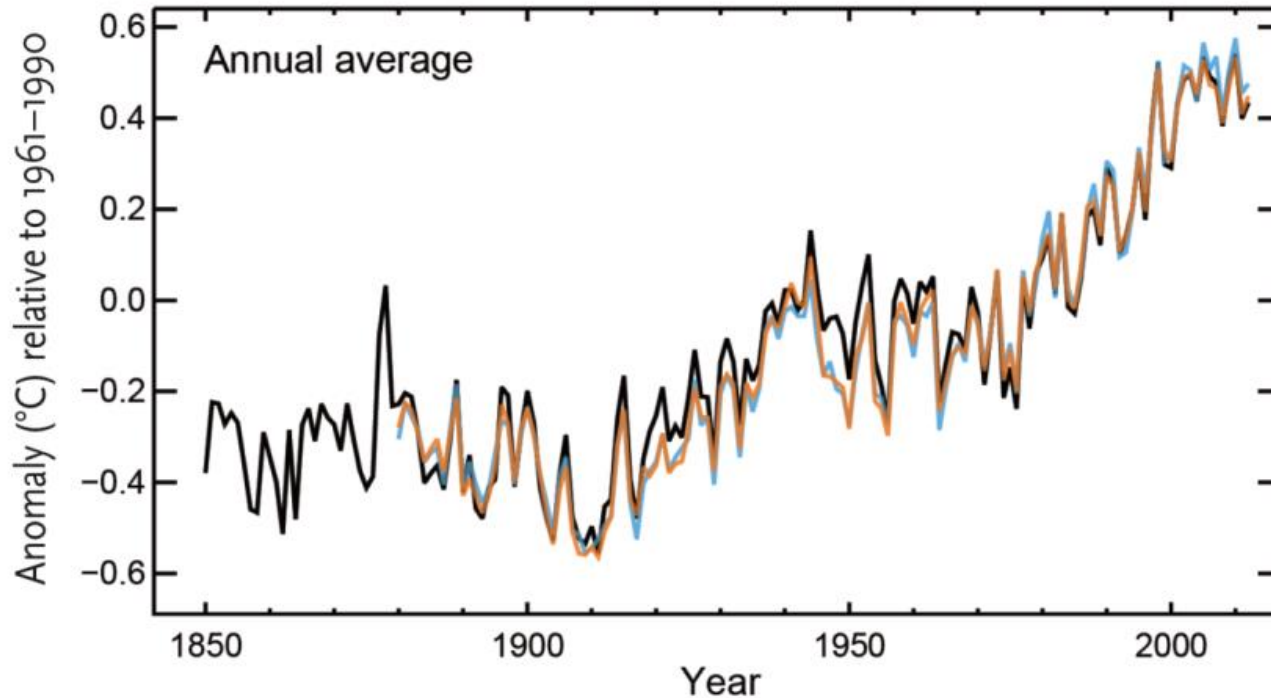
We know that...

- Greenhouse gases are increasing...
 - CO₂ increased by 40%
 - Methane increased by 150%
- and are higher now than anytime in last 800,000 years.



We know that...

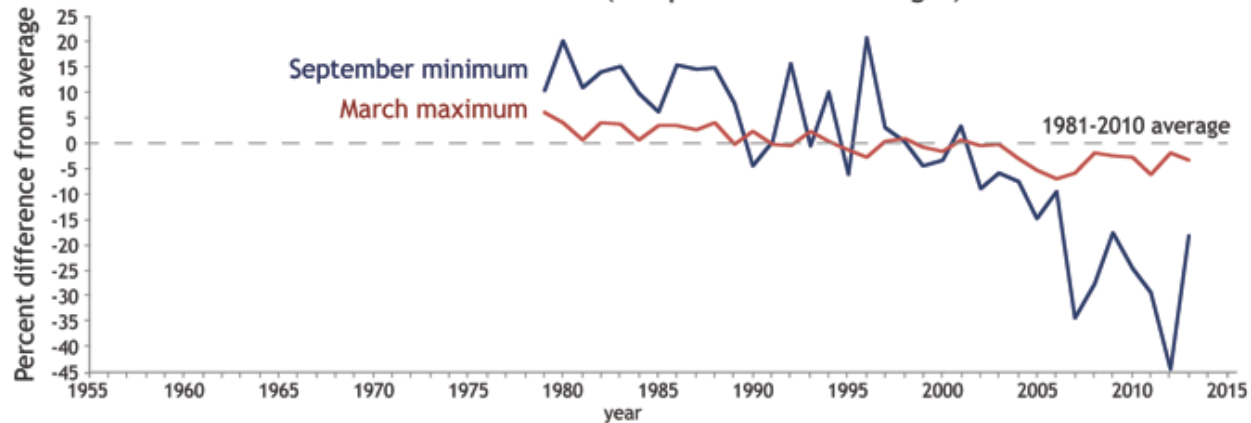
- The planet has warmed 0.8°C (1.4°F) since 1900



We know that...

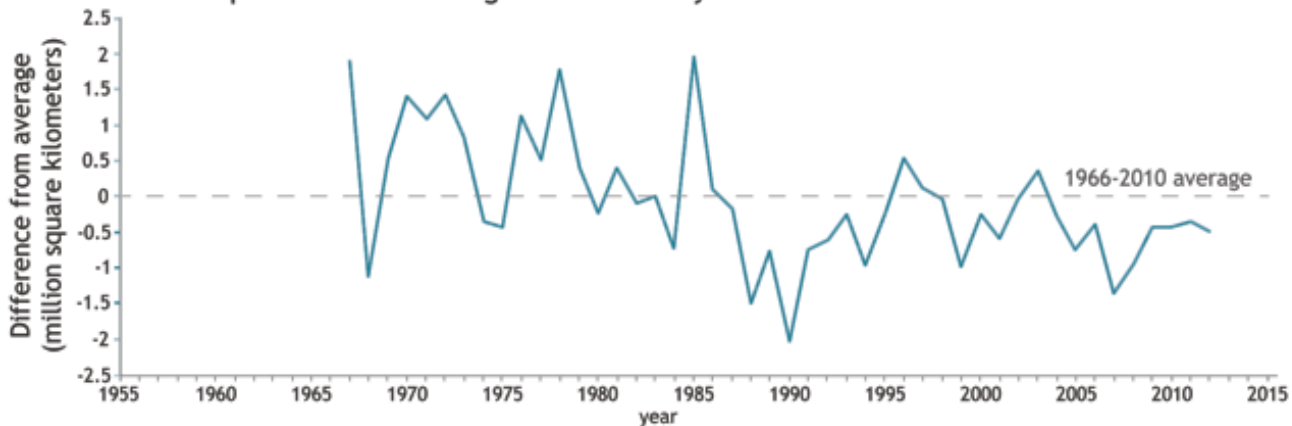
- Ice and snow are decreasing.

Arctic sea ice minimum and maximum extents (compared to the averages)



Based on data provided by NSIDC.

Northern Hemisphere annual average snow anomaly

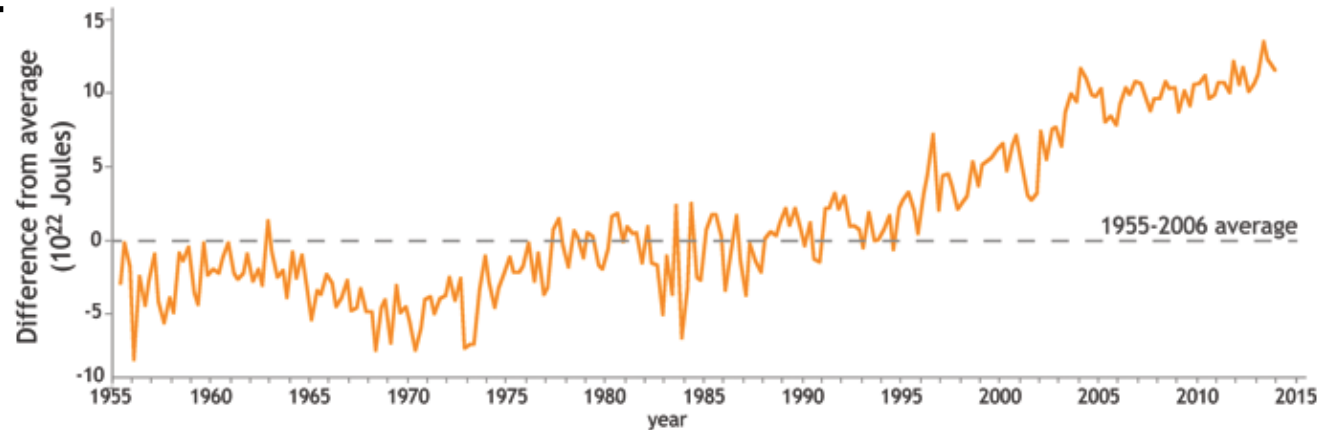


Adapted from Figure 1.1(h) in the BAMS State of the Climate report.

We know that...

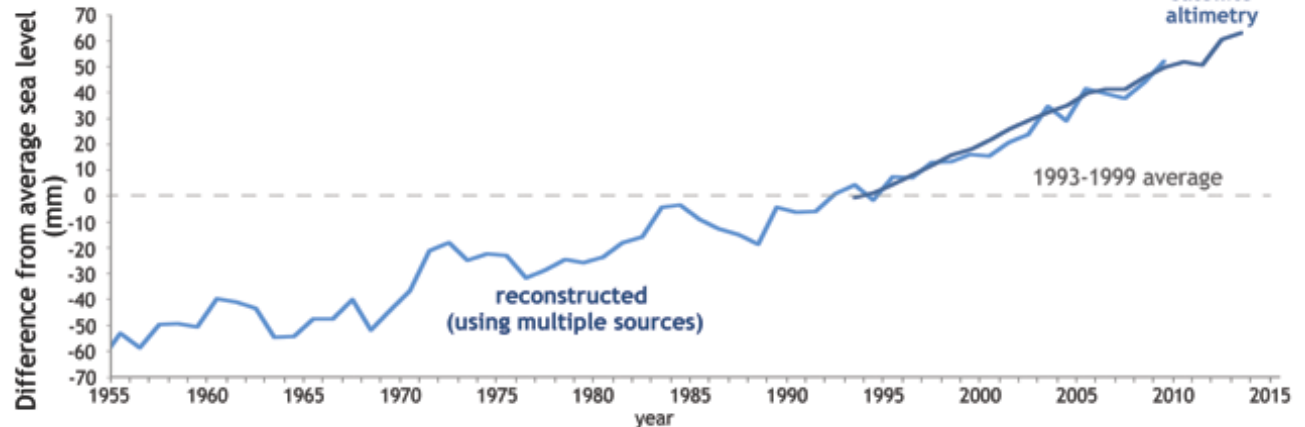
- Ocean heat and sea level are increasing.

Ocean heat content anomaly



Data provided by the National Oceanographic Data Center.

Global sea-level rise

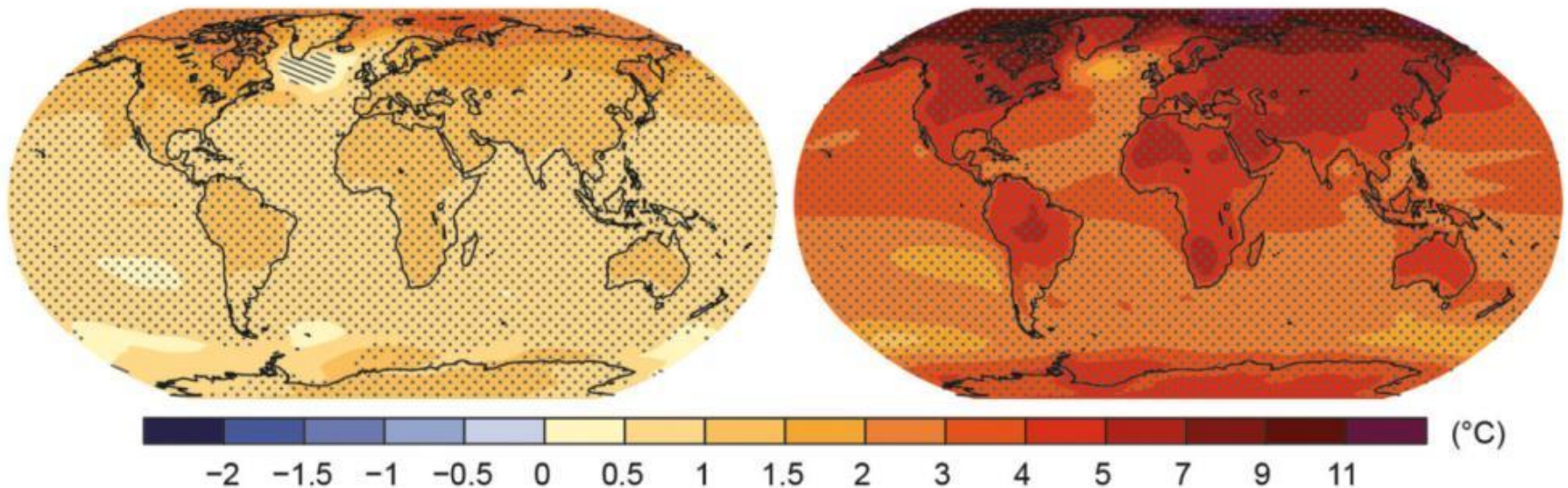


Data from C.K. Shum, Chungyen Kuo, Benoit Muysignac, Junkun Wan.

We know that...

- More warming is expected as CO₂ and other greenhouse gases increase.
- Reductions in emissions can limit future warming.

Change in average surface temperature (1986–2005 to 2081–2100)



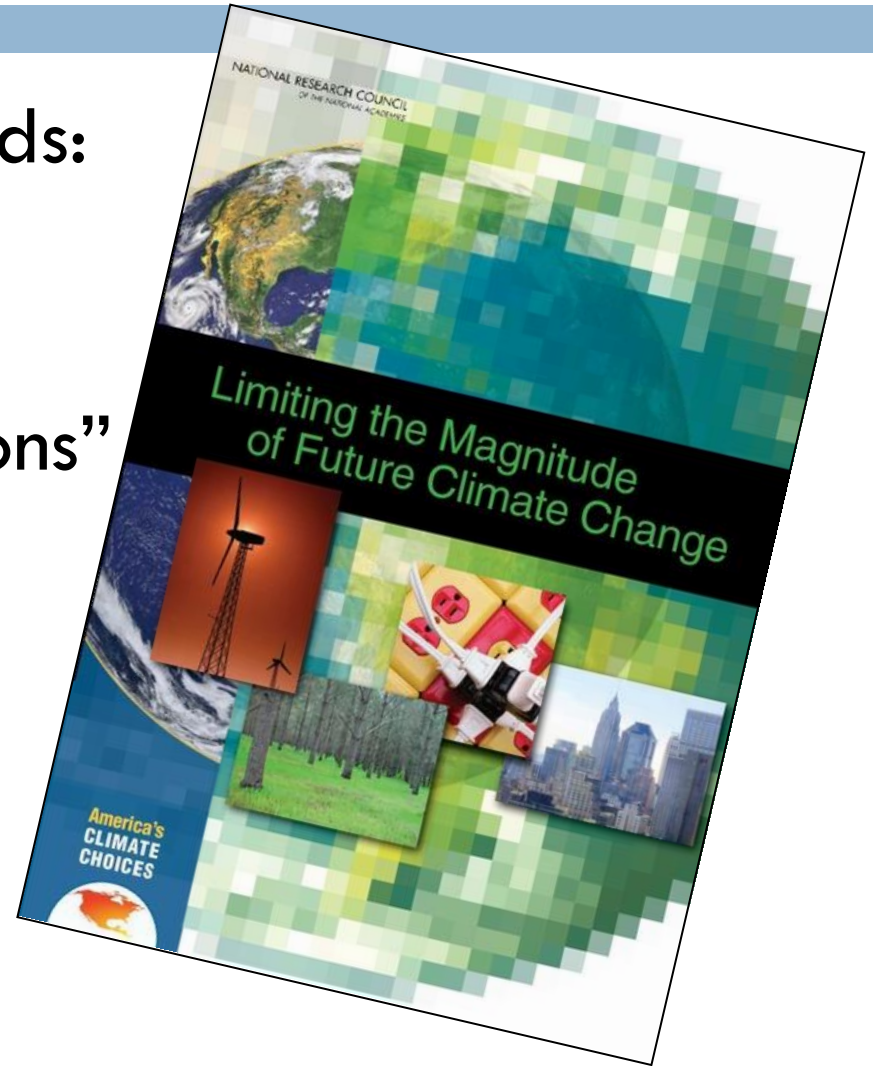
We know that...

- a few degrees is cause for concern
 - ▣ Widespread changes in regional and local temperature and precipitation
 - ▣ Weather extremes: more frequent heavy rainfall and snowfall events and heat waves
 - ▣ Impacts on human societies and the natural world

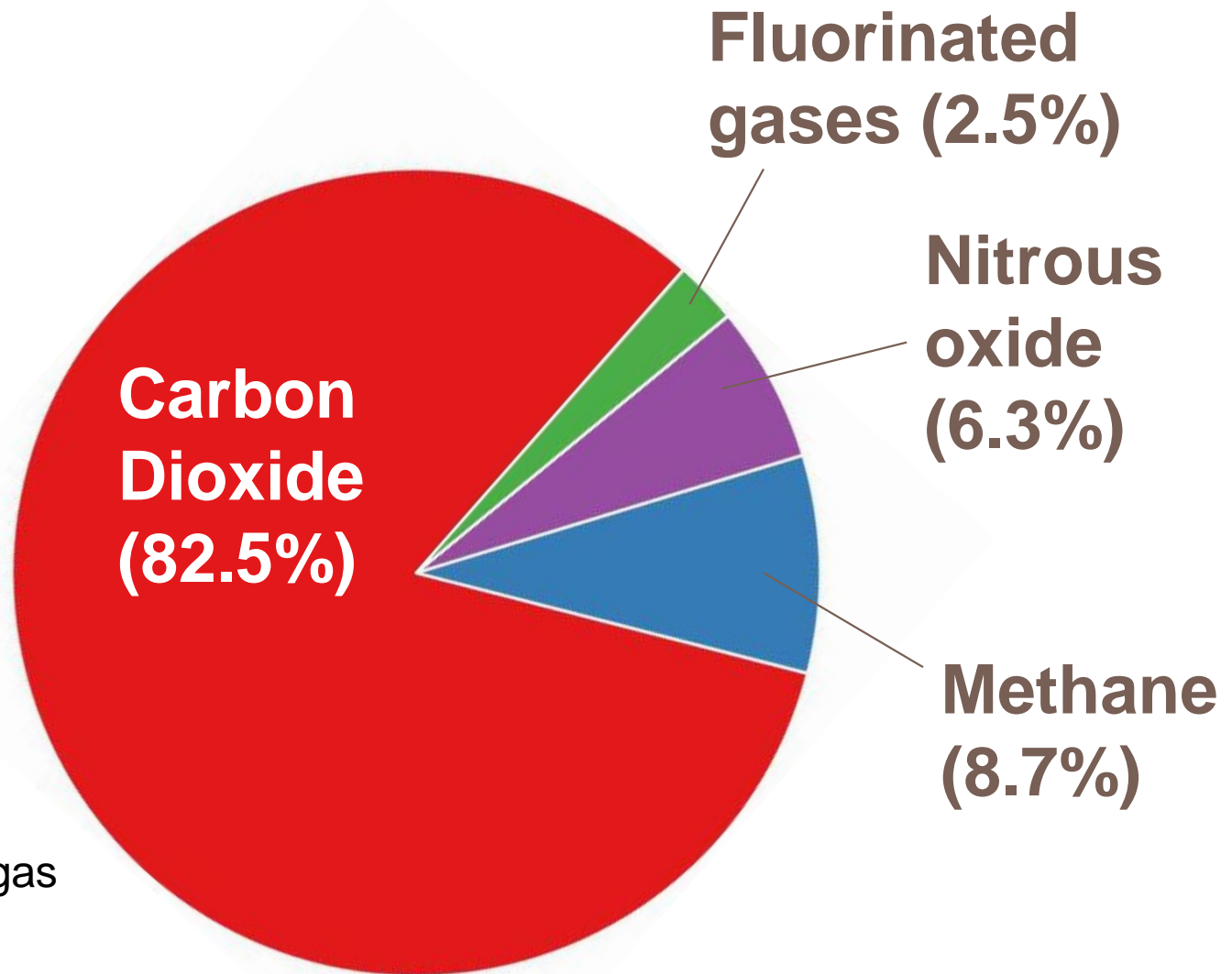


How can we limit future warming?

- “The United States needs: prompt and sustained strategies to reduce greenhouse gas emissions” (NRC, 2010)

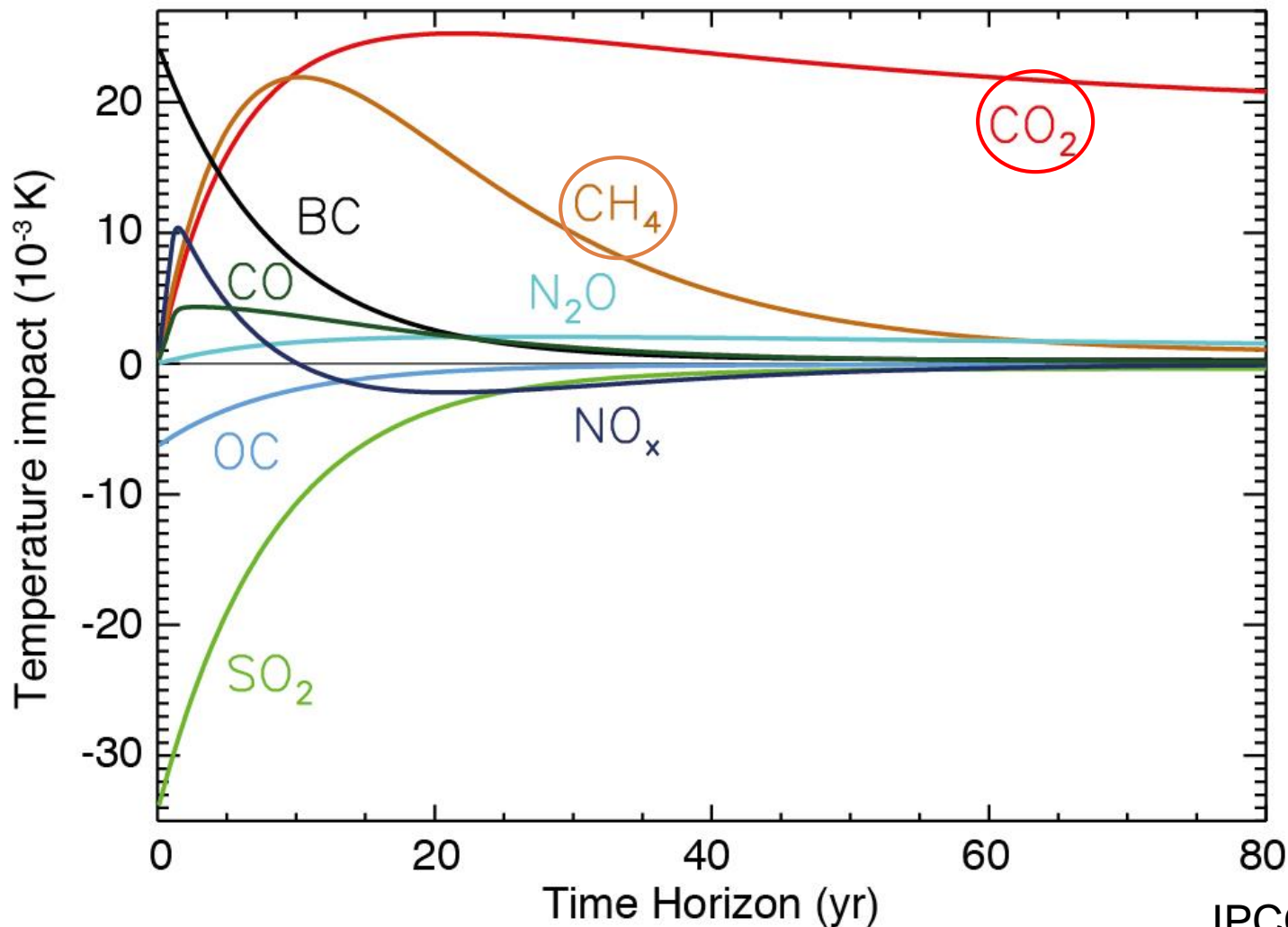


U.S. Greenhouse gas emissions, 2012



EPA estimates of
U.S. greenhouse gas
emissions 2012

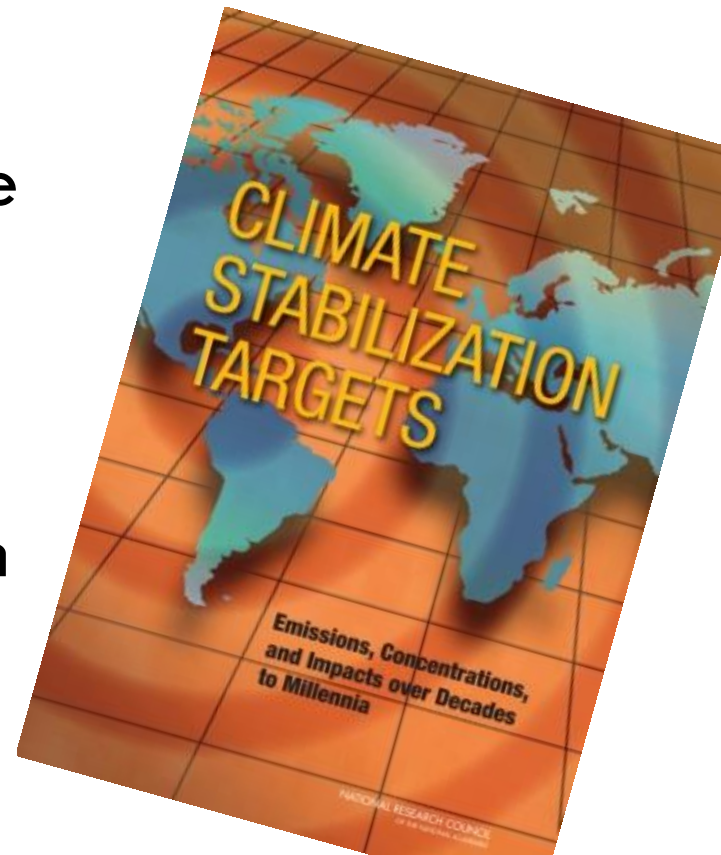
Methane is a significant Short-Lived Climate Pollutant (SLCP)



Controls on CO₂ and SLCP affect different aspects of climate

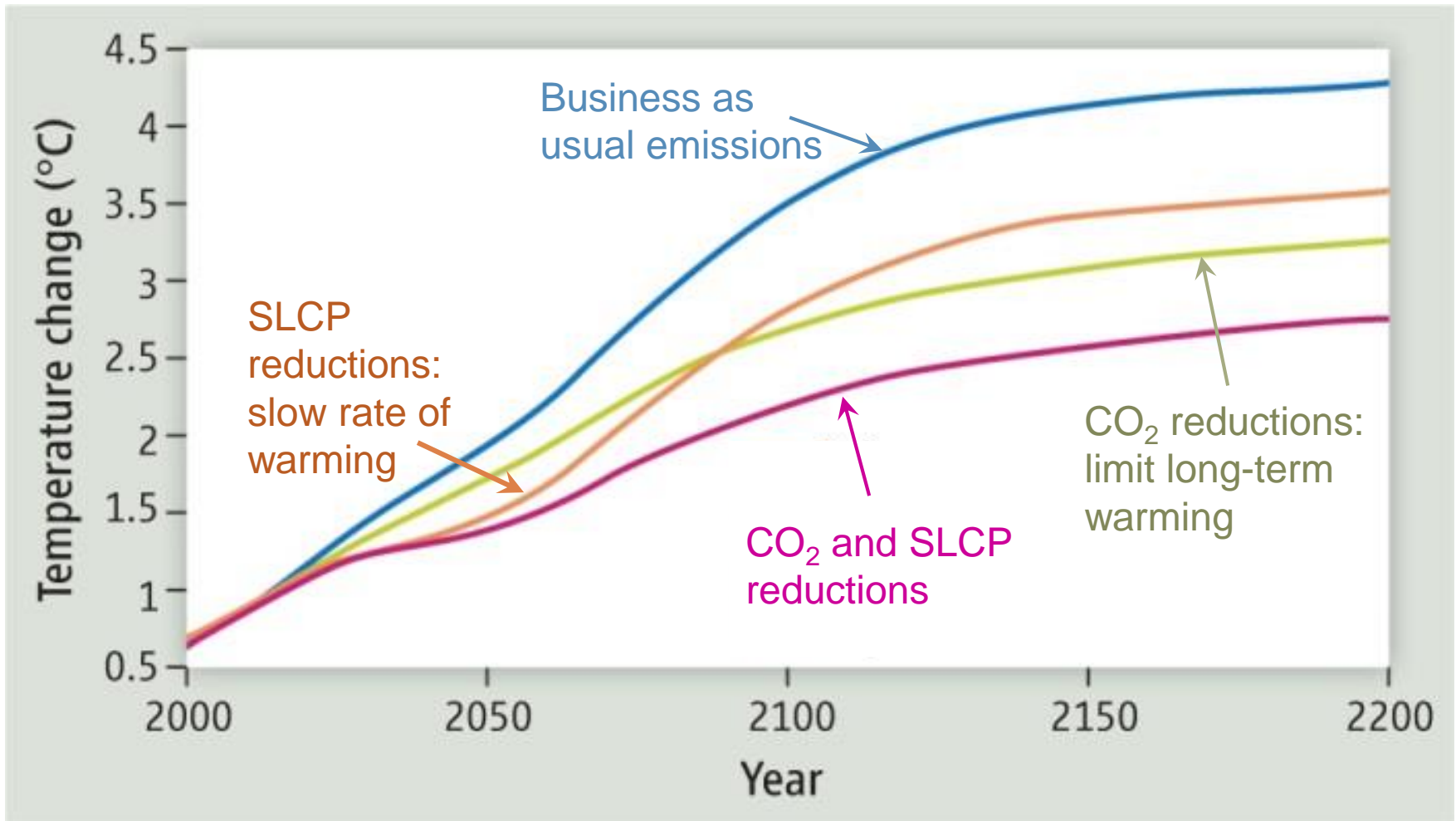
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- “The effect of mitigation of methane and black carbon is thus to trim the peak warming rather than limit the long-term warming to which Earth is subjected. If the early action to mitigate methane emissions was done *instead* of action that could have reduced net cumulative carbon emissions, the long-term CO₂ concentration would be increased as a consequence.” (NRC, 2011)



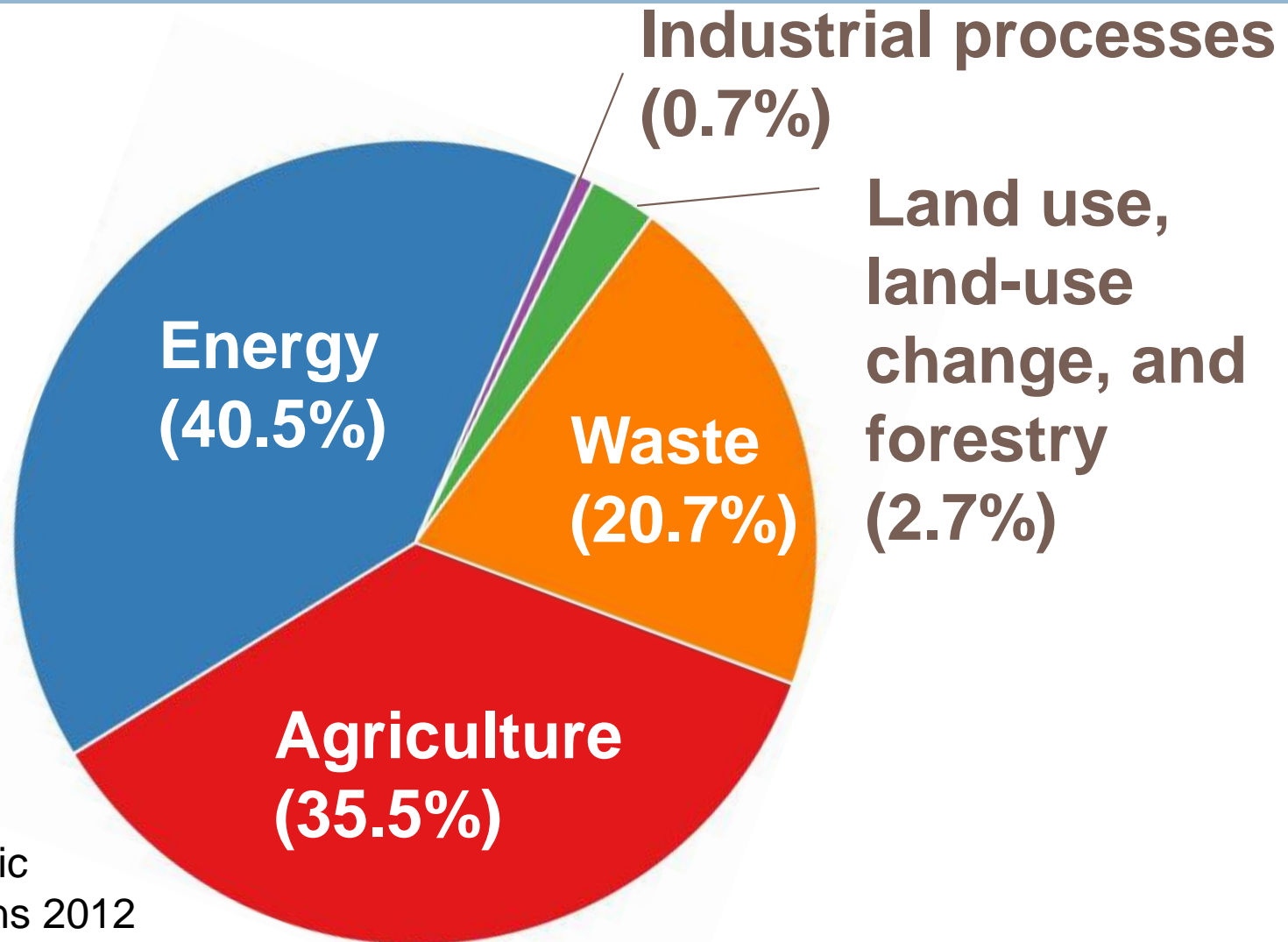
Temperature response to reductions in emissions of CO₂, SLCPs, or both.

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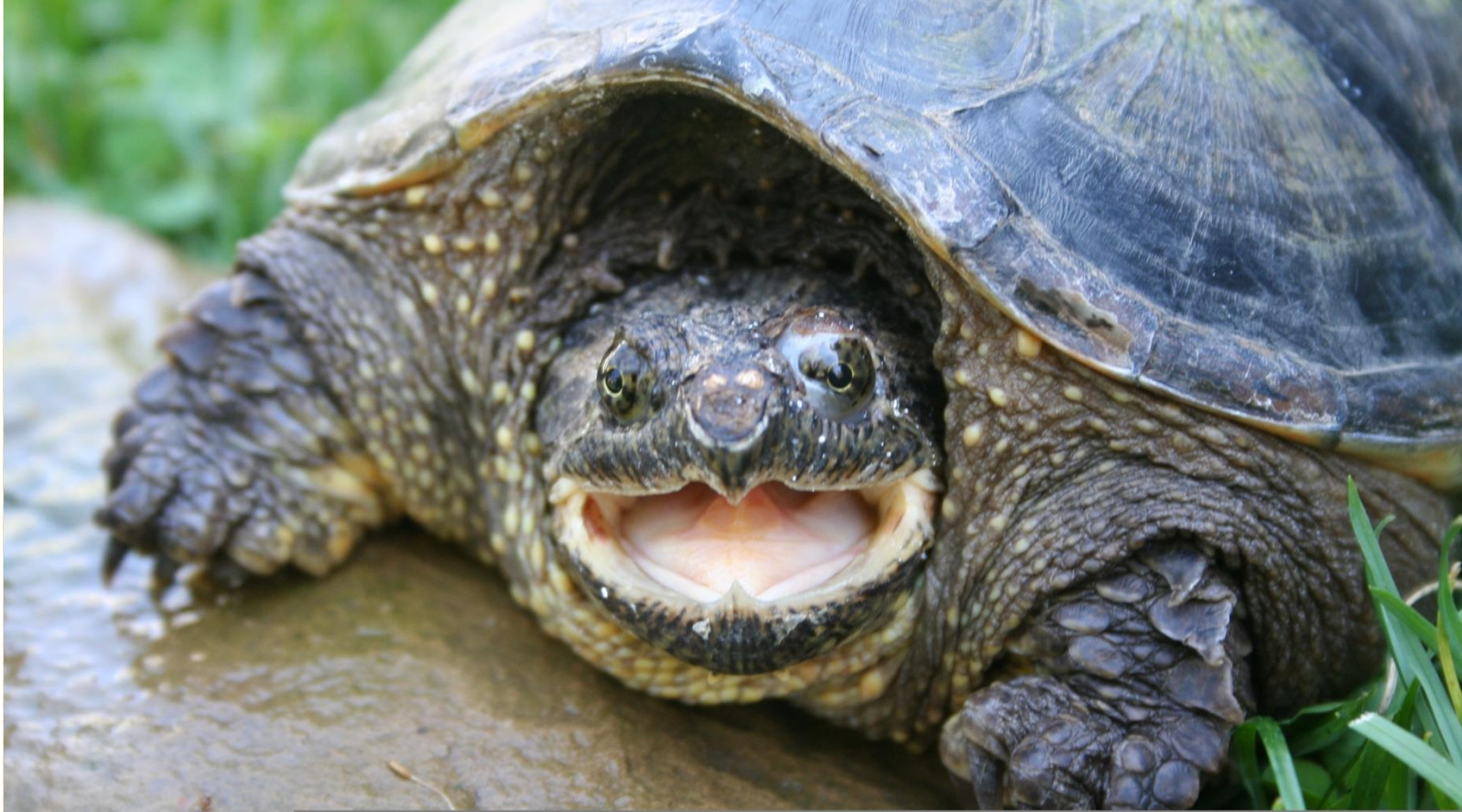


SOURCE: Shoemaker et al., 2013.

Methane has many sources



EPA estimates of
U.S. anthropogenic
methane emissions 2012



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THANK YOU!

For more information, visit americasclimatechoices.org.