

# 2015

## UNIVERSITY SUMMER FORUM

# *Chemistry & Society*

WITH **BASSAM Z. SHAKHASHIRI**

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**DEPARTMENT OF CHEMISTRY**

**UNIVERSITY OF WISCONSIN-MADISON**



Wisconsin Initiative for  
Science Literacy

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[www.scifun.org](http://www.scifun.org)

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Wisconsin Initiative for  
Science Literacy

# **The Strongest Forces in Society**

**Religion**

**Science**





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# Grand Challenges to Society and to Scientists

Help sustain Earth and its people in the face of:

- Population Growth
- Finite Resources
- Malnutrition
- Spreading Disease
- Deadly Violence
- War
- Climate Change
- Denial of Basic Human Rights, *especially the right to benefit from scientific and technological progress*





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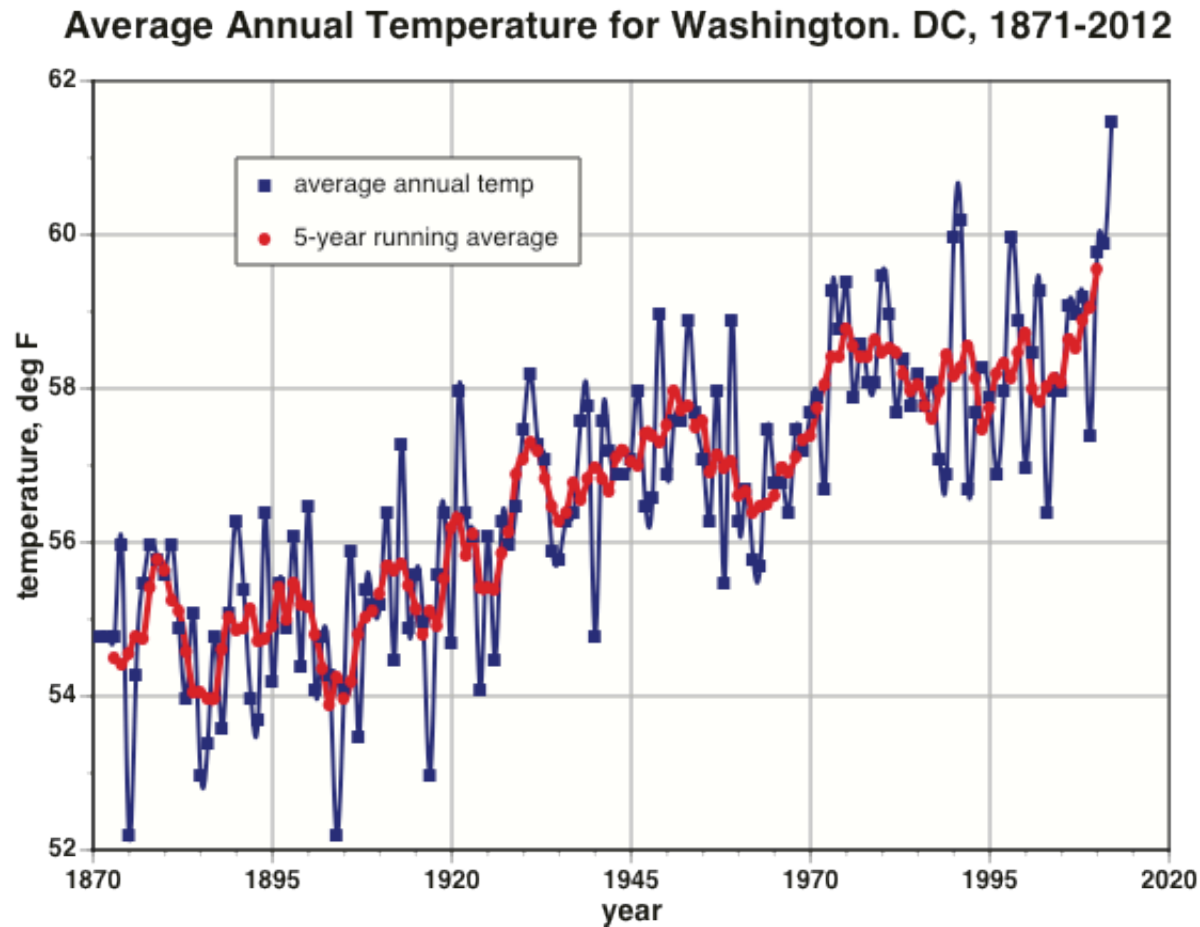
**SCIENCE OF  
CLIMATE CHANGE**

**BASSAM Z. SHAKHASHIRI**



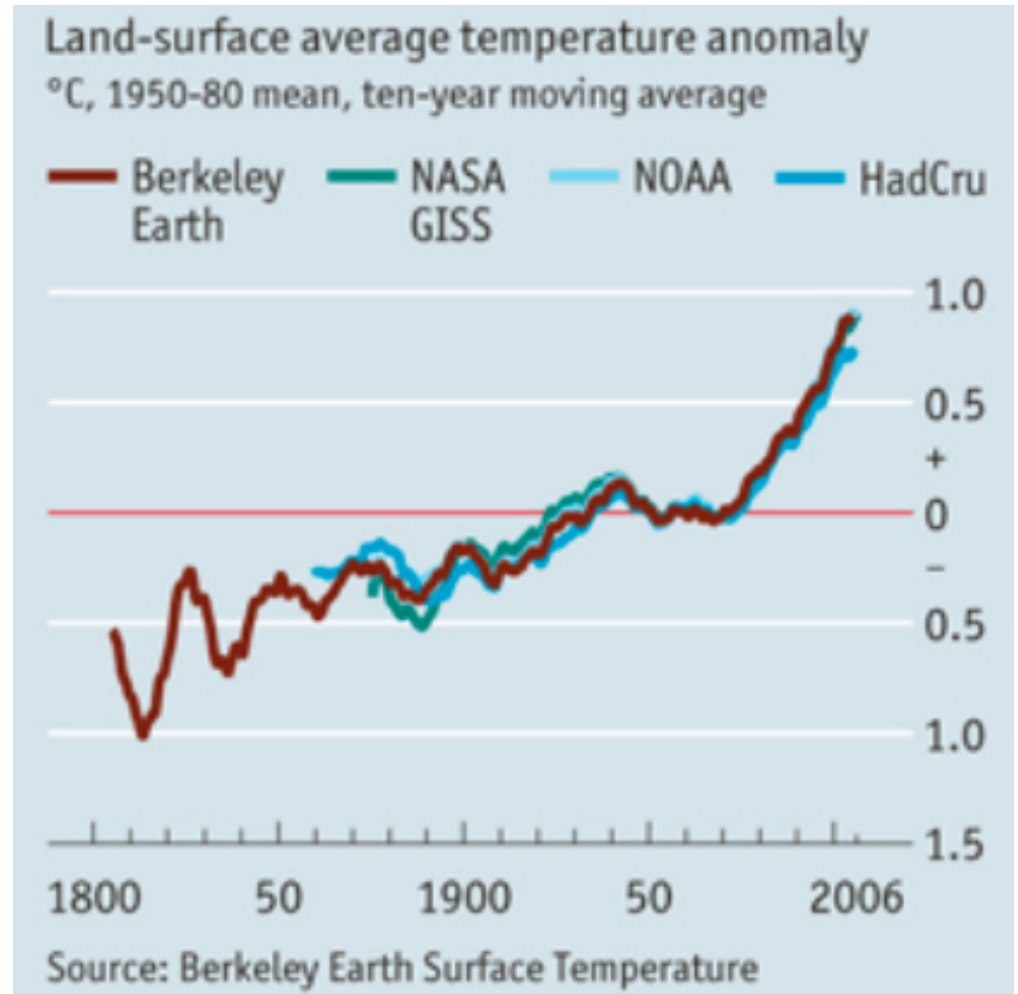
**Our planet has changed and continues to do so.**

**It's gotten warmer locally.**



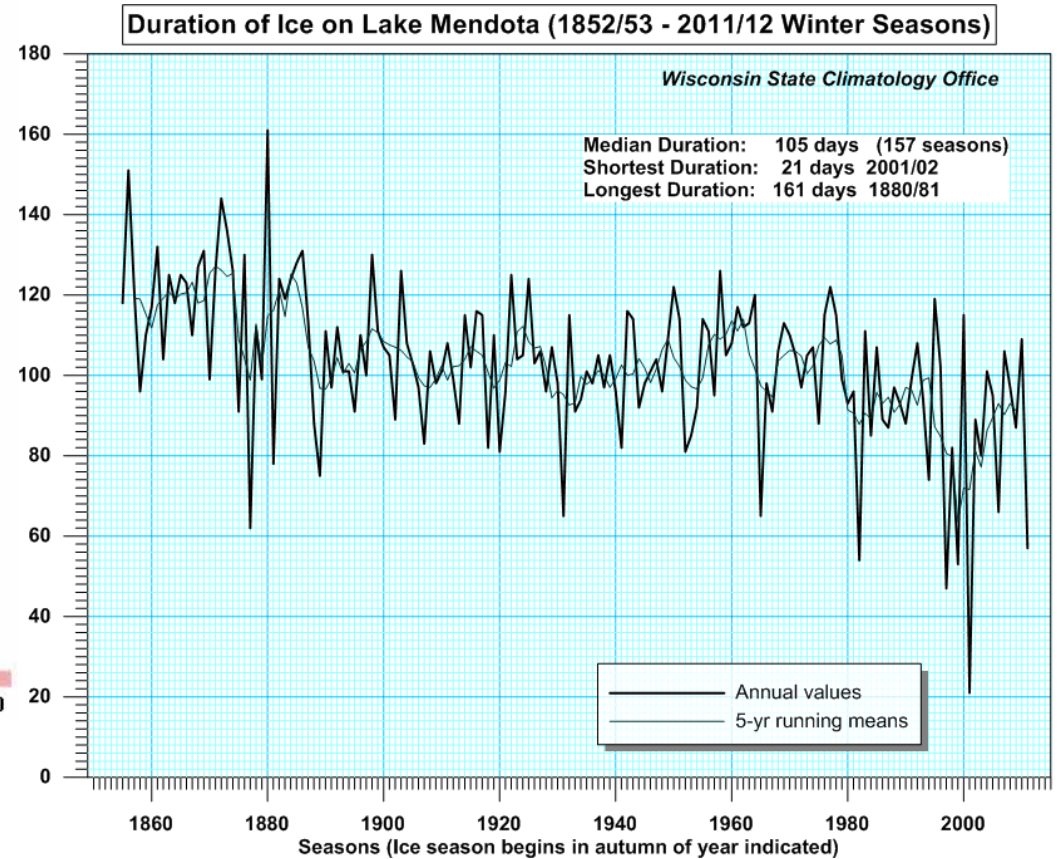
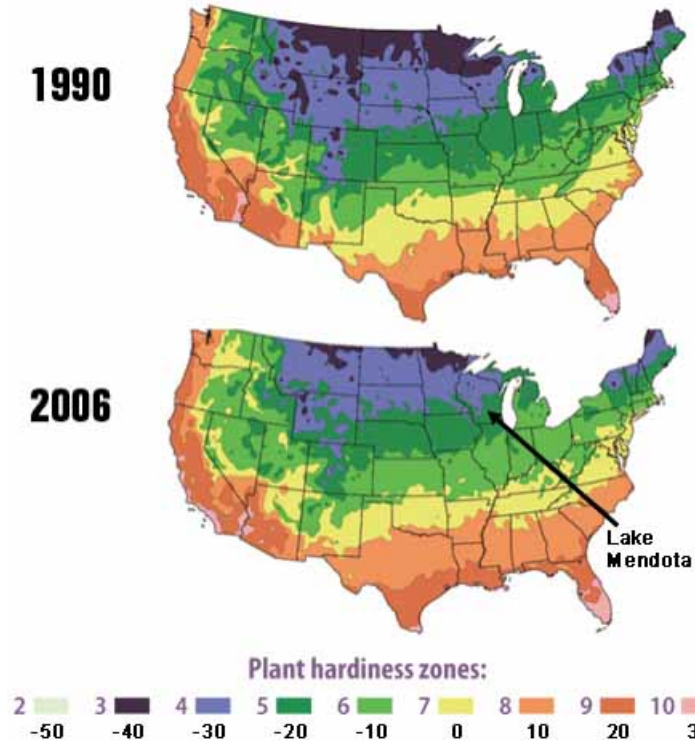
**Our planet has changed and continues to do so.**

**It's gotten warmer locally and globally.**



Our planet has changed and continues to do so.

Winters have gotten milder.



**Our planet has changed and continues to do so.**

**Ice has melted.**



**Grinnell Glacier, Glacier Nat'l Park  
1940**



**2006**

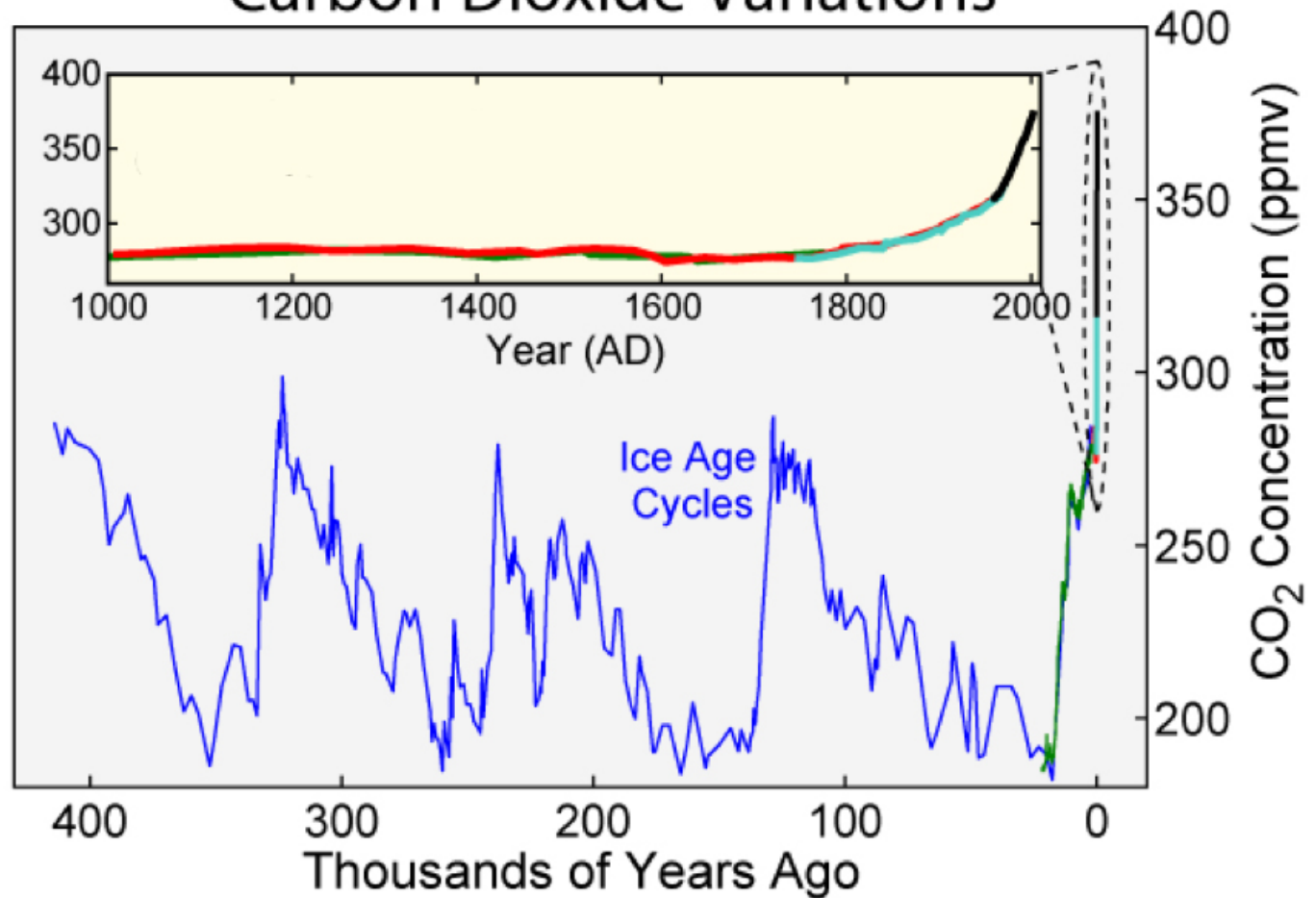




**Our planet has changed and continues to do so.**

**Human activities change the composition of the atmosphere.**

## Carbon Dioxide Variations





# ACS Climate Science Toolkit

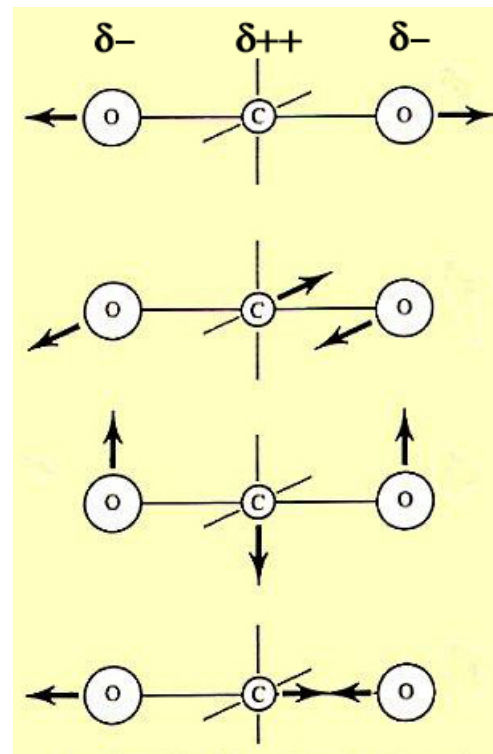
Tools to better understand and communicate climate science

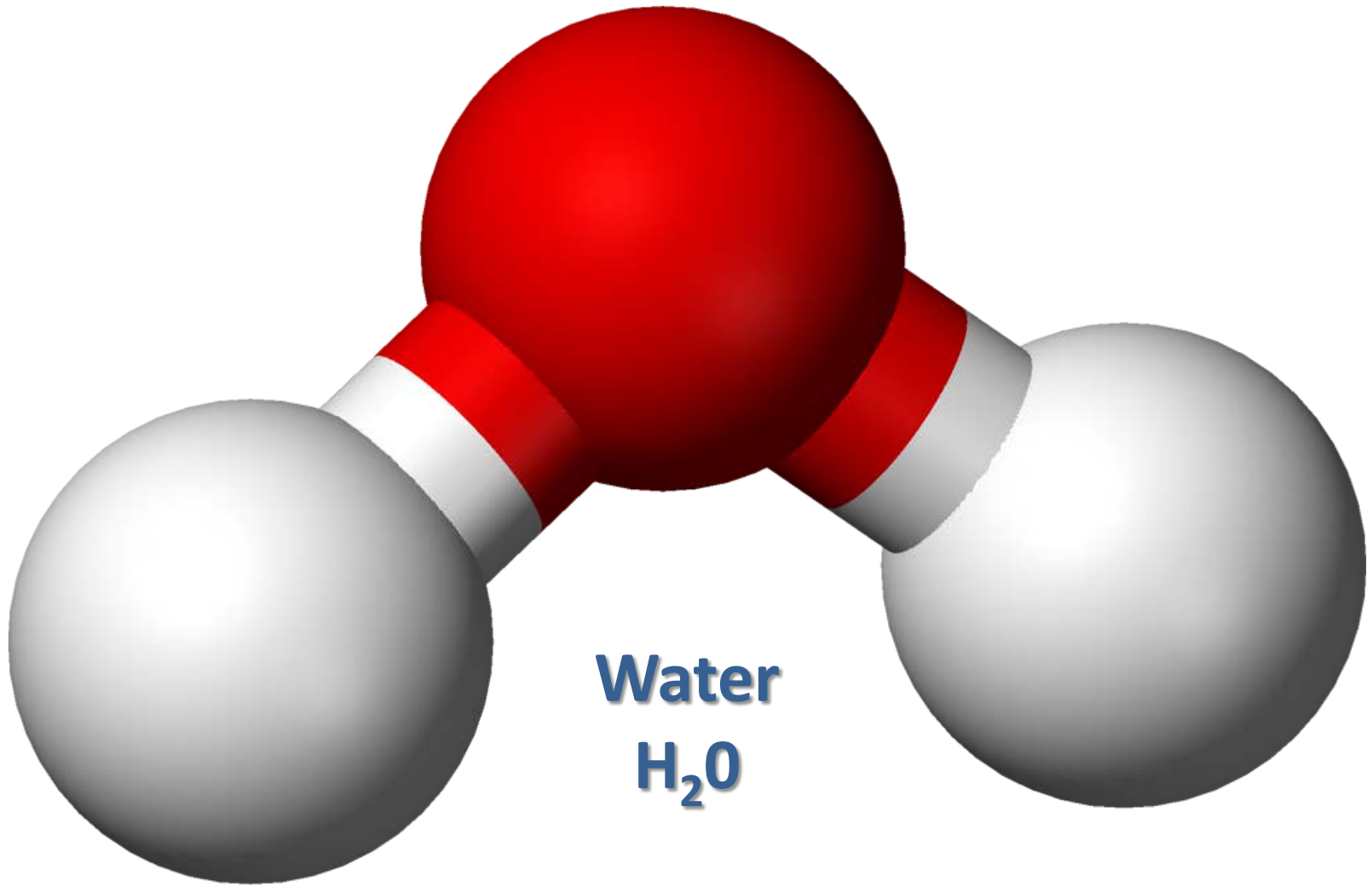


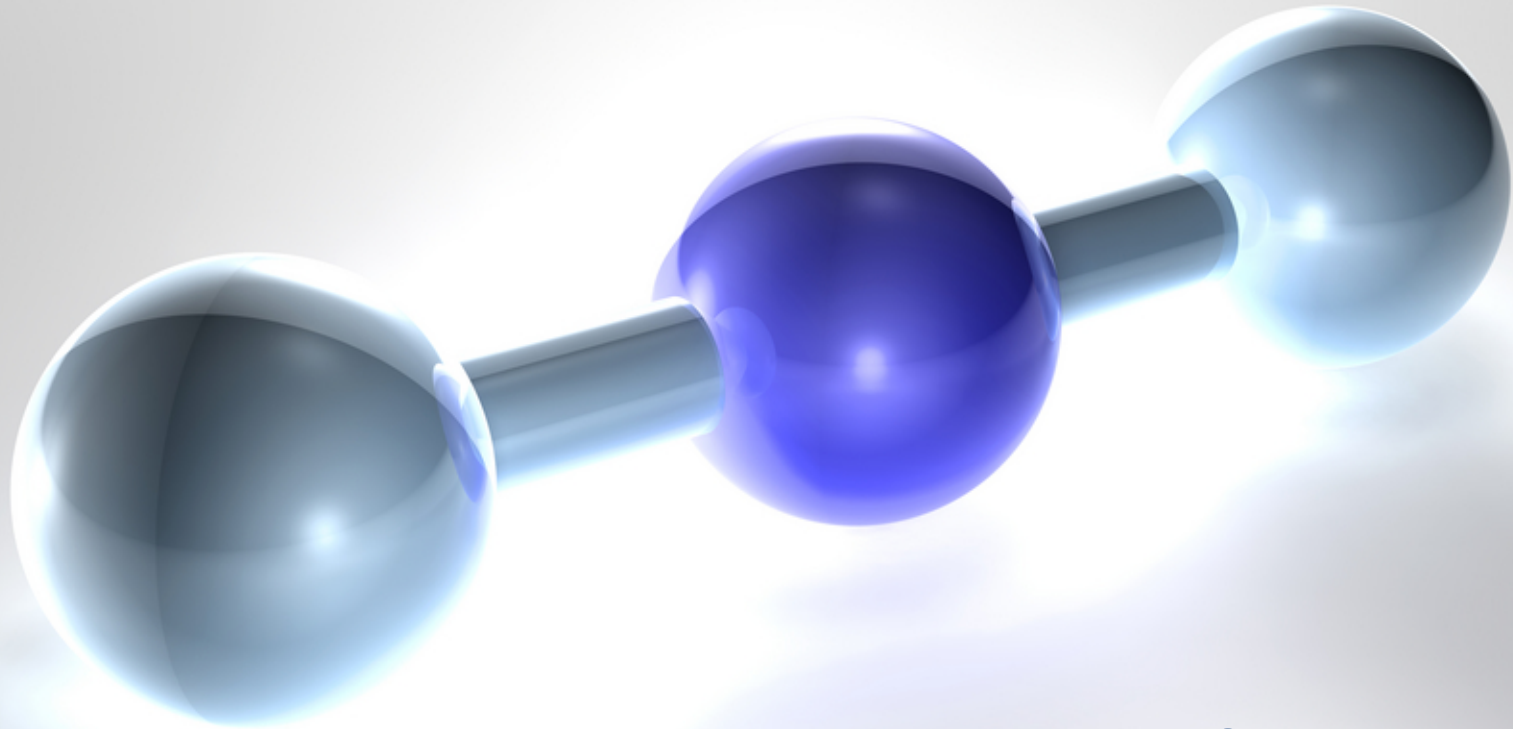
**[www.acs.org/climatescience](http://www.acs.org/climatescience)**

# ACS Climate Science Toolkit

- To absorb IR energy, molecular vibrations must change the dipole moment of the molecule.
- All molecules with three or more atoms meet this criterion and are IR absorbers.
- The trace gases in Earth's atmosphere contain many species that absorb and re-emit IR.





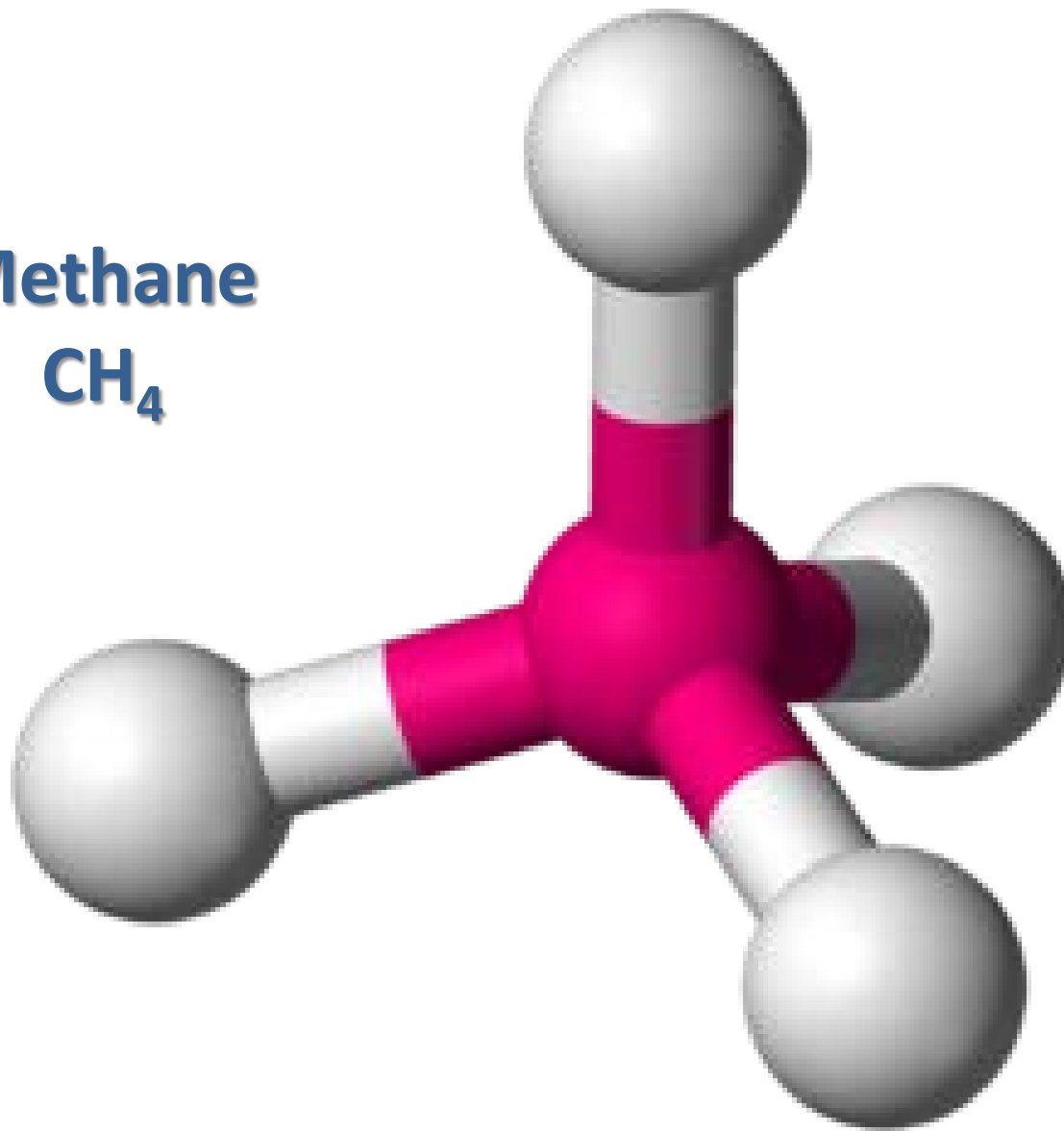


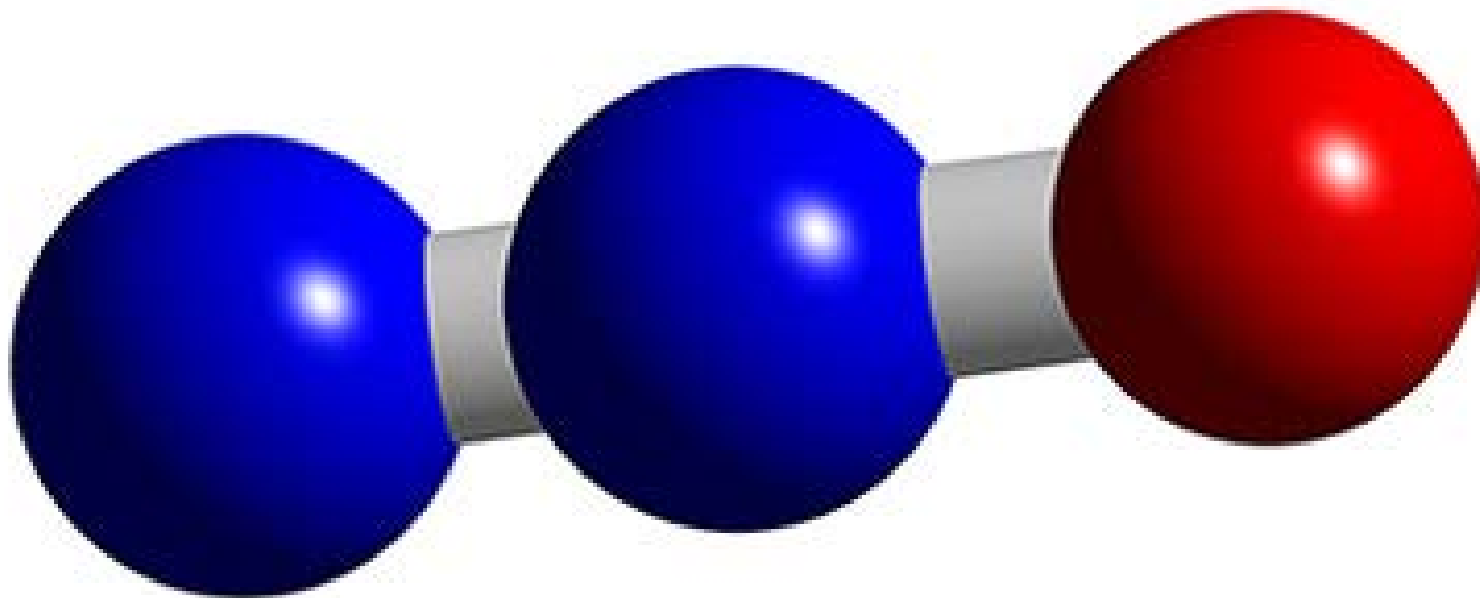
**Carbon Dioxide**  
**CO<sub>2</sub>**



# Methane

$\text{CH}_4$





**Nitrous Oxide**  
**N<sub>2</sub>O**

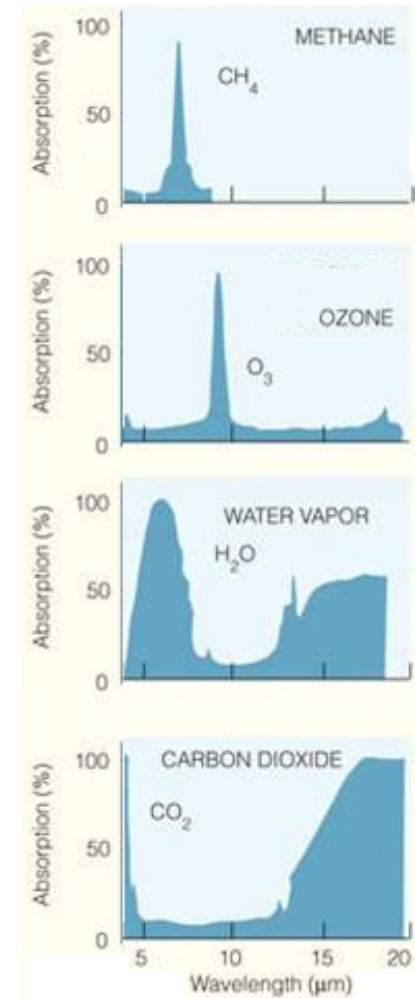




# ACS Climate Science Toolkit

Which gas is responsible for the largest fraction of the Earth's atmospheric greenhouse warming effect?

- A. methane
- B. ozone
- C. water vapor
- D. carbon dioxide





AMERICAN CHEMICAL SOCIETY

# Climate Science Initiative

When conversation turns to global climate change, are you comfortable with the basic science? As part of the ACS Climate Science Initiative, the ACS Climate Science Toolkit gathers the fundamentals of the science in one website, with resources to help you better communicate with others about this vital topic. Learn more, explore:



[www.acs.org/climatescience](http://www.acs.org/climatescience)

*The toolkit provides background for explaining the answer to a question like this:*

**Which gas is responsible for the largest fraction of the atmospheric greenhouse warming effect?**

- |                |                   |
|----------------|-------------------|
| A. methane     | B. ozone          |
| C. water vapor | D. carbon dioxide |

TURN OVER FOR MORE DETAILS, IDEAS, AND TO CHECK THE ANSWER TO THE QUESTION.

**The ACS Climate Science Toolkit contains tools to better understand and communicate climate science.**  
**The Toolkit is maintained by the ACS Committee on Environmental Improvement.**

**TOPICS INCLUDE:**

Energy Balance and Planetary Temperature  
How Atmospheric Warming Works  
Greenhouse Gases  
Oceans, Ice and Rock



**Climate change is a global issue, but individual choices make a difference:**

- using more efficient lights and appliances
- using more public transportation
- driving low emission vehicles
- teleconferencing more and traveling less
- consuming less, reusing more, and recycling as much as possible
- supporting efforts to mitigate the undesired consequences of climate change and encouraging governmental representatives to do the same

**Individual actions may have small effects, but inaction has zero effect.**

ANSWER: C. WATER VAPOR



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# Taking Care of Your Heart: *Chemistry and Heart Disease*



**Patrick McBride, MD, MPH**  
**Professor**  
**UW School of Medicine & Public Health**

