Climate Change: What We Know and What We Don’t Know

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How IPCC expresses scientific confidence

- The Intergovernmental Panel on Climate Change has used the following terms have been used to indicate the assessed likelihood, using expert judgment, of an outcome or a result:

  - *Virtually certain* > 99% probability of occurrence
  - *Extremely likely* > 95%
  - *Very likely* > 90%
  - *Likely* > 66%
  - *More likely than not* > 50%
  - *Unlikely* < 33%
  - *Very unlikely* < 10%
  - *Extremely unlikely* < 5%
Is the earth warming?

“Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level.”

(IPCC 2007)
Global Temperature (meteorological stations)

Source: NASA/Goddard Institute for Space Studies
“It can be said with a high level of confidence that global mean surface temperature was higher during the last few decades of the 20th century than during any comparable period during the preceding four centuries.”

“...the committee finds it plausible that the Northern Hemisphere was warmer during the last few decades of the 20th century than during any comparable period over the preceding millennium.” National Research Council.
Are human activities responsible for the observed warming?

“Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations.”

(IPCC 2007)
Global and Continental Temperature Change

Blue: Natural
Pink: Natural + Human-induced
Are extremes of weather and climate becoming more frequent?

“It is very likely that hot extremes, heat waves and heavy precipitation events will continue to become more frequent.”

Widespread changes in extreme temperatures have been observed over the last 50 years...hot days, hot nights and heat waves have become more frequent.

(IPCC 2007)
Changes in number of days with heat waves from UCS Northeast Climate Impacts Assessment
How are hurricanes affected by global warming?

“Based on a range of models, it is likely that future tropical cyclones (typhoons and hurricanes) will become more intense, with larger peak wind speeds and more heavy precipitation associated with ongoing increases of tropical sea surface temperatures. There is less confidence in projections of a global decrease in numbers of tropical cyclones. The apparent increase in the proportion of very intense storms since 1970 in some regions is much larger than simulated by current models for that period.”

(IPCC 2007)
Hurricane Katrina
Are Greenland and Antarctica contributing to rapid sea level rise?

“Dynamical processes related to ice flow not included in current models but suggested by recent observations could increase the vulnerability of the ice sheets to warming, increasing future sea level rise. Understanding of these processes is limited and there is no consensus on their magnitude.”

(IPCC 2007)
The Real Climate Change Controversy

- What’s the right climate policy?
- Not just a scientific question—but policy should be based on best science.
- Policymakers must balance a variety of considerations.
- There are no easy answers.
- Consequences of today’s actions will be felt decades to centuries in the future.