

Notable scientific and societal landmarks: 1985-present

- 1985 Ozone Hole Discovered: center-stage the human influences can have global environmental consequences (sudden discovery?)
- 1988 US Action
 - Drought and extreme heat wave in mid-west US
 - Jim Hansen (climate scientist, NASA) testifies to congress that he is "99% sure" that global warming is upon us
 - Pres Bush (I) establishes US Global Change Program; similar action in UK by Thatcher
- 1989 IPCC is established; first consensus science report issued in 1990

Notable landmarks (cont.)

- 1992 "Earth Summit" sponsored by the UN held in Rio de Janeiro ("Rio conference"). Discussions and negotiations led to the Kyoto Protocol (more later)
- 1995 Second IPCC assessment published (SAR)
 - Concluded "The Balance of Evidence suggests that humans have had a discernible influence on climate"
 - The strength of this statement made many climate scientists uneasy, and galvanized research to re-evaluate the science (models and data)
- 2000: The end of the 20th Century
 - Global annual average temperature continues to increase
 - The warmest decade in the instrumental record
 - Rate of temperature increase is greatest in the instrumental record

Notable landmarks (cont.)

- 2000 - Present: Third and fourth IPCC assessments published
 - TAR and AR4 reaffirm and strengthen conclusions from AR2 report
- 2000 - Present:
 - Stakeholders mobilize campaigns of disinformation and fear (on both sides)
 - Present US administration actively censors highly-outspoken US climate scientists (and scientists in other sciences) and suppress or misrepresents science
 - Examples, Dr. James Hansen (NASA), Dr. Ben Santer (Lawrence Livermore National Laboratory)

Examples

An Editor in the White House

Environmentalists are concerned that a...
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Extremists: who are they?

- Potential losers with singular priorities (ie, of direct financial interests, or local in space, or immediate in time)
 - Examples: Coal companies fear a carbon tax will make coal less attractive than renewables (e.g., solar, wind)
- People with priorities not directly related to human welfare, socially or economically
 - Examples: polar bear advocates, etc

Extremists are almost always motivated by issues not related to (uncertainty in) the science

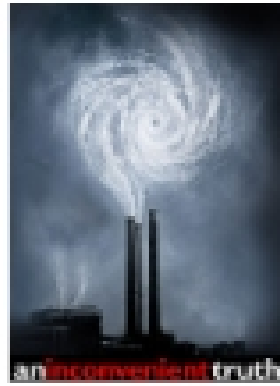
Extremists: who are they?

The non-scientists

- Stakeholders who feel they have a lot to lose if mitigation strategies are invoked
 - Often disseminate disinformation (lies) or use information (right or wrong) for the purpose of fear (e.g., mitigation is too expensive/will cost jobs)
 - Examples: Coal companies fear a carbon tax will make coal less attractive than renewables (e.g., solar, wind)
- Non-scientists with political or ethical bents that are at odds with mitigation
 - Lots of examples. A pop-culture example is Michael Crichton, novelist and author of "State of Fear". A novel written w/ footnotes and graphs (to give a look like it was a story backed by science). Information grossly distorted
 - For a full science critique, see www.realclimate.org and references therein

Extremists are almost always motivated by issues not related to (uncertainty in) the science

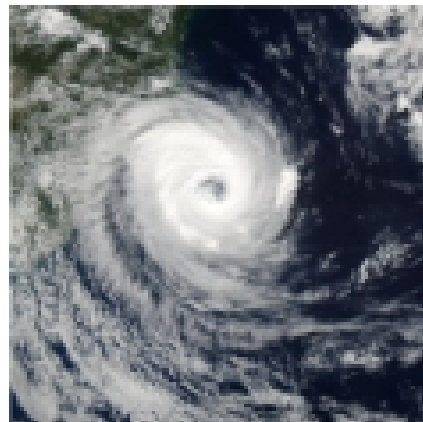
Hurricanes and Global Warming



- Hurricane strength depends mainly on sea surface temperature (SST) and wind shear (the change in wind speed and direction as you go up in the atmosphere)
 - The energy for a hurricane comes from condensation of water vapor. Hence, warmer water in general translates to more intense hurricanes
 - Hurricanes like low wind shear environments (too much wind shear and they are torn apart)
- Hurricane Katrina was featured in Gore's movie. Was it due to global warming?
 - Impossible to say anything about a single hurricane, but the odds of an intense hurricane are increased when the water is warmer (which it was for Katrina)

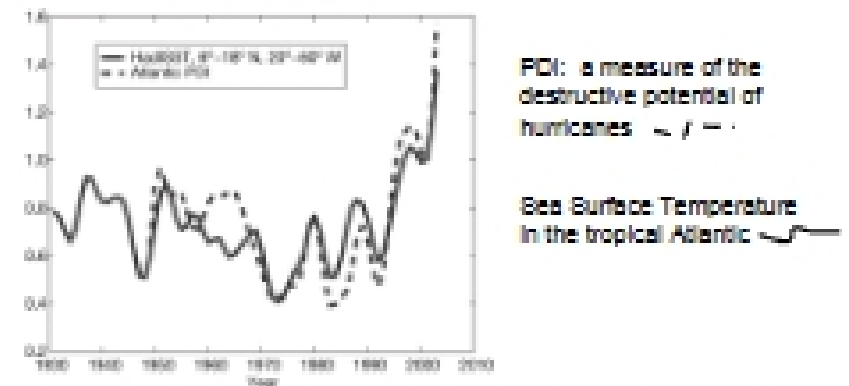
Hurricanes and Global Warming

- What about the hurricane off Brazil in March 2008? Hurricanes are unusual because the wind shear is large in that area.
- Cyclone (SH) Catarina had winds of 100mph. It formed in unusually low wind shear for that region, and SST was slightly above normal.
- Was it due to global warming? Again, a meaningless question for a particular storm.



Hurricanes and Global Warming

- Strongest relationship between warming and hurricanes should be in the frequency of intense storms. What have we seen so far?

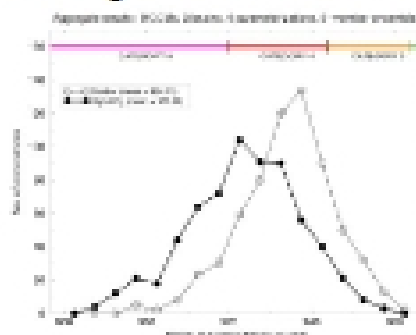


The intensity of hurricanes in the tropical Atlantic tracks SST closely

How will Global Warming affect hurricanes?

- Warmer water should cause more frequent intense storms
- Changes in wind shear are uncertain (sign) but likely small in magnitude

Projected change in the distribution of hurricane intensities



- Intense hurricanes should be more frequent

