Climate change: facts and myths

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This debate about climate change was held on the "Day of Teaching" under the umbrella of the 150-years ETH celebration. The purpose of the event was to demonstrate the pedagogical value of public debates in academic life. We have chosen to organize a debate on climate change because it is a topic that is not only scientifically contested but also of profound societal relevance.

ETH Zürich, Switzerland, http://www.ethz.ch
Tag der Lehre / Day of Teaching
November 14, 2005

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ETH Zürich, Switzerland
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My view …

- Climate is the statistics of weather.
- Anthropogenic climate change is real.
- We observe now changes of climate, which can be reasonably explained only through human agency.
- These changes take place mostly in global distributions of temperature.
- Claims that Global Warming is presently causing abnormally extreme rare events are mostly false.

My view …

- In the public, anthropogenic climate change is used as an explanation for rare events – which should be explained by the random character of weather. However, the reference to anthropogenic climate change is a culturally more consistent explanation.
- Examples: Extratropical storms in the 1990s; hurricanes in the 2000s.
- Scientists only suggest a causal relationship; in the media these suggestions become assertions. The scientific community objects only inefficiently.
The countdown to climate change catastrophe is being met by a task force of senior politicians, business leaders and academics from around the world - and it is remarkably brief. In as little as 10 years, or even less, their report indicates, the point of no return with global warming may have been reached.

And it breaks new ground by putting a figure - for the first time in such a high-level document - on the danger point of global warming, that is, the temperature rise beyond which the world would be irretrievably committed to disastrous changes. These could include widespread agricultural failure, water shortages and major droughts, increased disease, sea-level rise and the death of forests - with the added possibility of abrupt catastrophic events such as "runaway" global warming, the melting of the Greenland ice sheet, or the switching-off of the Gulf Stream.

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**German Papers**

**Katrina Should be A Lesson To US on Global Warming**

Seems like everything is President Bush’s fault. One day after Katrina hammered the Gulf Coast, German commentators are laying into the US for its stubborn attitude to global warming and Kyoto.

Hurricane Katrina is big news for German commentators, whatever their ilk. For some, the powerful storm which slammed the Gulf Coast on Monday, is a symbol of the sort of environmental horrors awaiting the world thanks to global warming and proof positive that America needs to quickly reverse its policy of playing down climate change. For the more conservative, it is simply another regrettable natural catastrophe.
Extratropical storms in Europe
Discussion in the early 1990s.


Extratropical storms in Europe
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Abbildung 49: Anzahl Stürme (oder mehr) im Winterhalbjahr für Zürich (ergänzt). Die Station Zürich zeigt einige umliegende Ergänzung fehlender Daten.
Extratropical storms in Europe
Discussion in the early 1990s.

North Sea: storm intensities

Date derived from air pressure readings at fixed stations

Alexandersson, SMHI, 2003

The case of hurricanes
More violent storms, caused by Global Warming?

Figure TS-5: The costs of catastrophic weather events have exhibited a rapid upward trend in recent decades. Yearly economic losses from large events increased 10.3-fold from US$4 billion yr\(^{-1}\) in the 1950s to US$40 billion yr\(^{-1}\) in the 1990s (all in 1999 US$). The insured portion of these losses rose from a negligible level to US$2.2 billion annually during the same period, and the ratio of premiums to catastrophic losses fell by two-thirds. Notably, costs are larger by a factor of 2 when losses from ordinary, noncatastrophic weather-related events are included. The numbers generally include “captive” self-insurers but not the less-formal types of self-insurance.
Annual Atlantic ACE and SST Data

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On what type of data are these values based upon?

Note: ACE is sum of squares of wind speed in knots for every 6 hour increment during which storm is at least a tropical storm (and hence is included in HURDAT dataset). ACE is shown here in raw units (in M) and not standardized.

Note: ACE data from National Hurricane Center’s North Atlantic hurricane database (HURDAT).

Note: SST data for 1870-2004 on a 1° grid for 6-18N, 20-60W, from Hadley Centre Sea Ice and SST data set (HadISST). SST data for 1855-1879 on a 5° grid for 5-20N, 20-60W from Physical Oceanography Distributed Active Archive Center (PO.DAAC) at the NASA Jet Propulsion Laboratory’s GOSTAPLUS data set.

Note: p-value is on simple linear regression

Regression of ACE vs. SST:
\( r^2 = 0.20 \)
\( p < 0.001 \)

ACE vs. Year:
\( r^2 = 0.28 \)
\( p < 0.001 \)

Trenberth, 2005, pers. comm.

The case of hurricanes
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Figure 7.1: Surface winds and analysis for Major Hurricane Emily on 9 September 2001 at 1200 UTC. This analysis utilizes all available surface and reanalysis wind data including satellite winds (WindSat, MODIS). The green contour is the inner core of the storm at 188 kmh. In 1999, Emily was designated a Category 4 on the Saffir-Simpson scale. Emily’s core was 40 km larger at 2001 than in 1999. The measurement is based on a standard maximum sustained surface wind of 1 min. 10 m/s. This storm was also tracked using satellite radars, 188 kmh.

Figure 7.2: Same as Figure 3, but without the benefit of surface-reduced aircraft reconnaissance flight-level winds. In this case, highest analyzed surface winds were only 188 kmh (40 m/s) based upon observations from Bermuda about 100 nautical miles from Emily’s center. Such an analysis is typical of data available before the advent of aircraft reconnaissance data in the mid-1970s and is illustrative of the underestimation bias that occurred for many tropical cyclones during the one of the late 19th and early 20th centuries being re-analyzed.
Conclusion

• History of overselling “inhomogeneous data”
  • Typically, better analyses of weather conditions lead to the description of stronger extreme events – which goes along with the detection of trends towards more intense events. This may be true, but can not be separated from the better analyses.
  • Multi-year and even multi-decennial trends may be entirely natural of origin. The “detection” of anthropogenic effects requires special statistical “detection”-algorithms.

Climate Research …

• is a social process.
  • serves social needs of providing explanations for otherwise unexplainable phenomena (in particular: disasters).
  • The understanding of “the public needs to be alarmed” leads to unsustainable practice of science, which undermines the role and functioning of science.
  • Normative arguments are seeping into public appearance of science, so that science may be perceived as just another form of normatively guided knowledge claim.