

# FMS1204S: Fraud, deception and data

Week 6

Uncertainty and controversy in environmental  
research

# Uncertainties in the environmental science

Environmental science is often beset with uncertainties due to (among other reasons):

- ▶ Uncertainties in measurements of environmental processes (random errors, systematic errors, poor spatial or temporal coverage of observations).
- ▶ Incomplete understanding of complex physical processes and feedback effects.
- ▶ Inability to use the knowledge we do have of known physical processes due to computing constraints and data limitations.
- ▶ Difficulties in validating environmental models when long time scales are required for validation but decisions must be made now.

# Controversies over global warming

## The Climategate

- ▶ In 2009, thousands of emails from the Climate Research Unit (CRU) at the University of East Anglia were made public following a computer security breach.
- ▶ Climate change skeptics used the emails to claim that researchers had deleted raw data, manipulated data or attempted to mislead the public and had subverted the peer review process of academic journals.
- ▶ The CRU was eventually cleared of any wrongdoing. However, there have been some troubling issues raised by the controversy about public availability of raw data and computer code to ensure repeatability of results. The controversy is widely perceived to have done some good in raising awareness of these issues.

# Controversies over global warming (cont.)

## Accusations against climate scientists

There are many allegations of manipulation of data leveled at climate scientists, for example:

- ▶ There were several errors of a trivial nature in the recent IPCC (Intergovernmental Panel for Climate Change) report on the status of global warming research. However the trivial errors are seized upon as being highly significant by skeptics.
- ▶ Climate change skeptics often question the reliability of temperature records - for example, a common claim is that the temperature record is subject to a "heat island effect" where many new observing stations may be in urban areas with few trees and a warmer than average microclimate perhaps leading to the appearance of trends in temperature records, though indeed there is no such effect.

# Controversies over global warming (cont.)

## Distortion by climate change denialists

- ▶ The climate data have often been obviously distorted by climate change skeptics.
- ▶ The distortions made by climate change skeptics are usually less interesting than possible distortions made by climate scientists.

## The controversies tend to continue

- ▶ There are legitimate uncertainties about the status of climate research and difficulties about quantifying these uncertainties.
- ▶ The uncertainties can be used or abused to make a claim.
- ▶ The controversy is unavoidable and will not go away in the future.

# Group 1

- ▶ MacDonald, Ian (2010). Deepwater disaster: how the oil spill estimates got it wrong. *Significance*, 7(4), pp. 149–154.
- ▶ The 2010 oil spill from BP's Macondo well in the Gulf of Mexico was a major environmental problem. This article discusses how estimates of the amount of crude oil leaking into the Gulf were badly wrong, and the problems this may have caused in managing the disaster.
  - ▶ Why were the estimates so wrong?
  - ▶ What were the consequences for management of the disaster?

## Group 2

- ▶ Smaje, Chris (2011). The ungreen city - or the polluting countryside? *Significance*, 8(2), pp. 61–64.
- ▶ You may have heard that urban dwellers have less impact per capita on the environment than people living in the country. This article reexamines the issue
  - ▶ What claims have been made about the environmental benefits of having large cities?
  - ▶ What complications arise in assessing these claims?

## Group 3

- ▶ Franklin, J. (2009). *What science knows: and how it knows it*. Encounter Books. (Chapter 13: The complexity obstacle to knowledge).
- ▶ In his book on the nature of scientific knowledge mathematician and philosopher James Franklin expresses a positive but cautious view concerning the evidence for global warming. Some issues to discuss:
  - ▶ According to Franklin, what are the three main propositions of global warming theory?
  - ▶ Where does the uncertainty lie in these propositions and why?

## Group 4

- ▶ Spiegelhalter, David (2011). Fear and numbers in Fukushima. *Significance*, 8(3), pp. 100–103.
- ▶ This article discusses the recent Japanese disaster at the nuclear power plant in Fukushima and the risks associated with nuclear energy.
  - ▶ How dangerous was the radiation from the Fukushima disaster?
  - ▶ Were the risks well communicated to the general public?

## Group 5

- ▶ The U.S. Climate Change Science Program, Synthesis and Assessment Product 5.2, January 2009. (provided on IVLE).
- ▶ An article from climate change skeptics  
<http://www.forbes.com/sites/markhendrickson/2012/09/16/climate-change-hoax-or-crime-of-the-century/>
- ▶ Read the non-technical summary of the Climate Change Science Program Report and summarize some of the issues for the class.