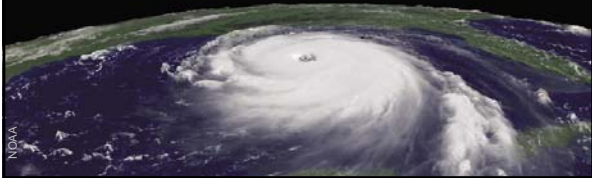


Urgent findings of the latest climate science

Dr Melanie Fitzpatrick
Climate Scientist, Union of Concerned Scientists
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SEI Symposium, December 5th, 2008



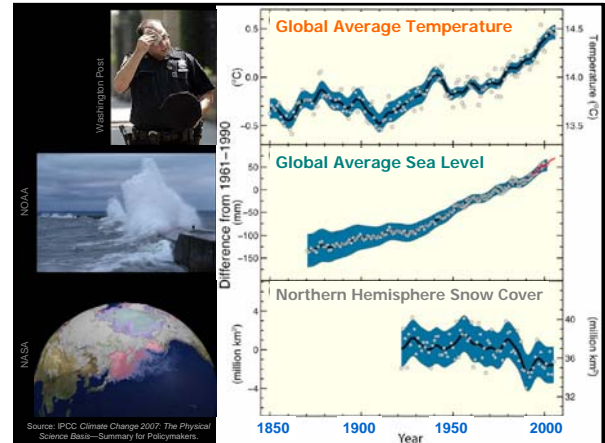
Talk Outline

- UN IPCC findings
- Climate in context
- Surprises - feedbacks
- Tipping points
- Choices from here?



UN IPCC 2007 reports

- UNEP / WMO 1988
- Review of science
- Six-year process
- Consensus, voluntary
- Not policy prescriptive
- Final government review



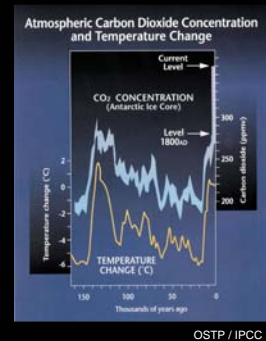
Human-induced climate change is now apparent on every continent



Source: IPCC 2007: Climate Change Impacts, Adaptation and Vulnerability—SPM

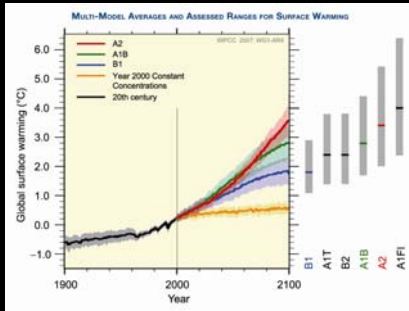
Current conditions are *unique*

- Concentration of carbon dioxide:
 - Ice age ~180 ppm
 - Interglacial warm period ~280 ppm
 - 2008 ~385 ppm
- Current rate of increase in emissions:
 - *Unprecedented* in geological history



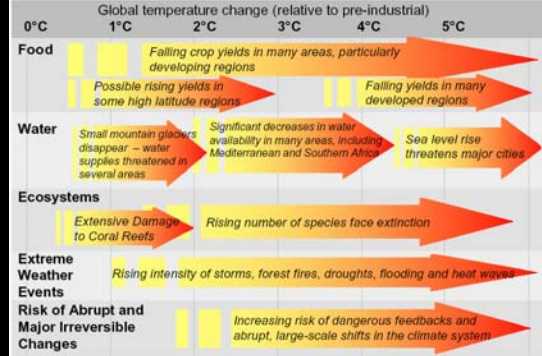
OSTP / IPCC

Past and future warming



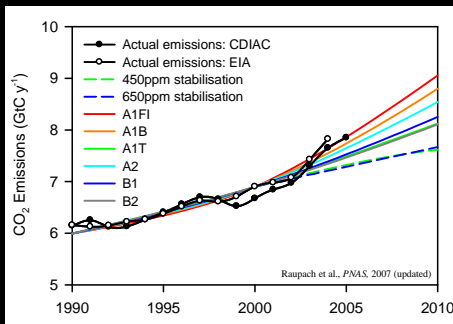
Source: IPCC Climate Change 2007: The Physical Science Basis—Summary for Policymakers

Projected Impacts of Climate Change



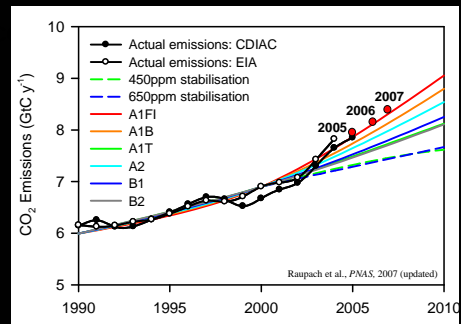
Source: Stern review on the economics of climate change, 2006

Current global emissions



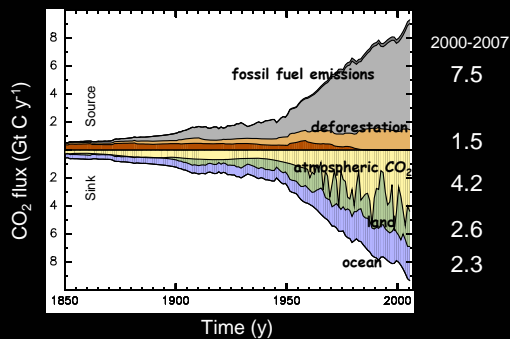
Raupach et al., PNAS, 2007 (updated)

Current global emissions



A1FI (high) projections: +2.7% per year
Actual growth: +3.5% per year during 2000-2007

Perturbation of global CO₂



Le Quéré, unpublished; Canadell et al. 2007, PNAS, Global Carbon Project 2008

Surprises: Climate-ecosystem feedbacks

- Ice-albedo feedbacks
- Carbon-cycle feedbacks



Greenland ice sheet record melt 2007

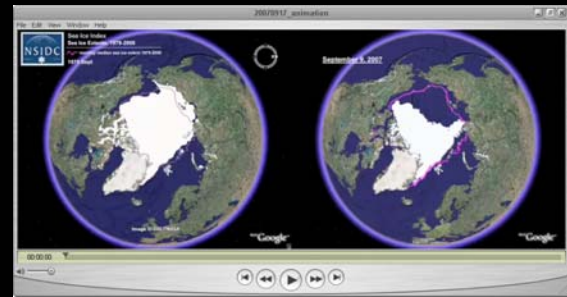
Ice albedo

- Sea level rise
- Ocean circulation
- Reflectivity (albedo)



Arctic sea ice September 2007

Ice albedo



http://nsidc.org/news/press/2007_seaiceminimum/images/20070917_animation.mov

Release of methane

Carbon cycle

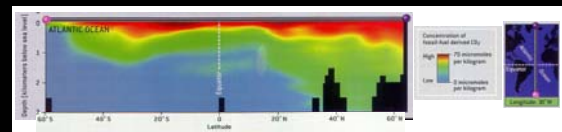
- Permafrost thawing
- Arctic lakes thinning
- Potential for release of clathrates in ocean?



Ocean warming and acidification

Carbon cycle

- Warming of surface ocean
 - Increased sea level rise
 - Reduced CO₂ uptake
- Increased acidity of ocean

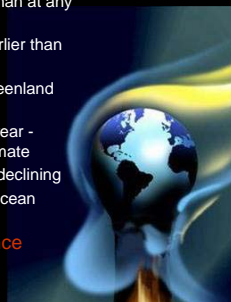


Source: Robert Key, Princeton University

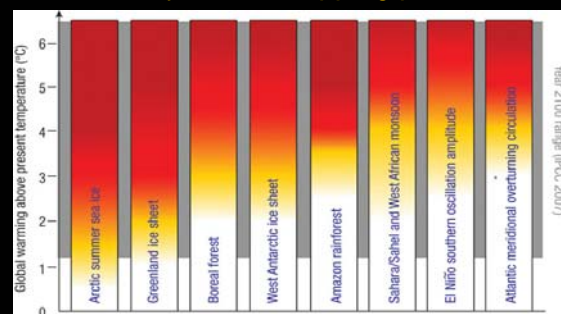
Reasons for concern

- Current global emissions higher than IPCC scenarios
- Atmospheric CO₂ concentrations greater than at any time in human history
- Record Arctic sea ice losses - decades earlier than projected by IPCC
- Accelerating glacier flows measured in Greenland and the Antarctic Peninsula
- Revised sea-level rise estimates 3.3 mm/year - higher than the 2 mm/year IPCC best estimate
- Capacity of land and ocean sinks may be declining
- Possible methane release from land and ocean

Low probability, high consequence

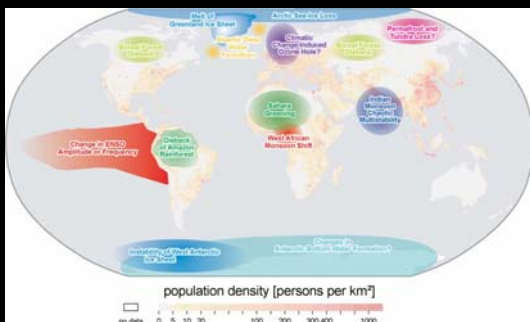


Policy-relevant tipping points



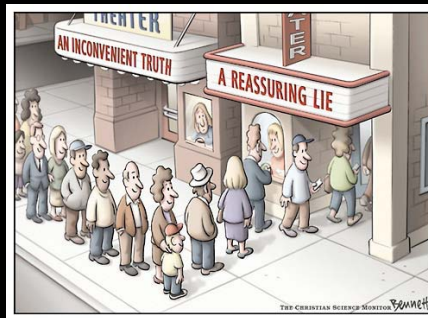
Lenton and Schellnhuber, *Nature*, 2007

Climate tipping points



Lenton et al., *PNAS*, 2007

So, should we go home now?



Repower,
refuel, rebuild
nationally
and globally

A Wake-Up Call for America

Scientists and Economists Urge U.S. to Act Now on Global Warming

More than 1,700 of America's leading scientists and economists have written a letter urging U.S. policymakers to act now to reduce global warming pollution.

"No longer can wait, the faster and more costly it will be to find, identify, change and to adapt to those impacts that will not be avoided."

Their recommendation is clear: Reducing global warming pollution today can save money for businesses and consumers, create new, sustainable jobs, and improve both air quality and America's energy security. Most importantly, these science-based, market-driven reductions in global warming pollution are both achievable and consistent with sound economic policy.

To view the letter, "U.S. Scientists and Economists' Call for Swift and Deep Cuts in Greenhouse Gas Emissions," go to: www.ucsusa.org/timelineletter

There's No Time to Waste

Union of Concerned Scientists
Sound Science. Practical Solutions.

Resources

- IPCC www.ipcc.ch
- National Snow and Ice Data Centre www.nsidc.org
- Global Carbon Project www.globalcarbonproject.org
- Stern Review www.hm-treasury.gov.uk/independent_reviews
- Lenton et al. *PNAS* paper
<http://researchpages.net/ESMG/people/tim-lenton/tipping-points/>
- Canadell et al. *PNAS* paper
<http://researchpages.net/ESMG/people/tim-lenton/tipping-points/>
- UCS www.ucsusa.org

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