What Does Climate Change Mean for Public Health?

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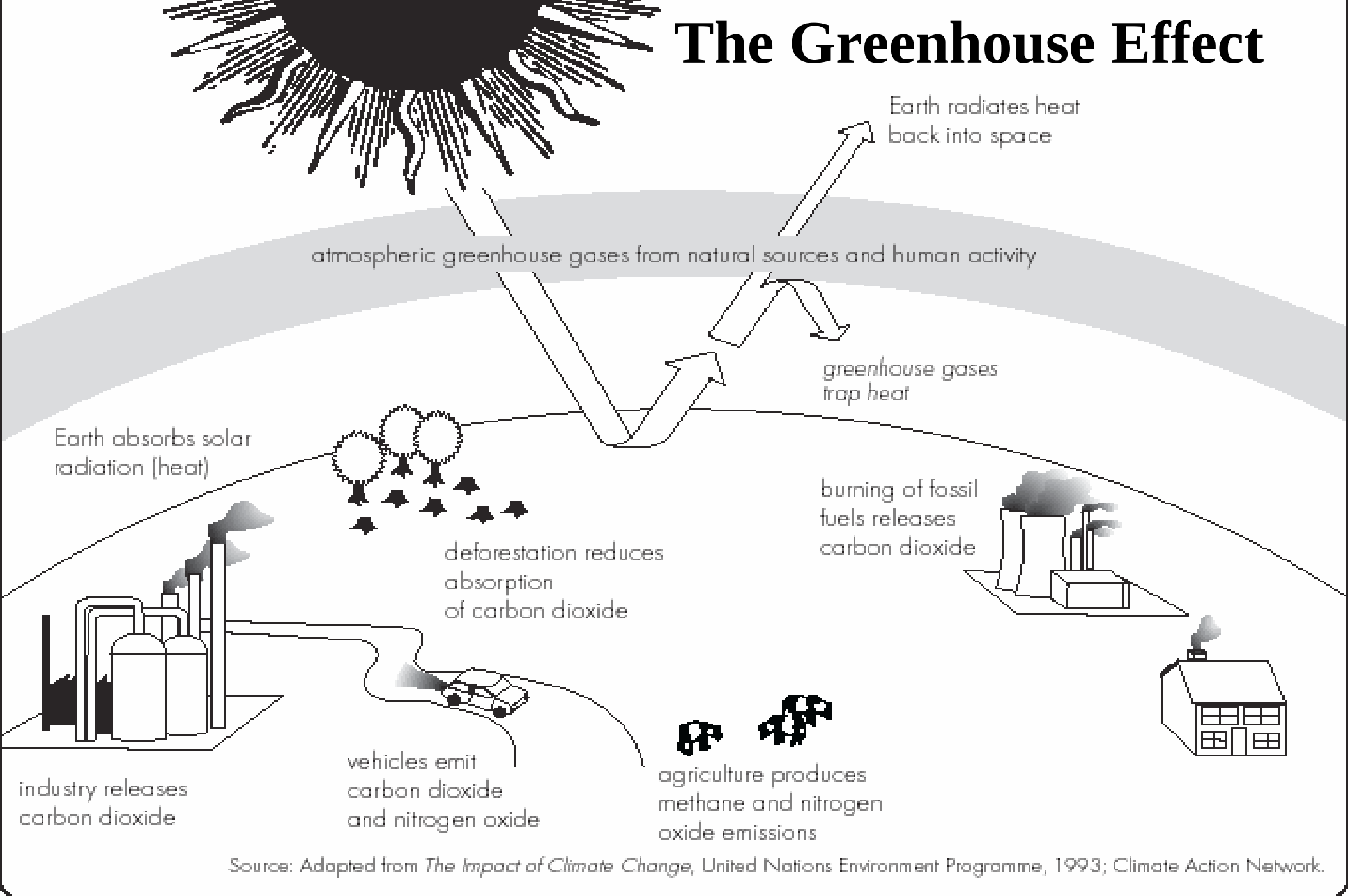
Terms and Definitions

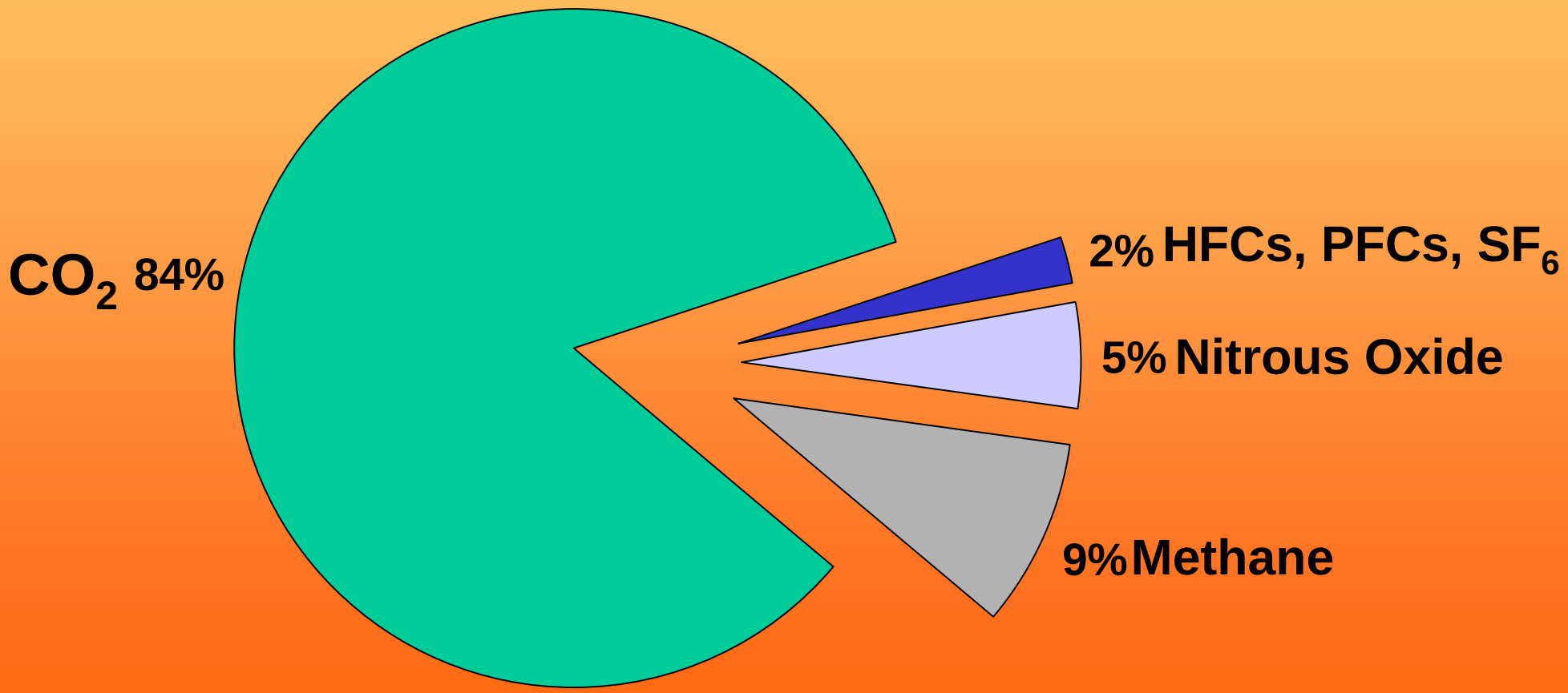
- **Weather**-what happens outside from day to day
- **Global warming** -emphasizes only rising temperature
- **Global climate change** -describes a series of changes in Earth's weather patterns driven by temperature resulting in changes in precipitation, winds, ocean currents, and storms
- **Global environmental change** -includes global climate change along with all the other major changes that are occurring in our global environment

The Greenhouse Effect



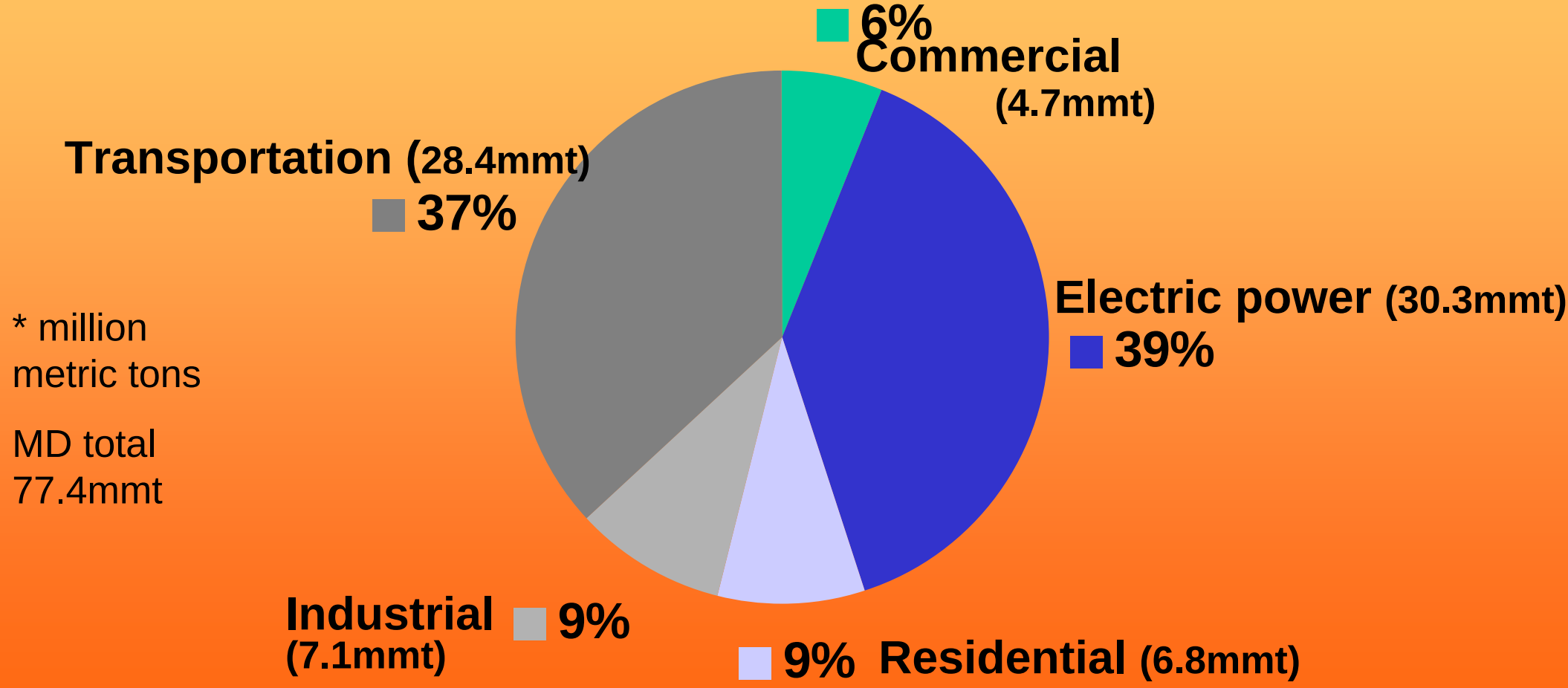
Source: Adapted from *The Impact of Climate Change*, United Nations Environment Programme, 1993; Climate Action Network.

2005 U.S. Greenhouse Gas Emissions



http://www.eia.doe.gov/oiaf/1605/ggrpt/executive_summary.html

2001 Maryland CO_2 Emissions by Energy Sectors (mmt*)



* million metric tons

MD total 77.4mmt

http://www.eia.doe.gov/oiaf/1605/ggrpt/pdf/appc_tbl2.pdf

Carbon Intensity of Fuels

Not all fossil fuels have the same amount of carbon per unit of energy:

- Coal has the highest
- Oil has 25% less than coal
- Natural gas has 45% less than coal

Intergovernmental Panel on Climate Change (IPCC) Projections 2007

- Higher temperatures: 2 to 11.5 °F rise by 2100
- Rising sea-levels: 7 to 23-inch increase by 2100 (excluding future rapid dynamical changes in ice flow)
- Increase in weather extremes

Small Increases in Average Temperature Can Make a Big Impact: only 9° F difference since last ice age

Climate Change and Public Health

- More heat-related illness
- Greater risk of infectious diseases
- Worsening air quality
- Rising sea levels
- More accidents and injuries from increased flooding, storm surge, and extreme weather events
- Threatened food supplies, toxins
- Environmental refugees, global security concerns
- Stressed ecosystems, potential for collapse, and loss of ecosystem services
- Threatened quantity and quality of water supplies

Heat Stress: Some Populations Are Particularly Vulnerable

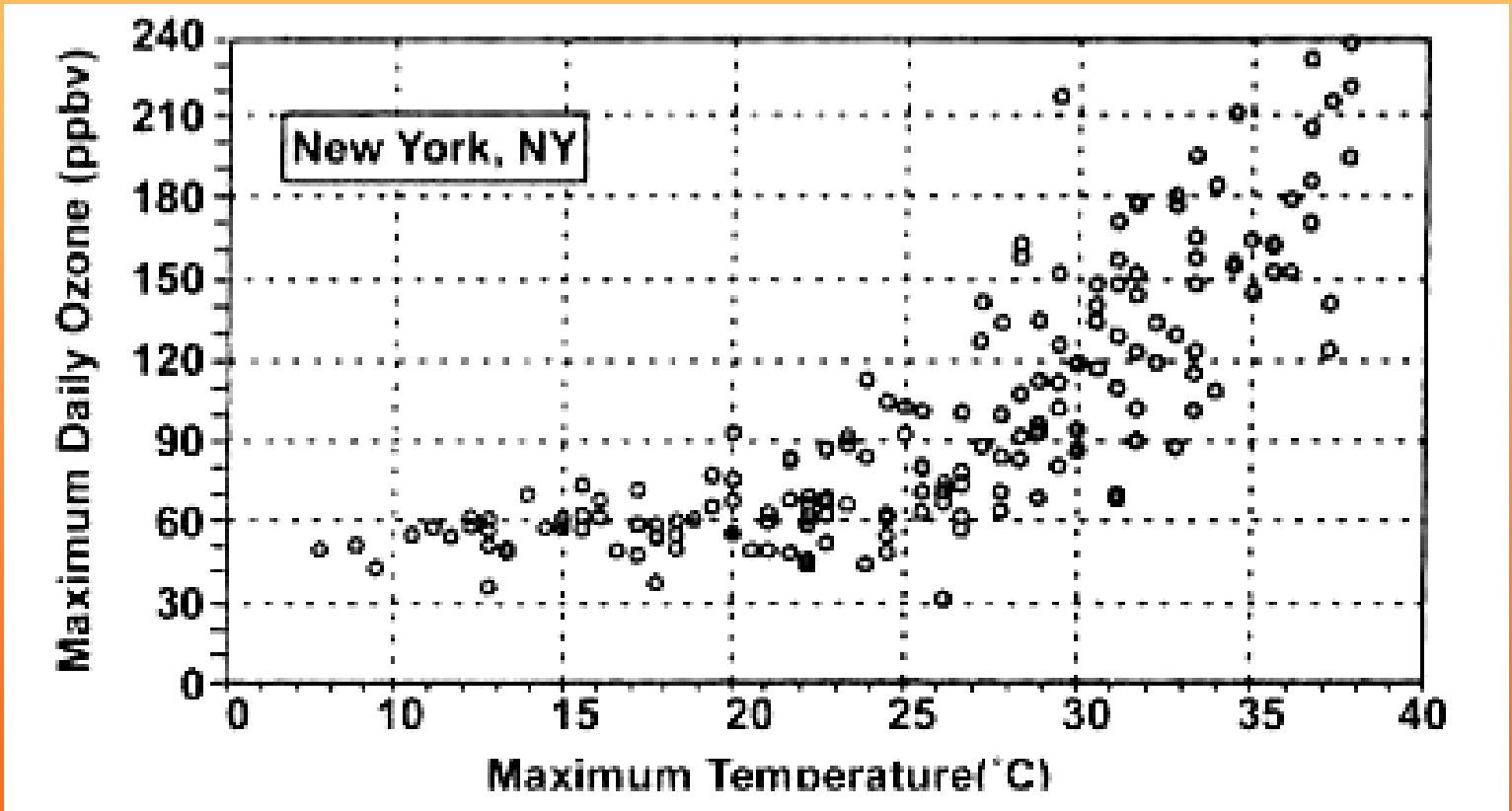
August 2003: 45,000+ died of heat stress in Western Europe

Infectious Disease: Dengue Risk

- In 1990, **almost 30% of the world population, 1.5 billion people**, lived in regions where the estimated risk of dengue transmission was >50%
- In 2085, an **estimated 50-60% of the projected global population, 5-6 billion people**, would be at risk of dengue transmission, compared with 35% (3.5 billion) if climate change didn't happen.

Hales, de Wet, Maindonald, Woodward, *The Lancet*, 2002, 360:830

Climate Change and Air Quality



U.S. National Assessment of Climate Change

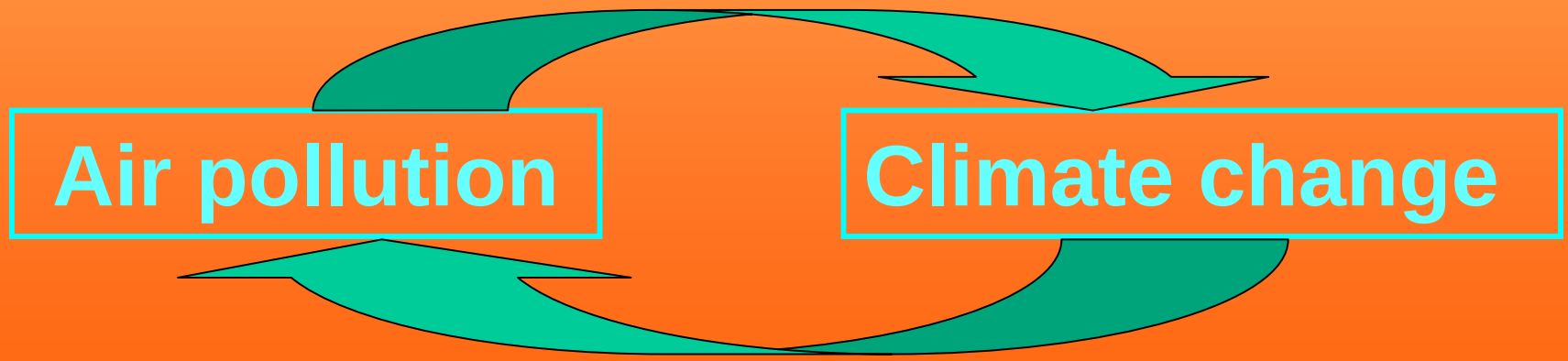
Health Effects of Ground-Level Ozone

- Increased risk of hospital admissions and ER visits for people with asthma

  (Friedman et al, JAMA, 2001, 285:897-905)

- 3X greater risk of DEVELOPING asthma

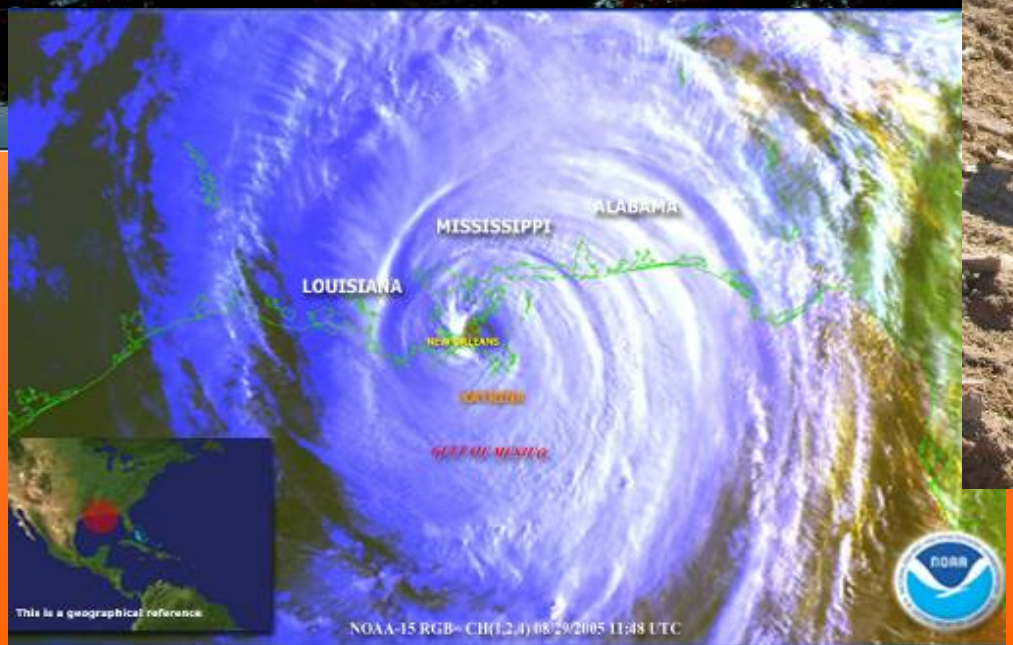
  (McConnell et al, Lancet, 2002, 359: 386-391)



Rising Seas, Vanishing Shores

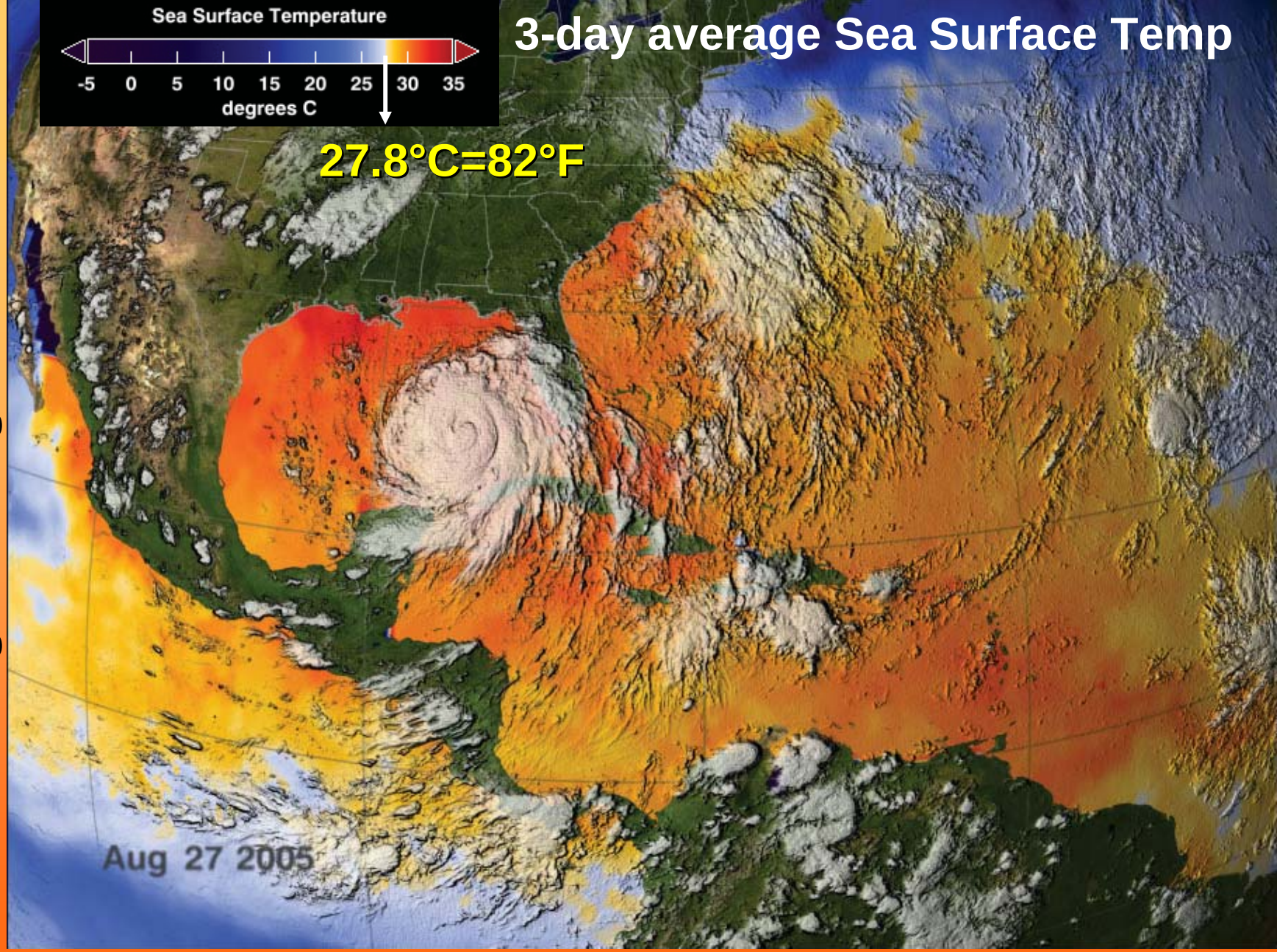
North Beach,
Maryland

More Extreme Weather Events



27.8° C needed for hurricanes to strengthen

Min 26° C needed for hurricanes to form.



NEJM, October 6, 2005, 353;14

Health Effects of Floods

- Cause injuries and deaths
- Long term psychological and physical effects
- Increased risk of infectious disease
- mold
- Contaminate water supplies: surface & wells

Photo courtesy of FEMA

Food Supply: Effects of Climate Change on Crop Production

Direct Effects:

- temperature
- precipitation
- CO_2 levels

Indirect Effects:

- plant pests
- plant diseases

Climate Change and Security: An Equation for Disaster

+ Forced migration of millions of people
+ Scarce resources becoming scarcer
+ Already stressed infrastructures

= **Conflict**

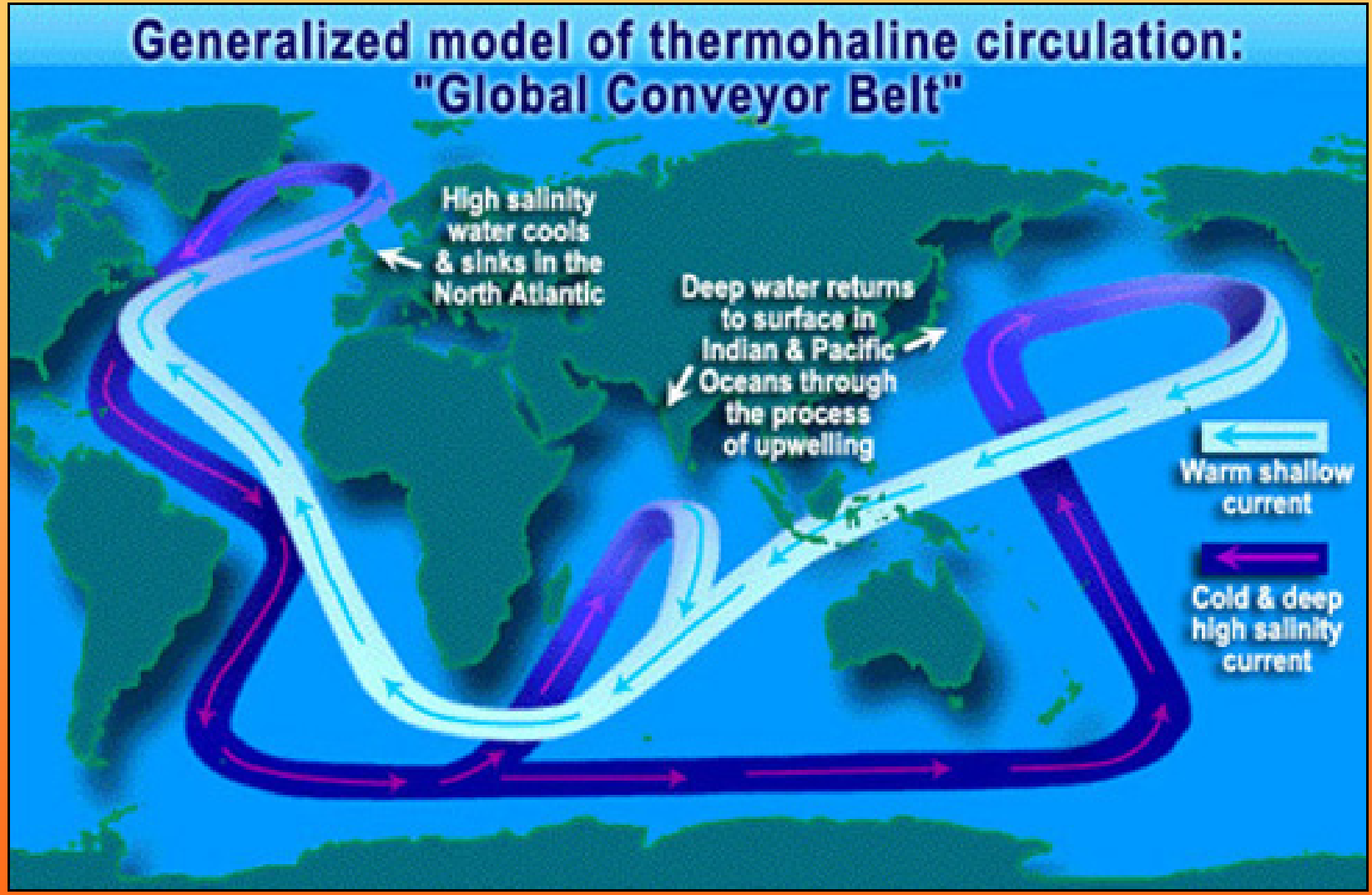
How Bad is the Water Problem?

- **1/3 of the world's population, about 2 billion people, currently lives in water-stressed countries** (UNEP, IPCC)
- **By 2025, that number is expected to increase to 5 billion** (UNEP, IPCC)
- **Nearly 1/3 of the world's land surface may be at risk of extreme drought by 2100.** (Burke et.al. Journal of Hydrometeorology, Sept. 2006)

Health Effects of Droughts

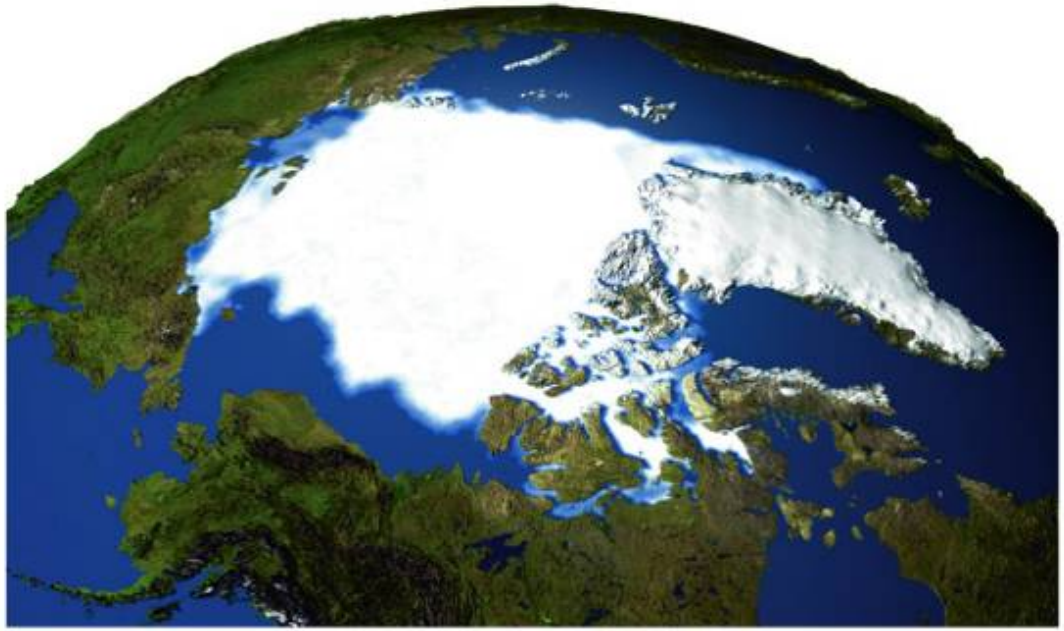
- Concentrate micro-organisms and contaminants in water supplies
- Crop failures
  - **~1 billion people hungry**
  - **5 million children die starvation**
- Water shortages for hygiene
- Increase risk of forest fires
- Increase risk of infectious disease

Abrupt Climate Change



NASA. More info available at science.hq.nasa.gov/oceans/system/climate.html

Melting Arctic Sea Ice



©NASA

Observed September 1979

Observed September 2003

Arctic Climate Impact Assessment
11/2004

Projected Arctic Sea Ice Extent

2010-2030

2040-2060

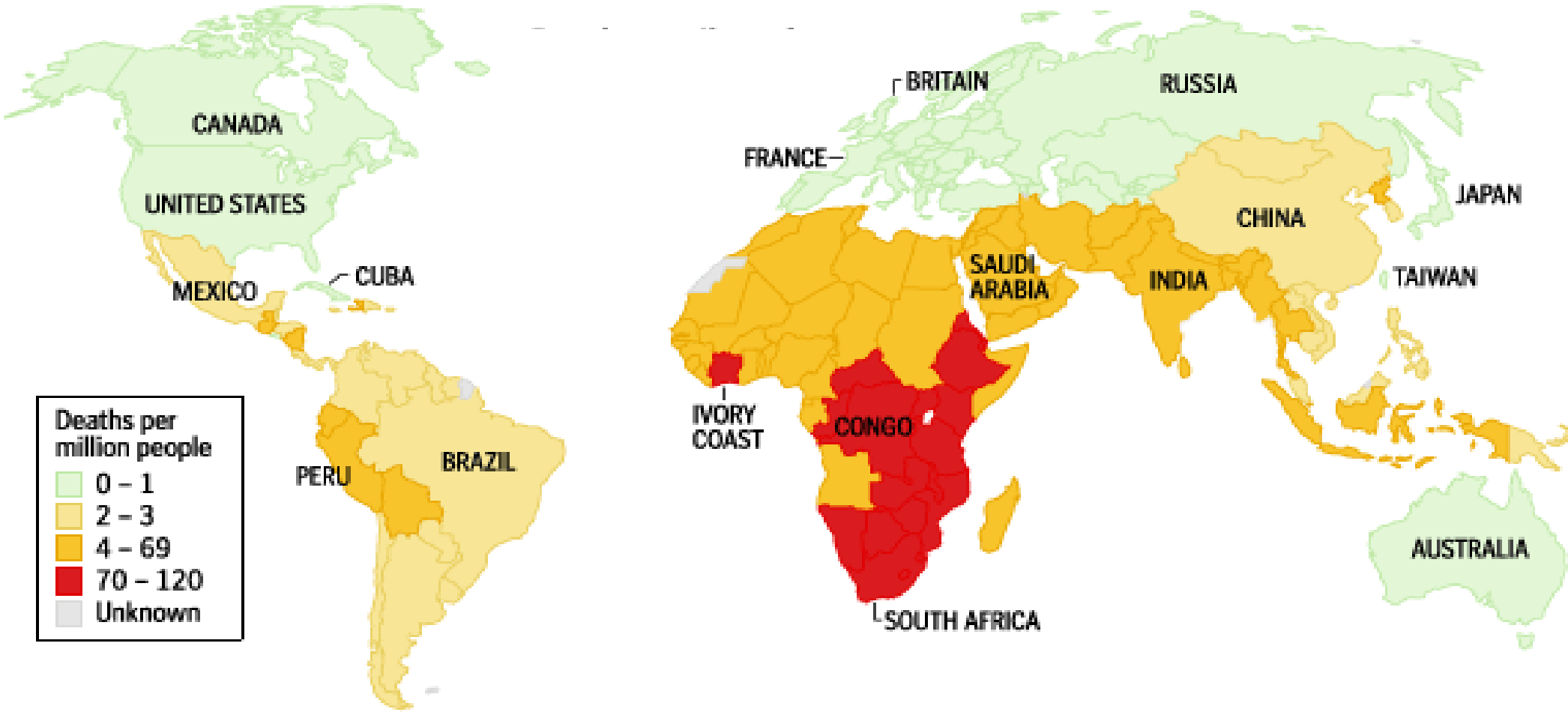
2070-2090

Intergovernmental Panel on Climate Change 2001

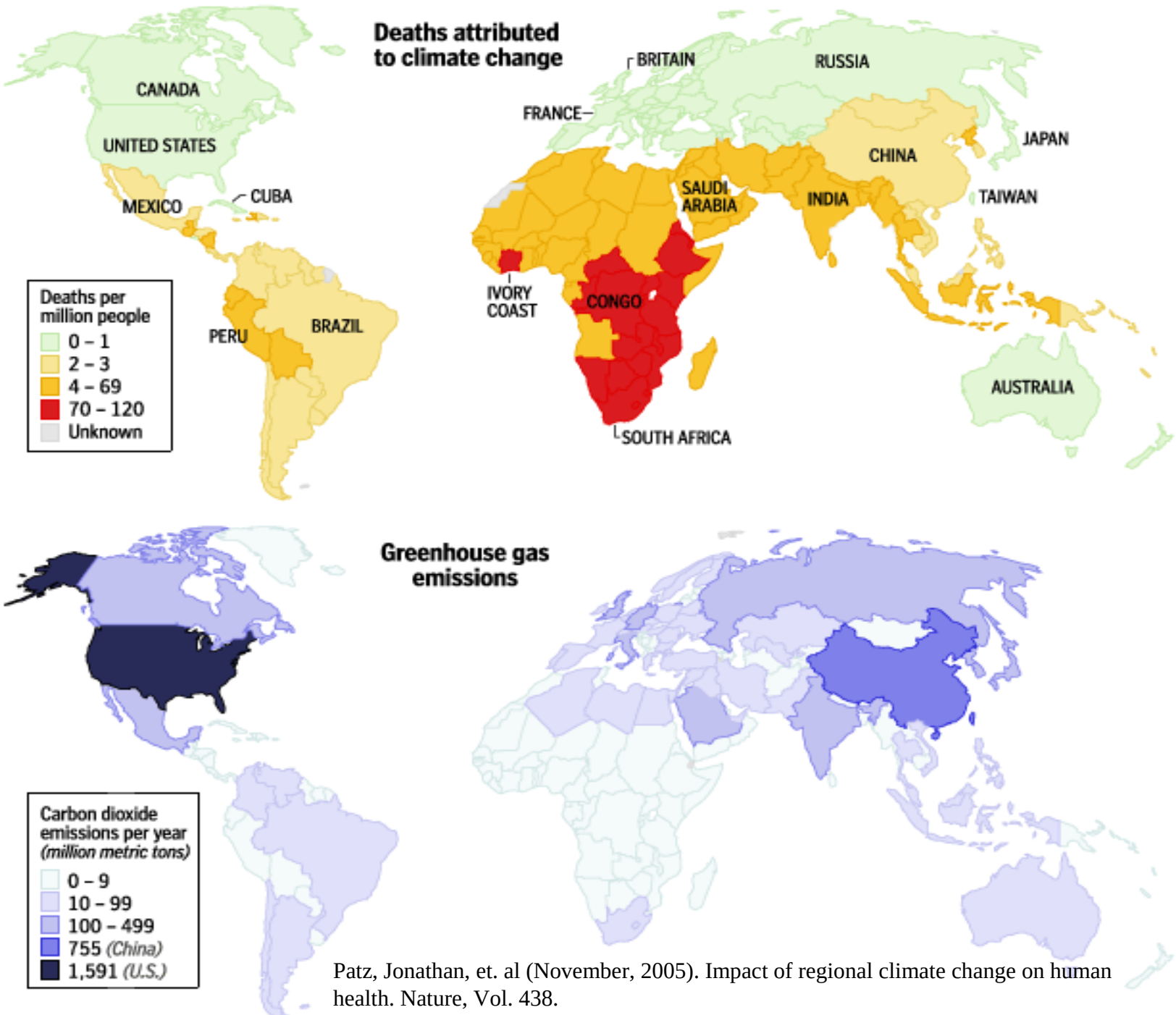
Abrupt Climate Change: Potential Mechanisms

- Thermohaline circulation
- Melting arctic
  - Less ice and snow to reflect sunlight
  - Potential for large releases of methane from thawing permafrost

Deaths Attributed to Climate Change NOW
150,000 per year



Patz, Jonathan, et. al (November, 2005). Impact of regional climate change on human health. Nature, Vol. 438.



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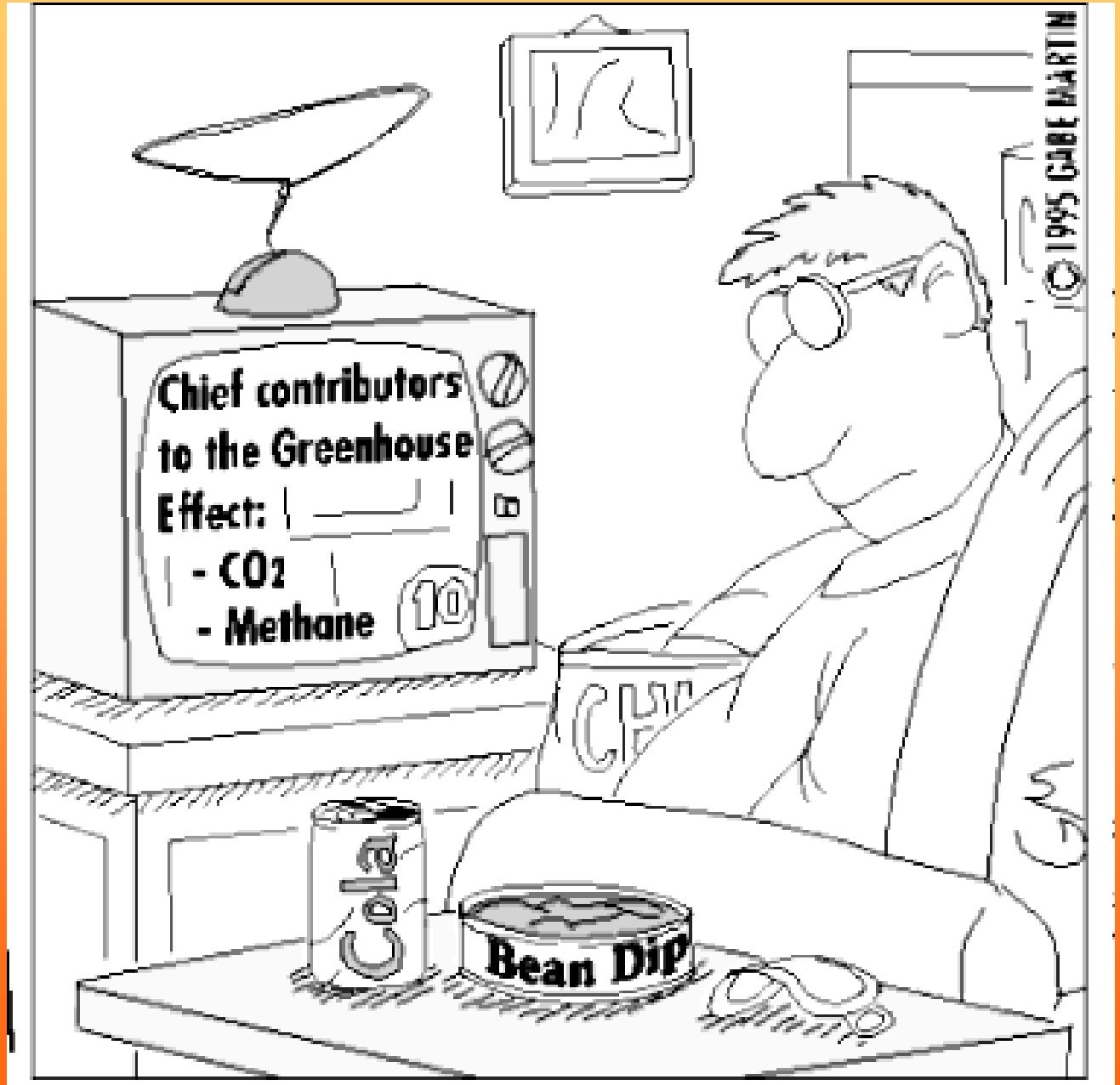
‘If we do not change direction, we are likely to end up exactly where we are headed”

- Chinese proverb

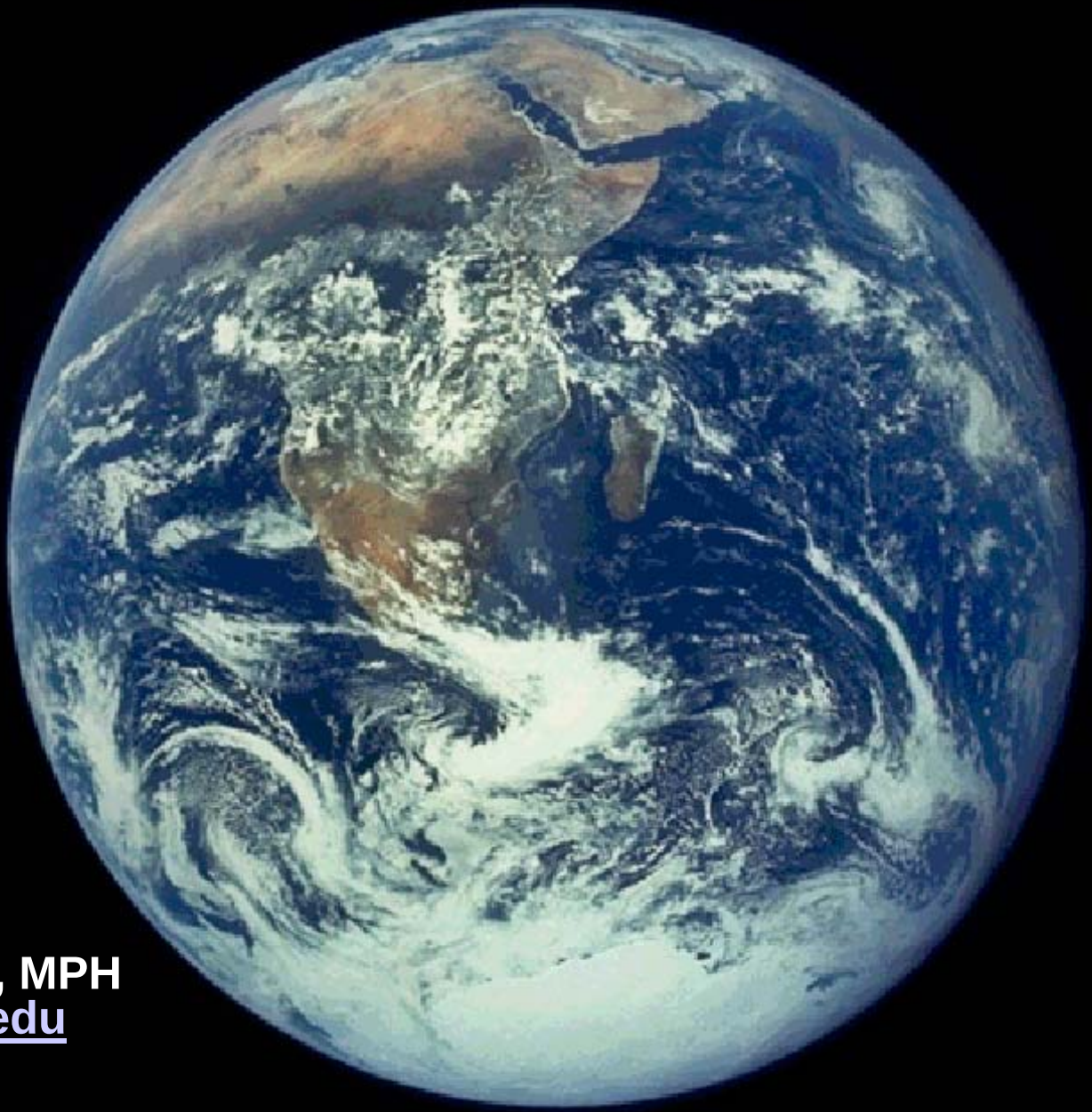


Suddenly, Bob realizes that he's "part of the problem".

What Do We Need to Do?

- Stabilize CO_2 at 450* ppm by 2050 to avoid ***dangerous*** climate change (<2°C)
- CO_2 emissions have been increasing at ~2%/year, therefore our CO_2 emissions must level out soon and decline well before 2050
- We have less than 10 years to make big changes in how humans behave

*currently at 380 ppm



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