What's New in Climate Science?
Richard Somerville, Scripps, UCSD

Thanks to many friends, including:

Debbie Zmarzly, Scripps/UCSD
Cherilynn Morrow, Georgia State U.
Wendelin Montciel, UC Santa Cruz
Susan Hassol, Climate Communication
Catherine Gautier, UC Santa Barbara
Tom Bowman, Bowman Design Group

and my students, who are my teachers

How does the Intergovernmental Panel on Climate Change work?

Were the conclusions of the IPCC Fourth Assessment Report (AR4), published in 2007, mainly correct?

How has climate science changed since the papers assessed in AR4?

The Working Group I (physical science) part was written by 152 "Lead Authors." 22 are "Coordinating Lead Authors," who led the writing teams for each chapter.

25% earned a Ph. D. in the last 10 years.

75% were not previous IPCC authors.

35% are from developing countries and countries with economies in transition.

The WGI IPCC report (AR4) took three years to write. More than 30,000 review comments were received on the drafts.

The authors' responses to every comment are in the public record.

The open and transparent IPCC process, multiple stages of peer review, and credentials of the authors, all contribute to the stature of the report.

“The balance of evidence suggests a discernible human influence on global climate.” - IPCC (1995).

“There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities.” - IPCC (2001).

IPCC = Intergovernmental Panel on Climate Change

“Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level.”

- IPCC, 2007.

“Most of the observed increase in globally averaged temperatures since the mid-20th century is *very likely* due to the observed increase in anthropogenic greenhouse gas concentrations.”

- IPCC, 2007.

(‘*very likely*’ means at least 90% probable)

IPCC reports are at: www.ipcc.ch

Recent Climate Observations Compared to Projections

Stefan Rahmstorf, Anny Cazenave, John A. Church, James E. Hansen, Ralph F. Keeling, David E. Parker, Richard C. J. Somerville

Science, 2007

"Overall, these observational data underscore the concerns about global climate change. Previous projections, as summarized by IPCC, have not exaggerated but may in some respects even have underestimated the change, in particular for sea level."

Since the release of the IPCC report in 2007, new knowledge has emerged that furthers our understanding of climate change and the human influence on climate.

To bring this new knowledge together, 26 climate scientists from 8 countries wrote a short report, The Copenhagen Diagnosis, released in November 2009, available at:

www.copenhagendiagnosis.com

The Copenhagen Diagnosis

Updating the World on the Latest Climate Science

www.copenhagendiagnosis.com

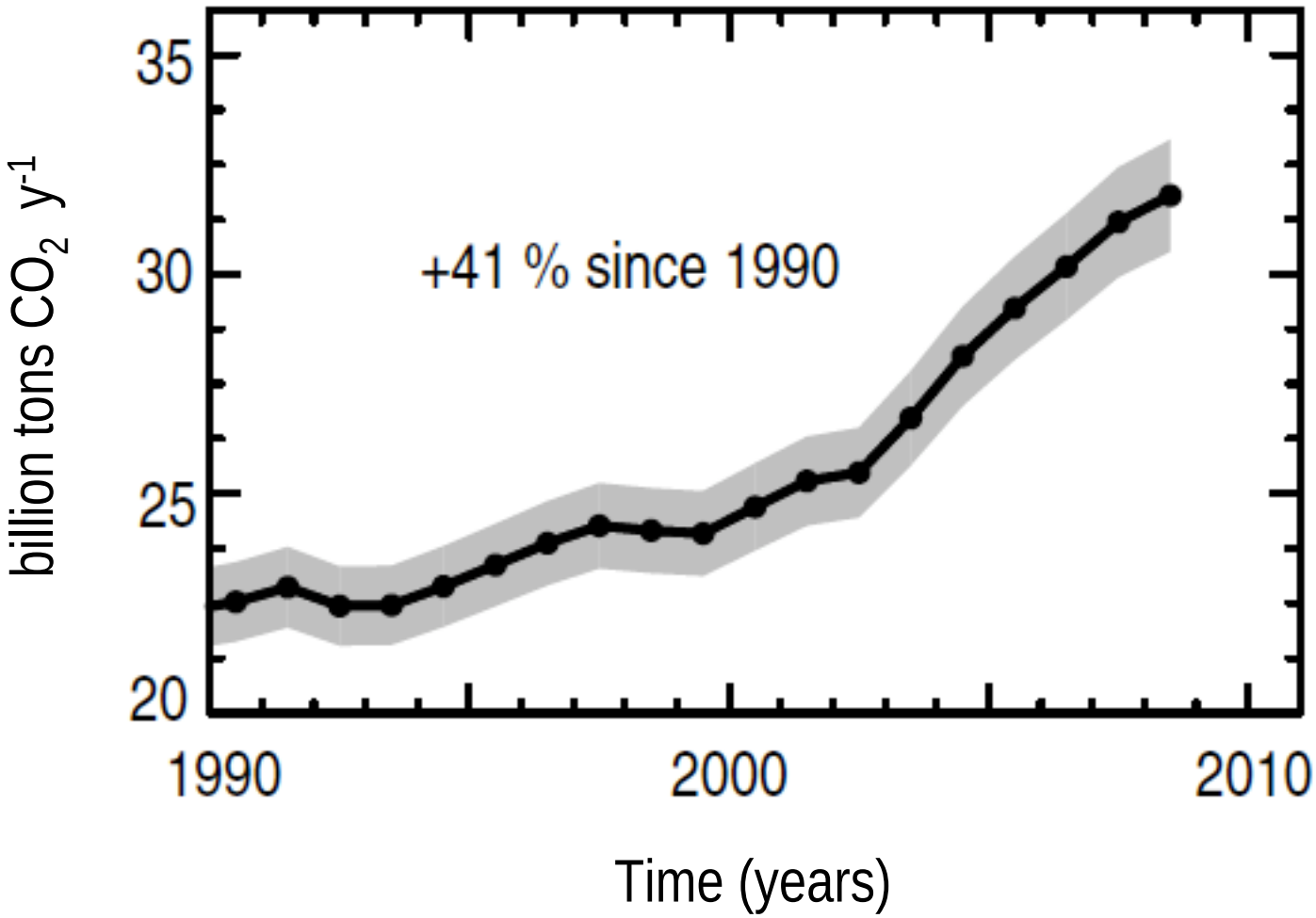
The Copenhagen Diagnosis

Updating the World on the Latest Climate Science

What's new in science since the 2007 IPCC report?

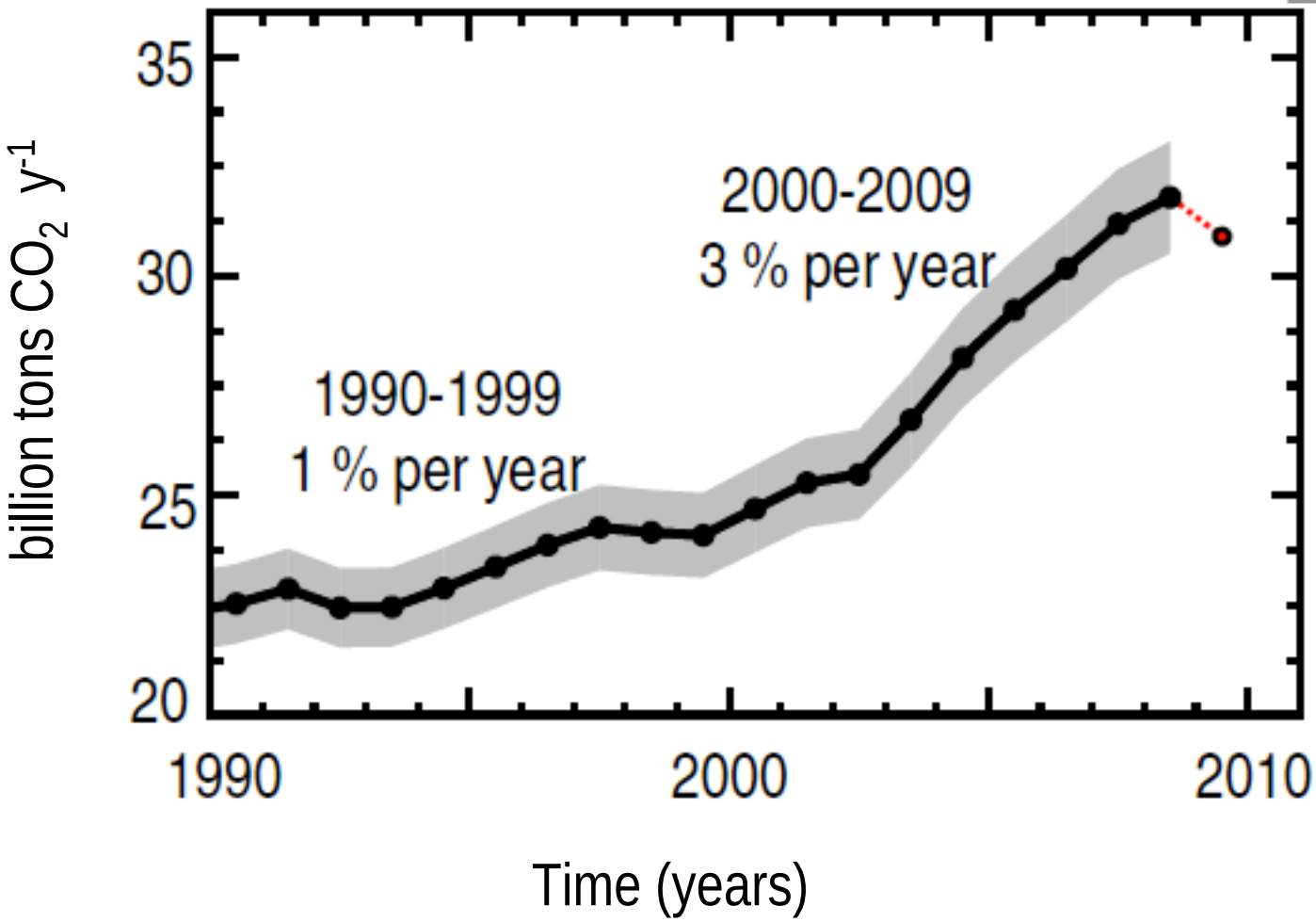
- Surging greenhouse gas emissions.
- Rising global temperatures due to human activities.
- Accelerated melting of ice sheets, glaciers, ice caps.
- Rapid Arctic sea ice decline. Sea level rapidly rising.
- Sea level rise forecast exceeding earlier estimates.
- Changing ocean temperatures, heat content, salinity, acidity, oxygen.
- Delay in action risks irreversible damage.
- The turning point must come soon.

Fossil Fuel CO_2 Emissions



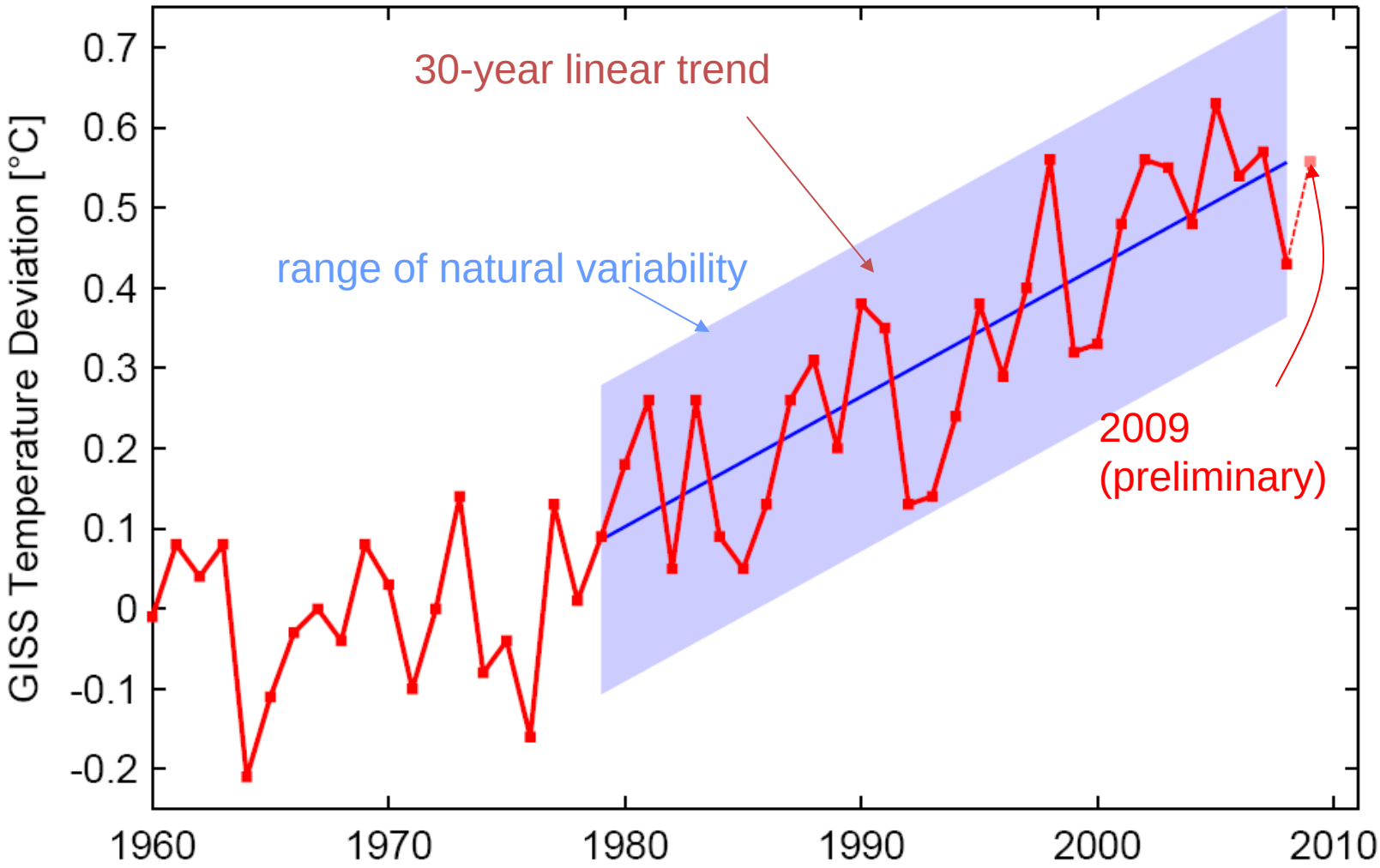
data: CDIAC; Global Carbon Project

Fossil Fuel CO_2 Emissions

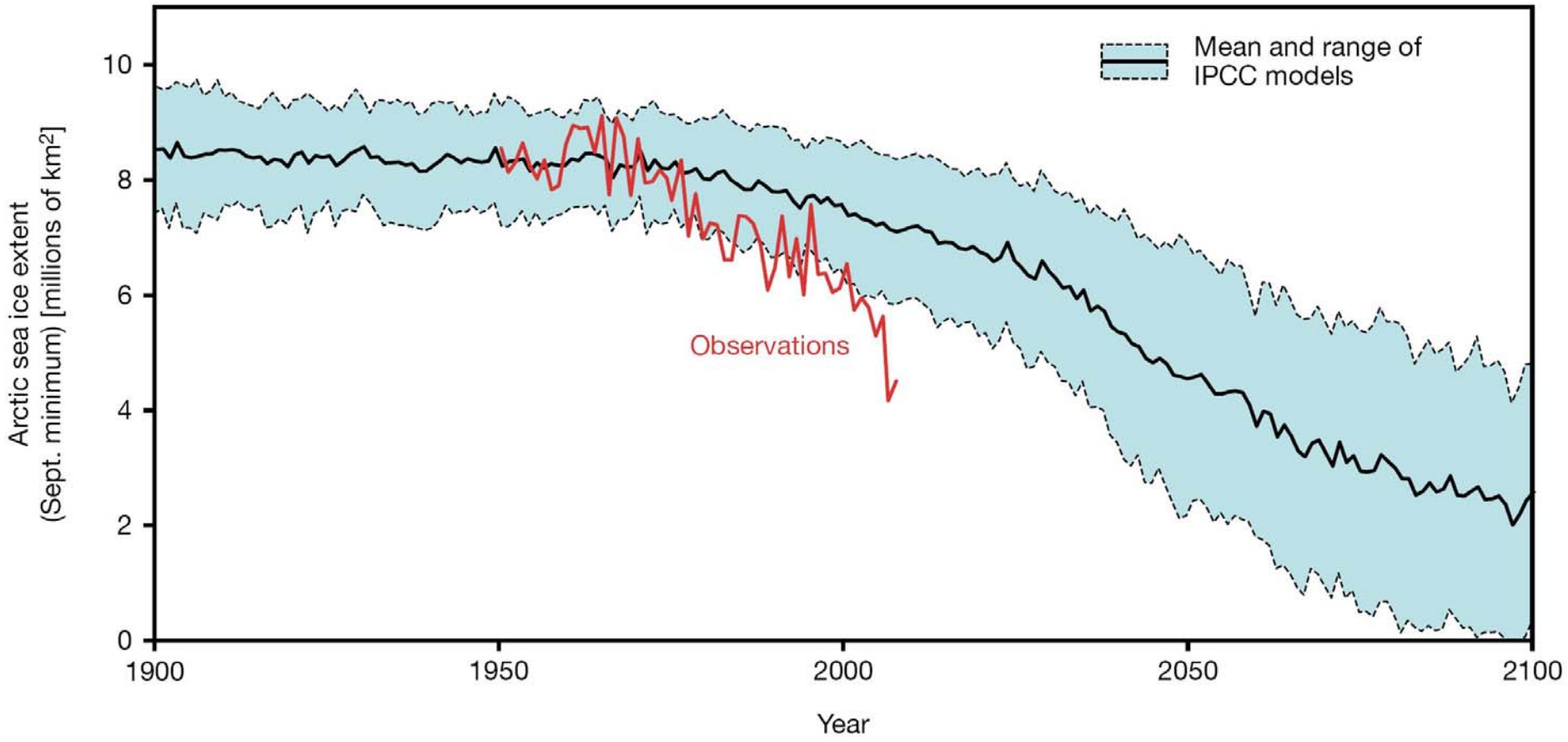


data: CDIAC; Global Carbon Project

Global Temperature Change Since 1980



Observed and Modeled Arctic Sea-ice Extent



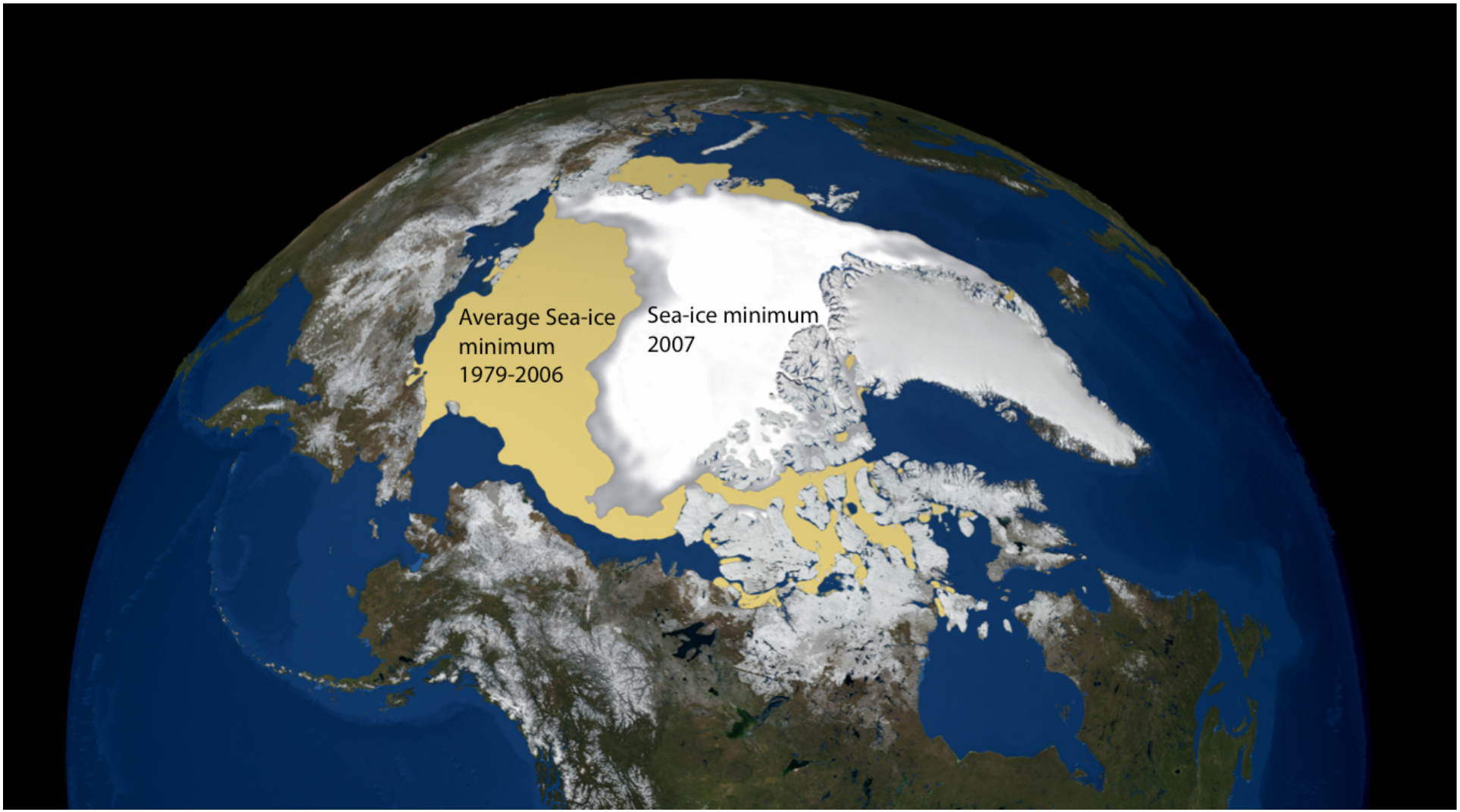
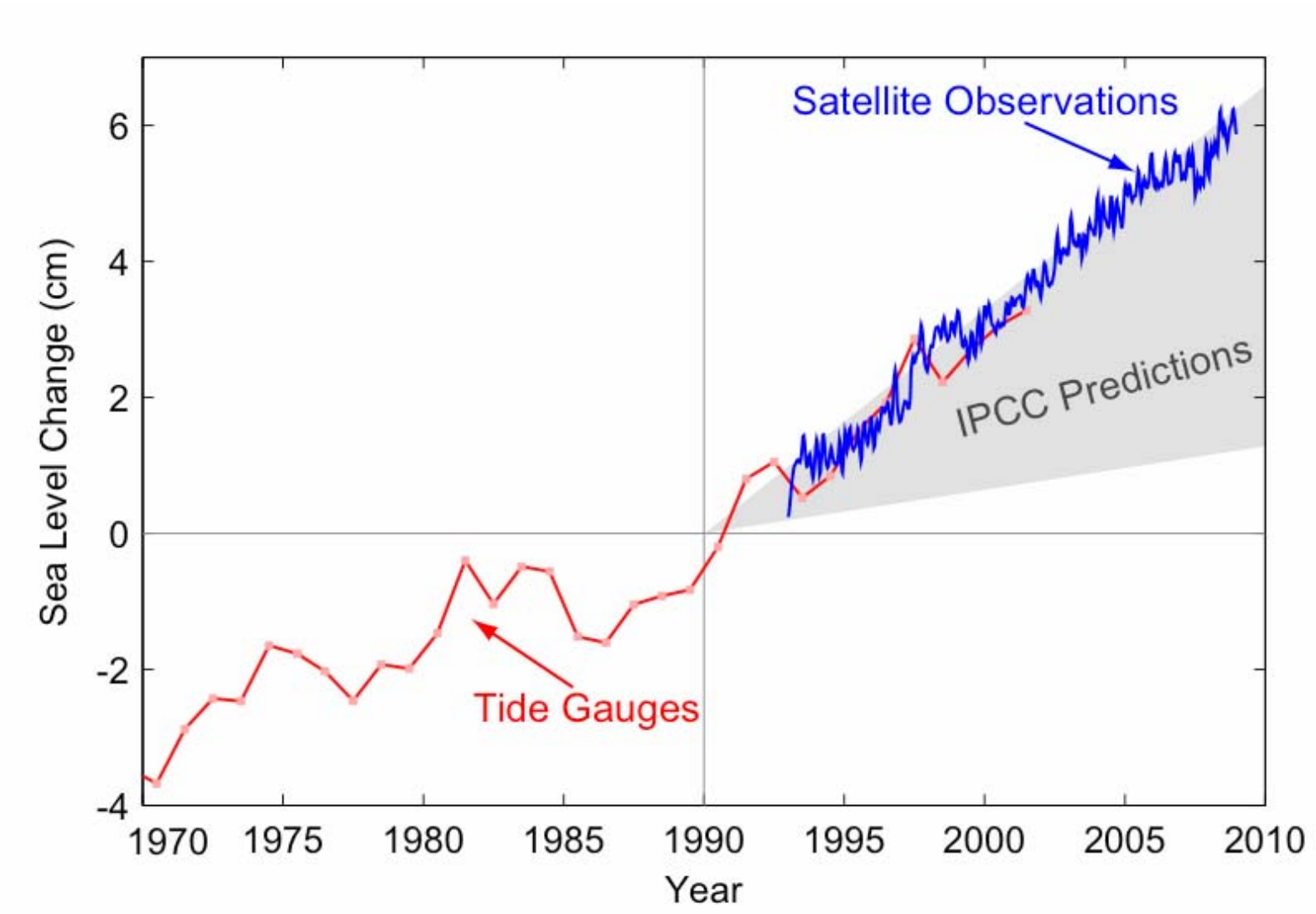


Figure 12: Minimum arctic sea-ice extent from 1979 to 2007

Sea-level change 1970-2010



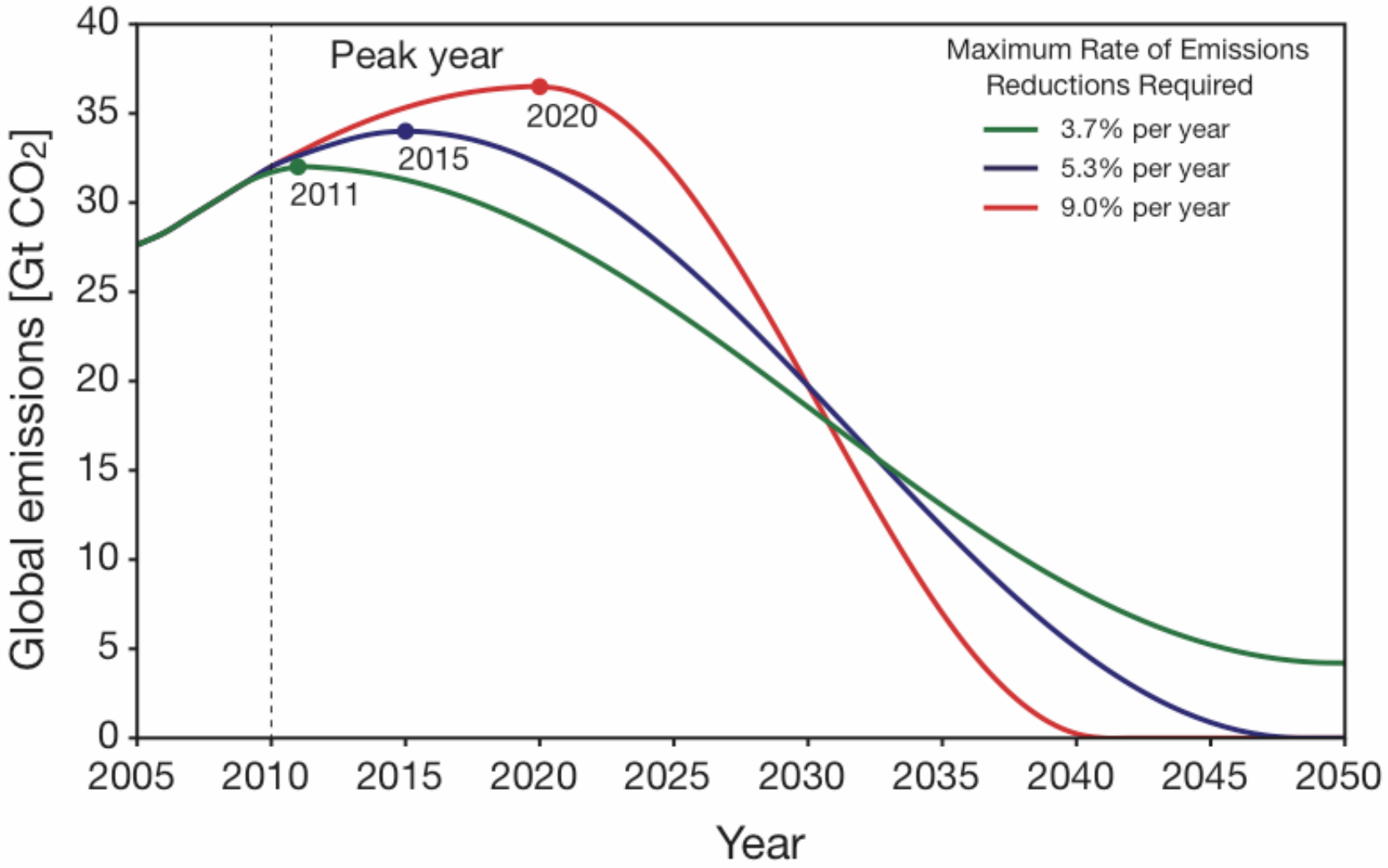
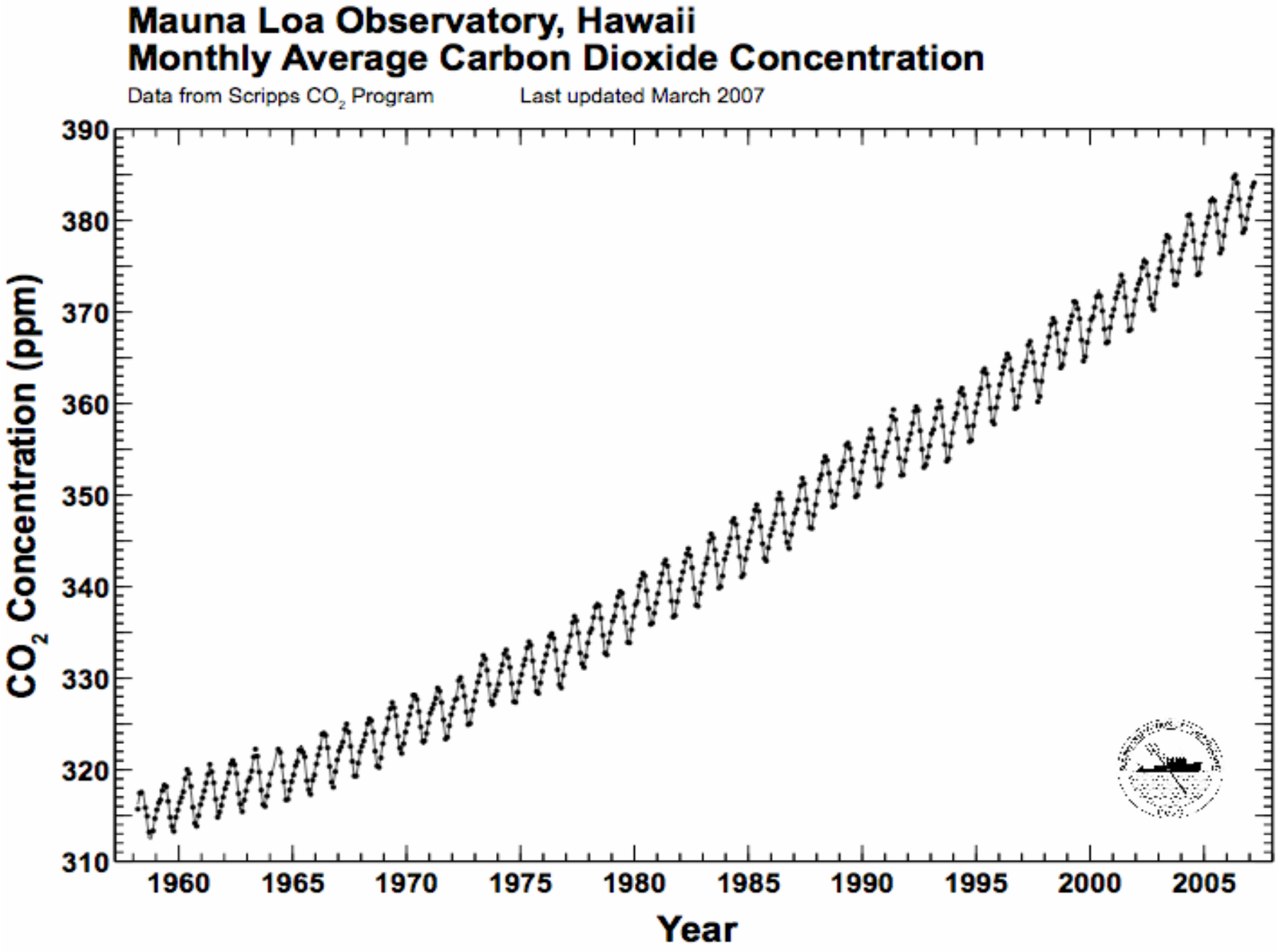
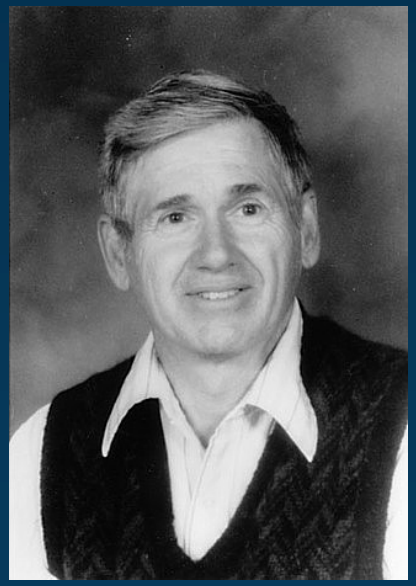
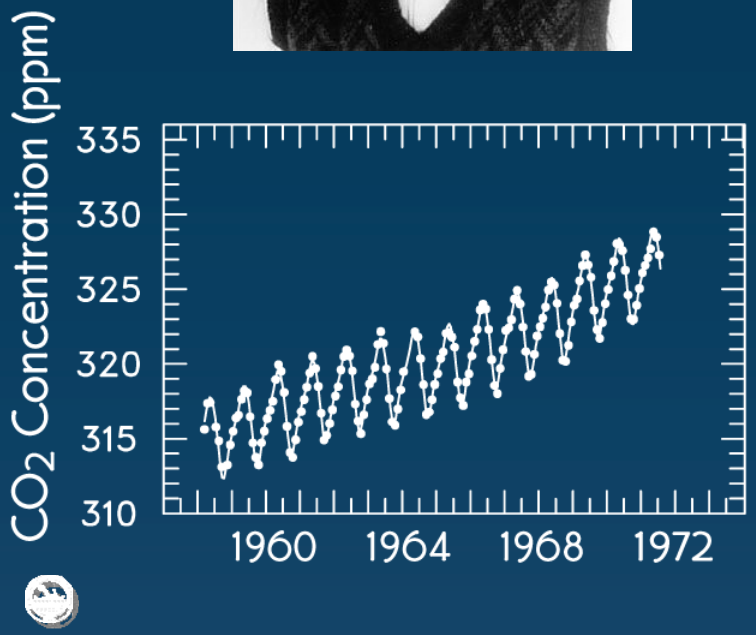


Figure 22: Emissions pathways to give 75% chance of limiting global warming to 2ºC


Mauna Loa Observatory, Hawaii
Monthly Average Carbon Dioxide Concentration
Data from Scripps CO2 Program
Last updated March 2007
CO2 Concentration (ppm)
390
380
370
360
350
340
330
320
310
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
Year

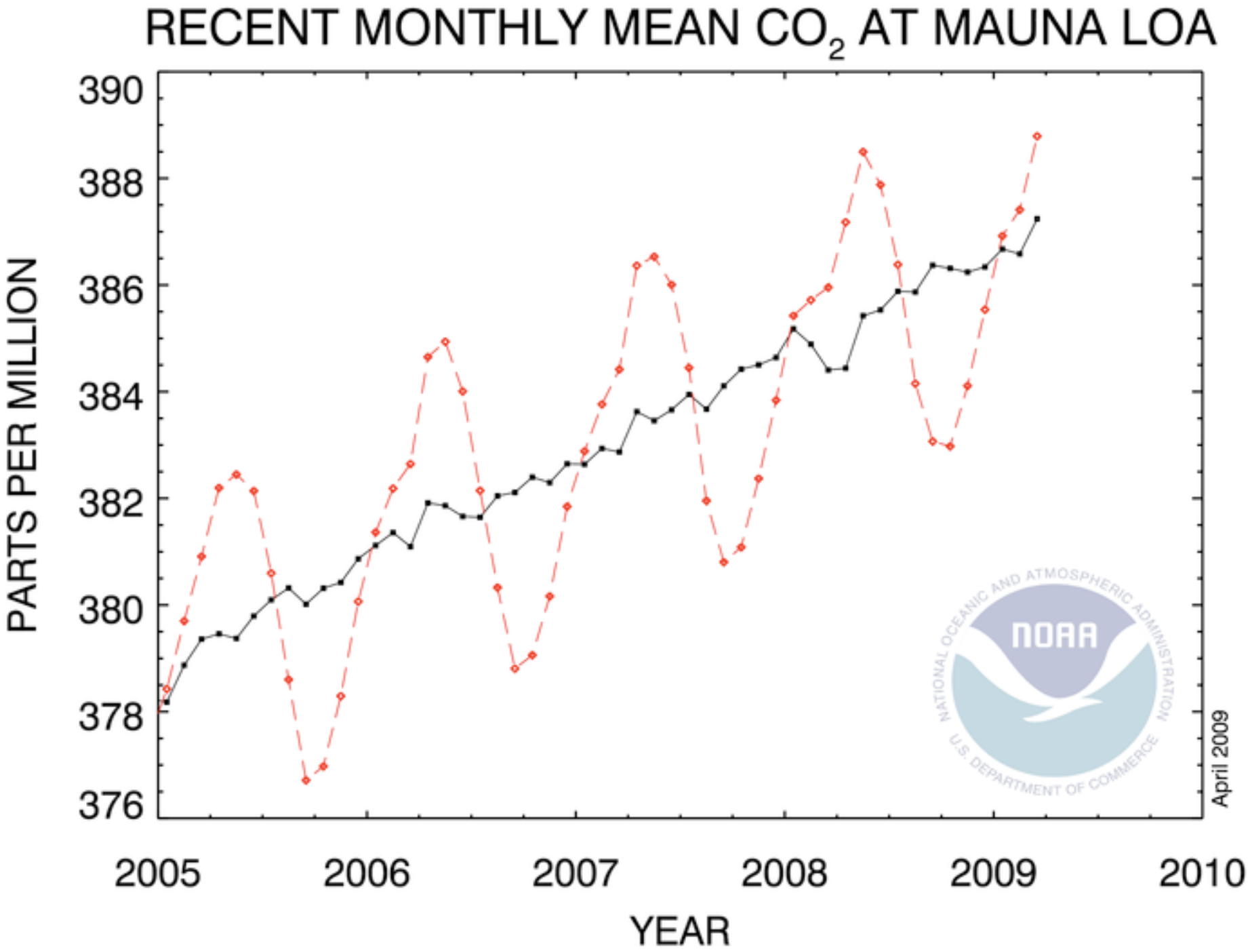




Charles D. Keeling (1928-2005)

Image credit: Publication of the National Oceanic & Atmospheric Adminstration (NOAA), NOAA Central Library;
Photo Date: 1982 February; Photographer: Commander John Bortniak, NOAA Corps (ret.)


CO2 CONCENTRATION (PPM)
375
370
365
360
355
350
345
340
335
330
325
320
315
310
1958 60 62 64 66 68 70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 00 02
BOOKSTORE


RECENT MONTHLY MEAN CO_2 AT MAUNA LOA
PARTS PER MILLION
390
388
386
384
382
380
378
376
2005
2006
2007
2008
2009
2010
YEAR
NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE
April 2009

The Forgiving Air

UNDERSTANDING ENVIRONMENTAL CHANGE

RICHARD C. J. SOMERVILLE

second edition, revised and updated

Should scientists be policy advocates?

I think some should, some of the time.

"What's the use of having developed a science well enough to make predictions, if in the end, all we're willing to do is stand around and wait for them to come true!"

- F. Sherwood Rowland, concerning ozone, 1984

(quoted by Paul Brodeur, *The New Yorker*, June 9, 1986, p. 81)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Communicating Climate Science

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