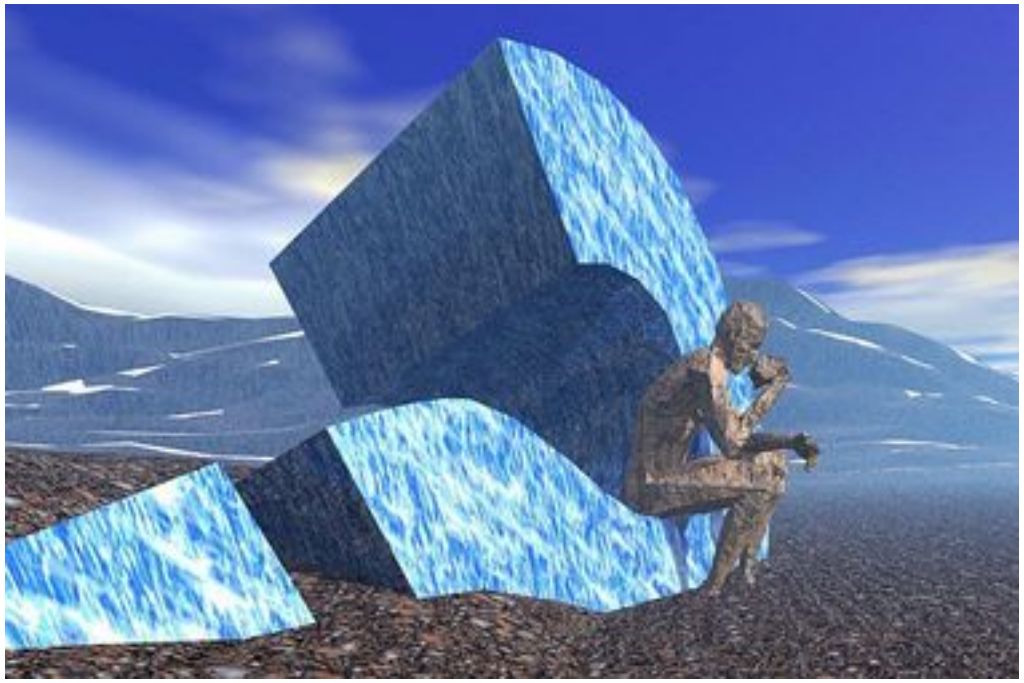
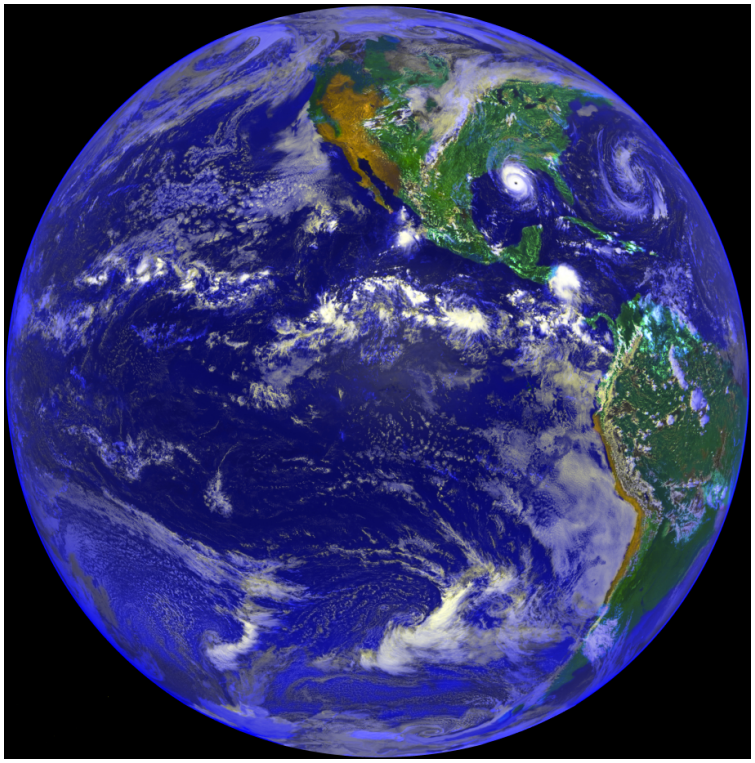
Climate Change & Energy Policy: The Controversy

Judith Curry

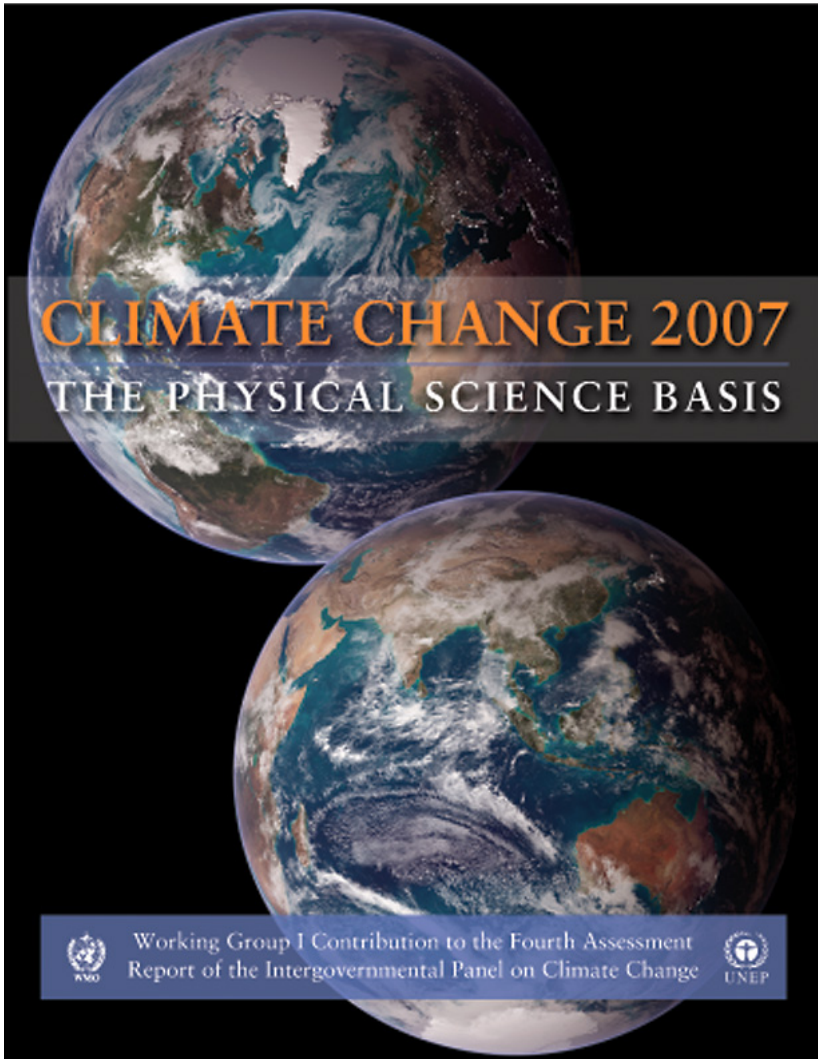
Georgia Institute of Technology



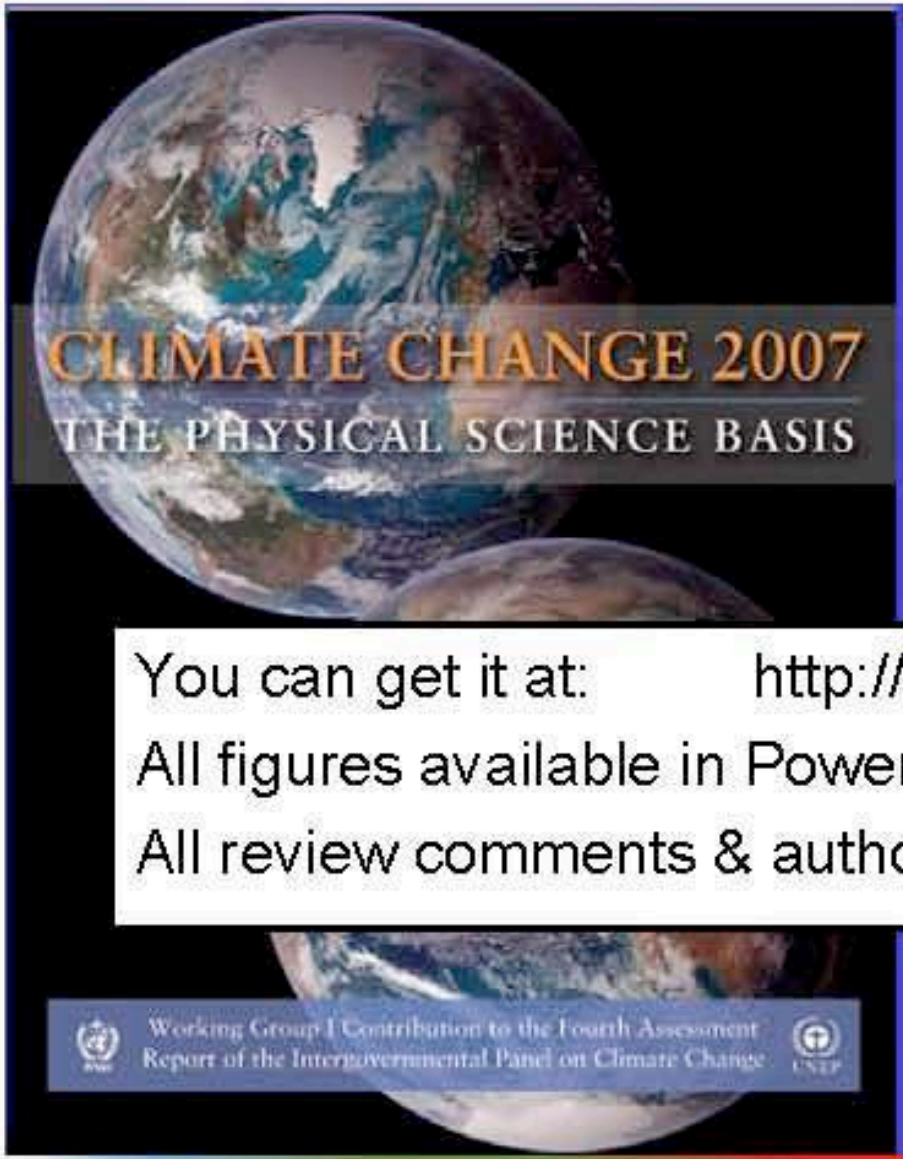


Al Gore:
an inconvenient truth

IPCC:
4th Assessment Report



The Working Group I Report



- Started 2003
- Completed February 2007
- 152 Authors
- ~450 other contributors
- ~600 expert reviewers
- 30,000+ review comments

Contents

You can get it at: http://ipcc-wg1.ucar.edu/

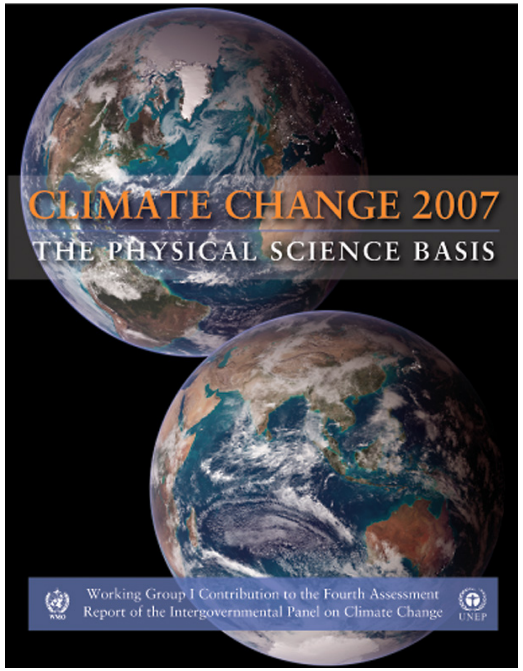
All figures available in PowerPoint format.

All review comments & author responses publicly available

- ~5000 literature references
- ~1000 pages

Key conclusion of the IPCC AR4:

"Most of the observed increase in global average temperatures since the mid-20th century is *very likely* [>90%] due to the observed increase in anthropogenic greenhouse gas concentrations."



97% of actively publishing climate experts agree with this statement (Anderegg et al. 2010)

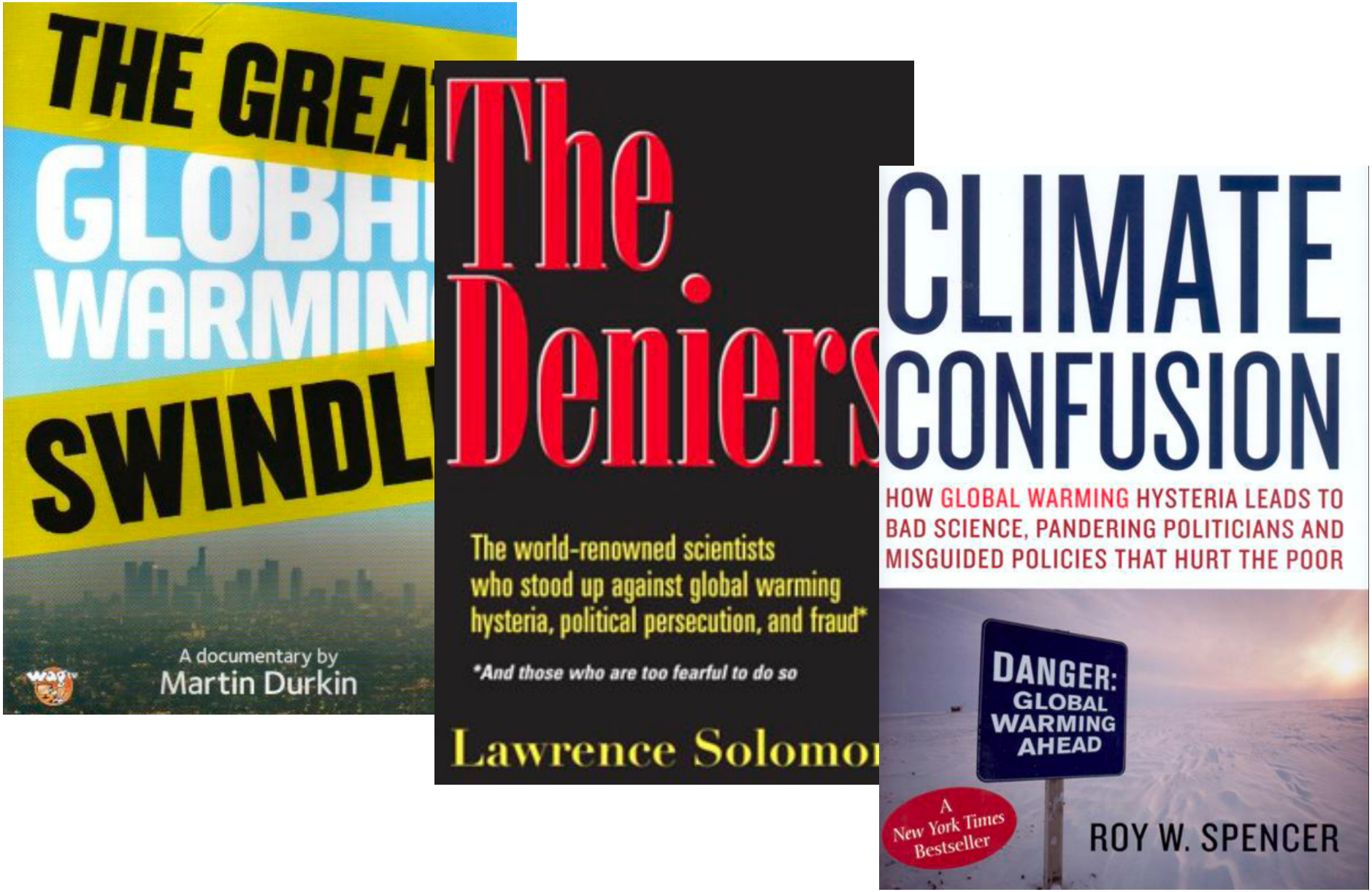
IPCC
INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

UNFCC Treaty (1992):

The UNFCCC established a goal of stabilization of atmospheric greenhouse gases to prevent dangerous climate change

IPCC AR4:

1. Anthropogenic climate change is real
2. Anthropogenic climate change is dangerous
3. Action is needed to prevent dangerous anthropogenic climate change


THE GREA
GLOBA
WARMIN
SWINDL
A documentary by
Martin Durkin
The
Deniers
The world-renowned scientists
who stood up against global warming
hysteria, political persecution, and fraud*
*And those who are too fearful to do so
Lawrence Solomon
CLIMATE
CONFUSION
HOW GLOBAL WARMING HYSTERIA LEADS TO
BAD SCIENCE, PANDERING POLITICIANS AND
MISGUIDED POLICIES THAT HURT THE POOR
DANGER:
GLOBAL
WARMING
AHEAD
A
New York Times
Bestseller
ROY W. SPENCER

IPCC/UNFCC Ideology

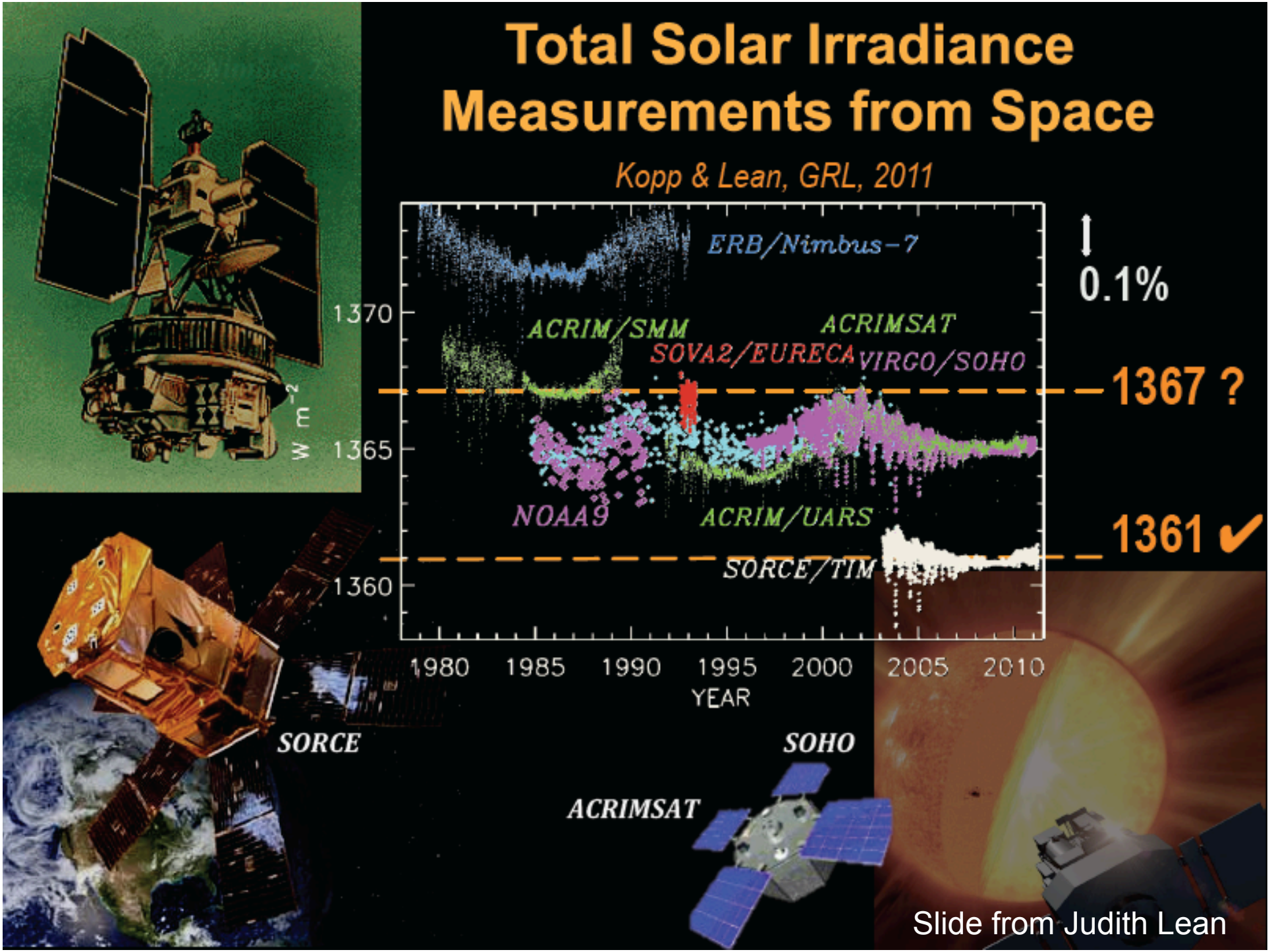
1. Anthropogenic climate change is real
2. Anthropogenic climate change is dangerous
3. Action is needed to prevent dangerous climate change
4. Deniers are attacking climate science and scientists
5. Deniers and fossil fuel industry are delaying UNFCCC CO2 stabilization policies.

What if the IPCC is wrong?

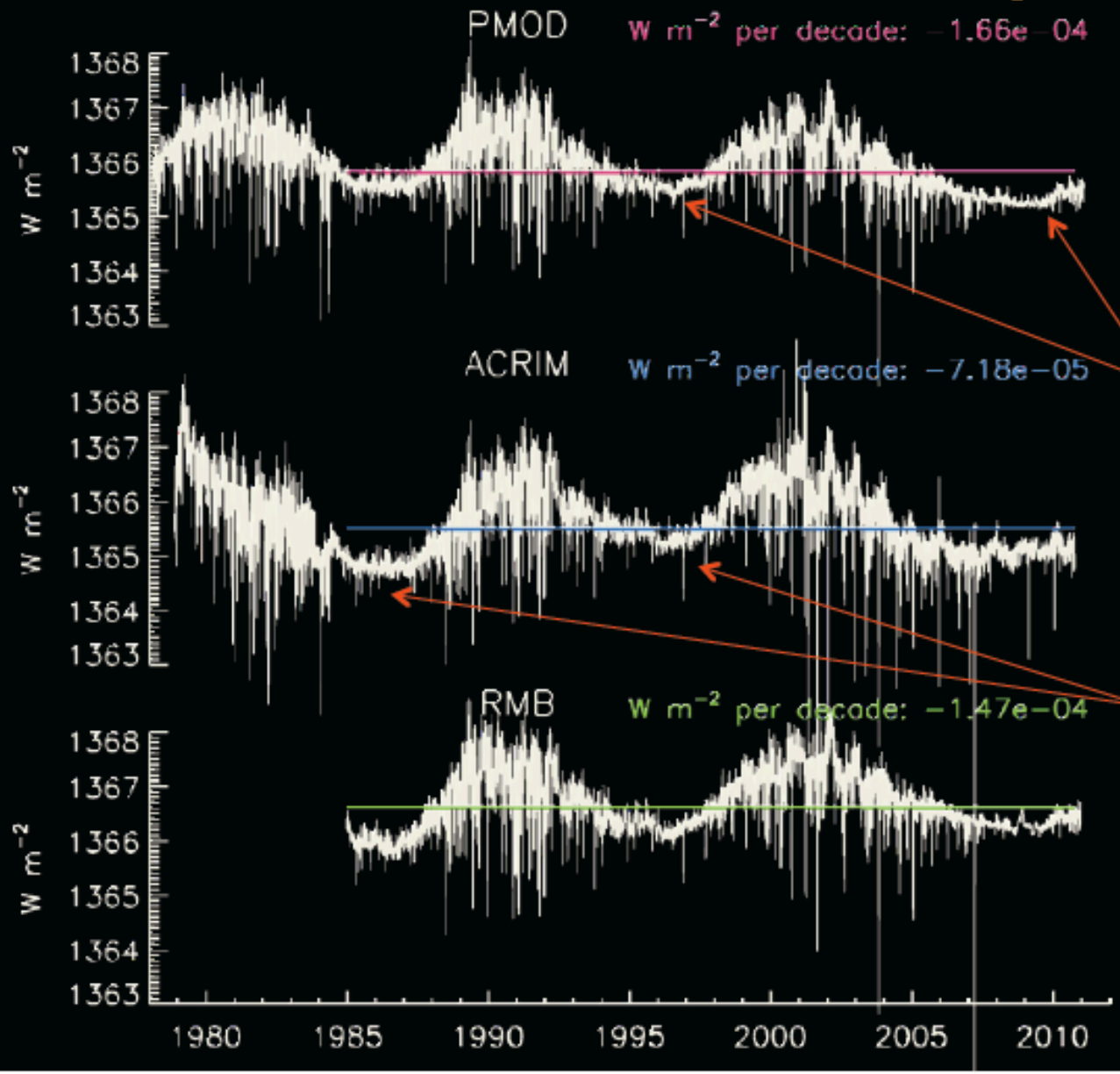
Energy balance accounting

1.7 W m^2: 20th century CO_2 radiative forcing

3.7 W m^2: radiative forcing from doubling CO_2


Total Solar Irradiance Measurements from Space
Kopp & Lean, GRL, 2011
ERB/Nimbus-7
ACRIM/SMM
SOVA2/EURECA
ACRIMSAT
VIRGO/SOHO
NOAA9
ACRIM/UARS
SORCE/TIM
0.1%
1367 ?
1361 ✔
1370
1365
1360
W m⁻²
1980
1985
1990
1995
2000
2005
2010
YEAR
SORCE
SOHO
ACRIMSAT
Slide from Judith Lean

Three Different Total Solar Irradiance Measurement Composites



Differences in
- absolute scale
- temporal structure
- solar minimum levels
- long-term trends

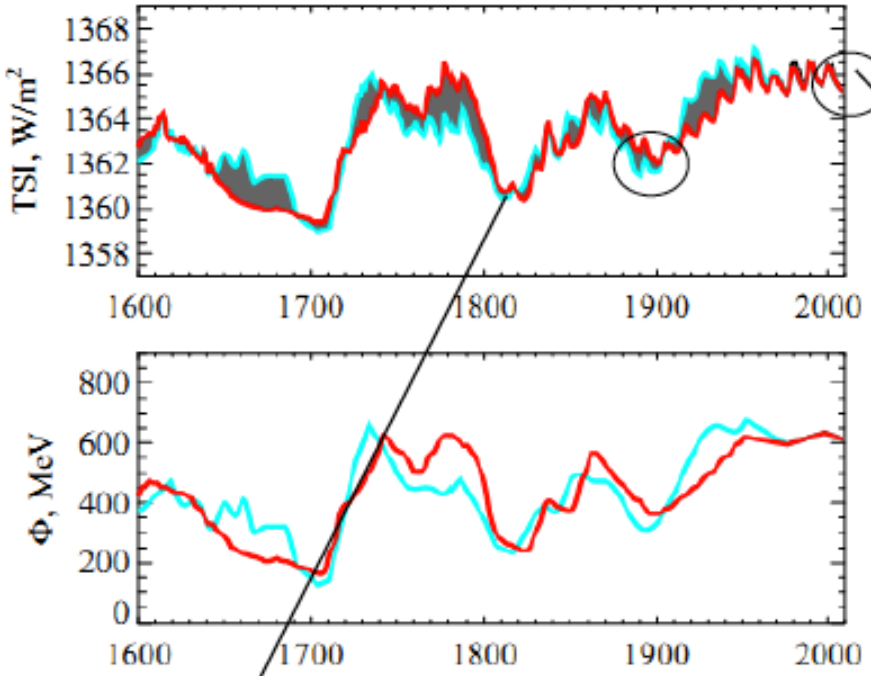
Irradiance decrease from 1996 to 2008 solar minimum claimed to produce global cooling…but decrease in PMOD and ACRIM composites could be instrumental

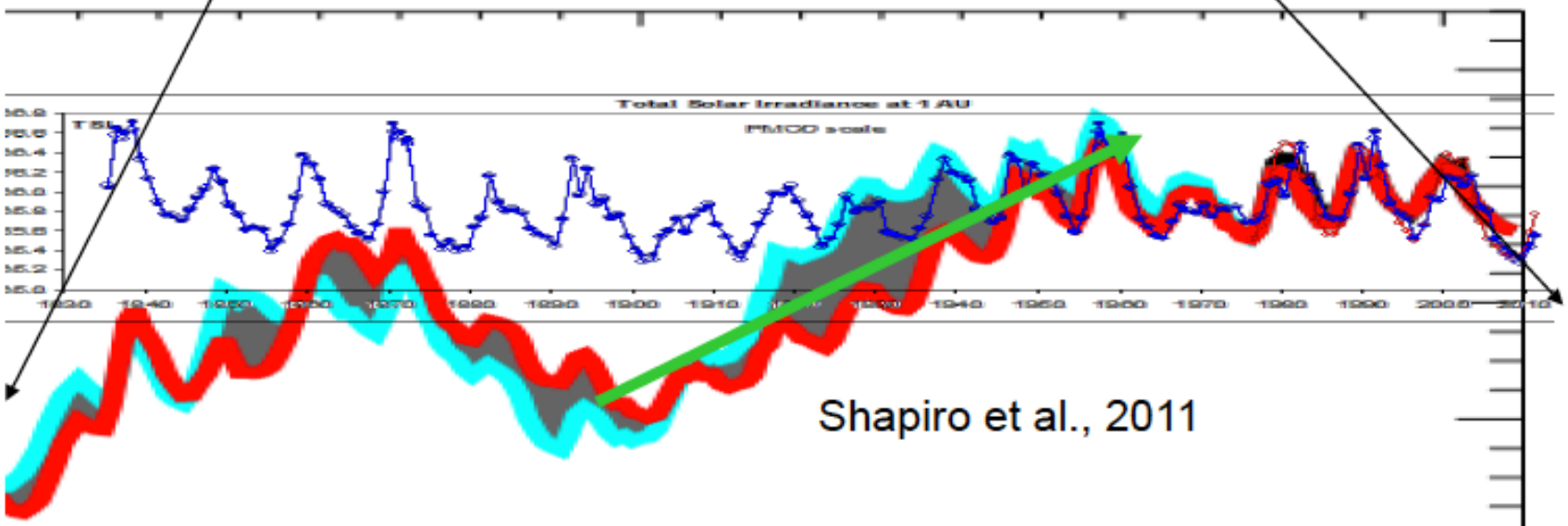
Irradiance Increase from 1986 to 1996 solar minimum claimed to produce 20%-30% of recent global warming…but increase in ACRIM composite could be instrumental

Slide from Judith Lean

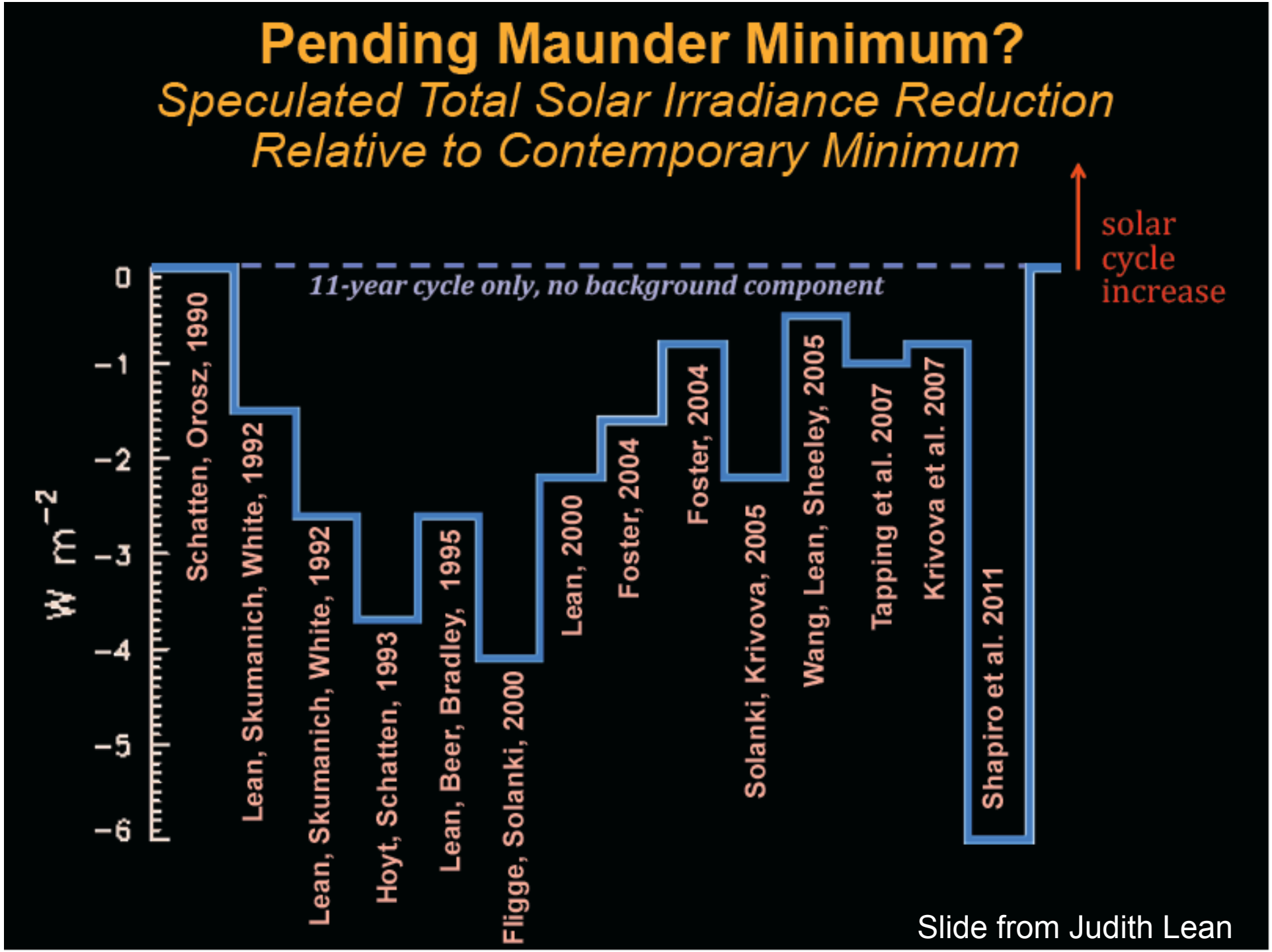
Slide from Leif Svalgaard

The Discrepancy between Now and 100 years ago, *if real*, is severe





- Experts cannot agree on the long-term variation of solar activity
- Solar influence on climate on shaky ground if we don't even know solar input



Slide from Judith Lean

Energy balance accounting

1.7 W m^2: 20th century CO_2 radiative forcing

5 W m^2: uncertainty in solar forcing in early part of the 20th century

0-0.8 W m^2: uncertainty in trend in solar forcing since 1980 (0-30% attribution to solar)

3.7 W m^2: radiative forcing (warming) from doubling CO_2

0 to 6 Wm^2: solar forcing (cooling) during the 21st century

Dangerous (?): winners vs losers

- Who decides what is “dangerous”?
- How do we balance benefits vs harm, winners vs losers?

Example:

~50% of the worlds population is supported by the circum-Himalayan rivers; this is the fastest growing population in the world and they are already water limited. AGW is projected to increase precipitation in the region by 20-30%.

How does this benefit, to half of the global population, weigh against other possible harmful effects, in other less populated regions and other parts of the world?

Solutions: unintended consequences

Economic issues:

- Many proposed solutions have substantial economic costs
- Many studies show that countries with a strong economy and abundant energy can more easily deal with climate change and weather disasters

Unintended consequences:

- Kyoto Protocol: shift of manufacturing to China (dirty energy) as developed world tries to achieve emission targets
- Biofuels: raising food prices, depleting soils, concerns about net carbon reduction

Scientific perils of an explicit consensus building process

- Explicit consensus building processes can enforce overconfidence and belief polarization.
- Beliefs tend to serve as agents in their own confirmation
- Dismissal of skepticism is detrimental to scientific progress
- Disagreement provides a basis for focusing research in a certain area
- Overreliance on expert judgment motivates shortcuts in reasoning and hidden biases

Why is there such strong belief among scientists in the IPCC attribution statement?

Some hypotheses:

- Overconfident interpretation of the scientific evidence
- Groupthink in context of a consensus building process
- **Confidence in, and authority of, the IPCC**
- High salience of the issue motivates individuals to take a stand
- **Solidarity among scientists against a perceived "war on science"**
- Defense of the status quo (strong funding feedback)
- Personal and political sympathies for environmental movement
- UNFCCC/IPCC ideology

* Reasons for JC's belief ca. 2006-2008

Evolution of the IPCC attribution statement

1988 Hansen's testimony

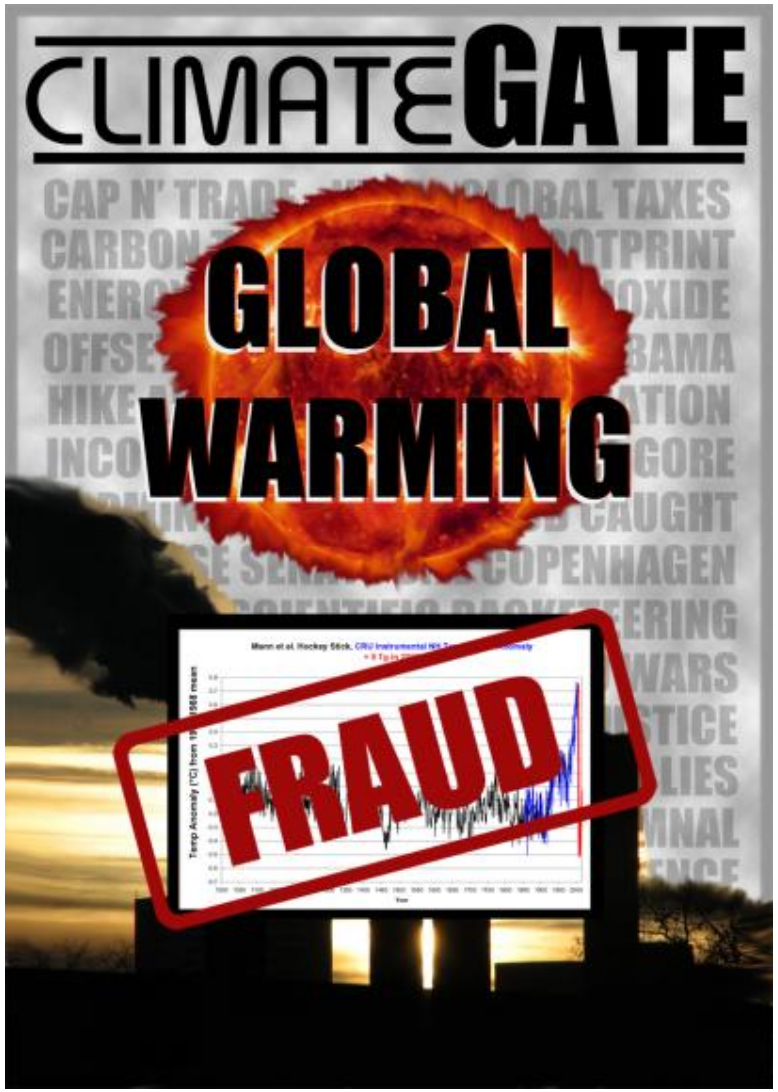
FAR (1990): "The size of this warming is broadly consistent with predictions of climate models, but it is also of the same magnitude as natural climate variability." 1992 UNFCC Treaty

SAR (1995): "The balance of evidence suggests a discernible human influence on global climate." 1997 Kyoto Protocol

TAR (2001): "There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities."

AR4 (2007): "Most of the observed increase in global average temperatures since the mid-20th century is *very likely* due to the observed increase in anthropogenic greenhouse gas concentrations."

Putting the policy cart before the scientific horse



CLIMATEGATE: CAUGHT GREEN-HANDED!

COLD FACTS ABOUT THE HOT TOPIC OF GLOBAL TEMPERATURE CHANGE AFTER THE CLIMATEGATE SCANDAL

Climategate from the scientists' perspective :

- The "climate denial machine" trying to derail climate science
- Scientists acting with the best of intentions; bad things happen to good people
- Fighting a valiant war to keep bad science from being published/publicized
- Embattled scientists circling the wagons to fight off malicious interference

- Focusing on moving the science forward rather than on the scientific janitorial work of record keeping, documentation, archiving metadata and computer programs, etc
- We're the experts, trust us

JC's comment. Our core scientific research values became compromised in the "war against the skeptics": the rigors of the scientific method (including reproducibility), research integrity and ethics, open minds, and critical thinking.

Climategate as a crisis of public credibility in climate research

- Dismissal of skeptics by *ad hominem* and appeal to motive attacks; tribalism that excluded skeptics
- Involvement of leading climate researchers in explicit climate policy advocacy
- Hubris with regards to a noble (Nobel) cause
- Alarmism motivated by policy makers failing to recognize the plain and urgent truth as the scientists understood it
- Arrogance of the defense by the scientists and their institutions: appealing to their own authority
- Motivated by obtaining research $$$
- Lack of transparency in data, methods, models
- Inadequate attention to uncertainty, complexity, model verification and validation

Credit: problogger.net

Getting climate science back on track

- Get rid of the consensus seeking approach to climate assessments
- Bring considerations of doubt, uncertainty, and ignorance to the forefront of the climate debate
- Seek to better understand natural climate variability
- Recognize that at the science-policy interface, understanding uncertainty and ignorance is of paramount importance
- Remind ourselves that debate and disagreement are the spice of academic life

Does uncertainty in the science preclude policy responses?

Answer: **NO**

Decision Making Under Uncertainty

"OK, all those in favour of delegating decision-making, shrug your shoulders"

Key climate policy dilemma

Whether betting big today with a comprehensive global climate policy targeted at stabilization will:

- fundamentally reshape our common future on a global scale to our advantage

  - OR -

- quickly produce losses that throw mankind into economic, social, & environmental bankruptcy

Optimal decision making

more research --> less uncertainty --> political consensus --> meaningful action

When uncertainty is well characterized and the model structure is well known, classical decision analysis can suggest statistically optimal strategies for decision makers.

Decision making under deep uncertainty

Deep uncertainty is characterized by situations in which:

- phenomena are characterized by high levels of ignorance and are poorly understood scientifically
- modelling and subjective judgments must substitute extensively for estimates based upon experience with actual events and outcomes
- ethical rules must be formulated to substitute for risk-based decisions."

Bammer & Smithson 2008

Options for decision makers confronted with deep uncertainty:

"OK, all those in favour of delegating decision-making, shrug your shoulders"

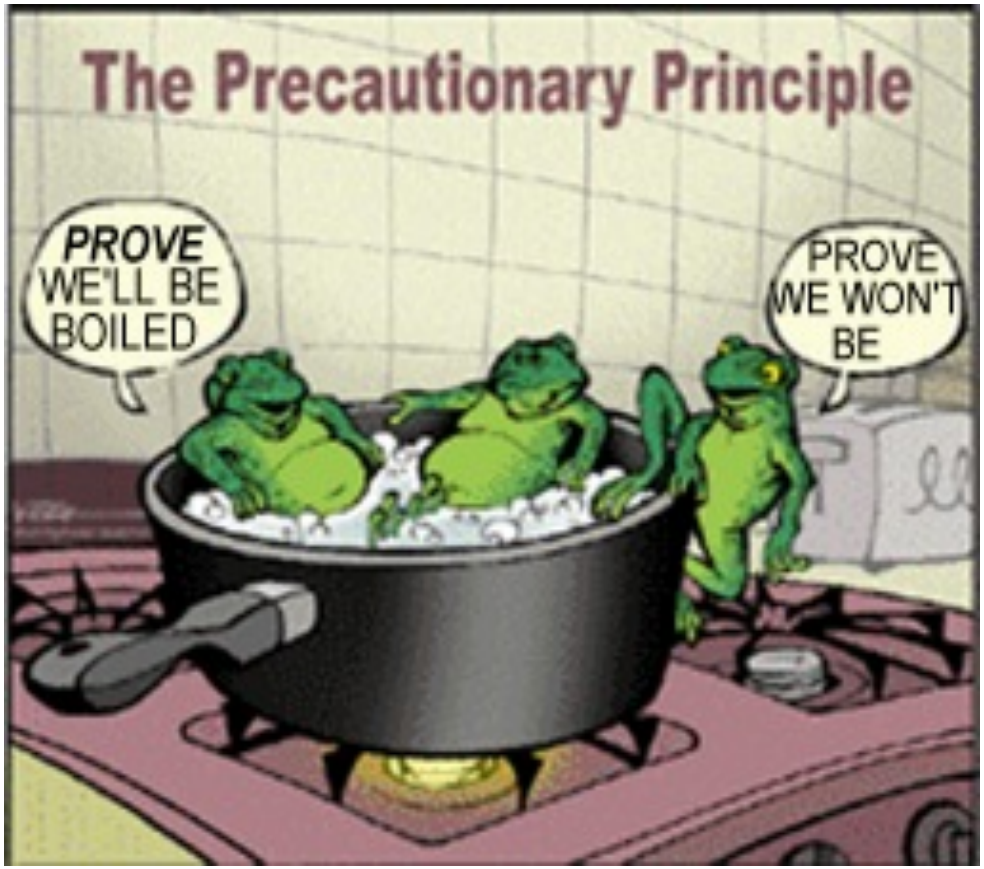
- Wait and see
- **Delay, gather more info**
- Target critical uncertainties
- Enlarge the knowledge base for decisions
- **Precautionary principle**
- Adaptive management
- Build a resilient society

Understanding uncertainty and areas of ignorance is critical information for the decision making process

The Precautionary Principle

"Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."

Based upon the precautionary principle, the UNFCCC established a goal of stabilization of atmospheric greenhouse gases to prevent dangerous climate change



Precautionary Principle

The original climate conference.

Issues with the precautionary principle . . .

What constitutes “dangerous” climate change?

Given the uncertainties, the emission target may be

- inadequate to prevent dangerous climate change

  - OR -

- overkill, incurring unnecessary costs

Robust decision making

Robustness is a strategy that seeks to reduce the range of possible scenarios over which the strategy performs poorly:

- uses available information to distinguish reasonable from unreasonable choices
- is flexible and can be adjusted quickly to increasing information
- considers unlikely but not impossible scenarios without letting them completely dominate the decision

"Robust, full-bodied bouquet with just a hint of bitter, mean-spirited despair."

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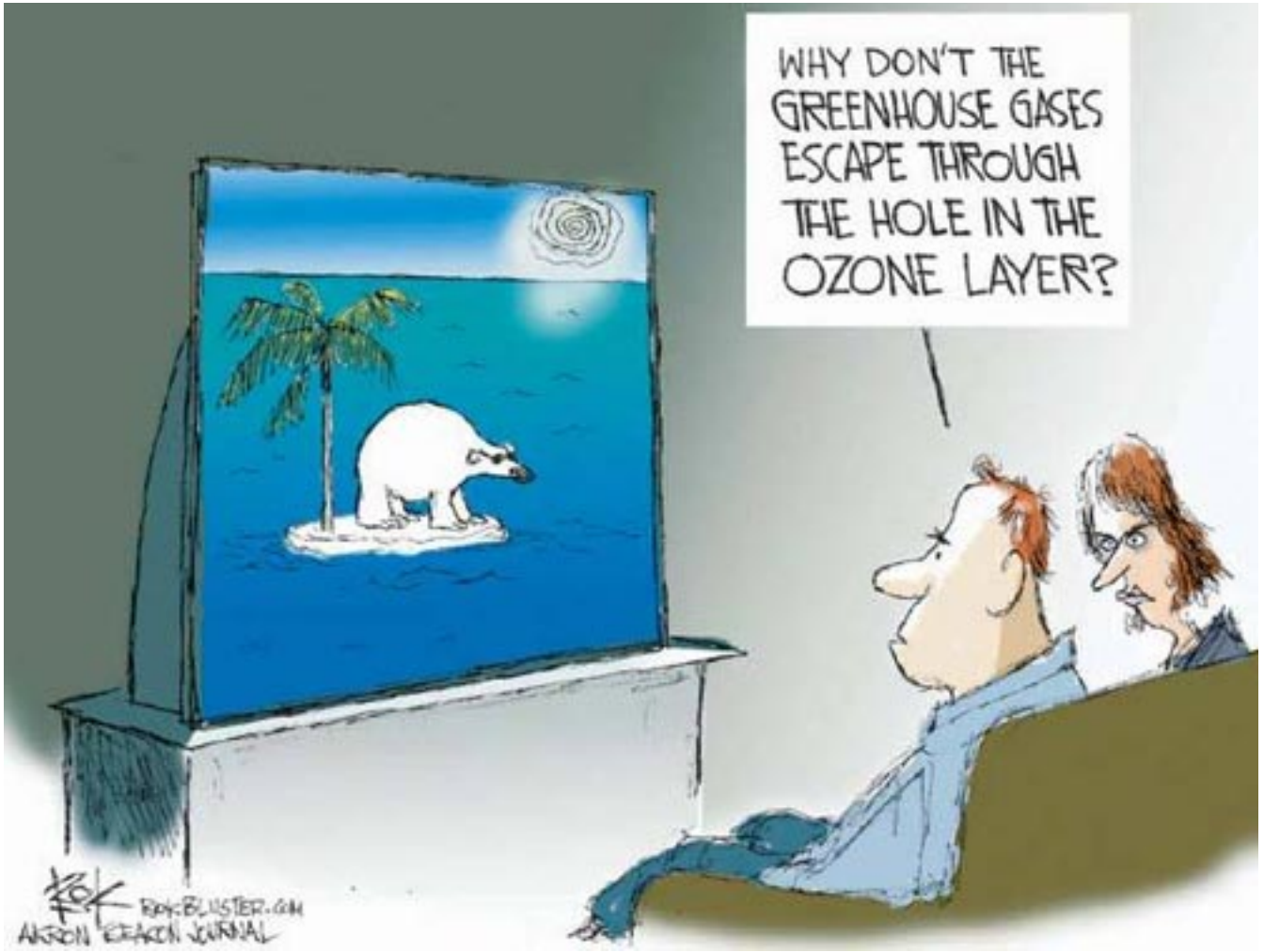
Climate Policy



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