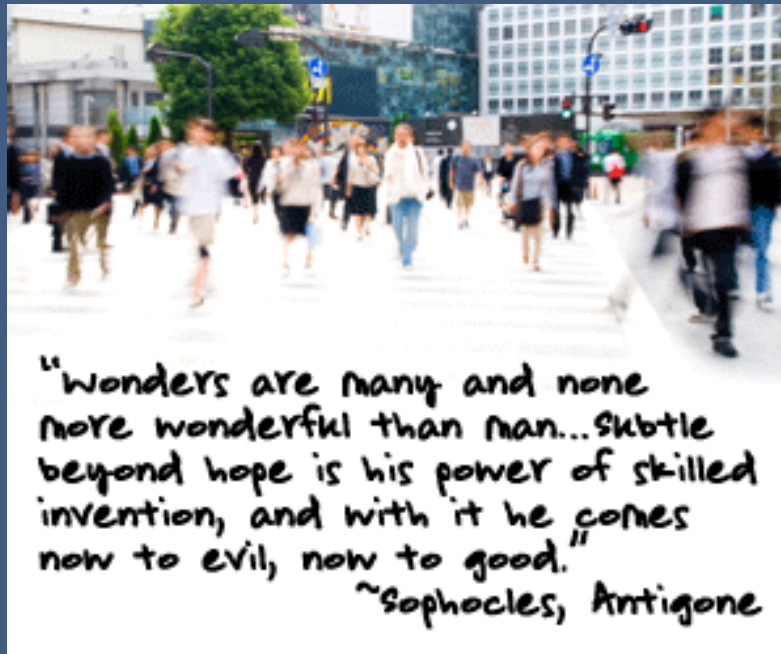


Science research questions for the Anthropocene:

How did we get here? Where are we going? How do we proceed?



James Arnott
Aspen Global Change Institute
August 21, 2014

Roadmap

- My career thus far
- Global change research in the holocene
- Global change research in the anthropocene
- Research implications
- Future directions



My career

- Adaptation practitioner



My career

- Adaptation practitioner
- Early mentorship

“science that’s credible but meaningful for humanity.”

“what to do in the face of uncertainty is never a question of science. the science is elucidating the possibilities and probabilities, but how to act or how to react is your own values. and we always have to make that explicit. But if you don’t have any information, it’s hard to know how to apply your values in more than a random way”



Stephen H. Schneider
Hotel Jerome
July 30, 1990

My career

- Adaptation practitioner
- Early mentorship
 - Evolving values, especially value for science
- Understanding Earth as a changing system with society as increasingly important dimension and, in turn with increasingly significant implications for society



Co chairs: Tom Wilbanks & Roger Pulwarty



Co chairs: Tim Crews, Alan Townsend, et al

Global change research to date

- From a societal perspective we've done relatively well at understanding and appreciating stationary risks and responding to them; we've also done a reasonable job of supporting and incorporating science relative to those risks (e.g. flood planning, building codes, etc).
- From a research perspective, we've made tremendous progress in modeling, understanding processes, and systems. But we don't know enough about what happens in *our* system--that we are just starting to understand—gets shocked. Reports like National Academy on Abrupt Impacts of Climate Change gets at this but more likely is needed
- An important accomplishment that I'm excited to build off of is the notion of informing decisions as a mode of research, a concept pioneered by many in this room and provided a basis in USGCRP strategic plan. To me this enables my career to become situated as an “informative advocate” (Barnosky et al, 2014) which states:

*Informative advocacy ... uses scientific knowledge to foretell the environmental (in our case) changes of probable societal relevance that lie ahead. It differs from pure science communication, which is simply to inform, in having an important goal of **injecting the scientific realities into the many different categories of information that decision makers must take into account when formulating policy**. Informative advocacy also has a second goal that is critical: learning from decision makers about the kind of information they need. This back-and-forth dialog ultimately opens new doors for decision makers to formulate solutions to complex problems, and new doors for scientists to understand how their science is socially relevant.*

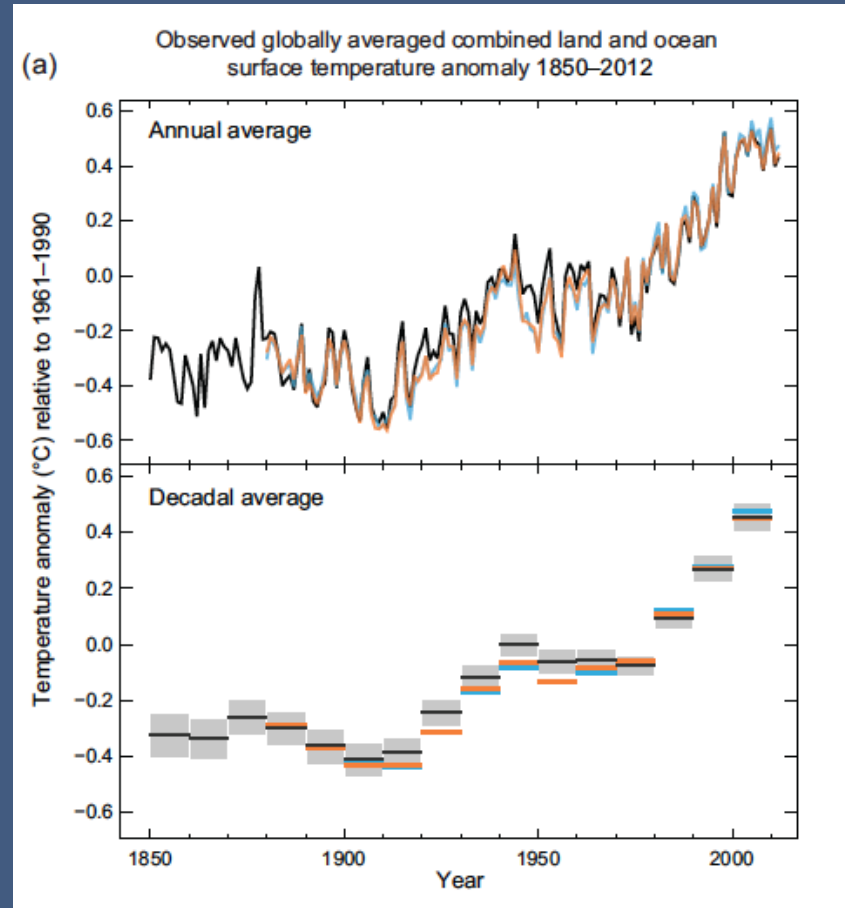


The anthropocene

An extraordinary moment in Earth and human history

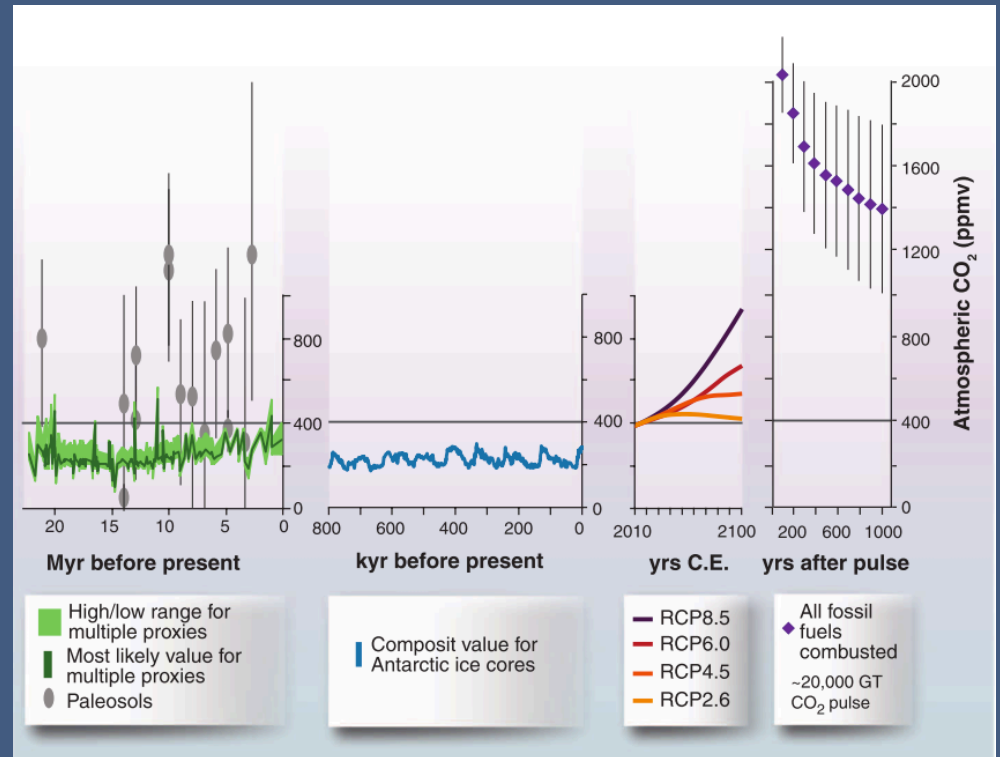
Lines of evidence for the anthropocene

- Temperature increase
- Biogeochemical alterations
- Extinction rates
- Appropriation of terrestrial and ocean systems
- Environmental contamination



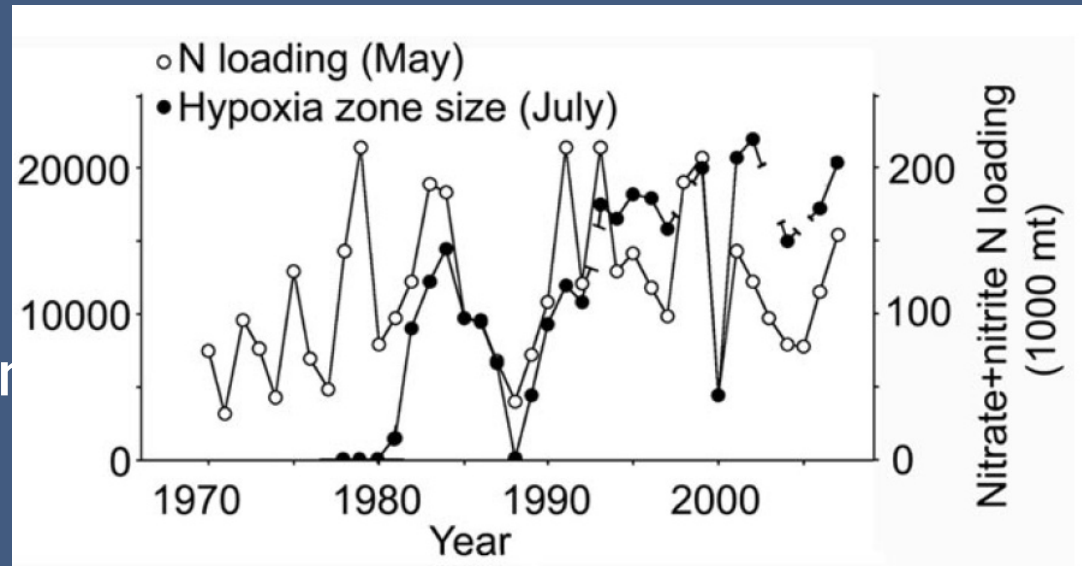
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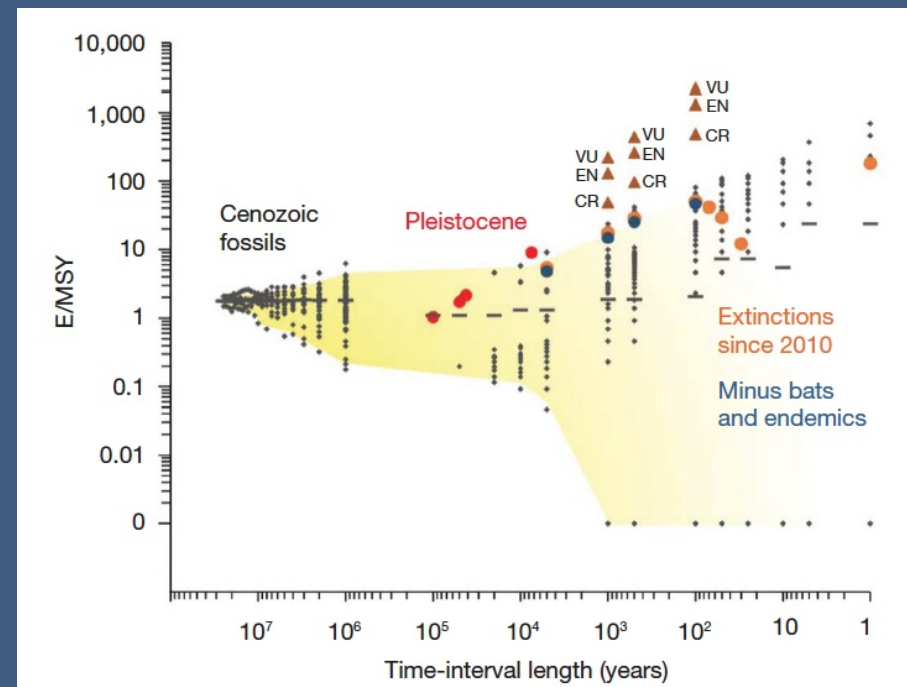
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Lines of evidence for the anthropocene

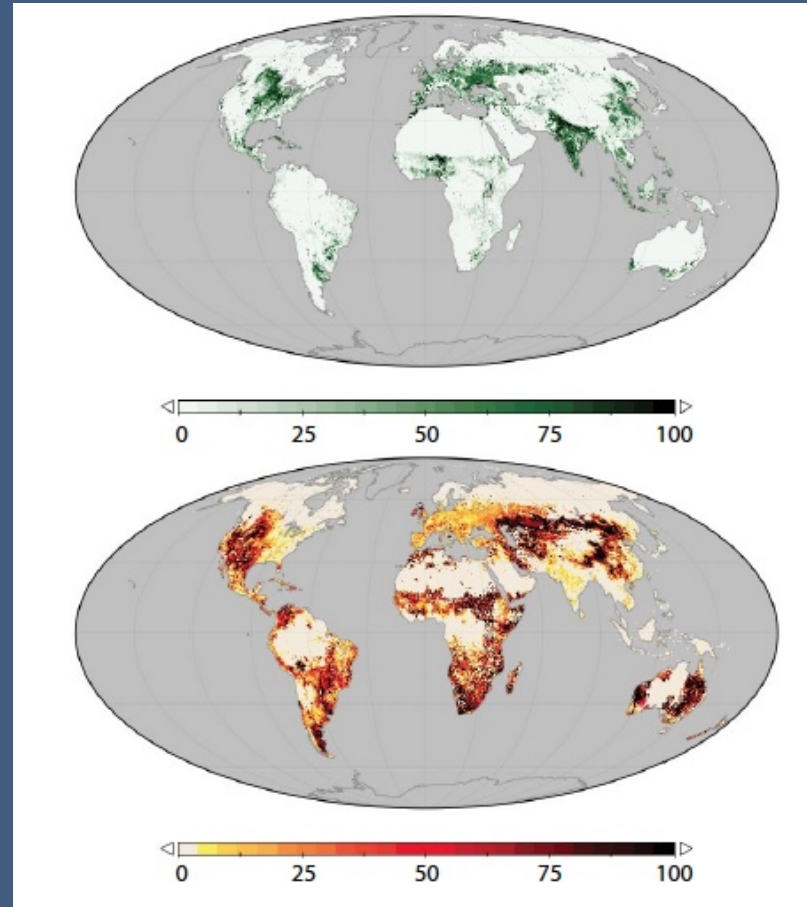
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Barnosky et al, 2011

Lines of evidence for the anthropocene

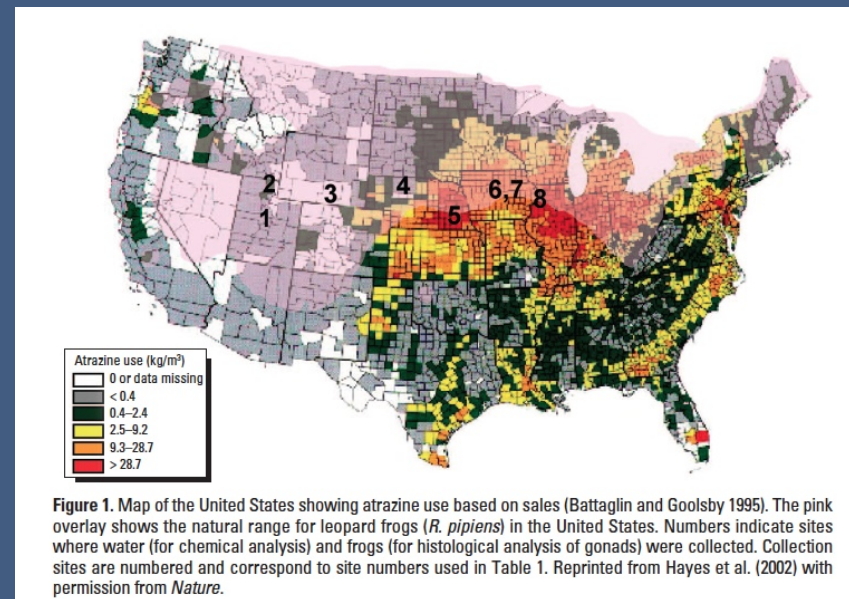
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Foley et al, 2007

Lines of evidence for the anthropocene

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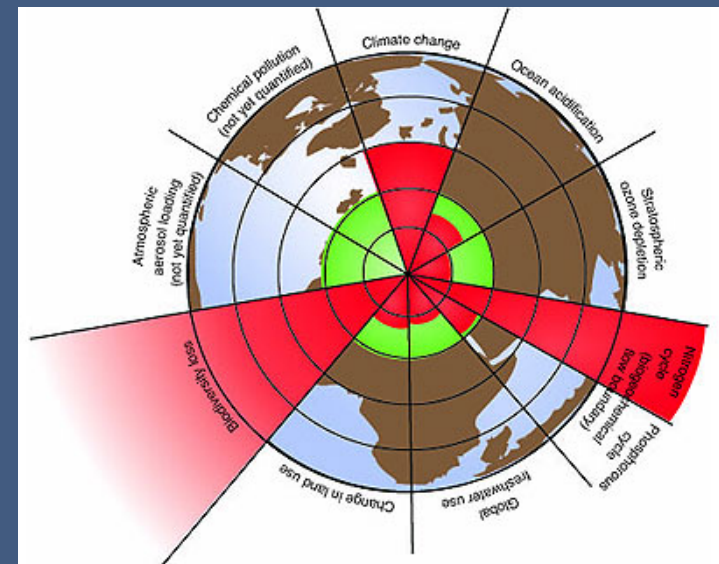
Atrazine usage & leopard frog habitat (pink)

If you see something, say something?



Some implications (research)

- Preserving “a safe operating space” for humanity will involve an ongoing, iterative set of research activities at different spatial and temporal scales
 - To monitor our current status, evaluate future conditions
 - Identify new boundaries, previously unknown



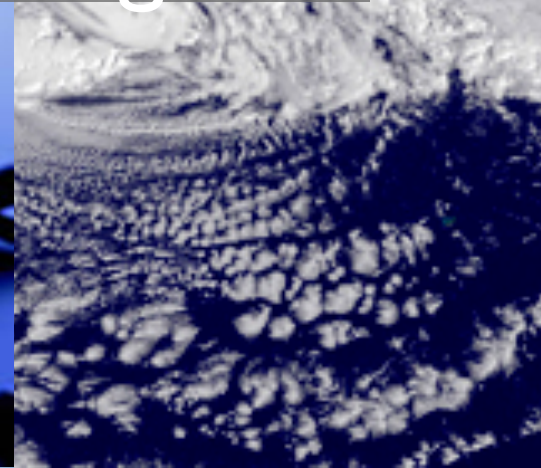
After Rockstrom et al 2011

Frontiers in summary

- Pathways from getting here to there
- Motivations
- Implications



Ongoing in a context of other
complex and competing challenges



Concluding thoughts

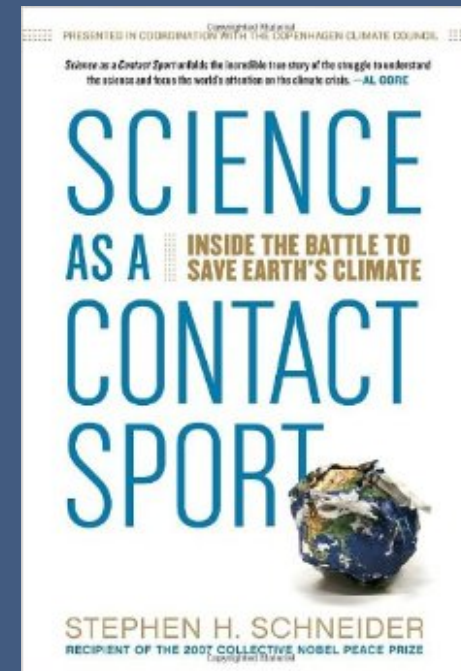
- How do humans individually and collectively make decisions at different spatial and temporal scales?
 - How can robust interaction between scientists and decision-makers be established more efficiently?
 - How can robust interaction be sustained?
 - How do we know when we (as scientists) are successful?
- What informs partitioning of investment for adaptation and mitigation?
 - How can science better complement societal values to help guide society to optimal outcomes?
- What are the key gaps in understanding thresholds in social and natural systems?
 - At what pace and scale are critical actions required and in what priority?
 - What additional planetary boundaries are out there that we are not yet cognizant of?



Thank you!

My career

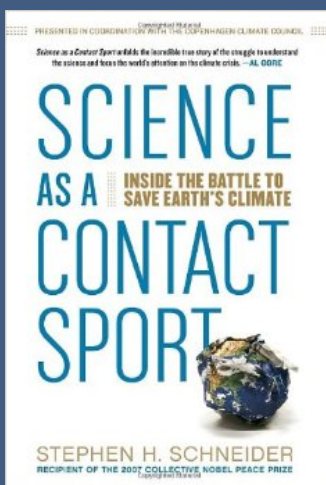
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Schneider, 2009

My career

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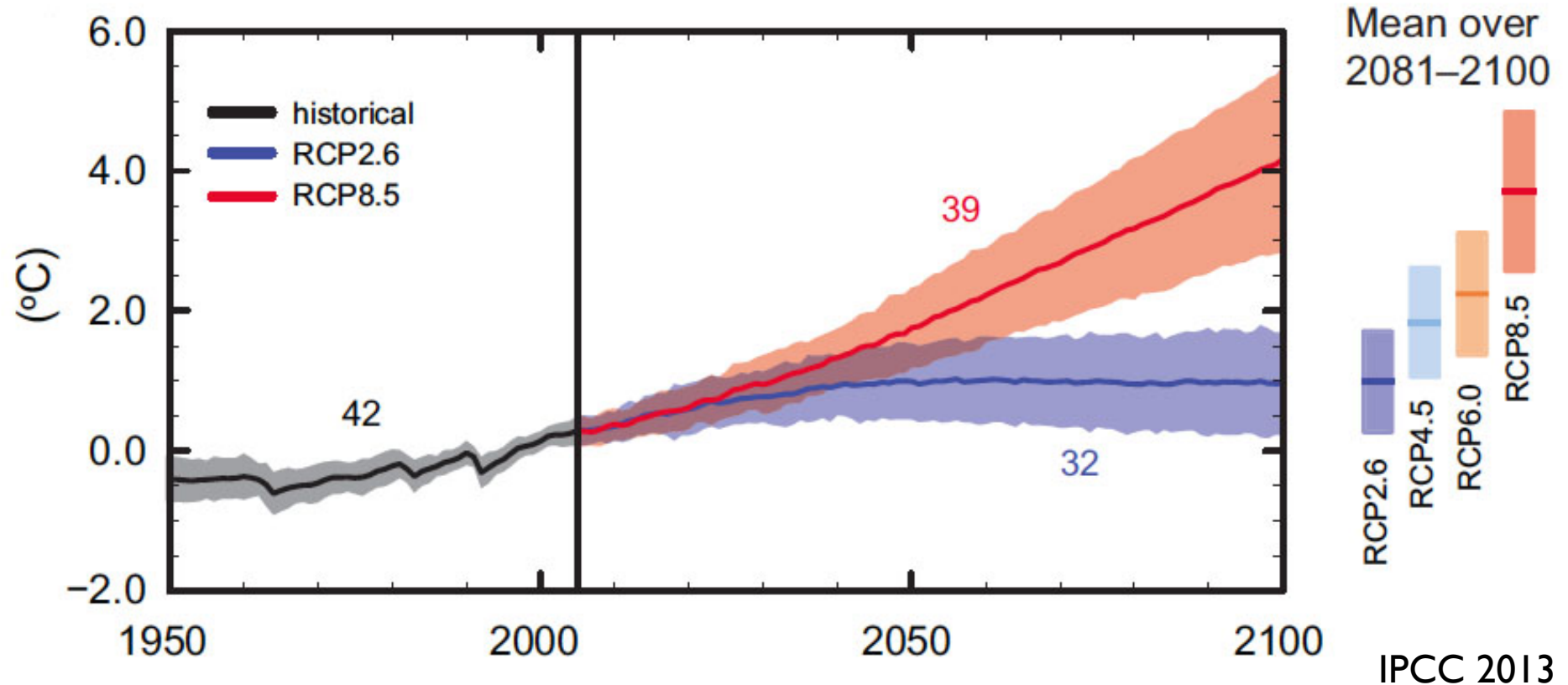


Schneider, 2009

“What keeps me up at night is a disquieting thought: *‘Can democracy survive complexity?’*”

If the public understood the basics of the real risks to nature and to themselves, their posterity, and their world, they would be much more likely to send strong signals to their representatives to act in a precautionary way. They might even learn how to vote consistently with their values on ballot propositions to solve the problems that the legislature and executive branch avoid. But if daunting complexity, fueled by deliberate special interest distortion and knee-jerk media balance is what we hear predominantly, then democracy has a hard time dealing with slowly evolving, large-scale, complex problems such as climate change and policy, health care policy, security and military policy, or education policy, just to name a few.”

Future Projections



PhD
Post-doc
Tenure
Sabbatical at AGCI
IPCC AR10
Grandchildren
Retire

