Project on the Benefits of Reduced Anthropogenic Climate changE (BRACE)

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NCAR

Societal Dimensions Working Group meeting

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Climate and Human Systems Project (CHSP)

https://chsp.ucar.edu/

New cross-cutting project within Climate & Global Dynamics (CGD) division

Better integrate research on human and earth systems, across NCAR and with external community

Focus on quantitative, large scale analysis

Better connect NCAR research to SDWG

Initial activity: cross-cutting project on avoided impacts

What are “avoided impacts”?

Impacts avoided by reducing or adapting to climate change

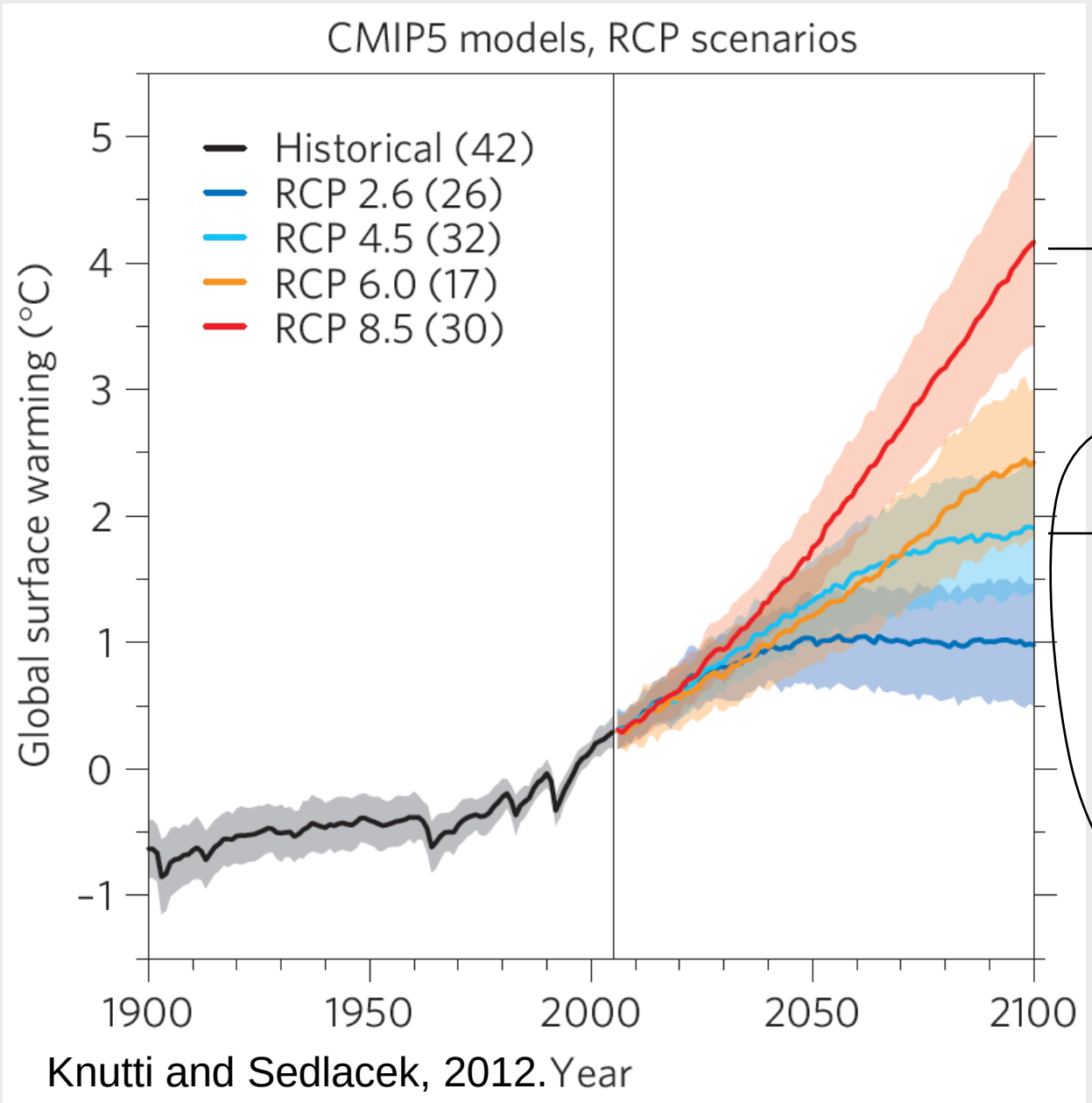
Reducing climate change either by emissions mitigation or geoengineering

Impacts terminology

Physical impacts (“hazards”) such as changes in temperature, precipitation, extreme events, sea level rise, sea ice cover, etc.

Impacts on society or ecosystems such as increased hunger, adverse health outcomes, loss of life/infrastructure to extreme events, species extinction, ecosystem change, loss of ecosystem services, etc.

Why do they matter?



Knutti and Sedlacek, 2012.

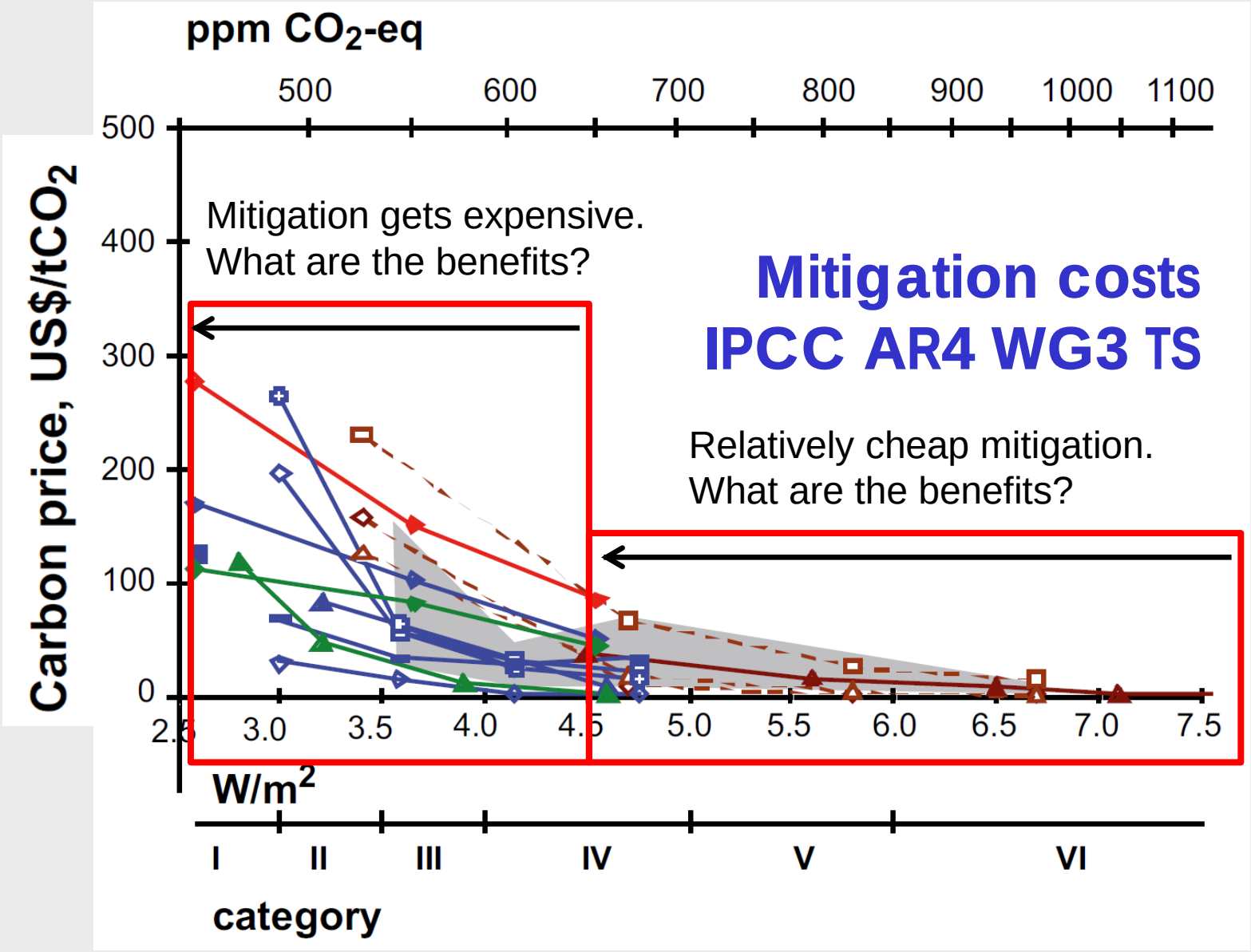
<u>RCP8.5</u>
No (or little) climate policy
High emissions
High impacts

<u>RCP4.5</u>
Mitigation, adaptation
Low emissions
Low impacts

Cost: Mitigation, adaptation

Benefit: Avoided impacts

Lots of work on mitigation costs



Not as much work on avoided impacts

Some prominent examples of attempts at summaries:

- IPCC WG2 tables of impacts by global mean temperature
- Reasons for Concern
- NAS Climate Stabilization Targets report
- UK AVOID project
- EPA CIRA project (US only)

What's missing

Improved quantitative estimates of differences in impacts between two levels of climate change, especially accounting for extremes

Many impacts not yet quantified

Internally consistent comparisons (within common modeling framework, common socio-economic scenarios)

Accounting for internal variability

Benefits of Reduced Anthropogenic Climate changE (BRACE)

Compare physical and societal impacts between RCP 8.5 and RCP 4.5

Take advantage of Large Ensemble (RCP 8.5)

CMIP5 analysis as well as new simulations

Particular emphasis on extremes

Include analysis of geoengineering implications for impacts

Global and regional analyses (?)

Aim to produce journal special issue

Paper submissions by fall 2014 (in time for 2015 COP)

Draft outline

METHODOLOGY (3)

- Detecting and attributing differences in extremes between RCP 8.5 and RCP 4.5 (Tebaldi, Wehner)
- On the dependency of climate variability and extremes with mean climate state (Sanderson, Tebaldi, Knutti)
- Detecting changes in extreme precipitation (Sain, Cooley, Fix)

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PHYSICAL IMPACTS (8)

- Simulated 21st century changes in large-scale **crop water requirements and yields** (Levis, Ren, Badger, Jones, O'Neill, Bonan)
- Avoided impacts of **extreme temperatures on crops** (Tebaldi, Lobell)
- Avoided impacts of **urban and rural heat waves** over the U.S. using large climate model ensembles for RCP4.5 and RCP8.5 (Oleson, Tebaldi, Lamarque)
- Hurricane/**tropical cyclone activity** in 2080-2100 in RCP4.5 vs RCP8.5 (Bacmeister)
- Assessing future changes in **tropical cyclone damage potential** using large-scale climate variables (Done, Holland, PaiMazumder)
- Avoided **ocean impacts** in RCP4.5 vs. RCP8.5 (Hu, Bates)
- Impacts in an RCP4.5 scenario with mixed mitigation and **geoengineering** (Wigley, Tilmes)
- Impacts in an RCP4.5 scenario achieved through **geoengineering** (Tilmes)

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SOCIETAL IMPACTS (7)

- Comparing societal impacts and/or mitigation between RCP8.5 vs 4.5: A review (O'Neill, van Ruijven)
- Population exposure to heat-related extremes: Demographic change vs climate change (Jones, O'Neill, …)
- Avoided extreme heat-related health impacts in U.S. cities (Anderson, Peng, Tebaldi, Jones)
- Tropical cyclone damage assessments in the 21st century: Climate and development contributions (Gettelman, Truesdale, Bacmeister, Rogelji, Bresch)
- Avoided impacts on agricultural systems (Ren, O'Neill, Levis)
- Using risk perceptions to identify and assess climate impacts under different scenarios (Lazrus, Morss, PaiMazumder, Towler)
- Climatic suitability for the dengue virus vector mosquito Aedes aegyti: Historical and future geographic patterns under CMIP5 RCP4.5 and RCP8.5 scenarios (Monaghan, Steinhoff, Hayden, Lozano-Fuentes, Bieringer, O'Neill, Eisen)

Draft outline

PAPERS

18

AUTHORS

40+

EXTERNAL INSTITUTIONS

City University of New York (CUNY)

Colorado State University

ETH Zurich

George Mason University

Johns Hopkins University

Lawrence-Berkeley National Laboratory (LBNL)

Stanford University

Swiss Reinsurance

Open questions

Analyses to add/drop

Coordinated regional (or global) focus?

- Possible Global + US focus

Common socioeconomic scenario(s) for societal impact analyses

- Probably SSP3 and SSP5

Common assumptions about adaptation

Relevance to SDWG

Application of CESM (and other ESMs) to impact assessment

Open for additional contributions

Future: include SDWG explicitly in planning, along with the NCAR Climate and Human Systems Project?