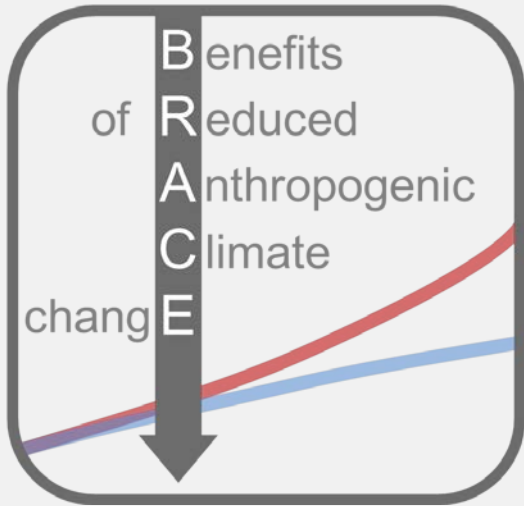


# Beyond BRACE: A new activity for the NCAR Climate and Human Systems Project

Brian O'Neill, NCAR  
*SDWG Winter Meeting*  
*February 28, 2017*

*#BRACEclimate*

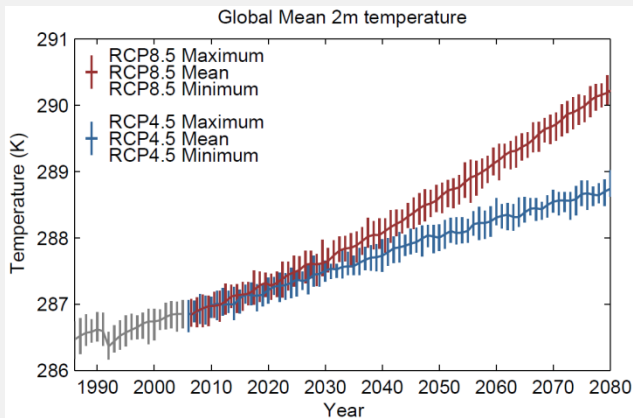


Difference in physical and societal impacts between RCP8.5 and RCP4.5 (also two development pathways)

20 papers, special issue of *Climatic Change* (17 Published, 1 In Press, 2 In Preparation)

50+ participants from NCAR and 18 other institutions

### CESM Large/Medium Ensembles



Biophysical  
& Societal  
Impact  
Models



- Avoided Impacts**
- Heat Extremes
  - Health
  - Ag & Land Use
  - Tropical Cyclones
  - Drought

# Example: Health Impacts

Proportional change in impact  
relative to recent

0 20 40 60 80

Number of U.S. high mortality  
heat waves

U.S. population exposure to  
high mortality heat waves

Global population  
exposure to heat waves

Heat-related deaths,  
Houston

Potential exposure to Dengue  
(and other) virus vector mosquito

RCP8.5  
RCP4.5

Uncertainty  
ranges:  
climate and  
socio-economic



# Main Conclusions

Substantial benefits to mitigation, 2060-2080:

- Heat wave days

- Population exposure to heat waves, record heat

- US population exposure to high mortality heat waves

- Maize/wheat exposure to extreme heat

- Likelihood of major slowdown in maize yield growth

Modest or insignificant benefits, or costs, to mitigation, 2060-2080:

- Potential crop yields

- Crop prices, esp. with CO<sub>2</sub> fertilization

- Population exposure to dengue vector

- Houston heat-related mortality

- Global tropical cyclone track densities

# BRACE 1.5 (underway)

CESM 1.5, 2 C simulations

Available CESM website

Climate model emulation

Physical impacts

Heat, precipitation means and extremes; aridity; sea ice

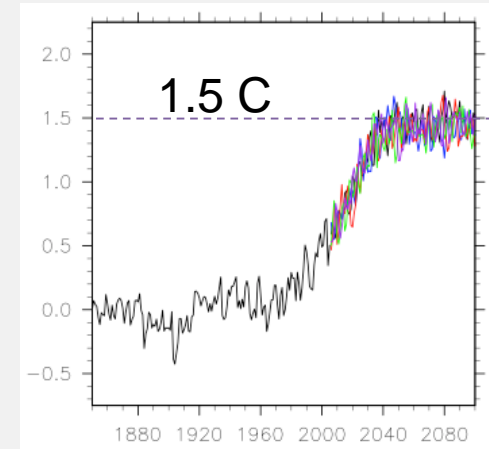
Impacts on managed systems, society

Yield and economic impacts to agriculture

Exposure to and mortality from extreme heat

Exposure to infectious disease vector

SLR?



# New CHSP Study: Ideas from Breckenridge 2015

Urban areas (coastal?)

Historical study

Cascade of uncertainty

Impacts in lower forcing scenarios (e.g. 2 C)

Mitigation effects on water quality and ecosystems

Water supply, climate and agriculture; water security

Forestry

Geoengineering

Topic aligned with a funding call

Topic aligned with a grand challenge (eg USGCRP)

Topic aligned with a MIP

Timing: Wait for completion of CESM2.0

Early enough to complete for IPCC AR6

# Short list?

## BRACE 2.0

CMIP6/CESM2.0 scenarios

Improvements to agricultural modeling, health impacts, tropical cyclones(?)

Other sectors: SLR/coastal, building energy, marine/coral reefs, ...

Geoengineering

Regional foci

## Determinants of Dangerous Climate Change

Define “dangerous” or high risk (IPCC def.) outcomes for various sectors; criteria:

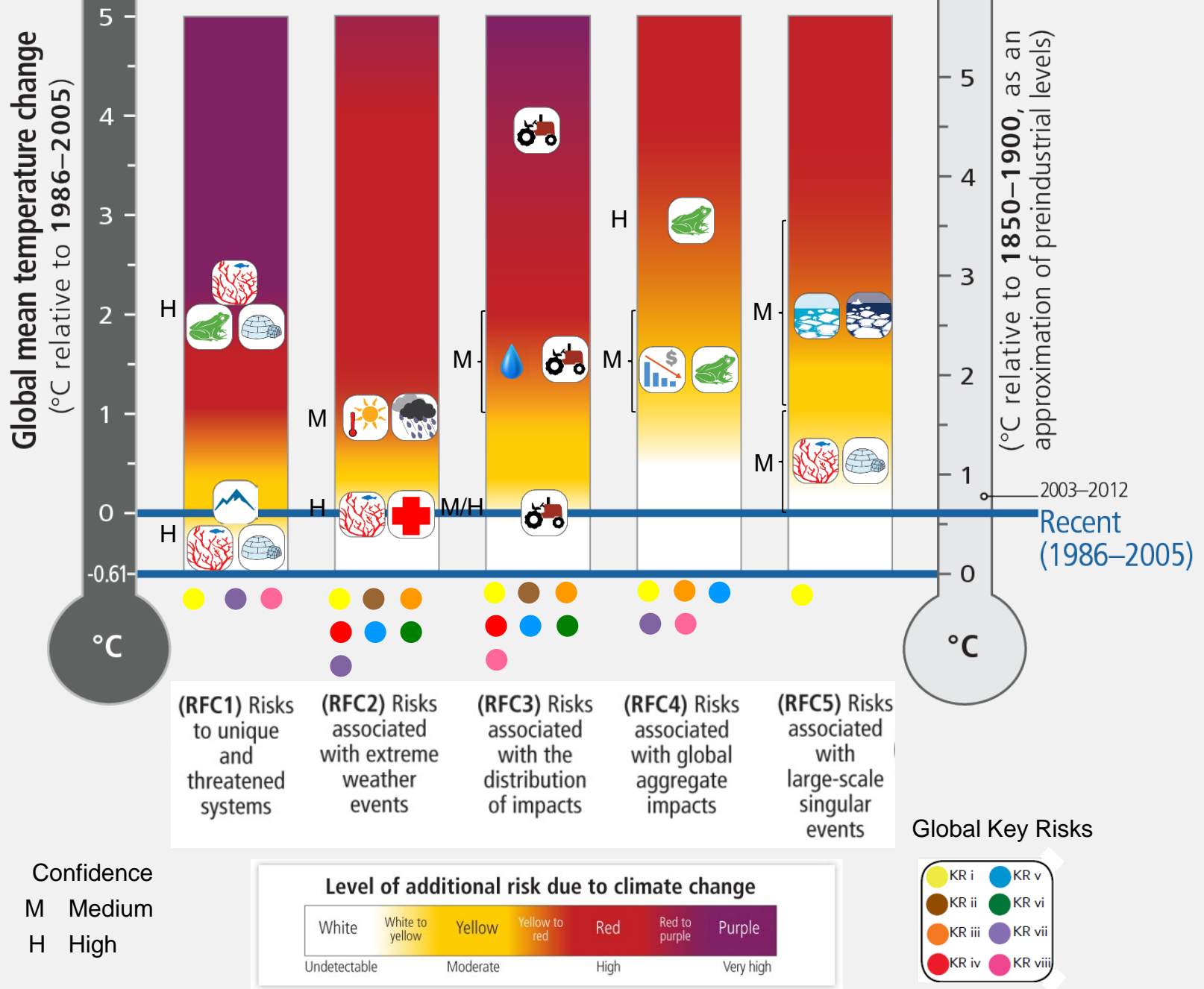
probability, timing, magnitude, importance, persistence of vulnerability, irreversibility, limited adaptation

Model combinations of socioeconomic and climate outcomes, identify those that would produce high risk





Fig. 1



# UPDATE BRACE Papers (20 total)

