

Realizing the impacts of a 1.5C warmer world

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The Paris Agreement

21st Conference of the Parties of the UNFCCC in Paris during December 2015.

“...pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels...”

IPCC have commission a Special Report on 1.5 degrees.

Potential issues in addressing the Paris Agreement

1. Differences in impacts between 1.5 and 2 degrees will likely be seen in the *extremes* of climate.
2. In our current CMIP-style experiments do we have the correct scenarios?

Potential Issues

(Mitchell et al, NCC, 2016)

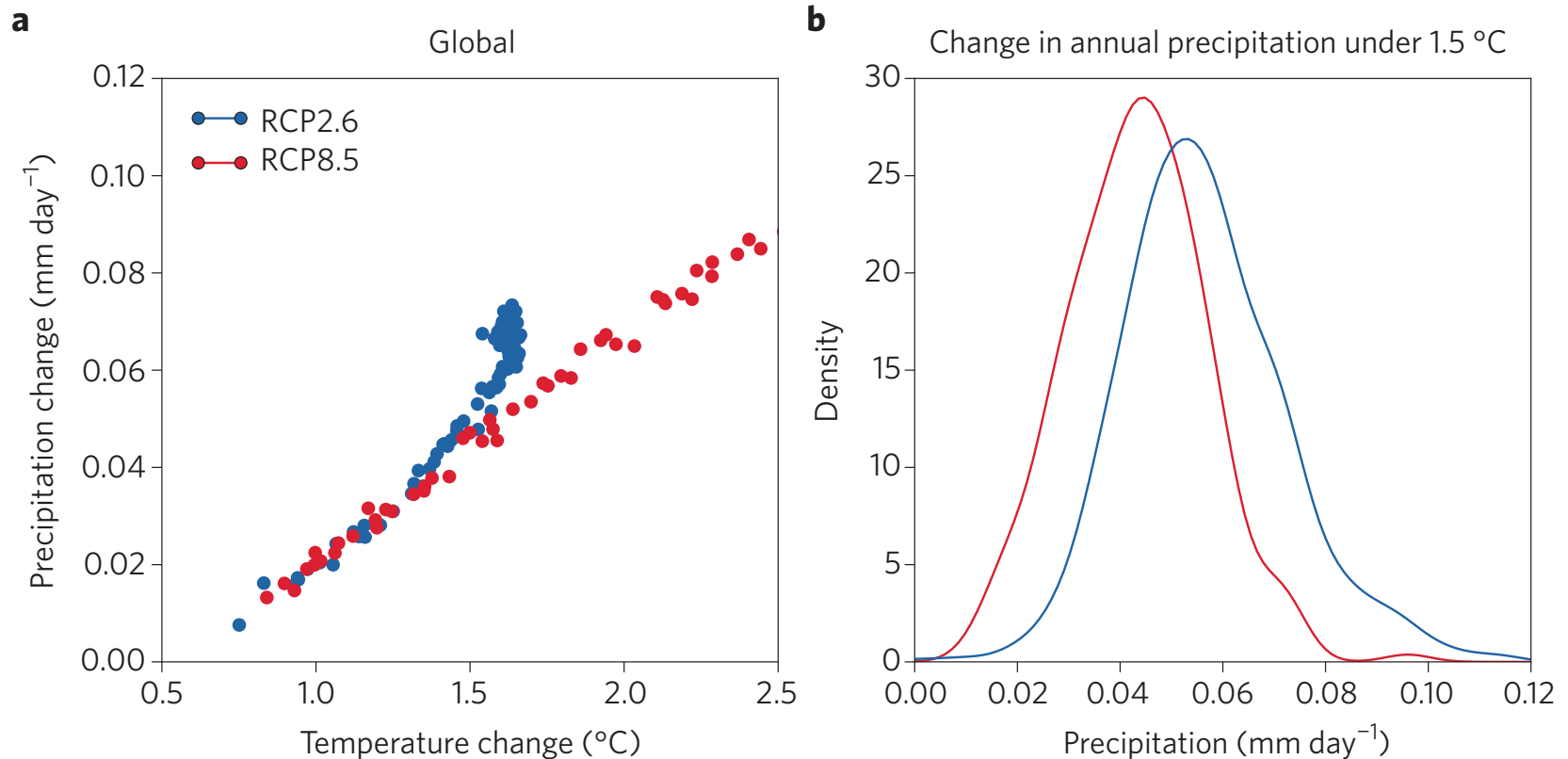


Figure 1 | Precipitation response to different RCPs. **a**, Changes in global mean precipitation versus changes in the global mean surface temperature for annual-mean multi-model-mean data from CMIP5. Data cover the period 2006–2100 for RCP2.6 (blue) and RCP8.5 (red). **b**, Smoothed probability density functions of precipitation change for all CMIP5 models that have a global temperature response of between 1.35–1.65 °C. All anomalies are relative to 1850–1900. Only the first ensemble member of each model is used.

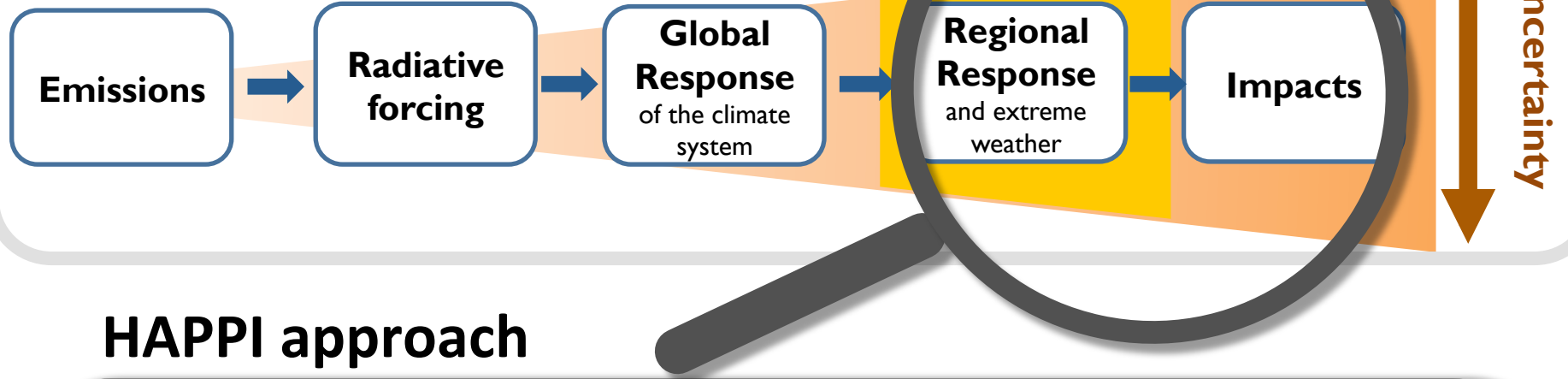
HAPPI

Half a degree Additional warming, Projections, Prognosis and Impacts

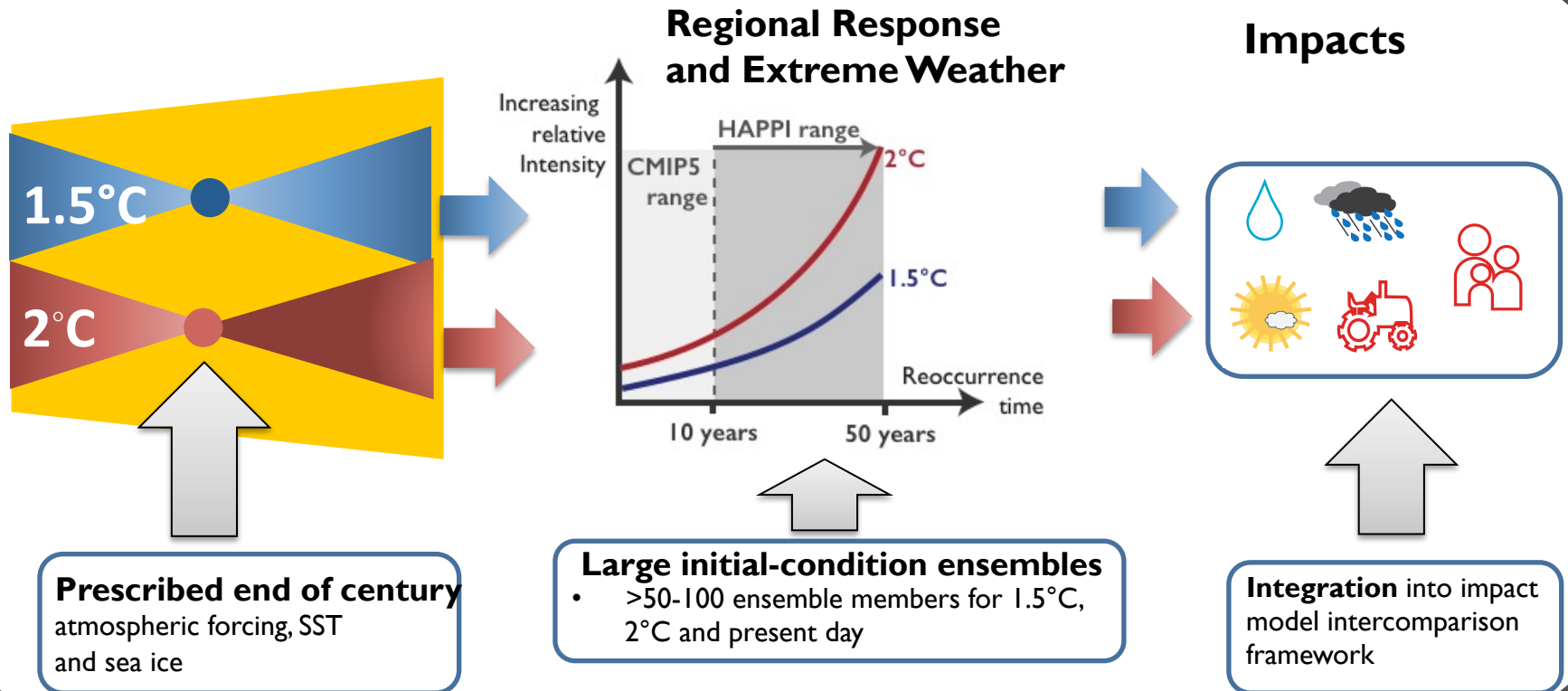
[OUR SCIENCE](#)

[THE PARIS AGREEMENT](#)

The Scenario approach

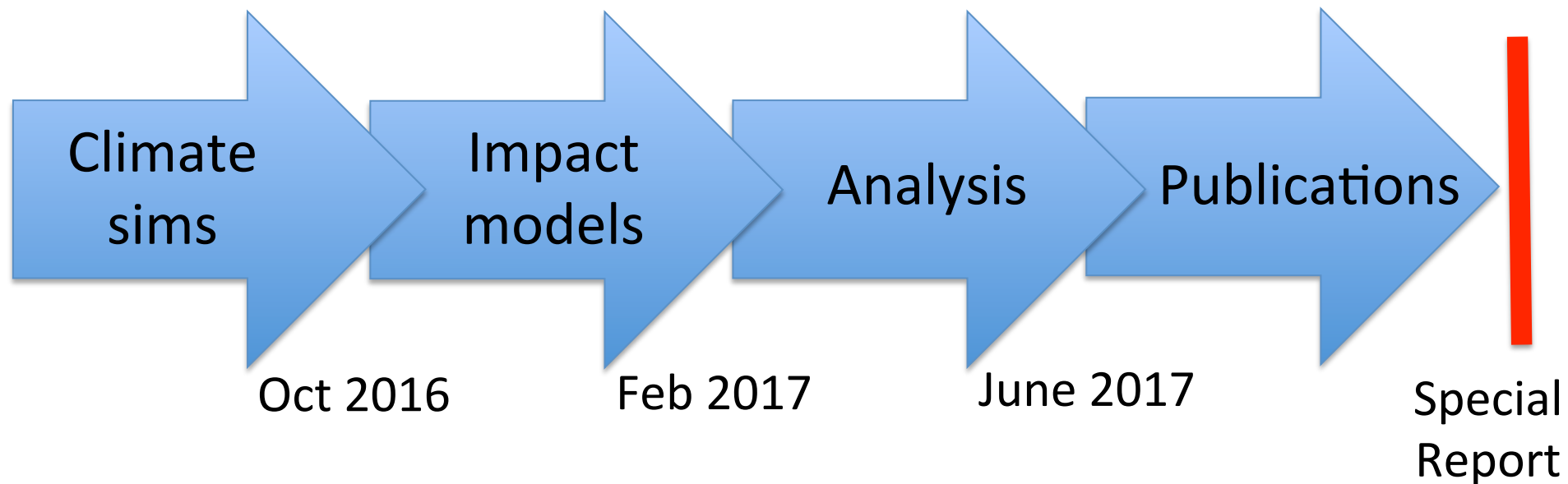


HAPPI approach



HAPPI – experiments and **status**

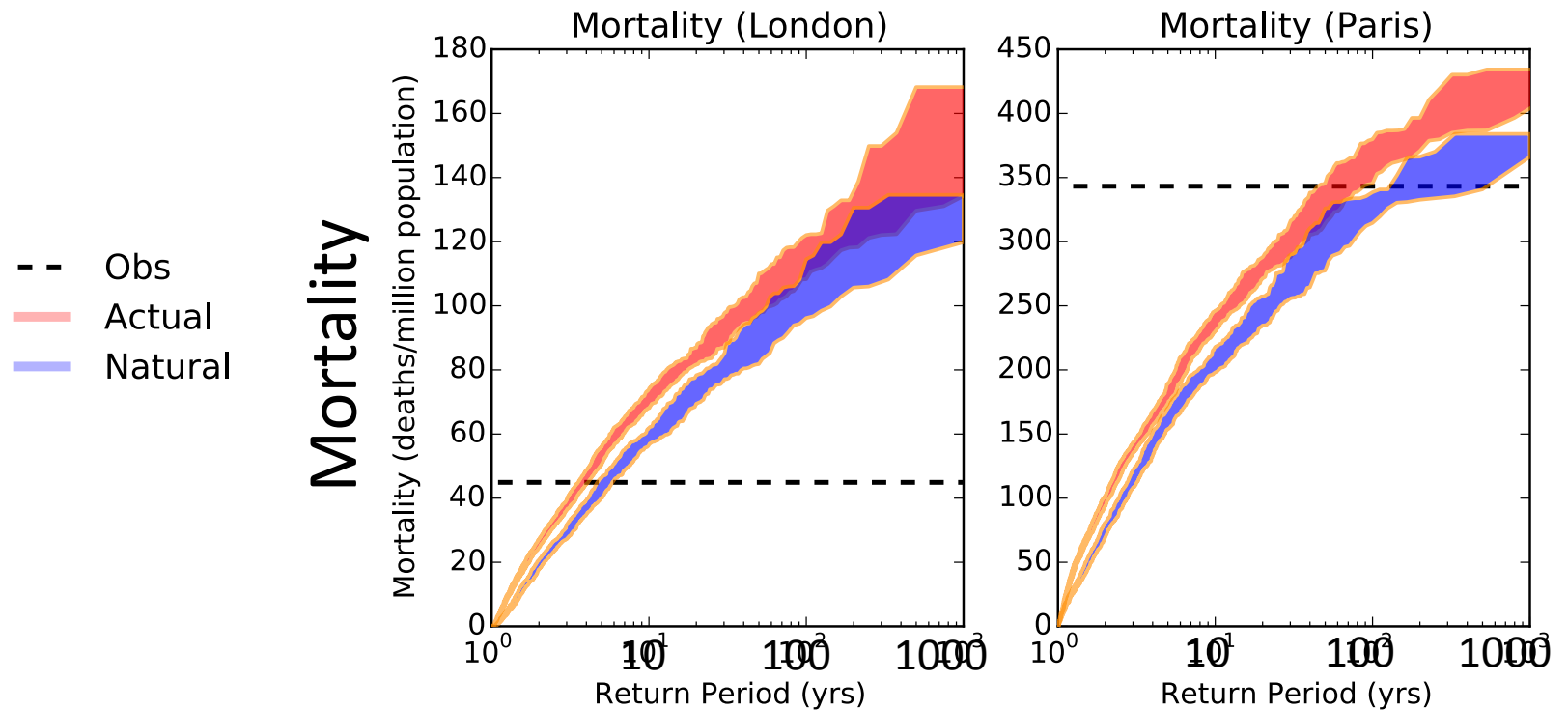
1. Time slice experiments of historical, 1.5 and 2 degree climates.
2. Decade long simulations.
3. ~50-100 member initial condition ensembles.



1. **Actively seeking funding for HAPPI-ISIMIP coordination.**

HAPPI – possible science

(mitchell et al, ERL, 2016)



Caption: Return period curves of mortality counts in (left) London and (right) Paris for two scenarios.

HAPPI

1. **Bristol University** (Paul Bates, Jim Freer)
2. **British Antarctic Survey** ([Emily Shuckburgh](#))
3. **Centre for Ecology and Hydrology** (Chris Huntingford)
4. **Chinese Academy of Sciences** (Wee Ho Lim, Fubao)
5. **CICERO** ([Jan Fuglestad](#), Bjørn Samset)
6. **Climate Analytics** ([Carl-Friedrich Schleussner](#))
7. **Environment Canada** (Nathan Gillett, Xuebin Zhang)
8. **Environmental Defence Fund** (Scott Weaver)
9. **ETH Zurich** (Reto Knutti, Sonia Seneviratne)
10. **Exeter University** (Mat Collins)
11. **Grantham Institute** (Jo Haigh)
12. **International Centre for Biosaline Agriculture** (Karin [Rashyd Zaaboul](#))
13. **IIASA** (Joeri Rogelj)
14. **Indian Institute of Technology** ([Krishna AchutaRao](#), Arpita Mondal)
15. **IPSL** (Robert Vautard)
16. **KNMI** (Geert Jan van Oldenborgh)
17. **LBL** ([Daithi Stone](#), Michael Wehner)
18. **Leeds University** (Piers Forster)
19. **Melbourne University** (David Karoly)
20. **MET Norway** (Trond Iversen)
21. **Met Office** (Richard Betts, Richard Jones, Peter Stott)
22. **MIT** (Kerry Emanuel)
23. **NCAS Climate** (Ed Hawkins, Rowan Sutton)
24. **NIES** ([Hideo Shiogama](#))
25. **Oxford University** ([Myles Allen](#), Rachel James, [Dann Mitchell \(co-ordinator\)](#),
26. **Potsdam Institute for Climate Research; PIK** (Katja Frieler, Sebastian Ostb)
27. **Public Health England** (Clare Heaviside, Sotiris Vardoulakis)
28. **University College London** (Nick Watts)
29. **University of California** (Fran Moore, James Rising)
30. **Walker Institute** (Nigel Arnell, Ros Conforth)

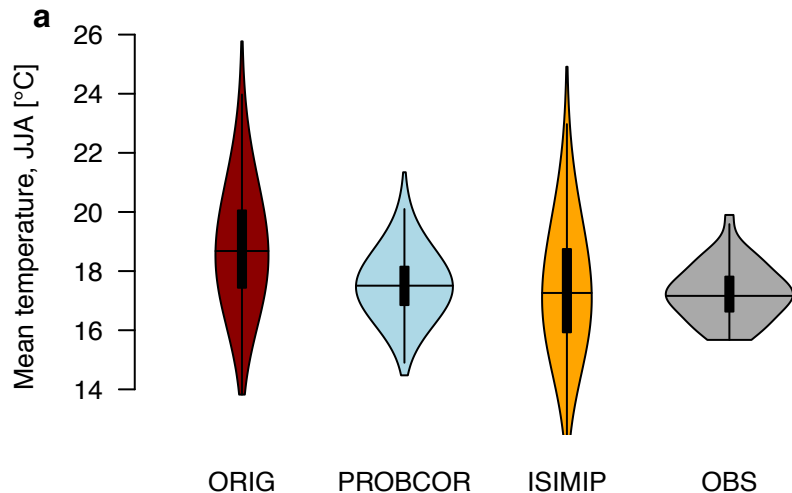
ISI-MIP collaborations

- HAPPI modelling protocol compatible with ISIMIP
- Model output will be provided bias corrected
- Keen for participation from the ISIMIP community.

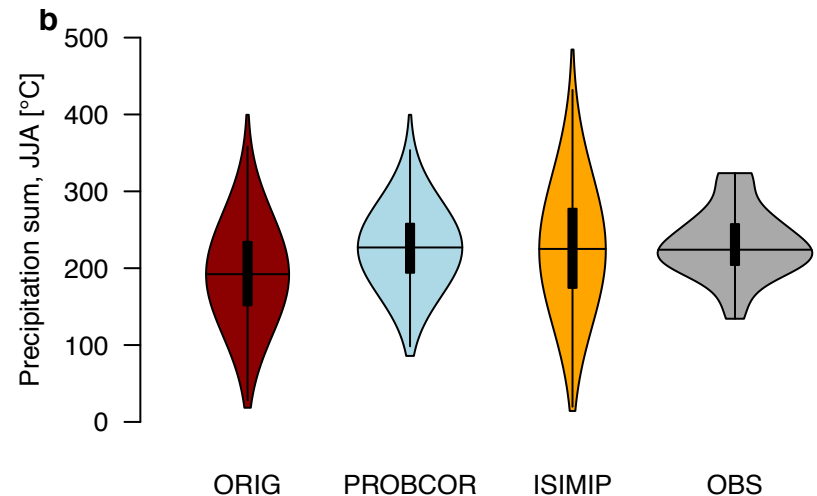
Bias correction

- What are you biases correcting to?
- Models sample spaces that observations do not.
- Bias correcting can result in physical inconsistencies.

Temperature



Precipitation



(Sippel et al, 2016; Hempel et al, 2013)

Impacts we are interested in

- *Extreme meteorology: Heat, precipitation and wind related risks.*
- *Health impacts relating to extreme hot or cold spells and infectious diseases.*
- *Flood risks changes, including droughts.*
- *Economic impacts from, e.g. flood damage*
- *Crop yield changes, specially in developing nations.*
- *Projected climatic extremes and sustainable development pathways.*
- *Changed extreme frequency on terrestrial carbon cycle.*
- *Hurricane frequency and location changes*
- *Open suggestions for other impacts*

Summary

- The UNFCCC and IPCC have asked the community a specific question.
- We are not necessarily set up to answer it.
- HAPPI presents an experimental design that is.
- There is still much to address, especially linking to the impacts community.

References

www.happimip.org

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