Our current hyperthermal?

Future climate, the Paris Agreement and impacts on society

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ClimateDann

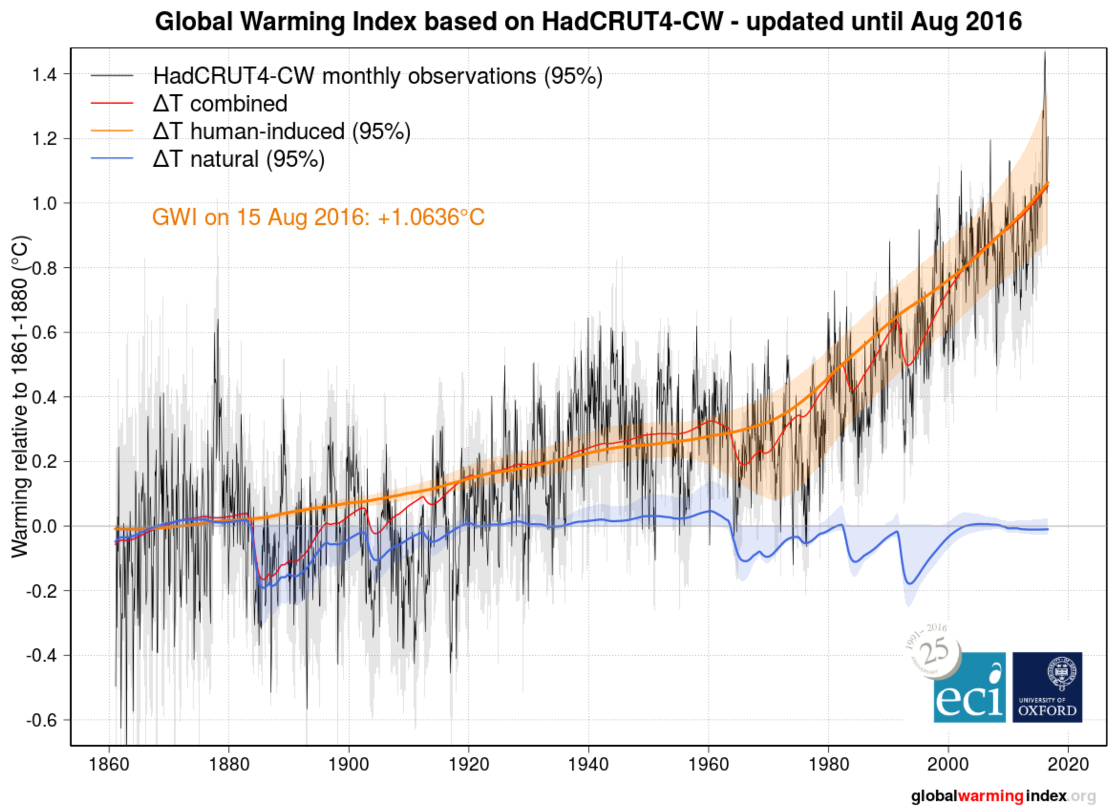
The Paris Agreement on Climate Change

"… to pursue efforts to limit the temperature increase to 1.5 ° C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change"

(Haustein et al, 2017: in revision)

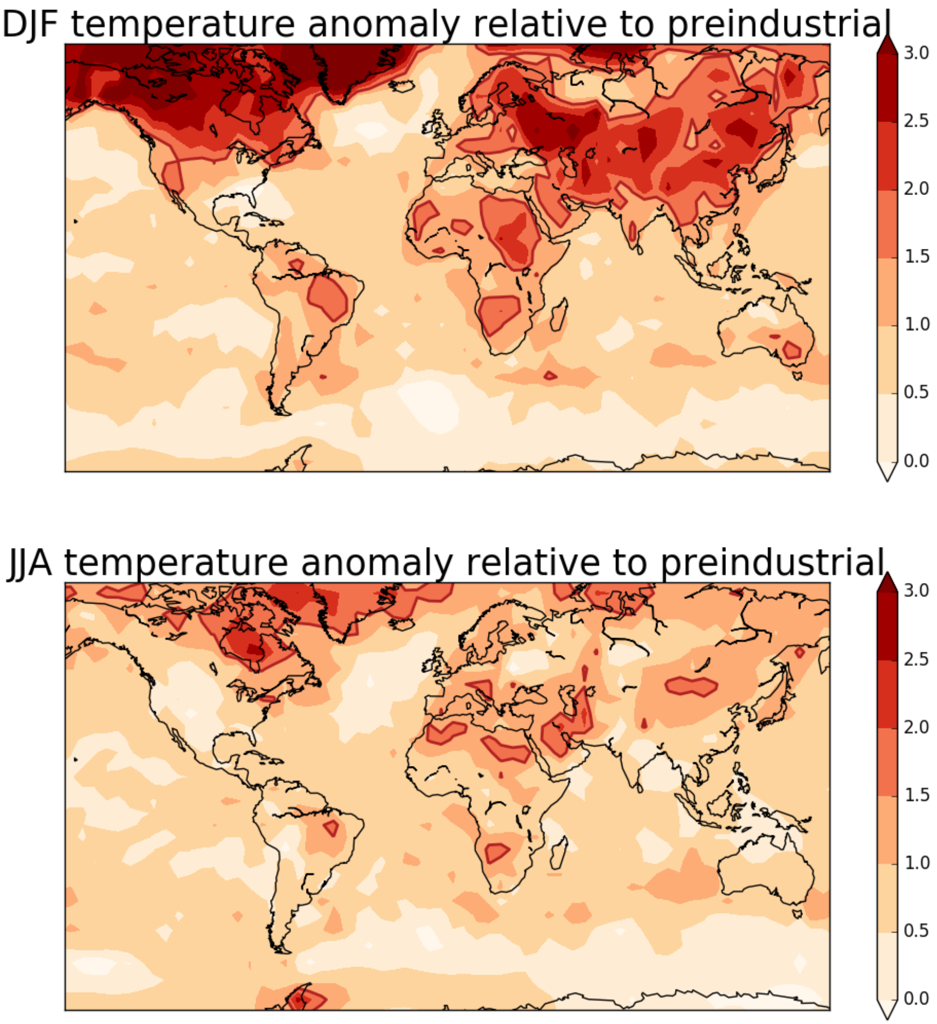
Where are we now?

- It is hard to define GMT.
- Haustein estimates we are ~1C above PI.
- Other studies suggestion 0.9-1.2



Where are we now?

- Figure shows current observed warming since preindustrial in HadCRUT4.
- Observations show regions that are warmer than 1.5C already.



> The scientists who produce those doomsday reports for the Intergovernmental Panel on Climate Change finally come clean. The planet has stubbornly refused to heat up to predicted levels

COMMENT

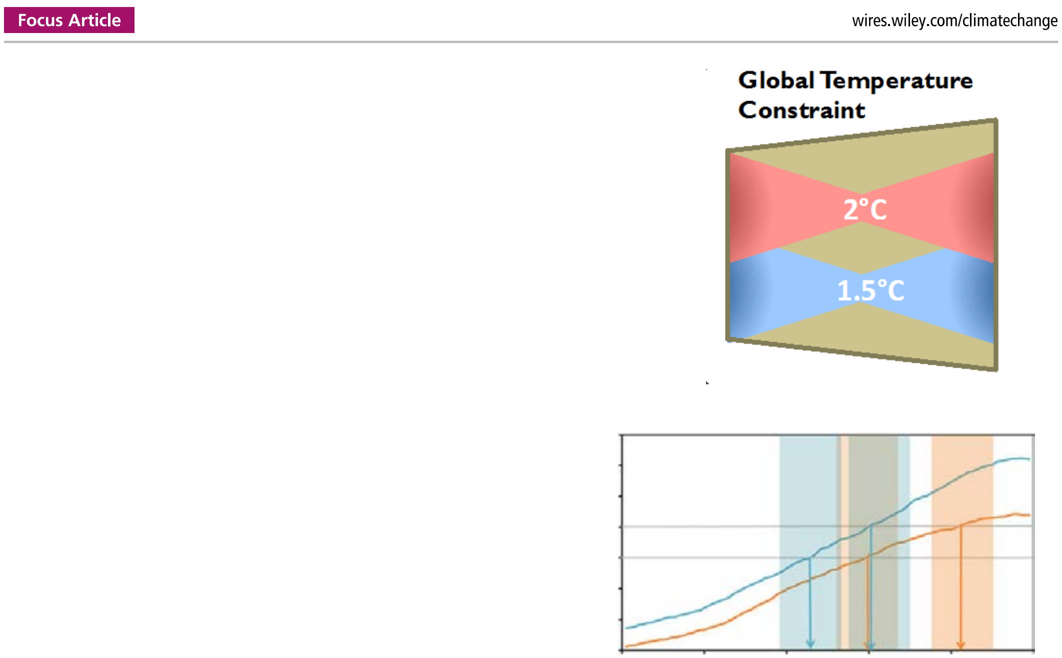
By James Delingpole, Guest Columnist

20th September 2017, 3:39 am | Updated: 20th September 2017, 4:05 am

low current levels before 2030.

- We then need to follow an extremely ambitious mitigation scenario.
- So 1.5C is NOT a geophysical impossibility.

How do we predict impacts in a future climate?



Examples of who have used these methods:

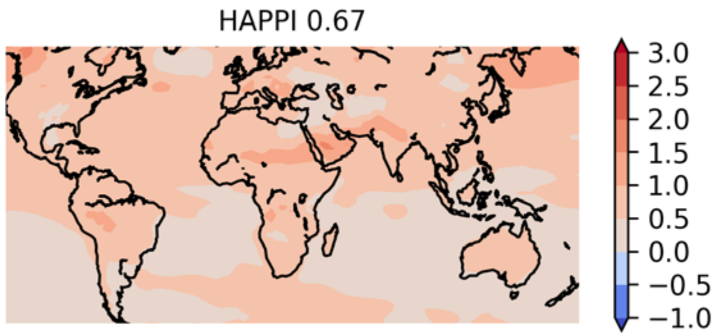
a) Sanderson et al, 2017
b) Mitchell et al, 2017
c) Huntingford et al, 2017
d) King et al, 2017

(adapted from James et al, 2017)

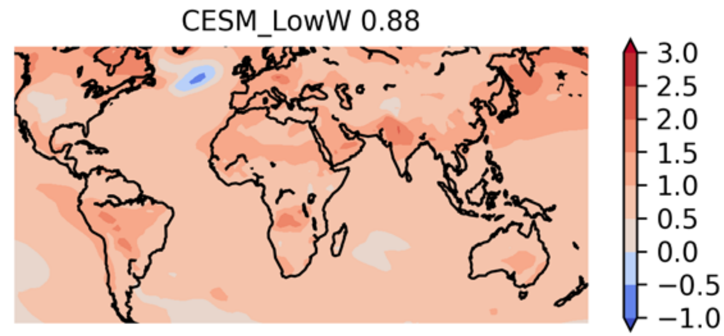
Does the method make a difference?

1.5-Hist JJA mean tas

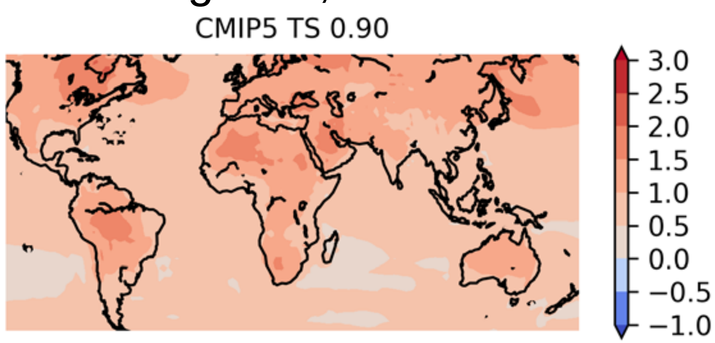
Mitchell et al, 2017



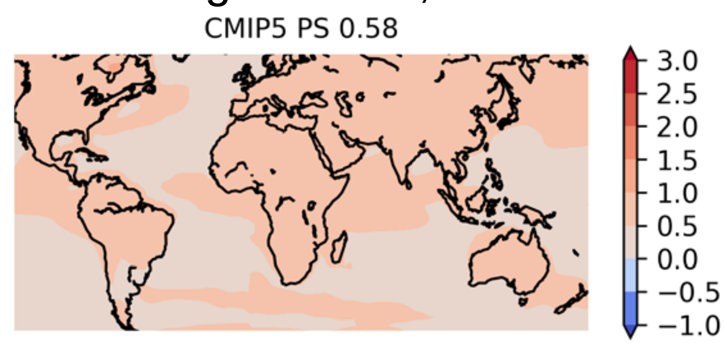
Sanderson et al, 2017



King et al, 2017

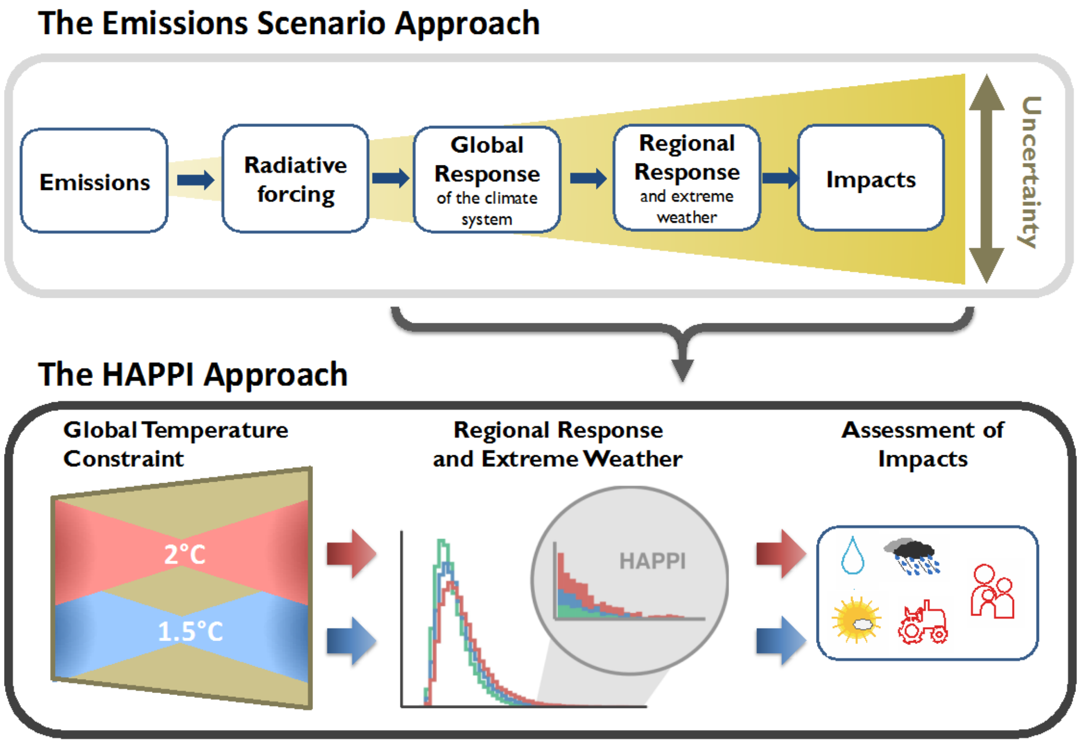


Huntingford et al, 2017



Half a degree Additional warming; Prognosis and Projected Impacts (HAPPI).

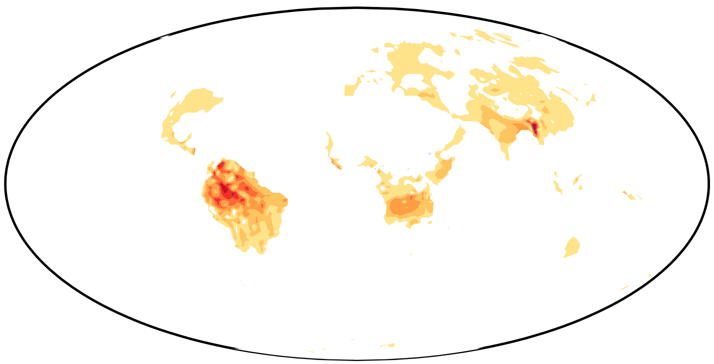
(Mitchell et al, 2017)



"... to pursue efforts to limit the temperature increase to 1.5 ° C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change"

Are global temperature limits a sensible framing of the problem?

(Baker et al, 2017: in review)

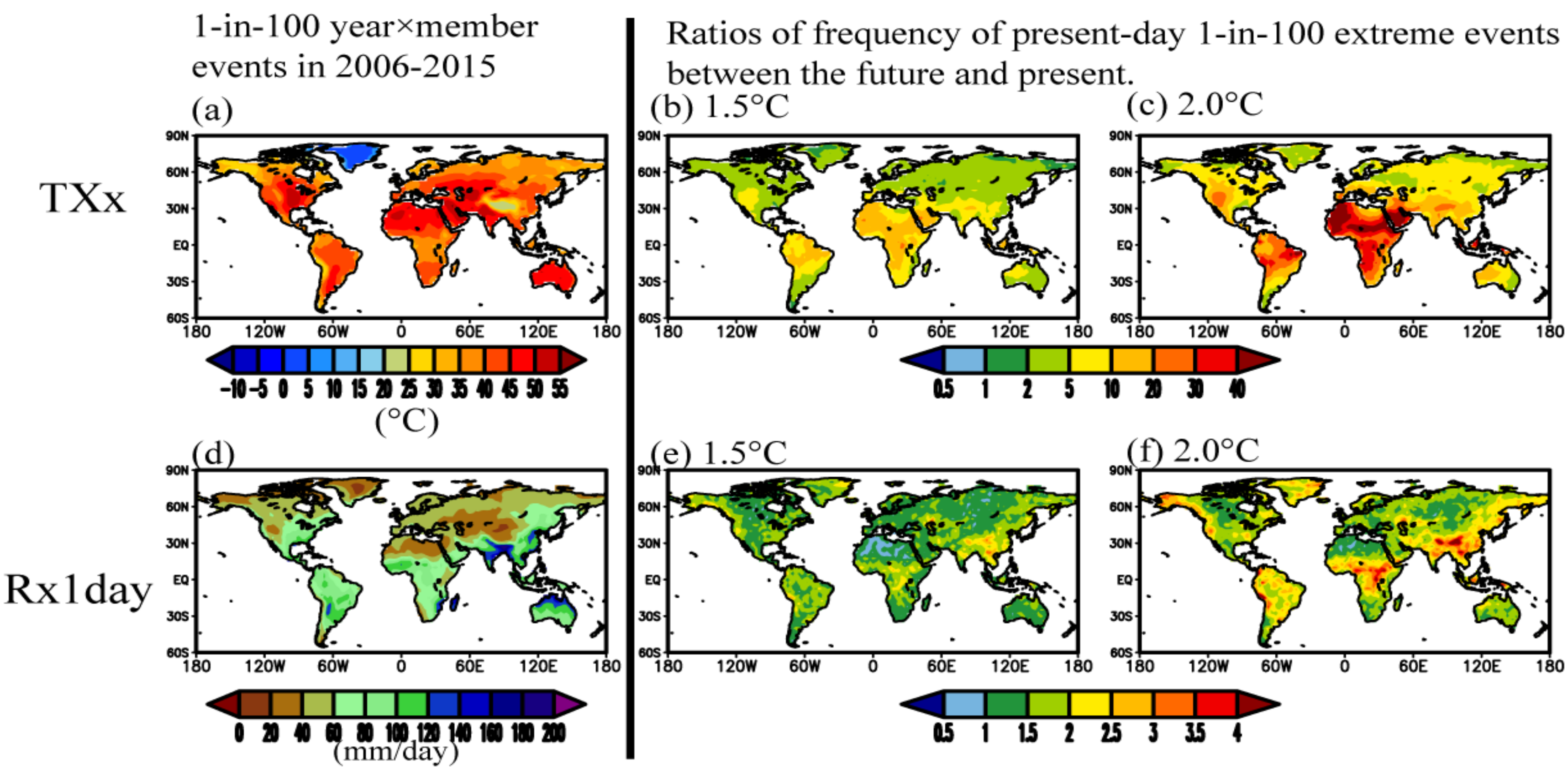


If we change the atmospheric composition, but keep the global meant temperature the same, what happens?

- 1 scenario with high CO2, 1 scenario with low CO2, both have GMT of 1.5C.
- A clear increase in hot days is observed under higher CO2 scenario.

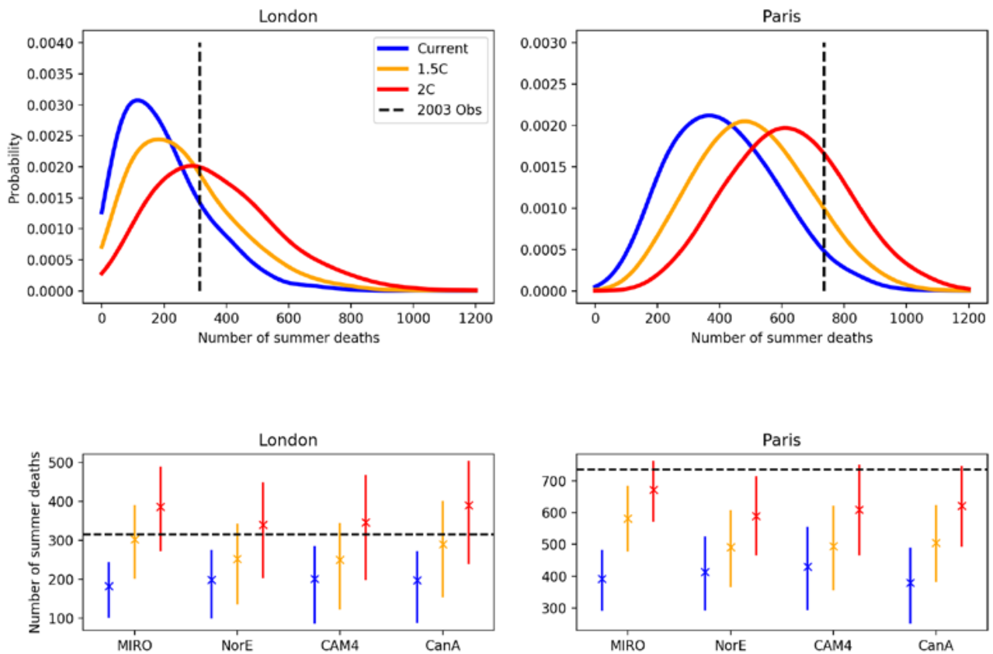
Future changes in extremes

(Shiogama et al, 2017: in review)



Future impacts – human health

(Mitchell et al, 2017: in review)

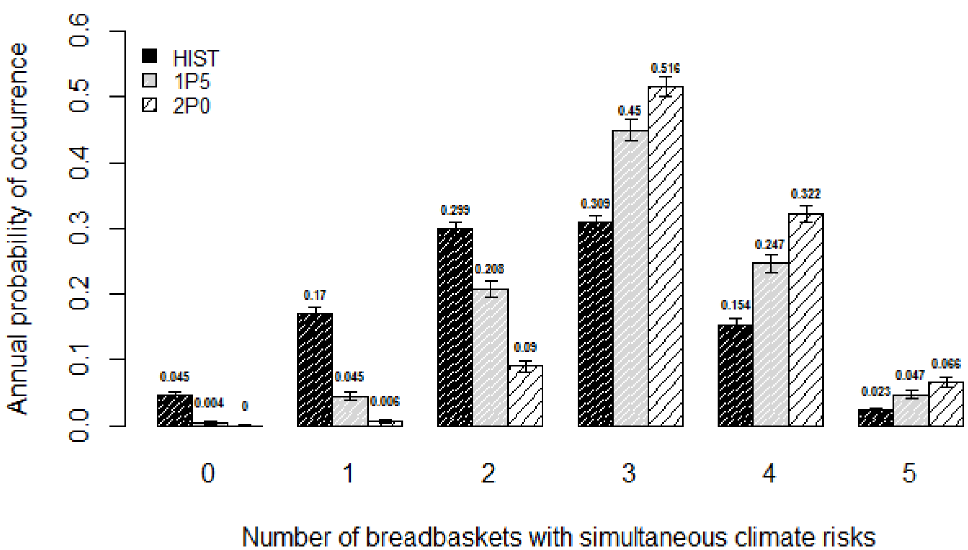


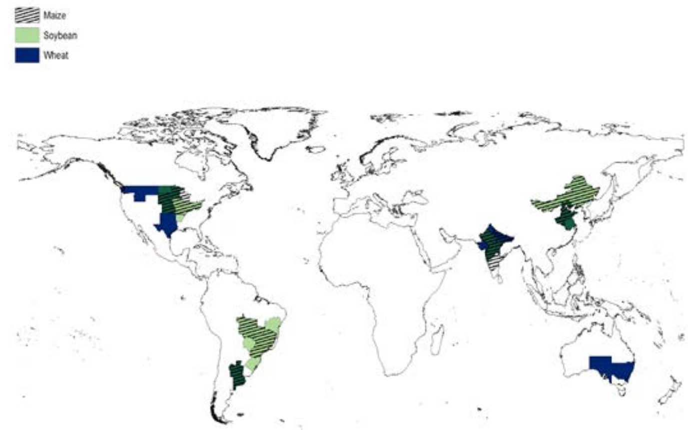
How would the 2003 European heatwave look like if it occurred in the future?

- Combining climate models with health models.
- Stabilization of climate at 1.5C over 2C would decrease mortality by ~15-22%.

Future impacts – crops (wheat)

(Guapp et al, 2017: in review)

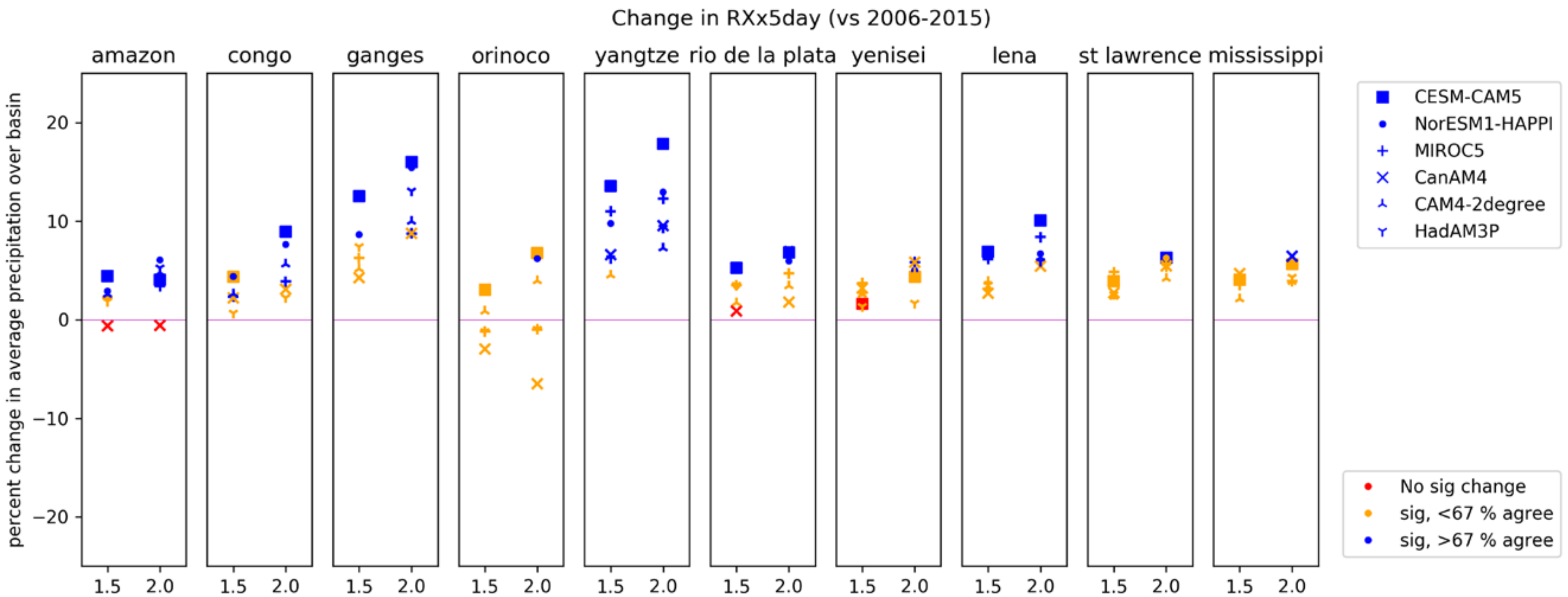




- The likelihood that none or just 1 breadbasket experiences risk decreases to ~zero.
- The return time of 5 breadbaskets failing together goes from 43 years to 15 years.

Future impacts - flooding

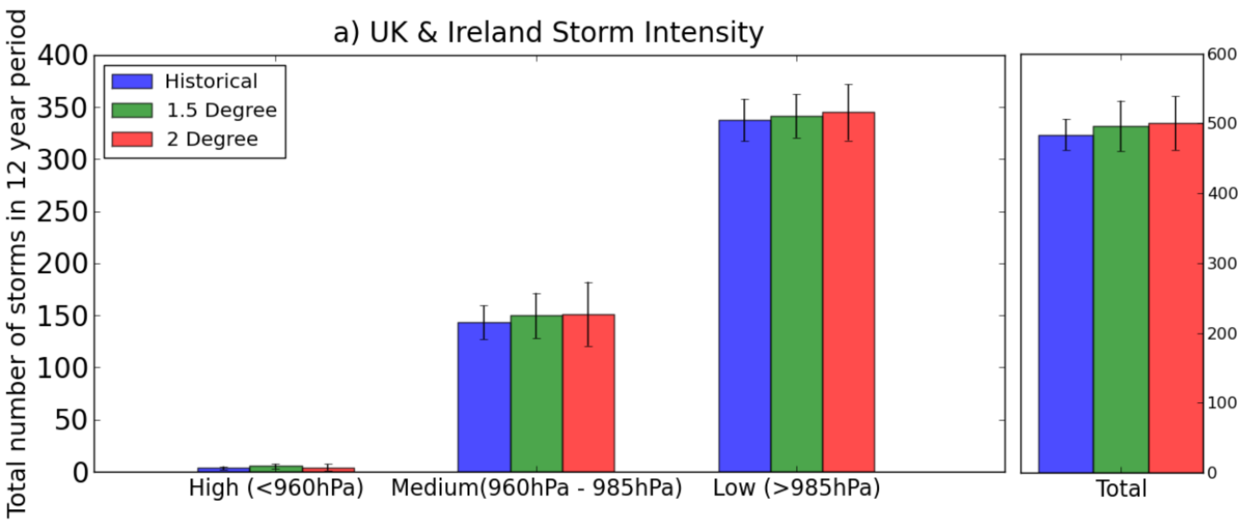
(Uhe et al, 2017: in prep)



- Detectable changes in most of the 10 largest river basins.

(Dan James dissertation (University of Bristol))

Future impacts – North Atlantic storms



- No real change in storm numbers observed.
- No change in storm strength.
- Small shift in storm tracks
- Similar arguments for Atlantic Hurricanes

University of BRISTOL

12 October 2017

The Paris Agreement: Understanding the physical and social challenges for a warming world of 1.5° C above pre-industrial levels

Paper type	Proposed author	E-mail of lead author	Potential co-authors	Editor	Proposed title
Introduction	All editors			All	
Review article	Achim Steiner (Oxford, UK)	achim.steiner@oxfordmartin.ox.ac.uk		JH	How 1.5 degrees came about
Research article	Hideo Shiogama (National Institute for Environmen	shiogama.hideo@gmail.com	Jana Sillmann, Michael Wehner	DM	Wind energy potential and connections to extreme indices
Review article	Sonia Seneviratne (ETH, Switzerland)	sonia.seneviratne@ethz.ch	Richard Wartenburger, Benoit Guillod, Annet	DM	Climate extremes, land-climate feedbacks, and land use forcing at 1.5°C
Research article	Robert Nicholls (University of Southampton, UK)	R.J.Nicholls@soton.ac.uk	Sally Brown	JH	Sea level rise under 1.5 and 2 degrees, implications for small islands.
Research article	Richard Betts (Met Office, UK)	richard.betts@metoffice.gov.uk	Carl Friedrick Schleussner	DM	Integrating climate and impact models under 1.5 degrees.
Review article	Marten van Aalst (Red Cross/Red Cresent, The Net	vanaalst@climatecentre.org	Richard Betts	BM	Reviewing policy-relevant impacts under 1.5 degrees
Research article	Cynthia Rosenzweig (NASS GISS, USA)	crr2@columbia.edu	Rachael McDonnell	CL	A global perspective in crop changes following the Paris Agreement.
Research article	Pete Smith (University of Aberdeen, UK)	pete.smith@abdn.ac.uk	Yadvinder Mahli	CL	The biodiversity impacts of 1.5 degrees: avoided and unavoided losses.
Research article	Joyashree Roy (Jadavpur University, India)	joyashreeju@gmail.com		MA	Changes in econometrics under 1.5 degrees.
Research article	Pierre Friedlingstein (Exeter, UK)	P.Friedlingstein@exeter.ac.uk	Jason Lowe, Joeri Rogelj, Richard Miller, Neb	MA	Potential mitigation pathways to achieve 1.5 degrees.
Research article	Jan Fuglesvedt (CISERO, Norway)	j.s.fuglestvedt@cicero.oslo.no	Myles Allen	CL	Short lived climate pollutants and net zero.
Research article	Stuart Haszeldine (Edinburgh, UK)	Stuart.Haszeldine@ed.ac.uk		MA	Negative emissions technologies to achieve the Paris Agreement commitments.
Research article	David Keith (Harvard University, USA)	david_keith@harvard.edu		DM	Solar geoengineering as part of an overall strategy for meeting the 1.5C Paris ta
Review article	Elmar Kriegler (Potsdam Institute for Climatic Rese	kriegler@pik-potsdam.de	Michael Grubb, Ottmar Edenhofer	JH	Appraisal of energy-land-economic pathways to 1.5 degrees.
Review article	Felix Pretis (Oxford University, UK)	felix.pretis@nuffield.ox.ac.uk		BM	Economic appraisal of a 1.5 degrees mitigation target
Review article	Nick Eyre (Oxford University, UK)	nick.eyre@ouce.ox.ac.uk		LR	Understanding societal behaviours for emissions reductions
Research article	Luis Gomez-Echeverri (IIASA, Austria)	luis.gomez.echeverri@gmail.com		JH	Climate and Development:Enhancing Impact through Stronger Linkages in the I
Review article	Rob Verchick	verchick@loyno.edu		LR	Loss and damage
Review article	Ian Holman (Centre for Ecology and Hydrology, UK	i.holman@cranfield.ac.uk	Paula Harrison	JH	Adaptation questions for 1.5C and 2C climate scenarios.
Review article	Lavanya Rajanani (Centre for Policy Research, Ind	lrajamani@gmail.com	Jacob Werksman	BM	Implications of the 1.5 degree target for governance.
Opinion piece	Henry Shue		None	LR	Mitigation Gamble: Uncertainty, Urgency, and the Last Gamble Possible
Research article	Sonja Klinsky (Arizona State University, USA)	Sonja.Klinsky@asu.edu	Harald Winkler	LR	Building Equity In: Strategies for Integrating Equity in Modeling for a 1.5 Trajecto
Opinion piece	Peter Frumhoff (Union of Concerned Scientists, US	PFrumhoff@ucsusa.org		DM	The 1.5C Target and the Conundrum of Solar Geoengineering Research
Research article	Jason Lowe			DM	

Conclusions

- The Paris Agreement on climate change aims for a 1.5C limit on GMT.
- Results of climate impacts are very method dependent.
- Results from HAPPI show detectable changes in human mortality, crop failure and river flooding, but not storminess. (www.happimip.org)