

Regional climate information needs related  
to climate prediction/projections for  
impact/risk assessment of different sectors  
(inc. SSPs)

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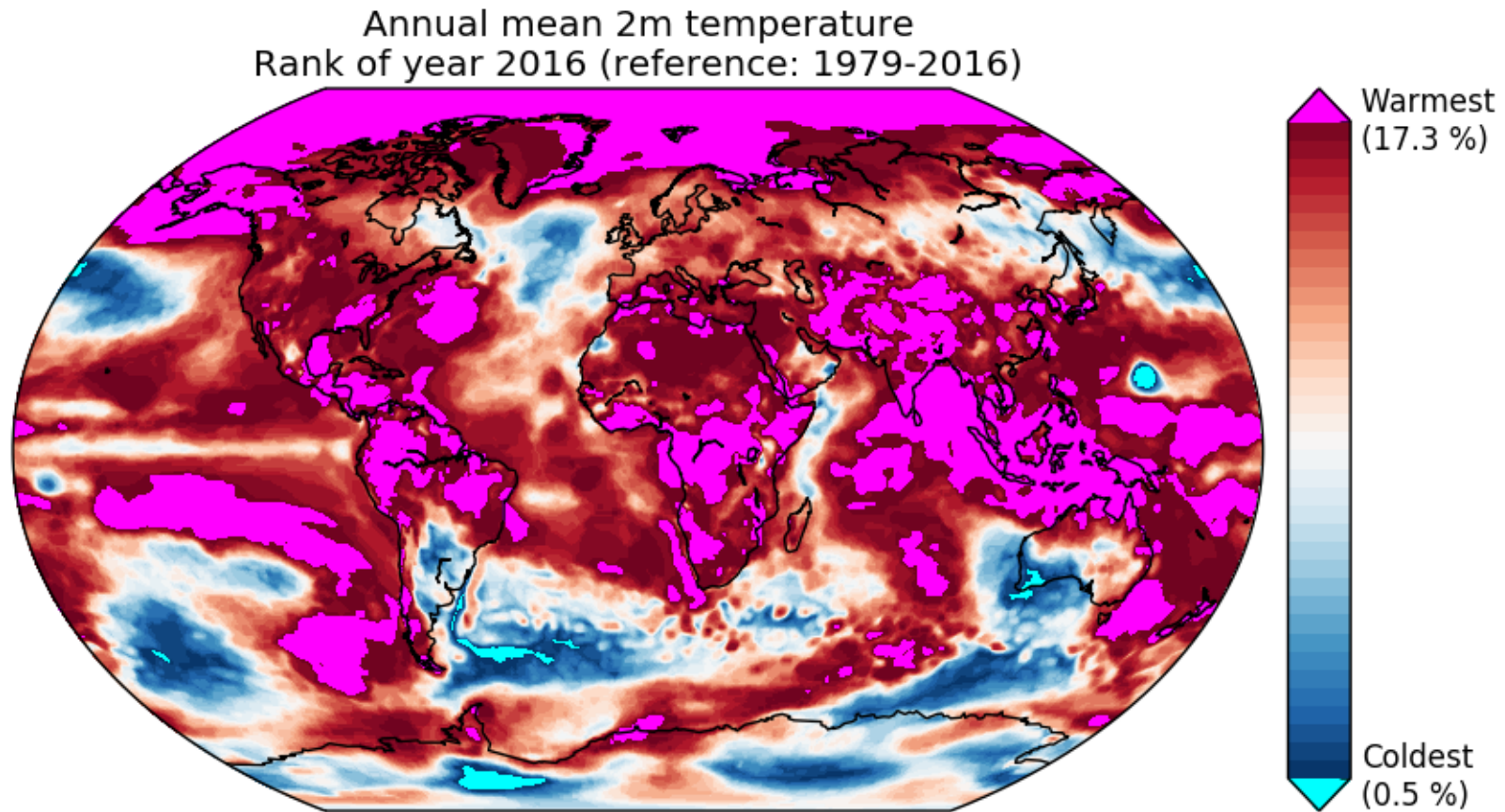
Brian O'Neill

# Looking at the near term

1. What kind of near-term climate information, and in particular of extreme events, is most relevant for WGs 1 and 2?
2. What is the relative role of model, scenario and internal uncertainty
3. What uses are being made of the climate information for the next 20 years and by which sectors
4. What are the communication challenges of the near-term climate hazard?

# What is going on now

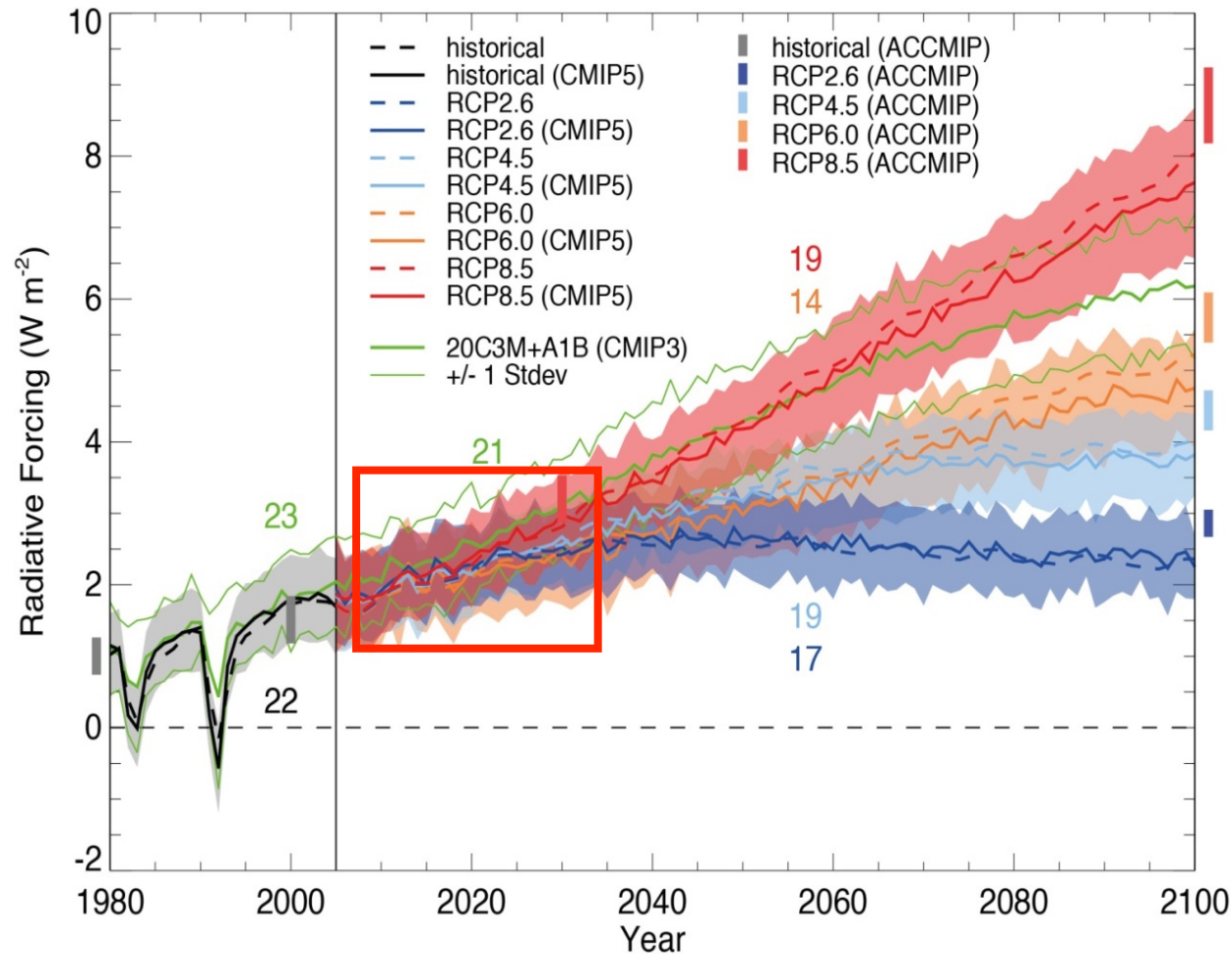
Ranking of the 2016 annual mean temperature over the previous 37 years from ERA Interim.



Data: ERA-Interim. Figure: F. Massonnet - BSC

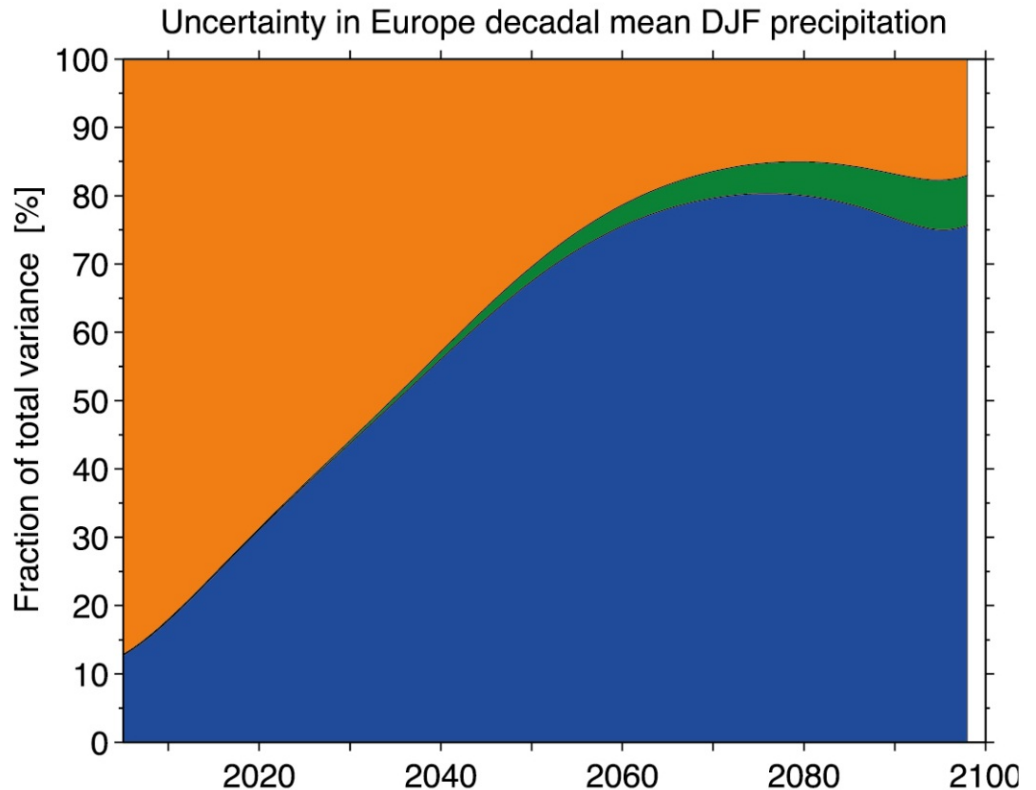
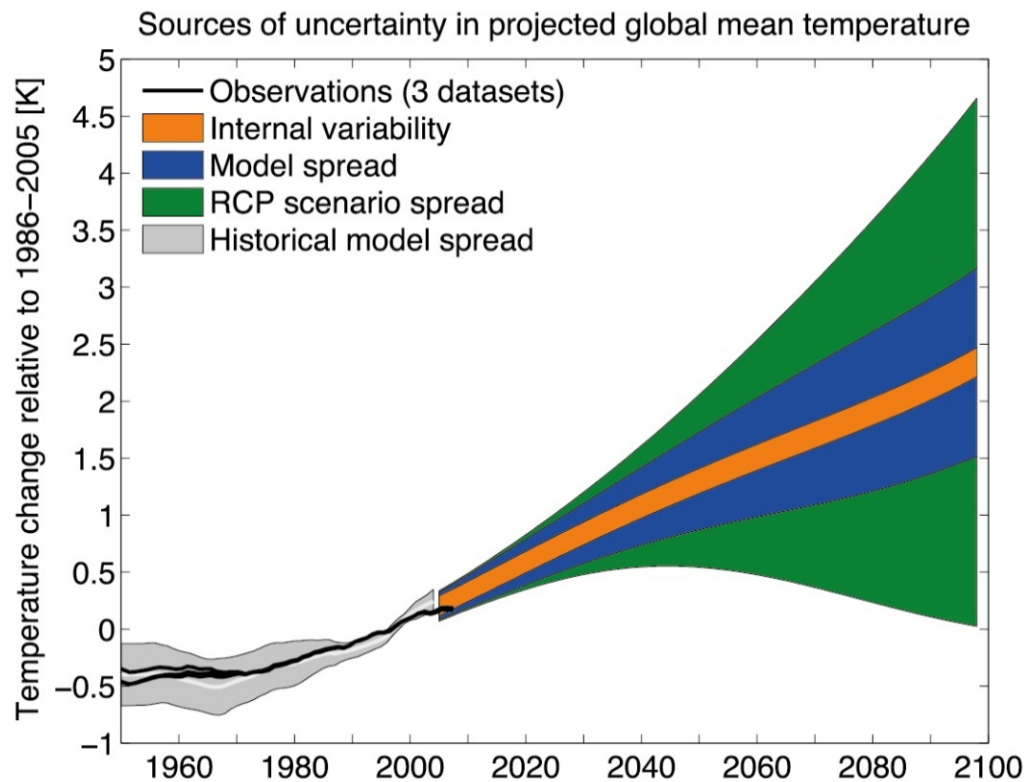
# The near future

Global mean radiative forcing ( $\text{Wm}^{-2}$ , dashed) and effective radiative forcing (solid) with 1850 as baseline. **Little difference between the RCPs before 2040.**



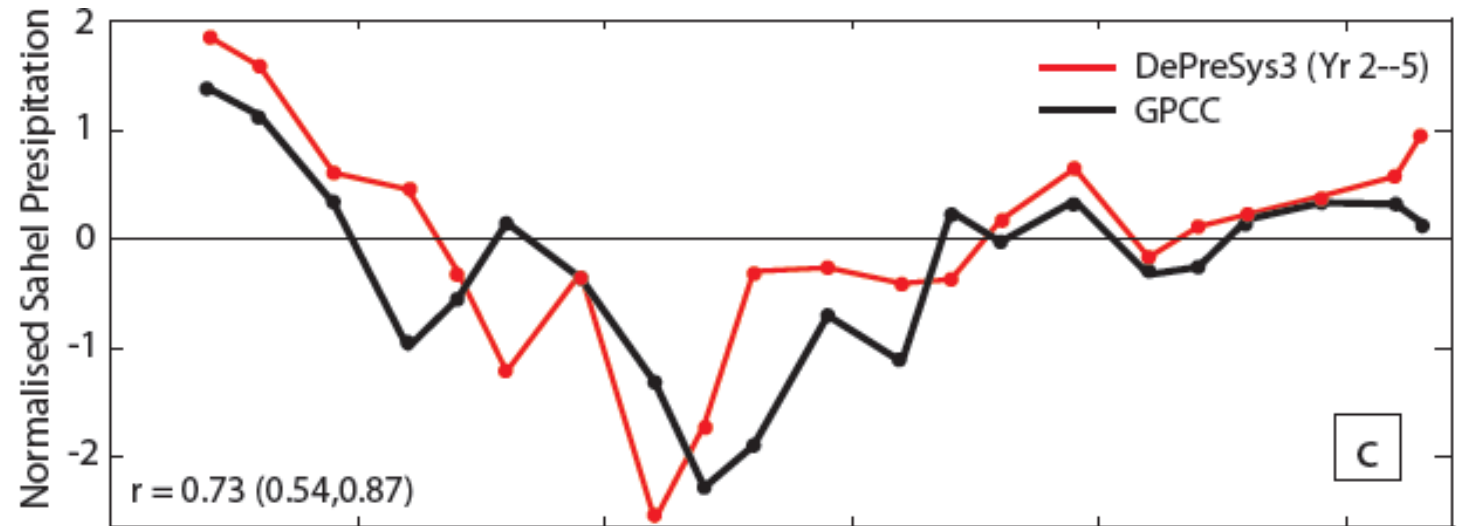
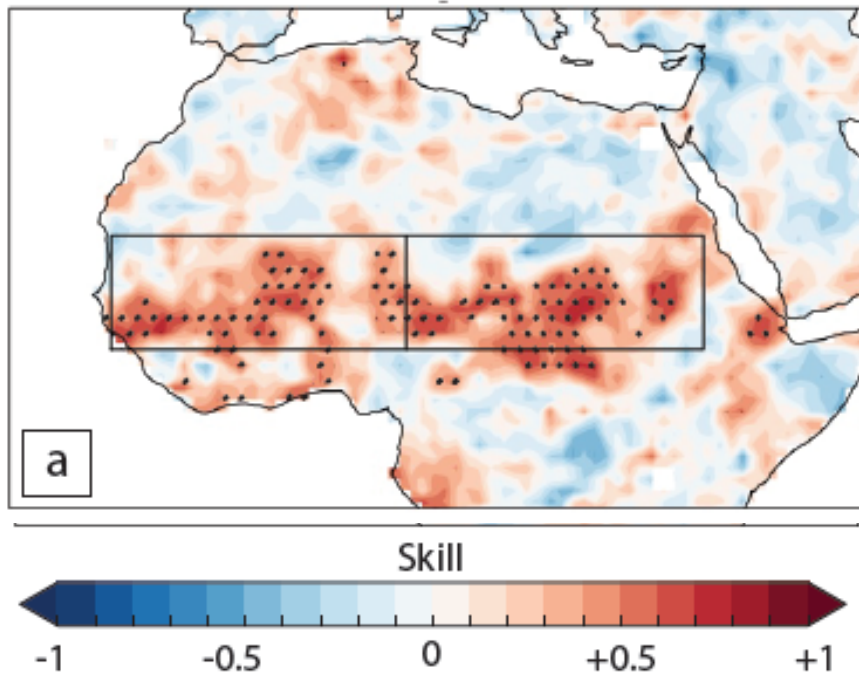
# The near future

The sources of uncertainty include the internal variability, model differences and scenario spread. Internal variability is an uncertainty source particularly important for the near term that could be reduced, especially at regional scales.



# What can be done for the near future

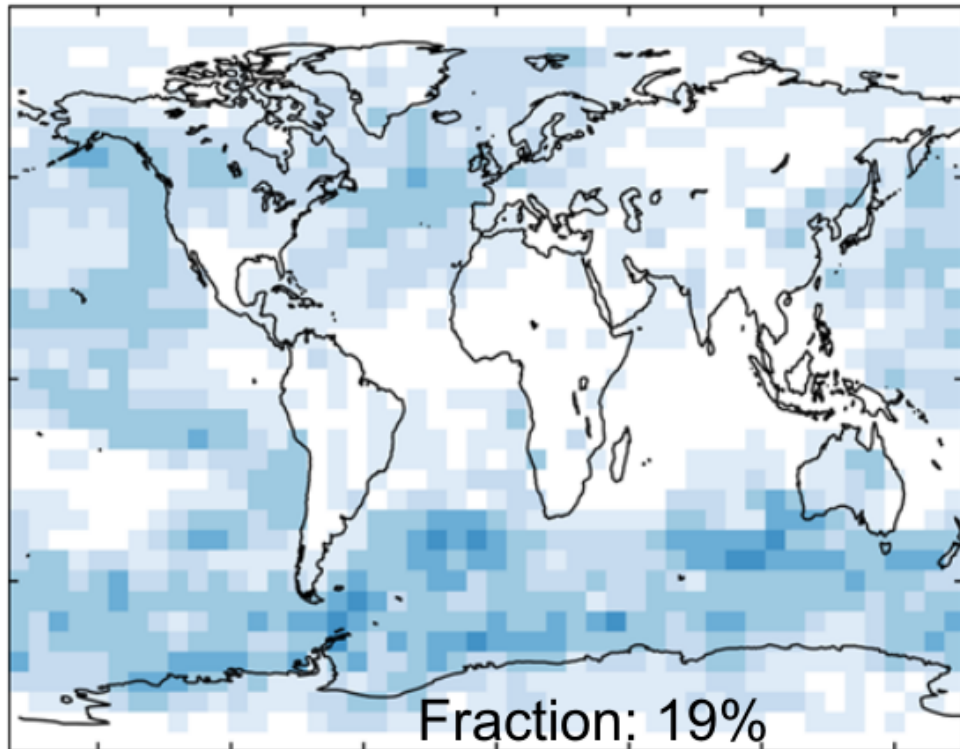
Correlation of the ensemble mean precipitation from decadal predictions (years 2-5) of DePreSys3 (N216-ORCA025).



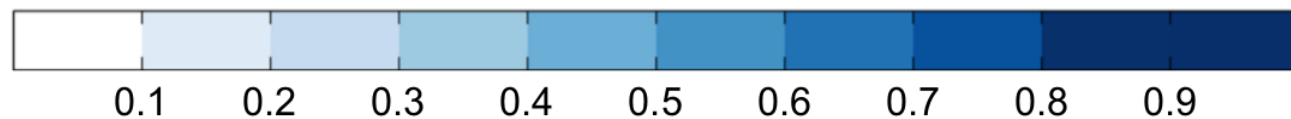
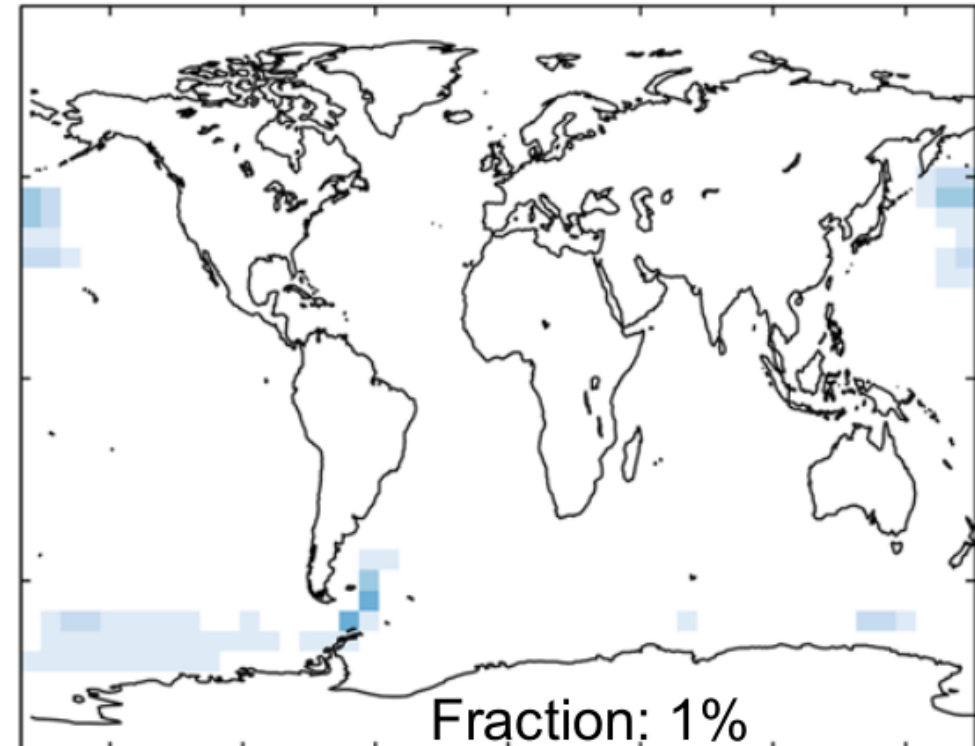
# What makes the next 20 years interesting

Fraction of simulations that show a cooling trend in the first N years of the FAMOUS 30-member ensemble (1% CO<sub>2</sub> from PI run) for N = 20 and 50. The average fraction of the surface area with a cooling trend is also given.

20 years



50 years



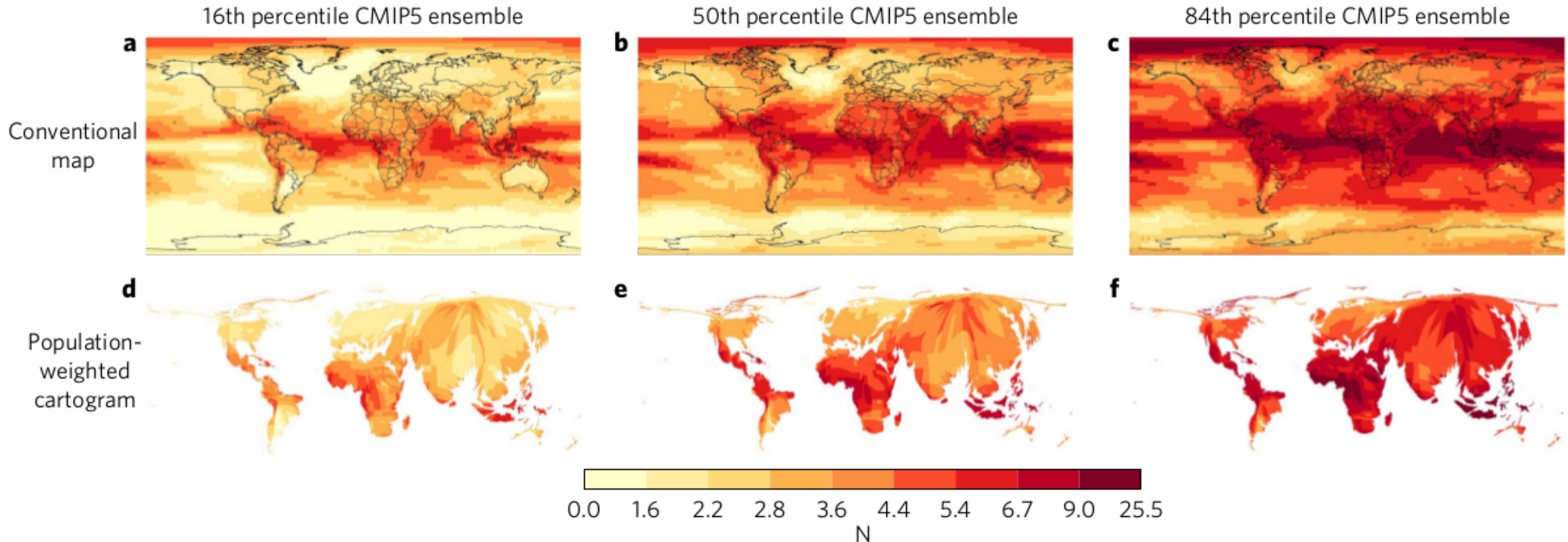
# What makes the next 20 years interesting

A winery accepted the impact of warming on its business and decided to look for new locations for its vineyards. To ensure the wine quality, beyond purchasing land at higher elevation, they consider acquiring land in South America in areas where wine is currently not produced. The winery requested regional climate information for the cycle of the vine, lasting 30-40 years.



# What makes the next 20 years interesting

Climate emergence under the RCP4.5 scenario. Annual mean signal-to-noise ratio. Note the population-weighted interpretation in the cartogram.



# An additional thought

WGI tends to give a disturbing message about regional climate change. We find ourselves communicating negative messages (compare with research in genomics trying to cure cancer). And when we say we improve it is to increase the certainty of the disaster message.

Another good reason for the **handshake**: warning message could come with a positive message about new opportunities.

# The medium and longer term

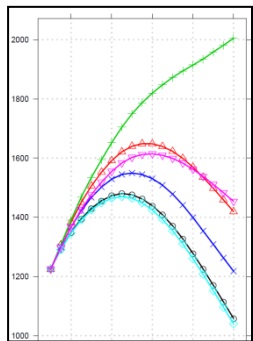
1. Use of SSPs by sector, to date
2. Impacts and CS community request for CMIP6 output
3. Climate information informing Reasons for Concern

# 1. Shared Socio-economic Pathways (SSPs)

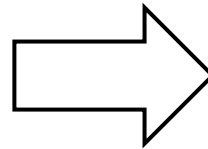
SSPs 1-5



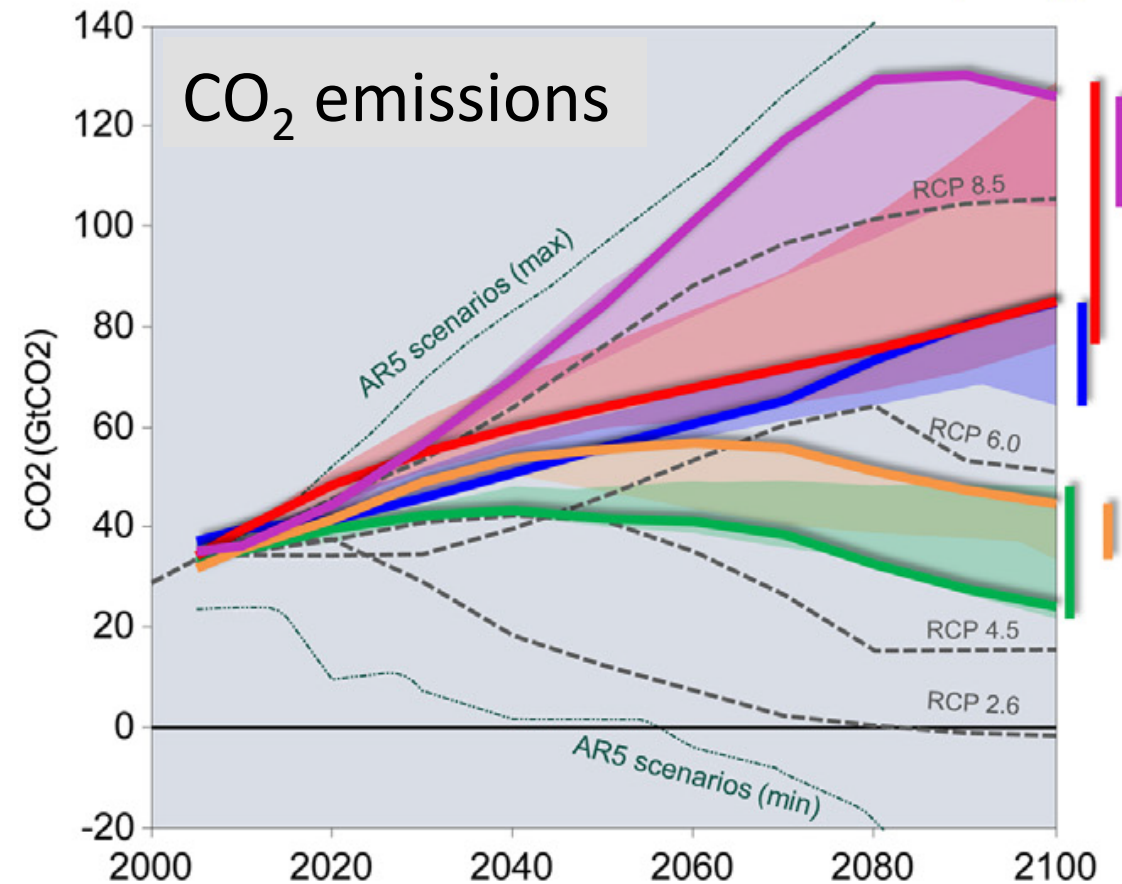
Narratives



Quantitative  
Elements



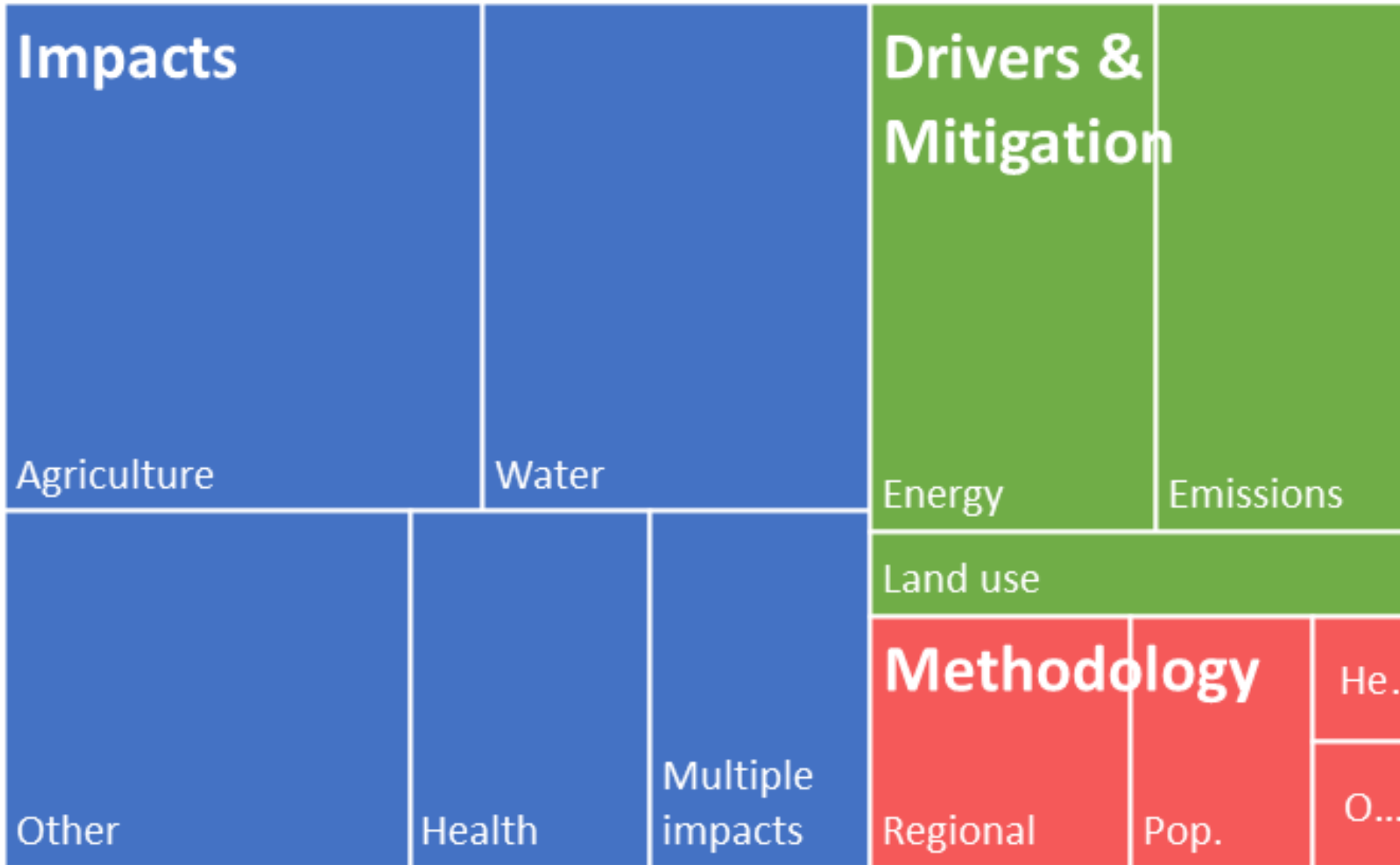
IAM scenarios:  
Energy, Land use, Emissions



Riahi et al., 2016.

# SSP Applications: Large coordinated projects

		SSP-related Information		
Project		Narratives	Quant. Elements	IAM scenarios
Sectors	AgMIP	Agricultural Model Inter-comparison	X	X
	ISIMIP	Impact Model Intercomparison	X	X
	IPBES	Intergovernmental Platform, Biodiversity and Ecosystem Services	X	X
Sust. Dev.	TWI2050	The World in 2050	X	X
	CD-LINKS	Linking Climate and Development Policies	X	X
	Shock Waves	World Bank Report: Climate & Poverty	X	X
Compare	IMPRESSIONS	Impacts and Risks from High-End Scenarios	X	X
	BRACE	Benefits of Reduced Anthropogenic Climate change	X	X



SSP  
Applications:  
200+ papers

Thanks to Bas van  
Ruijven, ICONICS  
database

He.. (Health)

O... (Other)

## 2. CMIP6 variable needs, impacts/CS communities

Vulnerability, Impacts, Adaptation and Climate Services (VIACS) Advisory Group

Most variables needed were already present in CMIP5

- Several community-specific packages available for CMIP6

- Interest in evaluation of impact-relevant metrics

Some new variables requested

- E.g., statistics of high-frequency events at monthly scale

- E.g., sub-grid cell tile information

Some needs expected to be met from downscaling products

- E.g., high-resolution, bias-corrected output on temp/precip extremes

Multi-model approach to climate information is critical

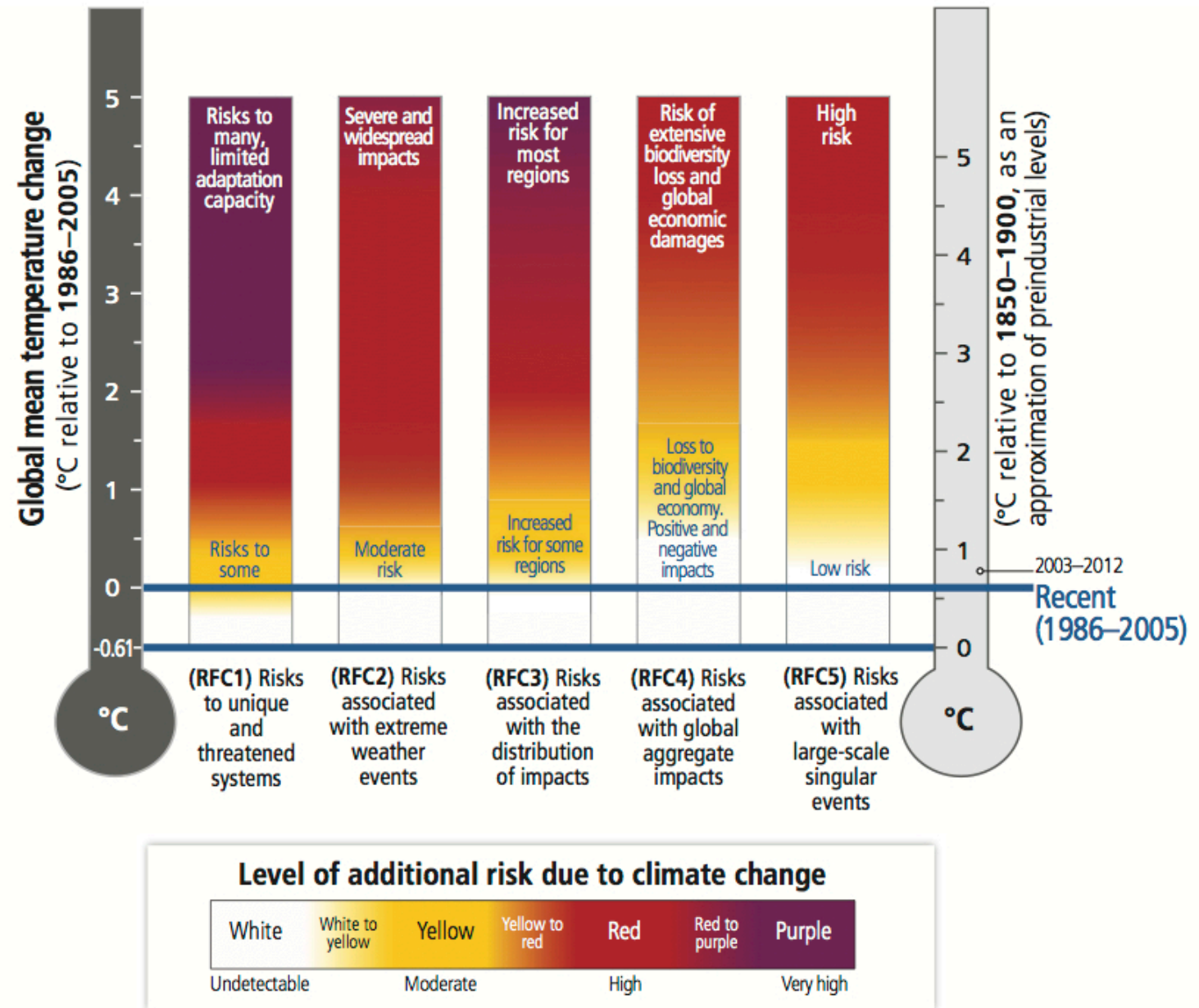
- Desire for common gridding of model output

VIACS interested in continuing facilitation of WG1-WG2 links

### 3. IPCC Reasons for Concern

Based on risks to society and ecosystems

Supported by, and in some cases drew directly on, observed and projected climate system outcomes

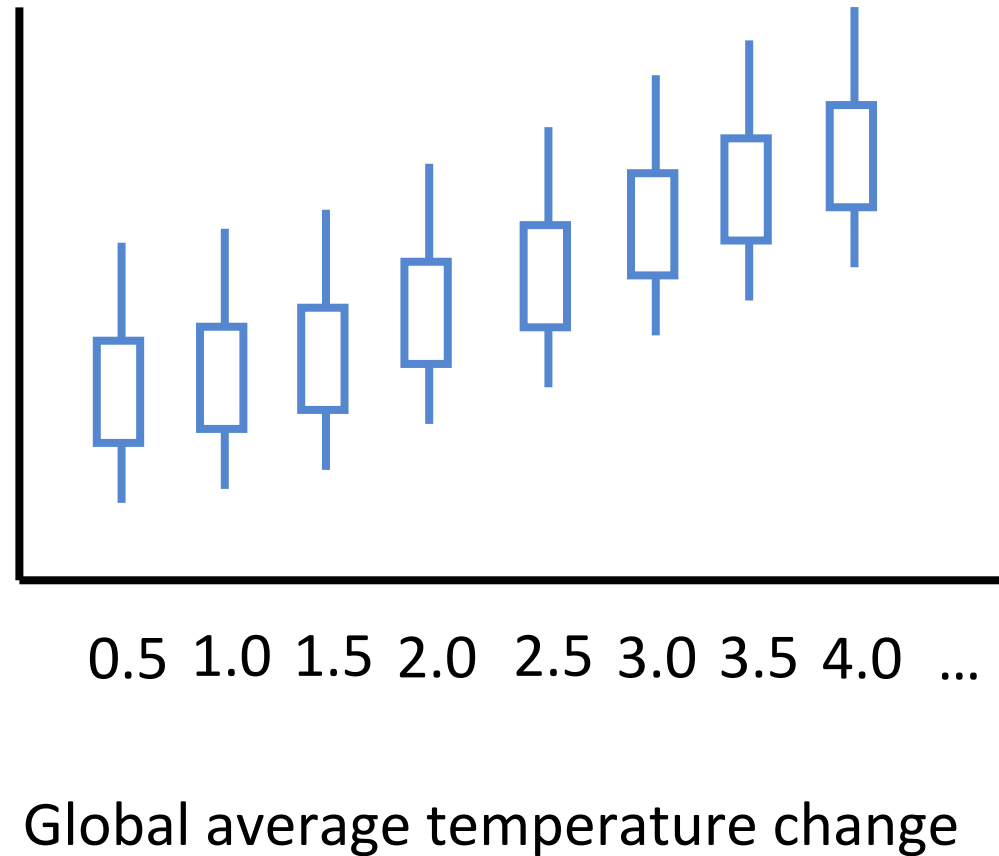


# Climate information in RFCs, AR5

Climate system outcomes/metrics	RFC
<b>Arctic sea ice extent</b> Detection and attribution E.g., Proportion of models showing nearly ice-free Arctic	1
<b>Shrinking/receding mountain glaciers</b>	1
<b>Extreme heat/precip events</b> Detection and attribution E.g., Projected changes in magnitude/likelihood of daily max temp	2
<b>Rapid (decade-century) SLR due to ice sheet loss</b> Timing of threshold for loss of Greenland Ice Sheet Warming level for substantial contribution from WAIS	5
<b>Rate of warming</b> Climate velocity	Additional RFC
<b>Ocean acidification</b>	Additional RFC

# RFC needs: Outcomes by 0.5-degree increments

Extreme heat  
Extreme precip  
Arctic sea ice extent  
Mountain glacier extent  
Climate velocity



# RFC needs: Outcomes by 0.5-degree increments

