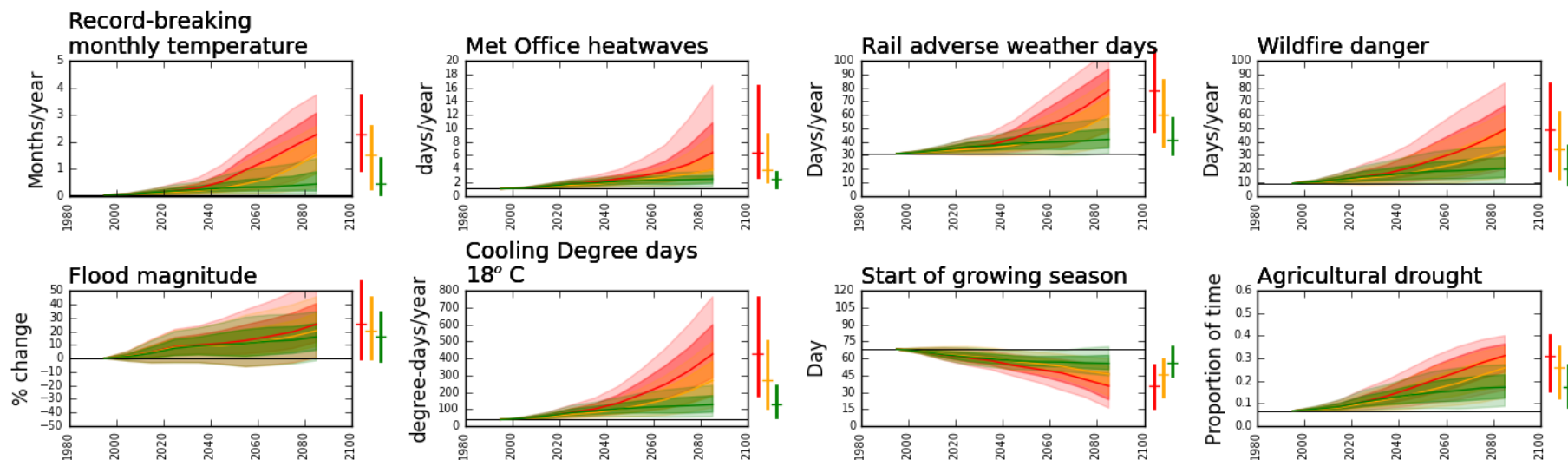


INDICATORS OF CHANGING CLIMATE RISK IN THE UK



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(Leeds)

Outline

Objectives of the project

Some core principles

Methodology and risk indicators

Overview of results

Key conclusions

Objectives



1. Characterising and quantifying climate-related risks
2. Managing climate-related risks through adaptation
3. Co-producing climate services

Project objectives:

- *to define policy-relevant indicators of climate risk*
- *to calculate indicators for different emissions pathways*
- *to calculate indicators for different levels of warming*
- *to produce a small number of spatially-coherent scenarios*

Motivation

In order to enhance resilience we need to understand current and future risks

There is surprisingly little consistent information on potential changes in risk across the UK in terms relevant to policymakers at national and local levels

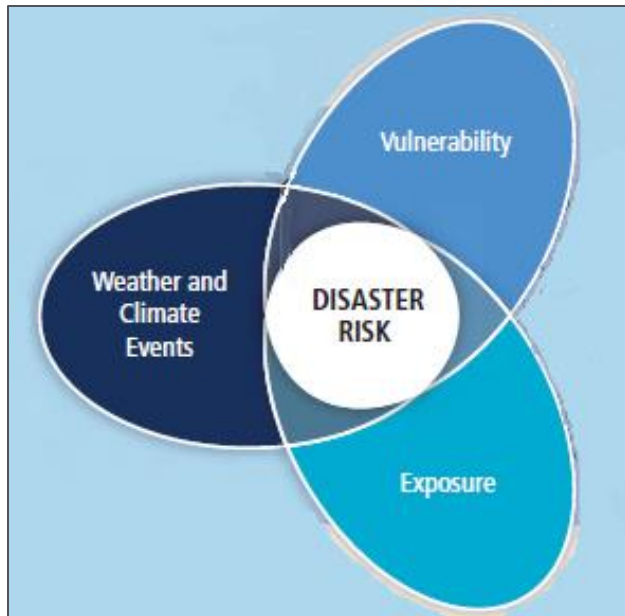
CCRA3, developing national policy, and declarations of 'climate emergency' constitute a demand for evidence

Core project principles

1. Calculate **indicators** rather than estimate **impacts**
2. Consult and engage with **stakeholders**
3. Use **UKCP18** climate projections

Indicators of climate risk

An indicator is representative of some type of consequence – for example for policy



IPCC SREX (2010)

Risk is a function of **hazard**, **exposure** and **vulnerability**

We concentrate on indicators of hazard (and resource), but our thresholds generally represent exposure and vulnerability, so our indicators represent **risk**

Indicators

Sector	Indicators
Health and well-being	Activation of NHS Heatwave and Cold Weather Plans Cold Weather Payments Met Office heatwaves
Transport	Road melt risk, road accident risk, fog Rail buckle, signal and systems failure risk Rail adverse and extreme weather days
Energy	Heating and cooling degree-days
Agriculture	Start of field operations, growing season start Frost days and extreme temperatures Growing degree days and crop growth duration Agricultural drought
Wildfire	MOFSI and Daily Hazard Assessment danger levels
Hydrological	River flows, flood frequencies, low flow frequencies, hydrological droughts
Emergency planning	Extreme heat and cold spells

Stakeholder engagement

Provided details on sector-specific indicators

Identified new relevant sectors

Identified pathways of interest

2^o v 4^o pathways

Identified scales of interest



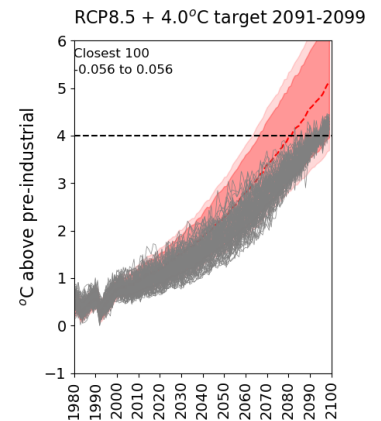
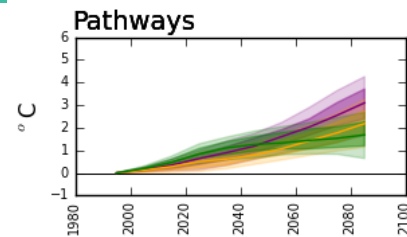
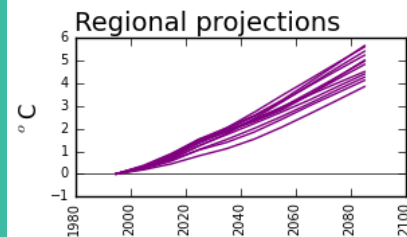
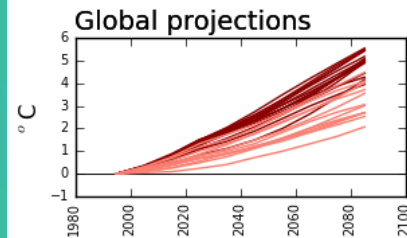
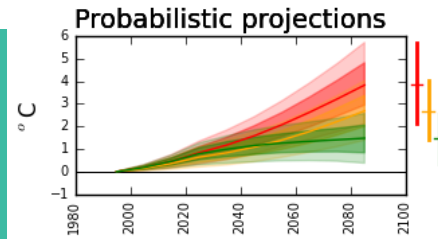
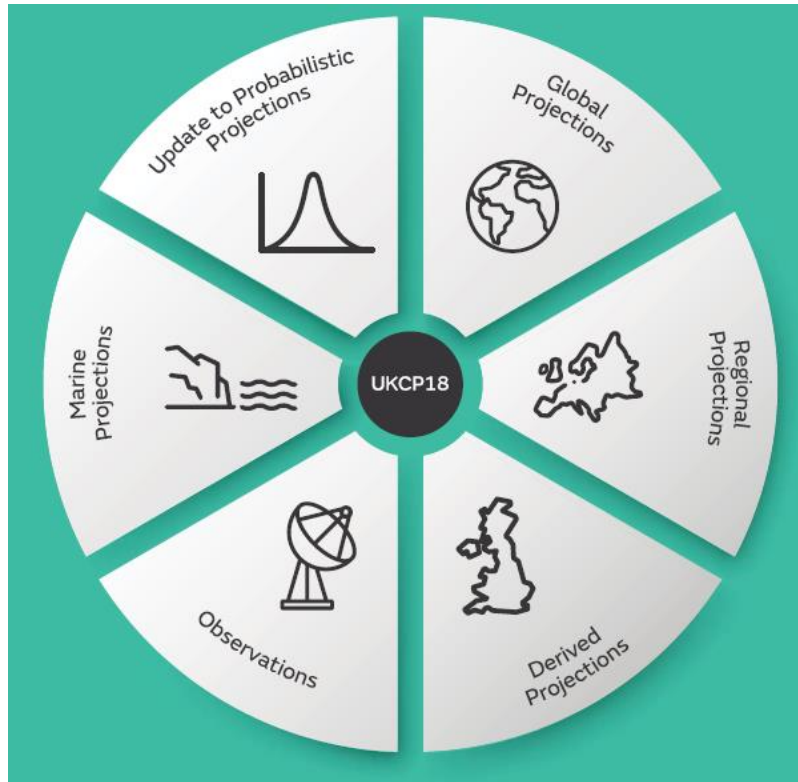
Kent Resilience Forum



PREPARING FOR EMERGENCIES IN KENT AND MEDWAY



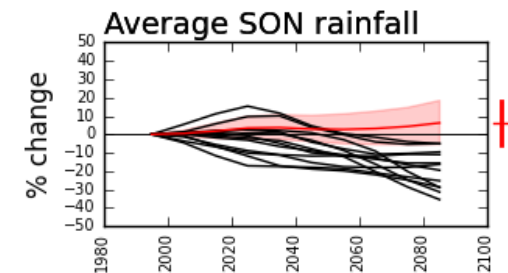
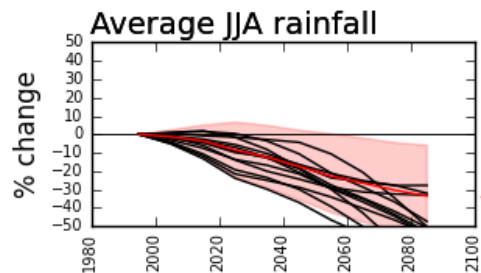
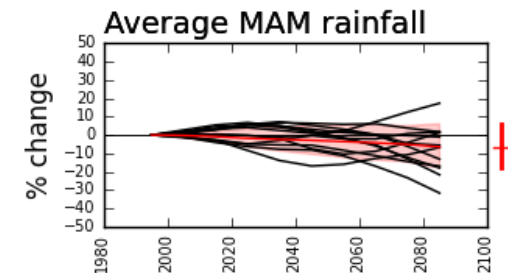
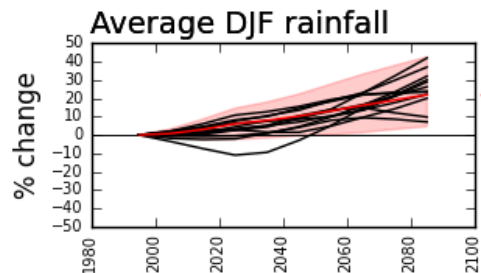
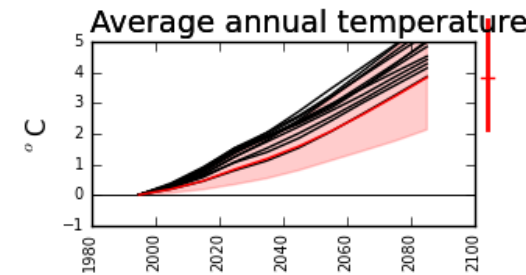
UKCP18 climate projections





UKCP18 climate projections

The UKCP18 global and regional projections span a different range to the probabilistic projections

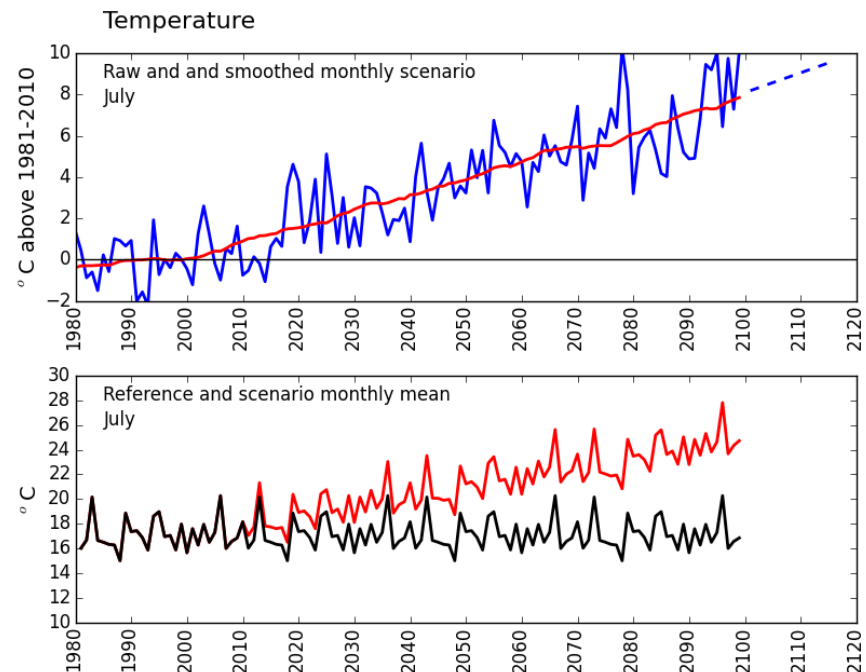


South East England, RCP8.5

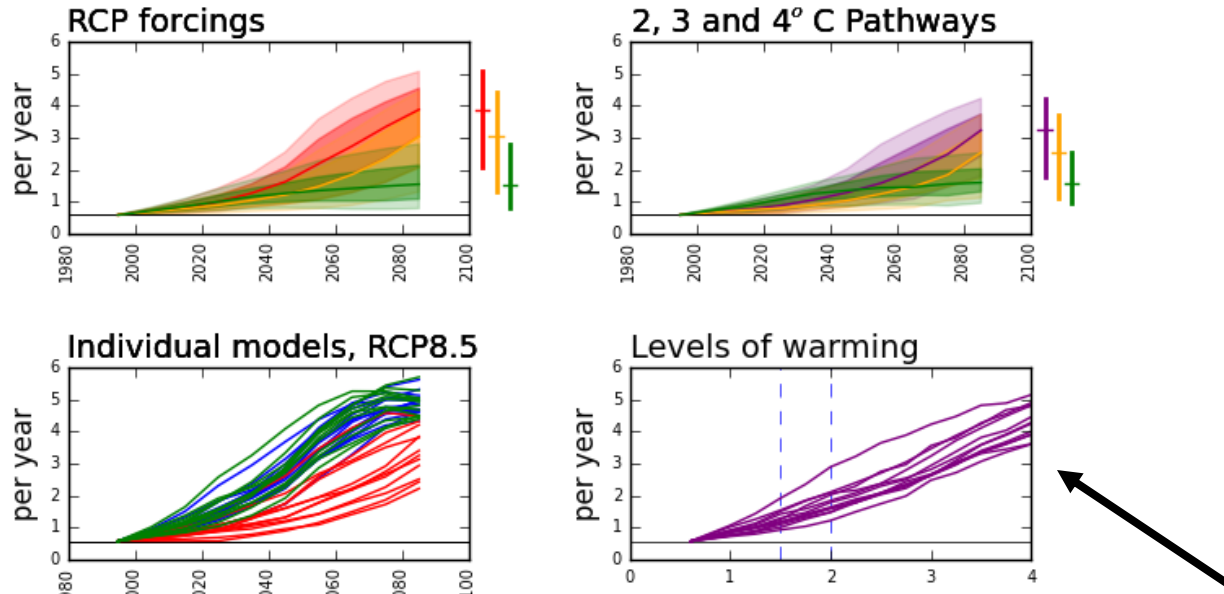
Application of the UKCP18 projections

Apply the projections to HadUK gridded observed data, using 1981-2010 as the reference period.

Use the delta method



Example outputs



For **n** geographic classifications, **n** indicators and **n** sets of projections....

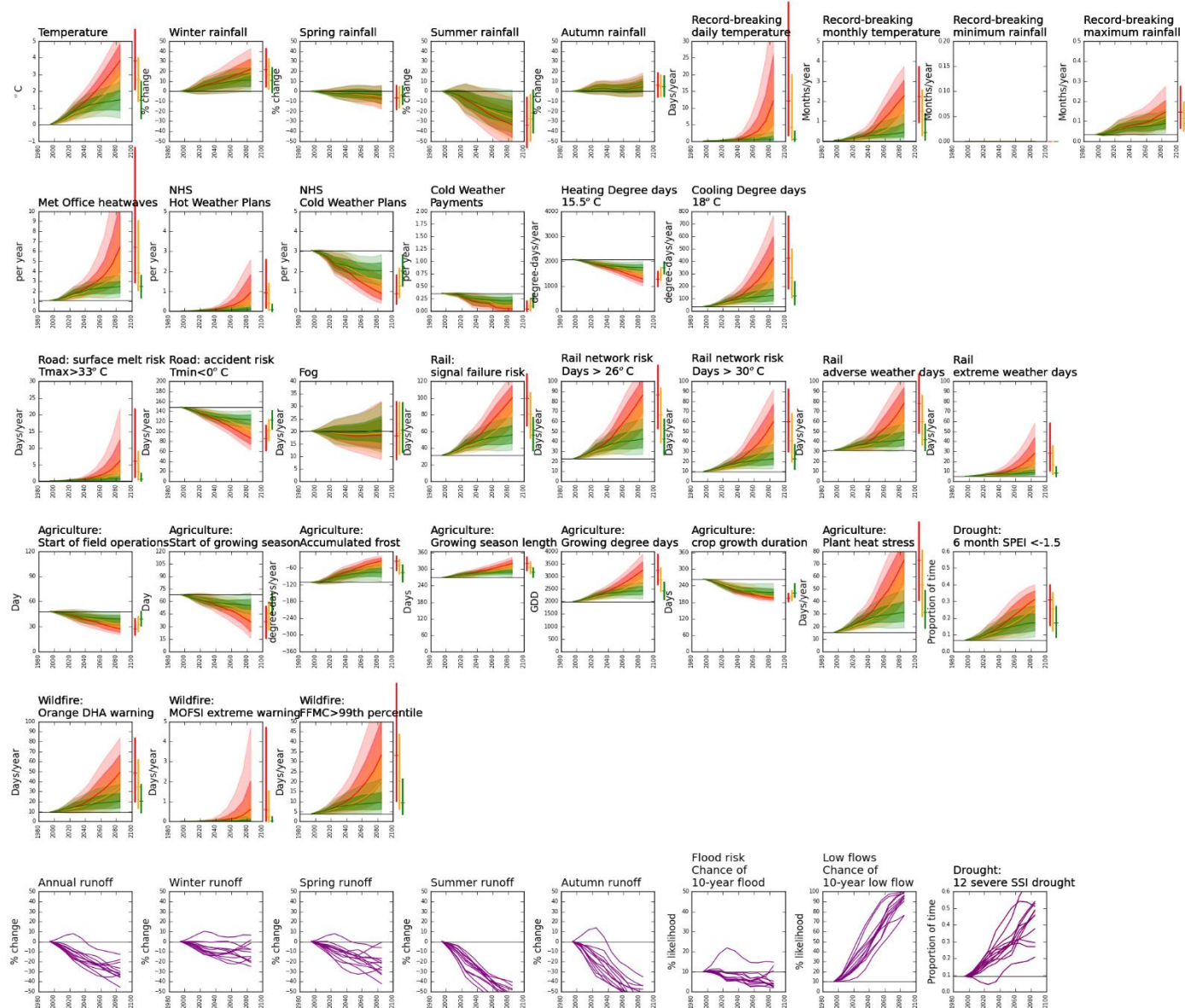
Extract indicators for a given level of warming from the time series of projections

South East England

RCP8.5 Probabilistic

RCP6.0 Probabilistic

RCP2.6 Probabilistic



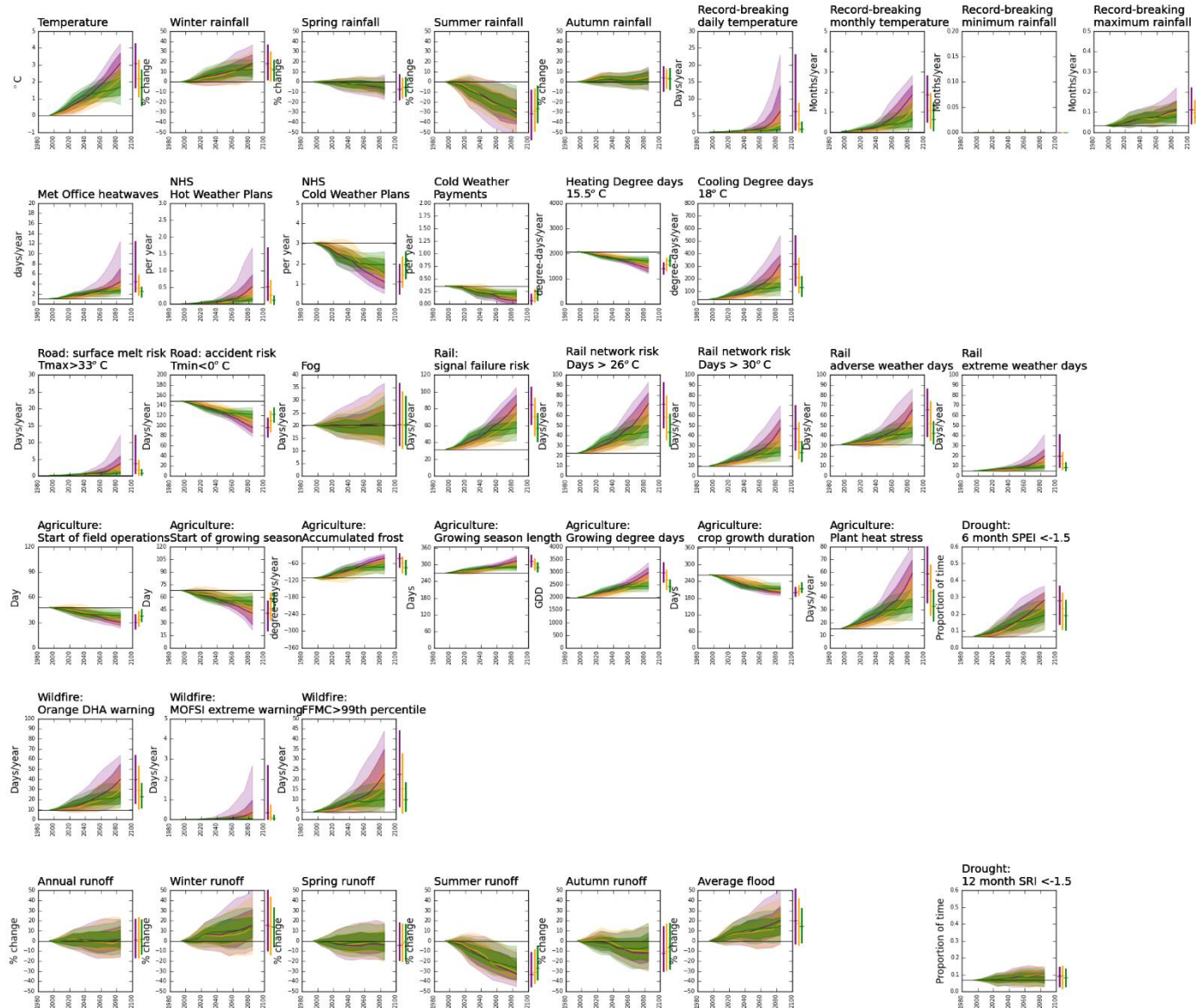
All indicators: one region, RCP pathways

South East England

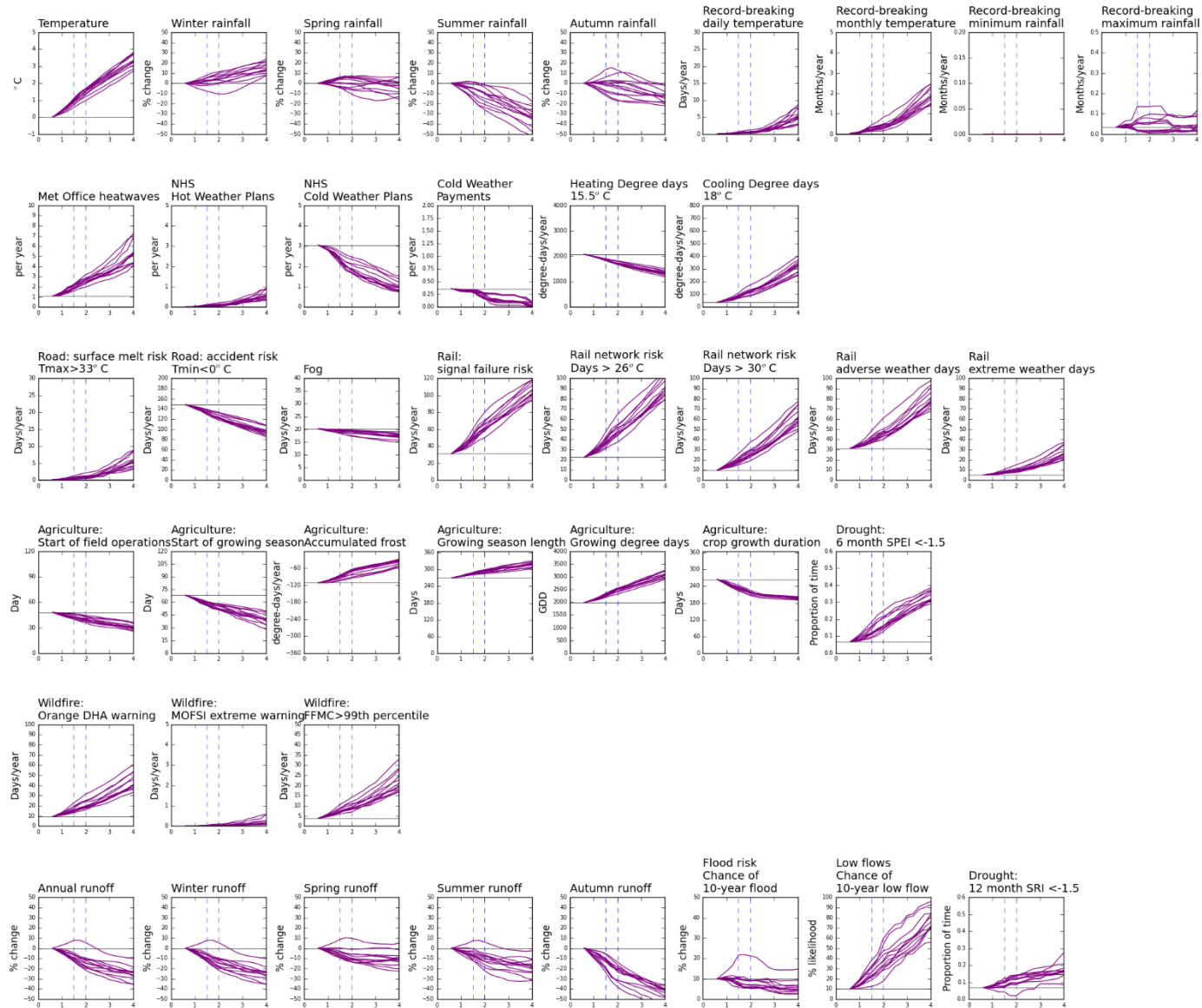
4° C pathway

3° C pathway

2° C pathway



All indicators: one region, 2,3 and 4°C



All indicators: one region, levels of warming

Headline conclusions

There are very large differences in change in risk across the UK

Days/year with rail adverse weather days
2016 definition

30-year mean

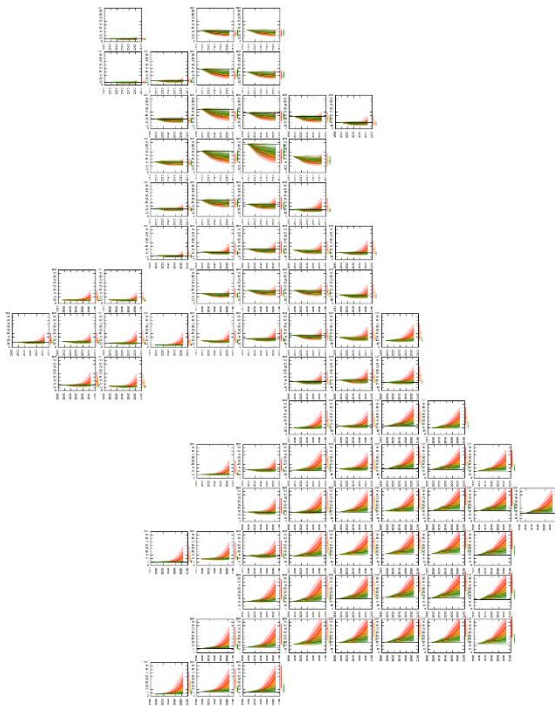
1980-2100

Axis limits = 0 - 100 Days/year

RCP8.5 probabilistic

RCP6.0 probabilistic

RCP2.6 probabilistic



Wildfire:
days with MOFSI extreme warning

30-year mean

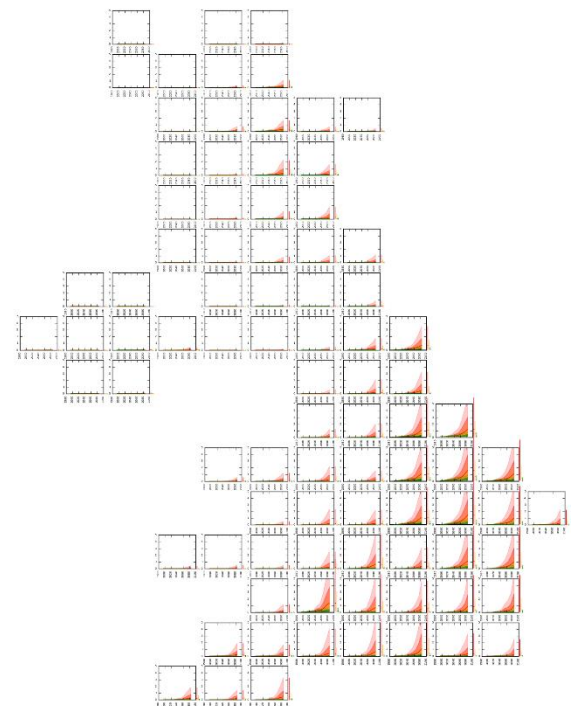
1980-2100

Axis limits = 0 - 5 Days/year

RCP8.5 probabilistic

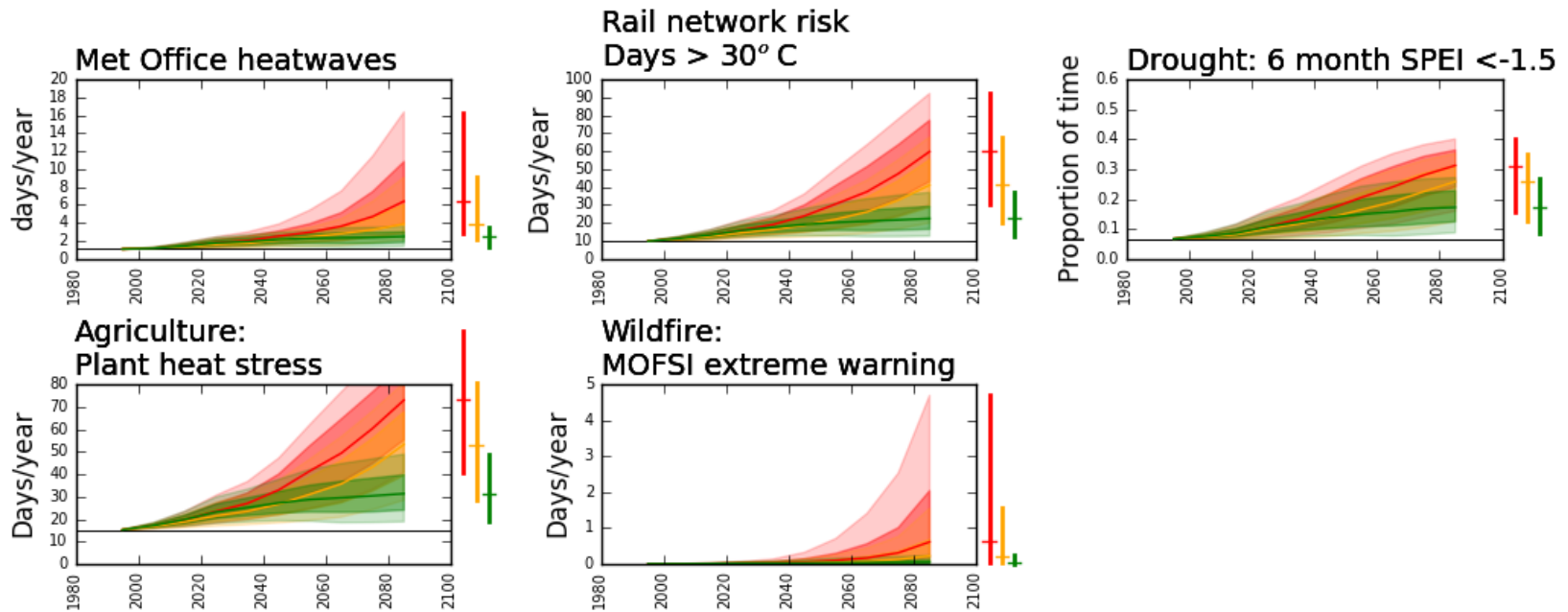
RCP6.0 probabilistic

RCP2.6 probabilistic



Headline conclusions

The increase in risk can be extremely large,
especially with high emissions



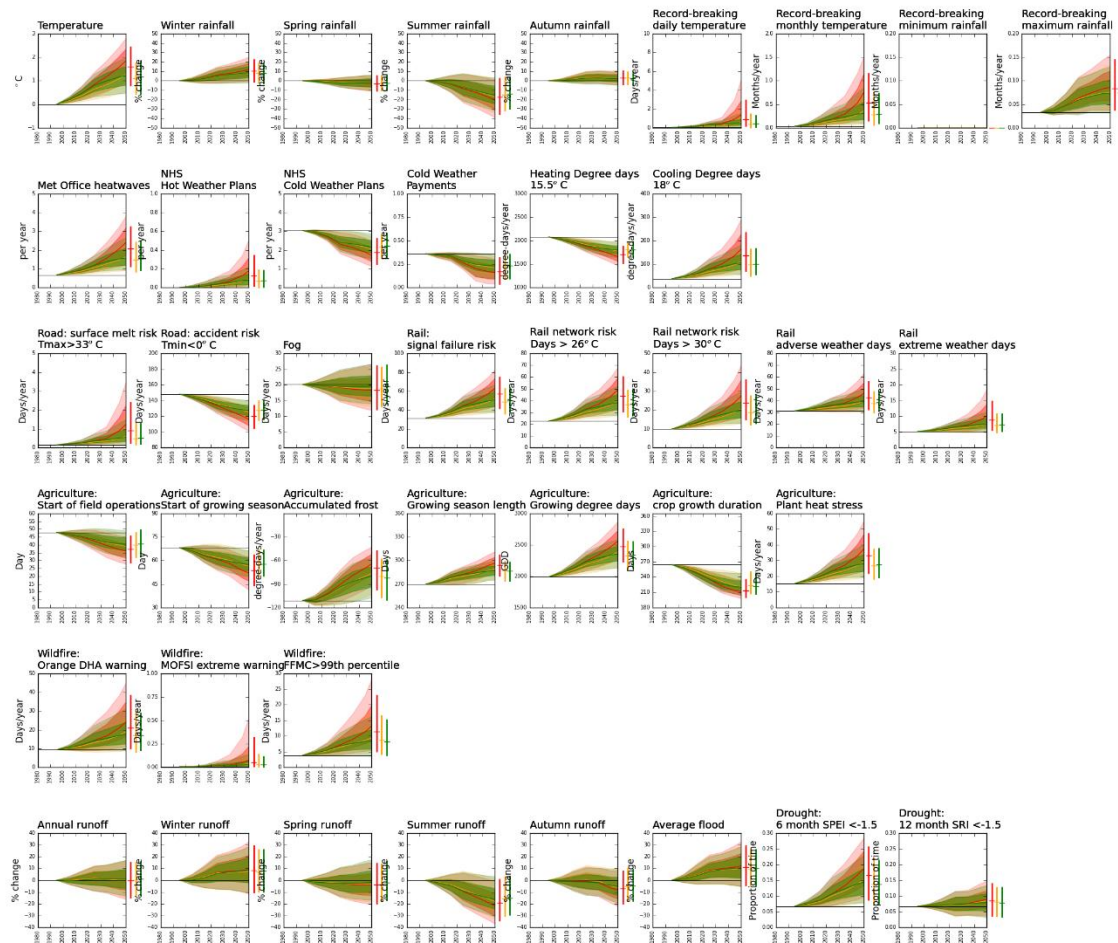
South East England

Headline conclusions

There is little difference between pathways to 2050

South East England

RCP8.5 Probabilistic
RCP6.0 Probabilistic
RCP2.6 Probabilistic



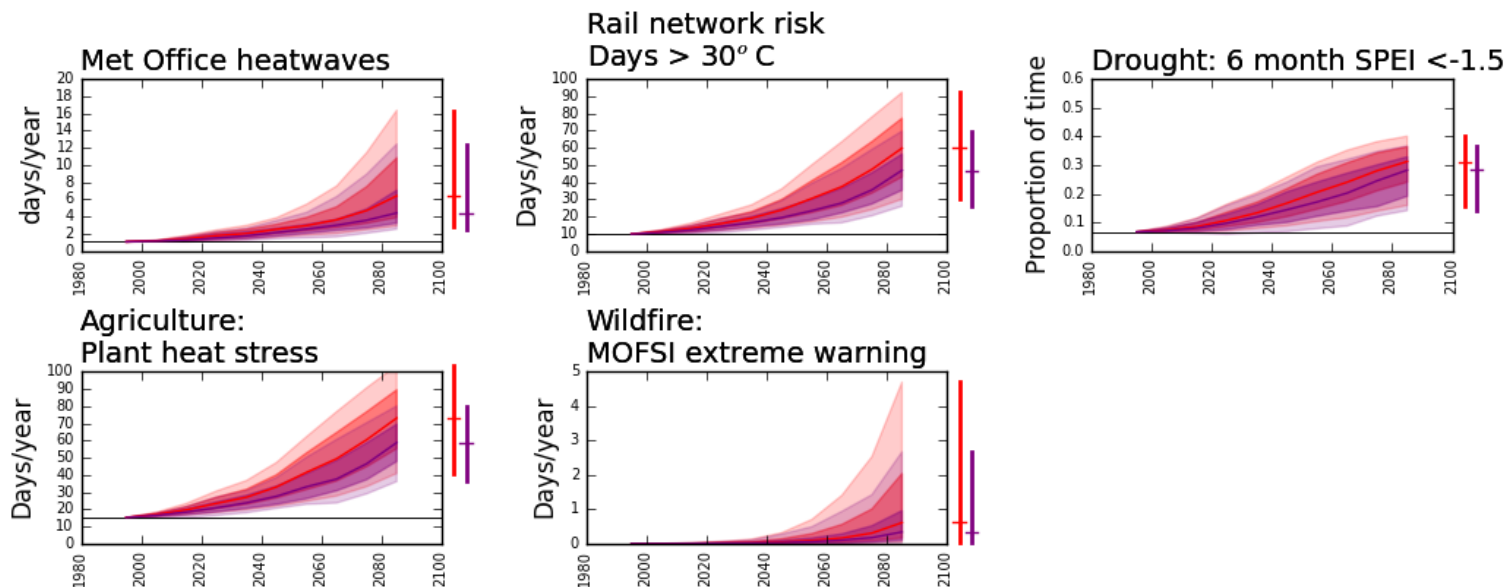
Conceptual / methodological implications

What is a plausible 'worst case'?

RCP8.5 Probabilistic

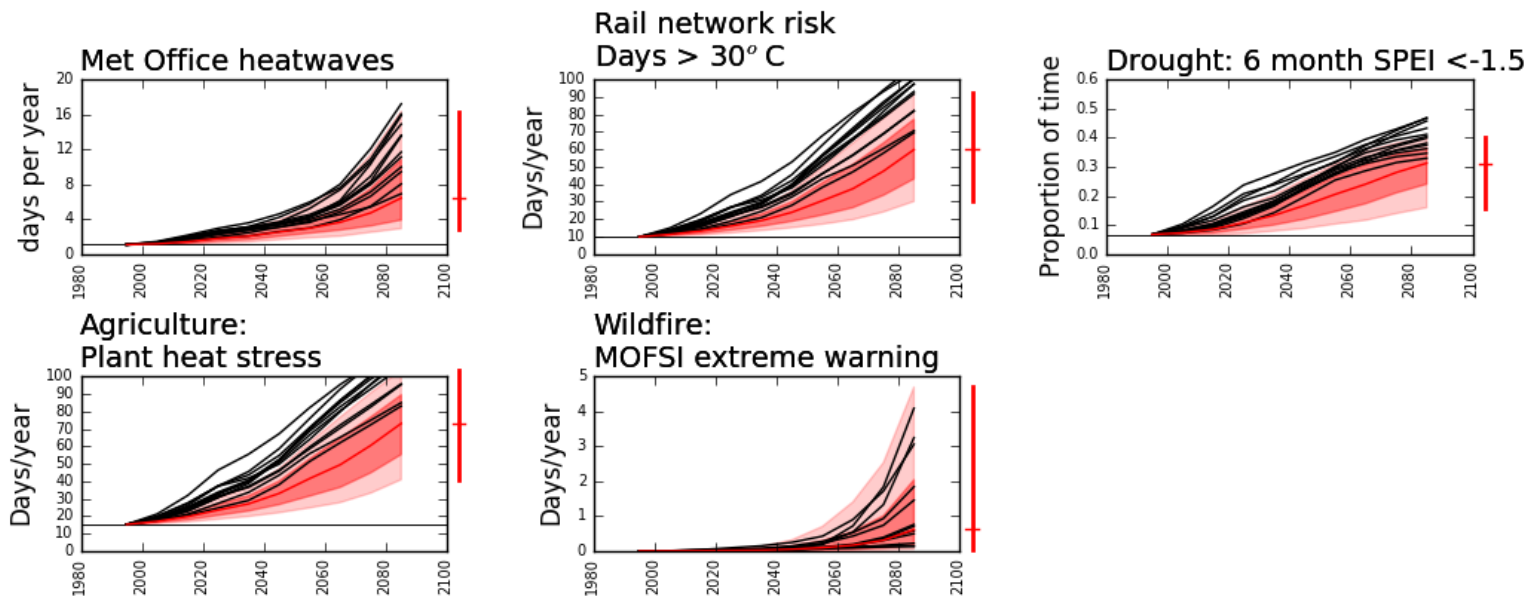
South East England

4° C pathway



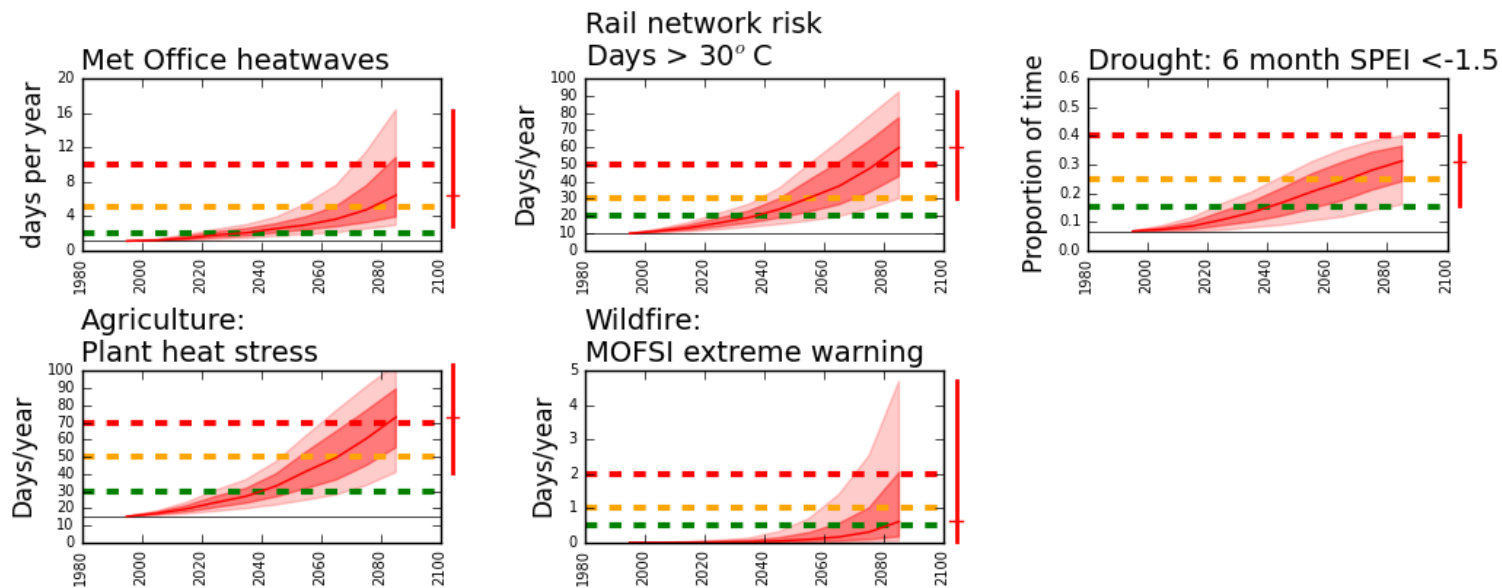
Conceptual / methodological implications

What are the implications of the Hadley projections being at the 'extreme' end?



Conceptual / methodological implications

Using indicators to inform risk assessment



What are the critical values for a RAG rating?

A summary

A wide range of policy-relevant **Climate Risk Indicators** has been calculated, at a range of spatial scales

Headline conclusions:

- change in risk varies across the country, and large-area averages may not be informative
- change in risk may be very large
- there is little difference in change in risk to 2050 with different emissions pathways

Conceptual issues:

- What is a sensible 'worst case'?
- What are the implications of the positioning of the Hadley projections?
- Using indicators in risk assessment

Comments much appreciated!

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