“Exploring inter-model uncertainties in scenarios of UK climate extremes using a daily weather generator”

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BACKGROUND

UKCIP/EPSRC Building Knowledge for a changing climate

CRANIUM
Climate Change Risk Assessment:
New Impact and Uncertainty Methods

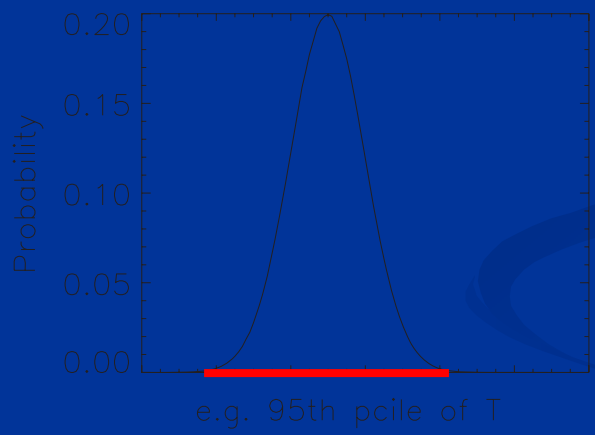
Acknowledgements:

Dr. Clare Goodess
Prof. Phil Jones

CRANIUM AIMS

PDFs of future UK climate extremes

2071-2100



1: Incorporating RCM uncertainty: the CRANIUM methodology

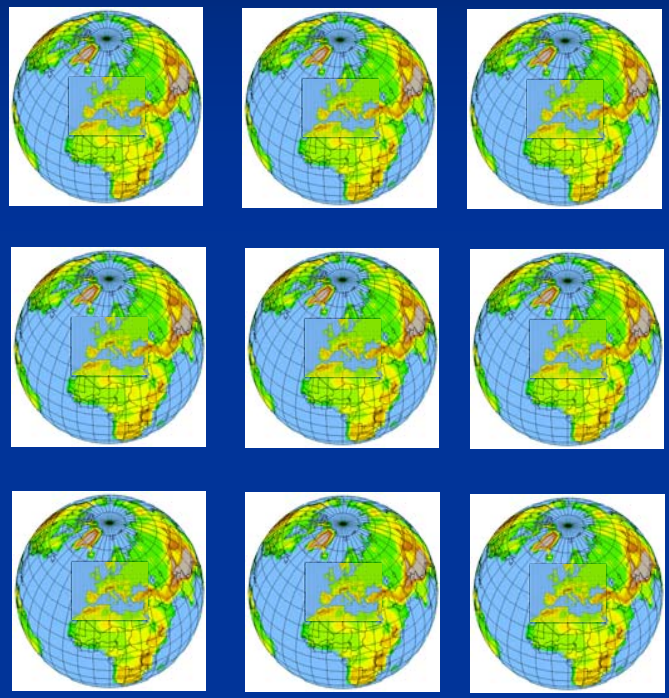
2: Example changes in UK extremes by 2071-2100

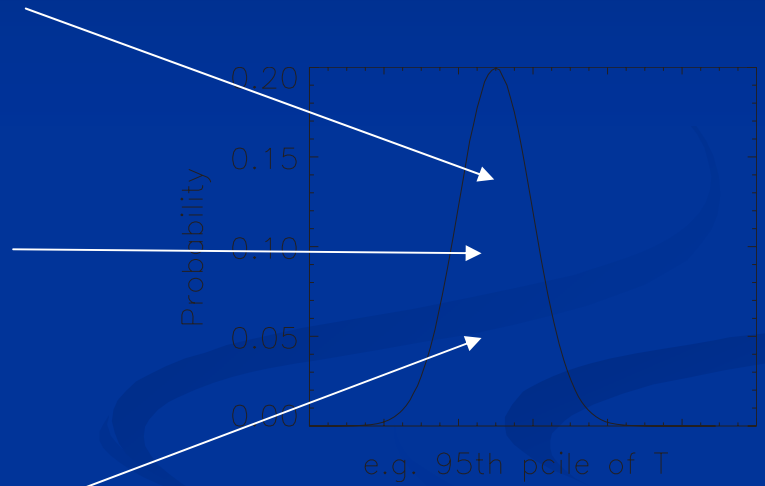
1: Incorporating RCM uncertainty: the CRANIUM methodology

RCM 1

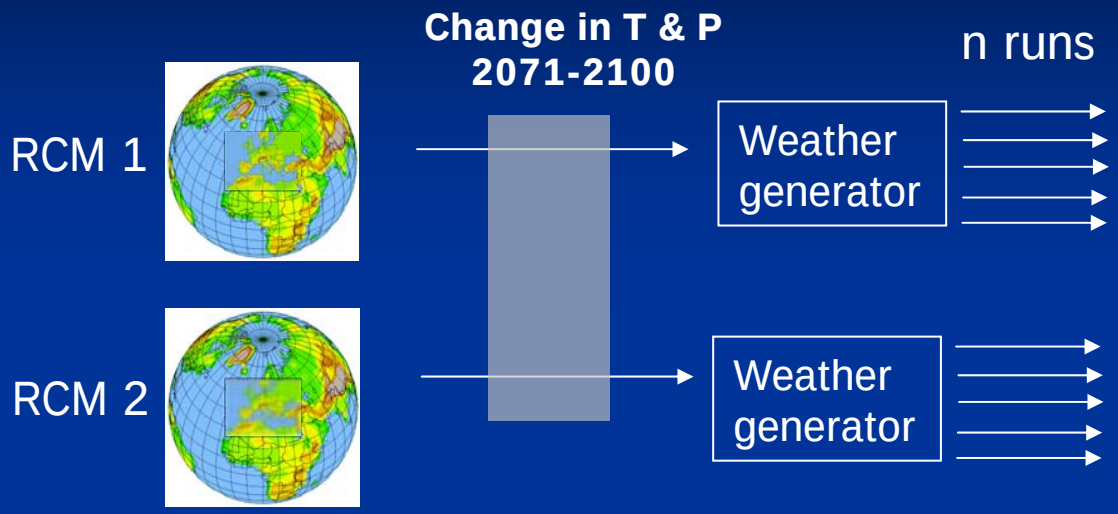
RCM 2

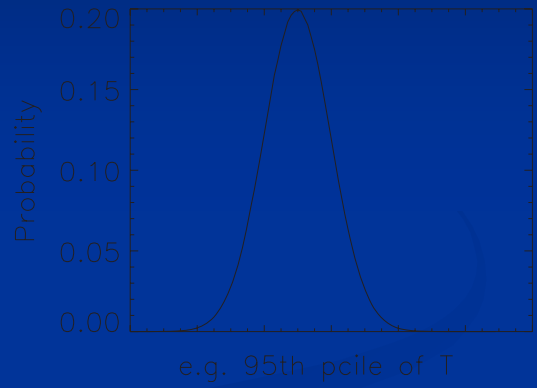
RCM ..n





1: Incorporating RCM uncertainty: the CRANIUM methodology





The CRU weather generator:
- developed for BETWIXT (Watts *et al.*, 2004)
- produces stochastic daily time series
- mean and s.d. constrained

1: Incorporating RCM uncertainty: the CRANIUM methodology

PRUDENCE simulations

Control 1961-1990	**Future Scen A2 2071-2100**	**Future Scen B2 2071-2100**
HIRHAM (x2)	HIRHAM (x2)	HIRHAM
HadRM3P	HadRM3P	HadRM3P
CHRM	CHRM	RCAO (x2)
CLM	CLM	PROMES
REMO	REMO	RegCM
RCAO (x2)	RCAO (x2)	Arpege (x2)
PROMES	PROMES	
RegCM	RegCM	
RACMO	RACMO	
Arpege (x2)	Arpege (x2)	

1: Incorporating RCM uncertainty: the CRANIUM methodology

Which climate extremes are we interested in?

Heatwave duration
Number of hot days
Number of cold days
Fraction of rainfall from intense events..

Station	Lat	Lon
1: Paisley	55.85	-4.43
2: Eskdalemuir	55.32	-3.20
3: Ringway	53.85	-2.28
4: Bradford	53.82	-1.77
5: Coltishall	52.77	1.35
6: Hemsby	52.68	1.68
7: Elmdon	52.45	-1.73
8: Heathrow	51.48	-0.45
9: Gatwick	51.15	-0.18
10: Yeovilton	51.00	-2.63

2: Example changes in UK extremes by 2071-2100

The number of hot days:

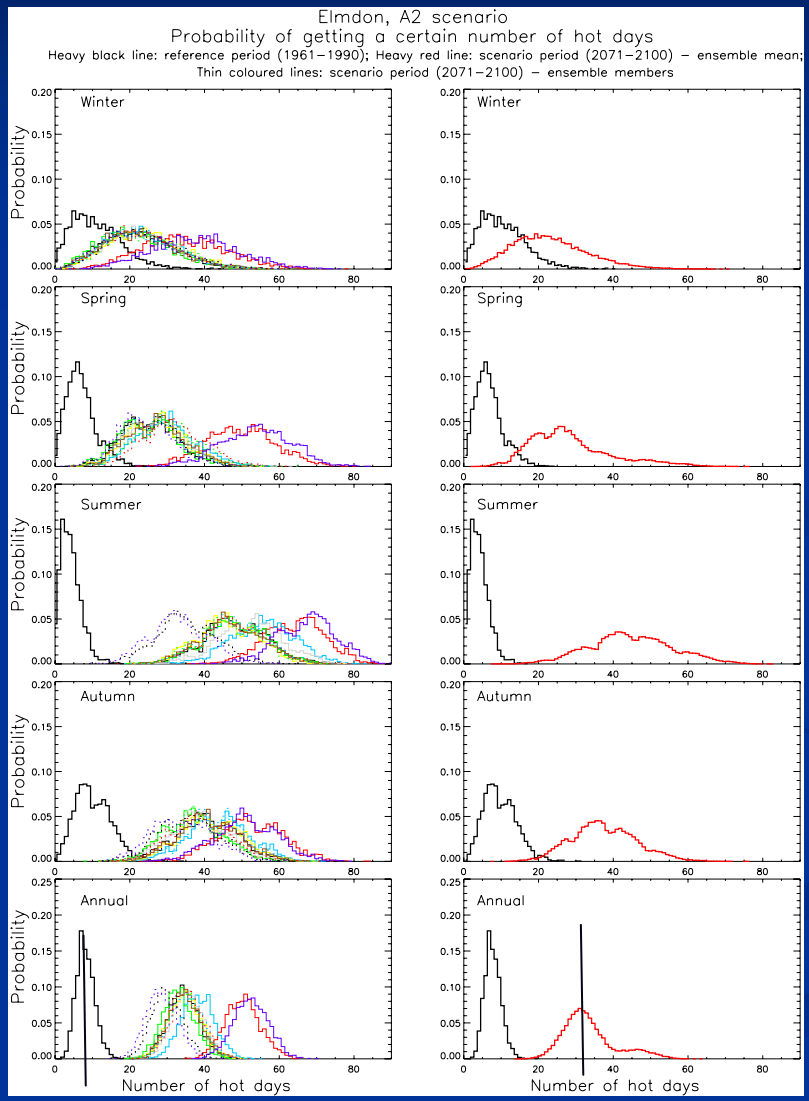
*"The number of days in a year or season (within the future climate) where Tmax exceeds the **95th percentile** of the year/season daily Tmax population within **a reference climate**"*

Reference climate?

BETWIXT project conducted a suite weather generator simulations using *observed station* data as constraining parameters (rather than *future* changes) to obtain a number of years of control daily weather.

2: Example changes in UK extremes by 2071-2100

Elmdon: under A2 scenario forcing



1961-1990: 7 hot days

2071-2100: 31 hot days...

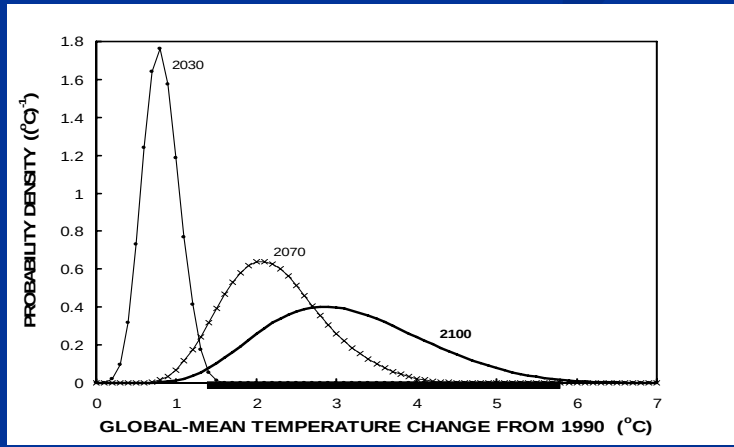
3: CONCLUSIONS

-consultation with stakeholders indicates PDFs are most useful tool for policy makers/stakeholders ….RISK ASSESMENT

-CRANIUM combines RCM/weather generator technique to enhance population size and incorporate RCM uncertainty

-some GCM –related uncertainty is also captured in mean perturbed PDFs…but n only = 2..

-incorporating GCM uncertainty will widen PDF but provide more realistic forecasts



Wigley and Raper [2001]