



Uncertainty analysis of the modelling chain from GCM to flood inundation

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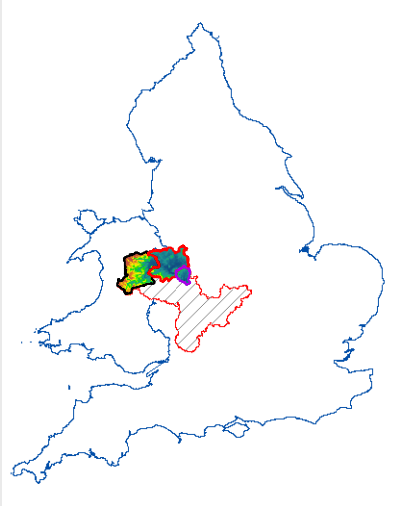


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School of Geographical Sciences

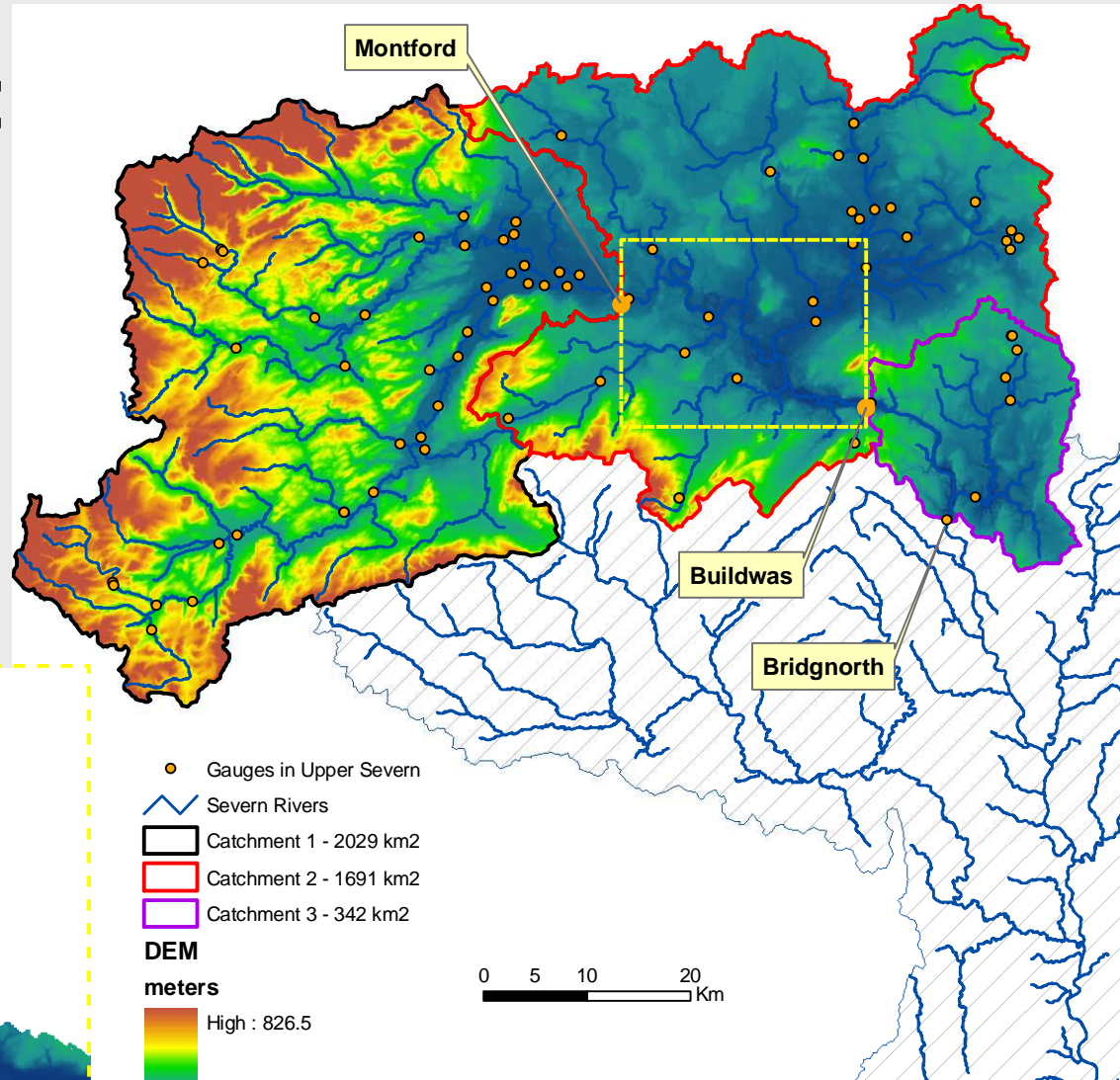
Outline

- Background
- Overview of methodology
- Climate input data
- Hydrological modelling
- Presentation of uncertainties

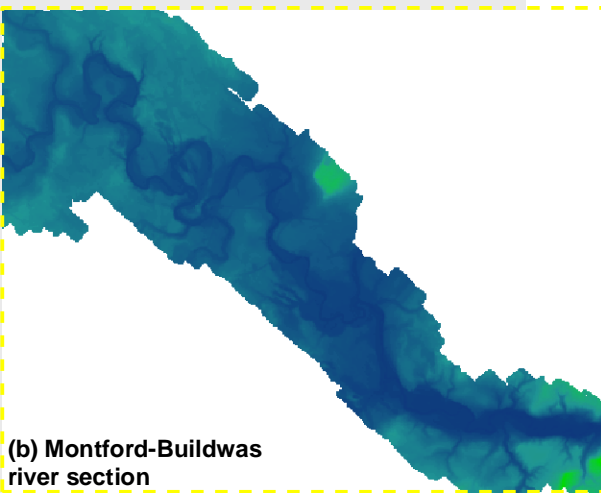
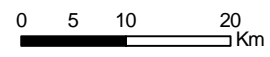
Project domain



(a) Severn Catchment located in the Midlands region of England



- Gauges in Upper Severn
 - Severn Rivers
 - Catchment 1 - 2029 km²
 - Catchment 2 - 1691 km²
 - Catchment 3 - 342 km²
- DEM**
meters
- High : 826.5
 - Low : 30.5
- Severn catchment



(b) Montford-Buildwas river section

(c) Digital Elevation Model (DEM) of the Upper Severn Catchment



Shrewsbury, Shropshire

Historic Flood Levels
February 1946

March 1947

October 2000

December 1960

February 1941

October 1998



2004



2008



2002



2000

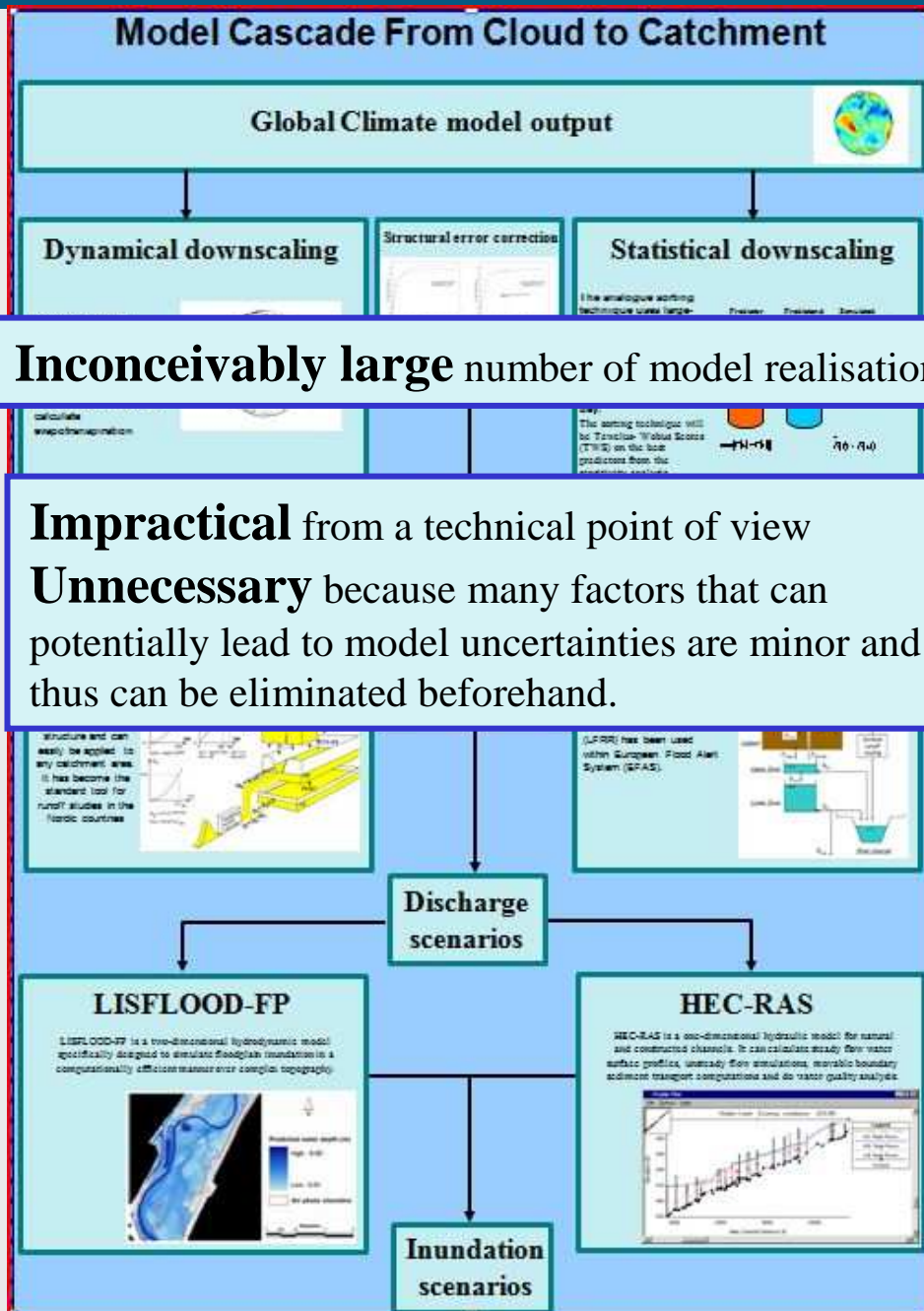


Research questions

1. How is flood inundation affected by climate change?
2. How to account for uncertainties in climate impact modelling?
3. How to communicate these uncertainties to the end users?

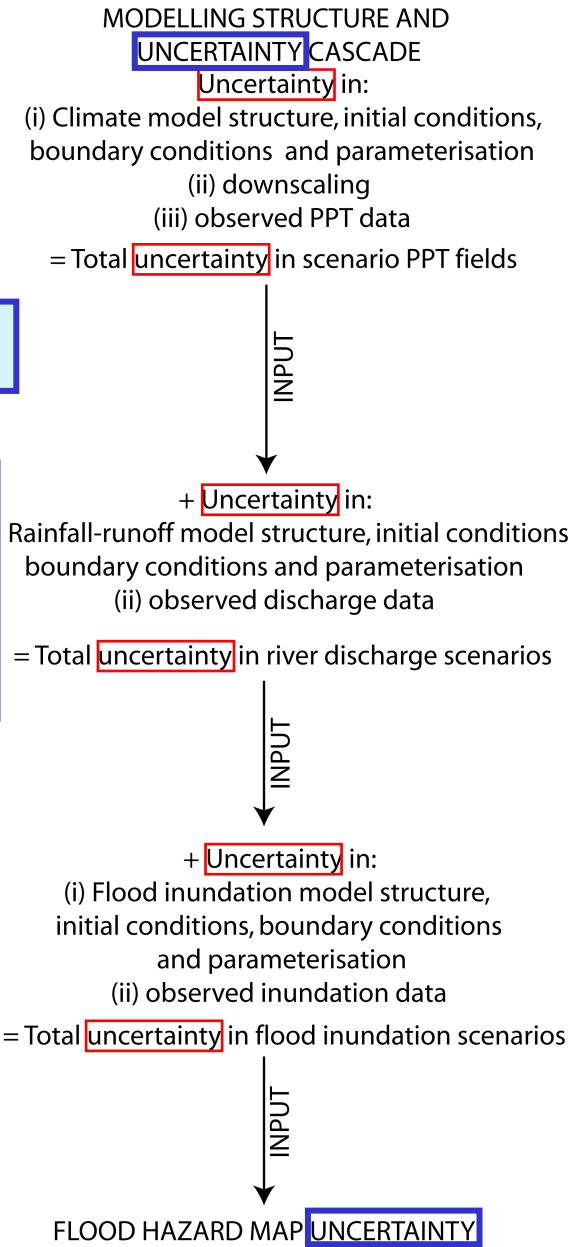
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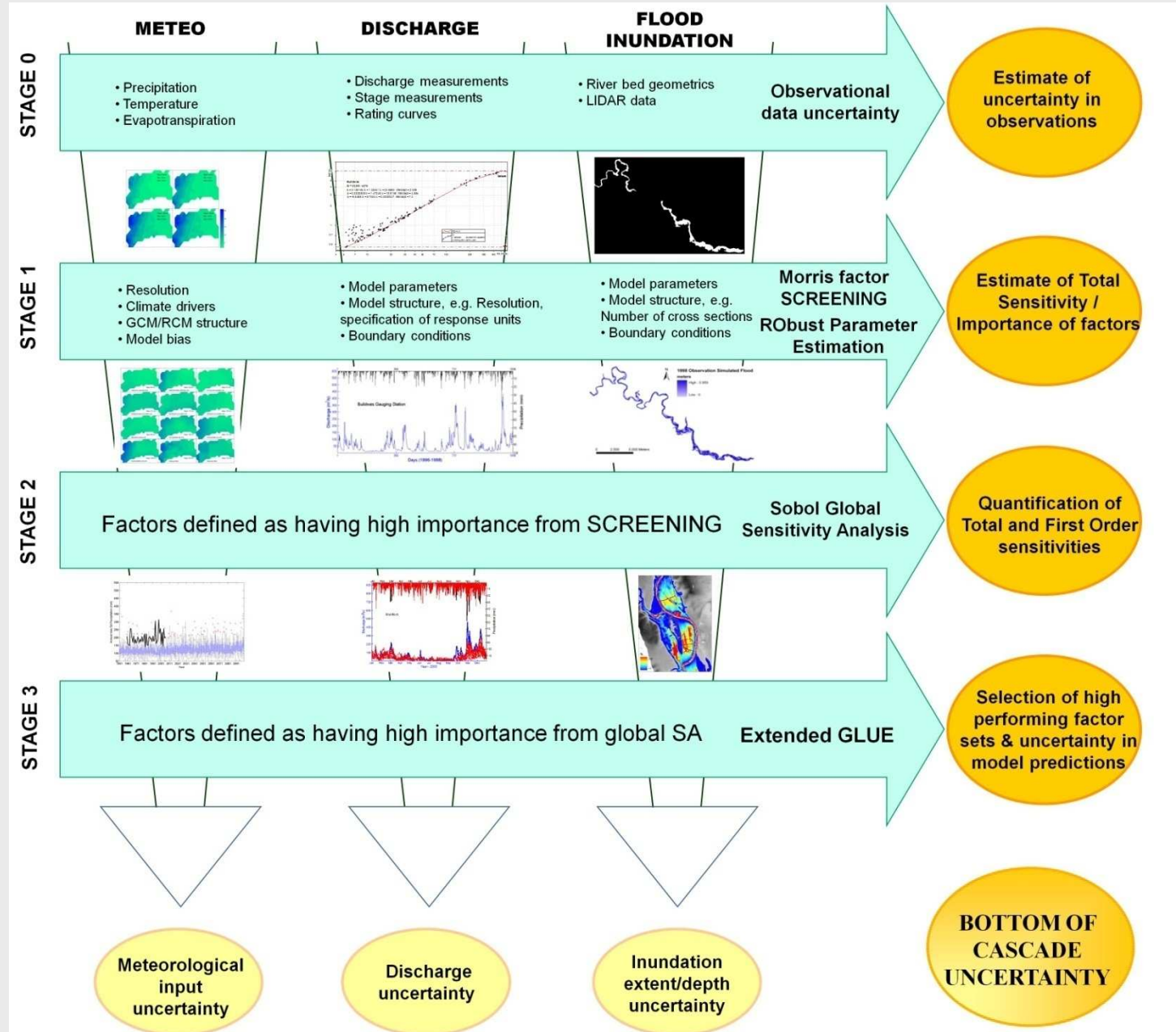


Inconceivably large number of model realisations

Impractical from a technical point of view
Unnecessary because many factors that can potentially lead to model uncertainties are minor and thus can be eliminated beforehand.



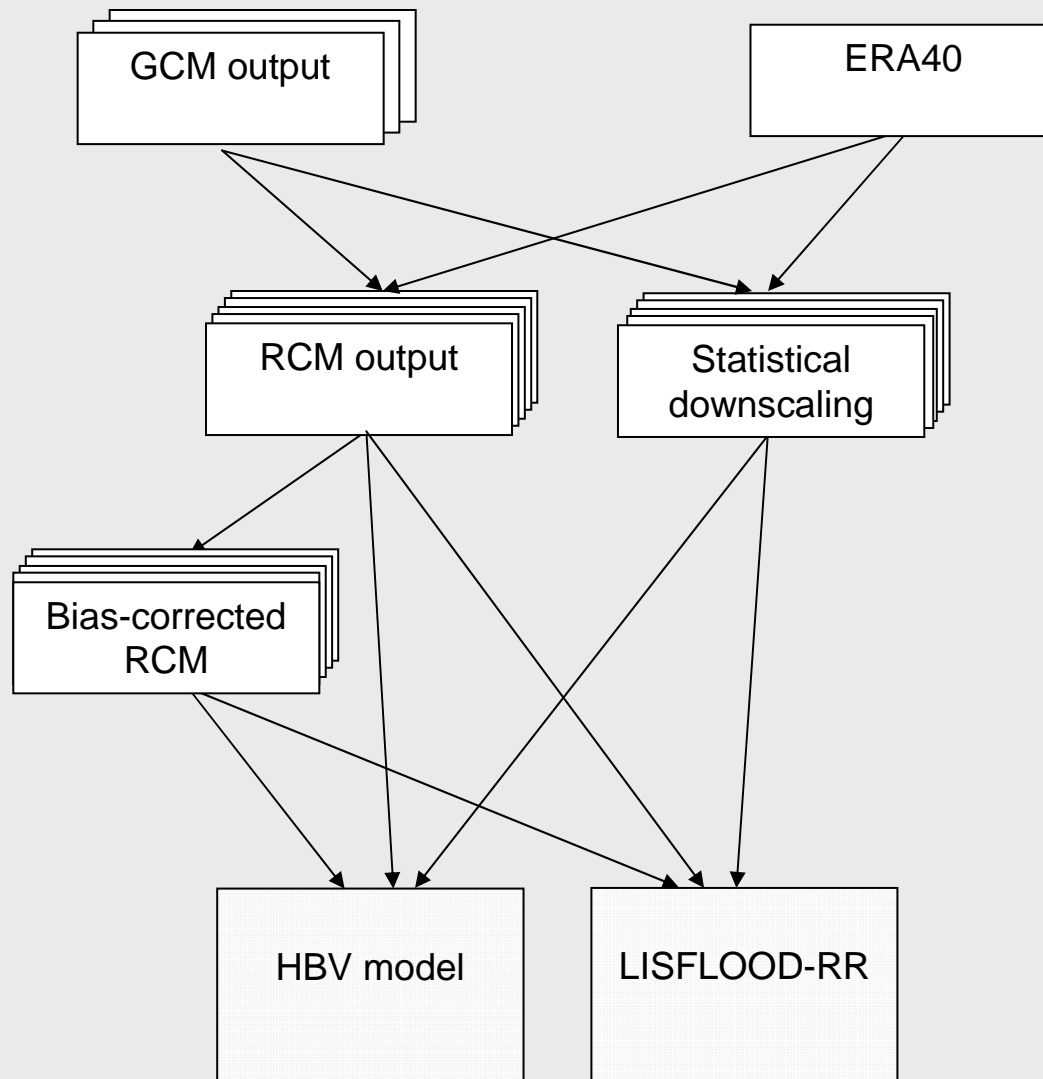
Cascading uncertainties and end-to-end modelling of floods



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Climate model downscaling



16 RCMs 25 x 25 km (ENSEMBLE)



C4I-RCA3	UCLM-PROMES	ICTP-REGCM3
INM-RCA3	ETH-CLM	KNMI-RACMO2
HC-HADRM3	CNRM-RM4	DMI-HIRHAM5
OURANOS	MPI-REMO	METNO-HIRHAM
GKSS-CLM	SMHI-RCA	CHMI-ALADIN

11 Ensemble members HadRM3 (UKCP09)

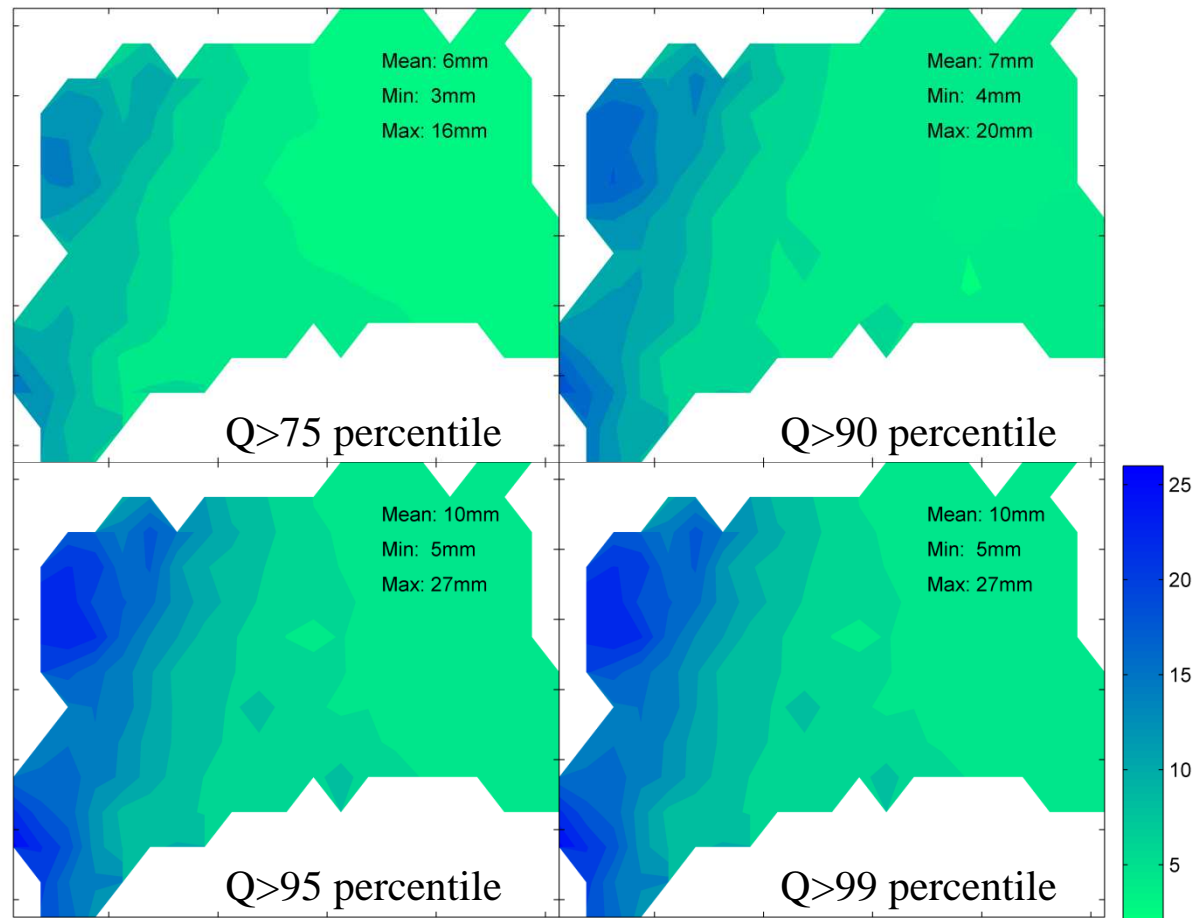


10 RCMs 50 x 50 km (PRUDENCE)

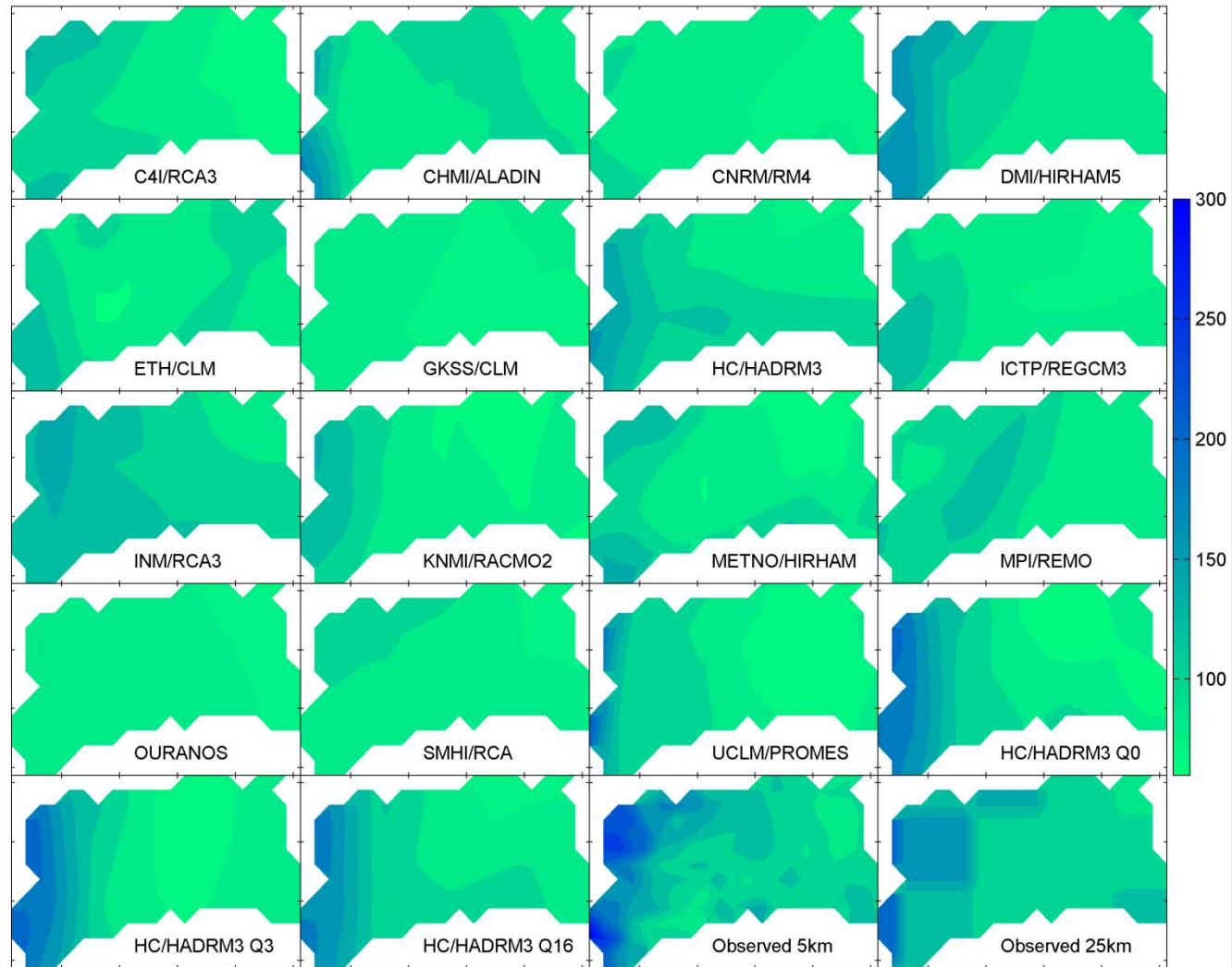


GKSS-CLM	ETH-CHRM	DMI-HIRHAM5
HC-HADRM3	MPI-REMO	UCLM-PROMES
MRI-AGCM	SMHI-RCAO	ICTP-REGCM3
KNMI-RACMO2		

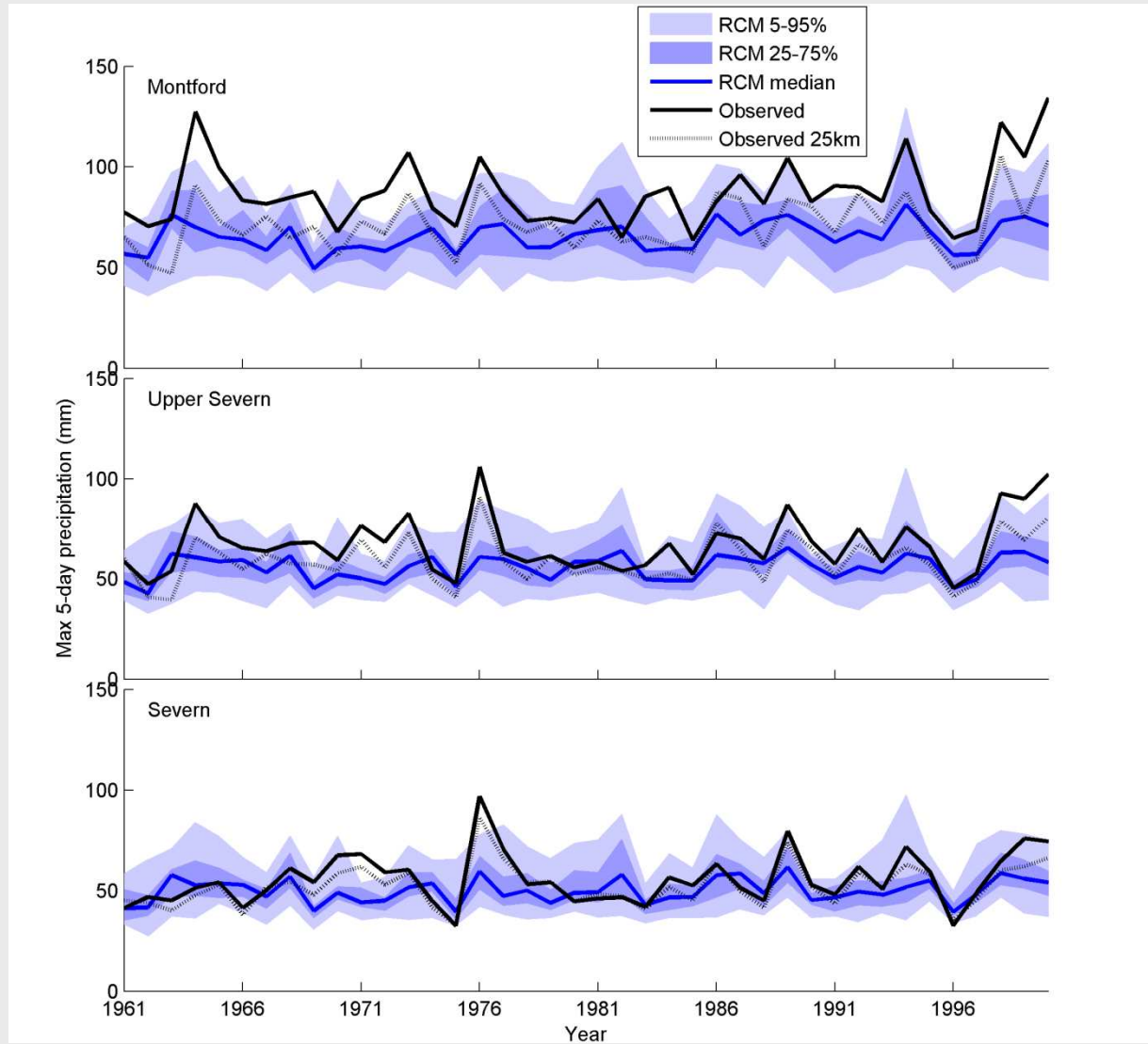
Precipitation preceding high floods



Maximum 5-day precipitation



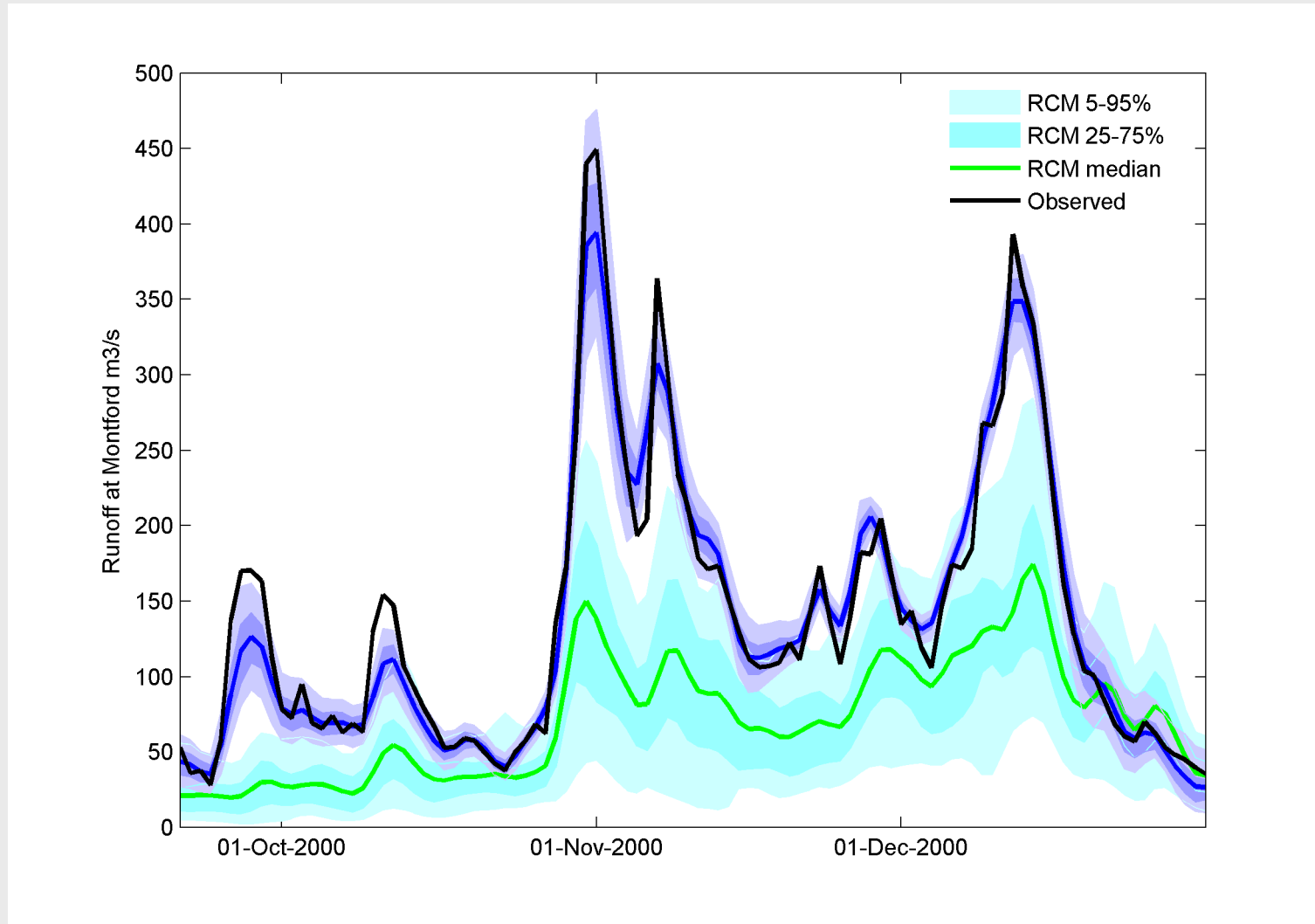
Maximum 5-day precipitation from RCMs



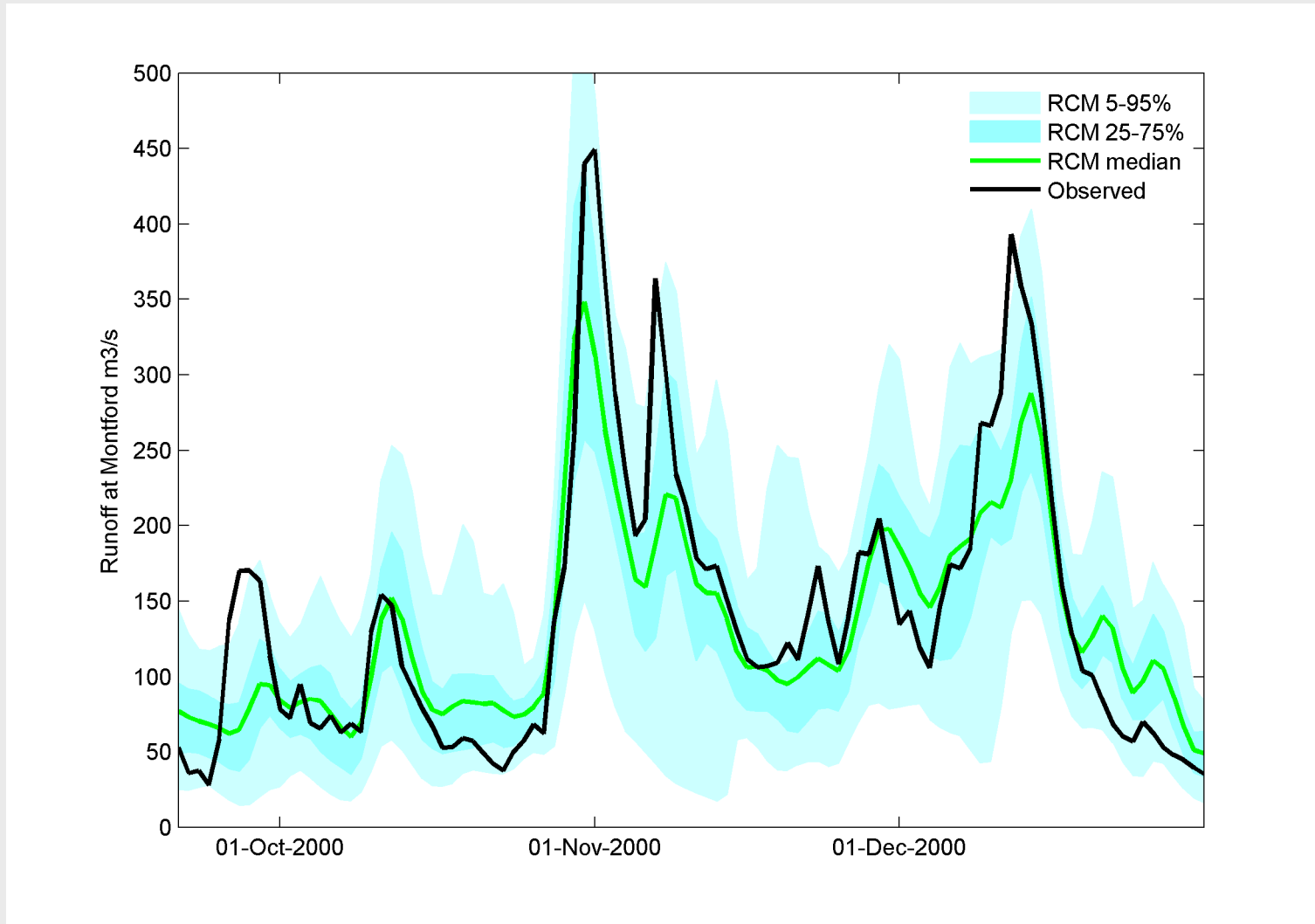
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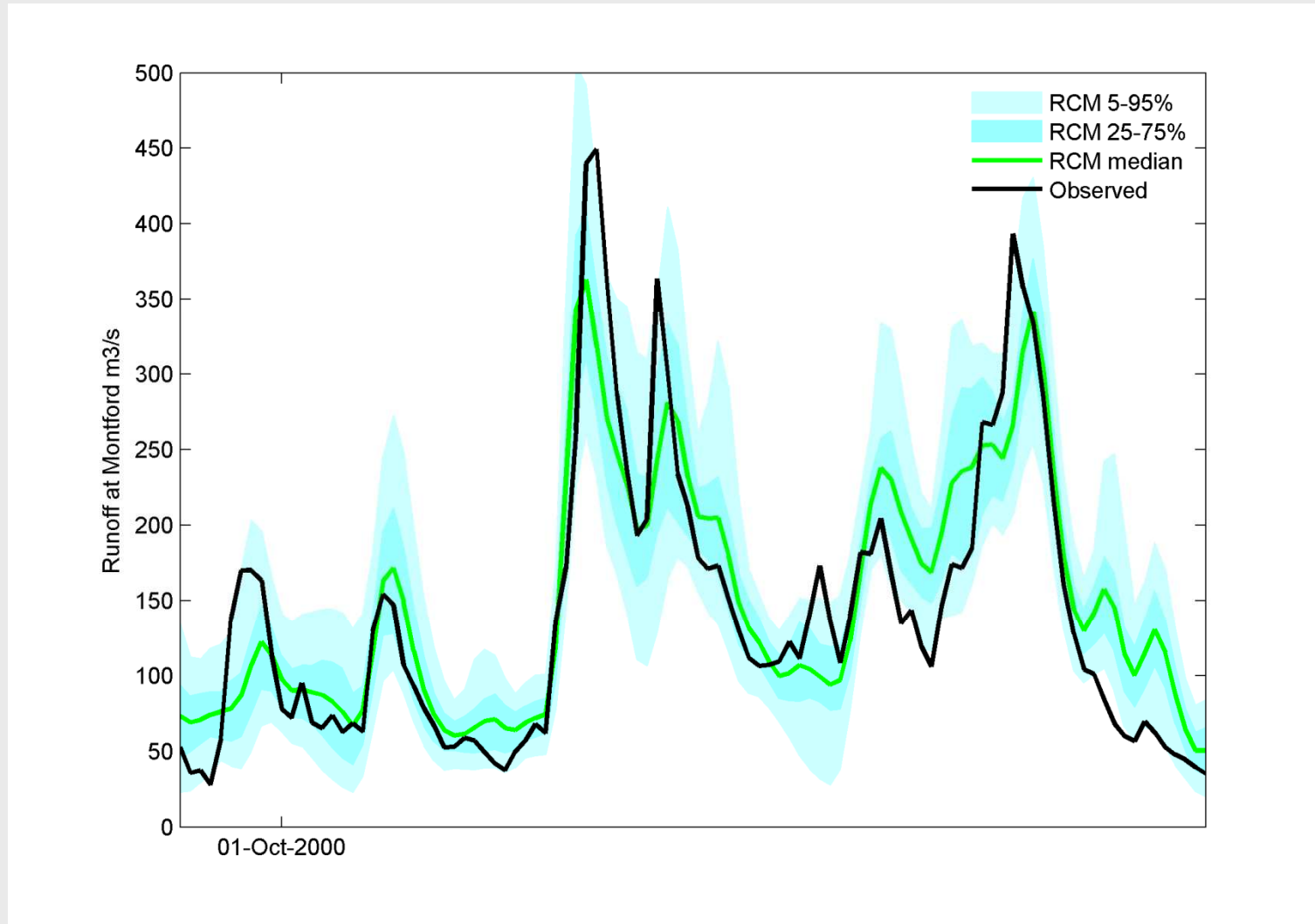
HBV model vs ENSEMBLES RCMs



Bias-corrected



Bias-corrected, NS-weighted

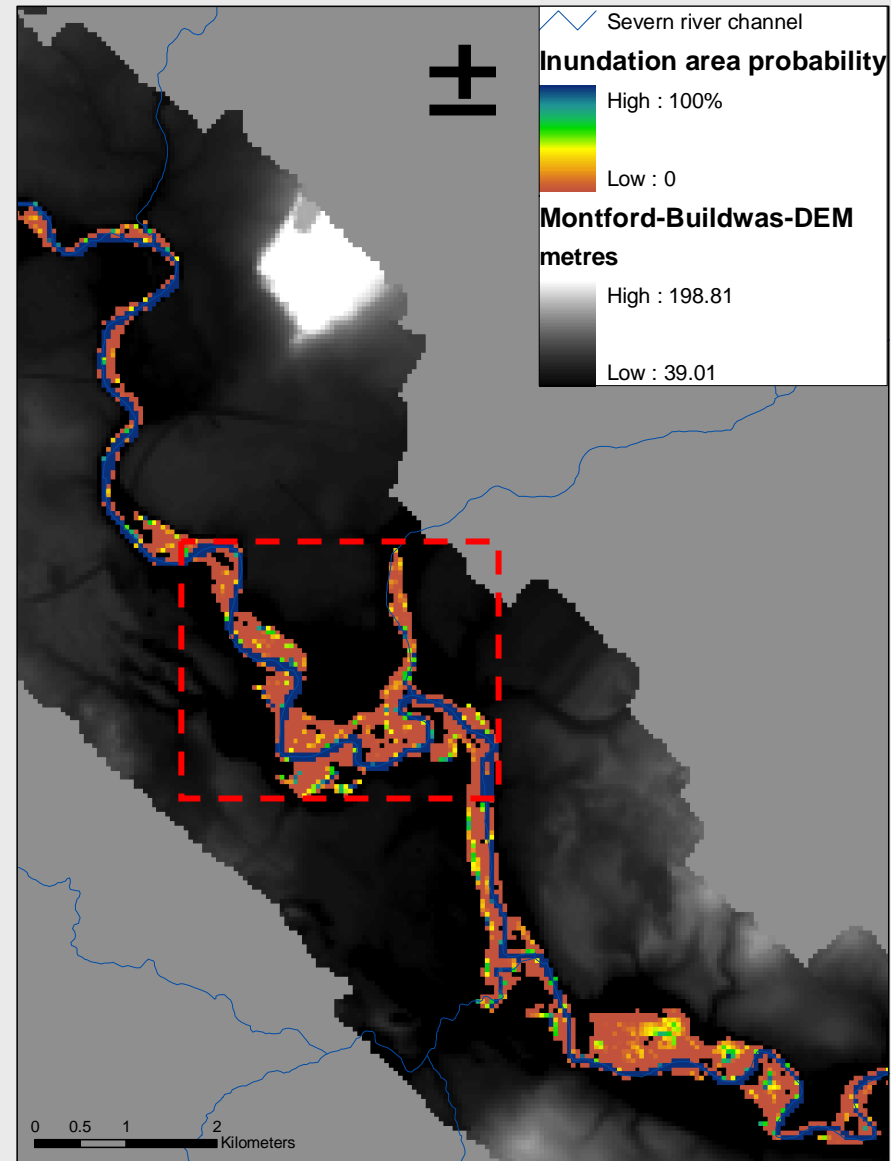
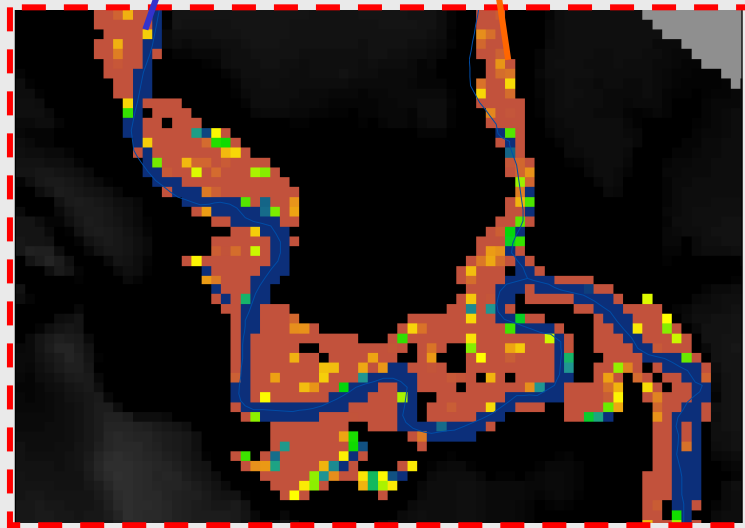


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Severn – probabilistic inundation estimate

100% inundated → not inundated



Welcome to HydroClimate

Wednesday, December 09 2009 | 3:42:40 PM

HydroClimate

Base layers

- Severn
- Upper Severn
- Rivers
- Gauges
- Legend

Hadrm3 (UKCP09)

- Un-corrected
- Corrected

ENSEMBLE (EU FP6)

- Un-corrected
- Corrected

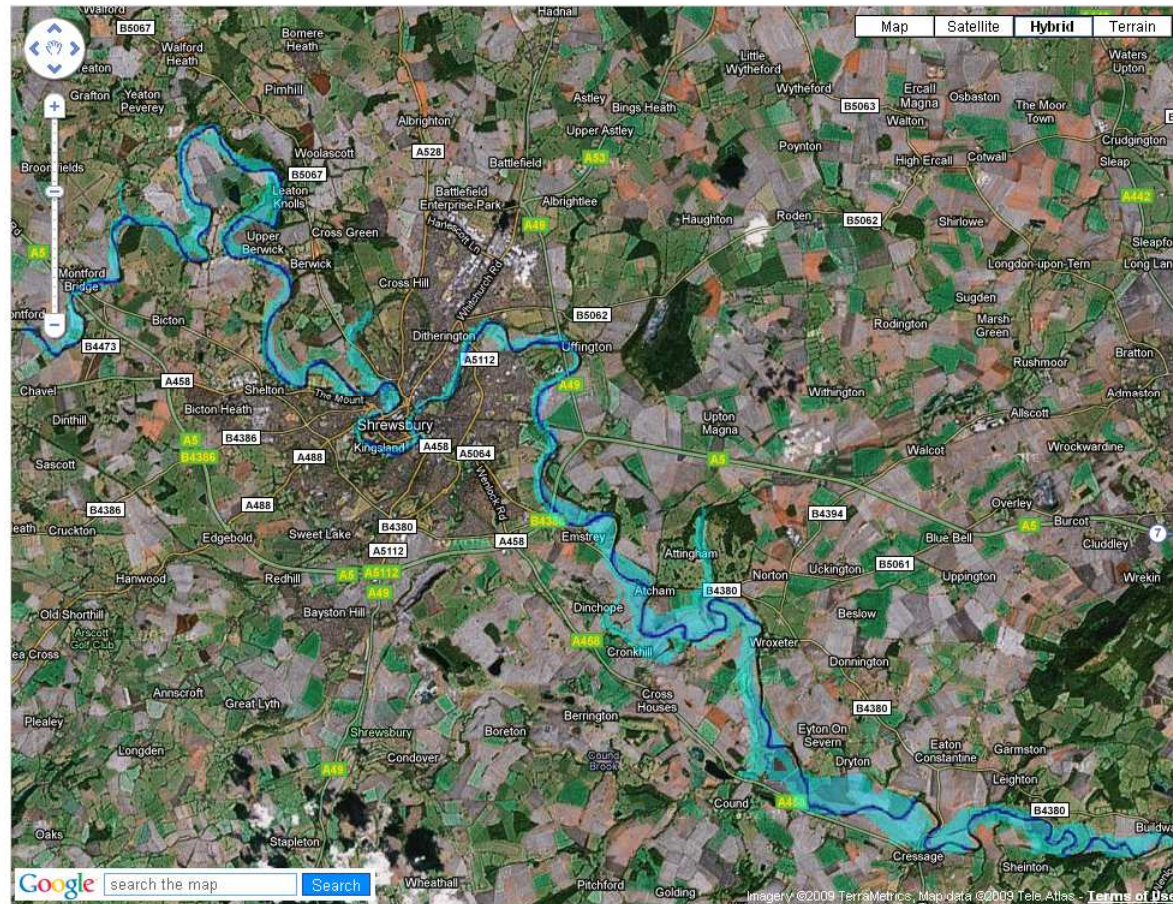
PRUDENCE (EU FP5)

- Un-corrected
- Corrected

Analog

- Analog

[Home](#) > [Project](#) > [Flood map](#)



Welcome to HydroClimate

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Analog

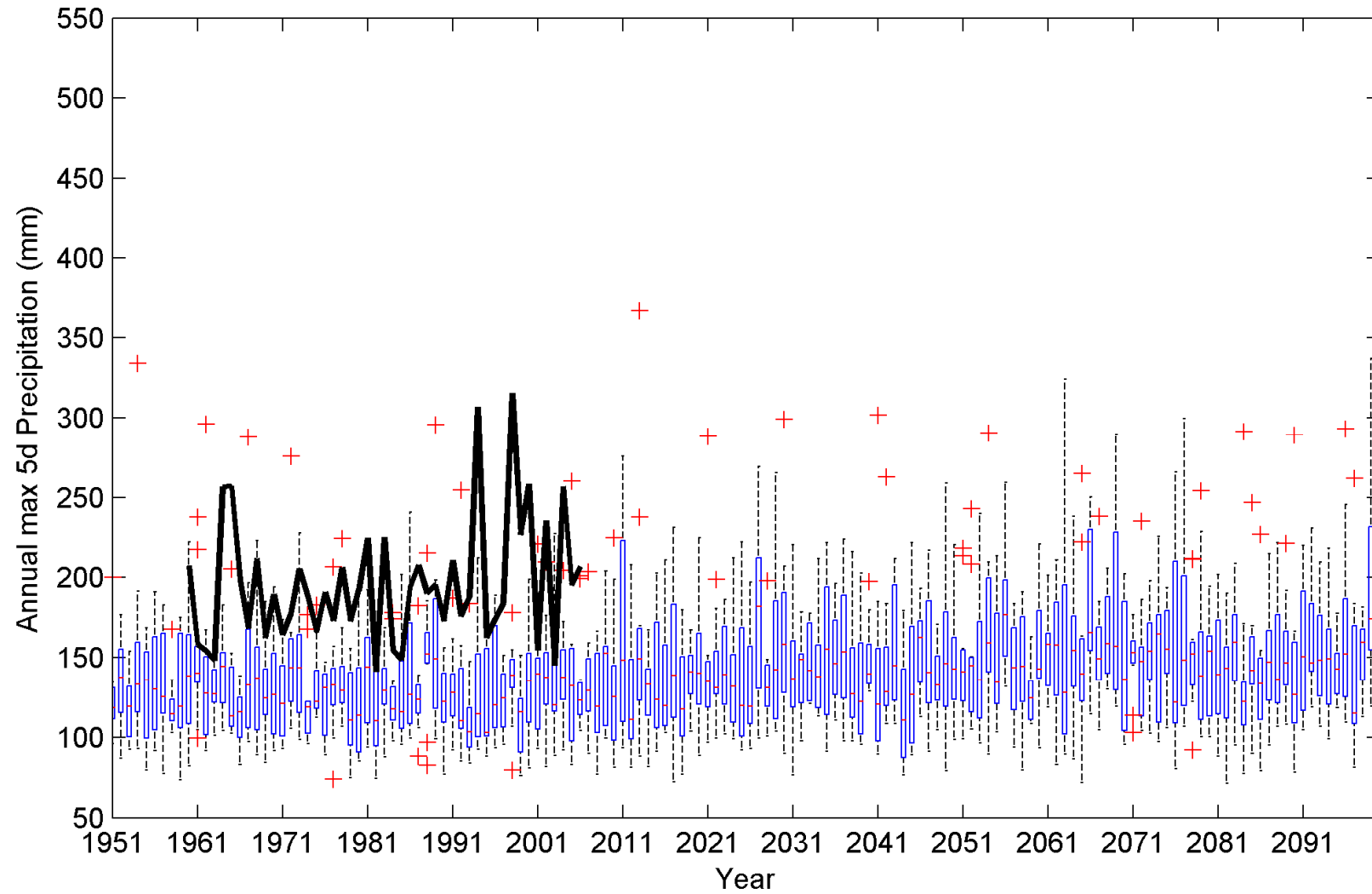
- Analog

Home > Project > Flood map



Thank you for your attention!

Multimodel ensemble max 5-day prec



Multimodel ensemble max 5-day prec bias-corrected

