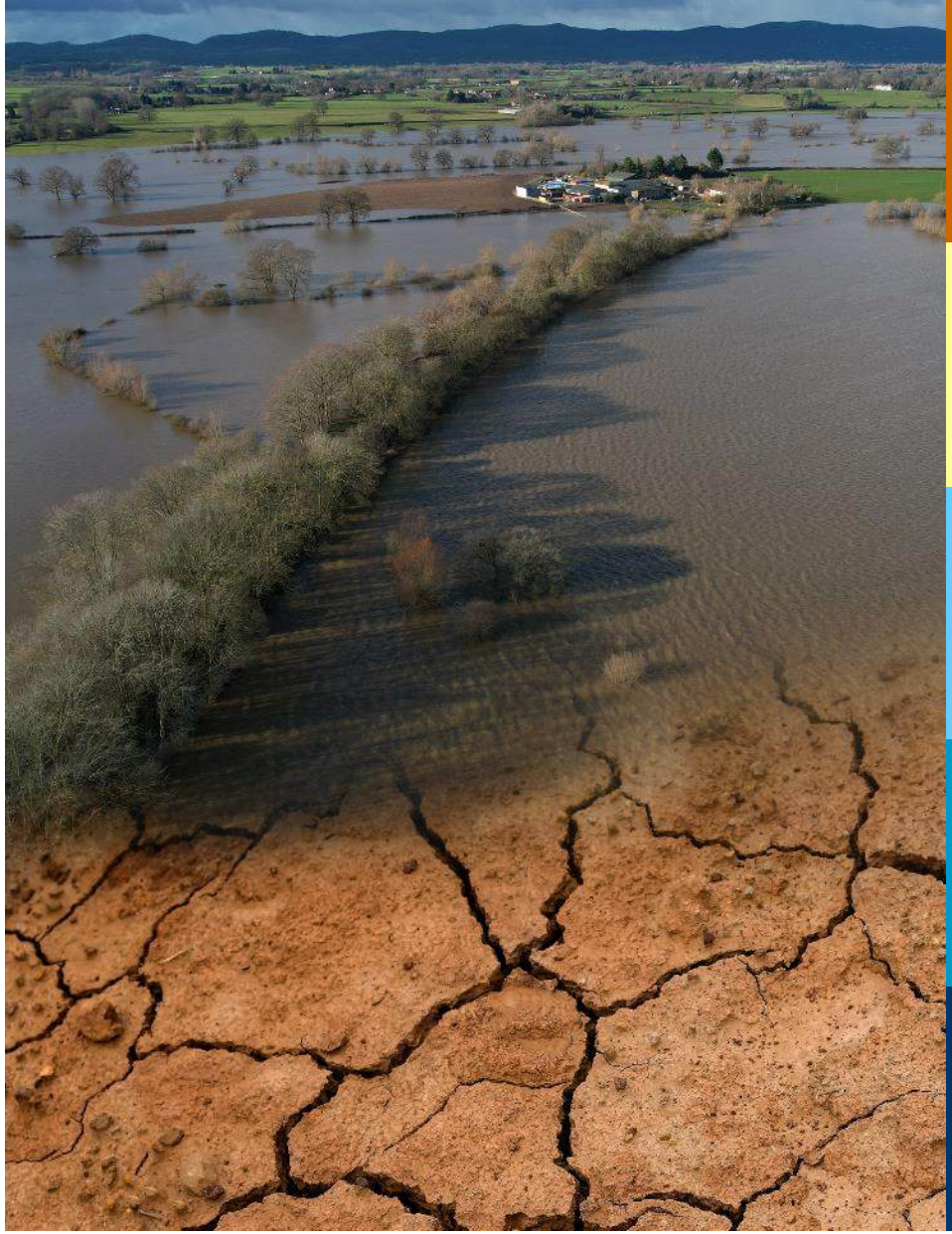
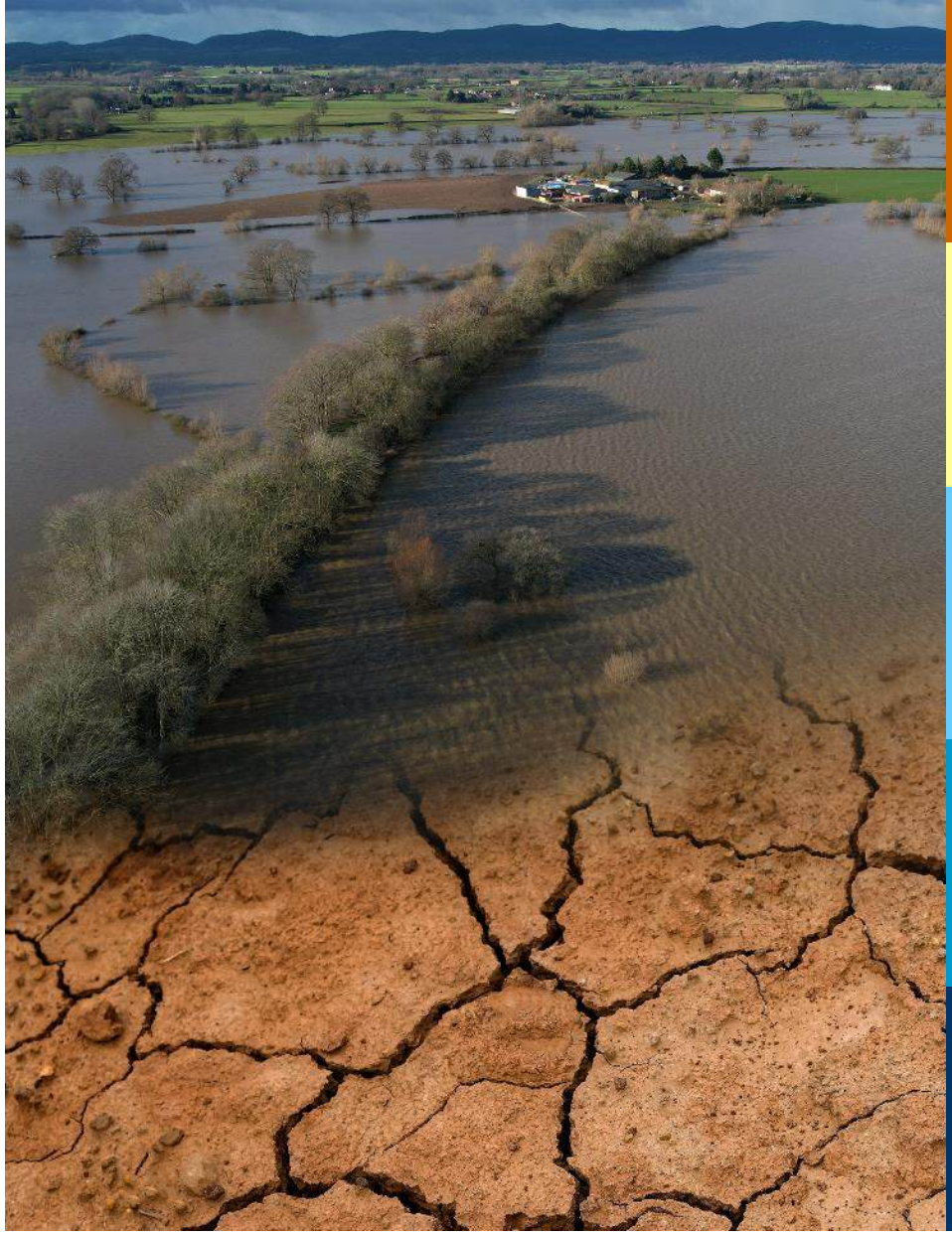
Flooding, droughts and hydro-ecology in a changing climate

Kate Heppell, Chess Champion, FDRI

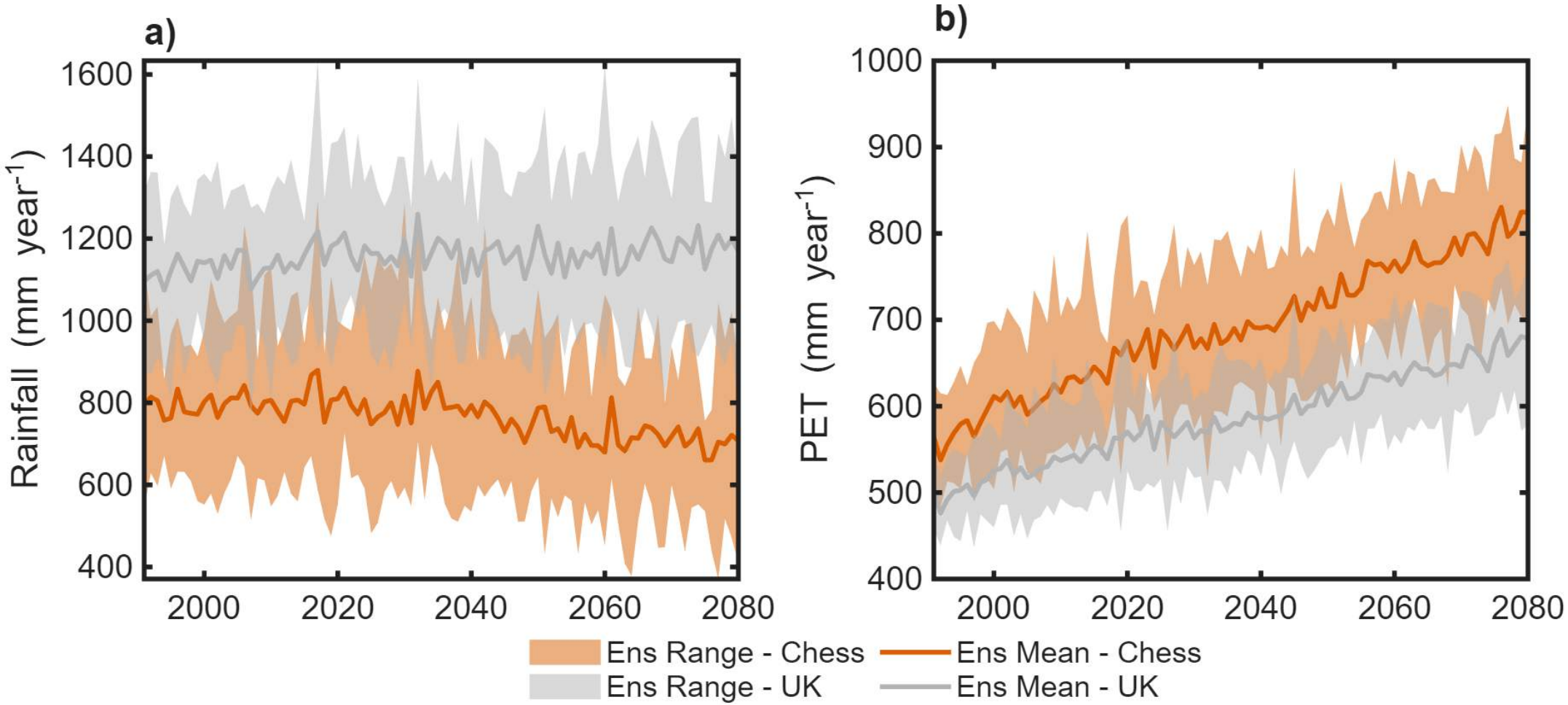


Climate predictions

- Met Office UKCP18 project provides climate model projections for the UK showing how climate is likely to change in the future



Future projections indicate increasing evaporation (driven by rising temperatures) and decreasing annual rainfall



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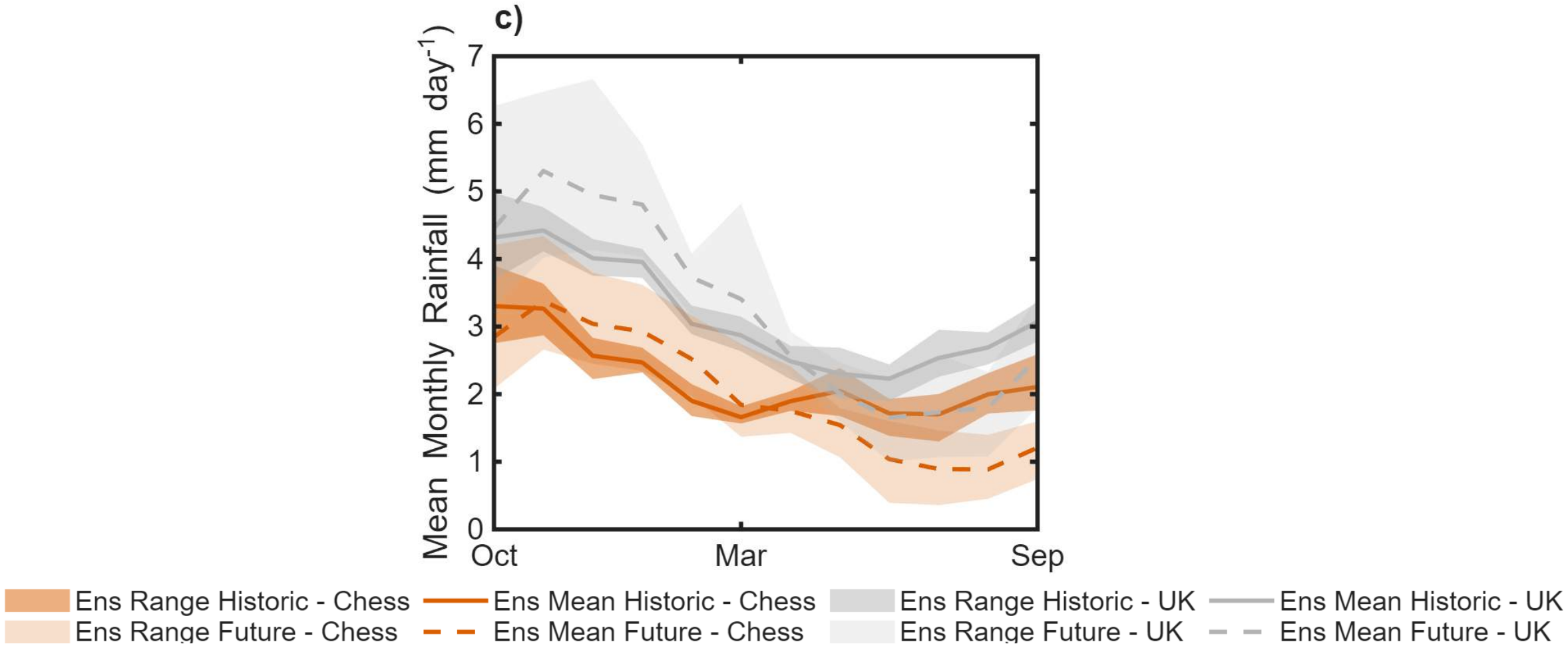
Changing variability of rainfall – wetter winters and drier summers



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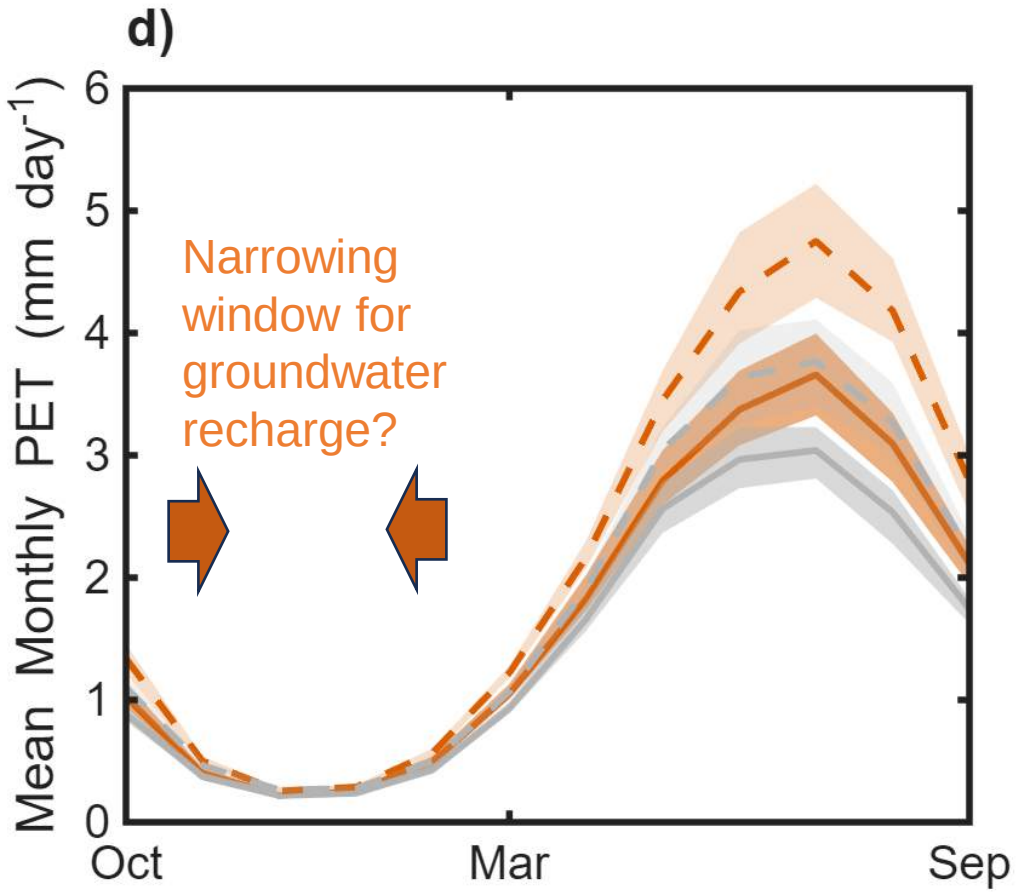

Ens Range Historic - Chess
Ens Mean Historic - Chess
Ens Range Historic - UK
Ens Mean Historic - UK
Ens Range Future - Chess
Ens Mean Future - Chess
Ens Range Future - UK
Ens Mean Future - UK

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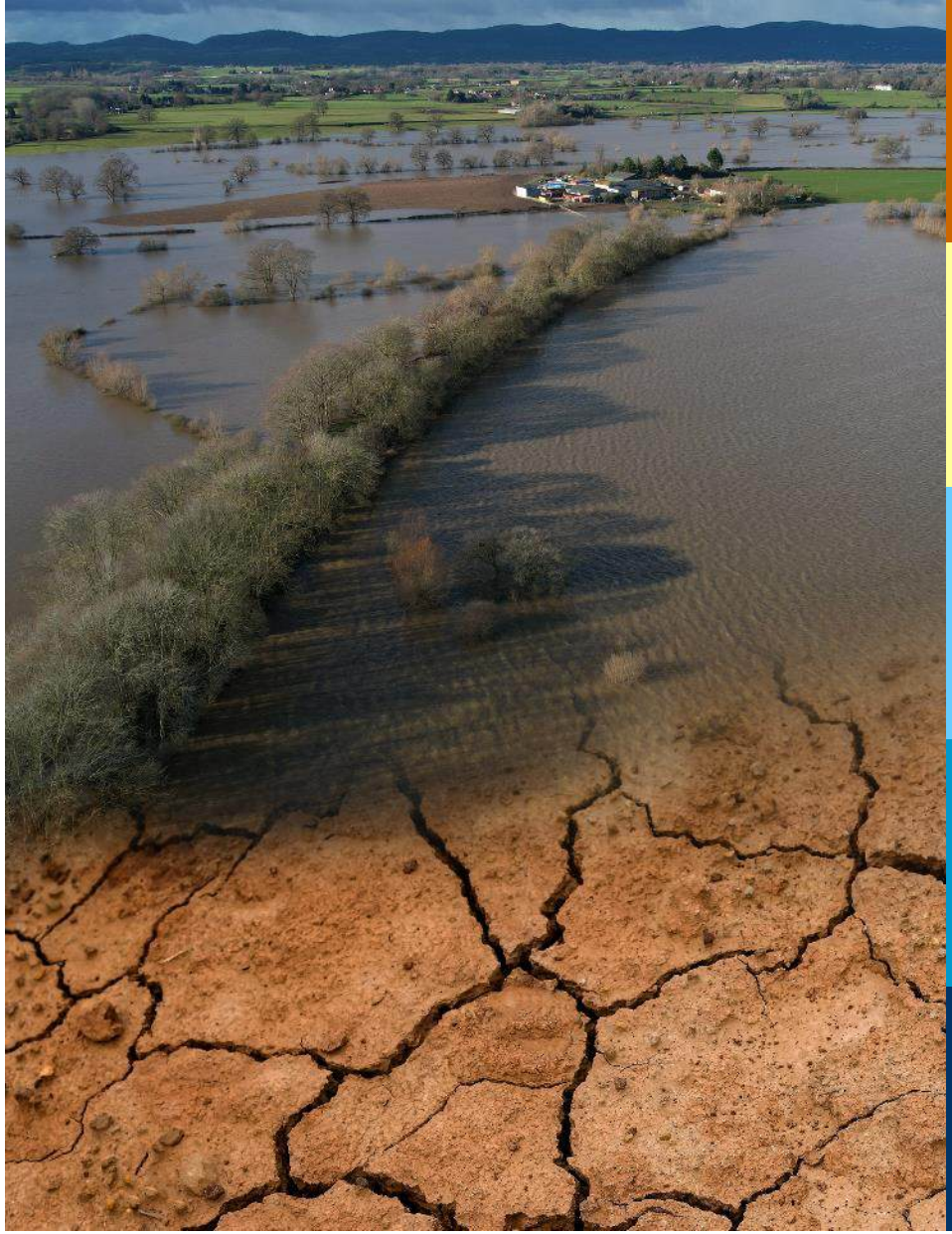
Predictions

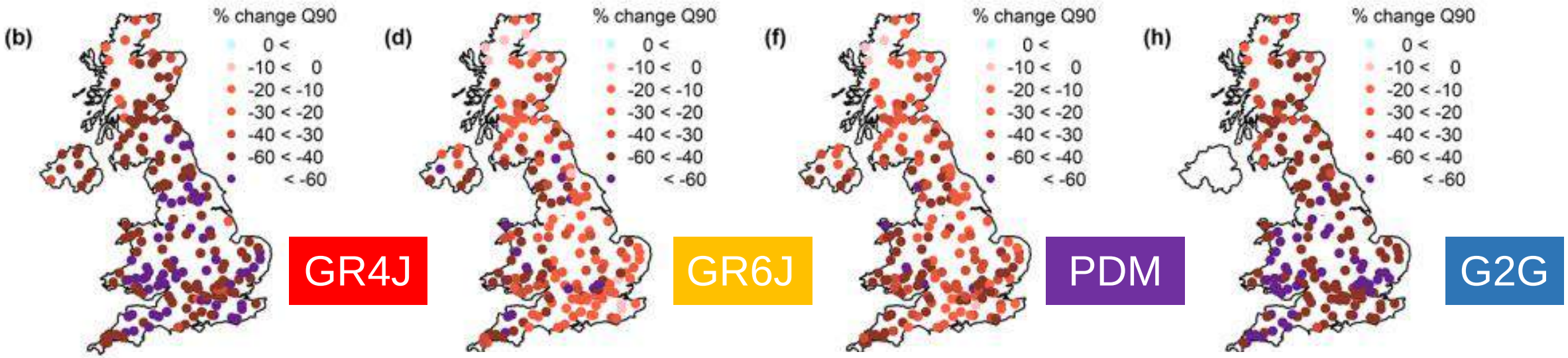
- Hydrological models are used to predict effects of climate change on river flows

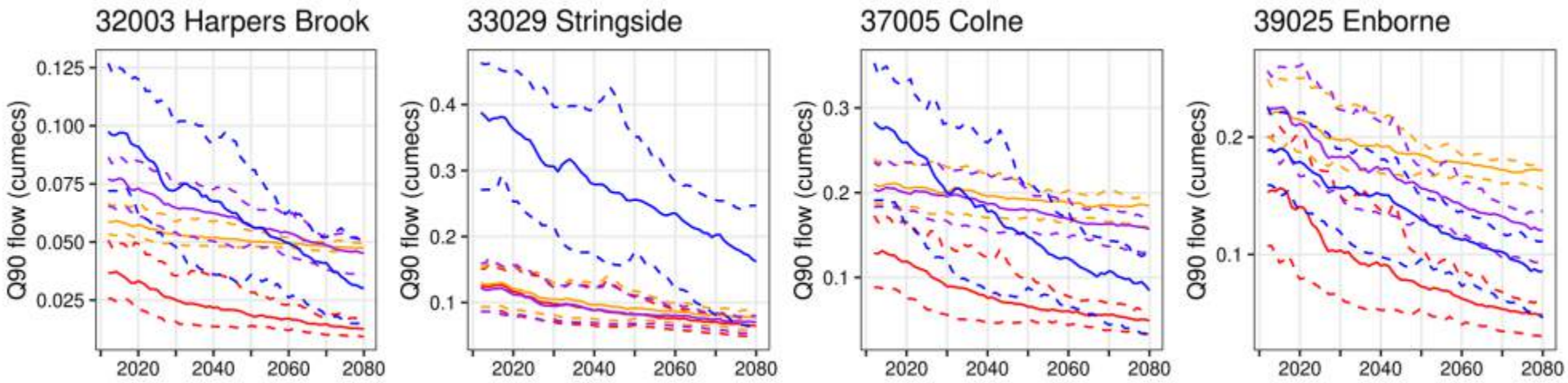
- They are run with predicted climate data (e.g. UKCP18) from climate models to simulate how river discharge will change over time

- There are various different models in use, e.g. GR4J and GR6J often used by water companies for water resources planning and low-flow forecasting



How will this impact river flows? High uncertainty in groundwater-dominated catchments





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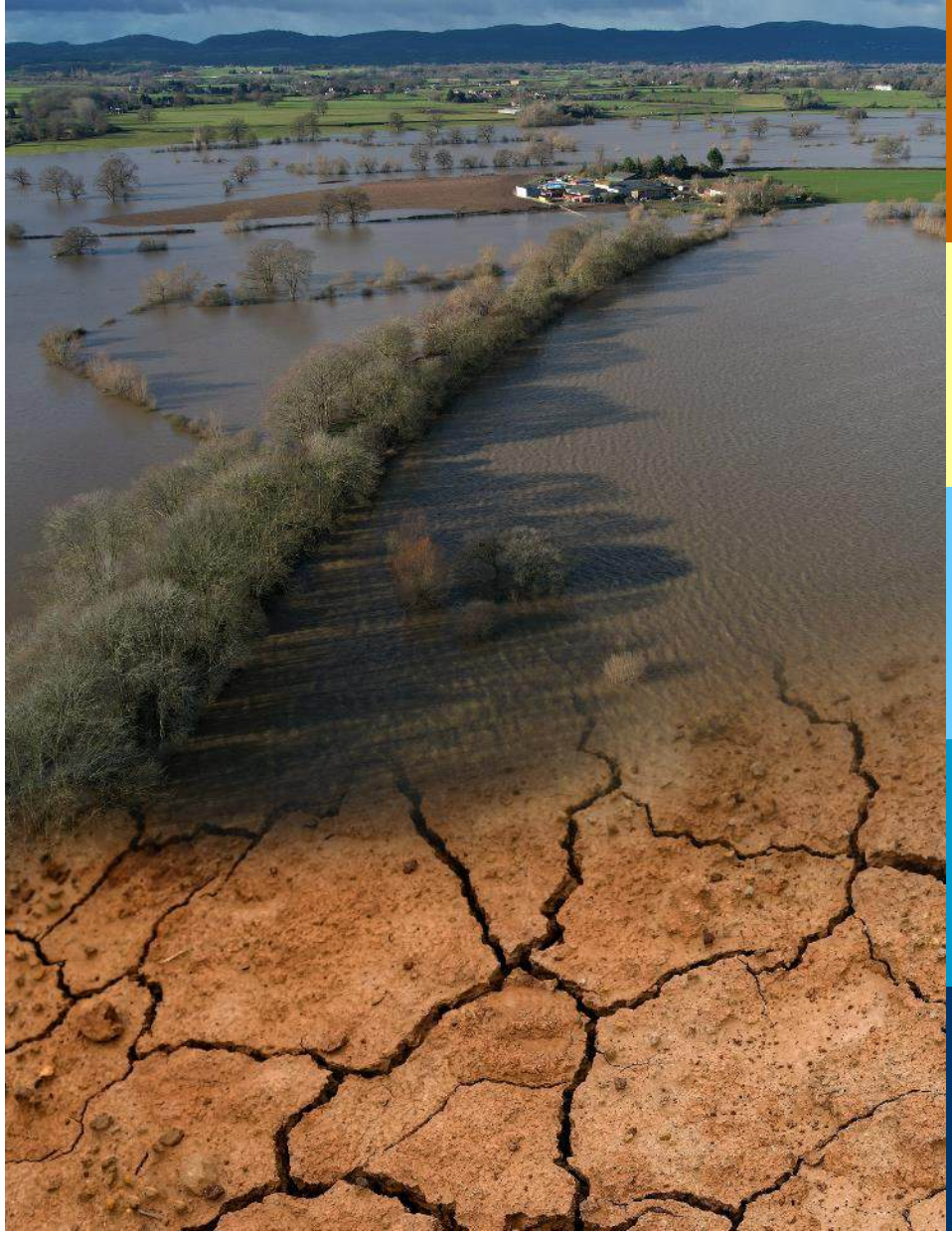
Parry et al (2024)

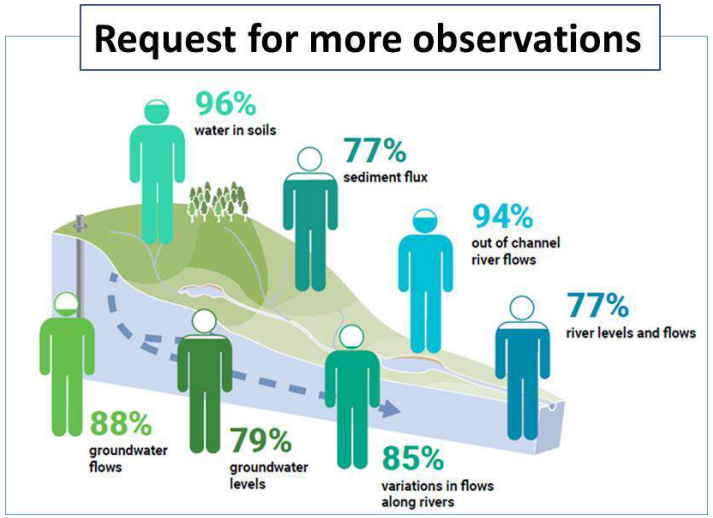
Impacts of changing Q90 flows on aquatic ecosystems

- Reduced size of aquatic habitats and depth of water
- Increased stress on fish and invertebrates
- Less oxygen in water
- Increased sedimentation and algal growth
- Increased risk of eutrophication



The Floods and Droughts Research Infrastructure vision

- A UK-wide digitally-supported floods and droughts research infrastructure (FDRI)
- Providing the scientific basis to enhance the UK's resilience to increasingly frequent and intense floods and droughts



Processes

Quantification

Prediction Forecasting

Digital Challenges

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Partners

- UK Centre for Ecology & Hydrology
- British Geological Survey
- Imperial College London
- University of Bristol

Science Community Advisory Group

Natural Environment Research Council

UK Centre for Ecology & Hydrology

Imperial College London

British Geological Survey

University of Bristol

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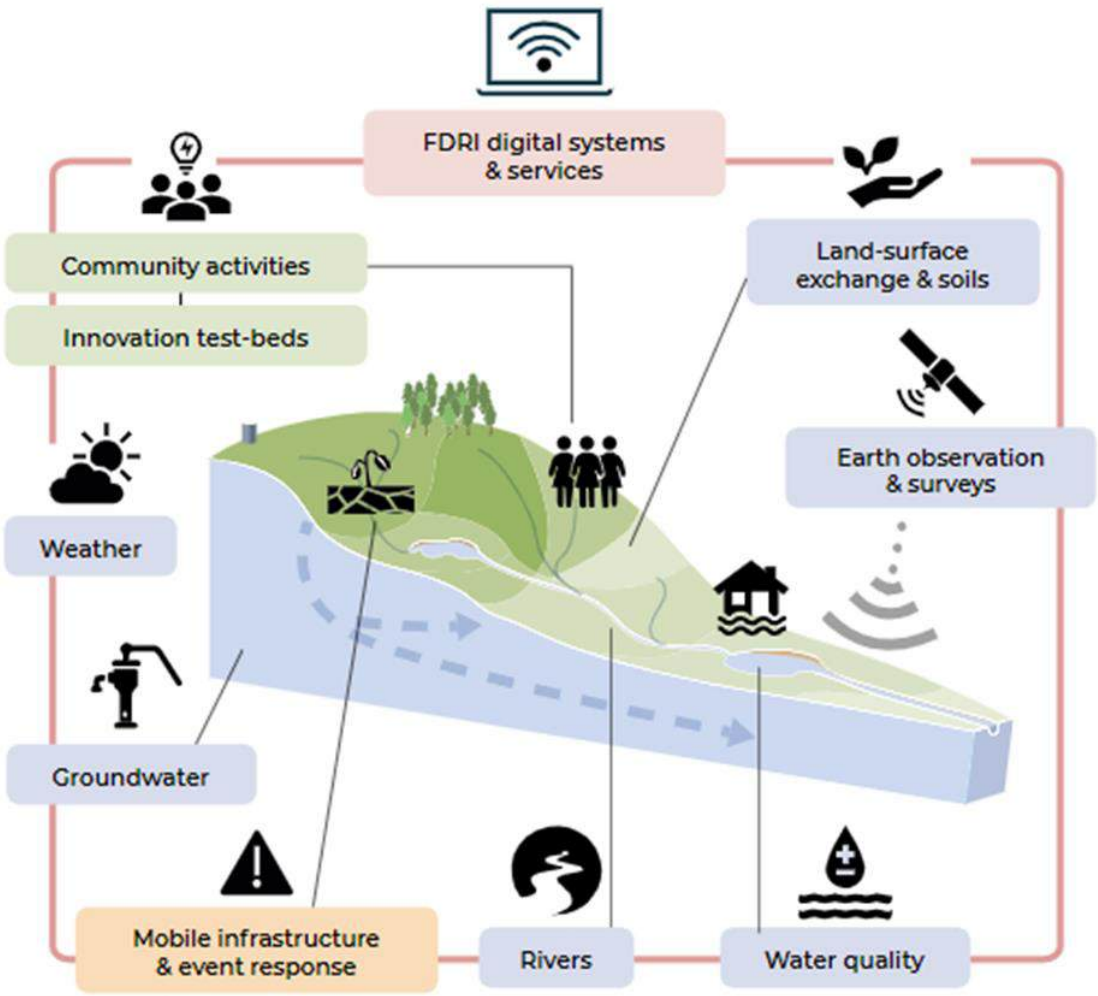
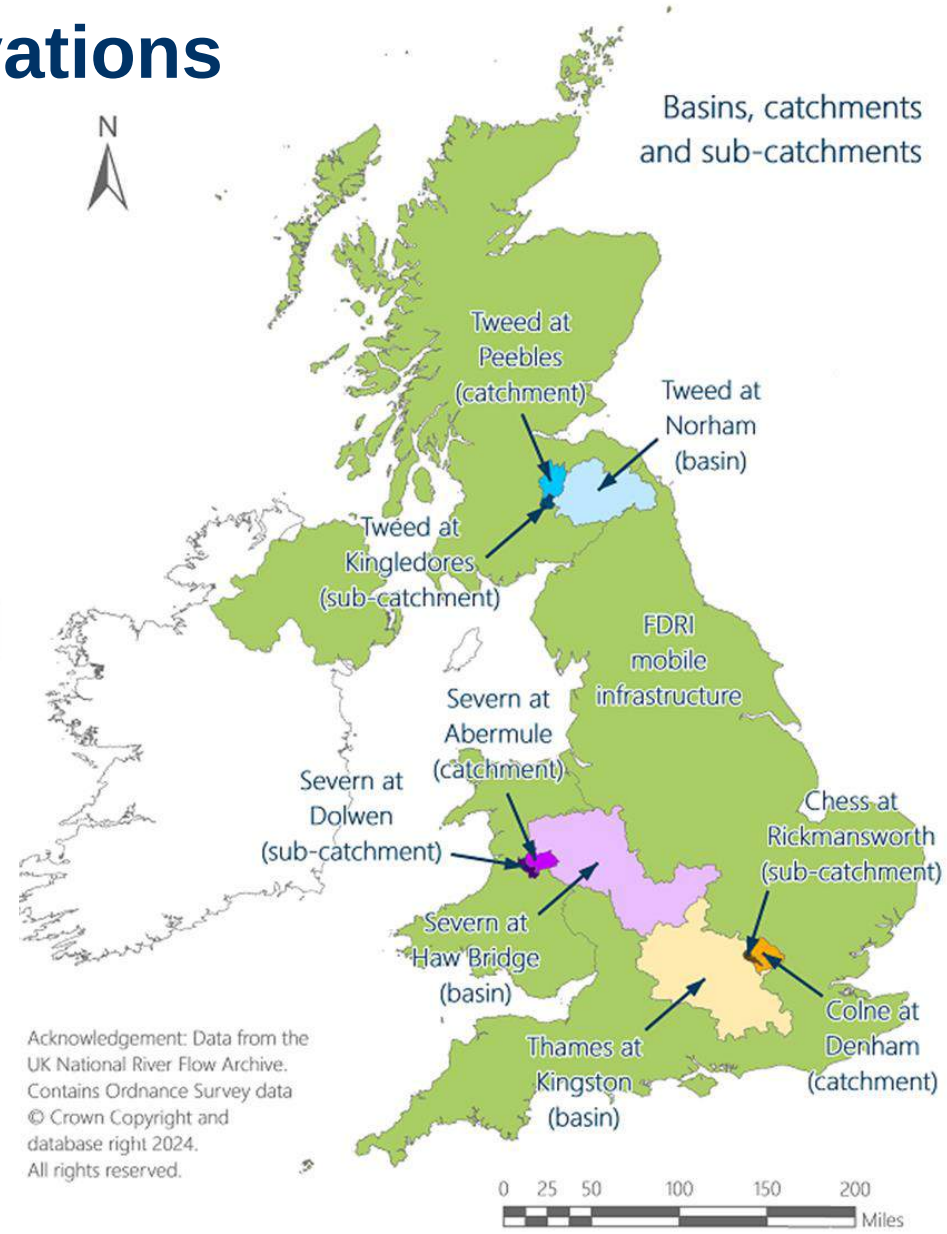
Need for new integrated observations





DIGITAL

CAPACITY BUILDING

INNOVATION

FDRI

The Floods and Droughts Research Infrastructure vision

Open access to field- and digital-infrastructure to address contemporary issues in the water environment, such as:

- Solutions to mitigate the effects of climate change on flooding & water shortage.
- Water pollution problems and viable solutions.
- Valuing the benefits and costs of Blue-Green infrastructure (network of semi-natural spaces to deliver ecosystem services).
- Flood forecasts better informed by catchment state.
- Optimal water solutions for food production, energy systems and nature recovery.
- Maximising the potential of the digital world to better manage the water environment.

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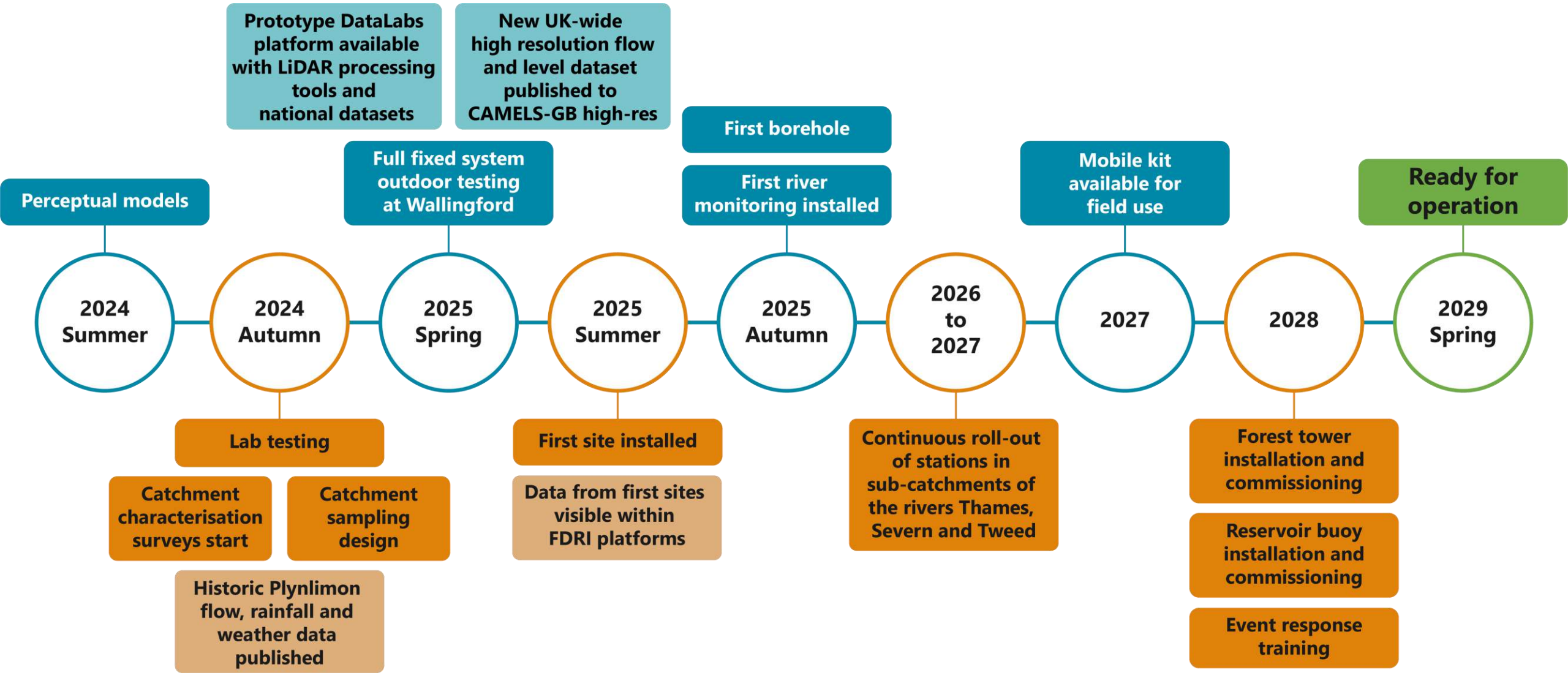
FDRI timeline for instrumentation and data



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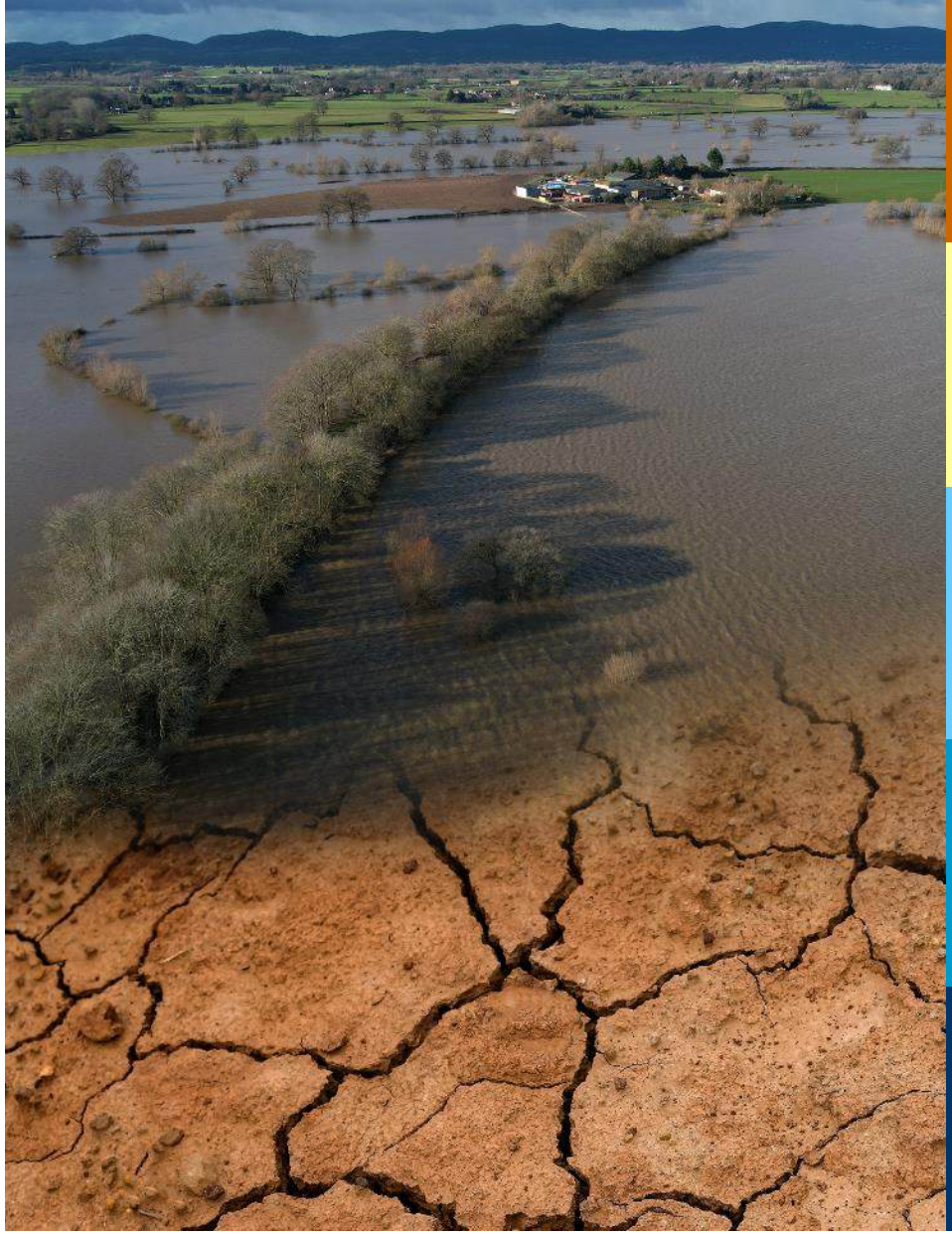
Do visit a few members of the FDRI team at our stand to find out more:

Kate Heppell – Chess Champion

Denise Pallett – Chess Engagement Manager

Anna Rose Klaptocz – Stakeholder and Communications Specialist

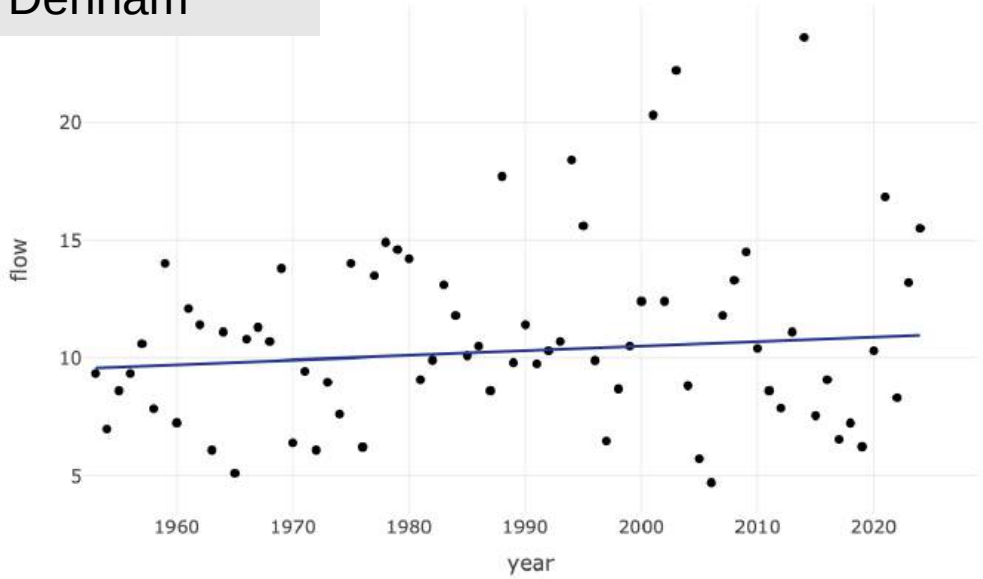


Observations

- AMAX (Annual Maximum) series are used to explore trends in river flows
- isolate and highlight the most significant high-flow events each year
- allow for the detection of changes in flood risk over time.
- crucial for understanding how climate and land use changes are impacting flood events.

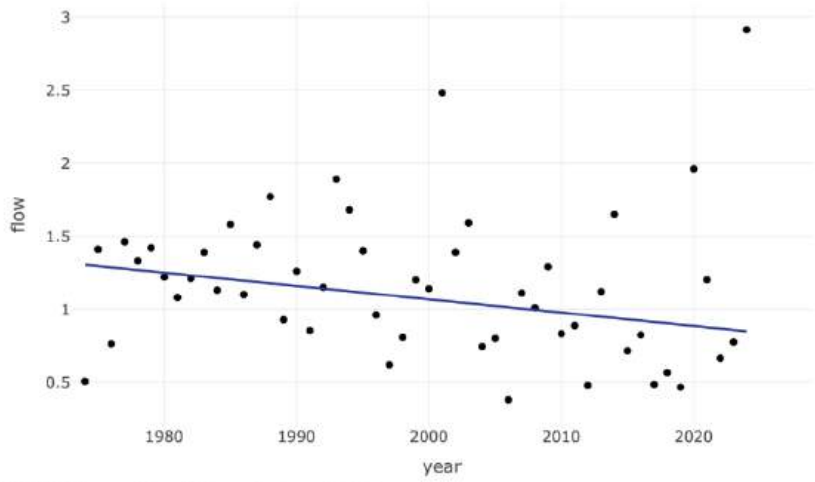
Mixed picture of trends in annual maximum river flows across the Colne

Colne at Denham



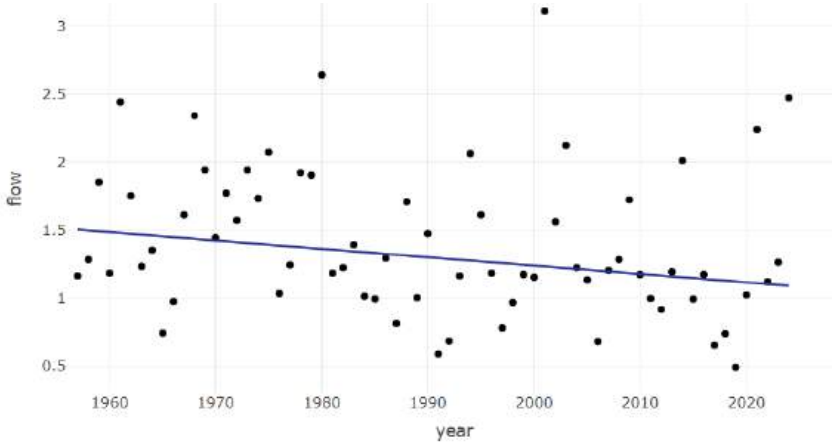
AMAX Mann-Kendall statistic: 0.87

Chess at Rickmansworth



AMAX Mann-Kendall statistic: -2.24*

Ver at Hansteads



AMAX Mann-Kendall statistic: -2.63*

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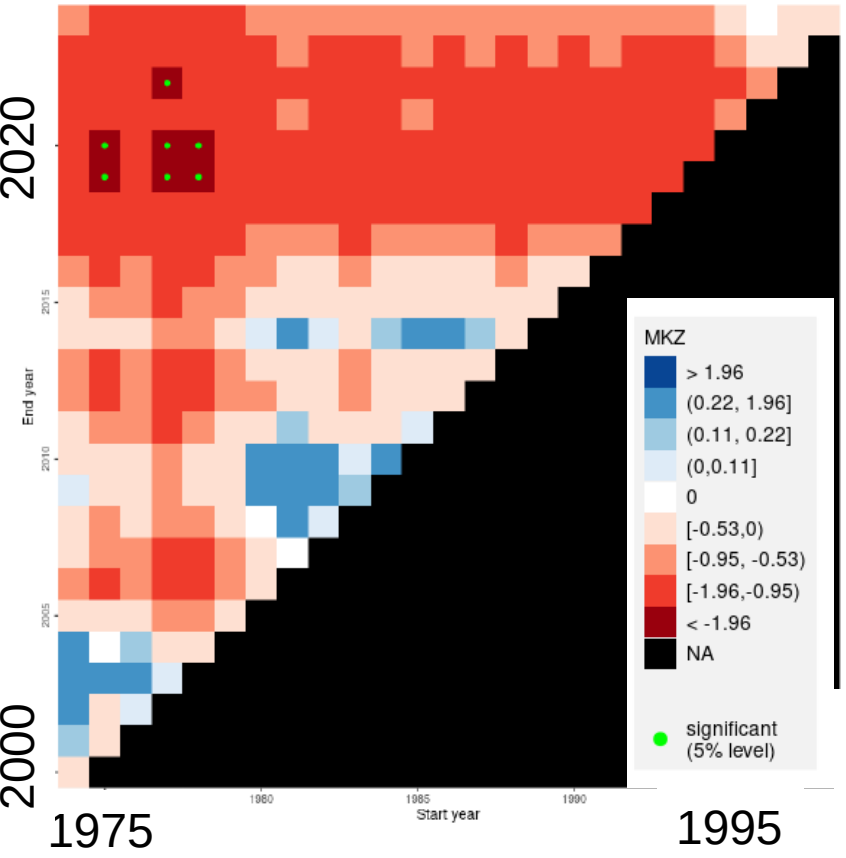
https://connect-apps.ceh.ac.uk/river-flow-trends-explorer/

Colne at Denham



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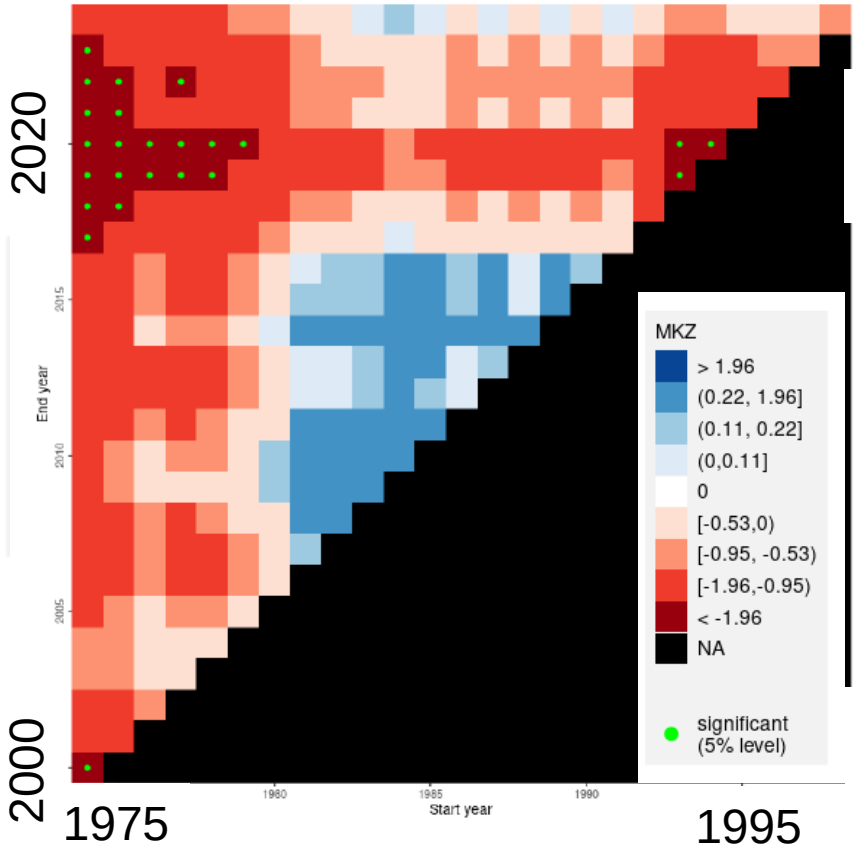

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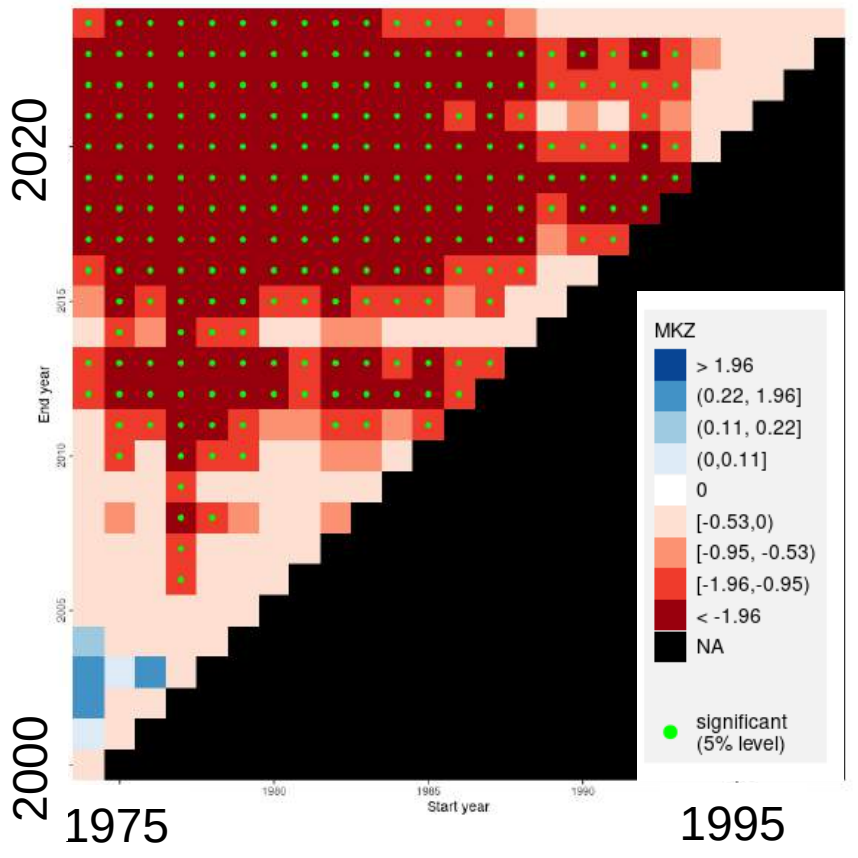

- Climate change signal in flow would need to be consistent across the region
- No significant trend in annual maximum flow over last 26 yrs

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