

Project Title: **Drought to Flood Transitions in a Changing Climate**

Lead Institution/Department: University of Bristol, School of Geographical Sciences

Primary Supervisor: Gemma Coxon

Co-Supervisor: Francesca Pianosi, School of Civil, Aerospace and Design Engineering

Co-Supervisor: Hayley Fowler- Newcastle University, Chris Hutton- Wessex Water

Summary: A fully funded PhD studentship including UK fees, annual stipend, and a research budget, is available at the University of Bristol to study drought to flood transitions in a changing climate. Study will begin in September 2025 and is funded for four years.

Project background

Compound hydrological extremes, such as successive drought and flood events, are a significant challenge to water managers and can have severe impacts. However, the drivers, impacts and adaptation to consecutive drought-flood events are a key unresolved problem. Typically floods and droughts are analysed separately, while adaptation measures address either floods or droughts in isolation.

This PhD aims to enhance our understanding of drought to flood transitions in a changing climate. It will study floods and droughts jointly, assessing the capabilities of climate and hydrological models to represent drought to flood transitions and understanding how these events might change in the future. Critically, it will focus on how we adapt to these changing extremes in partnership with water company experts. The PhD will focus on the UK which has experienced rapid hydrological transformations, such as the 2010-2012 drought to flood event that led to significant impacts across the UK. With the UK projected to experience warmer, wetter winters alongside hotter and drier summers in the future, understanding consecutive drought-flood events is critical.

Methodology

This project will leverage high-resolution climate projection datasets, national-scale hydrological models and water system models to:

- (1) assess the likelihood of consecutive drought-flood events in the future
- (2) enhance our ability to model compound hydrological extremes by incorporating new process representation in hydrological models
- (3) identify solutions for mitigating their impacts e.g. storing flood waters in reservoirs during the winter while still ensuring water supply during the summer.

We expect these objectives to evolve in line with the student's interests and for the student to refine the research objectives as their ownership of the research develops. The student will have the opportunity to do a placement at Wessex Water to determine how the knowledge and tools developed during the student's PhD can be used for decision making on future water resource planning.

Background Reading

Kreibich, H., Van Loon, A.F., Schröter, K. *et al.* The challenge of unprecedented floods and droughts in risk management. *Nature* **608**, 80–86 (2022). <https://doi.org/10.1038/s41586-022-04917-5>

Salwey, S., Coxon, G., Pianosi, F., Lane, R., Hutton, C., Bliss Singer, M., McMillan, H., and Freer, J.: Developing water supply reservoir operating rules for large-scale hydrological modelling, EGU sphere [preprint], <https://doi.org/10.5194/egusphere-2024-326>, 2024.

Useful Links

- <https://www.bristol.ac.uk/geography/courses/postgraduate/>
- <https://www.bristol.ac.uk/study/postgraduate/research/geographical-sciences-physicalgeography/>
- [Flood-CDT Projects | National Oceanography Centre](#)

How to Apply

The deadline for this position is 8th January 2025. The studentship will begin in September 2025. Please apply to the “Geography-PhD” at <https://www.bristol.ac.uk/study/postgraduate/apply/>