NC Internship Programme 2026

NC Programme

Hydro-JULES

Project Title

How do Floods Happen? Characterising UK Flood Events Using National Sub-Daily Rainfall and Flow Datasets.

Supervisors

Felipe Fileni

Tom Keel

Matt Fry

Xiaobin Qiu (Newcastle University)

Hayley J. Fowler (Newcastle University)

UKCEH Site

Wallingford

Project Overview

River Floods can happen for very different reasons. Some develop slowly after months of wet weather, while others are caused by intense storms that trigger rapid river rises within hours. For example, the widespread floods of February 2020 were caused by an exceptionally wet year, during which persistent rainfall in autumn and winter left soils saturated and river levels consistently higher than average across the UK. When further storms arrived, many catchments presented record peak flows, with prolonged flooding over large river systems. In contrast, the Boscastle flood in 2004 was driven by an extreme short-duration convective storm that delivered very intense rainfall over a steep catchment, causing river levels to rise rapidly and resulting in severe localised flooding within just a few hours.

These differences in how floods develop have been understood for years, but their quantification at the national scale has been limited. This is largely because UK-wide hydrological datasets did not previously offer the spatial and temporal detail needed to study sub-daily flood processes. The release of new national sub-daily rainfall and flow datasets changes the current scenario, opening the door to large-sample studies that can reveal how different types of flood events happen across the UK.

In this internship, you will work with researchers at UKCEH and Newcastle University to analyse extreme flood events using these new datasets. You will investigate how factors such as rainfall intensity, spatial patterns, and soil moisture influence flood behaviour, helping improve national flood characterisation and risk assessment decision-making.

Key tasks

- Review scientific literature on flood processes and event classification
- Explore and visualise flood events across the UK
- Analyse events hydrographs and rainfall patterns
- Develop a reproducible workflow to classify flood events
- Apply statistical and machine-learning methods to identify key flood drivers of different flood events

Expected Outcomes

Through this internship, you will gain a clear understanding of how flood events develop in the real world, and how they are currently represented in UK flood-risk policy. By working with high-resolution rainfall and river-flow data, you will explore different types of flood events and identify how rainfall, catchment conditions, and river responses interact. This will help highlight where better event information could support stronger flood planning and risk assessment.

You will also develop a practical, reproducible workflow for analysing flood events and produce clear quantitative results on flood characteristics and drivers. All work will be fully documented and will contribute to publishable research and ongoing academic studies.

Required Skills and Background

Undergraduate, Masters, or PhD student

Essential

- Currently in undergraduate or postgraduate education (including PhD) at university or have graduated within the six months prior to the start of the internship
- Interest in extreme weather and extreme events
- Ability with a scientific programming language (preferably python)
- Good numeracy / statistical ability

Desirable

- Experience working with hydro-meteorological datasets
- Experience working with machine learning

Benefits this internship offers for the intern

By taking part in this internship, you will:

- Develop practical skills in hydrology and flood analysis
- Gain experience working with large environmental datasets
- Strengthen your programming and data-analysis abilities
- Learn modern statistical and machine-learning techniques

- Work closely with leading researchers at UKCEH and Newcastle University
- Build professional networks for future industry or academic careers