Making better use of local data in flood frequency estimation

Project Summary SC130009/S

This research project has developed methods and guidance to reduce uncertainty in flood frequency estimation through the incorporation of local data.

Flood frequency estimation

Flood frequency estimates are an essential part of flood risk management. They tell us what flood flows are expected to occur for a given rarity. They are central to many important decisions, such as the design and operation of flood defences, flood mapping, informing planning decisions in flood risk areas and long-term investment planning.

Methods described in the Flood Estimation Handbook (FEH) published in 1999, and its many subsequent updates, are considered the industry standard for flood estimation in the UK. They are used extensively by hydrologists from both the public and private sectors.

Flood frequency estimates (also known as design flood estimates) are associated with many sources of uncertainty. These hydrological uncertainties are often the most uncertain component in any flood risk assessment. As a result, any reduction in the uncertainty of flood frequency estimation has considerable benefit.

One way to reduce uncertainty is to incorporate complementary local data to refine the results obtained using the FEH methods.

What are local data?

The best estimates of design floods are almost always made from analysis of long-term records of accurately measured peak flows. Local data are defined as information that complements these primary data sources. Examples of local data include:

- short records of river flow
- river level measurements
- information on flood seasonality or hydrograph widths
- historical flood and palaeoflood data[1]
- information on river channel dimensions

Local data can be used to adjust generalised estimates obtained from FEH methods with the aim of reducing uncertainty in design flows – in other words, getting a better answer.

Recommendations and findings

The project reviewed existing research and practice relating to uncertainty analysis in flood hydrology and on the use of a wide range of local data for flood frequency estimation. It developed new and improved procedures for incorporating historical data and information on channel geometry into traditional flood frequency estimation.

Different approaches for incorporating historical data into flood frequency analysis were examined and recommendations made about the best method to use in the UK. The recommended method (maximum likelihood) has already been made available in the latest version of the UK standard flood estimation software (WINFAP-FEH v4). The work also confirmed that the inclusion of historical data can lead to a large reduction in the uncertainty in estimated flood design events.

To further encourage uptake of these methods by practitioners, the report outlines a proposal to develop a new local and historical flood data archive that would be integrated with the existing National River Flow Archive.

An improved method for estimating the median annual maximum flood (QMED) from catchment descriptors and channel geometry (bankfull channel width) is also presented. This can be used to improve the estimation of design flows.

There is now a challenge for the flood risk management community to put these findings into practice. More widespread use of local data in flood frequency estimation can potentially lead to reduced uncertainty and more credible and robust design flow estimates.

[1] Referred to as 'historical data' from here on in this summary.

This summary relates to information from project SC130009, reported in detail in the following output(s):

Report: SC130009/R

Title: Using local data to reduce uncertainty in flood frequency estimation

February 2017

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