

Motivation for the KTP

- **Floods impact on both individuals and communities, and have social, economic, and environmental consequences**
- The 2013/2014 UK winter floods are an example of the impact of flooding



An aerial view of flooding on the Somerset levels on 2 February 2014. Copyright Tim Pestrige.

- JBA and Lancaster University have developed a prototype model for assessing the risk of large scale river flooding
- The model has driven both regional and national assessments of flood risk
- Incorporate knowledge of the hydrological cycle into the statistical model
- **The end goal is to produce spatially and temporally realistic flood event footprints for the insurance industry and the Government's strategic planning**

Who are JBA Consulting?

- **JBA Consulting is a specialist flood risk and environmental engineering consultancy**
- 17 offices across the UK and Ireland and employ over 300 people
- JBA Consulting is a part of JBA Group Ltd
- JBA Risk Management sell flood risk maps and analytics to the insurance, reinsurance and allied industries
- **The KTP will benefit both JBA Consulting and Risk Management**

Why Lancaster University?

- Builds on strong existing research links between the two organisations
- **Previous work between JBA and Lancaster has provided the first tool to assess spatial risk of flooding in multiple rivers**
- JBA and Lancaster have also optimised the height of all coastal flood protection schemes in the UK
- These 900 schemes influenced a total spend of £0.9 Billion

Why should we model flood risk?

- **Floods are likely to occur simultaneously at a number of locations**
- **Accounting for this dependence between locations allows us to manage and mitigate flood risk**

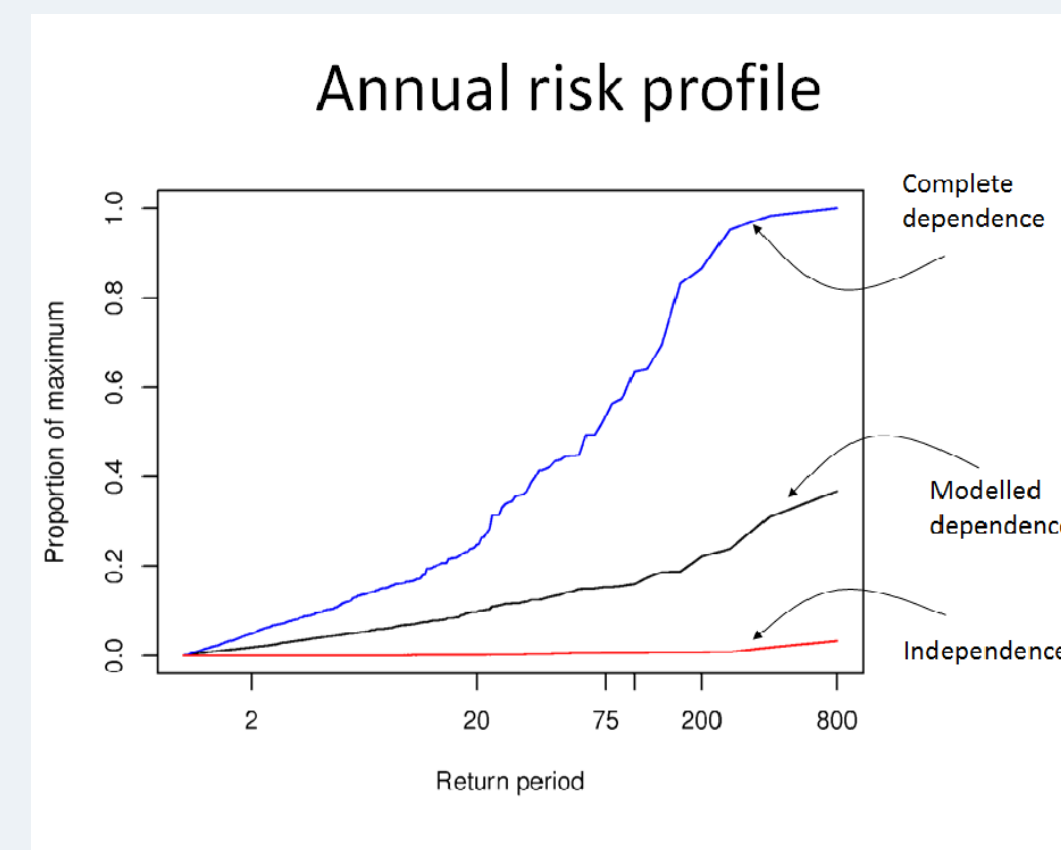


Image taken from presentation by J.A.Tawn and R.P.Towe for NERC Statistics for Environmental Evaluation Course, which was based on previous work by JBA Consulting.

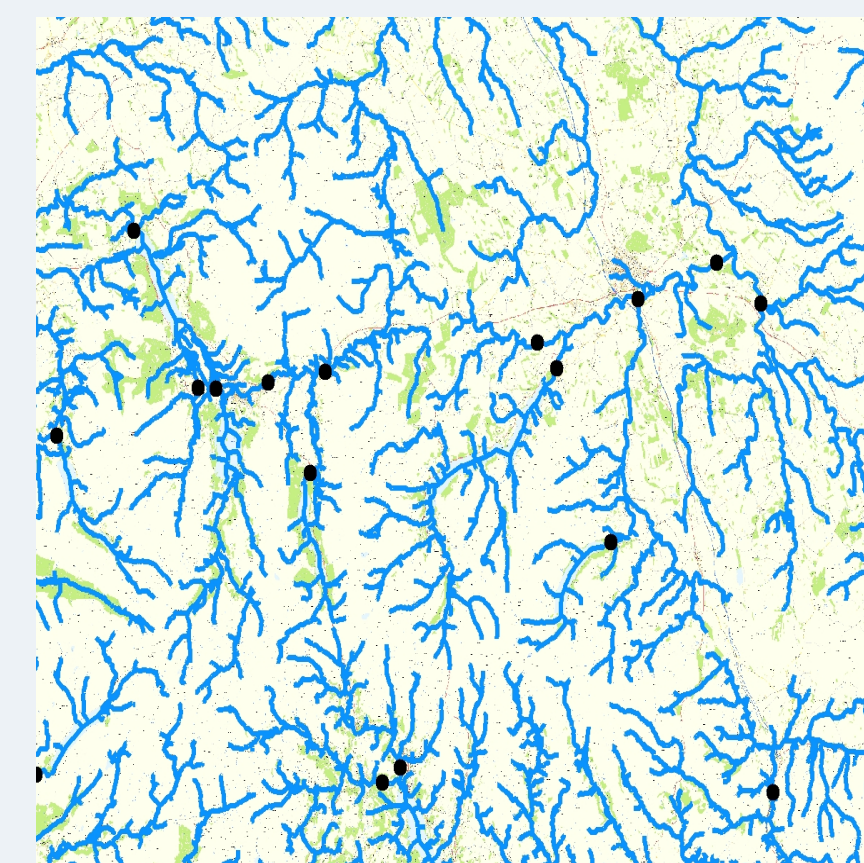
How do we characterise a flood event?

- **The return period of the event is used to describe the severity of the flood**
- A 100 year return period event is expected to be seen once every 100 years

Challenges we face

- Measurements of river flow are not recorded at every place along the river network
- The record length of available data varies
- Different gauging stations have missing data at different times
- Making sure that the statistical models include information about the physical processes
- How to use rainfall information to predict the spatial and temporal behaviour of floods

An example of where river flow measurements are available along the river network. Data locations are provided by the National River Flow Archive from the Centre of Hydrology. The river network comes from the Ordnance Survey.

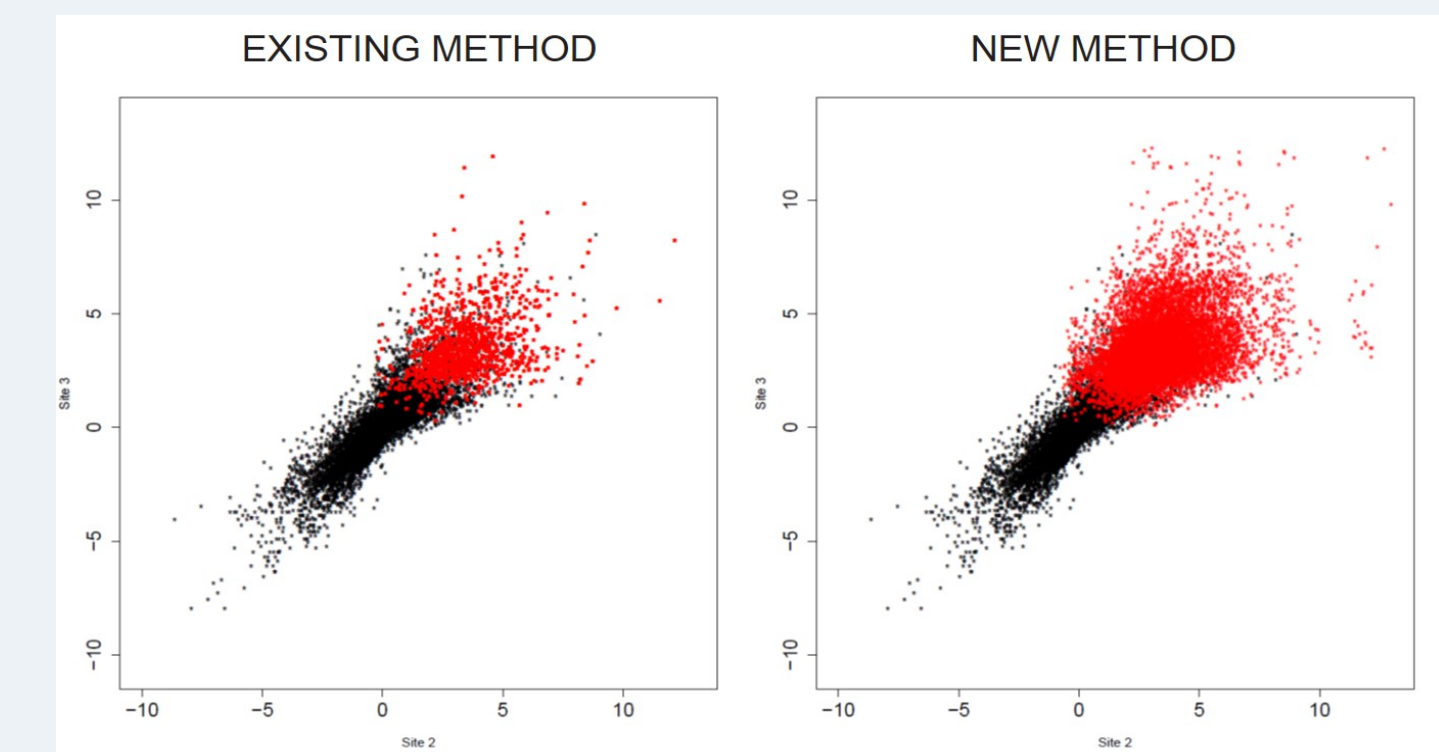


Steps we have taken

- Conducted a review of the previous methods used to model flood risk
- **Assessed the quality of the available rainfall and river flow data**
- Conducted an exploratory analysis on rainfall and river flow data in the North West
- **Developed a more computationally and statistically efficient method to handle missing values**

Comparison of the existing and new methods

- Consider river flow measurements at three sites
- Interested in the dependence between sites when events are large
- Measurements are transformed to be on the same numerical scale
- A 100 year event is observed at site 1, we want to know the values that could be observed at site 2 and 3



Plot of the possible events at site 2 and 3. The black points represent those events that are observed and the red points are simulated events.

Benefits:

- The new method generates a more realistic set of flood event sets
- The new method is also computationally more efficient

Next Steps

- Further assess the existing methods that are used by JBA Consulting
- Prioritise the ways in which to improve the statistical models
- Work out how we can use rainfall to produce more realistic predictions of flood events along the river network

How I have benefited from the KTP

- Attended the first KTP module
- Writing up papers from my PhD and previous work with the JBA Trust
- Gained experience of presenting at an international conference
- Helping to supervise a MSc dissertation project