# National river gauge rate of rise analysis

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## Introduction

Our aim was:

- To find historical events where rivers have risen exceptionally rapidly
- To quantify those events and assess their probabilities

We analysed 15-minute data from 2,578 river gauge records held in the Environment Agency's archives.

## Methodology

- Extract all rapid-rise events, defined over any 0.25-, 0.5-, 1- and 2-hour sampling interval
- Assess the return period (1/annual probability) of the most extreme rapid rise events using peaks-over-threshold statistical analysis
- Plot the results for each river gauge in a PDF summary sheet

## Outputs

For each gauging station we plotted:

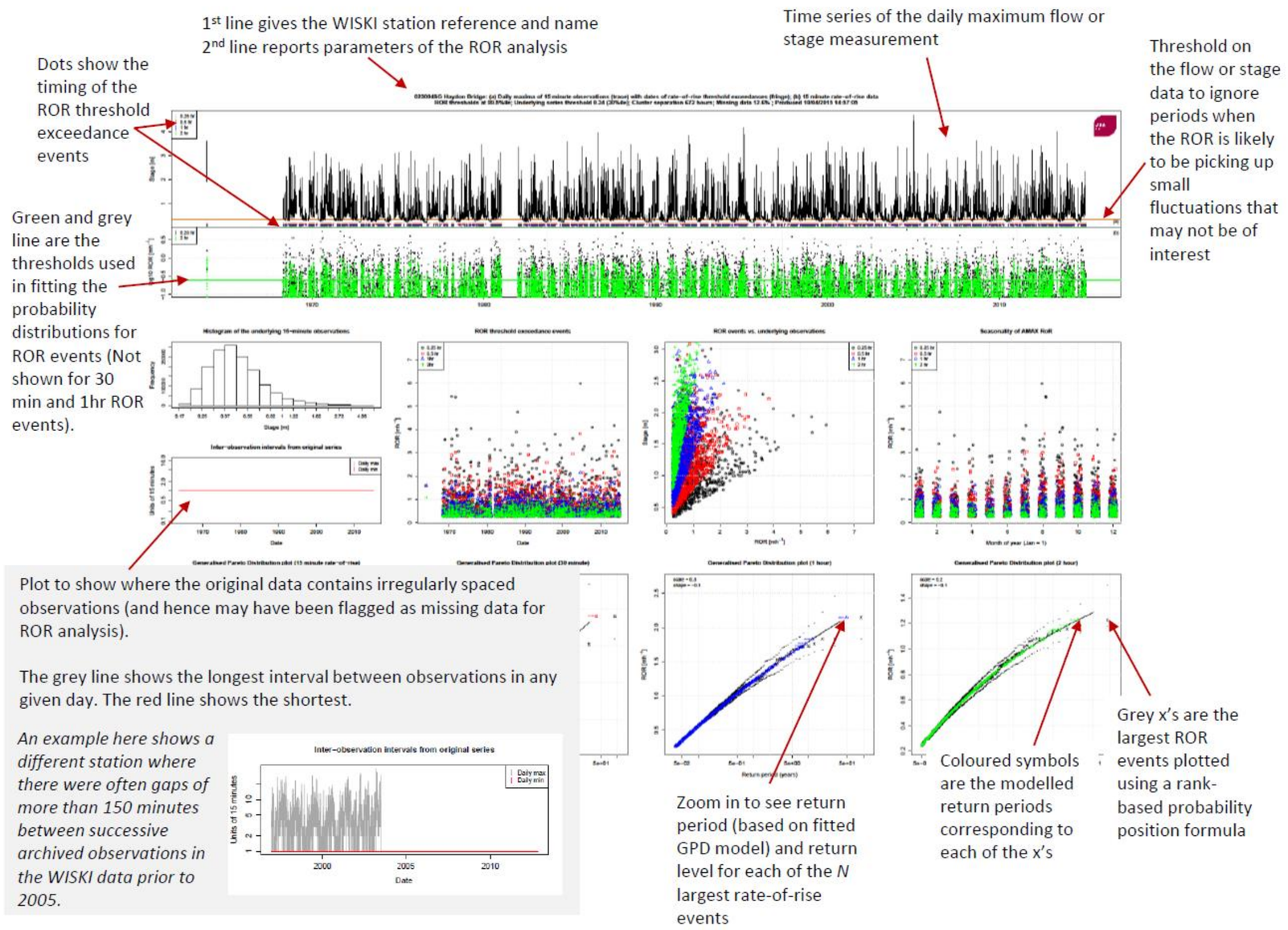
- Time series of the original flow or stage data and the rapid-rise events
- Histogram of raw observations
- Time series of gaps between successive observations to check for irregular measurement intervals
- Rapid rise events compared with the underlying flow or stage
- Seasonality
- Frequency curves (return level of Rate-of-Rise, ROR, against return period), highlighting the most extreme events

The most extreme rapid-rise events and frequency curve parameters were also tabulated.

## Data quality/issues

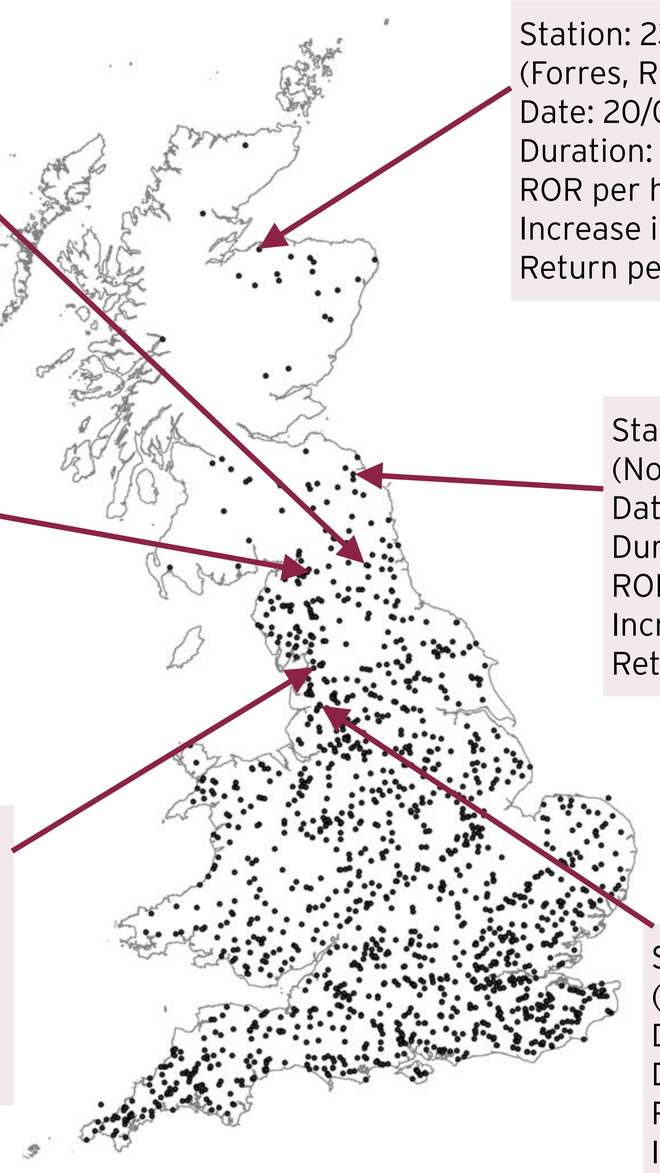
Issues with the data included:

- Gaps in the gauged records
- Observations collected at irregular sampling intervals
- Interpolated values
- There can be more than one "flow series" for a given gauging station location
- Station start and end dates do not always reflect the actual availability of useable data
- Questionable flow or stage values exist in the archived data




Outputs of gauging station analysis

## Notable rapid rise events at river gauges



Station: 023023FQ
(Riding Mill, River Tyne)
Date: 31/01/1995
Duration: 1 hour
ROR per hour: 295 $m^3s^{-1}$
Return period: 27 years

Station: 234221FQ
(Forres, River Findhorn)
Date: 20/09/1981
Duration: 1 hour
ROR per hour: 333 $m^3s^{-1}$
Increase in level (1 hr): 1.7 m
Return period: 23 years

Station: 762507FQ
(Warwick Bridge, River Eden)
Date: 24/03/1968
Duration: 0.25 hours
ROR per hour: 1,388 $m^3s^{-1}$
Increase in level (0.25 hrs): 2.5 m
Return period: > 1,000 years

Station: 9514FQ
(Norham, River Tweed)
Date: 17/01/1982
Duration: 1 hour
ROR per hour: 341 $m^3s^{-1}$
Increase in level (1 hr): 1.2 m
Return period: 489 years

Station: 724629FQ
(Caton, River Lune)
Date: 07/01/2005
Duration: 2 hours
ROR per hour: 192 $m^3s^{-1}$
Increase in level (2 hrs): 1.4 m
Return period: 178 years

Station: 713019FQ
(Samlesbury, River Ribble)
Date: 22/06/2012
Duration: 0.5 hours
ROR per hour: 566 $m^3s^{-1}$
Increase in level (0.5 hrs): 1.4 m
Return period: 131 years

## Next steps

- Further data QA to remove unrealistic rapid-rise events
- Mapping and analysis of patterns in rapid-rise event statistics
- Comparison with extreme rainfall within the FEPsys application

JBA trust

JBA Trust is a not-for-profit foundation promoting better skills and knowledge in environmental risk management.