UK Flooding 2000

06 Feb 2003

Professor Edmund Penning-Rowsell

Flood Hazard Research Centre

Middlesex University

Britain has taken a battering from floods in the last 5 years, with major events in 1998 and 2000, significant floods in 2001 and minor events in each of the other years.

So what can we learn from these events? We are fortunate that we have some world-class geographical research in this field in Britain, both on the physical side and on the human dimensions. Each is represented in this In-depth Report.

This means that we have a very large amount of data on the causes, extent and frequency of the flooding, for example concerning the autumn 2000 event. We have data on the impacts that these floods bring, in terms of damage to property and the disruption of people's lives.

This means that we can relate very clearly the human dimensions of the flood hazard to their physical causes, and also to the intensive occupancy of the floodplain areas of this country that arises from the crowded nature of our small islands.

In this respect we can learn that some of the hazard is *self-imposed*: people are living and working in dangerous situations. In other cases the hazards are *imposed upon* the victims by others: upstream development causes accelerated downstream runoff and the flooding of property that would otherwise be safe.

Geography is about people and environments. Studying natural hazards such as floods serves to magnify our understanding of these relationships, by focusing on extremes of physical process and human impacts. The research results in this In-depth report provide an invaluable insight into these relationships. By focusing on what is in the news, this demonstrates the increasing relevance of geography to the world today.

Why the floods of 2000/01?

06 Feb 2003

What was happening long before the floods?

- Unsettled weather patterns in April and May 2000 ensured that soils did not begin to dry out until late spring.
- Although summer rainfall totals were below average, the limited period over which evaporation could exceed rainfall resulted in greater soil moisture than seen since mid to early 1990s. Saturated catchments from September, at a time when, in the eastern lowlands, soils are normally capable of absorbing significant further rainfall, were an important factor in the exceptional autumn flooding.
- The wet spring also prolonged the recharging of aquifers meaning that the lowering of river flows due to groundwater outflow did not begin until late June in many eastern and southern catchments. As a result flows in rivers draining most permeable catchments remained very healthy through the summer.

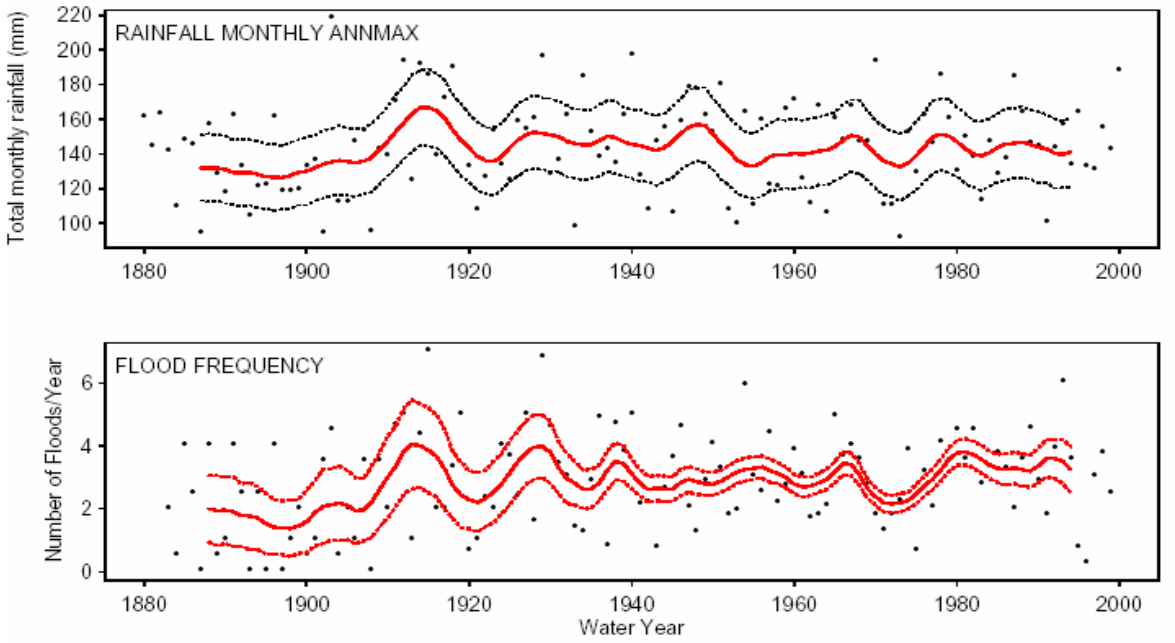
Why did this contribute to flooding in autumn?

- There was limited further capacity to accommodate surface runoff; intense summer thunderstorms produced localised flooding (e.g. across the Rother basin in Sussex). This vulnerability then led to a wider flood threat as, generally from mid-November, channel capacities could no longer contain the volume of groundwater outflow.

Are we getting more floods than before? Are they due to climate change?

1. Is there a correlation between rainfall and flooding?

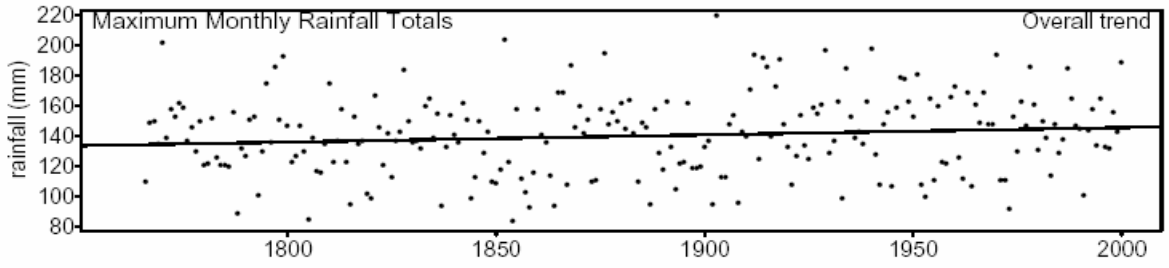
Graphs showing rainfall and flood frequency time series since 1880



The top graph shows the annual maximum monthly rainfall totals for England and Wales. The lower graph shows the average number of floods per year. The red smoothing curve fitted suggests a close resemblance in the general behaviour.

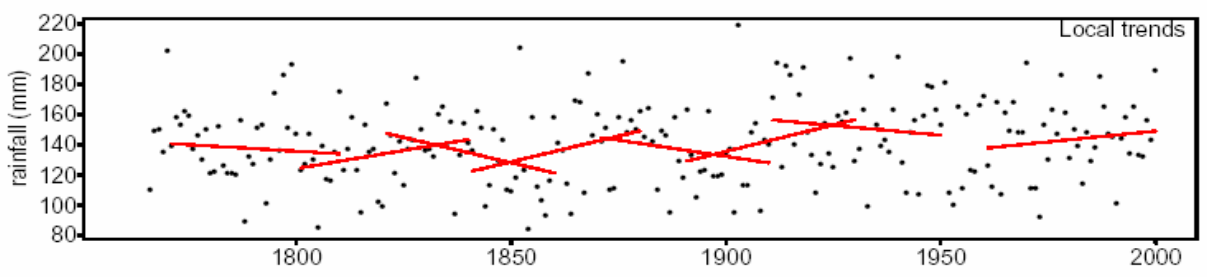
2. Are we getting more rain?

Graph showing long term patterns and trends in annual maximum monthly rainfall totals for England and Wales.



This graph also shows a just significant overall trend suggesting more rain.

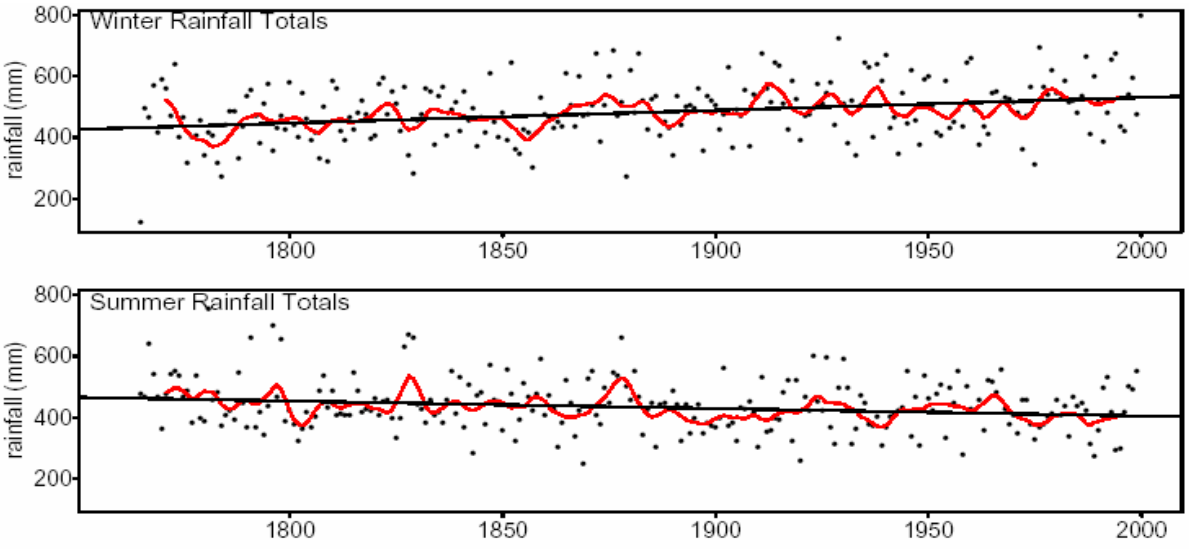
Graph showing trends for selected 40- year sub periods



The graph above shows significant upward and downward trends. Look at the ups and downs in the rainfall over since 1766. Would you consider an increase in rainfall in the last 40 years to be unusual?

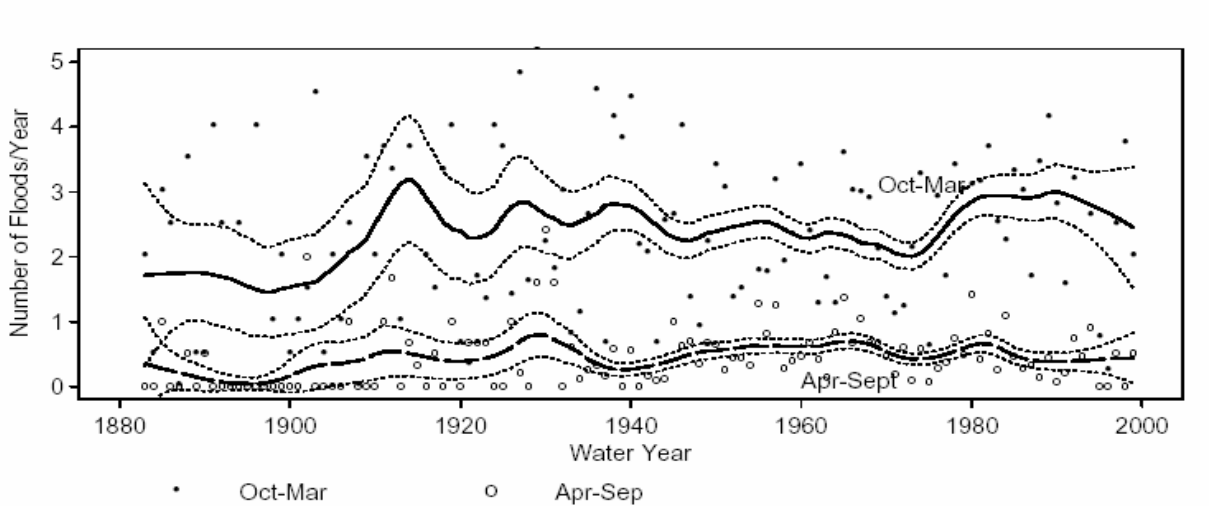
Although the last 40 years shows signs of upward trend, the gradient of this change is smaller than for a number of previous 40-year and cannot be considered unusual in the context of the full record.

Graphs showing winter and summer monthly rainfall totals. The winter series (upper graph) is for the months Oct-Mar and the summer series (lower graph) is for Apr-Nov.



A clear trend of wetter winters and drier summers can be seen

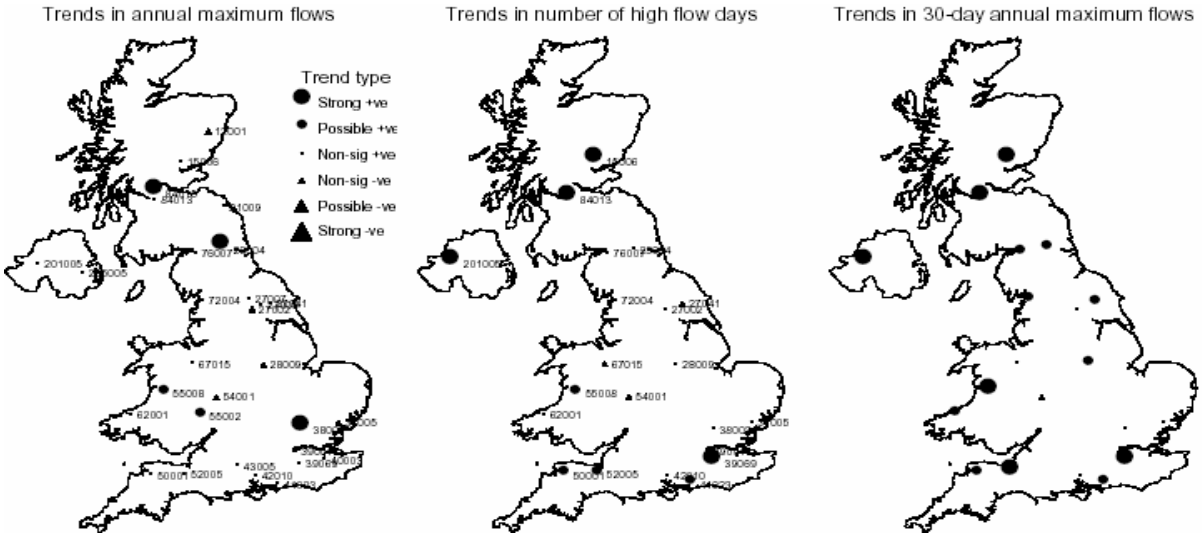
3. Are increases in winter rainfall is leading to an increase in winter floods?



Graph showing a time series plots for flood frequency for winter (Oct-Mar) and summer (Apr-Sep).
The thicker lines are the smoothing lines that have been fitted.

Although winter flooding is clearly more frequent than summer flooding, no overall trends are apparent. We can say that flood frequency does not provide a trend due to climate change.

4. Then why do we keep hearing about more floods due to climate change?



The maps above show trends in flooding using local flood data. Circles indicate upward trends. Triangles indicate downward trends.

Trends are most apparent for the high-flow day series and for the long duration annual maxima.

- There is clear evidence of recent trends (30-50 years) in the number of high flow days per year, and in the 30-day annual maxima flows.

- Increasing trends are seen on some Scottish rivers

Conclusion

- Over the last 30-50 years flood records show some evidence of upward trend, particularly in the number of high flow days and in the 30-day annual maxima. However there was a very dry period in the 1970s and only look at the series now as recent UK flooding prompts us. Looking at the long-term historical climate variability suggests that the changes over this period could reasonably be part of natural climatic variation and need not be a climate change effect.

However

- Recent trends in flooding are in agreement with current predictions of climate change. Given the known increase in temperature and increase winter rainfall, an increase in flooding would seem likely.

- It is important to note that although there is little evidence to show that climatic change has affected UK floods but it does not prove that climate change has not affected floods in the UK. Increases in rainfall and in rainfall extremes seem possible and, as the first graph in this section shows the obvious link between rainfall and flooding, would you expect changes in UK flooding?

Graphs and analysis courtesy of C.E.H. Wallingford