Scientists work on mathematical model that adds up to better flood prevention

September 26 2006

Scene of flooding at Boscastle, Cornwall in 2004. Credit: EMPICS/PA

Oxford researchers have won funding to improve the usefulness of weather predictions on the probability and extent of extreme rainfall. This will help hydrologists, civil engineers, policy-makers and government to take appropriate measures to protect buildings and people from the devastating effects of extreme floods such that in Boscastle, Cornwall, in 2004.

The new £300,000 research project at Oxford University is funded by the Natural Environment Research Council.

Dr Patrick McSharry, from Oxford University's Department of Engineering Science, said: 'What we are doing is bringing together, for the first time, three different areas of science: mathematics, supercomputer weather prediction, and historical data.

'We are using advanced mathematical techniques, which were originally developed for a different application. This helps us to improve the predictions we can make based on data that has already been collected. To do this we are using the vast computing power provided by new weather models. For example, there is a limit to the accuracy of data collection and tiny measurement errors can lead to increasing forecast uncertainty as you look further into the future.

'So if we can improve the mathematics to handle the uncertainty in the data and models, we can improve the accuracy of the predictions for people such as engineers and policy-makers.'

The new mathematical prediction techniques to be used in the study will be developed in collaboration with researchers at the Said Business School, who were originally looking to improve models for forecasting electricity demand.

The techniques will be used in conjunction with the output from a state-of-the-art supercomputer weather model at the European Centre for Medium-Range Weather Forecasts.

The data, on which the work will be based, will come from the largest record of historical data of UK rainfall patterns, which date back as far as 1860 when weather records were produced by amateur enthusiasts. It will be the first time that researchers will have gained access to this vast amount of data in electronic format. It will be made available by a specialist hydrologist at Hydro-GIS Ltd.

Dr Harvey Rodda, of Hydro-GIS said: 'Accurate rainfall predictions are needed as part of the information used to design measures to protect houses built in areas which are most vulnerable to flooding. The connection between rain and flooding is complicated. It is not enough just to predict rainfall depth, but the prediction must also say how likely rain is at any time, which means calculating the probability of rainfall. Another element is the pattern of rainfall: for example, for the severe floods in Boscastle in 2004 and those on the Thames in 2003, the causes and pattern of rainfall were different, so scientists need to know what pattern of rainfall caused the flooding.'

The research will also produce an automatic system for discovering the most likely pattern in the predicted rainfalls. The new prediction system and data will be freely available over the internet for use by hydrologists, civil engineers, government policy-makers and researchers.

For more information about the Systems Analysis, Modelling and Prediction Group at Oxford University's Department of Engineering, see www.eng.ox.ac.uk/samp/

Source: Oxford University