Flash floods predictions, subject to models' limitations

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Flash floods are very localised weather events. They are mostly triggered by heavy rainfall. Typically, over a period of less than 12 hours. They occur very infrequently at any one place. But when they do, it is often with a heavy loss of life and substantial damage.

Marco Borga, a hydrology researcher at the University of Padua in Italy, was the coordinator of the HYDRATE research project. Funded by the EU, this project's aim was to improving the forecasting of flash floods. Borgia tells youris.com what motivated researchers from several European countries, the United States, Canada, and South Africa to join forces around flash floods preparedness.

Why this international approach?

A local forecaster will only deal with a few cases of flash floods during their career. So it is difficult to gain experience about such events. There is a need for an organisation to collect local experiences and to develop a collective experience that is able to provide a basis for risk management models. And ultimately, to identify better ways to protect life and property.

So data collection and research approaches differ from region to region?

Yes, there is a great need to homogenise data collection across Europe.

There are, for instance, several different radar systems operating in Europe to estimate rain fall. All these systems operate at different wavelengths. There are efforts towards a unified management model for these radars. But we are still not close, particularly in the Mediterranean countries, like Spain, Italy and Greece. Also in Eastern Europe there are areas where these efforts must to be increased.

Are there other factors that made flash flood forecasting more reliable?

We set out to integrate hydrological models with meteorological models, which were the traditional ones for forecasting rainfall. This has been successful. However, many such extreme events have a negative impact on communities because of local features that increase the impact of floods, such as badly designed bridges. These local conditions are often poorly known, and sometimes the latest changes in the local infrastructure are not introduced in the models, or in preparedness strategies. Increasing the reliability of models is, of course, very important.

Did the project develop tools to aid flood prediction?

One of the results of the project was the publication of a collection of data on European flash floods. The database is made available at the flash flood data centre. We also devised a series of methods to collect data concerning flash floods that happened in the past. With these data, we were able to calibrate models and procedures for flash flood warnings, and thus to increase their reliability. And we were able to improve a number of methods and models that are now in use in various regions of Europe. Selected areas are the water district of North Eastern Italy, the district of the Adige River in Italy, the Carinthia region in Austria and the western district of Crete, Greece.

Is there still room for improvement?

In the last ten years there has been a tremendous improvement, mainly because of numerical prediction. We are operating at a scale where uncertainty has to be taken into account. We need to develop better ways to include uncertainty in our forecasts in a better way, and to communicate these uncertainties to stakeholders and decision makers.

Now that the project has been completed for three years, what is next?

We are now working on another project, called HYMEX . It is a European project, funded mainly by France. It focuses on the Mediterranean areas that are both highly impacted by flash floods and where fine space-time scales hydro-meteorological data are rare. We are collecting data and further developing the flash flood data gathering methodology. We are operating with satellites and radar systems, to better focus on flash floods.

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