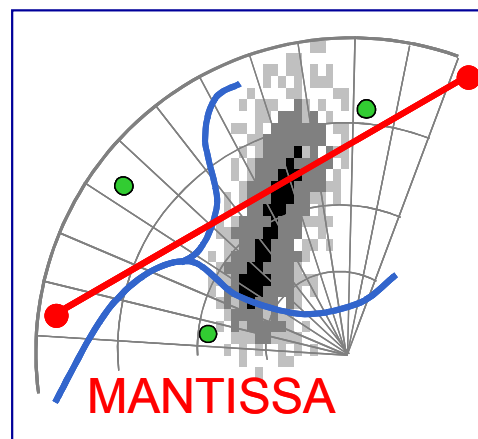


# All That Rain

## The MANTISSA Project

### Where, when and how much has it rain?

Rainfall is the most important driving force in flooding and pollution from runoff systems. Yet, rain is still one of the most uncertain quantities in most hydrological and hydraulic evaluations of drainage and other runoff systems. Many years of experience has shown that the intensity of rainfall over a catchment often varies so much that even a relatively dense net of point rain gauges is insufficient. Rainfall radar provides information on rainfall distribution but has a relatively poor intensity precision. A new technology under development is the use of microwave signals between mobile telephone masts. Signal dampening gives the average rainfall intensity between two points. Different rain measurement methods have their advantages and disadvantages. There is a potential for a combined use of these very different data sources.

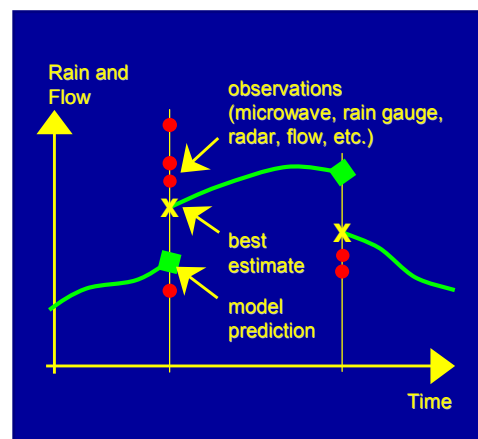


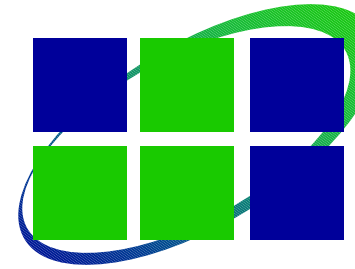
### The MANTISSA Project

The MANTISSA project is an EU sponsored research project aimed at evaluating the potential of using microwave links for rainfall measurement in relation to runoff systems. One of the objectives is to develop a methodology and tool for the assimilation of a multitude of rainfall and runoff data in rainfall-runoff modelling. The three year project, which runs until the end of January 2004, is coordinated by Salford University (UK) with partners at Rutherford Appleton Laboratories (UK), Essex University (UK), Emschergergenossenschaft og Lippeverband (D), Hannover University (D), Politecnico di Milano (I) and PH-Consult (DK). This leaflet focuses on PH-Consult's role in the MANTISSA project. Further information about the project and its complete content can be found on the internet at: [prswwww.essex.ac.uk/mantissa/](http://prswwww.essex.ac.uk/mantissa/).

### Methodology

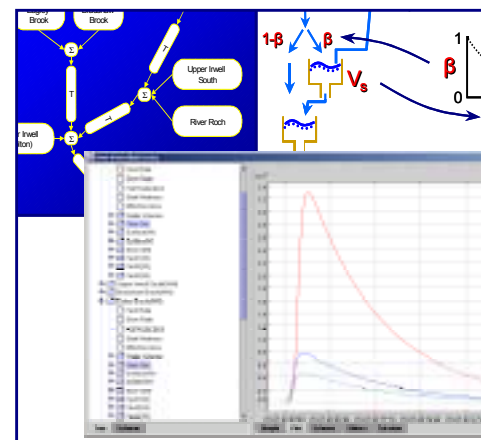
The methodology for simultaneous use of information from several different data sources relies on a simple model description of the rainfall plain and the runoff system. At any moment in time, when there are observations available, the state of the system is calculated as a weighting between the model's prediction and the various observations. Also states that are not observed directly get updated. Simple descriptions of the change in rainfall intensity, rainfall movement and the runoff processes are incorporated into a stochastic model. The Kalman filter is used in combination with a maximum likelihood criterion to do the weighting between the model's predictions and the observations. In addition to knowledge and experience with the methodology, PH-Consult will contribute to the project with many years of experience in working with urban drainage.





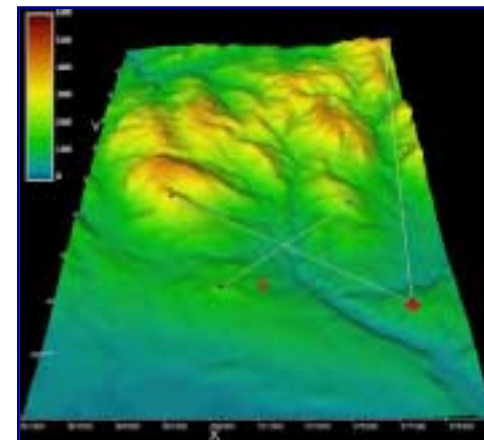
## Tool

The methodology is new to the field of water and environment. There exists no suitable software tool for the purpose. PH-Consult is responsible for creating a tool that implements this new methodology in a form suited to water systems. During the project the tool will be used to evaluate the potential of the method and to evaluate the relative importance of the various data sources in describing the rainfall-runoff system in both real time problems and planning. The software application is being developed following the newest software development methods. Flexibility, maintainability and user friendliness are key issues. Coding is taking place in Java with XML data. This makes it platform independent and opens the doors to easy integration into existing on- and off-line systems and to the provision of web services.



## River Basin in England

The English experimental site is close to Manchester in the northwest England and is mostly rural. The runoff from the 56 000 ha. large catchment flows in the Irwell river through Bolton, where there is a need for better flood warning systems. The catchment is equipped with rain gauges, radar coverage, three microwave links and several level measurements along the river.



## Sewer in Germany

The German catchment, Huller Bach, is 4 800 ha. and lies in the heavily industrialised Emscher district. Due to ground subsidence caused by intense coal mining, large parts of the drainage system has been constructed as open sewers. The catchment is equipped with level measurements, a dense net of rain gauges, coverage by two radar and soon a microwave link.



## Alpine Valleys in Italy

There are two experimental catchments in Italy. Sondrio is situated high in the Alps with quick flash floods. Due to the mountains there is no radar coverage. The second catchment is at the foot of the Alps. In contrast to the project's other catchments the two Italian catchments receive much convective rainfall and will thus show other aspects of the methodology and link.



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