

COPING WITH SPATIAL VARIATION OF RAINFALL  
EXPERIENCES GAINED IN THE WESTERN PENNINES

Spatial variation of rainfall is potentially one of the greatest impediments to successfully verifying a Wassp SIM model. The verification process is intended to generate confidence in the model. However use of incorrect rainfall data only serves to bring the process into disrepute and to destroy confidence.

Where spatial variation is significant averaging rainfall will result in underprediction in some sub - areas and over prediction in others, even worse the behaviour of overflows and constrictions will be incorrectly simulated resulting in incorrect inputs to the downstream (core) sections of the model. This problem can be overcome by:

- 1 dividing the model into the sub areas appertaining to each flow monitor
- 2 determining the correct rainfall hyetograph for that sub area
- 3 using input hydrographs to represent incoming upstream flows (these may be measured or predicted depending on confidence)
- 4 using the recorded level hydrographs where downstream throttles cause back water effects.

A detailed study of the rainfall pattern over the whole area is required to determine the input hyetographs. Plans should be constructed showing lines of equal rainfall (if necessary splitting the storm into two or even three parts). Wind direction should be determined by looking at the timing of the start of the event and peaks and troughs within the event. Finally the rainfall data for each sub area should be prepared using weighted averages.

This approach though initially time consuming forms a rational basis from which to commence verification. It allows the engineer to have maximum confidence in the input data. In addition to this it speeds the whole process by isolating problems, facilitating the identification of missfits.

The spacing of raingauges should be as little as 1 Km. This will allow for the malfunction of a raingauge without jeopardising the whole survey. An outer circle of gauges should be placed on the edge of the catchment, allowing for interpolation, rather than extrapolation when determining the rainfall data for a peripheral sub catchment.

## Discussion of J Blanksby's Paper

## 1 Martin Osborne (Hydraulic Research)

Q Was there any additional information available on wind direction rainfall pattern etc from other sources such as the local Met. Office or nearby airport ?

A Met. Office suggested the flow survey data was probably more accurate due to its denser network of raingauges.

## 2 Gareth Catterson (North West Water)

Q Do you have any comments on the dangers of using flow survey data as an input hydrograph rather than using WASSP hydrographs ?

A Yes, flow survey data needs to be looked at thoroughly. It may get to the stage of discounting one monitor's results entirely as it is not reliable. This scrutiny of a flow survey starts when planning the position of monitor sites.

## 3 Derek Buckland (Hydroscan Ltd)

Q Raingauge sites are difficult to choose. Security often demands a rooftop site but this is not ideal - does the author have any comments on this ?

A Yes siting is important and rooftop sites are not ideal but one has to be practical. Could investigate using 2 raingauges at each site to check on rogue results.

## 4 Philip Deakin (Northumbrian Water)

Q One cheap and easy way of getting an overall check on accuracy of raingauges is to use weekly read total depth gauges.

A Yes agreed.

One study done was shown predicted and measured flooding to show dependency on storm movement. Has the author seen any evidence of this ?

A No, though only relatively small areas looked at at a time, but is aware of the potential problem.