HOW MUCH TIME DO WE HAVE? THE VARIABILITY OF RIVERINE FLOOD WAVE ROUTING SPEED

Z Richards, S Gray, I Varga and M Babister

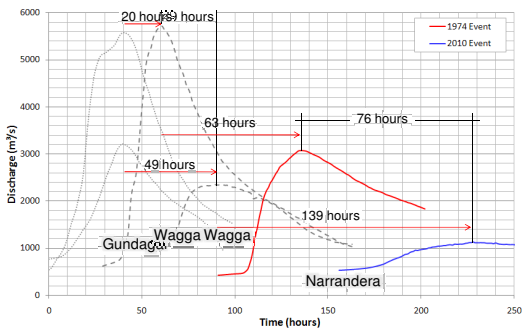
Introduction

Introduction

- Whilst carrying out this work we noticed that

1. SES information on travel time (for planning purposes) comes from previous events
2. Different Murrumbidgee River floods travel at markedly different speeds

Variability of Travel Time



Variability of Travel Time

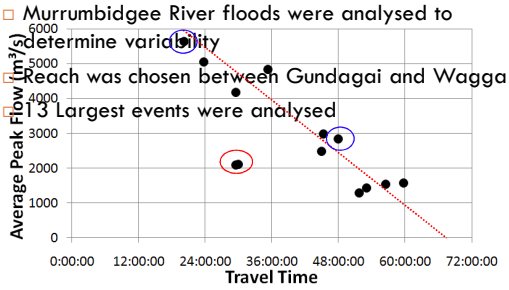
- Why is this important?
- Estimation of flood arrival time is key to emergency response

Study Goals

- Examine the overall variability in flood travel times and understand what factors influence it
- Evaluate how one might best estimate flood routing time for planning/response purposes?

Murrumbidgee Flooding

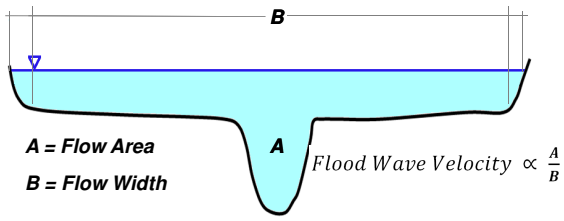
- Murrumbidgee River floods were analysed to determine variability
- Reach was chosen between Gundagai and Wagga
- 13 Largest events were analysed



Celerity Basics

- [illegible] dramatically

$$Flood\ Wave\ Velocity \propto \frac{A}{B}$$



Potential for Risk

- Majority of people are inexperienced with large floods
- Most common floods are minor out of bank events such as December 2010 Event
- Easy to use common floods as a basis for informing an impression of travel time

Potential for Risk

- Minor out of bank events have the slowest travel times
- The largest floods travel the fastest

Modelling Exercise

- Can models emulate the observed variability of travel time?
- Routing techniques trialled-
  - Muskingum Cunge Routing
  - Coarse 1D model
  - Calibrated 2D model
- 150 km of modelled reach near Wagga
- Variable floodplain shape

Simplified Models

- Muskingum Cunge – spreadsheet based
  - Far from simple
  - Input variables required high degree of user judgment
  - Was not investigated further
- Simplified1D model – no separate schematisation of in-bank and floodplain, no calibration
  - Cross-sections at chainage spacing of ~ 5 km
  - Previously tested roughness values used

Calibrated 2D Model

- 2D model - high quality attempt, detailed and calibrated
- Model was calibrated to the 1974 flood (70 year event)
  - gauged water levels
  - ~100 surveyed peak flood levels
  - peak flood extents
- Flood wave Celerity was verified against the 2nd peak of the 2010 event (ARI of ~5 years)

Results

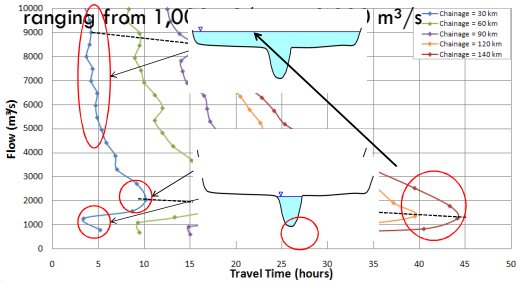
- 2D model reproduced travel time very well - underestimated by 2 hours (~7%)
- 1D model reproduced travel poorly - overestimated by 28 hours (~110%)

Model Results

- A coarse1D model will not produce a reasonable estimate of flood wave travel time
- A calibrated 2D model can produce excellent estimates of flood wave travel time

Further 2D Model Results

- A range of events were tested with discharges ranging from 1,0( ) m^3/s



Conclusions

- Flood travel times between different events vary significantly
- The flood you see most often is probably twice as slow as an rare event
- Simple model approaches do not reproduce realistic flood travel times
- Calibrated 2D model did an excellent job of reproducing timing