Time Series Analysis to Determine the Aquifer Properties of a Fractured Aquifer

Presenter: Wiki Li
Advisor: Chuen-Fa Ni
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Outline

• Introduction
• Methodology
• Study Area
• Results
• Conclusions
• Future Works
Introduction

• **Aquifer parameters** play an important role in hydrogeology

• Traditional well test is **costly** and **time-consuming**

• Conventional test scale is limited to **few meters** to **tens of meters**
Introduction

- Is there a simple method to obtain the aquifer properties?

Observed data may answer the question!!
Introduction

- Evans et al. (1991), Rotzoll et al. (2008), Zhang et al. (2010) fitted the observed data with the developed model.
Introduction

- Lee et al. (2000) identified the vertical recharge process with observed data in difference depth.
Methodology

Far Field

Study Area
Methodology

\[ V = K \frac{dh}{dx} \rightarrow K = V \frac{dh}{dx} \]

\[ Ss \frac{dh}{dt} = \frac{\partial}{\partial x} \left( K \frac{dh}{dx} \right) \]
Study Area

Chien-Shih well field

You Ioo Stream

5 Well table Logger

Ombrometer & Barometer

River level Logger
Study Area
Study Area

Far Field

River level raised WITHOUT/BEFORE rainfall

Flow direction from river to aquifer

~Stream~
Study Area

Original Data

Removing DC

Remove DC

Low-pass filter

Frequency: 0.001 Hz
Results

• Time lag: 33 min
• Distance: 19.57m
• Difference of head: 5.6m

• Hydraulic conductivity: 2973 m/day
  37.5 times higher than slug test
  4 times higher than pump test
Conclusions

• the frequency of noise in observed data are higher than 0.001 Hz.
• The extreme conductivity result show that preliminary model must to be improved.
Future Works

• Improve the model from:
  1. Other physical conditions
     (ex. Process of aquifer to river)
  2. Variation of the observed data
  3. The influence of physical scale
Future Works
Thanks for your attention

(Please speak in Chinese)
modeling