Discrete-depth heat dissipation tests as a potential tool for characterizing subsurface thermal conductivity variations

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Conceptual Design



Conceptual Design

 Heat water at various depths in a borehole and monitor the heat dissipation



Conceptual Design

- Heat water at various depths in a borehole and monitor the heat dissipation
- Assuming no vertical borehole flow, heat loss is due to
 - radial conduction (λ/ρc)
 - groundwater advection (v)



In-well heat dissipation tests:

 Induce heat pulses at discrete depths using downhole heater



Peter Sobol, UW – Madison

In-well heat dissipation tests:

- Induce heat pulses at discrete depths using downhole heater
- Monitor temperatures in the well with fiber optic Distributed Temperature Sensing system (DTS)





www.ctemps.org

Study Area



Depth (m)

Arlington DTS Tracer Test Data





Heat dissipation field data





	Acc 2 Ac 7	
1 m		



















Simulated center-of-well temperature for varying groundwater flow ($\lambda = 4.645 \text{ Wm}^{-1}\text{K}^{-1}$)





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- Center-of-well response somewhat sensitive to λ and groundwater flow velocity

The Test Well (Arlington Well)

- 305 m deep (casing to 79 m)
- Open to 186 m of Cambrian sandstone and 40 m of underlying granite
- No vertical flow
- Tests initiated at 21 depths over 2 days

