One-Week Introduction to Stochastic Groundwater Modeling

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Outline

- Motivation
- Spatial Correlation
- PMWIN
  - classroom model
  - homework exercise
- Monte Carlo
- Summary

Truman http://h-bombbook.com/images/truman.jpg 10/22/2013
Why Stochastic Modeling?

• Translate research to practice
• Demonstrate evaluation
  – top level of Bloom’s Taxonomy
• Show humility
  – All models are wrong, but some are useful (Box 1979)
Spatial Correlation

expensive http://www.armstrongre.com/upload/Hilltop%201.jpg 10/22/2013
PMWIN (Modflow)

Processing MODFLOW for Windows

A Simulation System for Modelling Groundwater Flow and Pollution

Wen-Hsing Chiang and Wolfgang Kinzelbach Institut für
Hydromechanik und Wasserwirtschaft (IHW)

By downloading the following data I confirm that I read, understood and accepted the license agreement below.

Download Processing MODFLOW for Windows

- PMWIN 5.32 - Full Version: PMWIN 5.32 (runs on WinXP and Windows 7)
- PDF-File of the Manual

To Install PMWIN: Download pmwin5.32.exe into an empty directory and execute
Classroom Model

```
Layer Options

<table>
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<th>Type</th>
<th>Anisotropy Factor</th>
<th>Transmissivity</th>
<th>Leakance</th>
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</thead>
<tbody>
<tr>
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<td>Confined</td>
<td>1</td>
<td>Calculated</td>
<td>Calculated</td>
</tr>
</tbody>
</table>
```

OK  Cancel  Help
Classroom Model

constant head boundary

no flow boundary

extraction well
Spatially Correlated ln(K)
Classroom Model

homogeneous

heterogeneous
Homework Exercise
Spatially Correlated ln(K)
Homework Exercise

Report head in cell (25, 14)
Monte Carlo Simulation

With small N!
Summary

1. Stochastic modeling—worthwhile!
2. Real estate analogy for spatial correlation
3. PMWIN for teaching Modflow
4. Monte Carlo through “crowdsourcing”
5. Give it a shot—fast, fun, and free
Thank You!

FOR MORE DETAILS
• learning objectives
• step-by-step instructions
• Likert assessment results

Mays (2010)
Journal of Geoscience Education
http://dx.doi.org/10.5408/1.3534852