CHAPTER 3

Basic Mathematics and the Computer Code

COMMON MODELING ERRORS

- The modeler insists on using a particular code even when the problem would be better simulated by another code.
- The modeler trusts that input to a GUI is correctly translated to the code even when model output disagrees with expected system response and hydrogeological common sense.
- The modeler fails to check results from a complex numerical model against results from simpler models or analytical solutions. Simpler models may help identify conceptual errors that can be hidden in a complex numerical model.
- The modeler neglects to investigate alternative solvers available in the code and the range of solver settings. It is especially tempting to use the default solver and default values for solver settings provided in a GUI without testing their effect on the solution. However, adjusting solver settings or switching to another solver may decrease execution time and may be necessary to solve convergence problems.
- The modeler fails to check model output to determine if convergence problems are occurring within the problem domain. The reasons for nonconvergence can often be identified by examining the spatial distribution of head and flux residuals, residual statistics, and the computed water budget.
- The modeler assumes input to the code is correct because the model executed to completion. With the option to use free format input, many codes will complete execution even when input data are missing. A listing of the input data should always be evaluated for correctness and completeness.
- Nonconvergence occurs because the modeler has set too low a value on solution precision. The solution should be run using higher precision (e.g., double precision versions of the code).

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