CHAPTER 9

Model Calibration: Assessing Performance

COMMON MODELING ERRORS

- Too much time and effort are spent on model design and construction; calibration is started too late and the project is nearly out of time and money. Consequently, the final model does not have an acceptable history match and/or has unreasonable parameters.
- Calibration is deemed complete simply because a summary statistic (e.g., a limit on the MAE) is met. Alternatively, an appropriate model is discarded because a summary statistic is not met.
- Calibration is deemed complete after a history matching exercise but optimized calibration parameters include unreasonable values.
- History matching only includes manual trial–and–error when the modeling objective requires a quantitative best fit. Model calibration should include parameter estimation.
- Weights assigned to calibration targets for parameter estimation do not reflect the same importance the modeler used for manual trial–and–error history matching. Consequently, the results of parameter estimation do not reflect the modeler's judgment of observation importance.
- The modeler accepts a history match produced by an oversimplified model that does not fully leverage information contained in the observations and degrades the model's forecasting ability.
- The initial model used for parameter estimation is overly complex and has not been tested via manual trial–and–error calibration. Models should illuminate system complexity, not create it (Saltelli and Funtowicz, 2014).
- Parameter results are accepted without evaluation simply because they are produced by a computer algorithm. The modeler should examine parameter estimation results for hydrogeological reasonableness.
- Too much time and effort are given to performing parameter estimation statistical analyses leaving little or no time for the primary modeling objectives of forecasting and related uncertainty analyses.
- SVD is not used on an ill–posed problem and the parameter estimation cannot find a best fit.

- SVD is used without some form of additional regularization (e.g., Tikhonov regularization). The process reports best fit calibrated parameters that are outside the range of reasonable values when a model with values within the range produces a fit that is only negligibly worse.