

Course Outline

Below is a course outline. However the material that is covered in the course will respond to the needs of those who attend. Time will be set aside for participants to discuss their own problems. Furthermore, participants are welcome to contact John after the course to continue discussions on matters that are important to them.

Day 1

- Introductions
- Discussion and reflections on decision support modelling
- Brief review of linear algebra and geostatistics
- What is the metric for successful calibration?
- How Bayes theorem is applied in groundwater modelling
- Predictive uncertainty and predictive error
- Old style calibration; parameter parsimony

Day 2

- Highly parameterized inversion and regularization
- Subspace methods including singular value decomposition
- Tikhonov regularization
- Pilot points as a parameterization device
- Construction of covariance matrices for parameter regularization and uncertainty analysis
- Efficiencies gained through dimensional reduction

Day 3

- Principles of uncertainty analysis
- Nonstationary geostatistics
- Generating random hydraulic property fields for structured and unstructured grids through spatial convolution
- Linear uncertainty analysis
- Ensemble smoothers: theory and practice
- Direct predictive hypothesis-testing

Day 4

- Uncertainty in uncertainty: parameterizing the prior
- Conceptual points and pilot points
- Data space inversion
- Ensemble space inversion
- Hierarchical inversion
- History-matching-induced predictive bias and its avoidance
- When to use what method

Day 5

- Optimization under uncertainty

- Data worth analysis
- Structural overlay parameters
- Some considerations for contaminant transport modelling
- Some considerations for low enthalpy geothermal modelling
- “Group therapy”: participants discuss their own problems