GeoPractical

Course outline: Six hours direct instruction with ample time for participants to work on their models

1. Introduction to modeling, (1.5 hr)
    a. Basic principles of groundwater modeling
        i. Forming a conceptual model
        ii. Domain properties and boundary conditions (BCs)
            -Participants will choose realistic domain properties and BCs for an example problem examining potential pathways for contamination of a confined aquifer.
        iii. The groundwater flow equation – how software calculates head at model nodes.
        iv. Review of the various GUI's available
    b. Types of groundwater models
        i. physical scale models
        ii. Computer models - finite element versus finite difference
        iii. 1D, 2D, and 3D models.
    c. Groundwater modeling software choices
        i. MODFLOW code and its relationship to a graphical user interface (GUI)
        ii. Benefits and drawbacks of various GUIs and how to choose
    d. How to interpret model results
        i. What information can one take from model results?
        ii. What are some common pitfalls and limitations of model results
        iii. How can field observations support models results best and vice versa.
2. Groundwater Modeling Ex. 1 – using Excel to create a simple finite difference model (0.5 hr)
    a. Participants will implement no flow and constant head boundaries to model groundwater flowpaths and head distributions in a confined aquifer.
3. Groundwater Modeling Ex. 2 – using USGS ModelMuse to create a simple steady state model, 1.8 hr)
    a. Participants will design the boundaries and domain properties of an aquifer to model the capture zone of a pumping well
    b. Experiments varying the location of a pumping well and the values of domain properties such as aquifer porosity will reveal how the capture zone geometry changes.
    c. Present results
4. Groundwater Modeling Ex. 3 – using USGS ModelMuse to create a complex steady state model with topography, stratigraphy, and surface water features, (2 hr)
    a. Participants will create a steady state model with grid refinement at critical parts of the model domain to capture details that are not possible with a coarse, uniform grid.
    b. Special emphasis will be given to importing data in GIS format, such as digital elevation models, shapefiles (e.g. rivers), and point data (e.g. wells).
    c. Present results
5. Evaluations and closing remarks, (0.2 hr)