Practical exercises:

Exercise

Run a groundwater simulation for a 1000 times 2000 meter unconstrained aquifer with a hydraulic gradient from west to east of 1 meters over the 2000 m domain length. Chose reasonable parameters for hydraulic conductivity (such as 0.0025 m/s) and effective porosity (such as 15 %) and start with an aquifer thickness of 100 meter. Run the simulation until steady state is achieved. Output the flow velocities as well as the hydraulic head. Introduce a region of higher or lower hydraulic conductivity of arbitrary shape in the domain and see how this effects flow velocities.

Exercise

Run a simulation for a confined aquifer. Remember to change the storativity value, which is much lower for a confined aquifer than for a unconfined aquifer. Also note, that the pressure head should be larger than the height of your aquifer, as otherwise it is not a confined aquifer.

Theoretical exercises:

Exercise

Explain the difference between structured and unstructured meshes. Name one benefit each.

Exercise

Explain the terms Delauney triangulation and Voronoi tessalation.

Exercise

Draw a parallelogram without a 90° angle and fill it with at least 5 triangles. Make an example for a good mesh and for a bad mesh and explain your examples.

Exercise

Explain the term adaptive mesh refinement. Name one benefit and one drawback of this method.

Exercise

Explain the differences between Finite differences, Finite elements and Finite volumes w.r.t. their concept and the possible meshes. Name a benefit and a drawback of each method.