Practical exercises:

Exercise

It is now time to put pieces together and conduct a more complex simulation: Simulate the one-time contamination from a point source of a 5 kg/m³ solute 10 m from the left corner of 200 m long and 50 m wide site. Assume a heterogeneous aquifer with a mean hydraulic conductivity of 0.0015 m/s with a variation of 20 % and a porosity of 7 % of a similar variation (20 % of the 7 % mean). Assume the diffusivity being aligned with the heterogeneity of the hydraulic conductivity varying around 0.0001 m²/s by 20 %. Set dispersivity length to 0.01 m. The unconfined aquifer is roughly 35 m thick and the hydraulic gradient from west to east is 0.2%. The depth to water table is around 7 m. Assure a spatial resolution that fulfils a Peclet Number smaller than 2. Conduct a monitoring at 20 m, 50 m and 80 m distance from the injection point downstream for the subsequent 30 days with daily measurements. Visualize and analyze the breakthrough curves at the three monitoring spots.

To conduct this simulation, you first must calculate the steady state flow system. Then use this flow system as the background for the contaminant transport.

Theoretical exercises:

Exercise

Explain how and why the Grass GIS function r.solute.transport. incorporates the Courant-Friedrich-Levy criteria on the time step besides using an implicit Euler scheme.

Exercise

Explain why iterative procedures are often applied with two kinds of stopping criteria.