HW1 Box Model Self Check Exercise

Exercise

Build a steady state box model. The model should have 25x25 cells, each 100 m in x and in y. There is one layer, 10 m thick. The medium is homogeneous with K = 1.0 m/day in x and y and 0.1 m/day in z. The porosity is 0.35, specific yield is 0.3, and storage coefficient is 0.001. The right boundary is constant flow with a total of 6.25 m^3/day leaving the domain. The left boundary is a constant head of 7 m relative to the datum, which is located at the bottom of the domain.

Question:

What is the head gradient across the domain? Visually, is the gradient constant across the domain?

Solution

Model setup:

Refer to the i-python notebook to see all of the steps in the model setup.

For the right boundary note that you need to first calculate the flux leaving every cell. The right boundary has a total of 6.25 m3/day leaving the domain over 25 cells. So, each cell has an assigned flow of 0.25 m^3/day. This value should be entered as a negative value to represent flow out of the domain. (Inflows are, by convention, positive.)

What is the head Gradient in the left half of the domain?

Refer to the notebook section 10.2 to see the heads extracted for a cross section. Printing theses heads out you can see the head on the right is 6.08 and the gradient is (7.00-6.08)/2500= 0.00037

Visually, the gradient is essentially linear over the domain. (Although, not exactly, as you will find in the graded assignment!)