

## Follow up Waquoit Bay and Lab Questions:

1. The field trip data, which is posted on the course web page, showed that the hydraulic conductivities were high and within a factor of three or four of one another between the three different test locations (see the slug test results). All three stations had a hydraulic head drop of around 1 mm (bay minus sediment) implying a water flux into the sediment. The salinities of the bay and sediment water were reported to be around 26-27 ppt. However, the near shore and far shore seepage meters measured a flux of water coming out of the sediment in the opposite direction of the gradient! Could Darcy's Law be wrong? Please give your best guess as to what happened with the field trip experiments (Hints. See previous solution set for one idea? Is the system at steady state? Do you think interesting things might occur where fresh and saltwater interface? Should this system be further researched?)
2. Since the field trip experiment suggests Darcy's Law is invalid, or at least we didn't take all the proper measurements, we will ask you to analyze some older data collected by Emily Slaby, which was taken at Waquoit Bay using the same measurement techniques that you applied. Please see attached excel sheet. First compare the tidal height and the fluxes (a graph with two different Y axis (flux and tidal height) vs. time might be helpful). What does this plot tell you about the boundary conditions controlling this flux?
3. Next make another plot of the gradient and flux over time (another plot with two Y axis). Does Darcy's law appear to be valid? If Darcy's law is valid why would there be any discrepancy at all?

4. Next take the data and determine the hydraulic conductivity. You should be able to do this two ways 1) one graphically and 2) a straight calculation that will also provide you with an uncertainty of your estimate. (Hint. Matlab's `interp1` function might be useful). How does your value(s) compare to the four values that we measured in the lab:  $5.6 \times 10^{-5}$  m/s,  $5.6 \times 10^{-5}$  m/s,  $6.8 \times 10^{-3}$ ,  $5.7 \times 10^{-7}$  m/s. All of these values are from sediment collected from a nice sandy beach. What do these values tell you about measuring hydraulic conductivity? What do these values suggest about hydraulic conductivity in nature?