GLY 5828, Chemical Hydrogeology

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Assignment 8: Inverse modeling of conservative Bromide and reactive Phosphorous

1. Use inverse modeling to fit the CDE to the Bromide tracer test data given at http://faculty.fiu.edu/~sukopm/GLY5828/W31BR_OBS.DAT. Values in the files are time in days and concentration in mg/L. Assume a one dimensional system. The pulse duration was 7 days. The pulse concentration was 20.8 mg/L and the background concentration was 0.5 mg/L. Base your initial guesses for v and D on the following:

   - Groundwater gradient of 60 ft/ 7000 ft
   - K of 4100 ft/d
   - Your selection of a reasonable porosity
   - A distance of 4000 feet from the leach field to well 31

   Explain how you arrive at your initial guesses. Compare your guesses with the fitted estimates. Plot the results as a dense line for the CDE model and show the observations on the same graph using open symbols.

2. Use the parameters estimated by fitting the Br⁻ data above as fixed inputs and fit the well 31 Phosphorous data given at http://faculty.fiu.edu/~sukopm/GLY5828/W31P_OBS.DAT. Use a two site conceptualization and give the final estimates for R, Kd, beta, omega, alpha, and f. Use the following time-varying boundary condition (multiple pulses).

Pulse	Start Time	End Time	Concentration
1	.0000	395.0000	.2670
2	395.0000	456.0000	1.9900
3	456.0000	487.0000	.1610
4	487.0000	579.0000	3.1200
5	579.0000	671.0000	1.0400
6	671.0000	822.0000	3.9200
7	822.0000	853.0000	6.3000
8	853.0000	884.0000	2.1500
9	884.0000	1157.0000	.2850
10	1157.000	4627.0000	.4340

   Comment on the meaning of the fitted parameters and their values. Plot the results as a dense line for the CDE model and show the observations on the same graph using open symbols.

3. Project the future Phosphorous concentrations 5000 feet from the source out to 200 years from time zero. Use the same time-varying BC, with the last pulse extended beyond the end of the simulation. Plot the prediction.