

HW#3**Assignment:** September 15, 2009**Due:** Friday, September 25, 2009

Please compare the following four 1D Buckley Leverett cases

- Case 1, done in HW#2. Explicit solution, $\Delta t = 0.1 \text{ day}$, $NX = 10$, $\Delta x = 10 \text{ feet}$.
- Case 2, Explicit solution, $\Delta t = 0.1 \text{ day}$, $NX = 20$, $\Delta x = 5 \text{ feet}$.
- Case 3, Implicit solution, $\Delta t = 0.1 \text{ day}$, $NX = 10$, $\Delta x = 10 \text{ feet}$.
- Case 4, Implicit solution, $\Delta t = 0.1 \text{ day}$, $NX = 20$, $\Delta x = 5 \text{ feet}$.

For each case, plot the results every 5 time steps on the same figure, using S_w from 0 to 1 and x from 0 to 100. Make sure the length of the x-axis is about the same as the y-axis when printed.

For each case, provide a table of the S_w versus grid cell at 10 days.

Write a short summary of how you solved the problem. Write a comparison of the 4 cases. Why are they different?

Please provide a printed copy of the source code.

Hints:

For this problem, you need to write your own back-substitution program. If the matrix solution becomes more complicated we will provide you with matrix solvers.

Solve for $\frac{\partial f_w}{\partial S_w}$ analytically and then implement this equation in your code.