

BAE 452/552

Problem set 7

Please make sure you state any assumptions that you make.

1. **(BAE 452/552)** DDT was applied in large amounts in the United States in the 1940s and 1950s. DDT is a very toxic pesticide, which is responsible for greatly reduced numbers of higher order birds (such as eagles) because it reduces the strength of egg shells. DDT has been banned since that time in the United States but may still be used in developing countries.
 - a. Assuming the year 1945 as the application year of DDT, estimate the depth to which the center of mass of the DDT “pulse” has traveled in silt loam soils of the Palouse Region (OM=1%). (You can assume 5 inches of percolation.)
 - b. What percentage of the initial amount of DDT ($= 100 \cdot C(T)/C(0)$) would still be present in this soil today?

2. **(BAE 452/552)** A scientist is investigating a location where a hazardous waste spill occurred 25 years ago. In this incident, a large quantity of nitrates ($K_d = 0$) and an industrial solvent ($K_d = 0.5 \text{ cm}^3 \text{ g}^{-1}$) were dumped on the soil surface as a massive pulse. Rainfall and evaporation records indicate that about 1000 cm of water has infiltrated into the soil since that time. This soil has an average moisture content $\theta_v = 0.25$, and a dry bulk density $\rho_{\text{dry}} = 1.5 \text{ g cm}^{-3}$, respectively.
 - a. Calculate the approximate positions of the nitrate and solvent pulses today
 - b. Given that the water table is 50 m below the soil surface, calculate the expected future arrival of both pulses in the water table, assuming the same rate of infiltration over time.