40.1 First, an inflow concentration can be determined as

$$m_{\text{in}} = \frac{11.4\times10^{12}}{167\times10^{9}} = 68.26\frac{\text{mg}}{\text{L}}$$

Next, Eq. 40.25 can be used to calculate

$$v_b = \frac{167\times10^{9}}{3030\times10^{6}}\cdot\frac{68.26-0.5}{(1-0.9)2.4\times10^{6}} = 0.0111\frac{\text{m}}{\text{yr}} = 11.1\frac{\text{mm}}{\text{yr}}$$

This result can be substituted into Eq. 40.25 to determine

$$v_r = 912.5\frac{20}{(1-0.9)2.4\times10^{6}} - 0.0111 = 0.06494\frac{\text{m}}{\text{yr}} = 64.94\frac{\text{mm}}{\text{yr}}$$

41.2 (*a*) The fraction in dissolved form in the water can be calculated as

$$F_{d1} = \frac{1}{1+1\times10^{-6}(10^{6})0.2(5)} = 0.5$$

Note that if you used the non-rounded relationship (Eq. 41.28), the result would be higher (= 0.618). For the sediment pore water,

$$F_{d2} = \frac{1}{0.8+1\times10^{-6}(10^{6})(0.05)(1-0.8)2.5\times10^{6}} = 4\times10^{-5}$$

Note that if you used the non-rounded relationship (Eq. 41.28), the result would be higher (= 6.48 x 10^{-5}).

(*b*) The concentration in particulate form is

$$v_2 = \frac{c_2}{(1-\phi)\rho} = \frac{10\ \text{mg/m}^3}{(1-0.8)2.5\times10^{-6}\ \text{g/m}^3}\frac{10^{3}\ \mu\text{g}}{\text{mg}} = 0.02\frac{\mu\text{g}}{\text{g}}$$

41.3 (*a*) The fraction in particulate form can be calculated as

$$F_{p1} = \frac{1\times10^{-6}(0.4)316227.8}{1+1\times10^{-6}(0.4)316227.8} = 0.387$$

Note that if you used the non-rounded relationship (Eq. 41.28), the result would be lower (= 0.281).

(*b*) With DOC, the result is

$$F_{p1} = \frac{1\times10^{-6}(316227.8)0.4}{1+1\times10^{-6}(316227.8)0.4+1\times10^{-6}(316227.8)5} = 0.197$$

Note that if you used the non-rounded relationship (Eq. 41.28), the result would be lower (= 0.165).

44.1 The resuspension velocity can be estimated from Eq. 44.8

$$v_r = \frac{m_1(\infty)}{(1-\phi)\rho}v_s = \frac{2.5}{(1-0.8)2.5\times10^6}0.25 = 1.25\times10^{-6} \text{ m d}^{-1}$$

This value along with other parameters can be substituted into Eq. 44.7 to calculate the profiles in the following plot,