5.2 ADVECTION (Convection – movement by "bulk" motion of the fluid (water))

$$V_x^a = -\frac{K_x}{n}\frac{dh}{dx} \quad (1)$$

V_a = average linear advective velocity
n = "effective" porosity
no-dead-end pores.

Advective flux; F_x.

$$F_x = V_x^a n c \quad (2)$$

volume of water flowing at concentration, c.

Conservation equation:

$$n\frac{\partial c}{\partial t} = -\left(\frac{\partial F_x}{\partial x} + \frac{\partial F_y}{\partial y} + \frac{\partial F_z}{\partial z}\right) \quad (3)$$

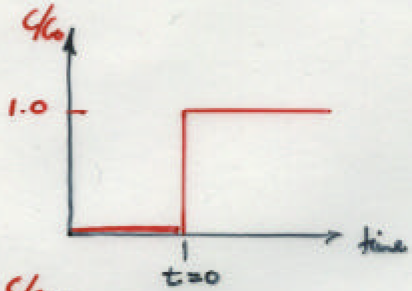
Substitute V_x^a from (2) and similar for V_y^a; V_z^a into (3)

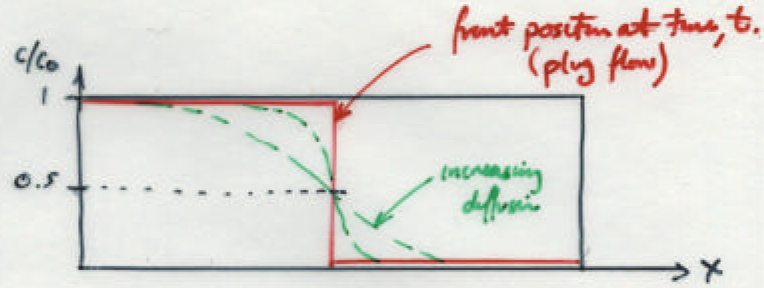
$$n\frac{\partial c}{\partial t} = -\left(\underbrace{V_x^a n}_{V_x^a n = V_d}\frac{\partial c}{\partial x} + V_y^a n\frac{\partial c}{\partial y} + V_z^a n\frac{\partial c}{\partial z}\right) \quad (4)$$

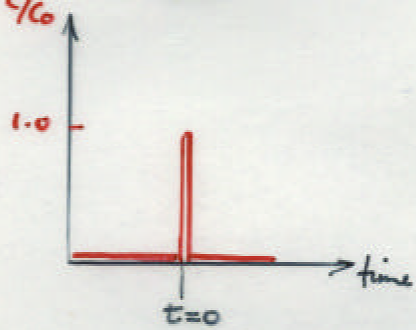
Remove, n in (4)

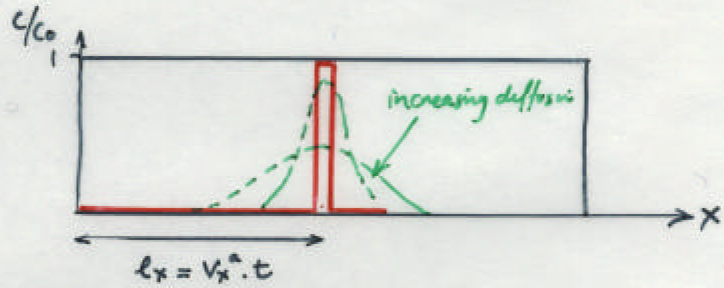
$$\boxed{\frac{\partial c}{\partial t} = -\left(V_x^a\frac{\partial c}{\partial x} + V_y^a\frac{\partial c}{\partial y} + V_z^a\frac{\partial c}{\partial z}\right)} \quad (5)$$

What does this mean, physically?









Boundary conditions