$$A\Delta z\frac{\partial(C_w\theta)}{\partial t} = J_D - J_V - J_{DW} - J_U - J_{QR} + J_{APP} + J_{FOF} \pm J_{TRN}$$

$$A\Delta z\frac{\partial(C_s\rho_s)}{\partial t} = -J_{DS} - J_{ER}$$

$$A\Delta z\frac{\partial(C_g a)}{\partial t} = J_{GD} - J_{DG}$$

where

A = cross-sectional area of soil column (cm^2)

Δz = depth dimension of compartment (cm)

C_w = dissolved concentration of pesticide (g cm^{-3})

C_s = sorbed concentration of pesticide (g g^{-1})

C_g = gaseous concentration of pesticide (g cm^{-3})

θ = volumetric water content of soil (cm^3 cm^{-3})

a = volumetric air content of the soil (cm^3 cm^{-3})

ρ_s = soil bulk density (g cm^{-3})

t = time (days)

J_D = represents the effect of dispersion and diffusion of dissolved phase (g day^{-1})

J_V = represents the effect of advection of dissolved phase (g day^{-1})

J_{GD} = represents the effect of dispersion and diffusion in vapor phase (g day^{-1})

J_{DW} = mass loss due to degradation in the dissolved phase (g day^{-1})

J_{DG} = mass loss due to degradation in the vapor phase (g day^{-1})

J_U = mass loss by plant uptake of dissolved phase (g day^{-1})

J_{QR} = mass loss by removal in runoff (g day^{-1})

J_{APP} = mass gain due to pesticide deposition on the soil surface (g day^{-1})

J_{FOF} = mass gain due to washoff from plants to soil (g day^{-1})

J_{DS} = mass loss due to degradation of sorbed phase chemical (g day^{-1})

J_{ER} = mass loss by dissolved removal on eroded sediments (g day^{-1})

J_{TRN} = mass gain or loss due to parent/daughter transformations (g day^{-1})