Depth-averaged sediment concentration equation

$$(\bar{c}H)_t + \nabla_h \cdot (\bar{c}H(\mathbf{u}_\alpha + \bar{\mathbf{u}}_2)) = \nabla_h \cdot (kH(\nabla_h \bar{c})) + P - D$$

Pick-up function (van Rijn 1984): $$P = 0.015 \frac{d_{50}}{a} \left(\frac{|\tau_b| - \tau_{cr}}{\tau_{cr}} \right)^{1.5} d_*^{-0.3} w_f, \quad |\tau_b| > \tau_{cr}$$

Deposition rate (Cao 1999): $$D = \gamma \bar{c} w_f (1 - \gamma \bar{c})^{m_o}$$

Bedload formula (Meyer-Peter and Muller, 1984)

$$q_b = \frac{8[(\tau_b - \tau_{cr}^b)/\rho_w]^{3/2}}{g(s-1)}$$

Bed evolution equation:

$$\frac{dZ_b}{dt} = \frac{1}{1-n}(D - P - \nabla \cdot \vec{q}_b)$$