Floc Sedimentation Model

Adachi, Y., and Tanaka, Y. (1997). “Settling velocity of an aluminum kaolinite floc.” *Water Res.,* **31**(4), 449-454..

Physical Constants

$\rho_w := 998.2 \frac{kg}{m^3}$ Density of water (at 20 deg C)

$\mu_w := 0.0010016 \cdot \frac{N \cdot s}{m^2}$* Dynamic viscosity of water (at 20 deg C)

$\nu_w := \frac{\mu_w}{\rho_w} = 1.003 \cdot \frac{mm^2}{s}$ Kinematic viscosity of water (at 20 deg C)

$g = 9.807 \frac{m}{s^2}$ Gravitational acceleration

Model Inputs

Range of Floc Sizes

$d_{Floc.Range} := 0.001mm, 0.002mm .. 1mm$ Range of particle sizes

Primary Particle Properties

$\rho_{Floc0} := 2640 \frac{kg}{m^3}$ Particle density (supended clay particles)

$d_0 := 1\mu m$ Primary particle size

Floc Properties

$D_{Fractal} := 2.3$ Floc fractal dimension

$\phi := \frac{45}{24}$ Floc shape factor

Floc Settling Velocity

$$V_t(d) := \left(\frac{g \cdot {d_0}^2}{18\phi \cdot \nu_w}\right) \cdot \left(\frac{\rho_{Floc0} - \rho_w}{\rho_w}\right) \cdot \left(\frac{d}{d_0}\right)^{D_{Fractal}-1}$$

$V_{Capture.Low} := 0.27 \frac{mm}{s}$ $V_{Capture.High} := 0.37 \frac{mm}{s}$ Range of capture velocities at the existing sed tanks