# Total-load Transport Equation

$k$ : Grain class

$h$ : Water depth

$C_{tk}$ : Total-load concentration

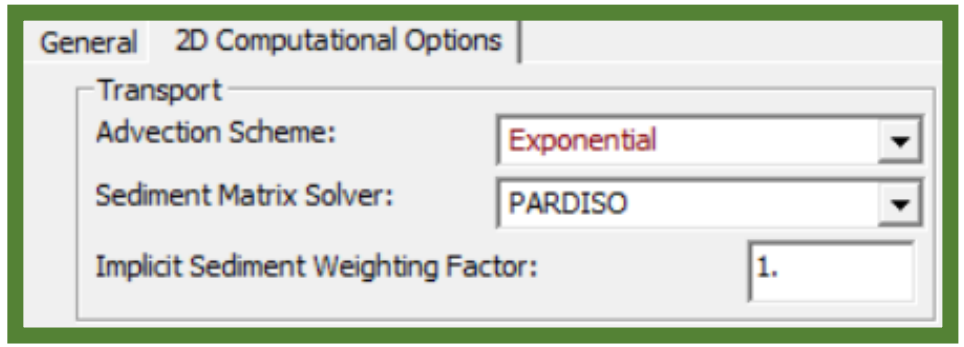
$\beta_{tk}$ : Total-load correction factor

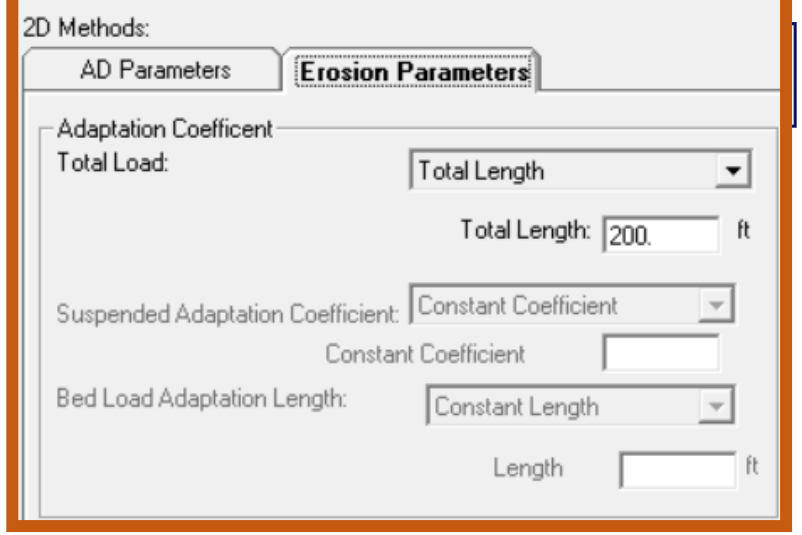
$\mathbf{U}$ : Current velocity

$\varepsilon_{tk}$ : Total-load diffusion coefficient

$E_{tk}$ : Total-load erosion rate

$D_{tk}$ : Total-load deposition rate




Advection

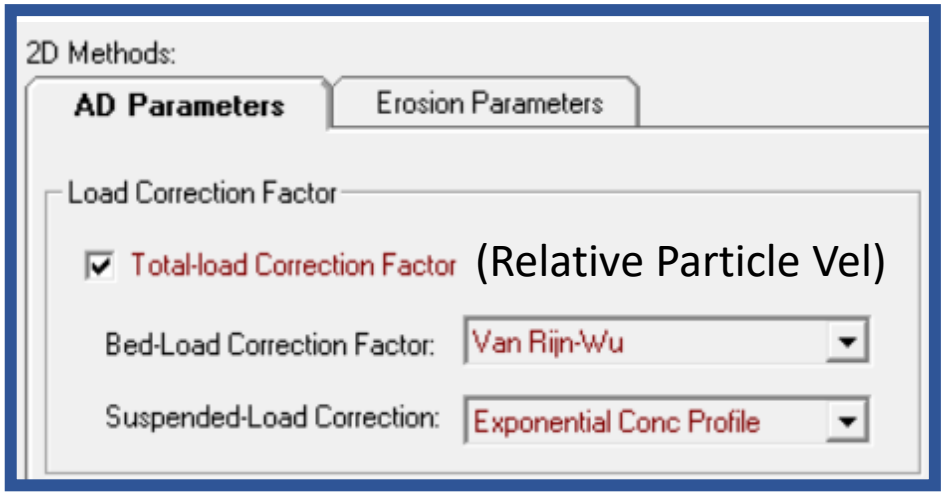
Erosion

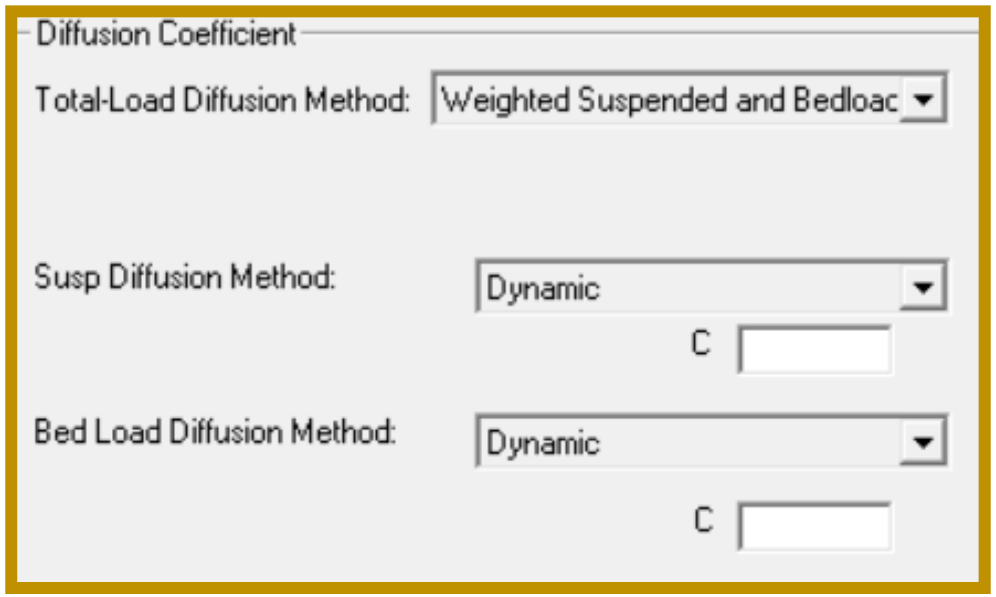
$$\frac{\partial}{\partial t}\left(\frac{hC_{tk}}{\beta_{tk}}\right)+\nabla\cdot\left(h\mathbf{U}C_{tk}\right)=\nabla\cdot\left(\varepsilon_{tk}h\nabla C_{tk}\right)+E_{tk}-D_{tk}$$

Diffusion

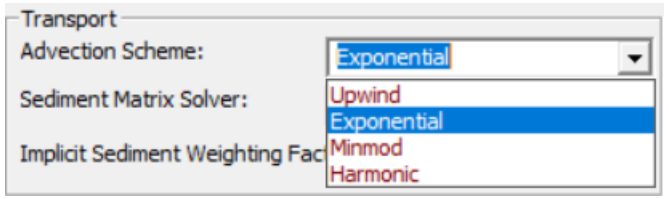
Deposition

Temporal/Storage



# User Defined Terms in the Transport Equation

| Variable | Term | Interface | Notes and Recomendations |
|---|---|---|---|
| $\beta_{tk}$ Load Correction Factor (Relative Particle Velocity) | $\frac{\partial}{\partial t}\left(\frac{hC_{tk}}{\beta_{tk}}\right)$ |  | Will be sensitive for rapid rates of change and insensitive for slow rates of change. |
| $\nabla \cdot (h\mathbf{U}C_{tk})$ Advection Scheme | $\nabla \cdot (h\mathbf{U}C_{tk})$ |  | Use the default advection scheme: **Exponential** |
| $\boldsymbol{\varepsilon}_{tk}$ Dispersion Coefficient | $\nabla \cdot (\boldsymbol{\varepsilon}_{tk} h \nabla C_{tk})$ |  | More important for suspended load than bedload. |
| $L_a$ Adaptation Length | $E_{tk}$ |  | Scales to the cell size (or up to 50% larger) |

$$\frac{\partial}{\partial t}\left(\frac{hC_{tk}}{\beta_{tk}}\right) + \nabla \cdot (h\mathbf{U}C_{tk}) = \nabla \cdot (\boldsymbol{\varepsilon}_{tk} h \nabla C_{tk}) + E_{tk} - D_{tk}$$