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LIST OF SYMBOLS

A = cross-sectional area of channel

A_{bank} = cross-sectional area of bank region

$A_{\text{bank}}^* = \frac{A_{\text{bank}}}{D_c^2}$ = dimensionless cross-sectional area of bank region

A_{bed} = cross-sectional area of flat-bed region

$$A_1 = \left(\frac{dD^*}{dy^*} \right)^2 + 1$$

$$A_2 = \frac{D^*}{A_1} \frac{d^2 D^*}{dy^{*2}}$$

$$A_3 = \frac{30 D^* A_1^{0.5}}{k^*}$$

$$A_4 = \ln(A_3)$$

$$A_5 = (A_2 + 1) A_1^{0.5} \frac{dD^*}{dy^*}$$

$$A_6 = \left((1 - 2A_2) \frac{dD^*}{dy^*} \frac{d^2 D^*}{dy^{*2}} + D^* \frac{d^3 D^*}{dy^{*3}} \right) / A_1$$

$$A_7 = \mu^2 - r^2 + 1$$

$$A_8 = \frac{A_7}{A_1} + r^2 - 1$$

$$A_9 = \frac{r\mu}{A_1^{1.5}} - \frac{A_7}{A_1^2 A_8^{0.5}}$$

$$A_{10} = 1 + \frac{1}{2A_4 - \frac{17}{3}}$$

$$A_{11} = (2 + A_2)^2 A_1$$

$$A_{12} = A_{10} \left\{ \frac{4 - A_2}{24(A_2 + 2)} \left(\frac{A_5}{A_3} \right) \left(\frac{30}{k^*} \right) + \left(\frac{5}{36} - \frac{A_4}{4} \right) \frac{(1 - 2A_2)}{A_{11}} \frac{dD^*}{dy^*} \frac{d^2 D^*}{dy^{*2}} \right\}$$

B = top channel width

$B^* = \frac{B}{D_c}$; dimensionless top channel width

B_f = flat-bed channel width

$B_f^* = \frac{B_f}{D_c}$; dimensionless flat-bed width

B_s = total width of the two curving bank regions

$B_s^* = \frac{B_s}{D_c}$; dimensionless bank width

$$C = \frac{(4 - A_2)}{24(A_2 + 2)} \left(\frac{A_5}{A_3} \right) \left(\frac{30}{k^*} \right) + \left(\frac{5}{36} - A_4 \right) \left(\frac{A_6}{36(A_2 + 2)^2} \right)$$

c = temporally averaged sediment concentration

$c|_{z=D}$ = near-bottom suspended sediment concentration

D = local depth

$D^* = \frac{D}{D_c}$; dimensionless vertical depth

D_c = depth at center of channel

D_n = normal channel depth

$$D_{3a} = \frac{d^*}{yD^{*2}} - \left(\frac{(y_1' + A_{12})}{y} + \frac{dD^*}{dy^*} \frac{(A_2 + 2)}{D^*} \right) \frac{dd^*}{dy^*} - \frac{A_1^{0.5}}{yD^*} \left(1 + \frac{1}{2} A_2 \right)$$

$$D_{3b} = \left\{ 2 \left(\frac{dD^*}{dy^*} \frac{d^2 D^*}{dy^{*2}} \right)^2 \left(\frac{1.5r\mathbf{m}}{A_1^{2.5}} + A_7 \left(\frac{A_7}{2A_8^{1.5} A_1^4} - \frac{2}{A_8^{0.5} A_1^3} \right) \right) - A_9 \left(\frac{d^2 D^*}{dy^{*2}} \right)^2 \right\} \frac{d_{cr}^*}{(1-r)\mathbf{m}}$$

$$D_{3c} = \frac{A_9 d_{cr}^*}{(1-r)\mathbf{m}} \frac{dD^*}{dy^*} + \left(\frac{5}{36} - \frac{A_4}{4} \right) \left(\frac{A_{10} D^*}{A_{11} y} \frac{dd^*}{dy^*} \right)$$

$\bar{D} = \frac{A_{bank}}{B_s}$ = mean depth of bank region

$d = y - B_f/2$ = lateral distance from junction point

$d^* = d/D_c$ = dimensionless lateral distance from junction point

d_{90} = the grain sizes such that 90% of the sediment is finer

d_{50} = the grain sizes such that 50% of the sediment is finer

$d_{50}^* = d_{50}/D_c$; dimensionless grain size such that 50% of the sediment is finer

D = deposition rate

$$E = \frac{P}{2} (1 - \sin^2 f)$$

E = erosion rate

f^* = correction factor

F_L = vertically integrated lateral volumetric transport of suspended sediment

g = acceleration due to gravity

$$j = -D_n \frac{d^2 D}{dy^2} / \left(1 + \left(\frac{dD}{dy} \right)^2 \right)^{1.5}$$

k = equivalent sand grain roughness

$k^* = \frac{k}{D_c}$; dimensionless equivalent sand grain roughness

$$k_1 = -1.85 \sqrt{\frac{g}{R_s^3 d_{50}}} S^2 D_c$$

$$k_2 = -0.001 \sqrt{\frac{g}{R_s^3 d_{50}^3}} \frac{(SD_c)^2}{v_s^*}$$

$$k_3 = \frac{R_s g d_{50} v_s^{*2}}{e_z}$$

n = roughness coefficient

P = wetted perimeter of channel

P_{bank} = wetted perimeter of bank region

Q = water discharge rate of channel

Q_{bank} = bank water discharge rate

Q_{bank}^* = dimensionless bank water discharge rate

Q_f = water discharge rate for flat-bed region

Q_s = sediment discharge rate

q_B = longitudinal bed load rate per unit width

q_{BL} = lateral bed load rate per longitudinal length

$R_s = (\rho_s - \rho) / \rho$; submerged specific gravity of sediment

$r = \mu\beta$

S = longitudinal channel slope

U = mean downstream velocity

u = mean velocity over flat-bed region

u' = fluctuating downstream velocity

\bar{u} = mean velocity based on mean depth of bank region

$u_{*c} = \sqrt{\tau_c / \rho}$; friction velocity corresponding to the shear stress at the center of the channel τ_c

$u_{*G} = \sqrt{\tau_G / \rho}$ = friction velocity corresponding to grain shear stress τ_G

V = mean cross-sectional velocity

v' = fluctuating cross-sectional velocity

v_s = settling velocity of the suspended sediment

$v_s^* = v_s / \sqrt{R_s g d_{50}}$

$x^* = y^* - y_j^* + \Delta^* / 2$; dimensionless distance from center of delta function interval

y = lateral distance from center of channel

$y^* = \frac{y}{D_c}$; dimensionless lateral distance from center of channel

y_j^* = lateral distance of junction point from center of channel

z = normal distance from channel bed

α_1 = correction factor

α_2 = coefficient in equation 31; bank cross-sectional area

α_3 = coefficient in equation 33; bank cross-sectional area

β = lift-to-drag ratio

Δ^* = delta function interval

Δy^* = step size

$\delta = \tau/\rho g S$; stress depth

$\delta^* = \frac{\delta}{D_c}$; dimensionless stress-depth

d_{ave}^* = average dimensionless stress-depth over the flat-bed region

δ_{cr} = critical bed stress depth

δ_{crb} = critical stress depth at a point on the bank

$\delta_{cr}^* = \frac{\delta_{cr}}{D_c}$; dimensionless critical bed stress depth

$\delta_{crb}^* = \frac{\delta_{crb}}{D_c}$; dimensionless critical stress depth at a point on the bank

$d_{cr\ max}^*$ = upper limit of d_{cr}^* range for a given value of μ

$d_{cr\ min}^*$ = lower limit of d_{cr}^* range for a given value of μ

ϵ_y = lateral sediment diffusivity induced by fluid turbulence

ϵ_z = vertical sediment diffusivity

μ = submerged coefficient of friction of channel material

$z = \int_0^D c dz$ = vertically integrated suspended sediment concentration

ρ = mass density of water

ρ_s = mass density of sediment

σ_g = gradation coefficient

τ = shear stress acting on the channel boundary

τ^* = dimensionless total shear stress

t_{ave}^* = average dimensionless shear stress over the flat-bed region

$\tau_{cr}^* = \delta_{cr} S / R_s d_{50}$; dimensionless critical shear stress

τ_G = grain shear stress

$\tau_G^* = \tau_G / \rho R_s g d_{50}$; dimensionless grain shear stress

ϕ = angle of repose

$$y = \left(\frac{4+j}{24(2-j)} \ln \left(30 \frac{D_n}{k} \right) - \frac{5}{36(2-j)} \right) \left(1 + \frac{1}{2 \ln(30 D_n/k) - \frac{17}{3}} \right)$$

$$y_1 = \frac{10 - 3A_4(4 - A_2)}{36(A_2 + 2)(2A_4 - \frac{17}{3})^2} \left(\frac{A_5}{A_3} \right) \left(\frac{30}{k^*} \right)$$

$$\psi_0 = \left(\frac{1}{12} \ln \left(\frac{30}{k^*} \right) - \frac{5}{72} \right) \left(1 + \frac{1}{2 \ln(30/k^*) - \frac{17}{3}} \right)$$