

# THREE-DIMENSIONAL SIMULATION OF POLLUTANT DISPERSION IN COASTAL WATERS

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## 0.3 LIST OF RELEVANT VARIABLES

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A list of the most important variables used in this thesis is presented below. All other variables are defined in the text when they are used.

$a_{ij}$	Reflectivity coefficient for cell (i,j)
$A_S$	Shortwave albedo
$a_w$	Wave amplitude
$\hat{A}_\delta$	Peak orbital excursion at the top of the wave boundary layer
$B$	Buoyancy flux of the discharge at the source
$b_B$	Distance from the axis at which the jet buoyancy has decreased to $B_m/e$
$b_C$	Distance from the axis at which the concentration has decreased to $C_m/e$
$B_m$	Centreline buoyancy flux
$b_w$	Distance from the axis at which the jet velocity has decreased to $w_m/e$
$C$	Concentration
$C_B$	Bed-load concentration
$c_g$	Group velocity
$c_{L,T,H(V)}$	Constant coefficients for the horizontal (vertical) diffusivities
$C_m$	Centreline concentration
$c_w$	Wave celerity
$C_0$	Initial concentration
$C\%$	Fraction of cloud-covered sky
$d$	Water depth
$D_B$	Breaking-wave energy dissipation rate
$d_s$	Particle diameter
$d_p$	Initial discharge diameter
$d_{50}$	Sediment grain diameter
$D^*$	Sediment grain parameter
$E(k,p)$	Energy (kinetic, potential)
$E_r$	Pickup function
$f_{wc}$	Wave-current friction coefficient
$g$	Gravity acceleration
$H$	Integration lengthscale; Resolution bandwidth
$h$	Still water depth
$h_B$	Still water depth at breaker
$H_w$	Wave height
$H_{w0}$	Wave height in deep waters
$H_{wB}$	Wave height at the breaker
$H_{wM}$	Critical value for wave height
$i$	Bottom slope
$I_o(t)$	Solar surface radiation
$J$	Julian day
$\mathbf{k}$	Wave number vector
$k$	Turbulent energy
$K'_d$	Hyperbolic microbiological decay coefficient
$K_d$	Linear microbiological decay coefficient
$K_H$	Horizontal diffusion coefficient
$K_L$	Horizontal longitudinal diffusion coefficient
$k_s$	Nikuradse grain roughness
$K_T$	Horizontal transverse diffusion coefficient

$K_Y$	Vertical diffusion coefficient
$K_x$	Dispersion coefficient
$l_B'$	Plume stratification lengthscale
$l_B$	Plume/cross-flow transition lengthscale
$l_M$	Jet/plume transition lengthscale
$l_m'$	Jet stratification lengthscale
$l_m$	Jet momentum lengthscale
$l_Q$	Discharge lengthscale
$l_T$	Momentum/buoyancy lengthscale
$L_w$	Wave length
$L_{wB}$	Wave length at breaking point
$M$	Total transported mass
$M$	Momentum flux of the jet at the source
$m$	Momentum flux of the jet
$m_p$	Particle mass; mass of particle $p$
$M_x$	Mass transport
$p$ ( $p'$ )	Pressure (fluctuations)
$Q$	Volume flux of the discharge at the source
$q$	Volume flux of the jet
$Q_B$	Bed-load transport rate
$Q_{SC}$	Source/sink term
$Ri$	Richardson number
$S$	Salinity; dilution
$s$	Relative density
$S_m$	Mean dilution
$S_{xx}, S_{yy}, S_{xy}$	Radiation stresses
$T$	Temperature
$t$	Time
$T_w$	Wave period
$T_{90}$	Characteristic microbiological decay timescale
$T^*$	Excess bed-shear stress parameter
$u_a$	Ambient velocity
$u_a, v_a, w_a$	Advective components of the particle velocity
$u_{Dm}, \dots$	Particle velocity component due to molecular diffusion
$u_{Dt}, \dots$	Particle velocity component due to turbulent diffusion
$U_W$	Wind velocity
$\hat{U}_\delta$	Peak velocity at the top of the wave boundary layer
$w_B$	Vertical velocity due to buoyancy
$W_H$	Projection function; smoothing kernel
$w_m$	Centreline jet velocity
$w_R$	Vertical velocity due to resuspension
$w_S$	Vertical velocity due to settling
$w_{S0}$	Settling velocity for spherical particles in clear water
$w_0$	Initial discharge velocity
$x_B$	Breaker distance to the shoreline
$z_t$	Terminal height of rise
$\alpha_w$	Wave incidence angle
$\beta$	Buoyancy flux of the discharge
$\delta$	Angle between current lines and x-axis
$\delta_B$	Sediment saltation height
$\delta_{ij}$	Kronecker's delta function
$\varepsilon$	Rate of turbulent energy dissipation

$\phi$	Velocity potential
$\phi_G$	Geographical latitude
$\gamma_B$	Battjes's gamma
$\gamma_{ex}$	Light extinction coefficient
$\gamma_w$	$H_w/h$
$\eta$	Surface elevation
$\kappa$	von Karman's constant (= 0.41)
$\lambda_G$	Geographical longitude
$\lambda_F$	Fick's diffusion coefficient
$\nu$	Kinematic viscosity; molecular viscosity
$\nu_{H,V}$	Horizontal (vertical) turbulent diffusion coefficient
$\theta, (\theta')$	(Effective) Shields parameter
$\theta_{cr}$	Critical Shields parameter
$\theta_v$	Angle between the discharge and the horizontal plane
$\rho$	Density
$\rho_r$	Reference density
$\sigma$	Angular frequency
$\tau_b$	Bed shear stress
$\tau_{b,c}$	Bed shear stress related to currents
$\tau_{b,cw}$	Bed shear stress related to waves and currents
$\tau_{b,w}$	Bed shear stress related to waves