

Index

- 2D model, 378
- 3D model, 378
- 452-ton boulder, 221
- 500-yr flood, 220
- A-frame, 329
- abutment, 271
- abutment scour, 312–313, 315
- advection-dispersion, 365, 370
- adverse slopes, 108
- aerial photograph, 187, 226
- aggradation, 114, 199, 215, 219
- aggradation-degradation scheme, 375
- agricultural levee, 290
- alluvial channel, 158, 171
- alluvial fan, 219, 221
- alluvial river bar, 177
- alluvial system, 199, 203
- alternate bar, 177–178
- alternate depth, 103
- amplification factor, 358
- anabranching, 216
- anastomosed river, 215, 216, 218
- anchor, 265
- angle of repose, 18, 161
- angular frequency, 389
- annual erosion loss, 74
- annual migration rate, 187
- apex, 178, 180
- aquatic habitat, 322
- armor layer, 209, 210
- arrested saline wedge, 402
- artesian pressure, 238
- articulated concrete mattress, 260
- artificial cutoff, 319
- at-a-station hydraulic geometry, 81, 87
- Atchafalaya River, 86, 222, 295, 379
- Atlantic salmon, 403
- avulsion, 216, 219
- backward finite-difference, 355, 361
- backwater profile, 107, 110
- baffle, 324
- bank caving, 170
- bank failure, 235
- bank-erosion process, 234
- bank stabilization, 282
- bankfull discharge, 171, 183, 199, 224
- barge type, 317
- basket, 259
- bedform characteristics, 94
- bedload percentage map, 193
- bedload sediment transport, 113, 192–193, 218
- bed-material discharge, 199
- bedrock outcrop, 212
- bed shear stress, 27
- Belanger equation, 101
- benching, 237
- bend apex, 191
- bendway weir, 277–279
- Big Thompson flood, 42, 44
- blanket, 252
- block, 257, 258
- borrow area, 290
- bottom vane, 308
- boundary condition, 362
- box gabion, 259
- brackish water, 403
- braided river, 214–218, 223
- braiding and meandering, 216–217
- branches, 221
- bridge inspection program, 350
- bridge scour, 310
- broad-crested weir, 282, 302
- bucket dredge, 325, 327
- bulkhead, 264
- buoyancy force, 159
- burlap sack, 257
- buttress, 237, 264
- caisson, 263–264
- calibration phase, 353
- canal headwork, 306, 307–308

Cambridge University Press
0521562848 - River Mechanics

Pierre Y. Julien

Index

[More information](#)

428 *Index*

- cantilever wall, 262, 264
- canyons, 207
- capture, 216
- capture–recapture, 403
- celerity, 130–131, 389
- cellular cofferdam, 303–304
- center-of-mass curve, 193
- central finite-difference, 355, 361
- centrifugal acceleration, 23, 128, 166, 398
- channel conveyance, 288
- channel degradation, 204
- channel improvement, 288, 294, 316
- channel incision, 205, 207
- channel intake, 306
- channel morphology, 199
- channel shift, 224
- channel stability, 163
- channel widening, 222
- Chaudière watershed, 76
- Chézy coefficient, 54, 89, 91
- choking, 298
- chute cutoff, 178, 330
- circular cell, 305
- clay plug, 190
- climate, 34
- cofferdam, 303–304
- cohesive bank, 235
- Colorado River, 151
- commercial navigation, 317
- compacted levee, 290
- complete closure, 297
- complete mobile-bed similitude, 345
- complete-equilibrium hydrograph, 58–59, 60
- concave bank, 180
- concentration profiles, 154
- concrete wall, 263
- confined aquifer, 238
- confluence, 225
- conjugate depth, 100–101
- conservation of mass, 24, 122
- conservation practice, 70–71
- consistency, 356–357, 363, 366
- contaminant, 329, 365
- continuity, 122
- contraction scour, 311–312
- control volume, 122, 125
- convection instabilities, 368
- convective acceleration, 23
- convective rainstorm, 37, 39
- convergence, 356–357, 363
- conversion of units, 12
- convex bank, 180
- Coriolis acceleration, 23, 397–398, 400
- corrector algorithm, 373
- Courant number, 140–141, 356
- Courant–Friedrich–Levy (CFL), 140, 358
- covered-hopper barge, 317
- crib wall, 263–264
- critical flow depth, 100, 103
- critical shear stress, 18, 163
- cropland, 71
- cropping-management, 68, 69–70
- crossing, 178, 180
- crossover culvert, 324
- cross-section geometry change, 195
- cross wave, 134
- culvert scour, 291, 301
- cumulative distribution function, 40
- cumulative infiltration, 48, 53
- cumulative time of snowmelt, 61
- cut and fill, 237
- cutoff, 316, 318–319
- cutoff trench, 290
- cutoff wall, 252
- cutterhead dredge, 328
- dam, 323
- dam break, 220
- Darcy–Weisbach friction factor, 54, 89, 91
- database, 228
- deadman, 266
- debris, 283
- decreasing discharge, 195
- deep-water wave, 388–389, 401
- degradation, 114, 199, 207, 210, 219
- degree days, 61
- delta, 220
- densimetric velocity, 402
- density stratification, 401
- depositional zone, 199
- depth-integrated 2D model, 377
- depth of ponding, 48
- design flood elevation, 305
- detention basin, 286
- detention storage, 46, 53
- diaphragm cell, 304–305
- differential equation types, 353
- diffusive wave, 129, 134–136, 138, 141
- dike, 272, 274
- dipper dredge, 325, 327
- Dirichlet type of boundary condition, 362
- discharge duration, 206
- discharge measurement, 84
- dispersion number, 371
- distorted model, 335, 348
- divergence theorem, 122
- diversion tunnel, 297–299
- dominant discharge, 171, 203, 206
- double levee system, 289, 322
- double mass curve, 229
- downbound tow, 318
- downstream boundary condition, 362
- downstream fining, 212, 215

- downstream hydraulic geometry 158, 166,
 172–175, 202
 downwind, 356
 drain, 267
 drain well, 238, 239
 drainage network, 79
 drainage trench, 238
 dredged material, 329
 dredging, 325
 drift angle, 318
 drop structure, 280, 281
 Dry Creek, 212
 dry specific weight, 21
 dumped riprap, 247
 duration curve, 142–143, 147,
 151
 dustpan dredge, 327–328
 dynamic response, 199, 203
 dynamic similitude, 336
 dynamic variables, 10
 dynamic viscosity, 11
 dynamic wave, 135, 138

 earth cofferdam, 297
 earth plug, 319
 effective riprap size, 241
 effective saturation, 48
 elliptic equations, 362
 emptying, 323
 end-dumping, 298
 endangered species, 228, 322
 energy correction factor, 97, 103
 energy dissipation, 280
 energy grade line (EGL), 29, 110–111
 equation of motion, 25, 27, 128
 equilibrium in river bends, 166
 equivalent concentrations, 20
 erosion coefficient, 73
 erosion index, 187, 189
 erosional zone, 199
 Euler's relation, 358
 evapotranspiration, 46
 exact geometric similitude, 335, 337
 exceedance probability, 40, 42, 143, 147, 149,
 151
 excess rainfall, 51–53
 expected soil loss, 65–66
 explicit finite difference, 356, 365
 external forces, 25
 extremal hypotheses, 179
 extreme rainfall, 149
 extreme specific discharge, 149

 Fall River, 190
 fan apex, 221
 fence, 276
 fetch length, 395

 field survey, 228
 filling, 323
 filter, 247
 filter design, 250
 filter fabric, 264
 finite-difference approximation, 353–354
 fish population, 404
 flash flood, 45
 flexibility, 283
 floating debris, 276
 flood-carrying capacity, 294
 flood control, 286, 289
 flood damage, 289
 flood-frequency analysis, 227
 floodgate, 291
 floodplain, 171, 288
 flood protection, 288, 293
 flood routing, 139, 141
 floodwall, 289
 floodwave amplification, 135
 floodwave attenuation, 135, 137, 286–287, 289
 floodwave celerity, 131, 140
 floodwave diffusivity, 132, 134, 139
 floodwave propagation, 133
 floodway, 287, 293
 flow contraction, 104, 297, 304
 flow convergence, 4
 flow-discharge record, 227
 flow diversion, 297
 flow-duration curve, 227
 flow in bends, 128
 flow kinematics, 22
 fluvial system, 199
 flux, 124
 forestland, 71
 forward finite-difference, 355, 361
 Fourier series, 358
 freeboard, 290, 304
 freeze-thaw cycle, 262
 Froude similitude, 336–337, 340
 fundamental dimensions, 9

 gabion, 258–259, 263, 280
 gabion structure, 260
 gabion wall, 263
 Ganges River, 224–225
 gantry, 329
 gate pier, 324
 general scour, 310–311
 geographic information system (GIS), 226
 geometric similitude, 335
 geometric variables, 10
 geometry of meanders, 183
 geotextile, 263
 gooseneck, 255
 gradation coefficients, 17
 grade-control structure, 207, 280, 301–302

Cambridge University Press
0521562848 - River Mechanics

Pierre Y. Julien

Index

[More information](#)

430 *Index*

- gradually-varied flow, 102, 107, 110
- grain resistance, 92
- gravel filters, 248
- gravel mining, 210, 213–214
- gravity wave, 385
- gravity wall, 262
- grazing, 213
- great flood, 293
- Green and Ampt, 47
- Green's law, 401
- grid Peclet number, 367, 371
- groundwater control, 267
- group velocity, 393–394
- groynes, 268–269, 321
- guidebank, 270–271, 304
- guide vane, 307
- guide wall, 307
- gullies, 207
- hardpoint, 267
- headcut, 207, 210, 214
- high tide, 403
- higher-order approximation, 360, 362
- hopper dredge, 325, 327–328
- horizontal drain, 238–239
- horseshoe vortex, 313–314
- hydraulic conductivity, 48
- hydraulic-geometry changes, 204
- hydraulic-geometry relationship, 171
- hydraulic geometry of stable channel, 173
- hydraulic grade line (HGL), 29, 110–111
- hydraulic jump, 101, 106
- hydraulic model, 339
- hydraulic modeling, 336
- hydraulic pipeline dredge, 327
- hydraulic similitude, 334
- hydraulic suction dredge, 325
- hydraulically rough/smooth, 91
- hydrologic cycle, 31
- hydroseeding, 255
- hyetograph, 52
- hyperbolic function, 385–387
- hyperbolic partial differential equation, 354, 365
- hypsomeric curve, 33
- ice and debris movement, 236, 254, 320
- ideal cross-section geometry, 163–164
- impermeable spur, 270
- implicit finite difference, 356
- impulse-momentum relationship, 98
- incipient motion, 160
- incised river/channel, 205, 207
- incomplete mobile-bed similitude, 346–347, 349
- increasing discharge, 195
- infiltration, 46, 48–49
- inflection point, 180
- initial water content, 48
- interception, 46
- interference, 393
- irrigation canal, 306
- island, 215
- Jamuna River, 223–225, 348
- jet scour, 300–301
- jetty field, 275–276
- Kellner jack, 276
- kinematic similitude, 335
- kinematic variables, 10
- kinematic viscosity, 13
- kinematic wave, 129, 134–135, 138
- Kleitz–Seddon law, 131
- knickpoints, 207
- Lacey silt factor, 165
- Lagrangian celerity, 130
- landslide, 236
- Lane's relationship, 201
- lateral earth pressure, 267
- lateral migration, 170, 184, 186, 188–189, 224
- lateral mobility, 185, 189
- lateral stability, 187
- launching apron, 252, 257
- Lawn Lake, 220
- Leonard scheme, 368, 371
- levee, 171, 219, 288–290, 293
- lift-drag ratio, 161
- lift force, 159
- lightweight sediment properties, 344, 349
- linear stability analysis, 357, 369
- local acceleration, 23
- local scour depth, 302
- lock and dam, 296, 323–324
- logarithmic equation, 92
- logjam, 295
- long wave, 388
- longitudinal dyke, 319
- longitudinal profile, 80
- longitudinal shear stress, 185
- loop, 180
- loop-rating curve, 136
- low sill, 299
- low tide, 403
- low water reference plane (LWRP), 81, 331
- lower guard wall, 324
- Lower Mississippi River, 261
- MacCormack scheme, 372
- magnetic sliding collar, 350
- mainstream lengths, 33
- maintenance, 282
- maintenance dredging, 330

- Manning coefficient, 54, 90–91
 Manning-Strickler similitude, 340
 marching procedure, 354
 masonry wall, 263
 mass curve, 229
 mass density, 10
 mass wasting, 237
 Matamek River, 83, 87, 403
 mathematical model, 352
 matting, 255
 mattress, 258–259
 maximum precipitation, 36
 maximum scour, 304
 maximum sill elevation, 105
 mean annual flood, 171
 mean daily sediment discharge, 151
 mean radius of curvature, 183
 meander belt, 180
 meander cutoff, 288
 meander length, 179–184
 meander loop, 179, 187, 190
 meander width, 179–184
 meandering, 186, 189, 217
 mechanical dredge, 325
 method of moment, 144–145
 Meuse River, 210
 mid-channel bar, 178
 migration rate, 188
 mild slopes, 108
 minimum channel width, 105
 minimum radius of curvature, 181–182
 minimum stream power, 179
 Mississippi River, 222, 255, 278, 291, 330, 379, 398
 Mississippi River Commission (MRC), 293
 mobile-bed model, 339, 342, 344, 348
 mobile-bed similitude, 343
 model accuracy, 353
 model calibration, 352
 model dimension, 348
 model distortion, 340–341
 model scale, 334, 342
 model verification, 353
 modified slump failure, 251
 momentum correction factor, 96, 99
 momentum equation, 97, 126
 mountainous terrain, 213
 multidimensional river model, 376

 National Geodetic Vertical Datum (NGVD), 81, 331
 native plants, 253
 navigable waterway, 296
 navigation, 316–318
 neck cutoff, 189–190
 Neuman type of boundary condition, 362
 noncohesive alluvial channel, 171
 noncohesive bank, 235
 nonexceedance probability, 40, 42, 143
 nonuniform thalweg depth, 381
 normal depth, 90
 normal stresses, 25
 numerical diffusion, 366–367
 numerical stability, 141, 359, 368
 numerically smooth simulation, 370

 open-hopper barge, 317
 overland flow, 57–58, 63
 overtopping, 305
 oxbow lake, 190

 Padma River, 222, 224–225
 parabolic equation, 365
 partial closure, 297
 partial-equilibrium hydrograph, 58, 60
 particle erosion, 250
 particle-orientation angle, 162
 particle-size distribution, 17
 particle stability, 158, 162, 168, 194
 pasture land, 71
 path line, 22
 paved bed, 209
 peak discharge, 220
 perched river, 216, 219, 289
 perforated pipe, 238
 permeable spur, 270
 perturbation theory, 179
 pervious toe trench, 290
 phase velocity, 388
 physical model, 334
 physical properties, 9, 14
 pier footing, 314
 pier scour, 313–315
 pile, 273
 pile cap, 314
 pile cluster, 274
 pile retard, 272
 pilot channel, 319
 pipeline, 329
 piping, 236, 290
 planform geometry, 181
 plunging jet scour, 300–301
 point bar, 169–170, 177
 point bar sedimentation, 194
 point-bar slope, 191
 point rainfall precipitation, 40
 pontoon, 329
 pore pressure, 238
 porosity, 21
 port, 329
 potential evapotranspiration, 34
 potential infiltration, 52
 precast cellular block, 257

432 *Index*

- precision, 353
- predictor-corrector scheme, 372
- Preissmann scheme, 373
- preservative treatment, 283
- pressure-relief well, 290
- probability density function, 143
- project durability, 282
- project flood, 294
- project life, 282
- properties of sediment, 13
- pumping plant, 291, 306

- quasi similitude, 347
- quasi-steady dynamic wave, 129

- radial acceleration, 128
- radial shear stress, 128, 166–167
- radial surface slope, 167
- radius of curvature, 167, 172, 178–179, 181, 187
- raindrop impact, 55, 63
- rainfall erodibility, 67
- rainfall excess, 53
- rainfall precipitation, 35
- rapidly varied flow, 102
- Red River, 295
- regime equation, 165
- regulated outlet work, 297
- relative infiltration, 50
- relative migration rate, 187
- relative particle stability, 169
- reservoir, 286
- resistance to flow, 93
- resistance to overland flow, 53–54
- retaining wall, 262, 266
- retard, 271–274
- revegetation, 256
- revetment, 252, 330
- Rhine River, 151, 152, 321
- rigid-bed hydraulic model, 337, 339–341
- rills, 63, 207
- Rio Grande River, 228–229
- riprap design 238, 240–242, 244–247, 250
- risk, 304
- river branches, 222
- river closure, 297–299, 304
- river confluences, 221–222
- river control, 320
- river crossing, 310
- river database, 226
- river diversion, 297
- river dynamics, 199
- river engineering, 286
- river estuaries, 385, 401
- river flood control, 286
- river floodwave, 130
- river flow-control structure, 267
- river formation, 4
- river meandering, 179
- river model, 365
- river-stabilization structure, 234
- riverbank engineering, 234, 236, 253, 282
- riverbed armoring, 208
- riverbed degradation, 204
- rivers around the world, 5
- Roaring River, 190, 220
- rock dike, 331
- rock durability, 240
- rock fill, 274
- rock riprap, 240
- rockfill abutment, 313
- rockfill cofferdam, 297
- rockfill weir, 282
- roll wave, 134
- rotational failure, 235
- Rouse equation, 114
- runoff, 51
- Russian river, 212

- sack revetment, 257–258
- Saint-Venant equation, 28, 129, 139
- saline wedge, 401–404
- salmon capture, 404
- sampling duration, 191
- satellite imagery, 226
- scale ratio, 339
- Schoharie Creek, 349
- scour adjustment, 283
- scour depth, 303, 310
- scour monitoring, 350
- scrolls, 187
- second-order approximation, 361
- secondary circulation, 166, 169
- sediment ejection, 306, 308
- sediment exclusion, 306–307
- secondary flow, 168
- sediment budget, 222
- sediment concentration, 19
- sediment continuity relationship, 114
- sediment-delivery ratio, 75
- sediment discharge, 113
- sediment diversion, 223
- sediment grade scale, 16
- sediment overload, 215
- sediment-rating curve, 137
- sediment record, 228
- sediment source, 72, 199
- sediment transport, 111
- sediment yield, 72, 74
- settlement, 283
- settling basin, 309
- settling velocity, 21, 112

Cambridge University Press
0521562848 - River Mechanics

Pierre Y. Julien

Index

[More information](#)

Index

433

- shallow-water wave, 388
- shear stresses, 25
- shear velocity, 18, 89
- sheepfoot roller, 262
- sheet erosion, 63
- sheet flow, 63
- sheet pile, 262, 264, 281–282, 305
- Shields parameter, 112, 161, 172
- short wave, 388
- sidecasting dredge, 327
- sideslope failure, 250–251
- sieve analysis, 17
- sill raising, 298
- similitude criteria, 342
- sine-generated curve, 180, 182
- sinuosity, 180, 184–185, 189
- slackwater zone, 225
- slope adjustment, 205
- slope length steepness, 67
- slope-reduction method, 237
- slope reinforcement, 236
- sloping sill, 281, 282
- sluice gate, 105, 300, 302
- slump, 250
- smolts, 403
- snowmelt runoff, 61
- sodding, 254
- soil cement, 261–262
- soil classification, 47
- soil erodibility, 67
- soil loss, 64, 71
- specific discharge, 150
- specific energy, 110, 130
- specific-gauge record, 84, 86, 208
- specific gravity, 15
- specific momentum, 100
- specific weight, 10, 15, 21
- spillthrough abutment, 313
- spillway crest, 287
- spillway gate, 324
- splash zone, 254
- splitter wall, 324
- sprigging, 254
- spud, 329
- spur, 268–270, 321
- St. Lawrence River, 404
- stability, 357
- stability factor, 160–161, 168
- stability number, 161
- stability diagram, 217
- stabilizing moment, 160
- stable bed condition, 209
- stable channel, 158
- stable channel geometry, 176
- stable foundation, 310
- stage-discharge relationship, 56, 84, 227
- starboard, 329
- steady 3D model, 379
- steady-nonuniform flow, 97
- steady-uniform flow, 88
- steel jack, 275
- steep slopes, 108
- stilling basin, 280, 324
- stone fill dike, 272
- stone gradation, 247
- storage capacity, 286
- stratified bank, 235
- streak line, 22
- streambank erosion control, 253
- streambank failure, 236
- streamline, 22
- streamline deviation angle, 160, 168, 170, 191
- stream rehabilitation, 322
- subcritical normal depth, 108
- submeander, 178
- submerged jet scour, 300–301
- submerged specific weight, 15
- submerged weight, 159–160
- subsidence, 219
- subsurface drainage, 238
- summer levee, 322
- supercritical normal depth, 108
- surface runoff, 53
- surface-runoff hydrograph, 60
- surface vane, 308
- surface wave, 236, 385–386
- suspended load, 113
- swing cable, 329
- synthetic filter cloth, 248
- Tanana River, 218
- tank barge, 317
- tectonic activity, 219
- temperature effect, 86
- tension crack, 235
- terrace zone, 254
- tetrahedron, 276
- thalweg, 169–170, 178, 191
- thalweg erosion, 194
- thunderstorms, 44
- tieback, 252, 271, 273
- tide, 385, 388, 396, 399–401, 404
- tilted river model, 335, 340
- timber crib wall, 264
- timber pile dike, 272, 274–275
- timber pile fence, 274
- time scale for bedload motion, 344
- time to equilibrium, 59, 60
- toe protection, 258, 272–273
- toe scour, 235
- topographic measurement, 191
- towboat, 317
- translational slide, 250–251

434 *Index*

- transport zone, 199
- transversal shear stress, 185–186
- trap efficiency, 115
- trench, 239, 256–257
- trenchfill revetment, 320
- tributary bar, 177–178
- tributary basin improvement, 294
- truncation error, 361
- tunnel, 297
- tunnel ejector, 308–309
- turbulent-velocity profile, 95

- uncoupled formulation, 376
- underground seepage, 290
- uniform thalweg depth, 381
- universal soil-loss equation, 66
- upland erosion, 63–64
- uplift, 219
- upper lock gate, 323
- upstream boundary condition, 362
- upwind, 356
- urban levee, 290
- urbanization, 213

- valley slope, 186, 189
- vandalism, 283
- vane dike, 277
- vegetation, 253
- velocity against stone, 244

- velocity measurement, 191
- vertical drain, 238
- vertical wall, 313
- volumetric flux, 126
- von Neumann procedure, 357
- vortex tube, 309

- Waal River, 321–322
- washload, 199, 214
- water and sediment loads, 6
- water quality, 329
- watersheds, 31
- waterway alignment, 316, 318
- wave, 131, 254, 362, 364, 385, 387, 389–391, 394
- weather radar, 39
- weephole, 258, 267
- Weibull plotting position, 147
- weighting coefficient, 373
- wetting front, 48
- wildfire, 213
- wind wave, 395–396
- windrow, 256, 257
- windrow revetment, 257
- windstorm duration, 395
- wire fencing, 275

- Yampa River, 137