Index

Adapted process, 50	175, 176, 192, 204, 205, 206,
Advection, vii, 12, 14, 15, 16, 17,	207, 214, 215
18, 20, 21, 58, 108, 146, 169,	Covariation, 35, 36, 46, 52, 54, 62,
181, 182, 183, 192, 193, 195,	63, 64
196, 197, 198, 199, 201, 202,	Darcy's law, 4, 5, 7, 21, 127
203, 204, 228, 233	Deceleration, 136, 155, 164, 165,
Angular frequency, 43	167
Anisotropic, 123, 233	Differential operator, 24, 98, 175,
Aquifer, 5, 18, 21, 22, 23, 24, 25,	177
152, 194, 195, 196, 197, 199,	Diffusion, 1, 2, 3, 5, 7, 8, 12, 13,
201, 202, 203, 204, 205, 207, 233	14, 17, 19, 20, 21, 23, 25, 58, 60,
Boundary layers, 6	66, 76, 86, 96, 98, 102, 129, 130,
Breakthrough curves, 18, 184, 185,	131, 132, 135, 147, 148, 149,
188	181, 232
Cellular, 1	Dirac delta-function, 110
Central Limit Theorem, 41	Dirichlet problem, 95
Characteristic operator, 98	Discontinuity, 33, 212
Computer simulation, vi, 31, 68	Dispersion, vii, 5, 6, 7, 13, 14, 15,
Confidence intervals, 81, 187	16, 17, 18, 19, 20, 21, 22, 23, 24,
Contamination, 1	25, 27, 58, 59, 108, 127, 135,
Continuity, 12, 23, 33, 38, 96, 129,	136, 146, 147, 148, 149, 152,
130, 132	163, 164, 165, 166, 167, 169,
Convergence, 37, 38, 47, 51, 110,	170, 172, 181, 182, 183, 184,
155, 179, 181, 209, 214, 220	189, 192, 193, 195, 196, 197,
Correlation, vii, 8, 40, 49, 113,	198, 199, 201, 202, 203, 204,
114, 115, 116, 117, 119, 120,	228, 230, 231, 233, 235
122, 123, 124, 125, 131, 139,	Drift, 58, 59, 60, 66, 76, 86, 96,
140, 146, 174, 176, 179, 181,	102, 108, 112, 139, 151, 220,
185, 189, 205, 207, 209, 211,	226, 228
215, 230	Dynkin's formula, 99, 102, 106
Covariance, 40, 44, 52, 114, 115,	Eigen value, vii
116, 117, 119, 120, 122, 123,	Euler scheme, 126
124, 125, 128, 139, 173, 174,	Eulerian, 21

event, 29	204, 206, 208, 209, 210, 211,
exit time, 99, 100, 104	212, 213, 215
Fluid, vi, 4, 5, 6, 7, 10, 11, 12, 13,	Kinematic, 132
14, 15, 16, 25, 93, 94, 111, 112,	Kolmogorov's backward equation,
113, 120, 125, 127, 128, 129,	100
130, 131, 132, 135, 136, 137,	Kummer functions, 153
138, 140, 141, 142, 143, 145,	Laguerre, 110
148, 149, 154, 161	Laminar flow, 8, 93
Fluorescent, 16	Left-continuous, 33, 50
Flux, 11, 12, 13, 15, 16, 18, 21, 24,	Linearity, 36, 51
128, 130, 147, 148, 167, 169,	Markov, 2, 48, 95, 233
170, 171, 172	Markov's chains, 2
Fourier transform, 43	Martingale, 48, 52
Gedanken-experiment, 25	Maximum likelihood, 221, 225,
General Linear SDE, ix, 90	226
Generator, 98, 100, 102, 104, 106,	Mean-square, 37
109, 139, 140, 146, 149, 153,	Microspheres, 16
154, 157, 158	Milstein scheme, 126
Granularity, 13, 205	Monitoring wells, 195
Groundwater, 1, 5, 218, 224, 232,	Navier-Stokes equations, 7
233, 234, 235	Orthogonal polynomials, 110
Hermite, 110, 153, 154, 155, 156,	Orthonormal, 109, 110, 114, 115,
157, 158	117, 119, 121, 154, 176
Hilbert space, 175, 181, 235	Partial differential equation, 3, 94,
Hydraulic conductivity, 5, 20, 21,	106, 141, 225, 232
22, 23, 25, 111, 112, 151, 173,	Peclet number, 17
180, 205, 218, 225	Polarization, 36
Hydrodynamic dispersion, 6, 232	Polya's theorem, 102
Indicator, 11	Polymethylmethacryle, 16
Inverse Method, xi, 218	Population dynamics, 27, 58, 67
Isometry, 51	Potential theory, vi, 94, 95, 127,
Ito, ix, 32, 49, 50, 51, 52, 53, 55,	140, 234
56, 58, 59, 60, 61, 62, 64, 65, 67,	Predictable process, 50, 58
68, 69, 70, 73, 74, 75, 76, 77, 78,	Probability space, 29
83, 85, 86, 88, 90, 91, 96, 97, 98,	Pumps, 195
175, 179, 221	Quadratic variation, 35, 36, 39, 46,
Jump, 33	47, 52, 54, 59, 64, 85
Kakutani's theorem, 102	Recurrent, 101
Karhunen-Loeve expansion, 115,	Representative Elementary
117, 205	Volume, viii, 9
Kernel, 49, 115, 116, 117, 119,	REV, 8, 9, 10, 12, 13
122, 128, 139, 140, 176, 192,	Rhodamine, 195

Index 239

Riemann, viii, 32, 38, 39 Right-continuous, 33 Scale dependence, 22 Spectral density, 43 Spectral expansion, 115, 119, 120, SSTM, xi, 181, 182, 183, 192, 193, 197, 198, 199, 201, 202, 203, 204 Stagnation, 134, 151, 152, 164, 166 Stationary, 4, 5, 10, 12, 21, 30, 43, 69, 93, 95, 129, 132 Stochastic calculus, vi, 1, 2, 3, 25, 27, 32, 34, 35, 53, 68, 69, 83, 170, 204, 234 Stochastic Chain Rule, ix, 53, 55 Stochastic differential, vi, 3, 24, 25, 27, 31, 44, 58, 61, 62, 66, 68, 69, 81, 83, 84, 85, 86, 91, 94, 96, 111, 127, 175, 205, 218, 220, 221, 231, 234 Stochastic exponential, 85, 90, 91 Stochastic Product Rule, ix, 62 Stopping time, 99, 100, 101, 103, 142 Stratonovich, 32

Symmetry, 36 Taylor series, 56, 170, 171 Temperature, 4, 41, 42, 94, 95, 148 Thermodynamics, 1 Tortuosity, 13, 14, 15, 18 Tracer, 1, 5, 6, 7, 8, 10, 16, 19, 195 Transcendental equations, 118 Transport, vi, vii, 1, 3, 4, 5, 10, 13, 14, 15, 16, 20, 21, 22, 23, 24, 94, 96, 108, 128, 136, 139, 141, 152, 166, 169, 170, 193, 195, 204, 218, 224, 229, 230, 233, 234, 235 Validation, 82, 193, 201 Variance, 22, 40, 41, 42, 43, 44, 45, 46, 47, 52, 69, 72, 81, 117, 128, 134, 142, 144, 146, 147, 148, 163, 164, 165, 167, 176, 181, 184, 189, 220 Variation, viii, 9, 34 Velocimetry, 16, 19 White noise, viii, 31, 44, 67, 69, 70, 72, 84, 111, 113, 173, 219, 220 Zero Mean Property, 51