

Index

A

- Absorption, 1, 7, 8, 16, 17, 25, 46, 59, 60, 63, 66, 68, 73, 76, 78, 80, 86, 113, 116, 151, 152, 159, 164, 174, 177, 179, 186, 188–190, 206, 209, 215, 238, 253, 254, 256, 258–260, 263–268, 270, 272, 274, 275, 277, 280
- Absorption coefficient, 59, 63, 73, 152, 164, 189, 266, 267
- Aerosol, 1, 2, 55–57, 59, 64–67, 72–74, 76, 77, 90, 120, 217, 219, 222, 235, 236, 238, 252, 265, 280, 284
- Aggregates, 63, 69, 75, 78, 79, 89–92, 203, 211–213, 215, 226–230, 256, 259, 260, 262, 264, 269–276
- Airborne particulates, 265
- Albedo, 32, 40, 41, 65, 72, 85, 206, 208–210, 221, 236, 260, 266, 270, 275
- Angular scattering, 159, 166, 170, 171, 175, 272, 273
- Anomalous diffraction, 60, 135, 139
- Artificial spherical beads/bubbles, 44, 77, 109, 159, 162–164, 205
- Ash, 61, 74, 252, 275, 277, 288
- Aspect ratio, 41, 138–140, 202, 203, 210–216, 218, 219, 225, 228–237
- Astigmatism, 123, 138, 143
- Asymmetry parameter, 204, 208, 210–215, 220, 222, 228–234, 237, 274, 275
- Atmospheric remote sensing, 263
- Auto-correlation, 281

B

- Backscattering, 41, 67–69, 72, 73, 77, 79, 86, 92, 109, 152, 153, 155, 164, 168, 169, 175–180, 183–190, 192, 214, 217–219
- Backscattering coefficient, 65–67, 69, 77, 152, 177, 178, 185, 187–189

- Backscattering ratio, 153, 164, 168, 178–180, 184, 186, 189, 190
- Ballistic imaging, 281–283
- Beam steering, 259
- Bi-disperse systems, 262

C

- Calibration, 154, 159, 160, 164, 165, 168, 178, 192, 229, 255, 256, 258, 259, 262–264, 267, 277, 280, 283, 284, 287
- Calibration independent method, 263
- CALIPSO, 77, 217, 222
- Carbon in ash, 277
- Cavity Ring Down (CRD), 65, 264–266
- Chiral media, 1, 9, 14, 43
- Chlorophyll, 159, 179, 180, 184, 189, 190
- Cholesteric phase, 45, 46
- Cirrus, 3, 8, 37, 38, 200, 204, 205, 217, 219, 223, 225, 226, 235, 238
- Clouds, 3, 4, 8, 37, 38, 40, 55, 62, 65, 73–75, 77, 119, 120, 198–200, 202, 204, 205, 208, 215–219, 222, 227, 229–238
- Clouds of bubbles, 119
- Coagulation, 268, 271, 275
- Coal, 252, 263, 275, 276, 277, 288
- Coarse structures, 124, 127, 138, 139
- Coastal seawaters, 190
- Coated particles, 263
- Coating of particles, 263, 266, 274
- Complex-Angular Momentum theory, 112
- Complex refractive index, 56, 57, 59, 60, 64, 65, 72, 73, 75, 79, 84, 85, 86–89, 91–93, 190, 257, 261, 265, 277, 280
- Composition, 31, 34–36, 64, 66, 77, 110, 119, 120, 178, 179, 180, 186, 189, 230, 266, 281, 287
- Convection, 200, 231, 232, 261
- CPL, 217, 218, 230, 231

- Critical-angle refractometry and sizing technique, 119
- Cross section, 16–18, 60, 116, 140, 154, 205–207, 210, 217, 236, 256, 260, 263, 265–267, 270, 274, 275
- D**
- Depolarization, 4, 43, 70, 71, 74, 76, 77, 79, 80, 86–89, 91–93, 217–219, 230, 231, 234–238
- Digital imaging, 276
- Direct Dipole Approximation (DDA), 61, 62, 90, 93, 120, 252, 256, 272, 275
- Direct inversion, 267, 268
- Discrete ordinates, 258
- Dissolved colored organic matter, 159
- Dissymetry, 4, 45, 46, 122, 140, 215
- Distortion, 11, 203, 214, 218, 224, 231, 237, 279
- Drops, 110, 111, 197, 217, 219, 223, 252, 253, 278–281, 284, 285, 287
- Dual burst, 280
- E**
- Edge diffraction, 257, 277
- Effective radius, 209, 226, 230, 231, 238
- Eikonal approximation, 268
- Elastic light scattering, 262, 271
- Emissivity, 256, 257, 260, 261, 268
- Energy balance, 5, 37, 131, 135, 142, 262, 265
- Eotvos number, 110
- Extinction, 2, 3, 7, 14–18, 22, 26, 27, 30, 35, 38, 39, 41, 60, 63–67, 69, 116, 168, 206–209, 217, 220, 230, 235, 236, 257, 258, 260, 264–269, 272, 274, 275, 278, 283
- Extinction coefficient, 64–67, 207, 258, 264–266, 268, 272
- Extinction efficiency, 207–209, 265
- F**
- Far-field, 5, 63, 83, 116, 119, 131, 132, 139, 142
- Fast Fourier Transform (FFT), 285
- Femtosecond pulse, 286
- Fibre laser, 278
- Fine structure, 133, 135, 143
- Fluorescence, 74, 159, 252, 257, 263, 264, 273, 283, 284, 287
- Forward diffraction, 123, 124, 135, 138, 139, 143, 285
- Fourier analysis, 37, 279
- Fourier Interferometric Imaging (FII), 284
- Fractal aggregates, 89, 256, 274
- Fractal dimension, 259, 270, 271–273
- Fractal geometry, 252
- Fragmentation, 271
- Fraunhofer diffraction, 8, 9, 252
- Fraunhofer's approximation, 132, 135
- Fresnel coefficients, 121, 124, 126, 137, 138, 143
- Fringes, 124, 131, 132, 143, 275, 279, 285
- G**
- Gas conduction, 256
- Gaussian beam, 118, 138
- Gaussian cut-off, 272
- Generalized Lorenz-Mie Theory, 117
- Genetic algorithm, 268
- Geometrical optics, 7, 13, 60, 112, 121, 132, 137, 279, 280
- Geometrical Optics Approximation, 112, 121, 137
- Geometric optics, 61, 206, 218
- Glare points, 279, 281
- Global Phase Doppler (GPD), 280
- Goos-Hänchen shift, 132, 134
- H**
- Habit, 200–203, 211, 212, 215, 216, 224–229, 231, 234, 237
- Halo, 37–39, 197, 205
- Hexagonal, 37, 40, 41, 197, 198, 202–205, 210–212, 214, 215, 217–219, 227, 228, 230, 237, 238
- High spatial resolution, 265, 282
- Hollow, 205, 214, 218, 224, 225, 227–230, 237
- Hollowness, 205, 214, 218, 237
- Holography, 276, 278
- Hygroscopic growth, 265
- I**
- Ice crystals, 1, 3, 8, 37, 38, 40, 41, 197–200, 202–208, 210, 213–216, 218–224, 227, 228, 230, 232, 234–238
- ILIDS, 252, 279, 280
- Image analysis, 276, 278, 285
- Inclusions, 117, 205, 225, 278, 279
- Interactive scattering, 270
- L**
- Laser, 44, 58, 65–68, 74, 80–82, 92, 110, 152, 155, 177, 216, 217, 254–265, 268, 273, 275, 276, 278–283, 287

- Laser beam profile, 260
 Laser Doppler Velocimetry (LDV), 275
 Laser flux (fluence), 255, 258–261, 263
 Laser induced fluorescence (LIF), 273, 287
 Laser induced incandescence (LII), 254, 258–260
 Laser sheet, 258, 259, 280, 282, 283
 LED, 158, 159
 Lidar, 56, 57, 58, 59, 66–69, 74, 77, 80, 199, 216–219, 222, 230, 231, 235–238, 263
 LIF/Mie ratio, 273, 275, 283, 284, 287
 Light, 3, 4, 37, 38, 42–46, 55–93, 110–113, 117, 124, 137, 142, 151–159, 162, 164, 169–173, 175, 184, 185, 190, 204, 206–208, 210, 211, 217, 220, 222, 253, 262, 263, 266, 268, 269, 271, 272, 275–279, 282–284, 286
 Light scattering, 46, 55–66, 68–93, 110–112, 152, 164, 170–172, 184, 185, 190, 262, 263, 269, 271, 272, 275–278, 283
 Liquid crystals, 4, 11, 45, 46
 Lorenz-Mie theory, 59–61, 63, 71, 72, 79, 112, 117, 206, 217, 259
- M**
 Mass spectroscopy, 262
 Maxwell equations, 2, 4, 5, 6, 13, 45
 Mean free path, 260
 Mie, 41, 59, 60, 85, 112, 113, 162, 163, 166–169, 263, 265, 268, 271, 274, 277, 278, 284, 286
 Mie theory, 112, 162, 163, 168, 169, 265, 268, 271, 277, 286
 MODIS, 199, 222, 223, 225, 226
 Morphology (Shape), 57, 61, 68, 77, 79, 90, 93, 204, 205, 259, 260, 261, 266, 273–275
 Morton number, 110
 Multi-angular, 2, 219–223, 238
 Multi-directional measurements, 216, 220, 238
 Multiphase flows, 112
 Multiple scattering, 5–8, 15, 57–59, 62, 63, 65, 70–72, 74, 76, 79, 85, 88, 89, 119, 166, 217, 221, 256, 259, 271, 272, 274, 276, 282–284, 288
 Multispectral Volume Scattering Meter (MVSM), 157, 158, 174, 180, 181, 183, 190, 192
- N**
 Near-critical-angle, 111, 117, 120, 122, 124, 127, 132, 133, 135, 139, 140
 Near field, 113, 117, 131, 139, 272
 Nematic phase, 45, 46
 Nephelometer, 72, 80, 153, 154, 166, 170, 192
 Non-spherical particles, 1, 8, 37, 41, 77, 217, 252, 253, 268, 276
- O**
 Oceanographic platform, 188, 189
 Optical depth, 65, 223, 238, 276, 283
 Optically active media, 2–4, 7, 9, 12, 14–17, 26, 33, 43, 44
 Optical particle counter, 277
 Optical patternator, 278
 Optical thickness, 22, 23, 65, 85, 205–208, 220–223, 226, 229, 232, 233, 238, 259
 Orientation, 1, 9, 15, 37, 39, 41, 74, 83, 90, 91, 93, 199, 206, 207, 213, 215, 221, 223, 268, 274, 286
- P**
 Particle Imaging Velocimetry (PIV), 280
 Particle size distribution, 56, 57, 65, 85, 179, 209, 257, 261, 262, 267, 274
 Particle swarm (ant colony), 268
 Particulate media, 8, 55–59, 62–72, 74–78, 80, 81, 83–89, 91, 92
 Periscope prism, 155, 157
 Phase Doppler Anemometry (PDA), 280
 Phase matrix, 2, 3, 7, 14, 16–18, 26, 30, 33–39, 71, 83, 206, 207, 209, 210, 212, 217, 218, 236, 237
 Photoacoustic spectroscopy (PAS), 264–266
 Photochemical effects, 262
 Photography, 278
 Photomultiplier, 156–158
 Physical Optics Approximation, 123, 139
 Phytoplankton, 151, 159, 164, 168, 169, 174, 177–179, 184
 Planck function, 262
 Plasma, 4, 11, 42
 Polarimeter, 43, 73, 82, 221, 222, 235, 238
 Polarisation ratio, 282
 Polarization, 1, 3, 4, 8, 9, 11, 12, 13, 15, 16, 20, 23–25, 33, 35, 37, 41–43, 45, 46, 55, 56, 64, 69–80, 82, 88, 90, 116, 124, 127, 129, 131, 135, 137, 139, 199, 206, 207, 211, 212, 214, 217, 219, 220, 221, 222, 227, 235, 236
 polarized reflectance, 77, 199
 POLDER, 73, 222–228, 232, 233, 235
 Polycrystals, 200, 227
 Pressure, 232, 233, 254, 260, 261, 266, 267, 274, 277, 2778, 282, 287
 Primary particles, 256, 269–275

Pulse delay (time shift), 281
 Pulsed laser, 66, 81, 257, 278

R

Radiation attenuation, 35, 258
 Radiation transfer equation, 192
 Radiative shielding (trapping), 254
 Radii of curvature, 138
 Radius of gyration, 262, 270, 273
 Rainbow, 131, 132, 222, 235, 285, 286
 Rayleigh-Debye-Gans approximation (RDG), 252, 256, 266, 270, 271–274, 276
 Rayleigh limit, 262, 274
 Re-condensation, 255
 Reflectance, 2, 39, 44, 64, 73, 76–78, 151, 192, 199, 220, 222, 234, 238
 Refractive index, 6–8, 11, 15, 37, 42, 43, 46, 56, 57, 59, 60, 63, 64, 67, 72, 73, 75, 79, 81, 84–89, 91, 92, 93, 111, 113, 115, 117, 119, 132, 133, 135, 136, 139, 158, 166, 168, 169, 170, 171, 173, 174, 190, 209, 252, 253, 255, 256, 257, 261, 265, 266, 267, 268, 270, 273, 277, 280, 281, 284, 285, 286
 Reynolds number, 110
 Rough particles, 213, 227, 281
 RSP, 222, 225, 228, 230, 231, 233, 235
 RTT, 7, 8, 62, 72, 76, 83

S

Scanning mobility sizer, 262
 Scattering, 4, 7, 14, 16–18, 34, 37, 62, 63, 68, 73, 80, 85, 88, 112, 117, 119, 120, 131, 152–154, 160, 162–164, 166, 168–170, 171, 178, 184, 189, 192, 203, 205, 206, 214, 217, 219, 228, 253, 256, 260, 264, 270, 274, 284
 Scattering anisotropy, 170
 Scattering at small angles, 170
 Scattering by particles, 61, 76, 166, 178, 185
 Scattering coefficient, 118, 152, 154, 166, 169, 171, 172, 175, 177, 187, 188, 267
 Scattering cross-section, 267, 274
 Scattering indicatrix, 17, 172
 Semi-analytical algorithms for reflectance, 183
 Shadow Doppler Velocimetry (SDV), 275
 Shapes (bubbles), 77, 109, 110, 117, 137
 Shock waves, 255, 257
 Signal modulation, 281
 Single scattering albedo, 206, 208, 209, 236, 260, 266, 275
 Singly scattered photons, 282

Size distribution, 65, 68, 77, 79, 164, 169, 174, 189, 190, 229, 262, 267, 273, 274, 279, 284, 286
 Size parameter, 60, 63, 86, 113, 118, 120, 208, 209, 265, 272, 274
 Smectic phase, 45
 Soot, 55, 56, 65, 90, 252, 254–256, 260–262, 265, 266, 268–270, 274, 275, 287, 288
 Soot concentration, 258, 259
 Soot transformation, 260
 Specific absorption, 266
 Spectral extinction, 65, 266–268
 Spectrophotometer, 82
 Specular reflection, 112, 218, 223, 231
 Spheroid, 3, 11, 117, 121, 138–140, 142, 217, 219, 268, 269, 275, 286
 Sprays, 252, 276, 278, 280, 282–288
 Stationary phase method, 131
 Stokes parameters, 14, 15, 33, 222
 Stokes vector, 2, 3, 6, 7, 13–16, 19, 20, 32, 33, 70–72, 80, 207
 Structured illumination, 283
 Sublimation, 198, 204, 219, 254, 255
 Superaggregates, 90, 91, 271
 Surface roughness, 204, 205, 211, 213, 214, 218
 Suspended particles, 172

T

Temperature, 83, 110, 171, 198, 200, 202–204, 218, 232, 236, 255, 256, 259, 260, 262, 266, 276, 277, 282, 286, 287
 Temperature gradient, 285, 286
 Thermal accommodation coefficient, 254–256, 261, 263
 Time shift technique, 281
 T-matrix method, 121, 252, 270, 272, 274
 Tomography, 269, 278, 284
 Total reflectance, 220, 221, 224, 226
 Tunneling phase, 124, 126, 127, 130, 132, 137
 Turbulence, 171, 174, 259
 Two colour method (pyrometry), 255, 256, 259, 275

U

Unicellular algae monocultures, 168
 Upwelling radiance, 152

V

Vacuum, 261
 Van de Hulst geometrical approximation, 71

Vectorial Complex Ray Model (VCRM),
137–139

Vector radiative transfer, 72

Virtual wavefront, 131, 133, 140, 142

Volatiles coating, 263

Volume Scattering Function (VSF), 151, 152,
155–163, 166, 168, 170–178, 180, 181,
186, 191, 192

W

Wavelet transform, 279

X

X-rays, 274, 283