Index

absolute atmospheric humidity, 51
acceleration of gravity, 47
active systems, 1
active ventilation, 175
apparent emittance, 11
apparent radiation contrast, 14
apparent target radiance, 81
apparent temperature, 11
atmospheric boundary, 29
atmospheric emission coefficient, 46, 77
atmospheric propagation, 12
atmospheric transmissivity, 12
atmospheric visibility, 70

background elements, 123
bidirectional reflection, 125
blackbody, 7
blackbody operation, 84
blackbody position, 84
blackbody size, 84

calibrated signatures, 80
calibration curves, 96
calibration guidelines, 84
calibration procedure, 81
calibration sources, 85
camouflage, 164
camouflage efficiency, 174
camouflage materials, 166
camouflage net, 170
camouflage of personnel, 174
CARABAS system, 129
CHAR-II experiment, 103
cloud base temperature, 46
cloud emittance, 46
cloud radiation, 43

coefficient of thermal expansion
of air, 47
cold-sky radiation, 165
color pattern, 164
comfort levels, 174
conditional stability, 57
convective heat exchange, 47
COYOTE, 172
cumulative error, 63
curve fitting, 145
curve-fit method, 146
degree of cloud cover, 46
density of air, 50
density of water, 32
desert background, 154
detector voltage, 81, 133
dew-point temperature, 52
direct component, 41
diffuse irradiance, 41
element bearings, 136
emission coefficient ε, 10, 44
emittance, 9
energy conservation, 30
energy transfer, 30
environmental temperature, 11
environmental variations, 24
EOSTAR, 70
exhaust gases, 110
extended target, 23

field trial, 91
finite differences, 55
finite-difference method, 54
first-principle models, 54
focal plane array, 20
forced convection, 48
free convection, 48
friction velocity, 50
Grashof number, 47
gray bodies, 10
gray level offset, 83
heat capacity, 32
heat flow, 31
heat flux, 31
heat transfer coefficient, 48
heat-balance equation, 35
HOM experiments, 103
hydraulic conductivity, 32
hyperspectral imaging, 4
image sequence, 154
imaging systems, 20, 82
infrared detector, 19
infrared reflectometer, 101
initial condition, 57
instantaneous field of view, 22
intrinsic, 12
IR background characterization, 122
IR target modeling, 115
IRIS, 91
IRIS experiments, 103
irradiance, 7
Julian day, 41
Kelvin, 11
kinematic viscosity, 47
Kirchhoff, 7
laminar, 47
Lambert’s cosine law, 10
land mine detection, 111, 119
latent heat, 51
latent heat of vaporization, 51
Leopard I tank, 104
LIDAR, 2
line spread function, 74
long-wave sky irradiance, 45
long wave reflection coefficient, 11
long wave spectral reflectivity, 11
low-emissivity paint, 164
M113 (APC), 104
Maltese cross, 130
materials properties, 25
mean reflection coefficient, 40
mobile camouflage system, 172
MODTRAN, 18, 70
moisture content, 32
moisture flow, 32
Monin-Obukhov similarity, 49
NEL, 21
noise equivalent temperature difference, 74
nonlinear transport coefficients, 32
passive systems, 18
physical characterization, 29
physical description, 135
pixels, 20
Planck, 8
point target, 22
polar diagram, 97
polarizer, 115
porous materials, 32
principal directions, 136
PRISM, 115
properties of soils, 34
pyrgeometer, 70
pyrheliometer, 41, 71
Radar, 1
radiance, 10
radiance offset, 83
radiant exitance, 8
radiant flux, 7
radiant flux density, 7
radiant intensity, 9
radiation contrast, 18
radiometer, 19
rain gauge, 71
range, 13
relative error, 63
relative humidity, 52
relative system spectral response, 81
Reynolds number, 47
Richardson number, 49
roughness length, 50
SAR, 2
saturation deficit, 52
saturation vapor pressure, 52, 148
SCORPIO, 73
Index

sensitivity analysis, 60
signature management, 161
sky irradiance, 72, 152
sky radiance distribution, 75
solar absorption coefficient, 36
solar constant, 41
solar incident angle, 41
solar radiation, 41
solarimeter, 41, 70
spatial similarity, 161
specific enthalpy, 32
specific heat, 31
specific mass, 31
spectral absorptivity, 7
spectral diversity, 25
spectral emissivity, 8
spectral radiometer, 4
state diagram, 53
Stefan-Boltzmann constant, 9
sun azimuth angle, 41
sun elevation angle, 41
surface emittance, 47
synoptic, 70
system responsivity, 81
T62 tank, 115
target detection, 17
target conditions, 24
target radiance, 81
target signatures, 99
temperature contrasts, 142
temperature histograms, 117, 139
temperature prediction, 57
temperature similarity, 161
temperature statistics, 117
temperature-contrast statistics, 143
test bed, 113
thermal background behavior, 138
thermal conductivity, 31
thermal diffusivity, 31
thermal suits, 177
thermopile, 102
TICM-II FLIR, 109
turbulent, 47
visibility sensor, 70
von Kármán constant, 50
water vapor pressure, 45
weather parameters, 69
weather station, 157
Wien’s displacement law, 9
wind sensor, 71
zero displacement level, 50
Pieter A.M. Jacobs is a senior scientist working for the Electro-Optics group at TNO, located in The Hague, The Netherlands. The laboratory in The Hague is part of the Defence, Security, and Safety Organization, which is the main contractor for the Dutch Ministry of Defence. Over a period of more than 30 years he has become an expert on thermal sensor systems and countermeasures. He holds a master degree from the University of Eindhoven and a Ph.D. in physics from the University of Wageningen. As the Dutch representative in many national and international (NATO) research projects he is well informed on the state of the art in his area of expertise. He has presented his work during many conferences and symposia over the years. This Tutorial Text tries to summarize his experiences, without going too much into theoretical details, but instead focusing on practical issues.