Symbols

A	Amplitude of thermal wave in the subsurface medium (Chapter 4)
A	Aerodynamic surface area of vegetation per unit volume (Chapter 15)
A	Similarity constant or function (Chapters 10, 13)
A_s	Amplitude of thermal wave at the surface
A_θ	Mean advection terms in the thermodynamic energy equation
a	Albedo or shortwave reflectivity of the surface (Chapter 3)
a	Inverse length scale (Chapter 7)
a	An empirical constant (Chapter 10)
a_b	Acceleration due to buoyancy
a_i	Empirical constant
a_θ	Instantaneous advection terms in the thermodynamic energy equation (Chapter 9)
a_1	Empirical constant
a_2	Empirical constant
B	Bowen ratio
B	Buoyancy production term in the turbulent kinetic energy equation (Chapter 8)
B	Similarity constant or function (Chapters 10, 13)
b	Boltzmann constant
C	Heat capacity
C	Empirical constant (Chapter 9)
$\mathbf{C}$	Coriolis force (Chapter 6)
C_D	Surface drag coefficient
C_d	Drag coefficient (Chapter 15)
C_{DN}	Drag coefficient in neutral stability
C_g	Heat capacity of the near-ground soil layer (Chapter 4)
C_H	Heat transfer coefficient
C_{HN}	Heat transfer coefficient in neutral stability
C_S	Smagorinski constant (Chapter 13)
C_s	Volumetric heat capacity of soil (Chapter 4)
C_W	Water vapor transfer coefficient

C_w	A constant (Chapter 9)
C_θ	An empirical constant
C_0	Phase speed of dominant waves
c	Specific heat
c	Speed of light (electromagnetic waves) in vacuum (Chapter 3)
c	Empirical constant (Chapter 10)
c_g	Geostrophic drag coefficient
c_m	Electromagnetic wave speed in a medium (Chapter 3)
c_m	A constant (Chapter 14)
c_p	Specific heat at constant pressure
c_v	Specific heat at constant volume
D	Reference depth in the sub-medium (Chapter 4)
D	Viscous dissipation term in the turbulent kinetic energy equation (Chapter 8)
D/Dt	Total derivative
d	Distance of the earth from the sun (Chapter 3)
d	Damping depth of thermal wave in the submedium (Chapter 4)
d	Dimensionless constant (Chapter 13)
dH	Heat added to a parcel
d_m	Mean distance between the earth and the sun
dP	Change in the air pressure
dT	Change in the air temperature
d_0	Zero-plane displacement
E	Rate of evaporation or condensation
E	Average turbulence kinetic energy
E_a	Drying power of air
E_p	Potential evaporation or evapotranspiration
E_0	Rate of evaporation or condensation at the surface
e	Water vapor pressure (Chapters 5 and 12)
e	Fluctuating turbulence kinetic energy (Chapters 9 and 13)
e_r^*	Saturated vapor pressure at reference height (Chapter 12)
e_s	Water vapor pressure at saturation (Chapter 5)
e_0	Water vapor pressure at the surface or at $z = z_0$
F	Function of certain variables (Chapter 9)
F	Froude number (Chapters 13 and 14)
$\mathbf{F}$	Friction force (Chapter 6)
F_c	Critical Froude number
F_L	Froude number based on length of the hill
F_u	A similarity function
F_v	A similarity function
f	Coriolis parameter
f	Function of variables (Chapter 9)

f'	Normalized velocity as a function of η
G	Magnitude of geostrophic wind
$\mathbf{G}$	Geostrophic wind vector
Gr	Grashof number
G_0	Magnitude of surface geostrophic wind
$\mathbf{G}_0$	Surface geostrophic wind vector
g	Acceleration due to gravity
H	Sensible (direct) heat flux
H	Building height (Chapter 14)
H_1	Soil heat flux at depth z_1
H_F	Anthropogenic heat flux in an urban area
H_G	Ground heat flux to or from the subsurface medium
H_g	Soil heat flux at depth d_g
H_i	Heat flux at the inversion base
H_{in}	Energy coming in
H_L	Latent heat flux
H_{out}	Energy going out
H_s	Height of the dividing streamline
H_0	Sensible heat flux at the surface
h	Boundary layer thickness
h	Depth of channel flow or distance between two parallel planes (Chapter 7)
h_E	Ekman depth
h_i	Height of surface inversion (Chapter 5)
h_i	Internal boundary layer thickness (Chapter 14)
h_p	Planck's constant
h_0	Average height of roughness elements or plant canopy
I	Insolation at the surface
I_0	Insolation at the top of the atmosphere
i	Imaginary number $\sqrt{-1}$
i_u	Longitudinal turbulence intensity
i_v	Lateral turbulence intensity
i_w	Vertical turbulence intensity
K	Effective viscosity (Chapter 7)
K	Subgrid-scale eddy viscosity (Chapter 13)
K_E	Diffusivity of turbulence kinetic energy
K_h	Eddy diffusivity of heat
K_m	Eddy viscosity or diffusivity of momentum
K_{mr}	Eddy viscosity at the reference height
K_w	Eddy diffusivity of water vapor
K_*	Dimensionless eddy viscosity (Chapter 13)
k	Von Karman constant

k	Thermal conductivity (Chapter 4)
k_m	Hydraulic conductivity of the subsurface medium
L	Obukhov length
L	A characteristic length scale (Chapter 9)
L_{AI}	Leaf area index
L_e	Latent heat of evaporation/condensation
l	Large eddy length scale (Chapter 8)
l	Fluctuating mixing length (Chapter 9)
l_b	Buoyancy-limited mixing length (Chapter 13)
l_h	Mean mixing length of heat
l_m	Mean mixing length of momentum
l_o	Mixing length in the outer layer (Chapter 13)
ℓ	Large-eddy length scale (Chapter 13)
ℓ_ε	Dissipation length scale (Chapter 13)
M	Soil moisture flow rate
M_b	Soil moisture flow rate at the bottom of layer
M_d	Mass of dry air
M_w	Mass of water vapor
M_0	Soil moisture flow rate at the surface
m	Mean molecular mass of air (Chapter 5)
m	Exponent in the power-law wind profile equation (Chapter 10)
m	A coefficient (Chapter 15)
m_d	Mean molecular mass of dry air
m_w	Mean molecular mass of water vapor
N	Brunt–Vaisala frequency
Nu	Nusselt number
n	Exponent in the power-law eddy viscosity profile (Chapter 10)
n	A coefficient (Chapter 15)
P	Mean air pressure
P	Period of the wave (Chapter 4)
$\mathbf{P}$	Pressure-gradient force
P_{AI}	Plant area index
Pe	Peclet number
Pr	Prandtl number
P_0	Pressure of the reference atmosphere
p	Instantaneous pressure
p_0	Pressure of the reference state
p_1	Deviation of pressure from the reference state
Q	Mean specific humidity
Q_r^*	Saturation specific humidity at reference height (Chapter 12)
Q_s	Mean specific humidity at saturation (Chapter 5)
Q_0	Specific humidity at $z = z_0$

q	Specific humidity fluctuation
q_*	Specific humidity scale for the surface layer
R	Radiative energy flux or radiation (Chapter 3)
R	Specific gas constant (Chapter 5)
Ra	Rayleigh number
R_D	Diffuse radiation
R_d	Specific gas constant for dry air
Re	Reynolds number
Rf	Flux Richardson number
Ri	Gradient Richardson number
Ri_B	Bulk Richardson number
Ri_c	Critical Richardson number
R_L	Longwave radiation (flux)
$R_{L\downarrow}$	Incoming (downward) longwave radiation
$R_{L\uparrow}$	Outgoing (upward) longwave radiation
R_N	Net radiation
R_O	Surface Rossby number
R_S	Shortwave radiation (flux)
$R_{S\downarrow}$	Incoming (downward) shortwave radiation
$R_{S\uparrow}$	Outgoing (upward) shortwave radiation
R_s	Solar radiation flux at the surface
R_*	Absolute gas constant
R_λ	Radiative energy flux density per unit wavelength
R_0	Solar radiation flux at the top of the atmosphere
r	Correlation coefficient
r_H	Aerial resistance to heat transfer
r_M	Resistance to momentum transfer
r_w	Resistance to water vapor transfer
S	Shear production term in the turbulent kinetic energy equation (Chapter 8)
S	Soil moisture content (Chapter 12)
S	Skewness (Chapter 13)
S	Mean value of a passive scalar
S_F	Speed-up factor
S_H	Source or sink of heat
S_0	Solar constant
s	Static stability
s	Fluctuating passive scalar
T	Mean air temperature
T	Temperature of the subsurface medium (Chapter 4)
T_c	Complex stress variable
T_{eb}	Equivalent blackbody temperature

T_g Temperature of the near-ground soil layer
T_m Mean temperature of the surface and submedium
T_m Mean temperature of the lower soil layer
T_r Turbulent transport of turbulent kinetic energy
T_s Surface temperature (Chapter 4)
T_s Sea-surface temperature (Chapter 12)
T_u Urban air temperature
T_v Mean virtual temperature of moist air
T_{vp} Mean virtual temperature of the parcel
T_{v0} Virtual temperature at the reference state
T_* Convective temperature scale
T_x Normalized shear stress in x direction
T_y Normalized shear stress in y direction
T_0 Air temperature at the reference state
T_1 Deviation in the temperature from the reference state
T_{10} Air temperature at 10 m above the surface
t Time
U Mean velocity component in x direction
U_g Geostrophic wind component in x direction
U_h Velocity at $z = h$
U_h Velocity of the moving surface (Chapter 7)
U_m Mixed-layer averaged wind component in x direction
U_r Wind speed at the reference height
U_∞ Ambient wind speed
U_0 Mean velocity in the approach flow
U_{10} Wind speed at a reference height of 10 m
u Fluctuating velocity component in x direction
$\tilde{u}$ Instantaneous velocity in x direction
u_f Local free-convective velocity scale
u_ℓ Characteristic velocity scale of turbulence (Chapter 8)
u_* Friction velocity
V Mean velocity component in y direction
V Volume (Chapter 2)
V Characteristic velocity scale (Chapter 9)
$\mathbf{V}$ Wind vector
V_g Geostrophic wind component in y direction
V_m Layer-averaged wind speed in the PBL
V_m Mixed-layer averaged wind component in y direction
v Fluctuating velocity component in y direction
$\tilde{v}$ Instantaneous velocity in y direction
W Mean velocity component in z (vertical) direction
W Building width (Chapter 14)

W_{AI}	Woody-element area index
W_h	Mean vertical motion at the top of the PBL
W_*	Convective velocity scale
w	Fluctuating velocity component in z (vertical) direction
$\tilde{w}$	Instantaneous velocity in z direction
w_e	Entrainment velocity
z	Height above or depth below the surface or an appropriate reference plane
z_i	Height of inversion base above the surface
z_m	Geometric mean of the two heights z_1 and z_2
z_r	Reference height
z'	Height above the ground level
z_p	Height of a constant pressure surface
z_0	Roughness length parameter
z_{01}	Roughness parameter of the upstream surface
z_{02}	Roughness parameter of the downstream surface
α	Cross-isobar angle (Chapter 6)
α	Empirical constant (Chapter 15)
α_h	Molecular diffusivity of heat or thermal diffusivity
α_m	Soil moisture diffusivity
α_w	Molecular diffusivity of water vapor in air
α_λ	Absorptivity at wavelength λ
α_θ	Dimensionless coefficient (Chapter 12)
α_0	Cross-isobar angle at the surface
β	Coefficient of thermal expansion
β	Slope angle of an inclined plane (Chapter 7)
Γ	Adiabatic lapse rate
Γ_s	Saturated adiabatic lapse rate
γ	Solar zenith angle (Chapter 3)
γ	Psychrometer constant (Chapter 12)
γ	Potential temperature gradient above the PBL (Chapter 13)
Δ	Gradient operator
Δ	Slope of the saturation vapor pressure versus temperature curve (Chapter 12)
ΔA	Elemental area
ΔH_s	Rate of energy storage
ΔM	Rate of storage of soil moisture
ΔT_s	Difference between the maximum and minimum surface temperatures
ΔT_{u-r}	Difference between the urban and rural air temperatures
ΔU	Difference in mean velocities at two heights
ΔU	Velocity deficit in the wake

ΔU_g	Change in U_g over a layer
ΔV_g	Change in V_g over a layer
$\Delta\Theta$	Difference between potential temperatures at two heights
Δx	Small increment in x
Δy	Small increment in y
Δz	Small increment in z
Δz	$z_2 - z_1$
∇^2	Laplacian operator
ε	Overall infrared emissivity (Chapter 3)
ε	Rate of energy dissipation (Chapters 8, 9, 13)
ε_λ	Emissivity at wavelength λ
ζ	Monin–Obukhov stability parameter
η	Normalized distance from the surface (Chapter 7)
η	Sea-surface elevation (Chapter 13)
η	Kolmogorov's microscale of length (Chapter 8)
Θ	Mean potential temperature
Θ_m	Mixed-layer averaged potential temperature
Θ_r	Rural air potential temperature
Θ_u	Urban air potential temperature
Θ_v	Mean virtual potential temperature
Θ_0	Potential temperature at $z = z_0$
Θ_{01}	Temperature of the upstream surface
Θ_{02}	Temperature of the downstream surface
θ	Fluctuating potential temperature
$\tilde{\theta}$	Instantaneous potential temperature
θ_f	Local free convective temperature scale
θ_*	Friction temperature scale
κ	Wave number
λ	Wavelength (Chapter 3)
λ	Frontal area density of roughness elements (Chapter 10)
λ_{max}	Wavelength corresponding to spectral maximum
μ	Dynamic viscosity
μ_g	Heat transfer coefficient
μ_*	Dimensionless stability parameter (Chapter 13)
ν	Kinematic viscosity
ξ	Dimensionless height parameter (Chapters 10, 13)
ξ_τ	Dimensionless PBL height
Π	Dimensionless group
π	The ratio of circumference to diameter of a circle
ρ	Mass density of air or other medium
ρ_p	Mass density of the air parcel
ρ_0	Density of the reference state

ρ_1	Deviation in the density from the reference state
σ	Stefan–Boltzmann constant
σ_q	Standard deviation of specific humidity fluctuations
σ_u	Standard deviation of velocity fluctuations in x direction
σ_v	Standard deviation of velocity fluctuations in y direction
σ_w	Standard deviation of velocity fluctuations in z direction
σ_θ	Standard deviation of temperature fluctuations
τ	Shearing stress
$\boldsymbol{\tau}$	Shear stress vector
τ_0	Surface shear stress or drag
ϕ_h	Dimensionless potential temperature gradient
ϕ_m	Dimensionless wind shear
ϕ_w	Dimensionless specific humidity gradient
ψ_h	M–O similarity function for normalized potential temperature
ψ_m	M–O similarity function for normalized velocity
ψ_w	M–O similarity function for normalized specific humidity
Ω	Rotational speed of the earth
$\boldsymbol{\Omega}$	Earth's rotational velocity vector
ω	Wave frequency