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List of main symbols used

The list of main symbols contains those symbols that are used regularly in the text. Symbols not often used and specific for one chapter are defined at the first location where they are being used in that chapter.

| Symbol | Description | Units | Dimensions |
|-----------------------|---|----------------------------------|---|
| A | Available energy flux density | W m^{-2} | M T^{-3} |
| A_T | Amplitude of the soil temperature | K | Θ |
| a | Maximum interception loss | mm | L |
| b | Reciprocal value of a | mm^{-1} | L^{-1} |
| C, C_{\max} | Actual and maximum water storage on the vegetation or litter layer on an areal basis | m | L |
| C_{soil} | Volumetric heat capacity of the soil | $\text{J m}^{-3} \text{K}^{-1}$ | $\text{M L}^{-1} \text{T}^{-2} \Theta^{-1}$ |
| c_c, c_{veg} | Fraction of cloud cover, fraction of canopy cover | - | 1 |
| c_x | Specific heat ($x = p$ for air at constant pressure, v for dry air at constant volume, c for clay, o for organic matter, q for quartz, w for water, veg for vegetation) | $\text{J kg}^{-1} \text{K}^{-1}$ | $\text{L}^2 \text{T}^{-2} \Theta^{-1}$ |

| Symbol | Description | Units | Dimensions |
|-----------|--|---|-----------------------------------|
| D | Canopy drip | m s^{-1} | L T^{-1} |
| D_{BH} | (Tree) Diameter at Breast Height | cm | L |
| D_T' | Apparent diffusivity | $\text{m}^2 \text{s}^{-1}$ | $\text{L}^2 \text{T}^{-1}$ |
| d | Displacement height | m | L |
| e, e_D | Vapour pressure of water, Deficit of e | hPa | $\text{M L}^{-1} \text{T}^{-2}$ |
| E | Evaporation flux density | $\text{kg m}^{-2} \text{s}^{-1}$ | $\text{M L}^{-2} \text{T}^{-1}$ |
| E_i | Evaporation flux density of intercepted water | $\text{kg m}^{-2} \text{s}^{-1}$ | $\text{M L}^{-2} \text{T}^{-1}$ |
| F_{lat} | Lateral advective energy flux density | W m^{-2} | M T^{-3} |
| F_A | Photosynthesis flux density | $\mu\text{mol CO}_2 \text{ m}^{-2} \text{s}^{-1}$ | $\text{mol L}^{-2} \text{T}^{-1}$ |
| G | Soil heat flux density | W m^{-2} | M T^{-3} |
| g | Acceleration of gravity | ms^{-2} | L T^{-2} |
| H | Sensible heat flux density | W m^{-2} | M T^{-3} |
| h | Height | m | L |
| J | Change in energy storage of the vegetation and air per unit area | W m^{-2} | M T^{-3} |
| J_X | Change in storage ($X = H$ of sensible heat in the air, E of latent heat in the air, veg of the vegetation) | W m^{-2} | M T^{-3} |
| K_X | Turbulent exchange coefficient or eddy diffusivities ($X = E$ for moisture, H for heat and M for momentum) | $\text{m}^2 \text{s}^{-1}$ | $\text{L}^2 \text{T}^{-1}$ |
| k, k_s | Hydraulic conductivity, saturated hydraulic conductivity | m s^{-1} | L T^{-1} |
| k_T | Thermal conductivity | $\text{W m}^{-1} \text{K}^{-1}$ | $\text{M L T}^{-3} \Theta^{-1}$ |
| L | Monin-Obukhov scaling length | m | L |
| L_{AI} | Leaf Area Index | $\text{m}^2 \text{m}^{-2}$ | 1 |
| l | Parameter Van Genuchten function | - | 1 |

| Symbol | Description | Units | Dimensions |
|------------------------|--|--|-----------------------------------|
| m | Parameter Van Genuchten function | - | 1 |
| N_{tree} | Tree density | ha ⁻¹ | L ⁻² |
| n | Parameter Van Genuchten function | - | 1 |
| P, P_{net} | Precipitation rate, net precipitation rate | m s ⁻¹ | L T ⁻¹ |
| p | Atmospheric pressure | hPa | M L ⁻¹ T ⁻² |
| p_f | Free throughfall coefficient | - | 1 |
| p_{stem} | Stem flow coefficient | - | 1 |
| Q | Discharge | m ³ s ⁻¹ | L ³ T ⁻¹ |
| q_{lat} | Lateral soil water flow rate | m s ⁻¹ | L T ⁻¹ |
| $q_{b,net}$ | Net flow rate at the bottom of the soil profile | m s ⁻¹ | L T ⁻¹ |
| $q_r, q_{r,net}$ | Surface run-off, net surface run-off | m s ⁻¹ | L T ⁻¹ |
| R_s^{atm} | Solar radiation at the top of the atmosphere | W m ⁻² | M T ⁻³ |
| R_s^{down}, R_s^{up} | Downward, upward short-wave (0.3-3 μm) radiation flux density | W m ⁻² | M T ⁻³ |
| R_l^{down}, R_l^{up} | Downward, upward long-wave (3-100 μm) radiation flux density | W m ⁻² | M T ⁻³ |
| R_{net} | Net radiation flux density | W m ⁻² | M T ⁻³ |
| r_a, r_{aX} | Aerodynamic resistance, Aerodynamic resistance ($X = M$ momentum, $X = E$ vapour and $X = H$ heat) | s m ⁻¹ | T L ⁻¹ |
| r_s | Surface resistance | s m ⁻¹ | T L ⁻¹ |
| S_f | Stemflow (rate) | m s ⁻¹ | L T ⁻¹ |
| S_E | Sink term for the deep soil latent heat flux | cm ³ cm ⁻³ s ⁻¹ | T ⁻¹ |
| S_{roots} | Sink term for root water uptake | cm ³ cm ⁻³ s ⁻¹ | T ⁻¹ |
| T, T_x | Temperature, temperature ($x = a$ air -, d dry bulb -, s of surface -, $soil$ soil -, son sonic -, v virtual -, veg vegetation -, w wet bulb temperature) | K | Θ |

| Symbol | Description | Units | Dimensions |
|-------------------------------|--|----------------------------|-------------------|
| T_{AI} | Tree Area Index | - | 1 |
| T_f | Throughfall rate | m s^{-1} | L T^{-1} |
| t | Time | s | T |
| u | Wind speed in the x-direction | m s^{-1} | L T^{-1} |
| u_* | Friction velocity | m s^{-1} | L T^{-1} |
| u_{cup} | Scalar wind speed as measured by a cup anemometer | m s^{-1} | L T^{-1} |
| u_{dir} | Wind direction | ° | 1 |
| u_{hor}, u_{tot} | Horizontal wind vector, total wind vector | m s^{-1} | L T^{-1} |
| v | Wind speed in the y-direction | m s^{-1} | L T^{-1} |
| V_{AI} | Vegetation Area Index | $\text{m}^2 \text{m}^{-2}$ | 1 |
| w | Wind speed in the z-direction | m s^{-1} | L T^{-1} |
| W | Water holding capacity | mm | L |
| W_{AI} | Wood Area Index | $\text{m}^2 \text{m}^{-2}$ | 1 |
| X_x | Volume fraction ($x = a$ of air, c clay, o organic matter, q quartz, w water) | $\text{m}^3 \text{m}^{-3}$ | 1 |
| x, x_{max} | Distance upwind of sensor, distance upwind of sensor where the flux source is maximal | m | L |
| x_p | Path length | m | L |
| z | Elevation head, depth, height (positive upwards) | m | L |
| z_{0H}, z_{0M} | roughness length for heat, momentum | m | L |
| z_b, z_{ref} | Bottom boundary depth, height of the reference level | m | L |
| z_g, z_{sw} | Groundwater level depth, surface water level | m | L |
| z_i | Boundary layer height | m | L |
| z_s | Soil surface | m | L |
| $z_{tree}, z_{can}, z_{root}$ | Tree height, canopy base height, rooting depth | m | L |

Greek symbols

| Symbol | Description | Units | Dimensions |
|----------------------|---|----------------------------------|--|
| α | Parameter Van Genuchten function | m^{-1} | L^{-1} |
| α_l | Reflectivity of the surface for the long-wave radiation | - | 1 |
| α_s | Albedo of the surface | - | 1 |
| β | Bowen ratio | - | 1 |
| γ | Psychrometer constant | hPa K^{-1} | $\text{M L}^{-1} \text{T}^{-2} \Theta^{-1}$ |
| Δ_e | Gradient of the saturated vapour pressure versus the temperature curve | hPa K^{-1} | $\text{M L}^{-1} \text{T}^{-2} \Theta^{-1}$ |
| Δ_{\varkappa} | Gradient of the saturated specific humidity versus the temperature curve | K^{-1} | Θ^{-1} |
| ϵ | Dielectric permittivity | $\text{J V}^2 \text{m}^{-1}$ | $\text{M}^{-1} \text{L}^{-3} \Theta^{-2} \text{Q}^2$ |
| ξ_l | Absorptivity of the surface for the long-wave radiation | - | 1 |
| ζ | Stability parameter | m m^{-1} | $\text{L}^{-1} \text{L}^{-1}$ |
| κ | Von Karman constant (= 0.40) | - | 1 |
| λ | Latent heat of vaporization of water per unit mass | J kg^{-1} | $\text{L}^2 \text{T}^{-2}$ |
| η | Eddy-decay coefficient | - | 1 |
| ρ_x | Density (for $x = a$ of air, c clay, o organic matter, q quartz, w water, veg vegetation) | kg m^{-3} | M L^{-3} |
| σ | Stefan Boltzmann constant (= $5.67 \cdot 10^{-8} \text{ W m}^{-2} \text{ K}^{-4}$) | $\text{W m}^{-2} \text{ K}^{-4}$ | $\text{M T}^{-3} \Theta^{-4}$ |
| Θ, Θ_s | Potential temperature, potential temperature at the surface | K | Θ |
| θ, θ_D | Volumetric soil water content, Deficit of θ | $\text{m}^3 \text{m}^{-3}$ | 1 |

| Symbol | Description | Units | Dimensions |
|---------------------------------------|--|--|----------------------------------|
| θ_r | Residual volumetric soil water content | $\text{m}^3 \text{ m}^{-3}$ | 1 |
| θ_s | Saturated volumetric soil water content | $\text{m}^3 \text{ m}^{-3}$ | 1 |
| θ_{stem} | Moisture content of the stem | $\text{m}^3 \text{ m}^{-3}$ | 1 |
| $\varkappa, \varkappa_D, \varkappa_s$ | Specific humidity, Deficit of \varkappa , saturated specific humidity | kg kg^{-1} | 1 |
| \varkappa_{abs} | Absolute humidity | kg m^{-3} | M L^{-3} |
| \varkappa_r | Relative humidity | - | 1 |
| τ | Momentum flux density or shear stress | $\text{kg m}^{-1} \text{ s}^{-2}$ | $\text{M L}^{-1} \text{ T}^{-2}$ |
| μ | Solar energy ($\approx 0.422 \text{ J } \mu\text{mol}(\text{CO}_2)^{-1}$) | $\text{J} \mu\text{mol}(\text{CO}_2)^{-1}$ | $\text{M L}^2 \text{ T}^{-2}$ |
| ϕ_T | Phase angle of the diurnal cycle of the temperature | \circ | 1 |
| ϕ_X | Similarity function ($X = E$ for moisture, H for heat and M for momentum) | - | 1 |
| ψ | Soil water pressure | Pa | $\text{M L}^{-1} \text{ T}^{-2}$ |
| ω | Diurnal angular frequency | rad h^{-1} | T^{-1} |

Operators

| Symbol | Description |
|---------------|--|
| \bar{x} | Average of x |
| x' | Turbulent component of x |
| S_{xx} | Spectra and co-spectra of x and x |
| T_x, T_{xx} | Transfer functions of x and composite transfer functions of xx |