2.4.4 Daily net radiation (R_{nd})

Instantaneous net radiation is usually computed with the energy balance equation as follows:

$$R_{ni} = R_{si\downarrow}\cdot(1-\alpha) + \varepsilon_a\cdot\sigma\cdot T_i^4 - \varepsilon\cdot\sigma\cdot LST^4 \quad (5)$$

where subindex i means instantaneous, α is the surface albedo, $R_s\downarrow$ is the incoming short wave radiation, σ is the Stephan-Boltzmann constant; ε is the surface emissivity and ε_a is the air emissivity. The three terms of Eq. (5) regard to incoming net shortwave radiation, incoming longwave radiation and outgoing longwave radiation, respectively. However, B-method needs R_{nd} instead of R_{ni} as input. Therefore, in order to compute R_{nd} we approached the three terms of Eq. (5) on a daily basis as follows:

$$R_{nd} = R_{sd\downarrow}\cdot(1-\alpha) + L_d^{\downarrow} - L_d^{\uparrow} \quad (6)$$

where α is the surface albedo, $R_{sd}\downarrow$ is the daily incoming short wave radiation, $L_d^{\downarrow}$ is the daily incoming longwave radiation and $L_d^{\uparrow}$ is the daily outgoing longwave radiation.

Albedo (α) was computed using the Liang (2001) methodology in the case of Landsat-5 TM and Landsat-7 ETM+ images, and the method by Liang *et al.* (1999) in the case of TERRA/AQUA MODIS images. Both methodologies use a weighted sum of visible, near infrared and medium infrared radiation, and according to the authors the error in estimating albedo is less than 2%. Daily solar radiation ($R_{sd\downarrow}$) was obtained with the methodology proposed by Pons and Ninyerola (2008). Given a digital elevation model, we can calculate the incident solar radiation at each point during a particular day of the year taking into account the position of the Sun, the angles of incidence, the projected shadows, the atmospheric extinction and the distance from the Earth to the Sun at fifteen minute intervals. The diffuse radiation was estimated from the direct radiation and the exoatmospheric direct solar irradiance was estimated with the Page equation (1986) that Baldasano *et al.* (1994) fitted with information from Catalonia.

$L_d^{\downarrow}$ was computed by means of the methodology proposed by Dilley and O'Brien (1998) that according to the authors shows a RMSE of 5 W m^{-2} and a R^2 of 0.99 in is computation.

$$\mathrm{R}_{\mathrm{L}\downarrow} = \alpha + \beta\left(\frac{T_a}{T_*}\right)^6 + \gamma\sqrt{\frac{w}{w_*}} \tag{7}$$

where α, β y γ are 59.38, 113.7 and 96.96, respectively; w is the water vapour, in kg m^{-2}, T* is 273.16 K, w* is 25 kg m^{-2} and T_a is daily mean air temperature.

Finally, $L_d^{\uparrow}$ was modeled by means of the methodology proposed by Lagouarde and Brunet (1993) as follows:

$$\mathrm{R}_{\mathrm{L}\uparrow} = \varepsilon R \tag{8}$$

where ε is the land surface emissivity and *R* is defined as:

$$R = \sigma\int_0^{\tau}\left[T_{\min} + \alpha\Delta T\sin\left(\frac{\pi t}{D}\right)\right]^4 dt \tag{9}$$

where σ is Stefan-Boltzmann constant (5.67 10^{-8} W K^{-4} m^{-2} $día^{-1}$), ΔT is the difference between LST and T_a at satellite pass, *t*, (both in K), T_{min} (K), α = 1.13, D is the time difference between sunset and sunrise; and τ = 24 (for a 24 hour period).