Version du 5 octobre 2018

Calculation of equivalent solar irradiance and equivalent wavelength for each Venµs spectral band:

$$E_k^{eq} = \frac{\int E_k(\lambda).S_k(\lambda)d\lambda}{\int S_k(\lambda)d\lambda}$$

Equivalent solar irradiance for the spectral band k

$$\lambda_k^{eq} = \frac{\int \lambda.S_k(\lambda)d\lambda}{\int S_k(\lambda)d\lambda}$$

Equivalent wavelength for the spectral band k

with: $S_k(\lambda)$ is the spectral sensitivity of band k

$E_k(\lambda)$ is the top of atmosphere solar spectrum for the band k

Spectral band	Equivalent solar irradiance (W/m²/µm)	Equivalent wavelength (nm)
B1	1661.634	423.9
B2	1954.005	446.9
B3	1990.678	491.9
B4	1830.509	555.0
B5	1669.217	619.7
B6	1670.402	619.5
B7	1510.949	666.2
B8	1428.368	702.0
B9	1290.557	741.1
B10	1163.151	782.2
B11	965.547	861.1
B12	879.865	908.7

For each spectral band k and for each pixel (i,j), the relationship between the top of atmosphere radiance $L_k(i,j)$ and the top of atmosphere reflectance $\rho_k(i,j)$ is:

$$\rho_k(i,j) = \frac{\pi.L_k(i,j)}{E_k^{eq}.u(t).\cos(\theta_s)}$$

with:

- $L_k(i,j)$: pixel (i,j) radiance for the spectral band k (W/m²/sr/µm)
- θ_s : solar zenithal angle
- $u(t)$: correction coefficient of the Earth – Sun distance calculated with a space mechanics library
- E_k^{eq} : equivalent solar irradiance for the spectral band k