This is version 2.0 of the electronic supplement. If you already have an older version of the tables in use, please be advised that it is recommended to replace them with the new version.

The data are redundantly stored in two different file formats: Plain ASCII (.dat) and NetCDF (.nc). The user may choose which format suits him best.

Description of the Variables

k (broad band tables)

k is derived from two simulations of irradiance within the given FOV. One for clear sky (that is, only molecular extinction) I_0 and one for an atmosphere including a cloud (I_α) with optical thickness $\tau = 1.5$ at 550 nm.

$$k = \frac{\log\left(\frac{I_0}{I_\alpha}\right)}{\tau_{550\text{nm}}} \tag{1}$$

I_0 and I_α are broad band (integrated solar) values obtained using the "kato2" parameterization. The different optical property data sets Baum v2.0, Baum v3.5 and HEY cover different wavelength ranges. Because of this, the calculations for the different data sets were done with slightly different wavelength ranges; for Baum v2.0 and Baum v3.5 it covers 430 to 2000 nm; for HEY it covers 300 to 2600 nm. In terms of integrated solar irradiance corrected for molecular absorption the wavelength range for Baum covers 82% of the solar spectrum and for HEY it covers 98%.

k (spectral tables)

k is derived from two simulations of irradiance within the given FOV. One for clear sky (that is, only molecular extinction) I_0 and one for an atmosphere including a cloud (I_α) with optical thickness $\tau = 1.5$.

$$k = \frac{\log\left(\frac{I_0}{I_\alpha}\right)}{\tau} \tag{2}$$

All values in this equation are spectral, that is, for the wavelength specified in the variable *wvl*.

wvl **(spectral tables)**

Wavelength given in nm.

k_max_rel_dev

To check whether the condition $k(\tau) =$ const. is sufficiently met, k is furthermore calculated at $\tau = 0.5$ and $\tau = 3.0$. Both are compared to $k(\tau = 1.5)$ in terms of absolute values of the relative deviation. The larger of the two relative deviations is stored in the variable *k_max_rel_dev*.

k_MC_err

The values of k are based on Monte Carlo simulations of the irradiance with the model MYSTIC. This means that the results are to some extent prone to Monte Carlo noise. MYSTIC does not only output the result but also the standard deviation σ of the result. From this we calculate an estimate of the Monte Carlo error of k as

$$k_{\max} = \log\left(\frac{I_0 + \sigma(I_0)}{I_\alpha - \sigma(I_\alpha)}\right) \tag{3}$$

$$k_{\min} = \log\left(\frac{I_0 - \sigma(I_0)}{I_\alpha + \sigma(I_\alpha)}\right) \tag{4}$$

$$k\_MC\_err = \frac{k_{\max} - k_{\min}}{k} \tag{5}$$

Reff

Effective radius (in μm) supporting points at which k was tabulated.

FOV

Half-opening angle (in °) supporting points of the field of views for which k was tabulated.

nhabit

nhabit gives the number of the particle shape or particle shape mixture – also called habit – as in the list given given in the NetCDF-File global attribute "habits": habits = agg, col, dro, hol, ros, baum_v2, baum_v3.5. These stand for aggregates, solid-columns, droxtals, hollow-columns, rosettes, Baum v2.0 and Baum v 3.5. baum_v2 is also referred to bau and baum_v3.5 is also referred to as b35.

Please note that the new spectral tables only contain values for aggregates, solid-columns, hollow-columns and rosettes.

Change Log

v2.0:

- Bug-fix: Values for agg, dro, hol and ros were erroneous due to to usage of wrong extinction values in the calculation of $\tau_{550\text{nm}}$ (comp. Eq. 1). The errors were mostly below 1%. Nevertheless this has been fixed now and it is advised to use the updated tables.

- New spectral tables available: The k-factor in the spectral tables translates slant cloud optical thickness at certain wavelengths to apparent optical thickness at the same wavelengths. This might be useful for photovoltaic applications. Values were calculated at 8 wavelengths between 400 nm and 1000 nm. Note that values are only provided for the particle shapes aggregates, solid-columns, droxtals, hollow-columns and rosettes.