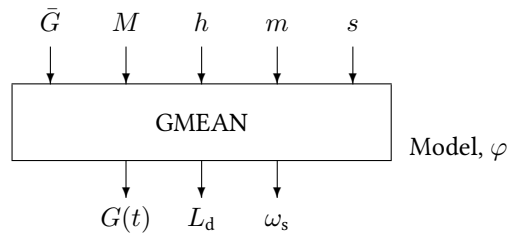


Block GMEAN

The GMEAN block returns the global radiation at a given real solar time for a mean monthly or daily radiation value based on statistical correlations.



Name	GMEAN
Function	em0013
Inputs	3 ... [5]
Outputs	3
Parameters	2
Strings	0
Group	S

Inputs

- 1 Monthly or daily mean value $\bar{G}$ of global radiation / W m^{-2}
- 2 Month M
- 3 Hour h
- 4 Minute m
- 5 Second s

Outputs

- 1 Mean global radiation $G(t)$ / W m^{-2}
- 2 Mean daylength L_d / h
- 3 Mean sunrise hour angle ω_s / °

Parameters

- 1 Model
 - 0 Liu Jordan Collares-Pereira Rabl correlation
 - 1 World Bank Standard Solar Day
- 2 Latitude φ / °

Strings

None

Collares-Pereira
Rabl correlation

The Collares-Pereira Rabl correlation which describes the ratio r between hourly and daily global irradiance for a given hour angle ω is given by

$$r = \frac{\pi}{24} \frac{\cos \omega - \cos \omega_{ss}}{\sin \omega_{sr} - \omega_{ss} \cos \omega_{ss}} (a + b \cos \omega)$$

with the coefficients

$$a = 0.4090 + 0.5016 \sin(\omega_{ss} - 60)$$

$$b = 0.6609 - 0.4767 \sin(\omega_{ss} - 60)$$

The relation between sunset hour angle ω_{ss} and day length (in hours) is
 $\omega_{ss} = 7.5(L_d - 12) + 90$.

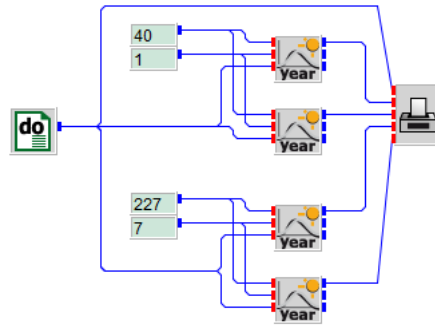
Standard solar day

The standard solar day has been introduced by the World Bank and is defined through the equation

$$G(t) = G_{\max} \sin\left(\frac{\pi t}{L_d}\right) \quad t = 0, 1, \dots, 11 \text{ h}$$

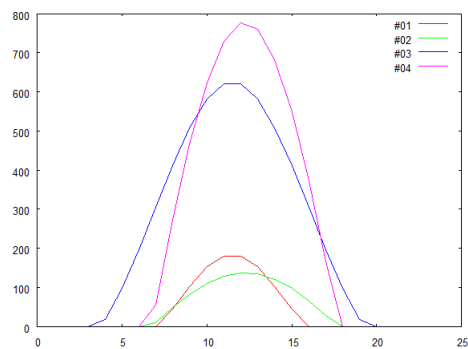
$G_{\max}$ denotes the daily maximum of the global radiation on a horizontal surface. L_d stands for the day length and is assumed constant with 11 hours. Both, hour angle and sunset hour angle are measured from true solar noon in this case.

gmean.vseit



A **DO** block counts the daily hours from zero to 23 in steps of one. Four **CONST** blocks provide the months January and July and their mean irradiances of 40 and 227 W/m², respectively. Four **GMEAN** blocks calculate the hourly mean irradiances from the Collarea-Pereira Rabl (upper **GMEAN** block) and Standard Solar Days (lower **GMEAN** block) correlations.

A **PLOT** block displays the four resulting curves on screen.



Remark Please observe, that the Standard Solar Day assumes a constant day length of eleven hours, which is automatically centered around true solar noon by the **GMEAN** block. The Collares-Pereira Rabl adds thirty minutes to the hour input as suggested by the Collares-Pereira Rabl approach.