Block ET

The ET block calculates the equation of time.



Name	ET
Function	em0003
Inputs	1
Outputs	1
Parameters	1
Strings	0
Group	S

Inputs

1 Day of the year d_n

Outputs

1 Equation of time e_t / min

Parameters

1 Approximation
- 0 Spencer
- 1 Wagner
- 2 Duffie Beckman
- 3 DIN 5034 Teil 2
- 4 Woolf 1968
- 5 Lamm 1981

Strings

None

Description

The equation of time e_t describes the difference between true solar time t_τ and mean solar time t_μ

$$e_t = t_\tau - t_\mu$$

A relatively simple formula for the equation of time is given by Duffie and Beckman

$$e_t = 9.87 \sin(2B) - 7.53 \cos(B) - 1.5 \sin(B)$$

where

$$B = \frac{360(d_n - 81)}{364}$$

According to Spencer the Fourier series

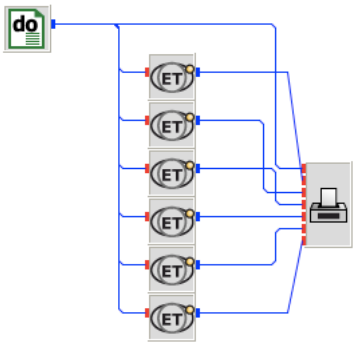
$$\begin{aligned} e_t \quad = \quad & (0.000075 + 0.001868 \cos(d) - 0.032077 \sin(d) \\ & -0.014615 \cos(2d) - 0.04089 \sin(2d))(180 \cdot 4/\pi) \end{aligned}$$

yields more precise results. d denotes the day angle defined by

$$d = \frac{2\pi(d_n - 1)}{365}$$

Both formulas are implemented in the ET block.

et.vseit



A DO block provides the days of a year starting from 1 to 365. Six ET blocks calculate the equation of time for the different approximations starting with Spencer's Fourier series (upper block) to Lamm's approximation (lower block).

The PLOT block shows that the differences are nearly negligible.

