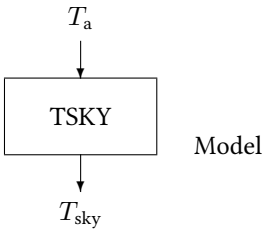
Block TSKY

The TSKY block calculates the sky temperature.





Name	TSKY
Function	em0021
Inputs	1
Outputs	1
Parameters	1
Strings	0
Group	S

Inputs

1 Ambient temperature T_a / °C

Outputs

1 Sky temperature T_{sky} / °C

Parameters

1 Model
- 0 Swinbank
- 1 Modified Swinbank

Strings

None

Description

The (effective) sky temperature T_{sky} depends on many factors such as ambient temperature T_{a}, humidity, amount and type of cloud cover, and elevation. In 1963, Swinbank proposed the equation

$$T_{\text{sky}} = 0.0552\, {T_{\text{a}}}^{1.5}$$

for clear sky conditions and averaged out other effects—both temperatures are in kelvin. However, this equation is not applicable during cloudy days, where we can expect that the sky temperature apporaches that of ambient.

In 1987, Fuentes suggests to use the average amount of cloudiness across the United States which causes approximately a 32 % decrease in the horizontal radiation and further assumes that the cloudiness and haziness causes the sky temperature to be 32 % closer to ambient on the average day than it would be during clear days. In conclusion Fuentes proposes the modified Swinbank equation

$$T_{\text{sky}} = 0.68(0.0552\, {T_{\text{a}}}^{1.5}) + 0.32 T_{\text{a}}$$

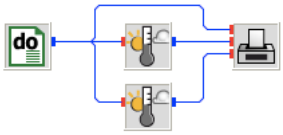
for the calculation of the sky temperature.

On the basis of extensive data from the United States Berndahl and Martin related the sky temperature to the dew point temperature T_{dp} and time

$$T_{\text{sky}} = T_{\text{a}}(0.711 + 0.0056 T_{\text{dp}} + 0.000073 T_{\text{dp}}^2 + 0.013\cos(15h))^{1/4}$$

Again, the temperatures are in kelvin, h denotes the hour of the day.

tsky.vseit



A DO block varies ambient temperature data from -40 to $+40$°C. Two TSKY blocks calculate the sky temperature according to the Swinbank equation and the modufied Swinbank equation. The PLOT block displays the graph on screen.

