

Appendix 10.1

Calculation of Day Length

The code for calculation of day length is found in “astronomy.C”.

The TimeYearFraction (Julian day/days in a year) is calculated and transformed to position on a circle as:

$$t = 2 \cdot \pi \cdot TimeYearFraction \quad (10.1.1)$$

The declination, *Dec*, is calculated as:

$$Dec = (0.3964 - 22.97 \cdot \cos(t) + 3.631 \cdot \sin(t) - 0.03885 \cdot \cos(2t) + 0.03838 \cdot \sin(2t) - 0.15870 \cdot \cos(3t) + 0.07659 \cdot \sin(3t) - 0.01021 \cdot \cos(4t)) \quad (10.1.1)$$

The declination is used to calculate tangent to the angle of the sun, *Mytan*, as:

$$Mytan = -\tan(\pi / 180.0 * Dec) * \tan(\pi / 180.0 * latitude) \quad (10.1.2)$$

$$Mytan^* = \begin{cases} -1.0 & \text{for } Mytan \leq -1.0 \\ Mytan & \text{for } -1 < Mytan < 1.0 \\ 1.0 & \text{for } Mytan \geq 1.0 \end{cases} \quad (10.1.3)$$

Daylength, *dl*, is now calculated as

$$dl = \begin{cases} T & \text{if } T \geq 0 \\ T + 24 & \text{if } T < 0 \end{cases} \quad (10.1.4)$$

where

$$T = \left(\frac{24}{\pi} \cdot \arccos(Mytan^*) \right) \quad (10.1.5)$$

Original text from	None (astronomy.C)	
Updated by	date	For Daisy version
Styczen, M	2024-11-06	6.47