Daily Reference Evapotranspiration

Daily Reference Evapotranspiration ET_{os}, ET_{rs} and HS ET_o Calculator using the ASCE-EWRI (2004) method
User's Guide for DYPM.EXE
ET006 Quick Answer

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INTRODUCTION

The DYPM.exe is an executable program that calculates reference evapotranspiration for a short (0.12 m) canopy (ET_{os}), for a tall (-0.5 m) canopy (ET_{rs}) and for the Hargreaves Samani equation (HS ET_o) for a grass reference using daily weather data. To obtain a copy of "DYPM.exe" and a sample data file "Lindday.csv", click on DYPM.zip. After downloading the zip file, you must extract the DYPM.exe and the Lindday.csv files to the same folder on your computer. Then click on DYPM.exe to run the program. To run the program with other data sets, you must create a ".csv" file with the same format as the Lindday.csv sample file. The format is explained below. Inputs include the daily mean (1) solar radiation (MJ m^{-2} d^{-1}), air temperature (^oC), wind speed (m s^{-1}), and humidity [e.g., dew point temperature (^oC) or relative humidity (%)]. The program calculates ET_{os} and ET_{rs} using the Penman-Monteith

equation (ASCE-EWRI, 2004) and HS ET_o using the Hargreaves-Samani equation (1982,1985). Documentation of the equations used in the DYPM.exe application is available by clicking on PMdayDoc.pdf.

DATA ENTRY

Data are read from a comma delimited file with the extension ".csv". A sample data set is included in the zip file DYPM.zip. The data filename is Lindday.csv. A sample of the first few rows of Lindday.csv is shown below. Any csv file with the same format can be analyzed.

lindday,36.49,119.01,146.3,120,,
CalDate,DOY, Rs, Tx, Tn, U2, Td
26-Apr-01,116, 25, 31, 13.3, 1.2, 14.8
27-Apr-01,117, 27.8, 29.3, 12.6, 1.1, 12.9
28-Apr-01,118, 17.5, 20.8, 11.5, 1.2, 10.9
29-Apr-01,119, 27.7, 24.3, 8.9, 1.2, 10.5
30-Apr-01,120, 28, 28.8, 11,1. 1, 12.7
1-May-01,121, 27.7, 29, 12.8, 1.3, 12.8
2-May-01,122, 28.5, 23.1, 12.8, 1.4, 5.6
3-May-01,123, 28.3, 26.2, 10.7, 1.2, 6.3

It is not important to have the correct spacing between variables, but it is important to have commas between the variable names. The first row contains the site information (Name, latitude, longitude, and elevation). The second row contains the column headings. Data with each row includeds solar radiation (R_s in MJ $m^{-2}d^{-1}$), max temperature (T_x in ^oC), min temperature (T_n in ^oC), mean daily wind speed (U_2 in m s^{-1}), and mean daily dew point temperature (T_d in ^oC).

OUTPUT

Reference evapotranspiration is calculated and the data are output to a file with the same name, but with the extension ".day" in the following format.

Lindday, 36.49, 119.01, 146.3, 120
CalDate, DOY, Rs, Tx, Tn, U2, Td, ETo, HS
26-Apr-01, 116, 25.0, 31.0, 13.3, 1.2, 14.8, 5.0, 5.9
27-Apr-01, 117, 27.8, 29.3, 12.6, 1.1, 12.9, 5.2, 5.6
28-Apr-01, 118, 17.5, 20.8, 11.5, 1.2, 10.9, 3.1, 3.7
29-Apr-01, 119, 27.7, 24.3, 8.9, 1.2, 10.5, 4.6, 4.8
30-Apr-01, 120, 28.0, 28.8, 11.0, 1.1, 12.7, 5.1, 5.7
1-May-01, 121, 27.7, 29.0, 12.8, 1.3, 12.8, 5.3, 5.6
2-May-01, 122, 28.5, 23.1, 12.8, 1.4, 5.6, 5.0, 4.1

3-May-01, 123, 28.3, 26.2, 10.7, 1.2, 6.3, 5.1, 5.2
4-May-01, 124, 28.8, 28.7, 9.3, 1.1, 6.5, 5.3, 5.9

The first row again contains site information and the second row contains the column headings. In addition to the input variables, the variable Penman Monteith ETo in mm/d is saved.

CONVERSIONS

From W m^{-2} to MJ m^{-2} d^{-1} multiply by 0.0864

From Cal cm^{-2} d^{-1}(ly d^{-1}) to MJ m^{-2} d^{-1} multiply by 0.04187

From Miles per hour (mph) to m s^{-1} multiply by 0.447

From Miles per day (mpd) to m s^{-1} multiply by 0.018625

From degrees Fahrenheit to degrees Celsius

$$°C = \frac{5(°F - 32)}{9}$$

REFERENCES

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