General Description

UV CALC is a computer program designed to aid in the analysis and interpretation of the YES Model UVB-1 Pyranometer data. The program can be used to calculate the effective erythemal irradiance, and the corresponding Pyranometer output signal, for any date and any geographical location. The calculation is performed using a mathematical model of the solar UV-B irradiance, erythemal action spectrum and the measured UVB-1 Pyranometer spectral response.

UV-B Irradiance Model

The UV-B spectral irradiance model used is a sophisticated UV atmospheric transmission and scattering model developed as part of the Climactic Impact Assessment Program (Green 1975). The total UV-B spectral irradiance is expressed as the sum of transmitted and scattered components of the solar UV light reaching the top of the atmosphere. In the model, both components depend critically on the solar zenith angle, measurement altitude, amount and altitude of atmospheric ozone and distribution of particulate matter in the atmosphere. UV CALC also uses highly accurate astronomical routines to calculate the sun's zenith angle. The remaining parameters can be set freely by the user, although suggested default values for various conditions are provided.

User Input

The required user input includes geographical location, altitude and date. Parameters of the UV-B spectral irradiance model can be changed from their default values. User specified action spectrum may be substituted for the default UV CALC erythemal action spectrum (Parrish 1982).

Calculations

Using the location and date information, the UV CALC astronomical routines calculate the solar zenith angles, in 15-minute intervals, from sunrise to sunset for the date chosen. For each angle, the UV-B spectral irradiance is calculated using the model of Green et al. The irradiance is then multiplied by the erythemal action spectrum, to obtain the effective erythemal spectrum, and by the UVB-1 spectral response function, to obtain the effective UVB-1 Pyranometer irradiation spectrum. The two resulting spectra are then numerically integrated to yield the effective erythemal dose rate (effective W/m^2) and the associated UVB-1 Pyranometer output signal.

Program Output

UV CALC generates an ASCII output file with a tabulation of the erythemal dose rate and UVB-1 output signal in 15-minute intervals for the date chosen. The total erythemal dose for the day is also calculated, and data from the output file are displayed graphically and an example is shown at the end of this document.
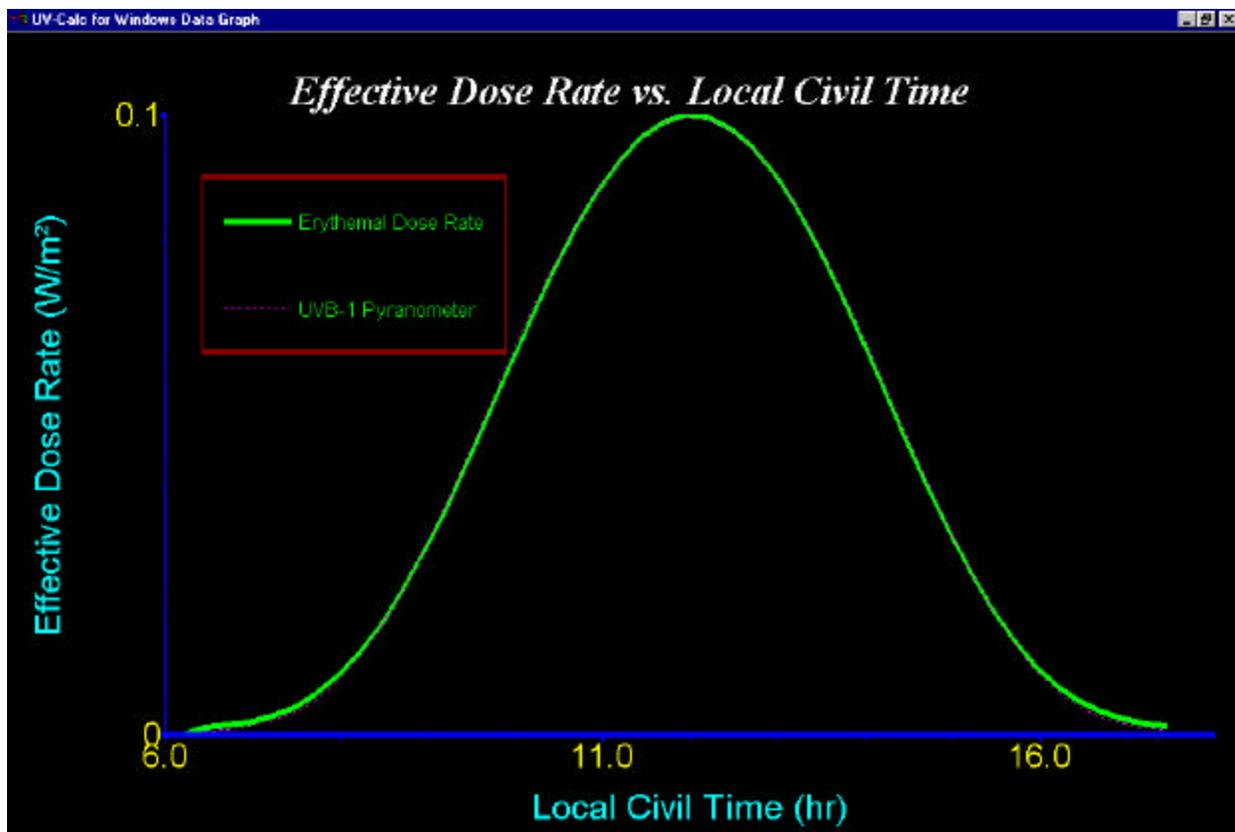
System Requirements

PC or 100% compatible running DOS or Windows 9.X/NT required. An EGA/VGA or better graphics display is required for DOS.

References

Green, Mo and Miller, Photochem. Photobiol. 20, 473 (1974).

Parrish, Jaenicke and Anderson, Photochem. Photobiol. 36, 187 (1982).

YES
YANKEE ENVIRONMENTAL SYSTEMS, INC.

Screen shot of UV Calc for Windows output.