

cesora

Calculation of Effective Solar Radiation



CESORA is a versatile calculation tool. This innovative software offers extensive and versatile calculations of the effective terrestrial solar radiation. It is designed to provide important information to users in numerous fields of application, in which knowledge of the spectral distribution of radiation is essential. The possible applications of CESORA concern virtually all technologies where solar radiation and its spectral distribution can cause measurable effects. For example, Automotive & Transportation – Plastics – Coatings & Paints – Solar Energy – Cosmetics – Agriculture – Photochemistry – Building & Construction.

For all these possible fields of applications instantaneous ('single case'), as well as time-integrated ('diurnal variations', 'time series') spectral or broadband irradiance on surfaces of specifiable geometry exposed to solar radiation at selectable times and locations under precise meteorological conditions, may be computed by CESORA. Predictions of irradiance can be obtained for the direct, diffuse and reflected components of solar radiation, and displayed in freely specifiable wavelength ranges.

The included 'Filter Function' tool can also be used to evaluate the spectral irradiance transmitted by any type of filter (e.g., window glass, automotive glazing) of known spectral transmission.

Within the 'Calculation Mode' the selection of a default 'action function' or 'action spectrum' (which can also be modified or defined by the user) enables calculation of the corresponding effective irradiance (e.g., erythemal irradiance).

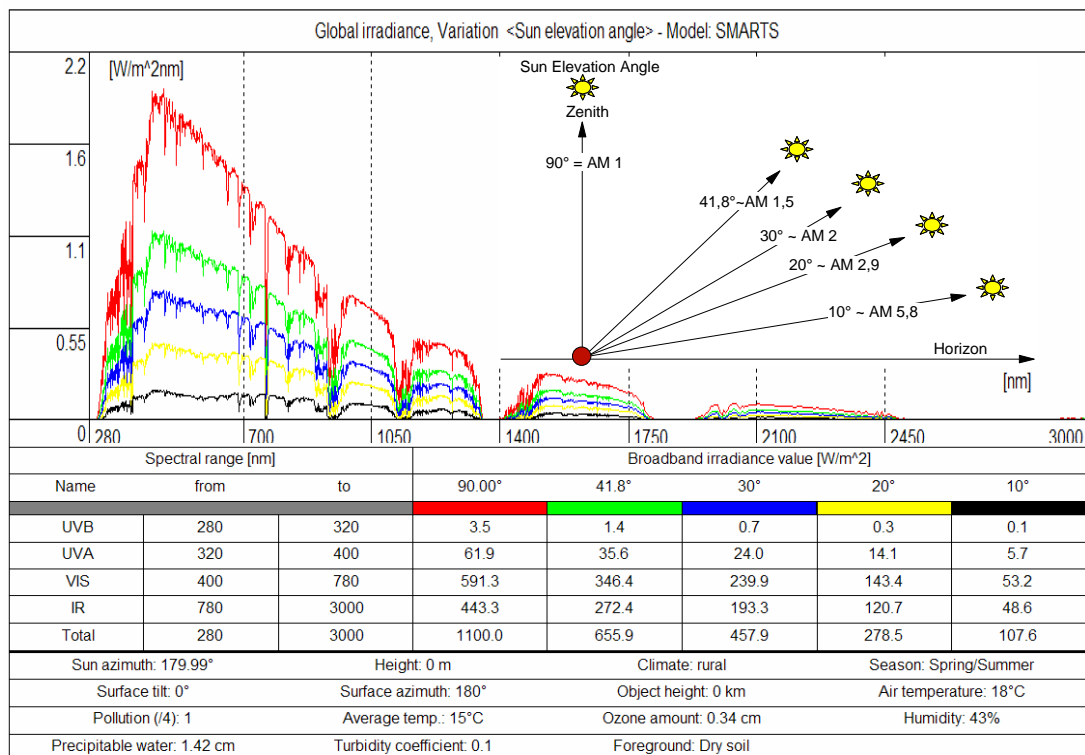


Fig.1 Example of output: Spectral Irradiance variation as a function of sun elevation angle

Specifications

Environmental Parameters (Inputs)

The following parameters may be entered:

- Geographical and time parameters
 - Geographical location (Longitude, Latitude, Time Zone, Climate and altitude above sea level), either user defined or from a data base
 - Time, Date, True Local Time or Local Standard Time with bias (e.g., daylight saving time)
 - Sun Coordinates can be used in lieu of geographical location.
- Object settings
 - Azimuth and tilt of surface
 - Height of object above ground (e.g., flying objects) up to 100km
 - Spectral reflectance of foreground (albedo), from a database
- Meteorological data
 - Air temperature and humidity – Ozone amount – Pollution – Cloud cover – Turbidity coefficient or visibility

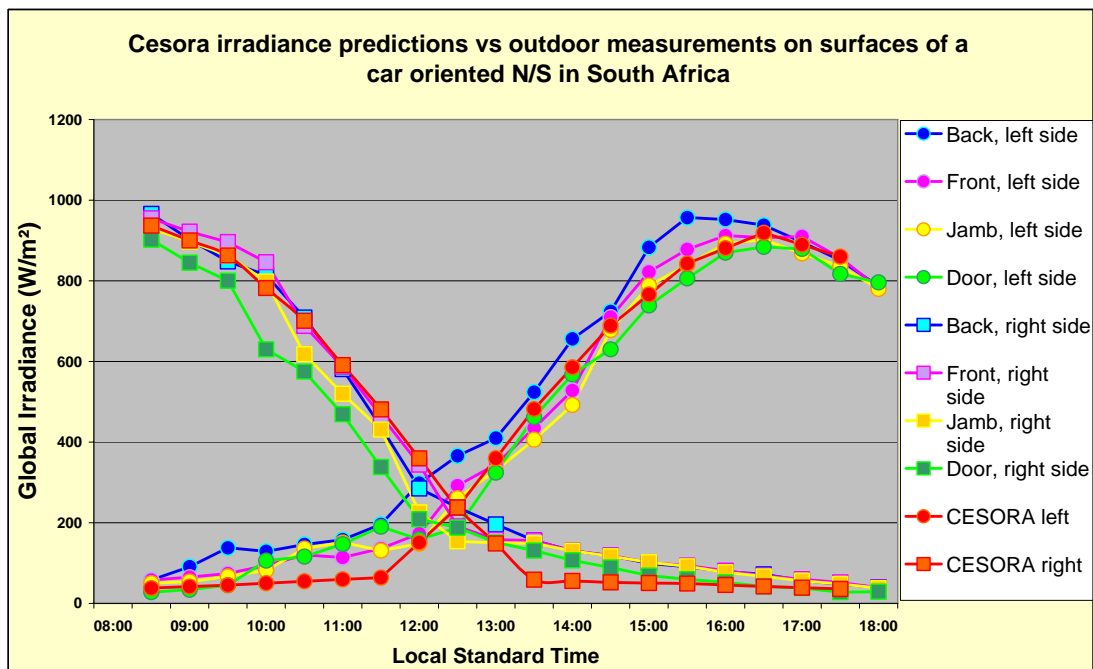
Calculated Quantities (Outputs)

Cesora is capable of predicting various quantities for instantaneous, as well as time-integrated events. The options include:

- Calculation of spectral irradiance and broadband irradiance for direct, diffused, reflected and global terrestrial solar radiation
- Calculation of the actual extraterrestrial solar radiation
- Display of selected references (e.g., CIE 85, T4, ASTM-G173-03)
- Integrated irradiance for freely specifiable wavelength ranges between 280 and 4000 nm
- Spectral irradiance and irradiance of filtered solar radiation (e.g., window glass)
- Effective irradiance for a default, modified or user-defined 'action function' or 'action spectrum' (e.g., erythema)
- Display of intermediate results like sun azimuth, sun elevation angle, or angle of incidence
- Parametric runs, i.e., variation of any single parameter (e.g., sun elevation angle, Fig. 1)
- Export of all data and graphs for further processing (spreadsheet compatible).

Calculation Models

- SMARTS, the internationally acknowledged model developed by Dr. C. Gueymard. This model has also recently been used for the development of two reference spectra (G173-03, G177-03) by ASTM
- SPEKTRA, a model based on the VDI guideline 3789, parts 2 and 3, and developed by Prof. Dr. G. Manier.



Installation requirements

- IBM compatible PC with Pentium processor
- 200 MB (RAM) hard drive, CD-ROM drive
- Operating system: Windows 2000/XP, Windows 98/NT/ME



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