

METEONORM

Global Meteorological Database
for Engineers, Planners and Education
Version 5.0 – Edition 2003
Software and Data on CD-ROM

*A tool for Solar Energy Applications,
Building Design, Heating & Cooling
Renewable Energy System Design,
Agriculture and Forestry, Environmental Research,
Meteorological Reference*



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The Swiss Federal Office of Energy supports the development of
METEONORM.

METEONORM – What is it?

METEONORM 5.0 (Edition 2003) is based on over 18 years of experience in the development of meteorological databases for energy applications. It is a comprehensive meteorological reference, incorporating a catalogue of meteorological data and calculation procedures for solar applications and system design at any desired location in the world. METEONORM addresses engineers, architects, teachers, planners and anyone interested in solar energy and climatology.

Features

- > Climatological data of 7'400 weather stations. 4'500 new stations added. **Updated**
- > Measured parameters: radiation, temperature, humidity, precipitation, days with precipitation, wind speed and direction, sunshine duration.
- > New derived parameters: driving rain, spectral UVA/B and erythemal radiation. **New**
- > Use of satellite data for areas with low density of weather stations. **New**
- > Complete coverage of the globe, including polar regions. **New**
- > Interpolation model for solar radiation and additional parameters for any site in the world. **Updated**
- > Inclusion of current monthly radiation and temperature data by internet. **New**
- > Import of user data.
- > Calculation of radiation for inclined surfaces.
- > Effects of high horizon considered in radiation calculations. High horizon calculated automatically for Switzerland, based on digital terrain model. **Updated**
- > Adaptation of algorithms to latest results of European Union Research Program FP5. **Updated**
- > Enhanced temperature generation based on measured distributions. **Updated**
- > Calculation of daily sunrise and sunset.
- > Graphical interface: Site selection on map.
- > Data output displayed graphically.
- > 18 different predefined output formats as well user-definable output format. **Updated**
- > 5 languages supported in user interface GUI: English, French, German, Italian, Spanish.
- > Manual, help in English and German, maps and illustrations included on CD-ROM. **Updated**
- > Low price: data and models on one CD-ROM for the price of a few hours of work.

7'400 meteorological stations worldwide

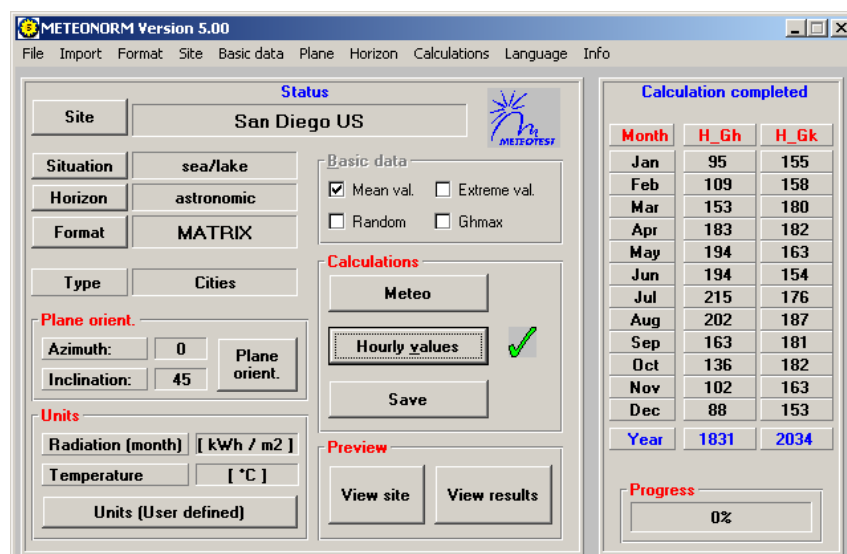
Several databases from different parts of the world have been combined and checked for their reliability. In the present version, most of the data is taken from the GEBA (Global Energy Balance Archive), from the World Meteorological Organization (WMO/OMM) Climatological Normals 1961–1990 and from the Swiss database compiled by MeteoSwiss.

Monthly climatological (long term) means are available for the following parameters:

- > global radiation
- > ambient air temperature
- > humidity
- > precipitation, days with precipitation
- > wind speed and direction
- > sunshine duration

Available parameters	global radiation and temperature	temperature, additional parameters	only temperature or radiation	total
Europe	335	1'169	60	1'564
North America	277	1'793	237	2'307
South/Central America	76	563	42	681
Asia (with Russia)	150	1'441	25	1'616
Australia / Pacific	39	473	155	667
Africa	123	413	34	570
World	1'000	5'852	553	7'405

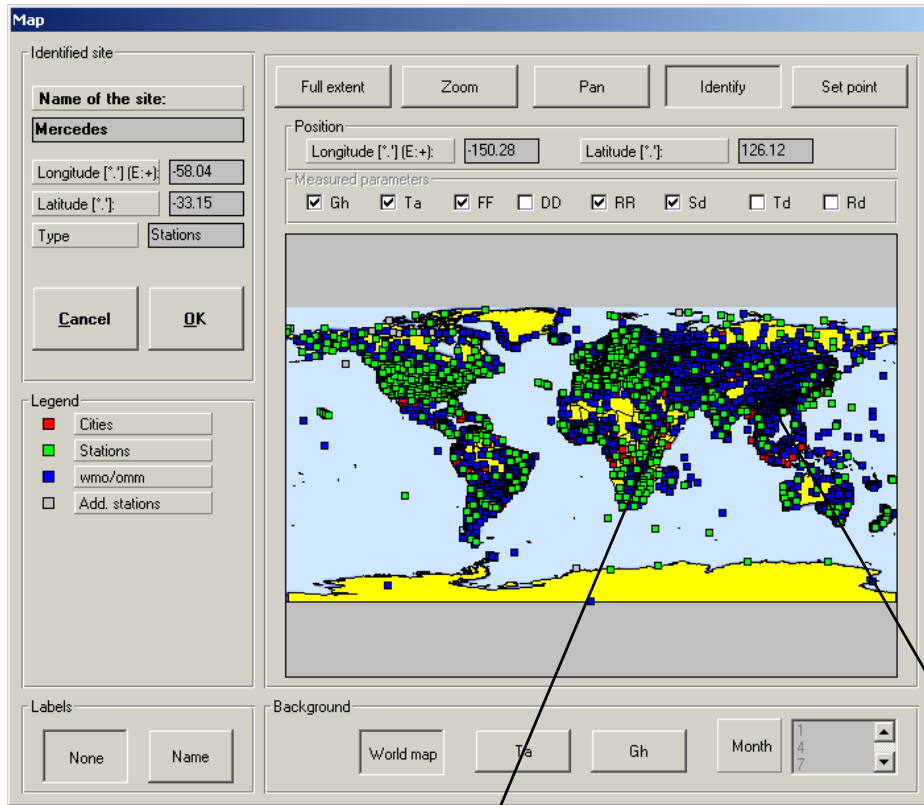
Distribution and number of available stations.



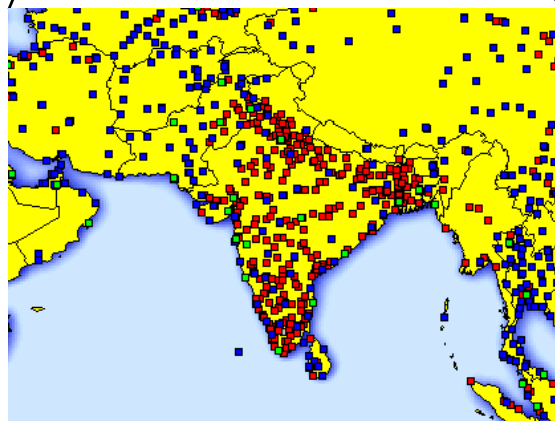
All operations are initiated from this screen. A number of important results are also displayed.

Graphical interface: selection of sites on map

Sites may be selected using a graphical interface. The maps can be panned and zoomed.



Graphical site selection interface; zoom on the Indian sub-continent.



Interpolation – data for any site worldwide

For many regions of the world, measured data may only be applied within a radius of 50 km from weather stations. This makes it necessary to interpolate parameters between stations. Interpolation models for solar radiation, temperature and additional parameters, allowing application at any site in the world, are included in the software.

The screenshot shows the 'Edit site' dialog box. The 'Name of the site' field contains 'Taj Mahal'. The 'Altitude [m]' field is 212. The 'Coord. X [km]' field is 0. The 'Coord. Y [km]' field is 0. The 'Longitude [°] [E: +]' field is 78. The 'Latitude [°]' field is 27.4. The 'Time zone' field is -5.5. The 'Situation' dropdown is set to 'open'. The 'Type of site' dropdown is set to 'Userdefined site'. The 'Code' field is 'Taj'. The 'IZRM' field is -30. The 'Continent' field is 'Asia'. The 'Climatic zone' field is 503. The 'Time system' section has 'legal' selected. On the right, a list of sites is shown, with 'Taj Mahal' selected. Buttons for 'New site', 'Save', 'Clear', 'Cancel', and 'OK' are visible.

Example: Editing the user-defined site "Taj Mahal" in the respective menu. The parameters can all be entered by hand or by choosing a nearby site and changing them. The software then interpolates all meteorological values for the new site Taj Mahal.

Data import

METEONORM offers a dynamic internet link to current monthly temperature and radiation data. With one mouse-click, current data is imported from the internet and displayed. It can be included in solar energy calculations and used for performance checks of energy systems.

Users may import their own (monthly or hourly) radiation and temperature data with the import utility. Subsequently, they can use the METEONORM models and procedures to generate random time series (from monthly data) and to calculate radiation on inclined surfaces and horizon effects. The imported data can be taken into account for the spatial interpolation of temperature and radiation.

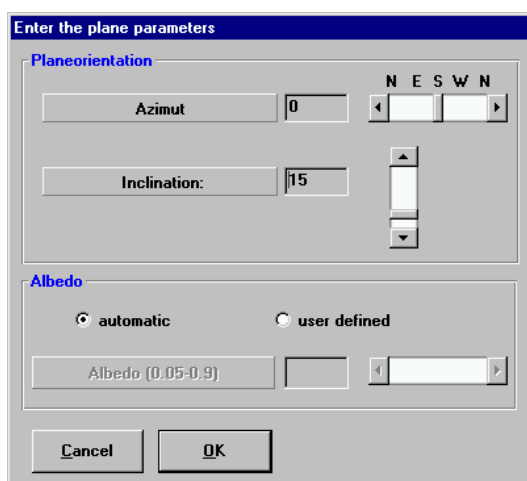
Calculation of hourly values

From the monthly values (station data, interpolated data or imported data), METEONORM calculates hourly values of all parameters using a stochastic model. The resulting time series correspond to "typical years" used for system design. Additionally, the following parameters are derived:

- > height of sun
- > diffuse radiation
- > beam radiation
- > longwave radiation
- > global radiation
- > direct radiation
- > solar azimuth and elevation
- > luminance
- > spectral UVA/UVB
- > erythemal radiation
- > driving rain

Calculation of radiation for inclined surfaces

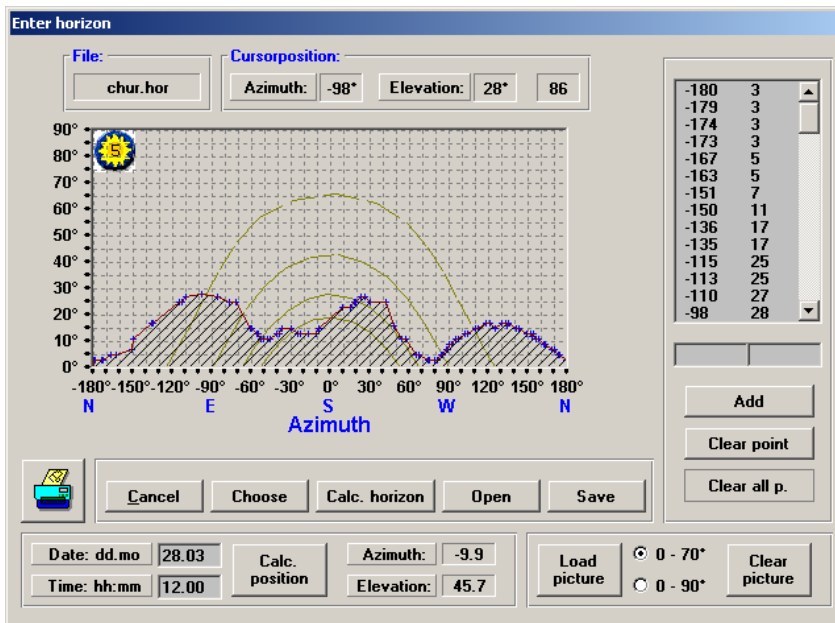
METEONORM calculates direct (beam) and diffuse radiation. Additionally, radiation can be calculated for any surface orientation. METEONORM uses up-to-date algorithms for these procedures.



Window for entering surface orientation and inclination.

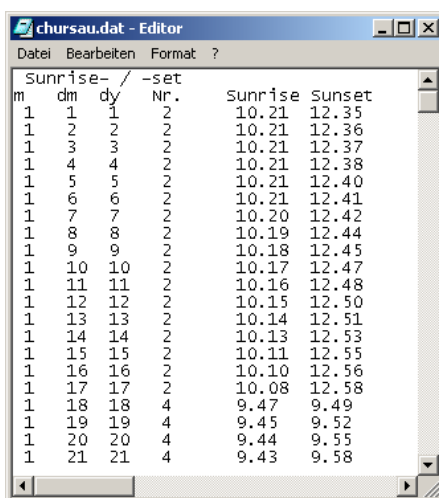
Effects of high horizon considered

METEONORM calculates reduced global radiation caused by a high horizon. The skyline profile can easily be entered either graphically (drag line) or numerically. A rectified picture of the horizon can be imported and used as a background for digitizing the horizon. For Switzerland, the horizon is calculated automatically, based on a digital terrain model.



Window for editing the horizon. Here the horizon was generated automatically from the digital elevation model.

After entering the horizon, the time of sunrise and sunset is calculated for each day and stored in an ASCII file. Multiple sunrises and sunsets, caused by a complicated horizon (e.g. trees, towers) can be calculated.

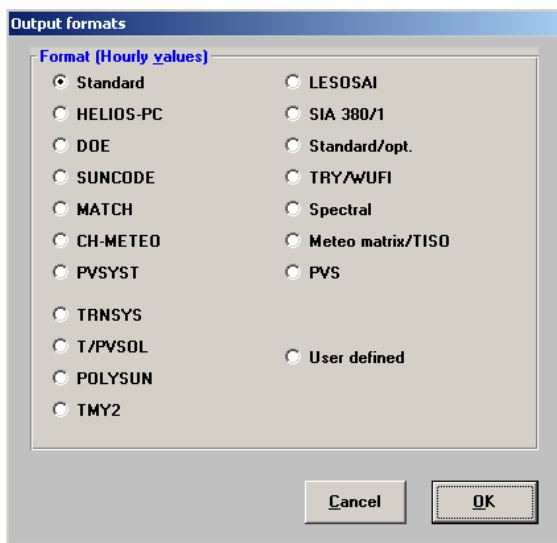


Sunrise and sunset ASCII-file.

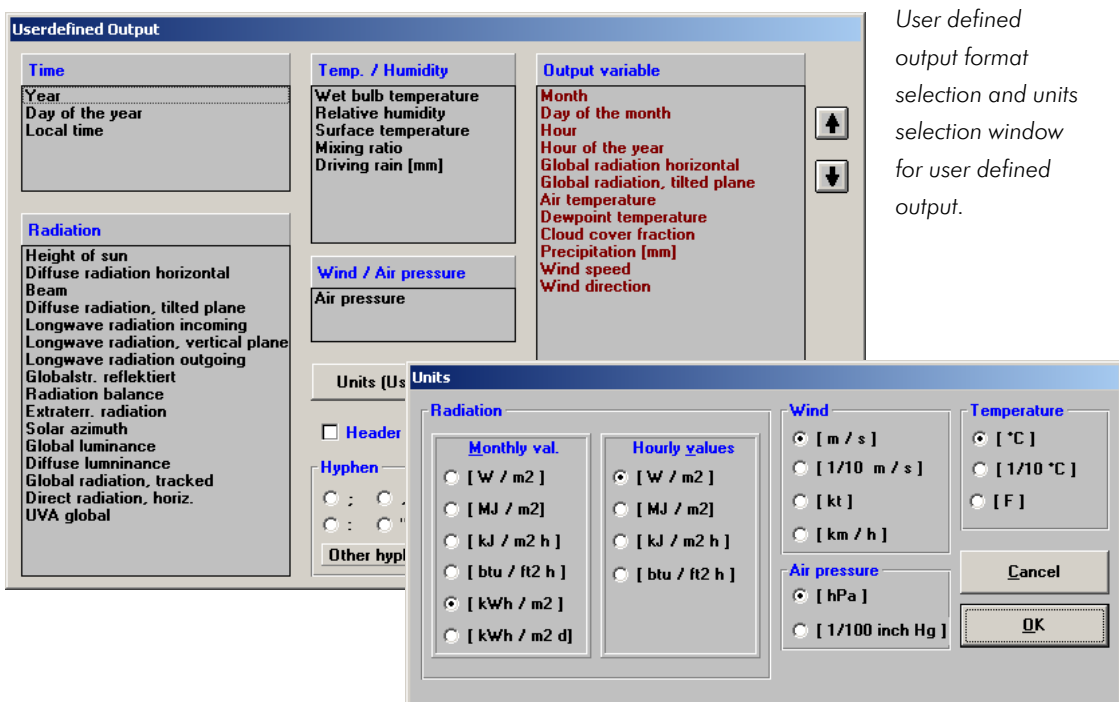
Data export

18 different predefined output formats are available. They cover most of the well-known simulation software in solar energy applications and building design, including TMY2, DOE, TRNSYS as well as output formats for TRY/WUFI (German test reference years, WUFI import format), Meteo Matrix (TISO) and PVS. They are available for the calculation of hourly as well as monthly values. Data is written to ASCII-files.

In user-defined format, the parameters which are to appear in the output file and the desired units can be chosen.



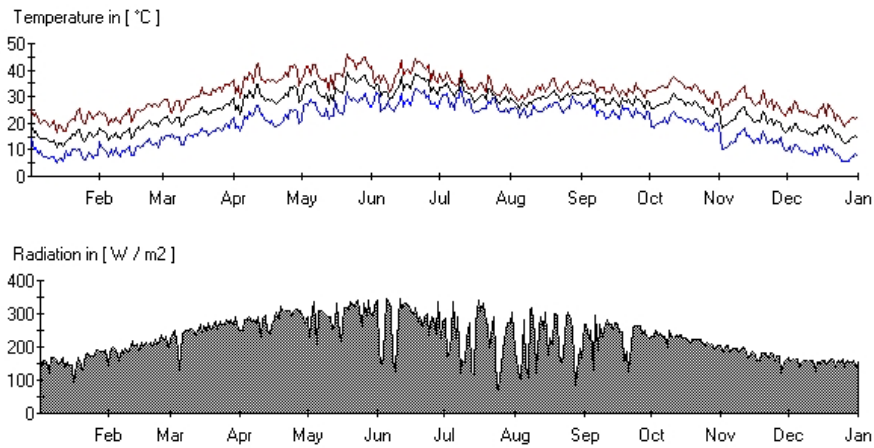
Choice of predefined output formats.



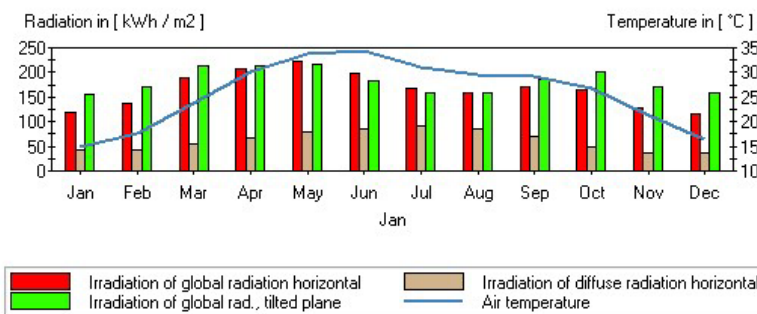
User defined output format selection and units selection window for user defined output.

Graphical data output

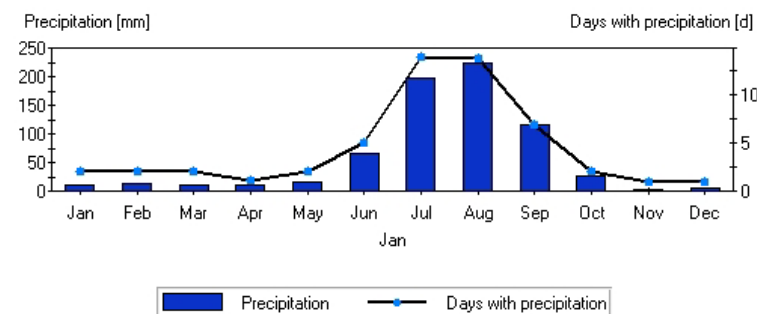
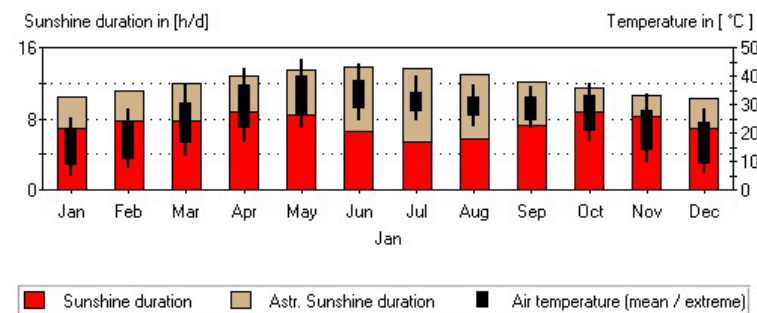
METEONORM features a summary output showing the calculated data either in tables or graphs. These results can be printed.



Summary output in graphs for the Taj Mahal site (hourly values).



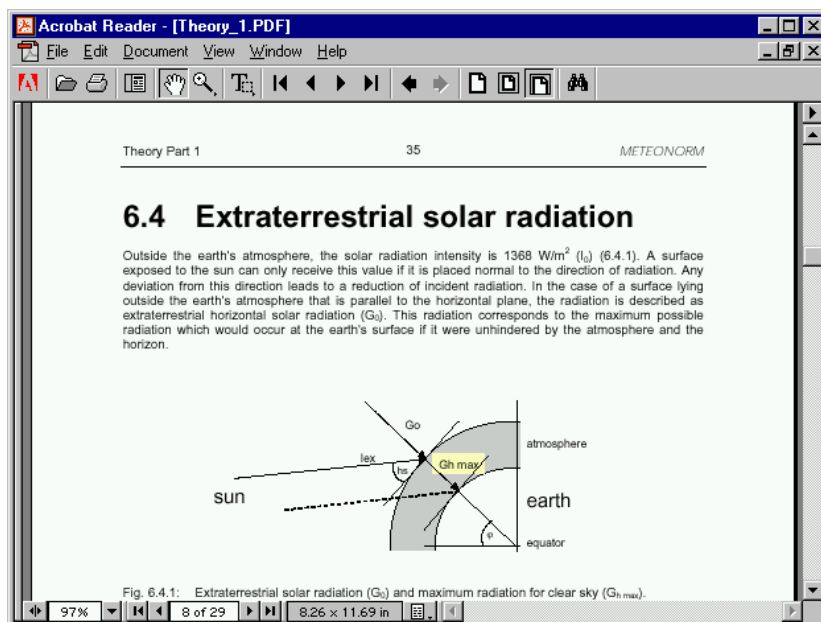
Summary output in graphs for the Taj Mahal site (monthly values).



Help, manual, maps and illustrations included on CD-ROM

METEONORM is delivered on a CD-ROM which contains:

- > setup and software, including data.
- > advanced help file in English and German.
- > user manual (80 pages, pdf files).
- > seasonal maps of the world, Europe and the Alps for monthly and annual means of global radiation and temperature in high quality pdf-format for printout



User manual
in Acrobat
Reader
format.

System requirements

Operating system: Windows 95/98/NT/2000/XP

Minimum requirements: Pentium I chip. 60 MB of storage space on the hard disk.

For more information ask your
authorized **METEONORM** dealer or
visit www.meteonorm.com

