

METEONORM

Version 6.1

*Global Meteorological Database
for Engineers, Planners and Education*
Version 6.1 – Edition 2009
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 6.1 (Edition 2009) 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. It is based on over 24 years of experience in the development of meteorological databases for energy applications. METEONORM addresses engineers, architects, teachers, planners and anyone interested in solar energy and climatology.

Features

- > Database:
 - > Climatological data of 8'055 weather stations. **Updated**
 - > Measured parameters: monthly means of global radiation, temperature, humidity, precipitation, days with precipitation, wind speed and direction, sunshine duration.
 - > Time periods 1961-90 and 1996-2005 for temperature, humidity, precipitation and wind speed selectable. **Updated**
 - > Updated global radiation database for period 1981-2000. **Updated**
 - > Use of satellite data for areas with low density of weather stations. **Updated**
 - > Inclusion of climate change forecast (Hadley CM3 model). **New**
 - > New Swiss DRY (via "Merkblatt 2028") included) **New**
- > Models:
 - > Interpolation models to calculate mean values for any site in the world. **Updated**
 - > Minute time resolution for radiation parameters. **New**
 - > Calculation of radiation for inclined surfaces with updated models. **Updated**
 - > Enhanced temperature and humidity generation for building simulation. **Updated**
- > Software:
 - > Total redesign of software. **Updated**
 - > Import of user data (including current data by internet).
 - > Effects of high horizon considered in radiation calculations. High horizon calculated automatically for all mountain regions. **Updated**
 - > 28 different output formats as well as user-definable output format. **Updated**
 - > 5 languages supported: English, French, German, Italian and Spanish.
 - > Manual in English, 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.

8'055 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.

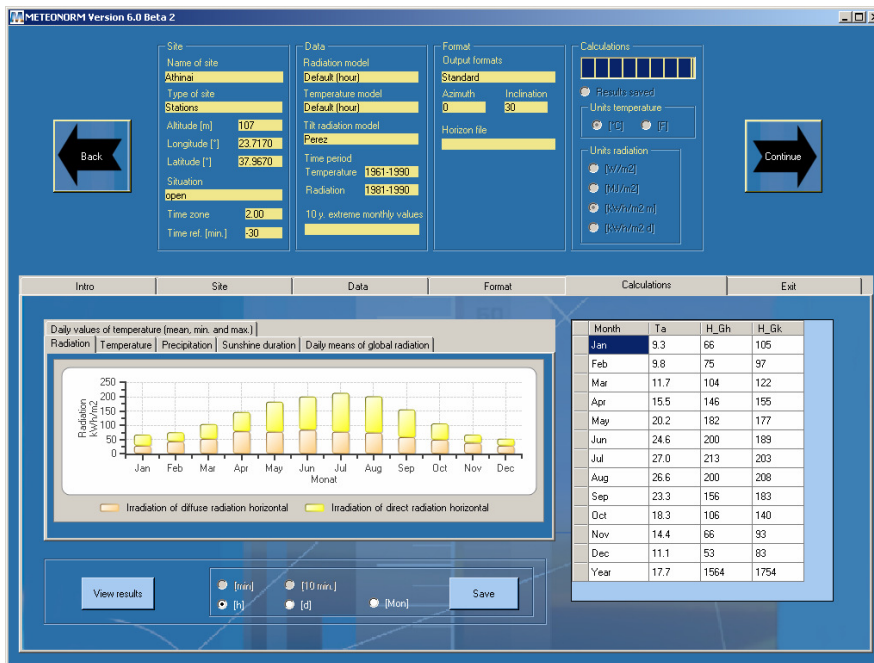
As a new feature in version 6.1 two different time periods can be chosen: for temperature, humidity, wind speed and precipitation the periods 1961-1990 and 1996-2005 and for radiation 1961-90 and 1981-2000 are available.

Monthly climatological (long term) means are available for the following 8 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	361	1'154	36	1'551
North America	287	2'178	19	2'484
South/Central America	102	685	62	849
Asia (with Russia)	288	1'491	36	1'815
Australia / Pacific	61	675	30	766
Africa	130	449	11	590
World	1'229	6'632	194	8'055

Distribution and number of available stations.

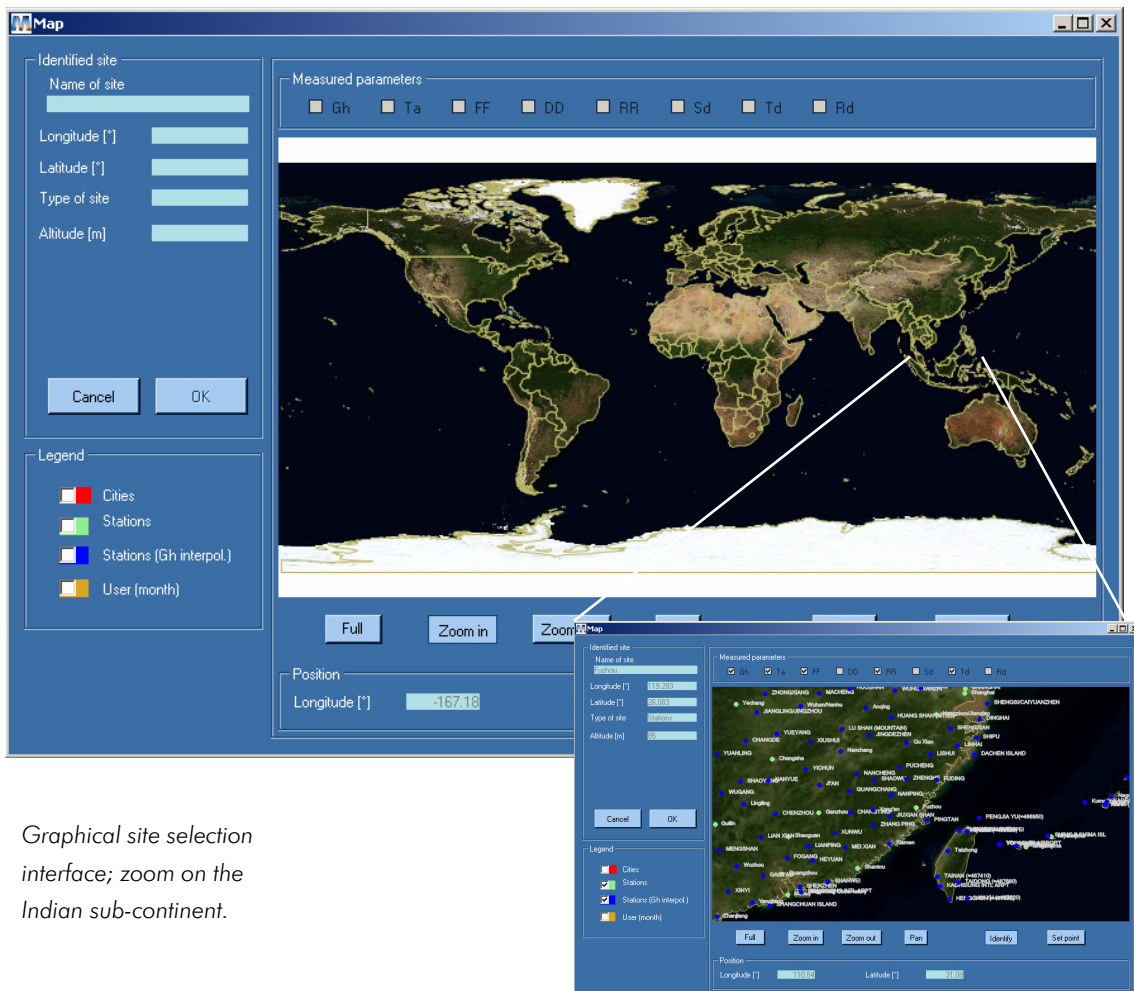


Result screen.

4 steps are needed to obtain the results. The new GUI will guide you secure and fast.

Graphical interface: selection of sites on map

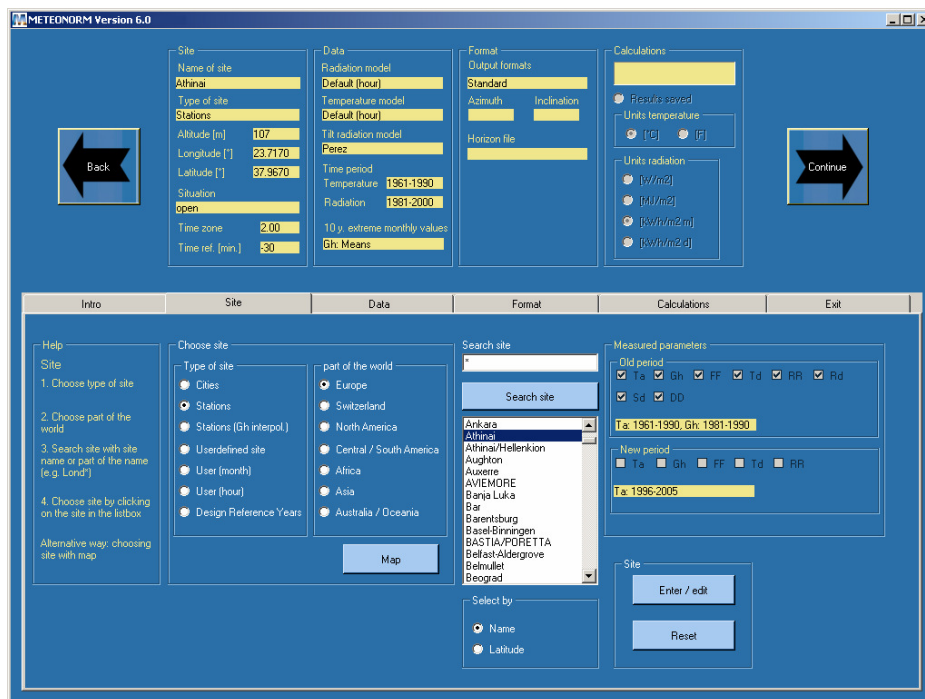
Sites may be selected using a graphical interface. The maps can be panned and zoomed.



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.



Example: Choosing Athens (Greece) in the respective menu.

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.

Calculation of hourly and minute 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:

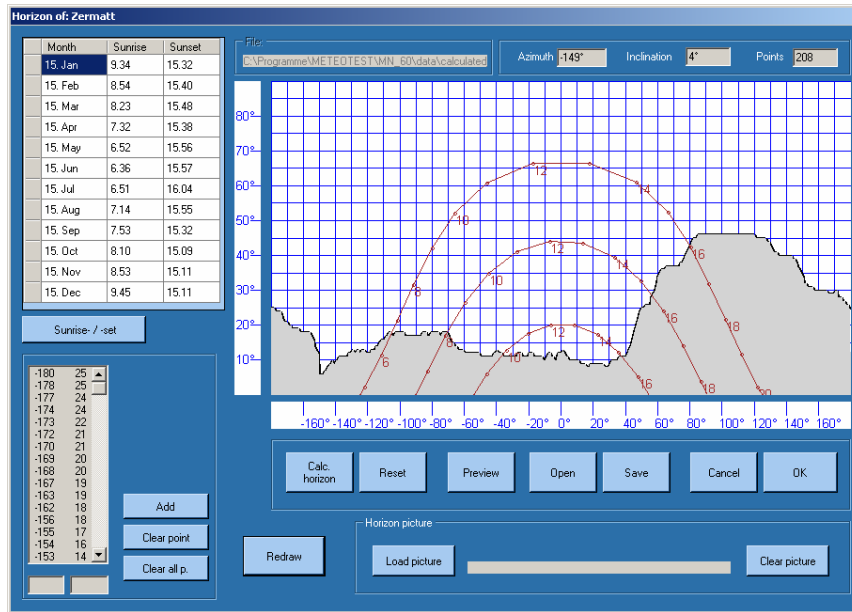
- > solar azimuth and elevation
- > global, diffuse and beam radiation (horizontal and on inclined planes)
- > longwave radiation
- > luminance
- > spectral UVA/UVB, erythemal radiation
- > precipitation, driving rain
- > humidity parameters (dewpoint, relative humidity, mixing ratio, psychrometric temperature)

The humidity generation was enhanced to fit better for building and climate system simulation (including extreme hourly values).

As a new feature in version 6.1 a minute time resolution stochastic generation model for radiation parameters is available.

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 the most important mountainous regions of the world, the horizon is calculated automatically, based on a digital terrain mode (accessed over internet).



Window for editing the horizon. Here the horizon was generated automatically from the digital elevation mode (Zermatt, Switzerland).

After entering the horizon, the time of sunrise and sunset is calculated for each day. Multiple sunrises and sunsets, caused by a complicated horizon (e.g. trees, towers) can be calculated. Horizon pictures made e.g. with HoriCatcher can be imported directly.

Data export

31 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 (German test reference years), POLYSUN and TSOL/PVSOL. 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.

The following output formats have been added in version 6.1:

- > Humidity (including an mx diagram)
- > Science (including most important parameters like temperature, dew point temp., global, beam and diffuse radiation, wind speed and direction, long wave radiation, precipitation, sunshine duration, cloud cover, Linke turbidity, clear sky radiation and extraterrestrial radiation).
- > Standard optimisation including automated search of best inclination and azimuth
- > Climate change (with simulated periods of 2016-45 and 2071-2100).
- > Energy Plus, Dynbil,). PHPP, PVScout, Pleiades/Comfie and sia 2028

Manual, maps and illustrations included on CD-ROM

METEONORM is delivered on a CD-ROM which contains:

- > setup and software, including data.
- > user manual (100 pages, pdf files).

System requirements

Operating system: Windows 2000/XP

Minimum requirements: Pentium II chip. 700 MB of storage space on the hard disk.
512 MB RAM

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

