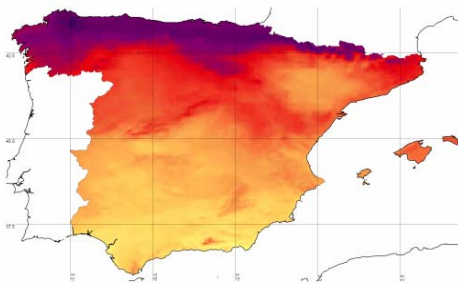


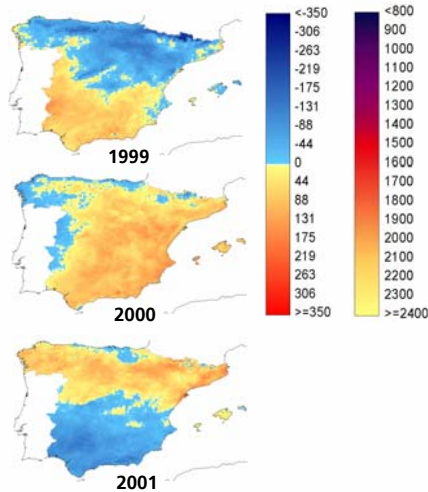
SOLEMI Solar energy Mining



SOLEMI - Solar Energy Mining - is a new service set up by DLR providing radiation data of high quality for the solar energy industry. The products are mainly based on Meteosat-data with a nominal spatial resolution of 2.5 km and half-hourly temporal resolution. Using data from both Meteosat positions at 0° and 63°East solar radiation maps and hourly time-series can be generated for almost half of the Earth's surface.

Why use satellite data for solar resource assessment?

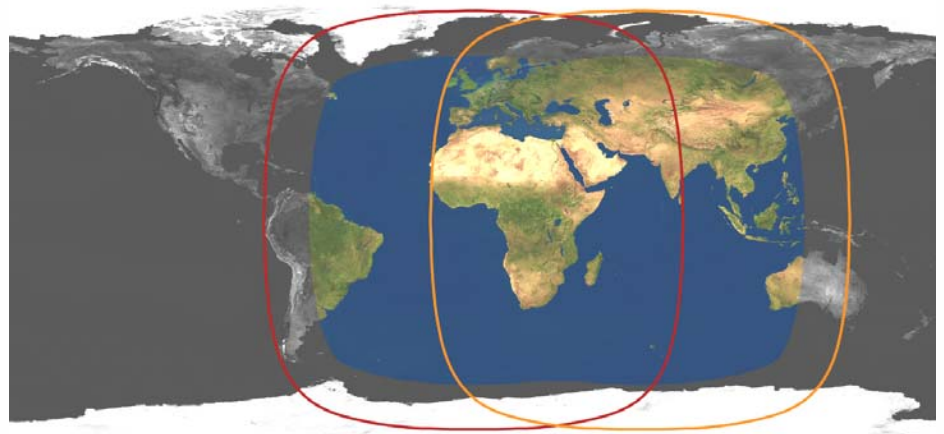
- Site-selection and planning of solar energy projects needs reliable data on the available solar resource.
- Solar radiation measurements are scarce. For most locations no measurement stations are available nearby. This is often the case for regions which offer best conditions for solar energy.
- The satellite based resource assessment SOLEMI has extensive coverage. The coloured area displayed in the figure below can be analysed in high quality. SOLEMI provides products for Europe, Africa, most of Asia and also for Eastern Brazil and Western Australia.
- Satellite data are available continuously for more than 20 years (Meteosat Prime position, 8 years for Meteosat East) and get permanently updated.



SOLEMI offers high quality irradiance maps integrated over the period of your choice: monthly, yearly or multi-annual averages.

For each location hourly time-series of global hemispherical and direct normal irradiance can be delivered. Direct normal irradiance – the beam component of solar radiation – is essential for planning concentrating solar applications or tracking PV systems, but hardly available from other sources.

Spatial variability of solar resources:
The large map shows the annual sum of beam irradiance in kWh/m² from 5 years for Spain (1998 to 2003). The maps below indicate how strong single years differ from the long-term average.



Meteosat Prime Meteosat East

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Benefits using SOLEMI

SOLEMI

- **saves costs:**

No expensive instruments have to be bought and no staff for the maintenance of stations has to be hired in the phase of site selection. If measurements are still required, they can be placed directly at the most promising sites.

- **data are available in retrospect:**

Large areas and long time periods can be evaluated at once. No waiting for measurement results is needed, preliminary planning and safeguarding of project prerequisites (e.g. land options) can start immediately.

- **has a unique long-term data base:**

Interannual variability of solar resources is strong. This requires analysis of at least 10 years (see figure below).

- **allows analysis of whole regions:**

Potentials of large regions can be quickly analysed to estimate the possible benefits of solar energy and to evaluate synergies of multiple projects.

- **data are very accurate:**

The high resolution allows the analysis of the exact proposed location. The long data base provides reliable averages and allows analysing the effects of good and bad years on financing.

- **is continuous:**

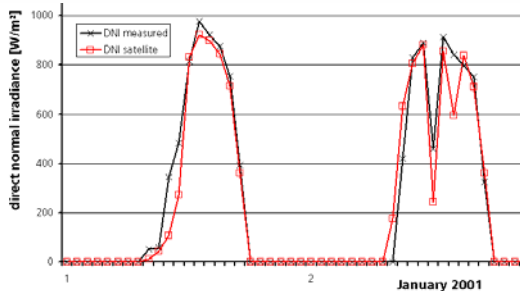
Satellite data have no large gaps or maintenance and calibration discontinuities like most measured time-series.

- **is representative:**

The spatial measurement from the satellite is more representative for a large solar plant than a single point measurement.

- **data are comparable:**

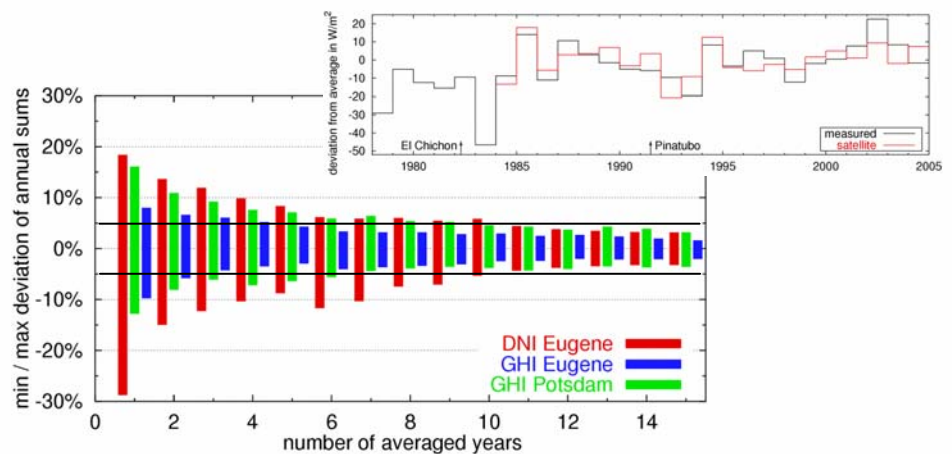
The satellite-derived products are based on the same sensor. A site ranking is not interfered by sometimes oppositional measurement errors. Analysis of several sites enhances planning flexibility and directs to selection of the most favourable location.



Example of hourly time-series derived by SOLEMI compared to measured data at the Plataforma Solar de Almería in Spain.

Inter-annual variability of solar irradiance:

The large figure shows the maximum deviations of a moving multi-year average for direct normal (DNI) and global horizontal irradiance (GHI). DNI shows much higher inter-annual variability than GHI. The small figure displays annual averages for a station in Eugene, Oregon. Inter-comparison to long-term measurements of GHI taken at Potsdam, Germany, unveils higher variability on other regions. For GHI here about 10 years of data are necessary to reach $\pm 5\%$ of the long term average, similar to what is necessary for DNI in Oregon.



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