



**Gridded Solar Exposure Metadata**

<b>Dataset</b>	
Title	Monthly and annual average daily solar exposure (1990 onward)
<b>Custodian</b>	
Custodian	Bureau of Meteorology
Jurisdiction	Australia
<b>Description</b>	
Abstract	Global solar exposure is the total amount of solar energy falling on a horizontal surface. The daily global solar exposure is the total solar energy for a day. Typical values for daily global exposure range from 1 to 35 MJ/m <sup>2</sup> (megajoules per square metre). For mid-latitudes, the values are usually highest in clear sun conditions during the summer, and lowest during winter or very cloudy days. See LINEAGE below for more information.
Search Word(s)	Gridded, satellite, climatology, solar, radiation, exposure, meteorology
Geographic Extent Names(s)	Australia
General Category	Gridded climatological data
General Custodian Jurisdiction	Australian Government Australia
Geographic Extent Polygon	Not applicable
Geographic Bounding Box	See below
North Bounding Latitude	-10.025
South Bounding Latitude	-43.975
East Bounding Longitude	153.975
West Bounding Longitude	112.025
<b>Data Currency</b>	
Beginning Date	1990
Ending Date	ongoing
<b>Dataset Status</b>	
Progress	Completed
Maintenance and Update frequency	Ongoing

<b>Access</b>	
Stored Data Format	Arc/Info grids – all Australia
Available Format Type	ASCII row major
Access Constraint	<p>Satellite-derived global solar exposure estimates are based on images from the Geostationary Meteorological Satellite GMS-4, GMS-5, MTSAT-1R (from Nov. 2005) and Geostationary Operational Environmental Satellite (GOES-9) satellites which are provided with permission of the Japan Meteorological Agency (JMA) and the United States National Oceanic &amp; Atmospheric Administration (NOAA). Any use of products from this imagery requires acknowledgement of the satellites of JMA and NOAA as the original source of the satellite data, and acknowledgement of the Commonwealth of Australia (Bureau of Meteorology) which received and processed the images. Acknowledgement should be in the form: <i>“Solar exposure data derived from satellite imagery processed by the Bureau of Meteorology from the Geostationary Meteorological Satellite series operated by Japan Meteorological Agency and from GOES-9 operated by the National Oceanographic &amp; Atmospheric Administration (NOAA) for the Japan Meteorological Agency”</i></p> <p>Please contact us (see details below) for more information.</p>
<b>Data Quality</b>	
Lineage	<p>The Bureau of Meteorology’s computer radiation model uses visible images from geostationary meteorological satellites to estimate daily global solar exposures at ground level.</p> <p>At each location for each satellite acquired image, the brightnesses are averaged over each grid cell and used to estimate solar irradiance at the ground. Essentially, the irradiance at the ground can be calculated from the irradiance at the top of the earth’s atmosphere, the amount absorbed in the atmosphere (dependant on the amount of water vapour present), the amount reflected from the surface (surface albedo) and the amount reflected from clouds (cloud albedo).</p> <p>These instantaneous irradiance values are integrated over the day to give daily insolation (daily radiant exposure) in megajoules per square metre. The daily exposure gridded datasets cover Australia with a resolution of 0.05 degrees in latitude and longitude.</p> <p>The exposure grids are missing for some days. This is because each day is the integration (a sum with interpolation in time) of values produced from hourly satellite images, and the accuracy of the integrated daily value is unacceptably poor if the data from more than two consecutive hours is missing. Missing data are due to:</p> <ul style="list-style-type: none"> <li>• Interruption to satellite operations, including technical problems on the satellite.</li> <li>• Problems with ground receiving equipment or data processing systems.</li> <li>• Rejection of images that are noisy due to solar radio interference at</li> </ul>

	<p>the receiving station at certain times of the year.</p> <ul style="list-style-type: none"> <li>• Resolving problems as data processing systems are adapted to each new satellite.</li> </ul> <p>These datasets were produced by reprocessing archived raw satellite data using software that was extensively rewritten in 2006, but based on the physical model that has been used since 1990. Bias with respect to exposure estimates from Bureau of Meteorology ground instruments was removed by a linear adjustment to each month's maps. The monthly averages have been adjusted (to reduce the effect of missing days as solar declination changes) using the ratio of top-of-atmosphere exposure totals for the full month and for the sampled days.</p>
Positional Accuracy	The satellite data on which the analyses were based have an associated resolution and typical accuracy of 0.05 degrees (approximately 5 km) up to and including June 1994 and 0.01 degrees (1.25 km) thereafter, although some individual images have errors of several km.
Attribute Accuracy	<p>The accuracy of the model's daily estimates of solar exposure is estimated by comparison with measurements from Bureau of Meteorology ground instruments.</p> <p>The source of uncertainties associated with calculations includes:</p> <ul style="list-style-type: none"> <li>• Anisotropy of cloud-top reflectance.</li> <li>• Water vapour in the atmosphere.</li> <li>• Satellite calibration.</li> <li>• The availability of hourly images.</li> </ul> <p>The model assumes that hourly (or less frequent) "instantaneous samples" of the irradiance will describe the conditions for the hourly (or longer) period.</p> <p>All these factors with both random and biased components means that the 95% uncertainty for any of the daily solar exposure estimates, regardless of the averaging period (that is, daily, monthly and seasonal), is of the order of 3 MJ/m<sup>2</sup>.</p> <p>For more information (metadata) please contact us.</p>
Logical Consistency	Not applicable
Completeness	All of the months in these periods had at least half of their days sampled, with the vast majority missing no more than one day. Details of missing data are available – see Contact Information below. GOES-9 ceased operation in November 2005.

<b>Contact Information</b>	
Contact Organisation	Bureau of Meteorology
Contact Position	Climate Data Services
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<b>Metadata date</b>	
Metadata date	2007
Additional Metadata	Additional information available on request (see contact above)