

## Metadata

| <b>Dataset</b>                   |  |
|----------------------------------|--|
| Title                            | Monthly and annual solar exposure (base climatological data sets)  |
| <b>Custodian</b>                 |  |
| Custodian                        | Bureau of Meteorology  |
| Jurisdiction                     | Australia  |
| <b>Description</b>               |  |
| Abstract                         | <p>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.</p> <p>These average data sets are based on 16 years (1990 - 2005) of solar exposure data derived from Japan Meteorological Agency and National Oceanographic &amp; Atmospheric Administration satellite imagery.</p> <p>See LINEAGE below for more information.</p> |
| 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<br>Australia   |
| Geographic Extent Polygon        | Not applicable   |
| Geographic Bounding Box          | See below  |
| North Bounding Latitude          | -11.00   |
| South Bounding Latitude          | -43.70   |
| East Bounding Longitude          | 153.60   |
| West Bounding Longitude          | 113.10   |
| <b>Data Currency</b>             |  |
| Beginning Date                   | 1990   |
| Ending Date                      | 2005   |
| <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, Arc/Info grid Interchange (.e00), Shapefiles.   |
| 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.</p> <p>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 maps for this dataset 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> |

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|----------------------------|--|
| Positional Accuracy        | The satellite data on which the analyses were based have an associated resolution and typical accuracy of 0.05 degrees (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 by 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 for the period had at least half of their days sampled, with the vast majority missing no more than one day. GOES-9 ceased operation in November 2005.   |
| <b>Contact Information</b> |  |
| Contact Organisation       | Bureau of Meteorology  |
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| <b>Metadata date</b>       |  |
| Metadata date              | 2007   |
| Additional Metadata        | Additional information available on request (see contact above)  |