

HANDBOOK FOR METEOROLOGICAL DATA FOR SOLAR POWER CALCULATION TOOL

EDITION 1
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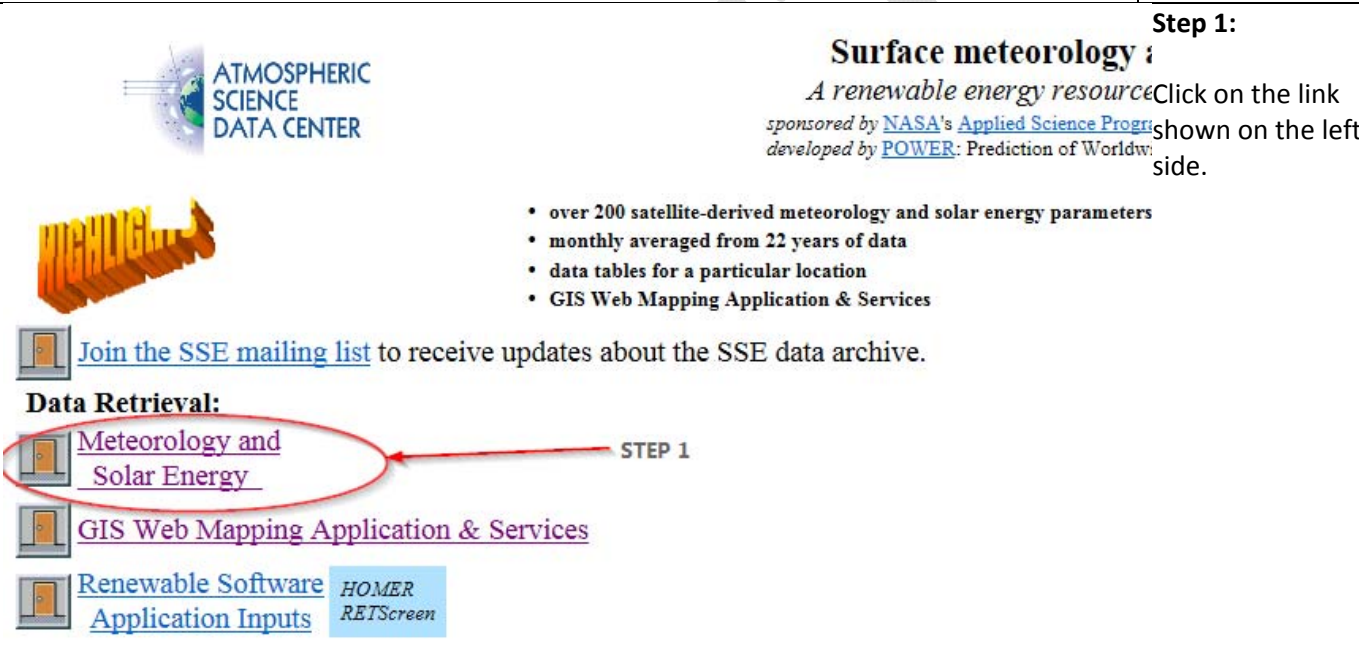




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1 INTRODUCTION


The following description shows how to extract relevant data from a public NASA website.

Another website to derive data from is <http://re.jrc.ec.europa.eu/pvgis/apps4/pvest.php>.

2 SHORT HANDBOOK FOR METEOROLOGY AND SOLAR ENERGY

Description	Action
http://eosweb.larc.nasa.gov/sse/	Click on the link at the left side to access the NASA's website.
 <p>Surface meteorology : <i>A renewable energy resource</i> sponsored by NASA's Applied Science Program developed by POWER: Prediction of Worldw</p> <p>Step 1: Click on the link shown on the left side.</p> <ul style="list-style-type: none"> • over 200 satellite-derived meteorology and solar energy parameters • monthly averaged from 22 years of data • data tables for a particular location • GIS Web Mapping Application & Services <p> Join the SSE mailing list to receive updates about the SSE data archive.</p> <p>Data Retrieval:</p> <p> Meteorology and Solar Energy STEP 1</p> <p> GIS Web Mapping Application & Services</p> <p> Renewable Software Application Inputs HOMER RETScreen</p>	

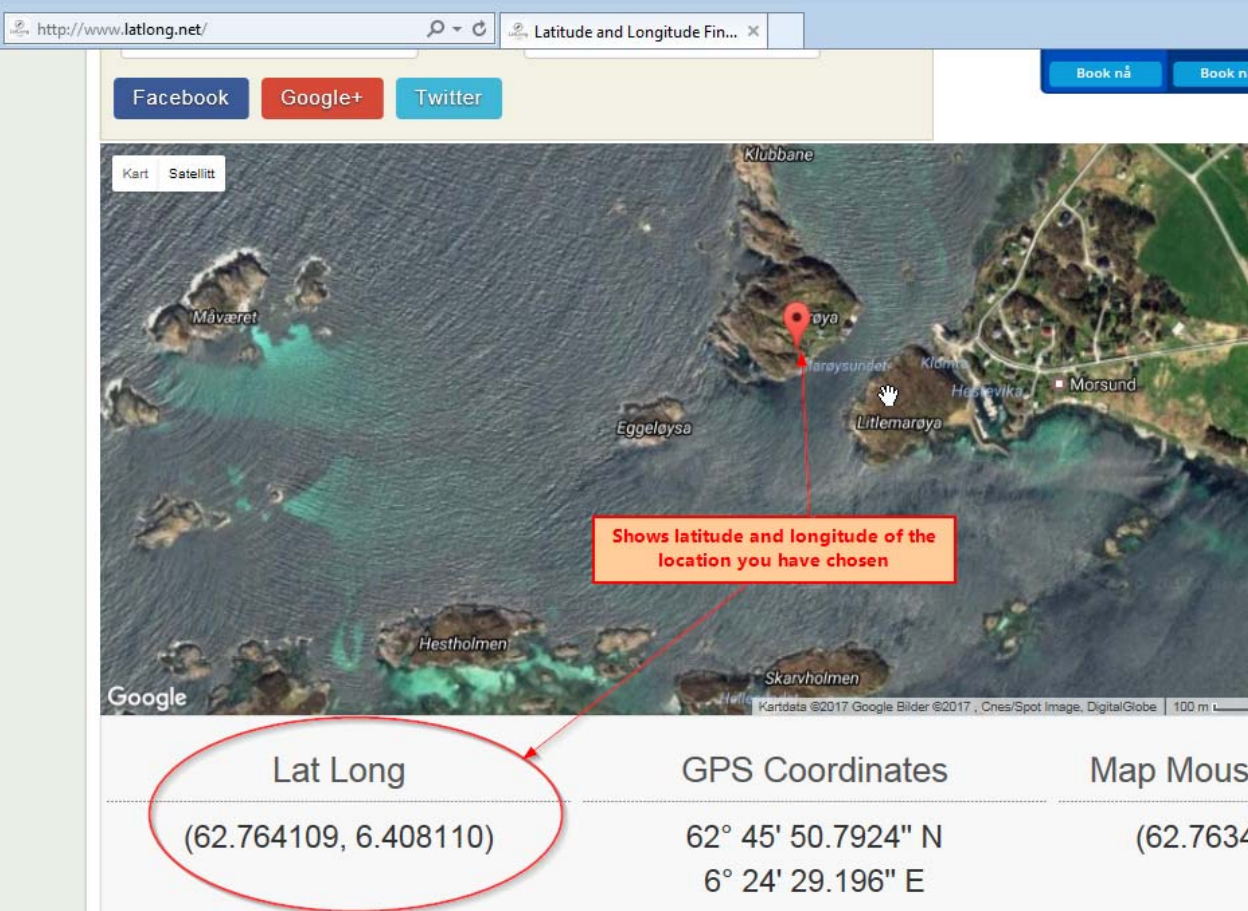
Description	Action
<div data-bbox="236 219 496 338">  ATMOSPHERIC SCIENCE DATA CENTER </div> <div data-bbox="153 376 336 495">  </div> <div data-bbox="948 210 1267 250"> Surface meteorology </div> <div data-bbox="884 250 1276 340"> <i>A renewable energy resource</i> sponsored by NASA's Applied Science Program developed by POWER: Prediction of World </div> <ul style="list-style-type: none"> • over 200 satellite-derived meteorology and solar energy parameter • monthly averaged from 22 years of data • data tables for a particular location • GIS Web Mapping Application & Services <div data-bbox="134 506 188 562">  </div> Join the SSE mailing list to receive updates about the SSE data archive. <div data-bbox="140 566 341 595"> Data Retrieval: </div> <div data-bbox="134 607 188 663">  </div> Meteorology and Solar Energy <ul style="list-style-type: none"> • Data tables for a particular location <p>Tables of all SSE data set parameters for a single site.</p>	<p>Step 2:</p> <p>Click on the link shown on the left side.</p>
<div data-bbox="223 824 443 920">  ATMOSPHERIC SCIENCE DATA CENTER </div> <div data-bbox="809 857 1276 887"> NASA Surface meteorology and Solar En </div> <div data-bbox="172 992 552 1178"> <p>Example:</p> <p>Latitude? <input type="text" value="78.246"/></p> <p>Longitude? <input type="text" value="15.552"/></p> </div> <div data-bbox="711 1014 871 1066"> Latitude 33.5 Longitude -80.75 </div> <div data-bbox="876 1081 1031 1142"> South: -90 to 0 West: -180 to 0 </div> <div data-bbox="743 1160 922 1189"> <input type="button" value="Submit"/> <input type="button" value="Reset"/> </div> <div data-bbox="925 1160 1276 1189"> This form is "Reset" if the input is out o </div> <div data-bbox="148 1261 316 1447">  </div> <div data-bbox="496 1323 801 1348"> Back to SSE Data Set Home Page </div> <div data-bbox="871 1283 1276 1406"> Responsible > Data: Paul W. Stackh Officials > Archive: John M. Ku Site Administration/Help: NASA Langl Services (Contact Us) (Privacy Policy and Important Notice) Document generated on Wed Mar 22 11: </div>	<p>Step 3:</p> <p>Enter the geographical position where your AtoN is located.</p> <p>To derive coordinates from a map you can use http://www.latlong.net/ (see short description at the end of the table).</p> <p>Then press the button "Submit".</p> <p>In this example, it is used a location in Svalbard.</p>

Description	Action
<div> SSE Homepage Find A Different Location Accuracy Methodology </div> <div>  <h3>NASA Surface meteorology and Solar Energy - Choices</h3> <p>Latitude 78.246 / Longitude 15.552 was chosen.</p> <p>Select parameters and press Submit (Default is ALL types)</p> <p><input type="button" value="Submit"/> <input type="button" value="Reset"/></p> </div>	Step 4: Select the headlines. Click on the link "Parameters" for more information and definition
<div> Geometry Latitude and longitude (center and border) </div> <hr/> <div> Parameters for Solar Cooking </div> <div> Parameters for Sizing and Pointing of Solar Panels and for Solar Thermal Applications </div> <hr/> <div> Solar Geometry </div>	<div> STEP 4 <div> Average insolation Midday insolation Clear sky insolation Clear sky days </div> </div> <div> Insolation on horizontal surface (Average, Min, Max) Diffuse radiation on horizontal surface (Average, Min, Max) Direct normal radiation (Average, Min, Max) Insolation at 3-hourly intervals Insolation clearness index, K (Average, Min) Insolation normalized clearness index Clear sky insolation Clear sky insolation clearness index Clear sky insolation normalized clearness index Downward Longwave Radiative Flux </div> <div> Solar Noon Daylight Hours Daylight average of hourly cosine solar zenith angle Cosine solar zenith angle at mid-time between sunrise and sunset Declination Sunset Hour Angle Maximum solar angle relative to the horizon Hourly solar angles relative to the horizon Hourly solar azimuth angles </div>
<div> Parameters for Tilted Solar Panels </div> <div> Parameters for Sizing Battery or other Energy-storage Systems </div> <div> Parameters for Sizing Surplus-product Storage Systems </div> <div> Diurnal Cloud Information </div> <div> Meteorology (Temperature) </div> <div> Temperature data may be lapse rate adjusted for differences in the elevation at your site versus the regional average over which the data set was developed. Elevation at site in meters above sea level (optional)? <input type="text"/> A web site that may help you determine your site elevation is the EarthTools web site. Alternatively, you may have to research local topographic maps or data. </div> <div> Meteorology (Wind) </div>	<div> Step 5: Add more choices to suit your location Select all parameters and press "Submit" button at the bottom </div> <div> Radiation on equator-pointed tilted surface Minimum radiation for equator-pointed tilted surface Maximum radiation for equator-pointed tilted surface </div> <div> Minimum available insolation as % of average values over consecutive-day period Horizontal surface deficits below expected values over consecutive-day period Equivalent number of NO-SUN days over consecutive-day period </div> <div> Available surplus as % of average values over consecutive-day period </div> <div> Daylight cloud amount Cloud amount at 3-hourly intervals Frequency of cloud amount at 3-hourly intervals </div> <div> Air Temperature at 10 m Daily Temperature Range at 10 m Cooling Degree Days above 18° C Heating Degree Days below 18° C Arctic Heating Degree Days below 10° C Arctic Heating Degree Days below 0° C Earth Skin Temperature Daily Mean Earth Temperature (Min, Max) Frost Days Dew/Frost Point Temperature at 10 m </div> <div> Wind Speed at 50 m (Average, Min, Max) Percent of time for ranges of Wind Speed Wind Speed at 50 m for 3-hourly intervals Wind Direction at 50 m Wind Direction at 50 m for 3-hourly intervals Wind Speed at 10 m for terrain similar to 50 m </div>

Description											Action
<div> <div>Western boundary 15</div> <div>Center Latitude 78.5 Longitude 15.5</div> <div>Eastern boundary 16</div> </div> <div>Southern boundary 78</div>											Step 8: Use the value of NASA table for the monthly average hours of daylight, convert it into duration of night (= 24 – daylight hours) and copy them into the IALA excel sheet.
<i>Parameters for Sizing and Pointing of Solar Panels and for Solar Thermal Applications:</i>											
Monthly Averaged Insolation Incident On A Horizontal Surface (kWh/m ² /day)											
Lat 78.246 Lon 15.552	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	
22-year Average	0.00	0.02	0.55	1.70	3.90	4.99	4.47	2.99	1.11	0.14	
Minimum And Maximum Difference From Monthly Averaged Insolation (%)											
Lat 78.246 Lon 15.552	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	
Minimum	n/a	n/a	-15	-33	-20	-13	-13	-9	-1		
Maximum	n/a	n/a	18	41	15	15	16	14	2		
Parameter Definition											
<i>Solar Geometry:</i>											
Monthly Averaged Daylight Hours (hours)											
Lat 78.246 Lon 15.552	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	
Average	0.00	1.45	11.4	20.4	24.0	24.0	24.0	24.0	14		
Parameter Definition											
<i>Parameters for Sizing Battery or other Energy-storage Systems:</i>											

Example for the month of June are shown here.

3 GET LATITUDE AND LONGITUDE OF A SITE FROM A WEB-BASED MAP

Description	Action
<p>http://www.latlong.net/</p>	<p>Click on the link at the left side to access a free program online, to find a certain location</p>
	<p>Click the map and the position with respect. Latitude and longitude of the location you have selected is displayed.</p>



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International Association of Marine Aids to Navigation and Lighthouse Authorities
Association Internationale de Signalisation Maritime