



GUIDELINE

G1039-2

HANDBOOK FOR METEOROLOGICAL DATA FOR IALA SOLAR POWER SYSTEM CALCULATION TOOL

Edition 2.0

December 2017



DOCUMENT HISTORY

Revisions to this IALA document are to be noted in the table prior to the issue of a revised document.

Date	Details	Approval
December 2017	1 st issue	Council 65



CONTENTS

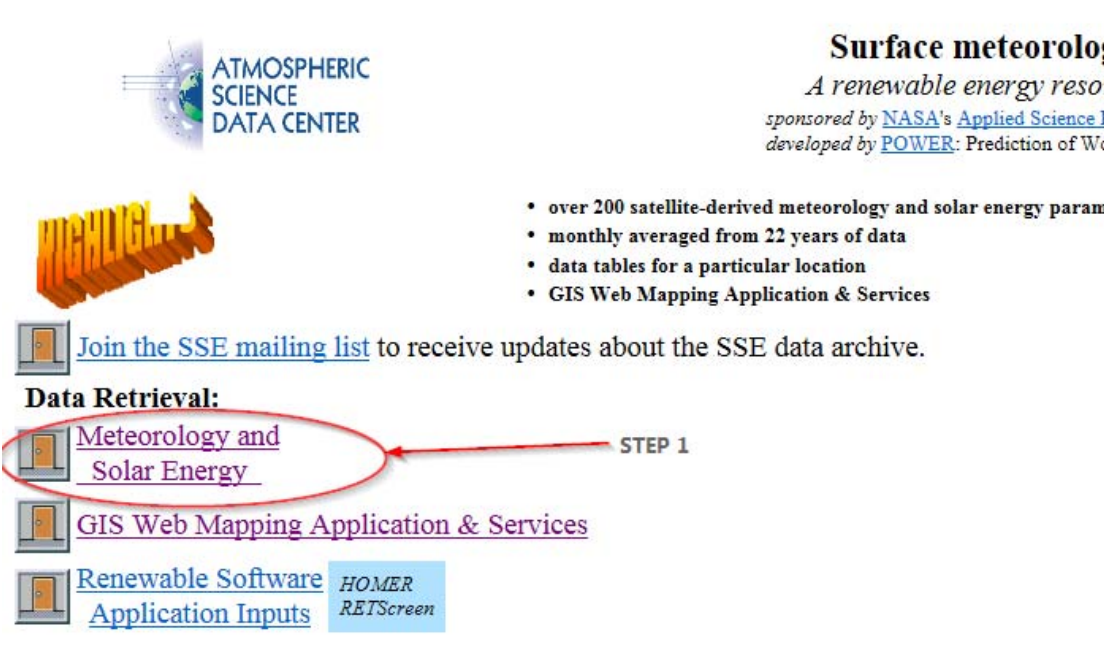
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3	GET LATITUDE AND LONGITUDE OF A SITE FROM A WEB-BASED MAP	9





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
<p>http://eosweb.larc.nasa.gov/sse/</p>	<p>Click on the link at the left side to access the NASA's website.</p>
 <p>ATMOSPHERIC SCIENCE DATA CENTER</p> <p>WELCOME</p> <p>Surface meteorology <i>A renewable energy resource</i> <small>sponsored by NASA's Applied Science Program developed by POWER: Prediction of World Energy Resources</small></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> <ul style="list-style-type: none"> Meteorology and Solar Energy (STEP 1) GIS Web Mapping Application & Services Renewable Software Application Inputs (HOMER, RETScreen) 	<p>Step 1:</p> <p>Click on the link shown on the left side.</p>

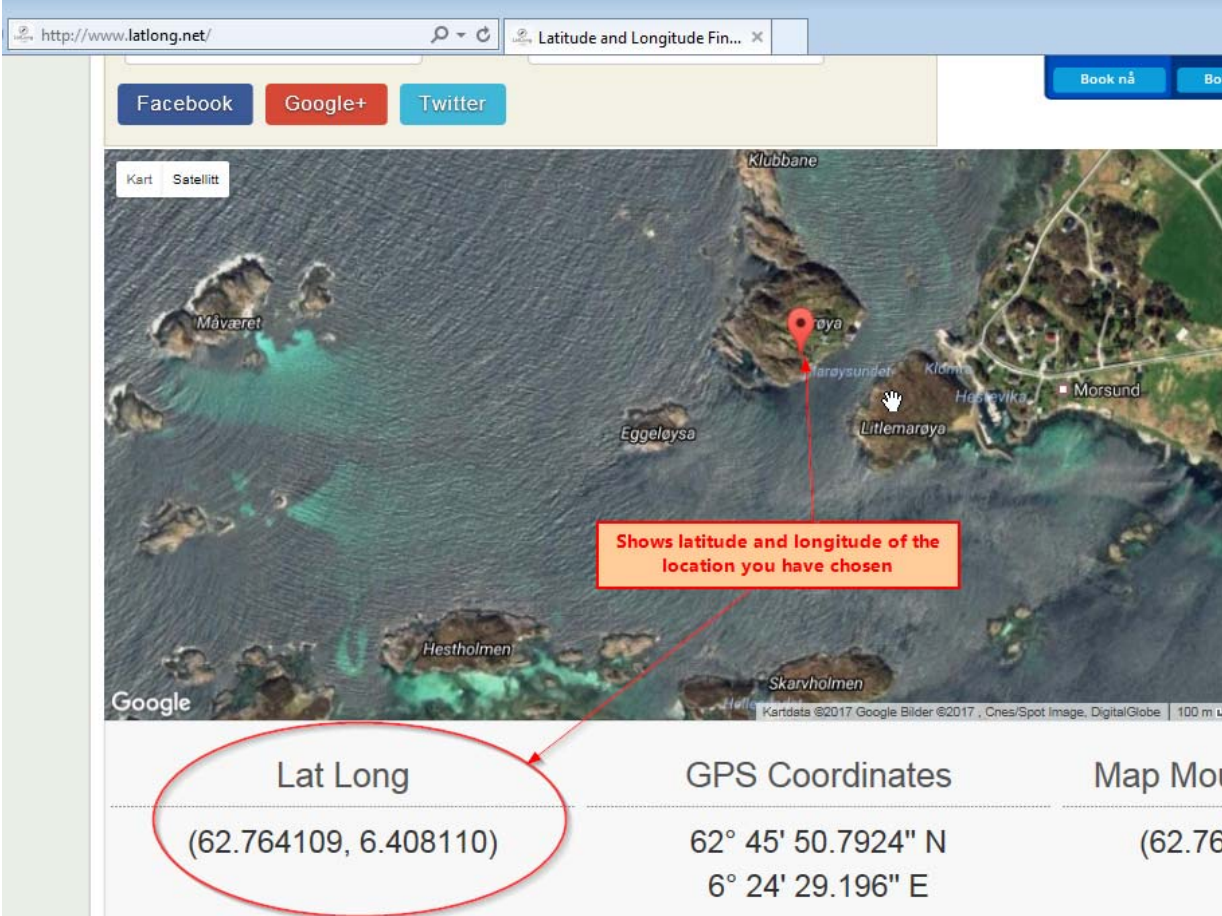
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 <p>Surface meteorolog <i>A renewable energy resou</i> sponsored by NASA's Applied Science Pr developed by POWER: Prediction of Wor</p> <p>HIGHLIGHTS</p> <ul style="list-style-type: none"> • over 200 satellite-derived meteorology and solar energy parame • 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</p> <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>
 <p>NASA Surface meteorology and Solar E</p> <p>Enter BOTH latitude and longitude either in decim degrees or degrees and minutes separated by a sp</p> <p>Example:</p> <p>Latitude? <input type="text" value="78.246"/> Longitude? <input type="text" value="15.552"/></p> <p>Latitude 33.5 Longitude -80.75</p> <p>South: -90 to 0 West: -180 to 0</p> <p><input type="button" value="Submit"/> <input type="button" value="Reset"/> <i>This form is "Reset" if the input is 0</i></p> <p>Back to SSE Data Set Home Page</p> <p>Responsible > Data: Paul W. Stac Officials > Archive: John M. Site Administration/Help: NASA Lan Services (Contact Us) [Privacy Policy and Important Not] Document generated on Wed Mar 22</p>	<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
<p>SSE Homepage</p> <p>Find A Different Location</p> <p>Accuracy</p> <p>Methodology</p>  <p>NASA Surface meteorology and Solar Energy - Choices</p> <p>Latitude 78.246 / Longitude 15.552 was chosen.</p> <p>Select parameters and press Submit (Default is ALL types)</p> <p>Submit</p> <p>Reset</p> <p><i>Geometry</i></p> <p>Latitude and longitude (center an</p> <p><i>Parameters for Solar Cooking</i></p> <p>STEP 4</p> <p>Average insolation Midday insolation Clear sky insolation Clear sky days</p> <p><i>Parameters for Sizing and Pointing of Solar Panels and for Solar Thermal Applications</i></p> <p>Insolation on horizontal surface (Average) Diffuse radiation on horizontal surface (i Direct normal radiation (Average, Min, h Insolation at 3-hourly intervals Insolation clearness index, K (Average, Insolation normalized clearness index Clear sky insolation Clear sky insolation clearness index Clear sky insolation normalized clearne Downward Longwave Radiative Flux</p> <p><i>Solar Geometry</i></p> <p>Solar Noon Daylight Hours Daylight average of hourly cosine solar zenit Cosine solar zenith angle at mid-time between Declination Sunset Hour Angle Maximum solar angle relative to the horizon Hourly solar angles relative to the horizon Hourly solar azimuth angles</p>	<p>Step 4:</p> <p>Select the headlines.</p> <p>Click on the link "Parameters" for more information and definition</p>
<p><i>Parameters for Tilted Solar Panels</i></p> <p>Radiation on equator-pointed tilted s Minimum radiation for equator-pointe Maximum radiation for equator-point</p> <p><i>Parameters for Sizing Battery or other Energy-storage Systems</i></p> <p>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</p> <p><i>Parameters for Sizing Surplus-product Storage Systems</i></p> <p>Available surplus as % of average values over consecutive-day period</p> <p><i>Diurnal Cloud Information</i></p> <p>Daylight cloud amount Cloud amount at 3-hourly intervals Frequency of cloud amount at 3-h</p> <p><i>Meteorology (Temperature)</i></p> <p>STEP 5</p> <p>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 1 Arctic Heating Degree Days below 0 Earth Skin Temperature Daily Mean Earth Temperature (Min, Frost Days Dew/Frost Point Temperature at 10 m</p> <p>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 develop <i>Elevation at site in meters above sea level (optional)?</i> <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 o</p> <p><i>Meteorology (Wind)</i></p> <p>Wind Speed at 50 m (Average, Mir Percent of time for ranges of Wind Wind Speed at 50 m for 3-hourly ir Wind Direction at 50 m Wind Direction at 50 m for 3-hourly Wind Speed at 10 m for terrain sir</p>	<p>Step 5:</p> <p>Add more choices to suit your location</p> <p>Select all parameters and press "Submit" button at the bottom</p>

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Description											Action
Western boundary 15 Center Latitude 78.5 Longitude 15.5 Eastern boundary 16 Southern boundary 78											Step 8:
<i>Parameters for Sizing and Pointing of Solar Panels and for Solar Thermal Applications:</i>											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.
Monthly Averaged Insolation Incident On A Horizontal Surface (kWh/m²/day)											
Lat 78.246 Lon 15.552 22-year Average	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	
Minimum And Maximum Difference From Monthly Averaged Insolation (%)											Put it into the IALA excel sheet. Example for the month of June are shown here.
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			
Maximum	n/a	n/a	18	41	15	15	16	14			
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			
Parameter Definition											
<i>Parameters for Sizing Battery or other Energy-storage Systems:</i>											

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>The screenshot shows a web browser window with the URL http://www.latlong.net/. The page features social media buttons for Facebook, Google+, and Twitter. Below these is a satellite map of a coastal region with several islands. A red pin is placed on a location, and a red box with the text "Shows latitude and longitude of the location you have chosen" points to it. Below the map is a table with the following data:</p> <table border="1"> <thead> <tr> <th>Lat Long</th> <th>GPS Coordinates</th> <th>Map Mou</th> </tr> </thead> <tbody> <tr> <td>(62.764109, 6.408110)</td> <td>62° 45' 50.7924" N 6° 24' 29.196" E</td> <td>(62.763</td> </tr> </tbody> </table>	Lat Long	GPS Coordinates	Map Mou	(62.764109, 6.408110)	62° 45' 50.7924" N 6° 24' 29.196" E	(62.763	<p>Click the map and the position with respect to Latitude and longitude of the location you have selected is displayed.</p>
Lat Long	GPS Coordinates	Map Mou					
(62.764109, 6.408110)	62° 45' 50.7924" N 6° 24' 29.196" E	(62.763					