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Tools for consumers and designers of solar

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05:35 | Monday 09 December 2024

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-33.8690024,151.1290231 | 33° 52' 8.409" S 151° 7' 44.483" E

SunRise: 04:41:12 * 119.26° | SunSet: 19:06:01 * 240.73° |

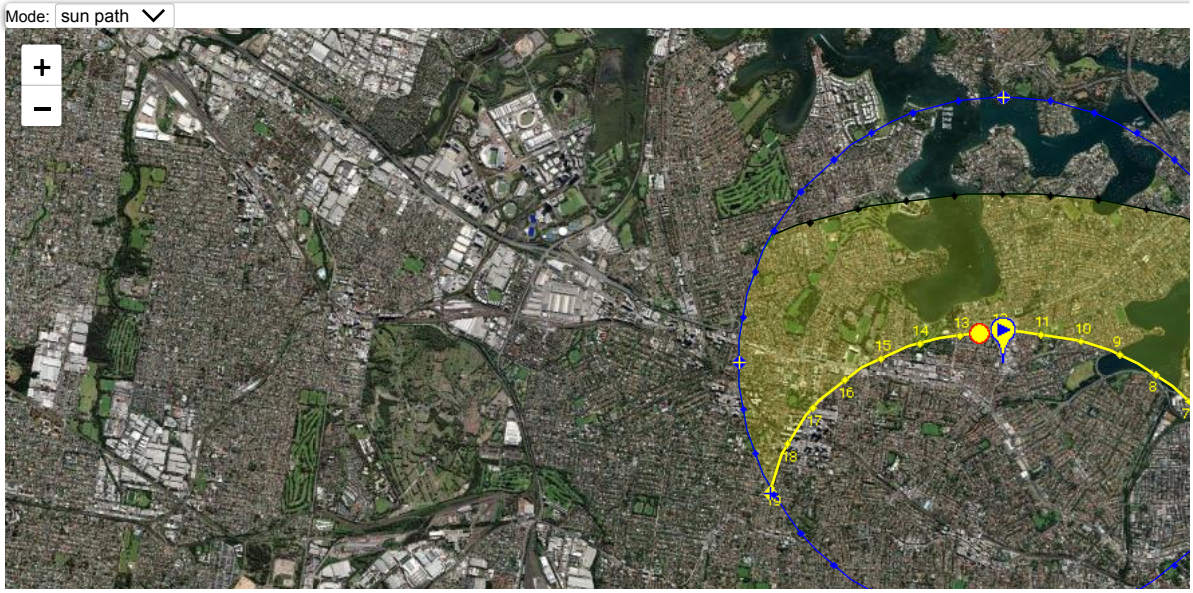
-33.86900240,151.12902310

Name | execute | Solar Disk | Analemma

year: 2024 | month: 12 | day: 21 | h: 12

Time zone: GMT+10 | DST | De

Mode: sun path



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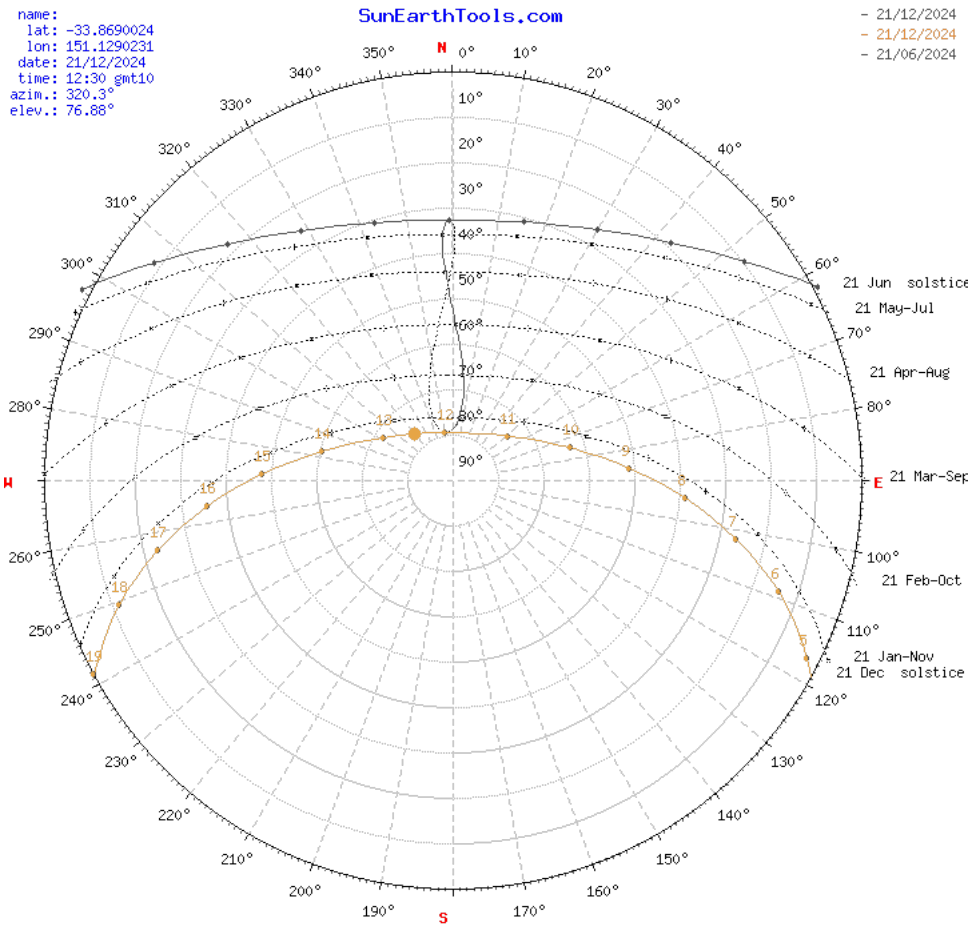
Bold line: | Trasparent background: | Months path: | execute



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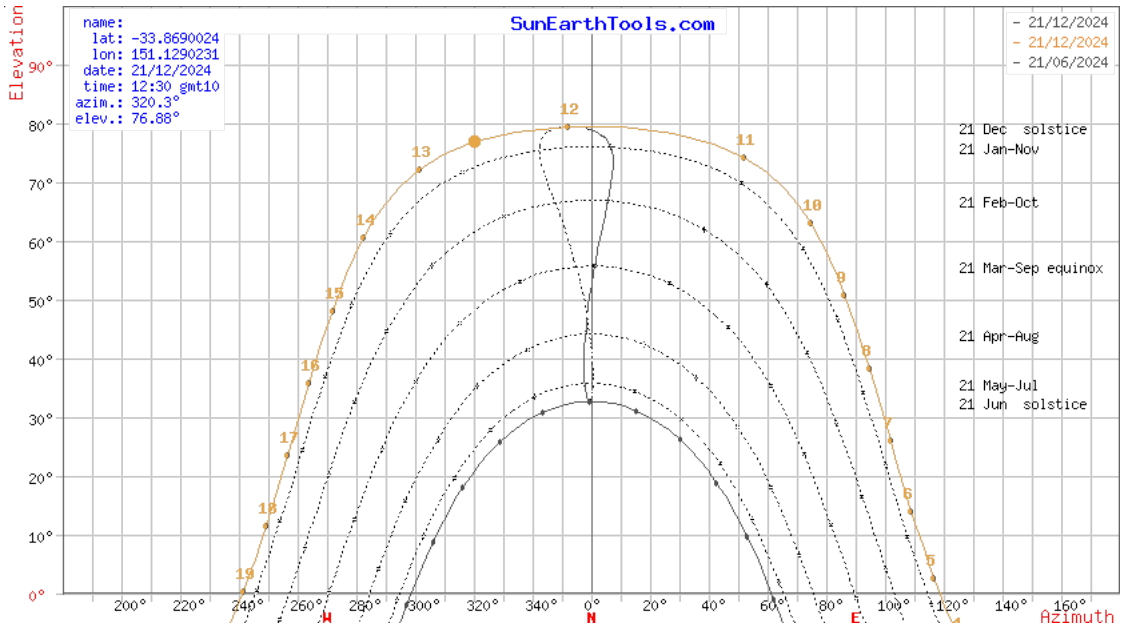

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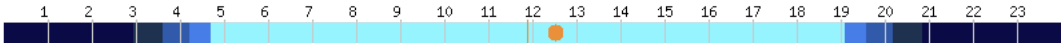

sun position	Elevation	Azimuth	latitude	longitude
21/12/2024 12:30 | GMT10	76.88°	320.3°	33.8690024° S	151.1290231° E
twilight	Sunrise	Sunset	Azimuth Sunrise	Azimuth Sunset
twilight -0.833°	04:41:12	19:06:01	119.26°	240.73°
Civil twilight -6°	04:12:01	19:35:08	123.52°	236.49°

Nautical twilight -12°	03:36:07	20:11:02	129.23°	230.78°
Astronomical twilight -18°	02:56:46	20:50:22	136.21°	223.81°
daylight	hh:mm:ss	diff. dd+1	diff. dd-1	Noon
21/12/2024	14:24:49	-00:00:01	-00:00:03	11:53:36

Step (minute): 60 execute download Excel table

Date:	21/12/2024 | GMT10	
coordinates:	-33.8690024, 151.1290231	
location:	-33.86900240,151.12902310	
hour	Elevation	Azimuth
04:41:12	-0.833°	119.26°
5:00:00	2.61°	116.67°
6:00:00	14.08°	108.99°
7:00:00	26.08°	101.82°
8:00:00	38.39°	94.55°
9:00:00	50.83°	86.25°
10:00:00	63.1°	74.67°
11:00:00	74.31°	51.82°
12:00:00	79.47°	351.95°
13:00:00	72.13°	301.38°
14:00:00	60.53°	282.36°
15:00:00	48.18°	271.82°
16:00:00	35.75°	263.86°
17:00:00	23.49°	256.67°
18:00:00	11.59°	249.43°
19:00:00	0.26°	241.58°
19:06:01	-0.833°	240.73°

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Annual sun path

coordinates: -33.8690024,151.1290231
year: 2024
Step : 60 (minutes)
email:

DST: (Daylight saving time [true|false])
Time zone: GMT+10 (GMT Greenwich Mean Time)
download Excel | download CSV

Set the data as you wish and click on email image to get the file in attach.
The excel file contain the sun path for one year, with step (5,10,15,20,30,60 min), for the moment restricted as a result of is just too heavy for the server.
The first column contain the date the others columns contain E=elevation A=azimuth and time (from 00:00 to 23:59).

For the annual SunRise SunSet Calendar additionally on excel file you'll be able to use this link: Sunrise Sunset Calendar

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shadow

The length of the shadow map is normalized (changing with the zoom), and the direction is opposite azimuth.
The measurement of the length of the shadow depends on the height of the obstacle and the elevation of the sun, the formula is:
length shadow = object height/tan (sun elevation).

shadow Normalized
Obstacle height: 50
execute

shadow lenght: 308.03 =
Height: 50 /tan
Elevation °: 9.22°

shadow °: 291.36°
Azimuth °: 111.36°

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Sun Position

Content

shadow

Sun position equation

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Format

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Sun Position

Calculation of sun's position in the sky for each location on the earth at any time of day. Azimuth, sunrise sunset noon, daylight and graphs of the solar path.
Sunrise and sunset are defined as the instant when the upper limb of the Sun's disk is just touching the horizon, this corresponds to an altitude of -0.833° degrees for the Sun.
Twilight is the time after sunset characterized by a diffuse light (by extension the morning twilight, use term aurora, dawn or sunrise).
Civil twilight lapse of time between sunset and when the sun reaches the elevation height of -6°, in the sky are visible only a few stars and planets particularly bright.
Nautical twilight represents the time the Sun takes a pass from -6° to -12° below the horizon, in this period are distinguished horizon line and the main stars.
Astronomical twilight is the time interval between sunset and when the sun reaches 18° below the horizon, the sky is dark, is possible to distinguish the stars up to the sixth magnitude.
Noon in solar time occurs when the sun is at its highest point in the sky for the day, and it is either due south or due north of the observer depending on the latitude.
Azimuth indicates an angle between a point and a reference plane. Generally is the angular distance of a point from the true North (geographic north) not magnetic, I made this choice, because in this way you can see the sun's position in the map, if you use a compass, you must add the magnetic declination for your location. There are some compass app for smartphones that automatically add the magnetic declination for your location.
The height, or Elevation , is the angular distance of the horizon a point on the celestial sphere, measured as positive if facing the Zenith, and negative if directed towar the Nadir.
Zenith , is the intersection perpendicular to the plane of the horizon passing through the observer with the visible celestial hemisphere and is the point above the head o the observer. The diametrically opposite point is called Nadir.
The knowledge of the position of the sun and the daylight hours, allow to know the **energy** radiated from the Sun (renewable) at the point on the Earth that we are examining.
The solar energy can be **heat engines** produced from solar panels or **electrical** produced by photovoltaic panels.

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Sun chart

Sun path charts can be plotted either in Cartesian (rectangular) or Polar coordinates.
Cartesian coordinates where the solar elevation is plotted on Y axis and the azimuth is plotted on the X axis.
Polar coordinates are based on a circle where the solar elevation is read on the various concentric circles, from 0° to 90° degrees, the azimuth is the angle going arour the circle from 0° to 360° degrees, the horizon is represented by the outermost circle, at the periphery.
The azimuth angle indicates the direction of the sun in the horizontal plain from a given location. North is defined to have an azimuth of 0° and south has an azimuth of 180°.
The various trajectories of the sun's in the sky are bounded by those of the 21st day (solstice) of each month from December 21 until June 21.
We plot the time, on the hour, for all hours during which the sun is in the chart.

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Daylight

The length of day is the time interval between sunrise and sunset, so the time period in which we can observe the direct sunlight.
The duration depends on the latitude, the longitude, altitude above sea level (more high and more great the length of day) and obstacles horizon.
The algorithm uses the altitude 0 meters.
The transition from day to night is not clear before and after there is a period of scattered light (twilight), where you can still see, the phenomenon is due to reflection (down) of light by the atmosphere that it's over to our point of observation.

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How to use the tool map

Search

allows you search for the following:
 # Address (example: Central Park West, New York), (example: Macquarie St, Circular Quay NSW 2000, Australia)
 # Geographic features (example: torre di pisa) (example: louvre)
 # Places - Cities, towns, states, provinces, states and continents (example: Berlin, Germany)
 # Coordinates (example: 41.38716 , 2.17010), (example: -34° 36' 43.56" -58° 24' 3.6"), (example: 41° 53' 24.72" N 12° 29' 32.64" E)

Map pan control

Press the up arrow on your keyboard to move north
Press the down arrow on your keyboard to move south
Press the right arrow on your keyboard to move east
Press the left arrow on your keyboard to move west

Map zoom control

Zoom: Click + to zoom in on the center of the map, click - to zoom out.
Zoom slider - Drag the zoom slider up or down to zoom in or out incrementally

Coordinates

This text visualize the coordinates referring to the marker on the map.

Address

This text visualize the address of the marker on the map.

MAP

This area displays the map, search results and much more.

Left click

Set a marker on the map and update the values in the text fields coordinates and address.

Double click

Zoom in on the center of the map.

Right click

Open a context menu
 # saveAsDefault
 # Zoom In Here
 # Zoom Out Here
 # Clear Markers
 # Mode: Point - Distance - Polyline - Area. See help Use Mode

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Use Mode

Before selecting the mode of use:
1) Select a point in the map, can set this centre by search on a given address and can drag the yellow bulb in the map to adjust where you want (for instance in your garden to later show sun or shadows directions).
To find in the map, the coordinates (latitude, longitude), read the guide How to use the tool map.
2) Choose a date & time for your calculation.
3) Choose your local time zone, caution: Mind to select the correct time (summer time vs winter) according to your chosen date.
4) Click execute button. You can view several sun charts, according to the option modes you select.

If you want to save or change your favorites points go to the link (after the login) then you can select them directly from the map.

Sun path

will display a yellow croissant with 3 important circles; the inner most is the path of the sun on 21th Jun(longest day light duration of the year), while the outermost is the sun's path on 21th Dec(shortest day light duration of the year) in the north hemisphere, while they are invert in the south hemisphere, the mid circle is the sun's path on your chosen date.The outer blue circle as for centre your chosen location and show the angular coordinates around which the sun revolves. If you find the display sun chart too small or too big, simply zoom in or out and hit again EXECUTE, it will then re-generate a chart according to the new zoom factor.

Sun path + rays

as its name suggest superimpose sun path + sun rays

Point

by left clicking on the map appears a marker that contain the latitude, longitude and street address information, each click creates a new marker.

Distance

by left clicking on the map appears a marker and a line from the default marker to new marker, the next click remove the old marker and creates a new. On the top text field you can visualize the distance value between the two points, measured in Km, mile (mi) or for short distance meters (m), foot (ft).

Polyline

by left clicking on the map appears a marker and a segment from the previous marker to new marker, all marker are linked with segment from the default. On the top text field you can visualize the distance value from default to the last point, measured in Km, mile (mi) or for short distance meters (m), foot (ft). This is very useful to calculate the distance of a path of trekking, mountain bike, sport, free time ...

Area

Measure the area enclosed in the polyline, the perimeter of the area and highlighted the direction of the last segment. Allows you to draw a rectangle or a polygonal area on the map

Sun rays

View the map the height and direction of sun rays (hourly sun rays), the segments represent the normalized elevation (when change the zoom, hit again EXECUTE button to re-generate the segments according to the new zoom factor).

Shadow

View on map the normalized shadow length (when change the zoom, hit again EXECUTE button to re-generate the segments according to the new zoom factor) and the direction of the shadow produced by an obstacle (180° opposite of sun rays), the formula is: shadow object lenght = object height/tan(sun elevation degree). Use this to to calculate the lenght.

Units of measurement

km - kilometers, m - meters, mi - miles, ft - foot, nmi - nautical miles.

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Equation of time

A Simple Expression for the Equation of Time:
n=day of the year.

$\Delta t = 9.873 \sin(4\pi / 365.242 (n - 81)) - 7.655 \sin(2\pi / 365.242 (n - 1))$

| Δt = 6:29 [minute : seconds] | Date : 09 / 12 / 2024 | Change data

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Sun position equation

The calculation of the position of the sun is based on equations from Astronomical Algorithms, by J.J. Michalsky.
reference: Solar Position Algorithm - Michalsky, Joseph J. 1988. The Astronomical Almanac's algorithm for approximate solar position (1950-2050).
Accuracy of 0.01 deg, the observed values may vary from calculations because they depend by: atmospheric composition, temperature, pressure and other conditions.
To reduce the atmospheric refraction in sunrise and sunset, we assume -0.833 degree in the calculated value.
The calculated results aren't certificated, than you can use for educational, work, research but not for litigation.

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Date

Year Month Day
Are the date, the values are selectable by combo, the default is today.
Hour : Minute
Are the time, the values are selectable by combo, the default is now.
Time zone GMT
Greenwich Mean Time, identifies the time zone of reference of the Earth. If we divide the 360° for 24 to obtain a 24 parts every 15° longitude, in reality the area is bounded by national borders.
DST
Daylight saving time, clocks are adjusted forward one hour near the start of spring and are adjusted backward in autumn.

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Format

Value range

Valid value for the latitude are from -90.0° to 90.0° for the longitude are from -180.0° to 180.0°, the + sign should be omitted, while the minus sign is not necessary if there is a radio component to select the direction N-S or W-E (Degree and Decimal format).

Decimal

You have to select a direction (N-S or W-E) and insert a number from 0 to 90 for the latitude or from 0 to 180 for the longitude (example 45.12345).

Degree

Degree format is composed of direction (N-S or W-E) and three sets of numbers separate by the symbols for degrees (°), minutes ('), and seconds (").
Degree is an integer value without sign, from 0 to 90 for the latitude or from 0 to 180 for the longitude. Minute is an integer value without sign, from 0 to 59. Seconds is double value without sign, from 0 (or 0.0000) to 59.9999.

Coordinates

Coordinates format is the pair of latitude and longitude, with sign minus (-) for the direction south latitude and west longitude separate by comma symbol (,), here some example:
52.5163 , 13.3779
40.7682 , -73.9816
-22.9708 , -43.1830

Search on map

Click on search to open the webpage Earth Coordinate, here you obtain the latitude and longitude simply by clicking on the map, and save the value by the button save.

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Thanks in advance for your contribution to improve this site (please correct the errors of grammar and translation).

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