

How to compute the horizon profile
by means of the
Orologi Solari
program

... e allora ?

The knowledge of the azimuth / elevation horizon profile can be used to:

- evaluate the hours of light for the dial
- draw the line of the true horizon
- draw the lines of the hours remaining to sunset

The profile can be experimentally measured by means of a theodolite.

However this instrument is not easily available to most people.

Moreover it's not always possible to go to the dial place to perform the measurements.

In such situations Orologi Solari can help you: it includes a software tool that can compute the horizon profile for whichever point in the earth.

Orologi Solari makes use of the DEM (Digital Elevation Model) data available from the SRTM (Shuttle Radar Topography Mission) program.

These altitude data

- are available for latitudes $-60^{\circ} \div +60^{\circ}$
- have a precision ± 16 m
- have a resolution $3'' \times 3''$ (about 90 m x 90 m at the equator)
- can be downloaded from <http://srtm.csi.cgiar.org/SELECTION/inputCoord.asp>
- are included in 6000 x 6000 points files each covering a 5 x 5 degrees area
- are available in GeoTiff and ArcinfoASCII formats (Orologi Solari uses the ArcinfoASCII format)

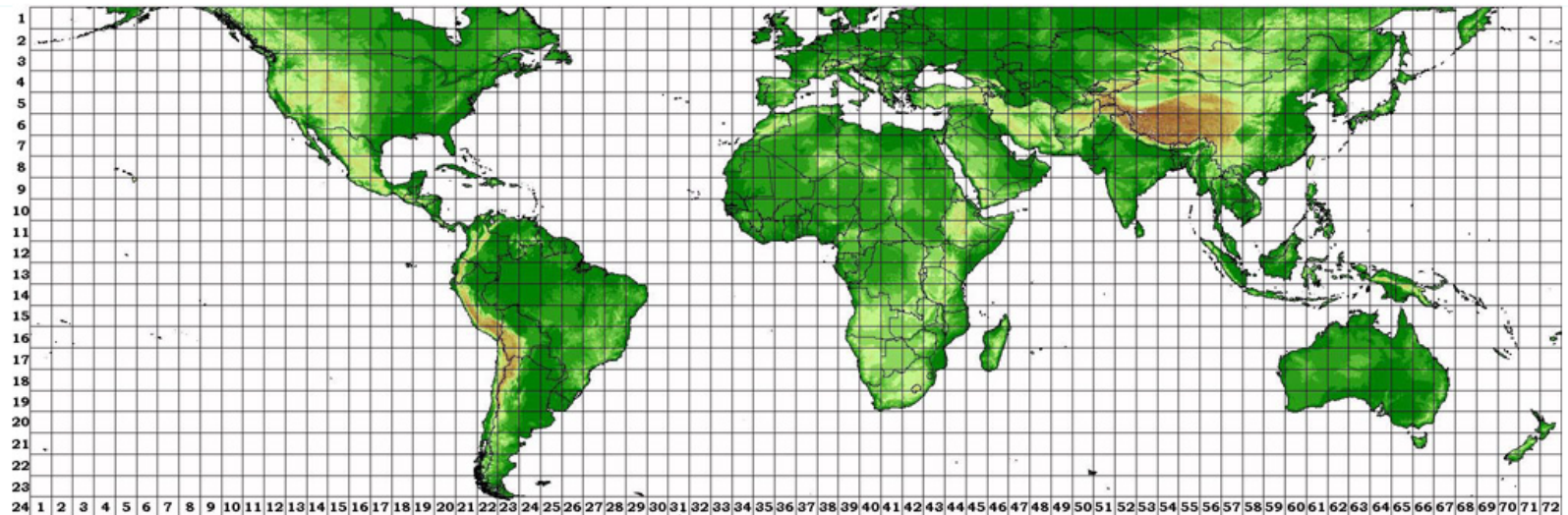
The first step is to download altitude data from the web site.

Select the desired cells with the mouse, select the ArcInfoASCII format and then click the “Click here to begin search” button.

SRTM Data Selection Options

 Chinese users : [中国用户可通过中国科学院遥感站点下载](#)

1. Select Server:	<input checked="" type="radio"/> CGIAR-CSI (USA)	<input type="radio"/> HarvestChoice (USA)	<input type="radio"/> JRC (IT)	<input type="radio"/> King's College (UK)	<input type="radio"/> TelaScience (USA)
2. Data selection method:	<input checked="" type="radio"/> Multiple Selection	<input type="radio"/> Enable Mouse Drag	<input type="radio"/> Input Coordinates		
Many tiles can be selected at random locations. These selected tiles are listed in the results page for download.					
<input type="radio"/> Decimal Degrees (ie 34.5, -100.5)			<input checked="" type="radio"/> Degrees: Minutes: Seconds (ie 34 30 00 N, 100 30 00 W)		
Longitude - min:	<input type="text"/>	max:	<input type="text"/>	Longitude - min:	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> East <input type="text"/>
Latitude - min:	<input type="text"/>	max:	<input type="text"/>	Latitude - min:	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> North <input type="text"/>
Longitude:	<input type="text" value="7.75"/>	Latitude:	<input type="text" value="47.35"/>	Tile X:	<input type="text" value="38"/>
				Tile Y:	<input type="text" value="3"/>
				<input type="button" value="Mark Area"/>	<input type="button" value="Clear Area"/>
3. Select File Format:	<input type="radio"/> GeoTiff	<input checked="" type="radio"/> ArcInfo ASCII	<input type="button" value="Click here to Begin Search >>"/>		

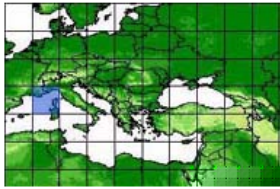



In the following page click the “Data Download” button for the desired file (ftp or http protocol) and wait for the end of the download operation.

Each file is about 40 MB large.

Downloaded files are compressed and should be decompressed and saved to a disc folder.

1 items have been Found.

Description	Location	Image
<p>Product : SRTM 90m DEM version 4</p> <p>Data File Name : srtm_38_04.zip</p> <p>Mask File Name: srtm_mk_38_04.zip</p> <p>Latitude min: 40 N max: 45 N</p> <p>Longitude min: 5 E max: 10 E</p> <p>Center point : Latitude 42.50 N Longitude 7.50 E</p>		

CSI Server :



[Data Download \(FTP\)](#)



[Data Download \(HTTP\)](#)



[Data Mask Download \(FTP\)](#)

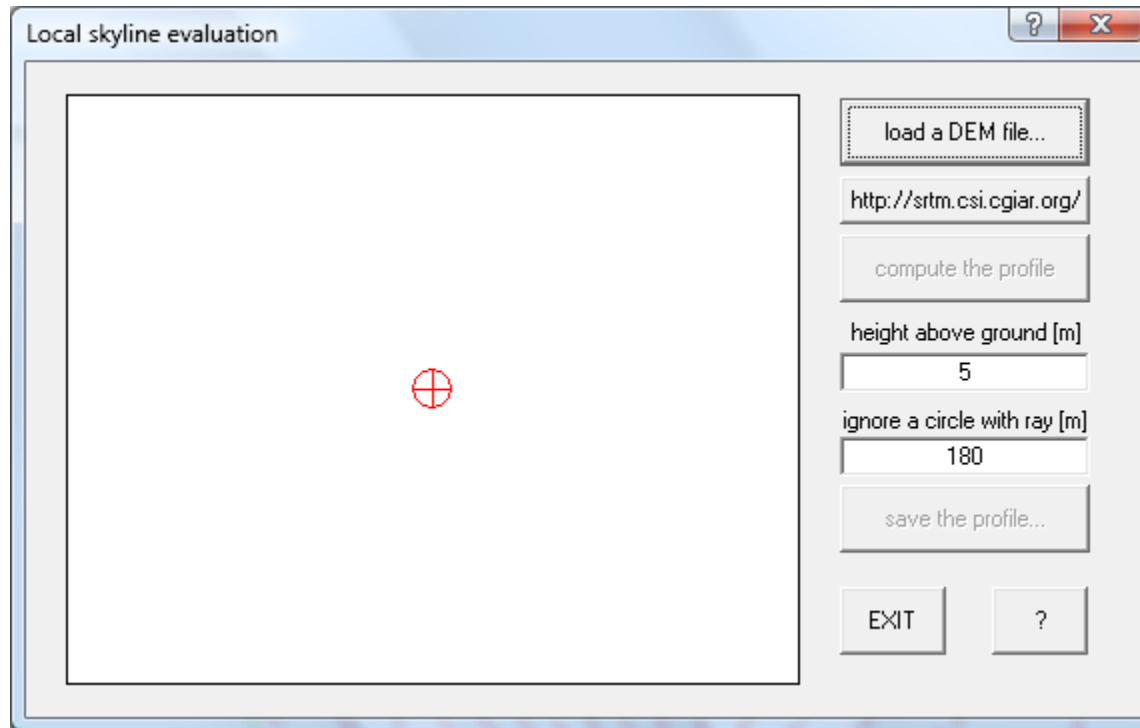


[Data Mask Download \(HTTP\)](#)

[^TOP](#)

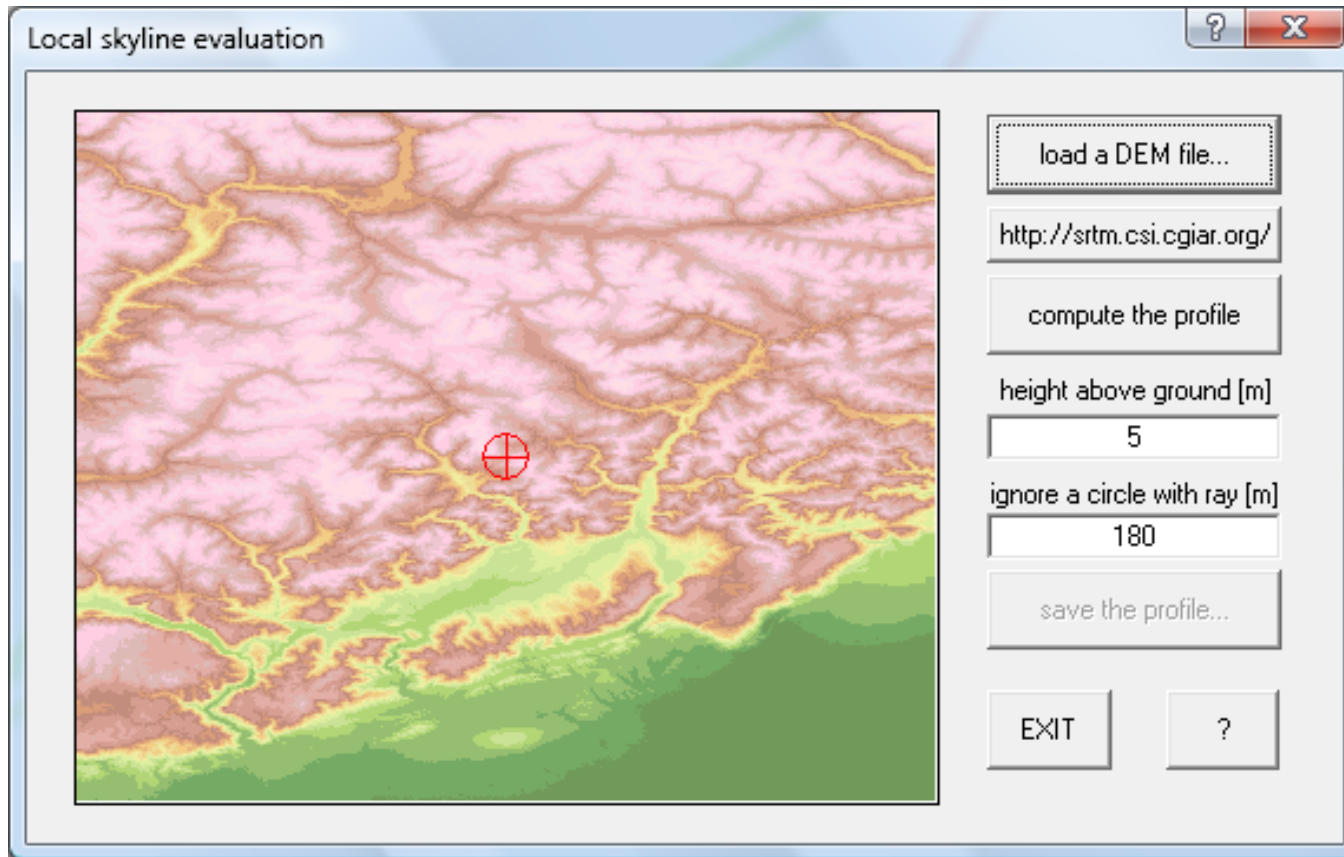
Run Orologi Solari and set the dial coordinates to the geographical coordinates of the place for which you want to compute the horizon profile.

Then select “Tools” → “Evaluate skyline profile”.



Click the “load a DEM file” button and select the .asc file that contains DEM data for the place. Repeat this step until when the map is completely filled.

Data from the DEM file are shown in a map with false colours that represent the altitude of each point. If the place is on the border between different DEM files, more files are to be loaded in order to fulfill the map.



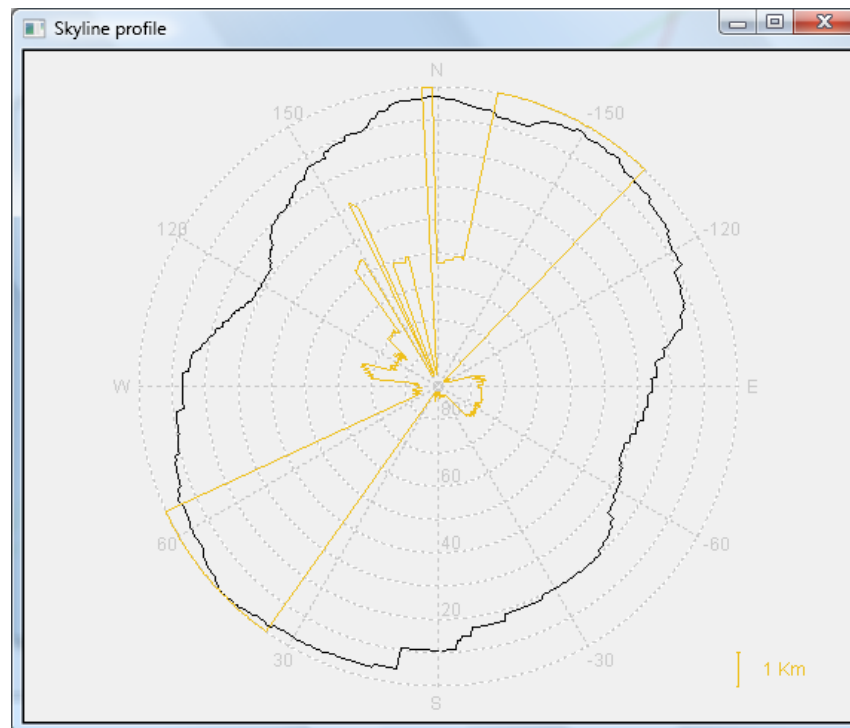
The horizon profile can now be computed.

Two parameters must be introduced in the window:

- the height of the dial (or the observation place) with respect to ground
- the radius of the area around the place that will be excluded from the computation (in order to avoid the strong influence of near points on the final result).

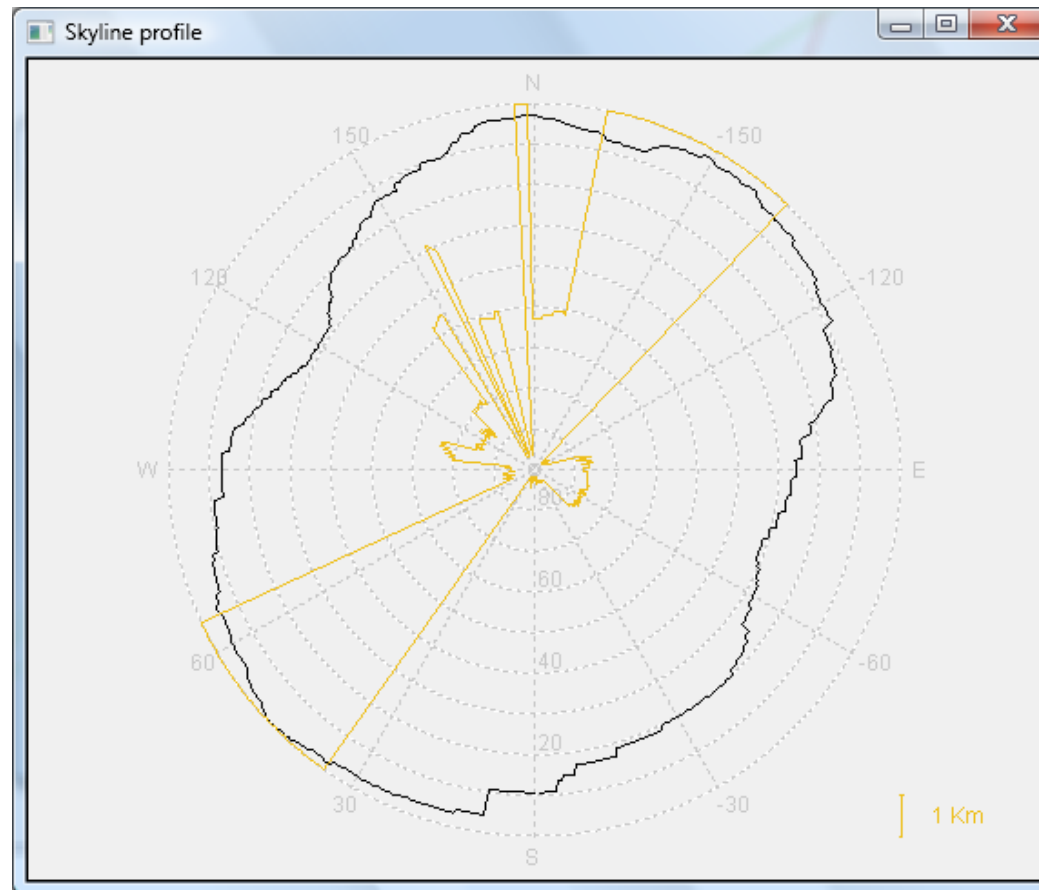
Click the “compute the profile” button to start the evaluation of the profile.

The following window will be displayed at the end of the process.



This window shows two different results as a function of azimuth:

- horizon height or elevation (black line)
- the distance of the horizon profile points from the observation point (orange line – these data can be useful to evaluate the precision of the result but they are not used by the program).



Now results can be saved to a file with the “save the profile” button.

The file has a .ele extension and is formatted as here shown:

	46,32416667	= Latitude	
	-12,09611111	= Longitude	
	720	= NPoints (min 2, max 3600)	
	-180,000000	3,024920	3706,500508
	-179,500000	3,270936	3707,052511
	-179,000000	3,270936	3707,052511
	-178,500000	3,623392	3708,708029
	-178,000000	3,623392	3708,708029
	-177,500000	3,881910	3711,465583
	-177,000000	3,881910	3711,465583
	-176,500000	4,172376	3807,770419
	-176,000000	4,172376	3807,770419
	-175,500000	4,495679	3812,603540
	-175,000000	4,831420	3818,502382
	-174,500000	4,831420	3818,502382
	-174,000000	5,149507	3825,462013
	-173,500000	5,149507	3825,462013

} 2 ÷ 3600 points

azimuth
-180÷180
0 = south

height
0÷90

profile distance
(not used)

The profile can now be used in Orologi Solari as explained in “[How to use the horizon profile](#)”.

If true height measurements are available they can be written in a well formatted .ele file and then used in the OS program.