Sun Position Calculations

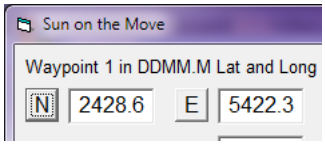
Sun on the move allows calculations of the sun during flight or stationary. The program allows readouts for sunrise, sunset, start and end of twilight (calculation of imsak, Muslim prayer time), sun position (Azimuth and angle relative to the horizon). The calculations are based on either the center or the top rim of the sun (selectable). All calculations are corrected for refraction and altitude, but the horizon (and thus the sunrise / sunset calculation) does not account for mountains or clouds. Also calculated and displayed are the distance in NM (nautical miles), the ground speed in Kts (NM / hour) and the bearing in deg. (initial true track of the great circle between the two waypoints).

Entry formats:

Waypoint: DDMM.M or DDDMM.MN
Latitude accepts 2 digits for degrees, 2 digits for minutes and 1 digit after the decimal point. Range: 0 – 9000.0
Longitude accepts 3 digits for degrees, 2 digits for minutes and 1 digit after the decimal point. Range: 0 – 18000.0
Leading ‘0’ can be omitted, decimal point can be omitted.

Example: 24˚ 28’ 35" / E 054˚ 22’ 18"

enter as:

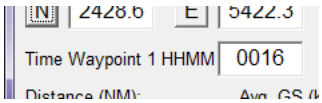


Caution: Minutes can not be omitted, e.g. 54˚N / 30˚W has to be entered as N 5400 W 3000.

Time: HHMM, all entries and readouts are in UTC (GMT).
Time accepts 2 digits for hours and 2 digits for minutes.
Range: 0 – 2359

Example: 00:16am

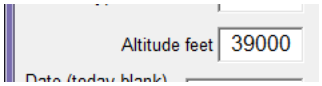
Enter as:



Altitude: Observation altitude, all entries are in feet. Range 0 – 60000 ft. If altitude is left empty, 0 ft is used as default

Example: Flight Level 390 (39'000 feet)

Enter as:

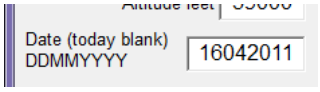


Caution: If you observe at 5000 ft, but you are on ground, enter 0 ft (or leave Altitude field empty), because calculations are based on the theoretical horizon of 0º.

Date: DDMMYYYY, enter date of observation or leave empty. If left empty, the current date is entered automatically.
Range: any valid date.

Example: April 16th. 2011

Enter as:

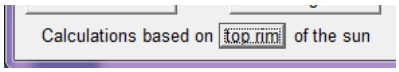


Caution: Dates before 1950 and beyond 2050 will not have the same accuracy, because of Almanac tables used.

Top Rim: If Top Rim is selected, calculations are based on the top rim of the sun. Otherwise (center selected) calculations are based on the center of the sun.
Note: The solar azimuth and angle displayed to the right of the waypoints are always referenced to the center of the sun, irrespective of the top rim / center button selection.

Example: Calculation based on the top rim of the sun.

Enter as:

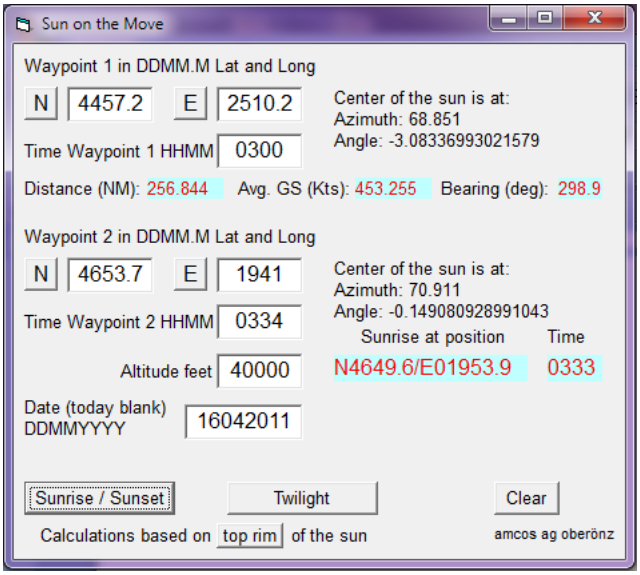


Caution: When changing between center and top rim a new calculation of the sunrise / sunset or twilight has to be started with the respective button.

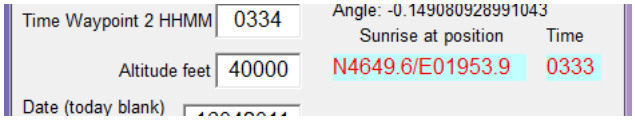
Between waypoints in flight:

Example 1: For calculations in flight, the path between the 2 waypoints is calculated along the great circle. The distance in nautical miles (NM), the average ground speed in knots (Kts or NM per hour) and the bearing (initial true track) between the two waypoints in degrees (deg) are calculated and displayed.

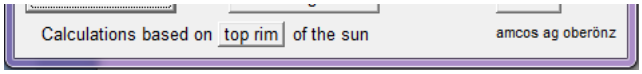
Enter the values as below. Date can be omitted, if the current date is desired for calculation. If altitude is omitted 0 ft is assumed. For this example top rim reference is selected.



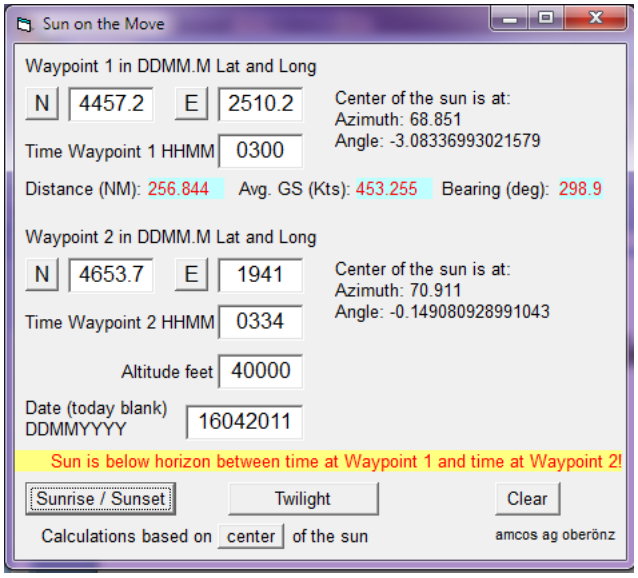
If a sunrise or sunset takes place between the two waypoints and time, the result is displayed in the corresponding fields. The same applies for twilight calculations.



Note that the above calculation was made with the top rim selection enabled. A sunrise does occur, but only the top part of the sun rises above the horizon (see next example).

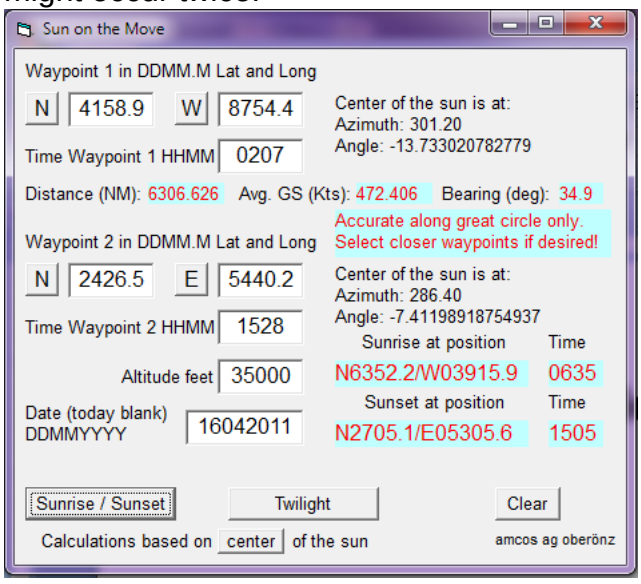


Example 2: The same entries for calculation as the previous example but with calculations based on the center of the sun, would not show a sunrise, because the center of the sun does not raise above the horizon between the 2 waypoints at the given time and altitude.



Note: The position of the center of the sun is always displayed beside the waypoints, irrespective of the center / top rim button selection.

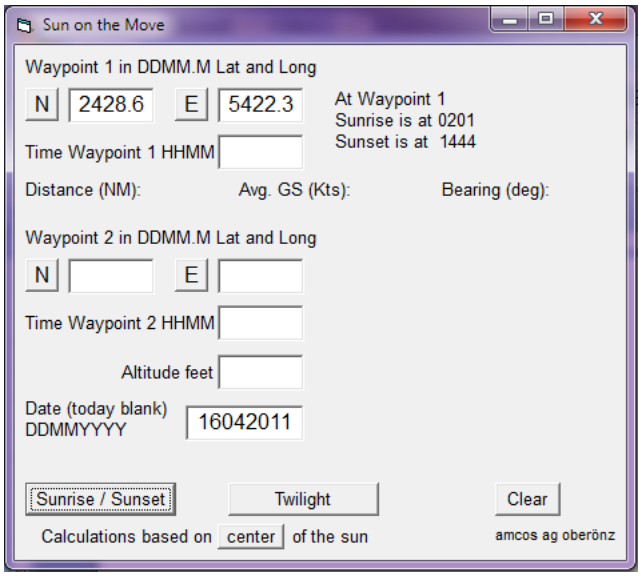
Example 3: When waypoints far apart are selected, sunset and sunrise might occur twice.



Note: The occurrences are calculated along the great circle (shortest distance) between the two waypoints. If the waypoints are chosen far apart (>1000 NM) an accuracy warning is displayed.

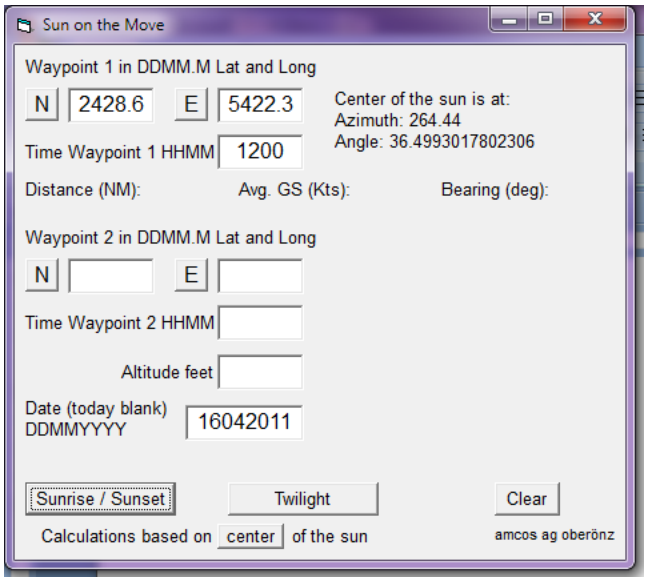
Calculate sunrise / sunset at any location:

Example: To calculate sunrise / sunset or twilight at any location, just enter the geographical position in latitude and longitude of waypoint 1. If all other fields are left blank, the sunrise and sunset or twilight start end times are calculated for the current date and displayed. The date field can be changed as well as the altitude and the top rim or center of the sun reference.



Calculate position and angle of the sun at any location:

Example: To calculate the sun position (Azimuth and angle) at any location, just enter the geographical position in latitude and longitude of waypoint 1 and the desired time in UTC (GMT). If all other fields are left blank, the position of the center of the sun is calculated for the current date and displayed. The date field can be changed as well as the altitude.



Note: The “center”/”top rim” button has no influence on the calculation. The “Sunrise / Sunset” and the “Twilight” buttons both calculate the same result.

Comments and questions:

Please forward questions or report errors to montich@swissonline.ch