CALCLUN ©

Virtual Moon Atlas Ephemeris Calculator

Documentation usable
for the version available on November 15, 2022

Welcome to "CALCLUN" the ephemeris calculation module integrated in the "Virtual Moon Atlas".

As amateur astronomers ourselves, we continue to refine the AVL to design software that is ever more useful for lunar observers and practical for use in the field.

We always try to define the most user-friendly and intuitive features and interface possible.

This is why we have incorporated a lunar ephemeris calculator **designed and programmed by Patrick Chevalley** called "CALCLUN" (c) which allows you to prepare your lunar observation or imaging sessions in detail.
.
This first version includes the functions that we found most useful. We are thinking about other possibilities that will eventually be included in the following versions.

We advise you to read this manual carefully, practicing at the same time the handling of the functions described in order to discover all the functions of the module.

Have a good use and we hope you enjoy this new program and recommend it around you.

Thank you very much for your trust.

**Christian Legrand & Patrick Chevalley**

THE CALCLUN MODULE :

CALCLUN © is a module of the Virtual Moon Atlas calculating lunar ephemerides over durations ranging from a day to a year.

It can be called from the "**Command Cente**r" screen by clicking on the **CALCLUN** button or from the same button in the button bar of the ATLUN module. It is also possible to launch it from the "**Right click**" contextual menu of the **ATLUN** module. Finally, it can be launched from the **calclun.exe** file present in the **VirtualMoon** directory.

It was designed in the same spirit as **DATLUN**©, the **Virtual Moon Atlas** lunar formation database management software also designed and programmed by Patrick Chevalley.

THE CALCLUN SCREEN
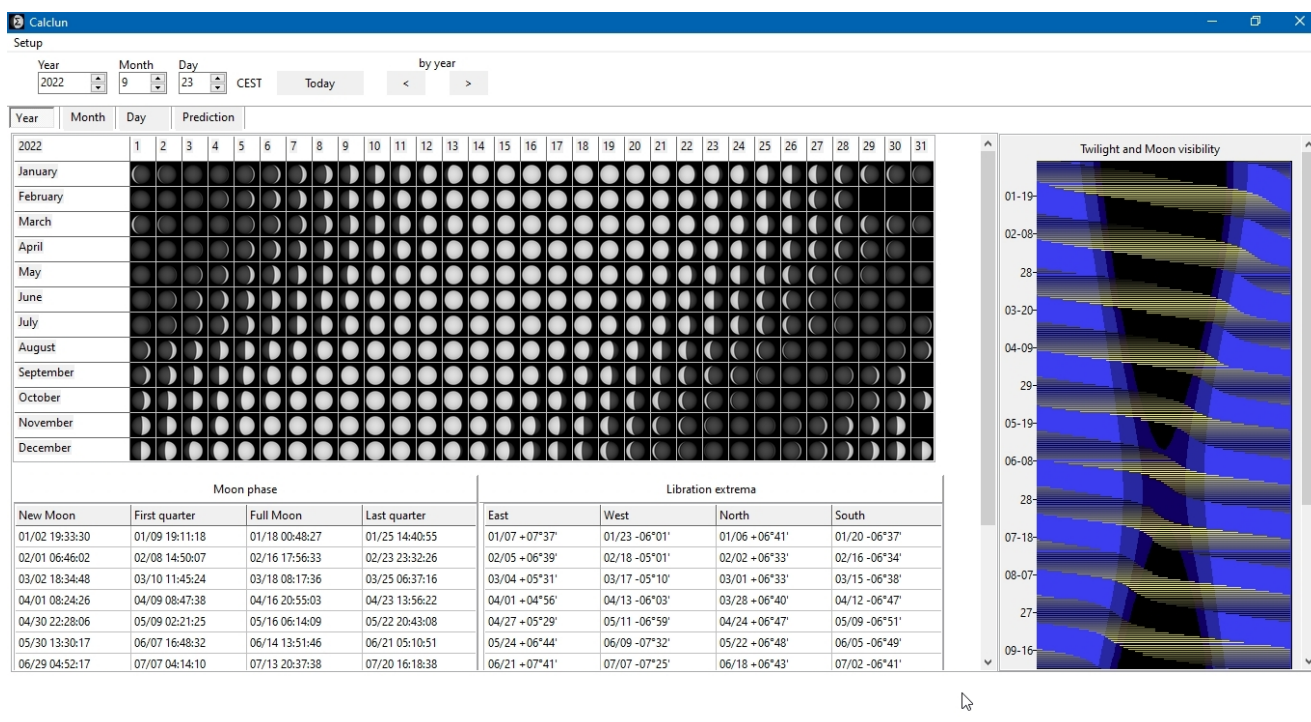
The **CALCLUN** screen fits in a "**Windows**" window. Like all Windows windows, you can minimize, maximize or adapt its size by clicking on the buttons to the right of the title bar. From the **CCLun Command Center**, it is possible to simultaneously open the other VMA modules (**DATLUN / PHOTLUN / WEBLUN / NOTELUN**) and **CALCLUN**, which allows the study of the Moon, while having access to the others VMA functions.

The **CALCLUN** window includes:
- The **menu bar**
- The **date selection banner**
- The **Ephemeris duration selection tabs**
- The **graph window** on the right if there is one.

THE MENU BAR

In CALCLUN, this bar presents only one menu.

THE "Setup" MENU

It is used in CALCLUN to access settings for location, time zone and language. It has only one "**Configuration**" tab.

Observatory coordinates

The software takes into account the coordinates and altitude of the observation site to display the lunar globe in real time and in 3D, taking into account the so-called "diurnal" libration.

"Date / Hour" Frame

The "**Date / Time**" frame allows you to specify the country and the time zone to use. CEST stands for "**Central European Summer Time**". This is indicated from the date internal to your computer if the territory is in daylight saving time.

"Languages" drop-down list

The "Language" drop-down list allows you to choose the language used by the software and the database. In the distributed version, you have French and English.

Are now also available in alphabetical order:
- German
- Catalan
- Croatian
- Spanish
- Greek
- Dutch
- Hungarian
- Italian
- Lithuanian
- Slovak

You can then download from the **VMA** site the translations of the words and expressions used in the menus for the languages not included in the distribution version. The translations page of the **VMA** site also indicates if translations of the database are available in this new language.
You can also offer yourself as a translator in a language not yet supported.

We would particularly like to thank the authors of the already existing translations for their support for our action.

Click on the "**OK**" button once your settings have been made or on the "**Cancel**" button to disregard them.

THE DATE SELECTION BANNER

The top banner allows you to choose a start date for the ephemeris calculation. You can change the year and/or the month and/or the day and validate the changes by pressing the "**Enter**" key. CEST stands for "**Central European Summer Time**". This is indicated from the date internal to your computer if the territory is in daylight saving time.

You can instantly return to today's date by clicking the "**Today**" button.

Finally, you can jump to the previous month or the next month by clicking on the "**<**" or "**>**" buttons.

EPHEMERIDES DURATION SELECTION TABS

"Year" TAB
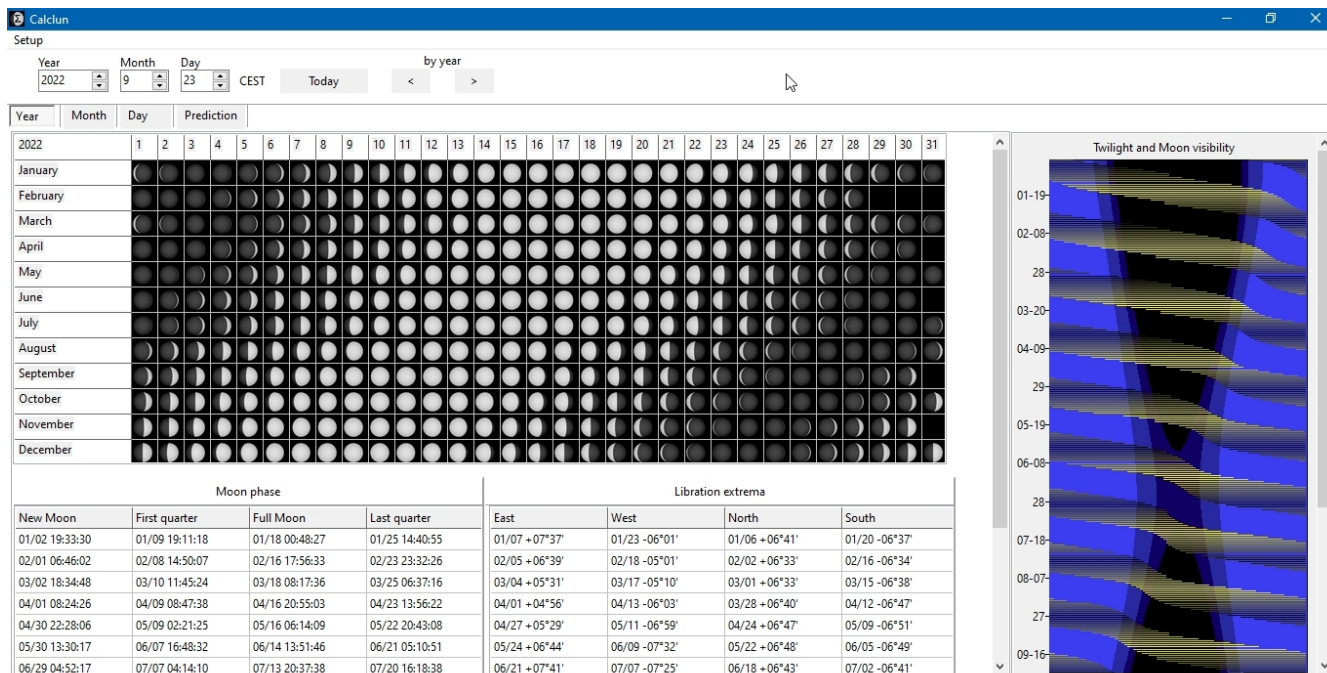
By clicking on this tab, the display will show:
- At the top left an annual graphic calendar of the lunar phases
- Bottom left: A table of the ephemerides of the phases of the Moon and the extrema of the librations for the year.
- On the right: A graphic representation of the visibility of the Moon throughout the year, differentiating between day and night.

"Month" TAB
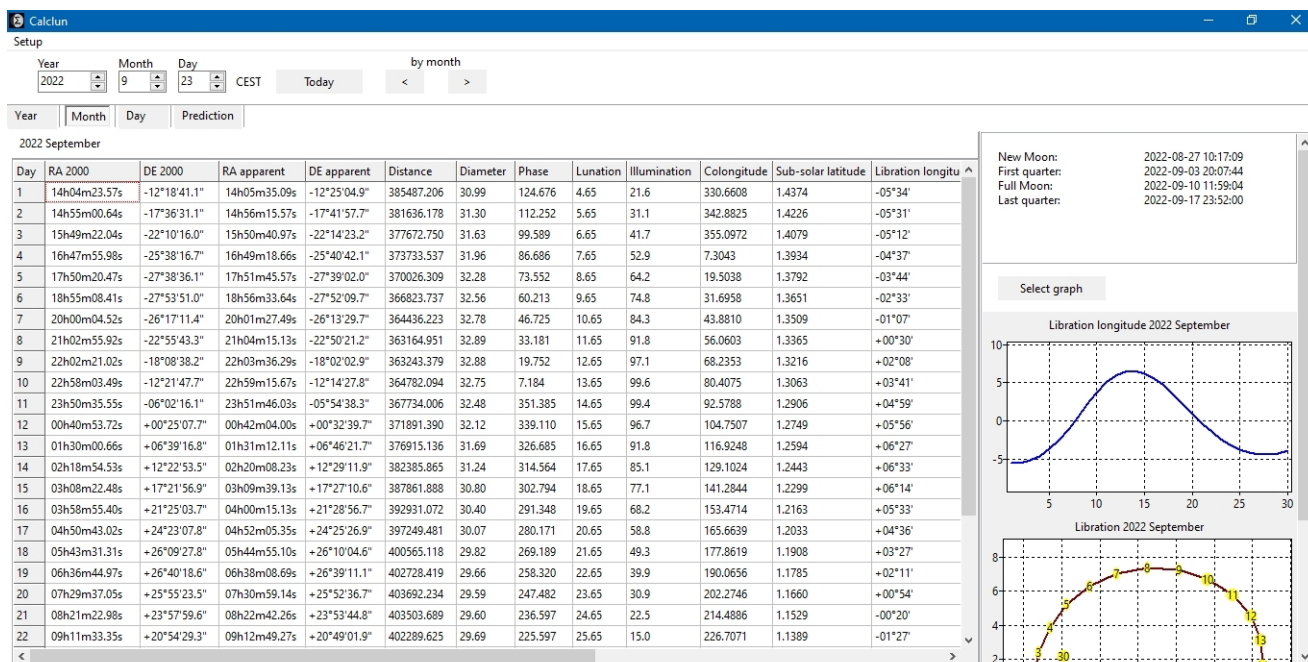
By clicking on this tab, the display will show:
- On the left: the lunar ephemerides of the selected month. Are displayed in column the numerical values over the duration of the month of :
    - Right ascension in coordinates 2000
    - Declination in 2000 coordinates
    - Apparent right ascension
    - Apparent variation
    - Distance in km
    - Diameter in minutes of arc
    - Phase as the terminator value over 360° of longitude.
    - Number of days of the Lunar Season
    - Illumination of the Visible Face from 0 to 100%
    - Colongitude as the lunar morning terminator value over 360° longitude
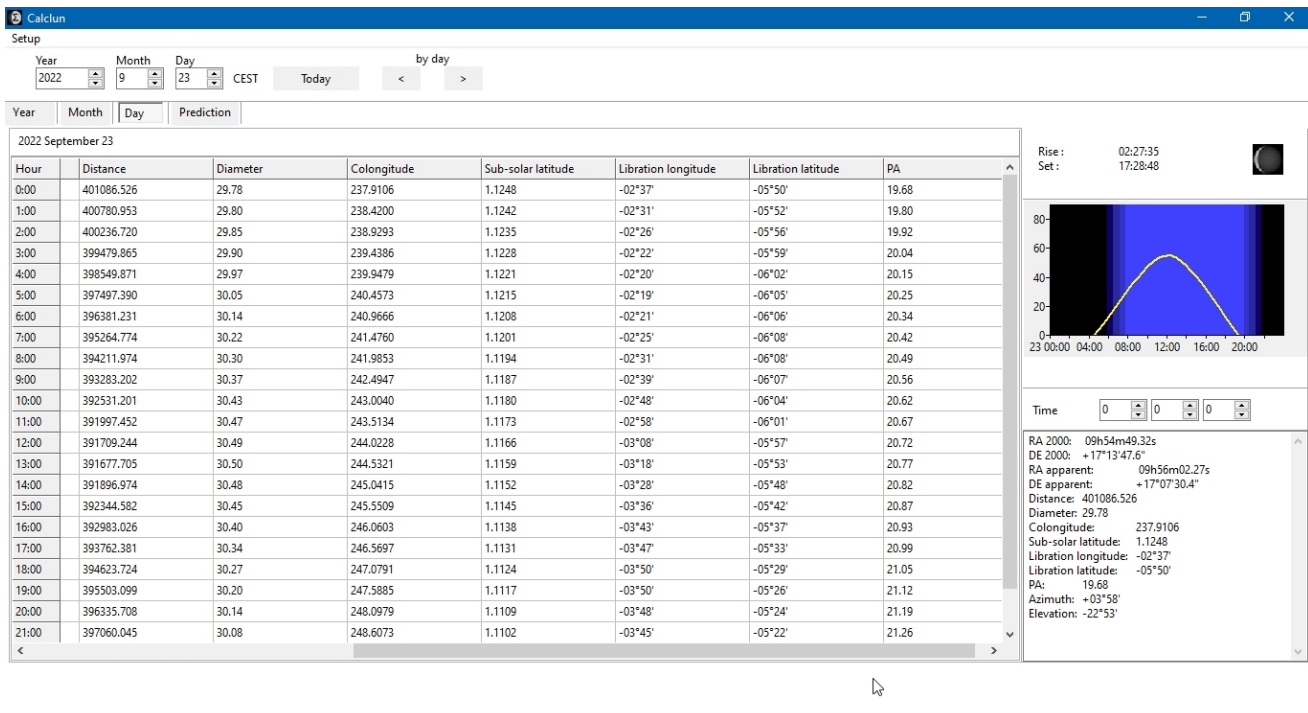   - Sub-solar latitude (Latitude of the place on the lunar surface where the Sun is at its zenith).
    - Liberation in longitude
    - Liberation in latitude
    - PA is for "Position Angle", the angle between North Celestial Pole (NCP) and the Moon.
    - Sunrise time
    - Bedtime

- Top right: A frame with the dates and times of the Quarters, New Moon and Full Moon of the month.

- A "Chart selection" button which gives access to the drop-down list of chart types that will be displayed under the button.
    - Right ascension in coordinates 2000
    - Declination in 2000 coordinates
    - Apparent right ascension
    - Apparent variation
    - Distance in km
    - Diameter in minutes of arc
    - Phase in the form of the graph of the value of the terminator over 360° of longitude
    - Number of days of the Lunar Season
    - Illumination of the Visible Face from 0 to 100%
    - Colongitude in the form of the graph of the value of the lunar morning terminator on 360° of

      longitude
    - Sub-solar latitude (Latitude of the place on the lunar surface where the Sun is at its zenith)
    - Libration in longitude showing a graph of the libration in longitude and a graph of the global libration
    - Libration in latitude showing a graph of the libration in latitude and a graph of the global libration
    - PA is for "Position Angle", the angle between North Celestial Pole (NCP) and the Moon.
    - Sunrise time showing a graph of the sunrise time and a diagram of the visibility during the month
    - Set time showing a set time graph and visibility diagram during the month

- One or two frames displaying the graphs selected in the drop-down list showing the variation of the parameter(s) chosen with the values of the grids inserted in the ordinate and abscissa.

"Day" TAB

Calclun — Setup

Year 2022 | Month 9 | Day 23 | CEST | Today | < | > | by day

Year | Month | Day | Prediction

2022 September 23

Hour	Distance	Diameter	Colongitude	Sub-solar latitude	Libration longitude	Libration latitude	PA
0:00	401086.526	29.78	237.9106	1.1248	-02°37'	-05°50'	19.68
1:00	400780.953	29.80	238.4200	1.1242	-02°31'	-05°52'	19.80
2:00	400236.720	29.85	238.9293	1.1235	-02°26'	-05°56'	19.92
3:00	399479.865	29.90	239.4386	1.1228	-02°22'	-05°59'	20.04
4:00	398549.871	29.97	239.9479	1.1221	-02°20'	-06°02'	20.15
5:00	397497.390	30.05	240.4573	1.1215	-02°19'	-06°05'	20.25
6:00	396381.231	30.14	240.9666	1.1208	-02°21'	-06°06'	20.34
7:00	395264.774	30.22	241.4760	1.1201	-02°25'	-06°08'	20.42
8:00	394211.974	30.30	241.9853	1.1194	-02°31'	-06°08'	20.49
9:00	393283.202	30.37	242.4947	1.1187	-02°39'	-06°07'	20.56
10:00	392531.201	30.43	243.0040	1.1180	-02°48'	-06°04'	20.62
11:00	391997.452	30.47	243.5134	1.1173	-02°58'	-06°01'	20.67
12:00	391709.244	30.49	244.0228	1.1166	-03°08'	-05°57'	20.72
13:00	391677.705	30.50	244.5321	1.1159	-03°18'	-05°53'	20.77
14:00	391896.974	30.48	245.0415	1.1152	-03°28'	-05°48'	20.82
15:00	392344.582	30.45	245.5509	1.1145	-03°36'	-05°42'	20.87
16:00	392983.026	30.40	246.0603	1.1138	-03°43'	-05°37'	20.93
17:00	393762.381	30.34	246.5697	1.1131	-03°47'	-05°33'	20.99
18:00	394623.724	30.27	247.0791	1.1124	-03°50'	-05°29'	21.05
19:00	395503.099	30.20	247.5885	1.1117	-03°50'	-05°26'	21.12
20:00	396335.708	30.14	248.0979	1.1109	-03°48'	-05°24'	21.19
21:00	397060.045	30.08	248.6073	1.1102	-03°45'	-05°22'	21.26

Rise : 02:27:35
Set : 17:28:48

Time 0 | 0 | 0

RA 2000: 09h54m49.32s
DE 2000: +17°13'47.6"
RA apparent: 09h56m02.27s
DE apparent: +17°07'30.4"
Distance: 401086.526
Diameter: 29.78
Colongitude: 237.9106
Sub-solar latitude: 1.1248
Libration longitude: -02°37'
Libration latitude: -05°50'
PA: 19.68
Azimuth: +03°58'
Elevation: -22°53'

By clicking on this tab, the display will show:
- On the left: the lunar ephemerides of the day selected hour by hour. Are displayed in column the numerical values on the length of the day of:
    - Right ascension in coordinates 2000
    - Declination in 2000 coordinates
    - Apparent right ascension
    - Apparent variation
    - Distance in km
    - Diameter in minutes of arc
    - Phase in the form of the graph of the value of the terminator over 360° of longitude.
    - Number of days since the beginning of the Lunation
    - Illumination of the Visible Face from 0 to 100%
    - Colongitude as the longitude of the lunar morning terminator over 360° of longitude
    - Sub-solar latitude (Latitude of the place on the lunar surface where the Sun is at its zenith).
    - Liberation in longitude
    - Liberation in latitude
    - PA is for "Position Angle", the angle between the Celestial North Pole and the Moon.

- At the top right, a frame with the moonrise and moonset times for the chosen day, as well as a graphic representation of the phase

- Below a frame showing the elevation of the Moon above the horizon according to the hours.

- Three drop-down lists to choose a specific time to the nearest second

- A frame presenting the values of the following parameters for the precise time specified:
    - Right ascension in coordinates 2000
    - Declination in 2000 coordinates

- Apparent right ascension
- Apparent variation
- Distance in km
- Diameter in minutes of arc
- Colongitude as the lunar morning terminator value over 360° longitude
- Sub-solar latitude (Latitude of the place on the lunar surface where the Sun is at its zenith).
- Liberation in longitude
- Liberation in latitude
- PA is for "Position Angle", the angle between the Celestial North Pole and the Moon.
- 360° azimuth with North at 0°
- Elevation in degrees, positive above the horizon and negative below

"Prediction" TAB

By clicking on this tab, the display will show three tabs allowing forecasts on colongitude (Longitude of the morning lunar terminator), on the elevation of the Sun above a given formation or on the global lunar libration.

"Colongitude" TAB

This sub-tab includes:
- Top left: a frame for entering the desired colongitude with its width of the terminator taken into account.
- Top center: a frame for entering the forecast time interval.
- Top right: a box for entering the observation constraints that you wish to take into account (Night observation and selection of the observation time after sunset, visibility of the Moon from the place of observation, height minimum of the Moon above the horizon if there are obstacles.
- At the bottom: the results table of the forecast calculation

"Sun elevation on a formation" TAB

This sub-tab includes:
- At the top on the far left: a search framework for the desired formation. Enter the name in the box and click on the "Search" button. Then click on the formation that interests you in the drop-down list that appears.
- Top left: a box for entering the coordinates of the formation if it is not in one of the databases.
- Top center: a frame for entering the Sun's elevation limit constraints.
- Top right: a frame for entering the forecast duration targeted by the calculation.
- At the top on the far right: a frame for entering the observation constraints that you wish to take into account (Night observation and selection of the observation time after sunset, visibility of the Moon from the place of observation, minimum height of the Moon above the horizon if there are obstacles.
- Bottom: two tables of forecast calculation results for increasing solar elevation (Morning Terminator) and for decreasing solar elevation (Evening Terminator).

"Libration" TAB

This sub-tab includes:
- At the top on the far left: a search framework for the desired training. Enter the name in the box and click on the "Search" button. Then click on the training that interests you in the drop-down list that appears.
- Top left: a box for entering the coordinates of the training if it is not in one of the databases.
- Top center: a frame for entering the desired libration stresses.
- Top right: a frame for entering the forecast duration targeted by the calculation.
- At the top on the far right: a frame for entering the observation constraints that you wish to take into account (Night observation and selection of the observation time after sunset, visibility of the Moon from the place of observation, minimum height of the Moon above the horizon if there are obstacles.
- At the bottom: the results table of the prediction calculation

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"CALCLUN" MANUAL END

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The authors kindly ask users to report any errors found in this manual to them through the forum on the website.