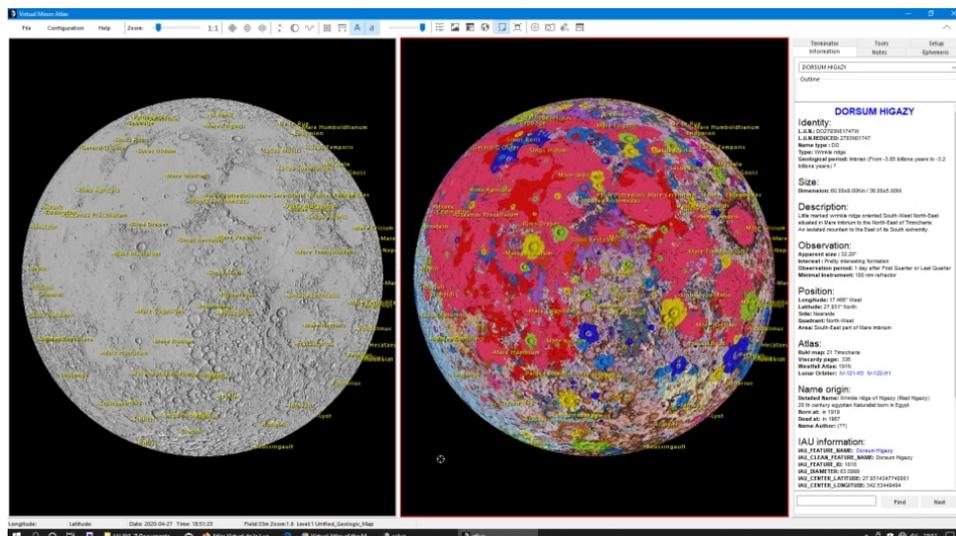
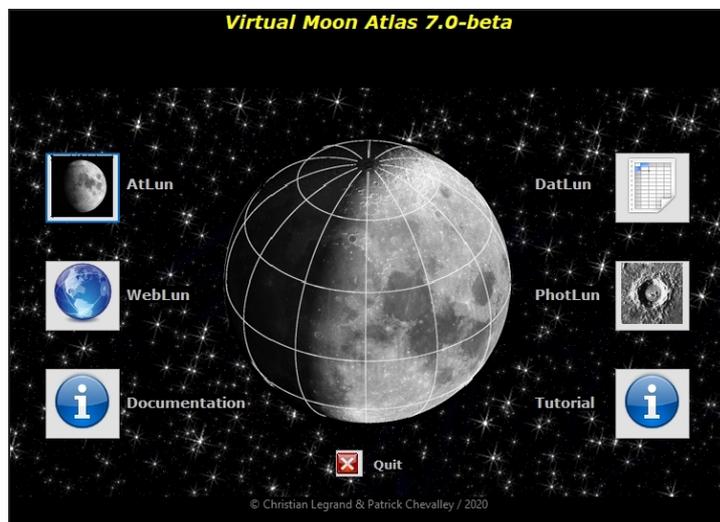


VIRTUAL MOON ATLAS

USER'S MANUAL



© Christian LEGRAND & Patrick Chevalley

May 2020

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WELCOME TO THE VIRTUAL MOON ATLAS MANUAL

For 18 years, as amateur astronomers ourselves, we have continued to perfect the AVL to design a software that is always more useful for Moon observers, more practical for use in the field and which may be of interest to professionals as a tool. basic. We are always trying to define the most user-friendly and intuitive features and interface.

Having devoted 4 years of development to the first two versions of the "Virtual planets Atlas" (<http://www.ap-i.net/avp/fr/start>) we had temporarily stopped developing VMA. But today, new data having been collected by an army of new lunar probes, we have the "material" to release a new version. We are happy to present to you now after three years of development the two new issues of the "**Virtual Moon Atlas Version 7**":

The **Version 7.0** is usable on **Windows** computers with powerful configurations with high resolution textures, large databases, scientific layers, bi-windowing, "full screen" and double screen display, as well as dynamic shadows on the terminator.

This version can be downloaded free of charge from the VMA website. They can be supplemented by the numerous image libraries which can also be downloaded free of charge from the VMA website.

Please note that we have abandoned the development of the MacOs version of VMA, given the increasing complexity of adapting graphics cards to Apple computers (c). It seems that VMA can be run under Wine, Parallels or Crossover emulators.

Also, we stop the Linux version development since we encounter technical difficulties and that we know that the windows version runs well with Wine emulator on Linux.

Please also note that since Windows XP (c) is absolutely no longer supported by Microsoft (c), we no longer provide installation packages for this OS.

WINDOWS "SD" CARD VERSION

We chose the SD card as the new distribution medium because of its large capacity with maximum compactness. In addition, the user can re-use this medium for personal purposes.

You can order "SD" versions from the VMA website if you want to support us or because you do not have a fast internet connection or if you prefer a quick and convenient installation.

This version can be used with powerful configurations. The SD contains the Windows

version with an installation program, all modules, all textures up to level L6, all scientific layers and several public domain image libraries (LOPAM, Apollo, Apollo Mapping, LAC / LM, Clementine and Consolidated Lunar Atlas).

This SD version can be completed with high resolution textures and others non public images libraries (Best of Amateurs, Best of Peach, Best of Cathala, Best of Pic du Midi, Kaguya ...) also downloadable for free from the website VMA, if you want to make the program even more efficient.

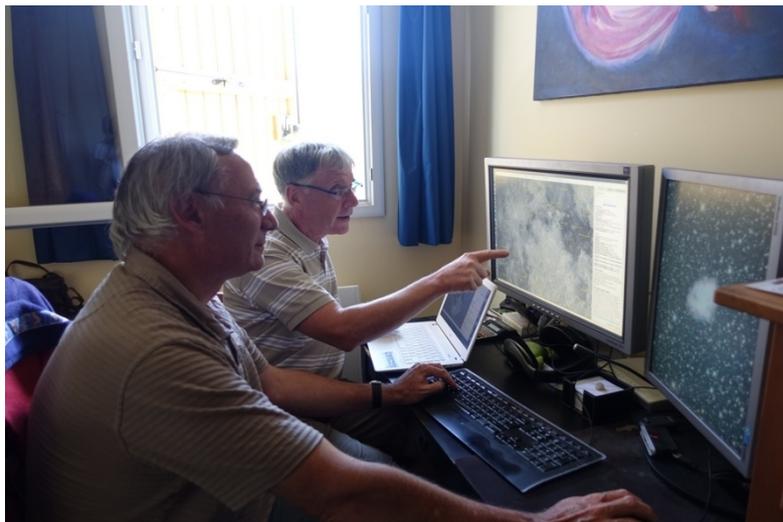
WHY THIS MANUAL?

Even if VMA is relatively easy to access, this manual is necessary to discover all of the possibilities of the ever-increasing software. We advise you to read it carefully while at the same time practicing the functions described.

Good use and we hope you enjoy this program and recommend it around you.

Thank you all for your trust which has enabled us to continue developing the Atlas since **18 years !**

Christian Legrand & Patrick Chevalley



The authors at full work ! In the foreground P. Chevalley and in the background C. Legrand

ATLUN

Maps manager of the Virtual Moon Atlas

Documentation for the version
available on May 15th 2020

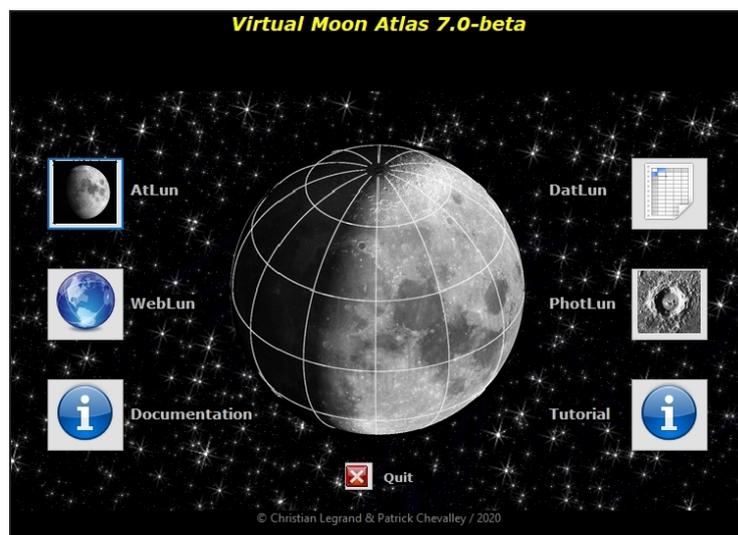
The "Virtual Moon Atlas" version 7 currently includes 4 modules:

- The "**ATLUN**" (c) module : it is the mapping module which is the basic module of the VMA. This manual describes its functionality.
- The "**DATLUN**" (c) module : it is the database management module which has particularly powerful sorting functions. **It has its own manual.**
- The "**PHOTLUN**"(c) module : this is the image library management module which has particularly powerful processing functions. **It has its own manual.**
- The "**WEBLUN**" (c) module : this is the database management module which has particularly powerful sorting functions. **It has its own manual.**

These modules are launched from the "**VMA COMMAND CENTER**"

THE "COMMAND CENTER"

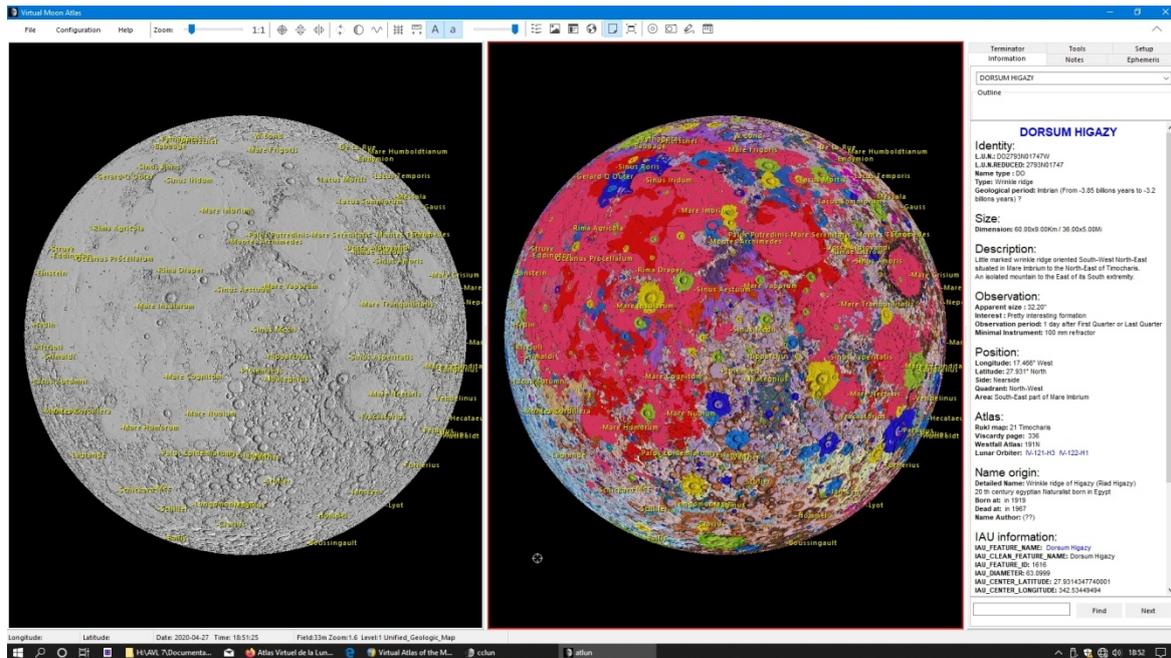
The "**VMA COMMAND CENTER**" presents buttons that can start every VMA modules or the documentations.



VMA Command Center screen

The "VMA COMMAND CENTER" screen presents 7 buttons usable today :**Atlun** : To start the lunar mapping software
DatLun : To start the lunar formations databases manager
WebLun : To start the lunar Web sites manager
PhotLun : To start the pictures libraries manager
Documentation : To open the present documentation
Tutoriel : To open the VMA tutorial
Quitter : To exit the VMA

THE "ATLUN MODULE" SCREEN



**ATLUN screen on 16: 9/22 "monitor with:
 Left : New texture "LOLA-Kaguya shaded"
 Right : New texture "USGS Geological 2020"**

For this new version 7.0, we have modernized the display of the main window with a new set of icons, new buttons, an adaptation to dark Windows (c) themes and now retractable tabs. It is also possible to split the window display on two independent monitors.

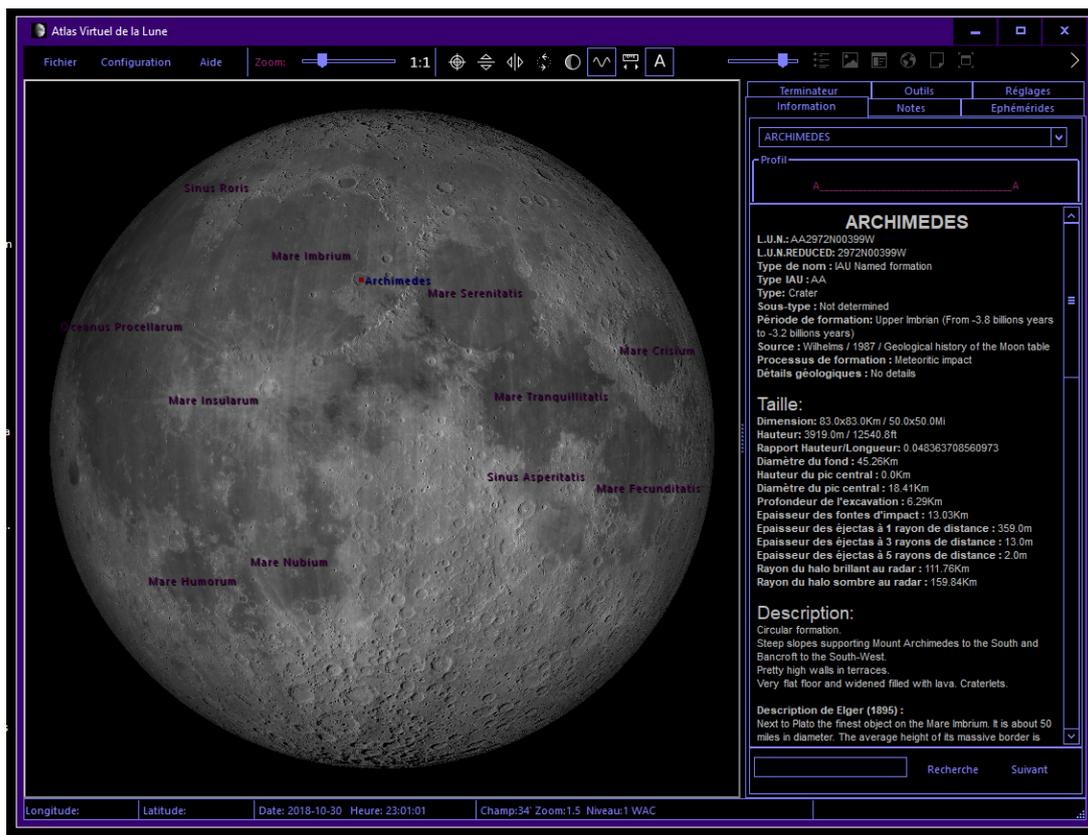
"ATLUN" screen appears in a "Microsoft Windows style" window. As you can see, the aspect is also the same on MacOS.

As usual, you can minimize or maximize the window, or choose its size with the buttons in the title bar, on right. You can open simultaneously two map windows, permitting maps comparisons as on the picture above. It's also possible to open the window of "DATLUN" (c), WEBLUN (c) and "PHOTLUN" (c).

Main window presents:

- Menus and buttons bar
- Map window that can be cut in two map windows as above
- tabs "Information", "Ephemeris", "Notes", "Tools", "Settings" and "Terminator" and the associated windows.
- Status bar with lots of information displayed in real time.

VMA can use dark Windows themes to limit glare or for simple aesthetic reasons

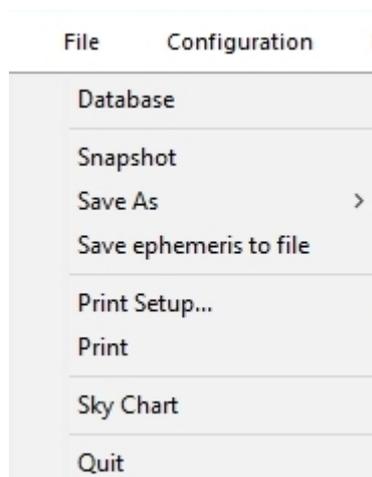


THE MENUS AND BUTTONS BAR



This bar presents menus to access different functions and buttons to quick launch of some other useful functions.

THE "FILE" MENU



Traditional in all Windows softwares, this menu is used here to open DATLUN (c), save screen pictures, to setup printing, to launch Patrick Chevalley's freeware "**Sky Charts**" if it's installed on your computer, and to quit the atlas.

"Databases" FUNCTION

This function opens a new window containing VMA database manager **DATLUN**

"Snapshot" FUNCTION

This function can open a new small window containing a map window capture. You can compare this capture with a new configuration applied to the map window.

"Save as" FUNCTION

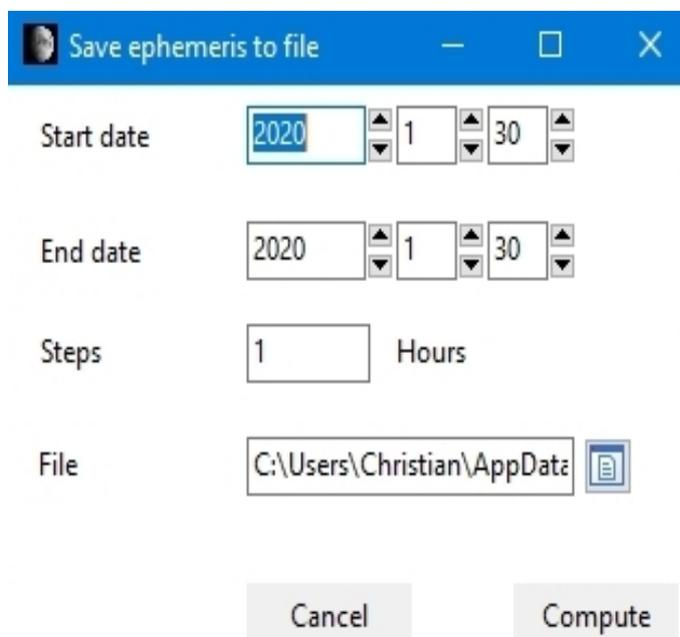
This function permits you to save the "**Map**" window as a .jpg or a .bmp file

"Printer setup" FUNCTION

This function permits you, with the use of the regular window selection, to choose your printer and to setup it.

"Save ephemeris to file" FUNCTION

This function allows you to save in a file "ephem.csv". It opens a window for choosing the deadlines, the recording step and the file saving directory. The "Compute" button creates the file from the specified dates and times. The button to the right of the "File" field allows you to choose the recording directory.



The screenshot shows a Windows dialog box titled "Save ephemeris to file". It has a blue title bar with a close button. The dialog contains the following fields and controls:

- Start date:** A date picker showing 2020, 1, 30.
- End date:** A date picker showing 2020, 1, 30.
- Steps:** A text input field containing "1" followed by the unit "Hours".
- File:** A text input field containing "C:\Users\Christian\AppData" with a folder selection icon to its right.
- Buttons:** "Cancel" and "Compute" buttons at the bottom.

"Print" FUNCTION

This function allows you to print the documents you chose in the [printed documents](#) (Map, ephemeris and / or information page).

"Sky chart" FUNCTION

This option is used to launch Patrick Chevalley's freeware "Sky Charts" to determine Moon position according to stars and horizon. It can help you for star occultations for example.

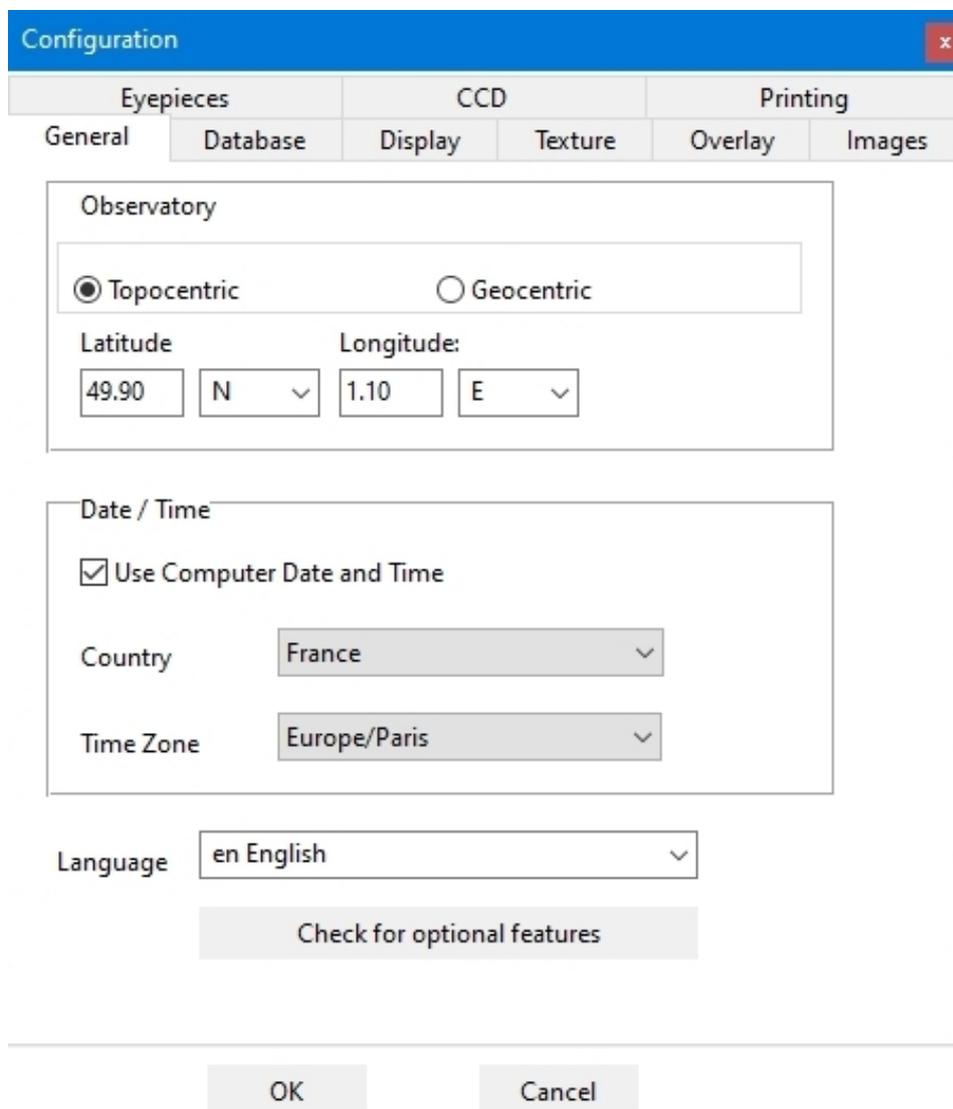
"Quit FUNCTION

You can leave the software using this option, closing all the open windows together.

THE "CONFIGURATION" MENU

This menu is used to adjust different parameters in **VMA**. It presents eight tabs

"General" tab



The screenshot shows the "Configuration" dialog box with the "General" tab selected. The dialog has a blue title bar with the text "Configuration" and a close button (X). Below the title bar are several tabs: "Eyepieces", "Database", "Display", "Texture", "Printing", "Overlay", and "Images". The "General" tab is active and contains the following settings:

- Observatory**
 - Radio buttons for Topocentric and Geocentric.
 - Latitude: 49.90, with a dropdown menu set to "N".
 - Longitude: 1.10, with a dropdown menu set to "E".
- Date / Time**
 - Use Computer Date and Time.
 - Country: France (dropdown menu).
 - Time Zone: Europe/Paris (dropdown menu).
- Language: en English (dropdown menu).
- Check for optional features (button).

At the bottom of the dialog are "OK" and "Cancel" buttons.

Observatory coordinates

Selecting "**Geocentric coordinates**", you will see the lunar globe as if you were positioned on the line joining the center of the Earth to the center of the Moon.

The software can instead use coordinates of your observing site to display a real time lunar disk with computations including diurnal libration.

To do this, you have to de-activate "**Geocentric coordinates**" (uncheck it) and input the latitude and longitude of your observing site.

Input also the time shift from GMT including eventual "summer time" in the "**Time zone**" field.

"Date / Hour" frame

The "**Date / Hour**" frame is used to precise the hour and the time zone to use.

Filling the box "**Use computer hour and time zone**" so that VMA use the computer internal clock as a reference.

If you don't fill the box, you can specify your own time zone with the case displayed.

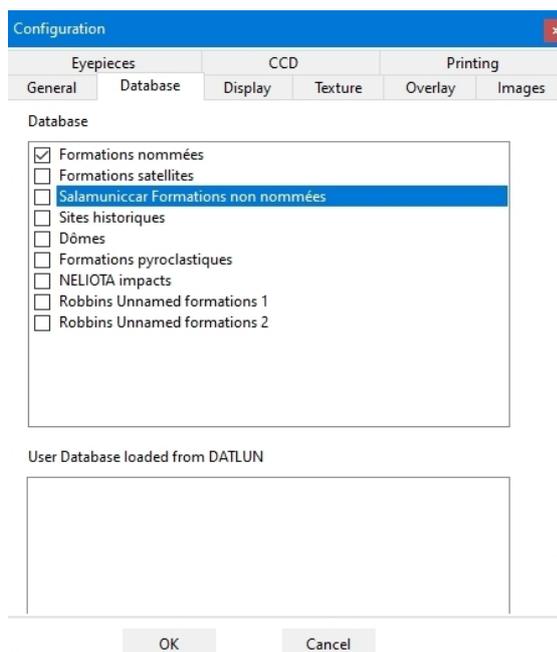
"Language" scrolling list

"**Languages**" scrolling list allows you to choose language used by the program and database. In this version, beyond French and English are now available in alphabetical order : Catalan, Czech, Dutch, German, Greek, Hungarian, Italian, Lituanian, Slovenian, Spanish

. You can also download from VMA Internet site, translations of words used in the menus in some other languages. Translation pages indicate if database translations are also available. You can also propose yourself to Patrick Chevalley if you are interested to translate VMA in your language if it's not yet done.

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

"Databases" tab



"Databases" boxes

The displayed databases are those automatically recognized by ATLUN.

"**Databases**" boxes allow you to choose the databases used together by the software. Check only the one useful if your computer is not too powerful. When all databases are selected, VMA has more than 1 300 000 entries to manage.

The "**DATLUN Personal Databases**" frame allows you to enter the access paths of the personal databases that you wish to link to ATLUN and DATLUN. Please note, these databases must be in "**csv**" format and have the same fields as the databases developed for VMA by Christian Legrand. The import procedure is described in the DATLUN manual and in the DATLUN program itself.

New databases are constantly on work and are released with new VMA versions.

"Display" tab

The screenshot shows the 'Configuration' dialog box with the 'Display' tab selected under the 'CCD' category. The dialog is divided into three main sections:

- Phase and Libration:** Two checkboxes, 'Show the phase' and 'Show the libration', are currently unchecked.
- Color:** Three color swatches are shown: a green square for 'Identification', a red square for 'Mark', and a yellow square for 'Label'.
- Mark and Label Settings:**
 - 'Mark the point of maximum libration' is unchecked.
 - 'Show mark' is checked.
 - 'Mark size' is controlled by a slider set to approximately 50%.
 - 'Show label' is checked.
 - 'Center label on the formation' is unchecked.
 - 'Short Label' is unchecked.
 - 'Labels font' is set to 'Default'.
 - 'Label density' is controlled by a slider set to approximately 75%.

At the bottom right, there is a 'Default' button. At the bottom center, there are 'OK' and 'Cancel' buttons.

Display boxes

When clicking the "**Show the phase**" box, a penumbra zone is painted on the lunar globe. Its limit follows the terminator for the date and hour set by the user (See "[Ephemeris tab](#)"). You can set the penumbra properties representation (See "[Setup tab](#)").

When clicking the "**Show the libration**" box, the lunar globe turns slightly so that it shows the effects of the global libration for the date and hour set by the user (See "[Ephemeris tab](#)"). You can set the penumbra properties representation (See "[Setup tab](#)").

The libration display takes account of the latitude libration due to the Moon orbit inclination and of the longitude libration due to the Moon variable speed on its elliptical orbit. More, if you choose to input your observing site coordinates (See "[Observatory coordinates](#)")., the Moon globe will take account also of the diurnal libration.

Colors

Clicking on the small colored squares allows you to choose colors indicating point and formation name label displayed on map.

Labels and marks

Activating the corresponding boxes will make you display a point showing the chosen formation and / or its official name

When clicking on the "**Mark the point of maximum libration**" box, an arrow is displayed on the lunar limb where libration effects are maximum.

Activating the corresponding boxes, you display the point (mark) showing the chosen formation, its official name, and the names of the other principal formations visible on the map.

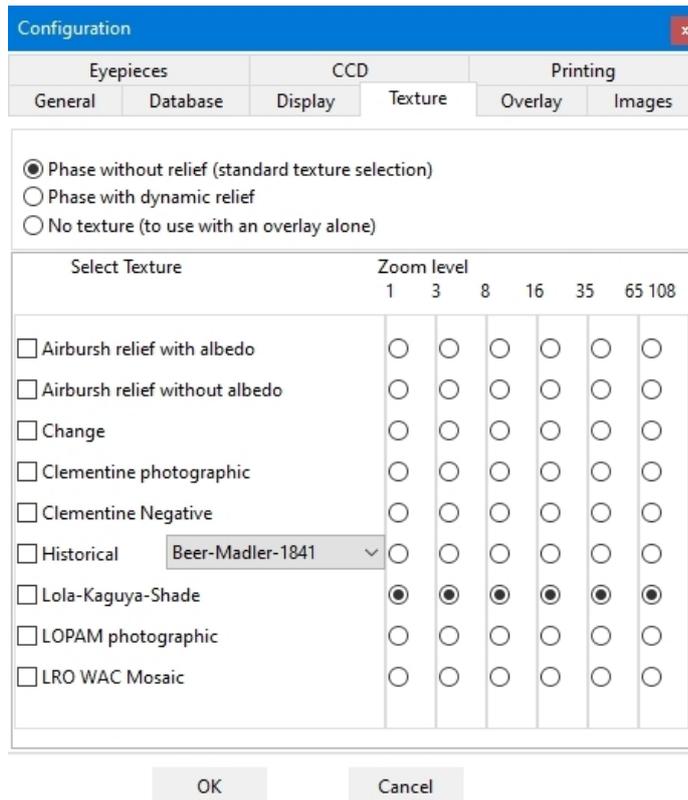
You can choose to center or to place on the right of the formation when using or not the "**Center label on formation**" box.

The button "**Labels font**" can be used to setup font type, size and style. The active font name is displayed right to the button.

The slider "**Label density**" can be used to setup the number of names displayed. You will certainly have several tests to determine the best compromise. These button and slider are also used to setup map printing because the printed map is exact clone of the map displayed in the screen window.

These two setups are also used to set the map's impression since the printed map is the exact copy of that displayed in the window.

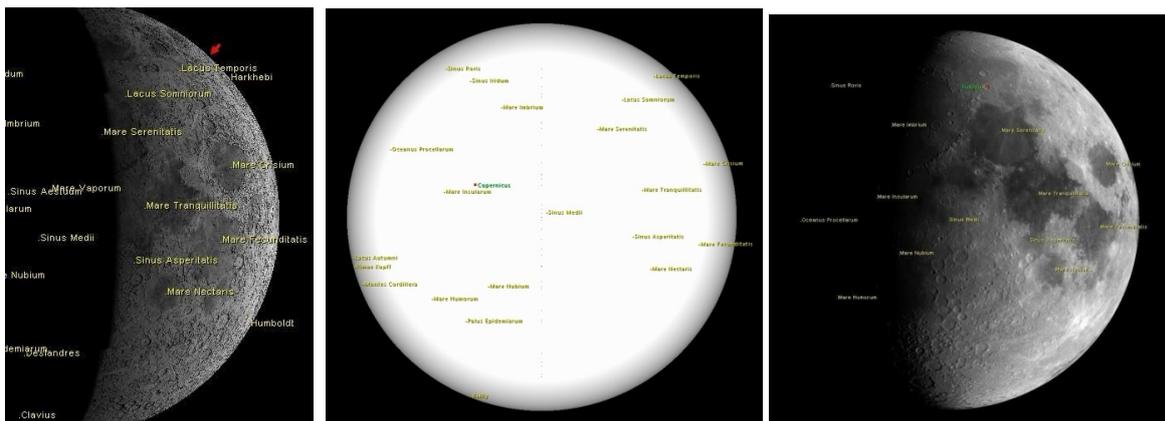
"Textures" tab



This tab allows you to choose the textures to apply depending on the zoom level reached.

« Phases » frame

The three alternative boxes to check "**Phase with relief**", "**Phase without relief**" and "**No texture**" are used to choose whether or not to activate the dynamic display of shadows at the terminator:

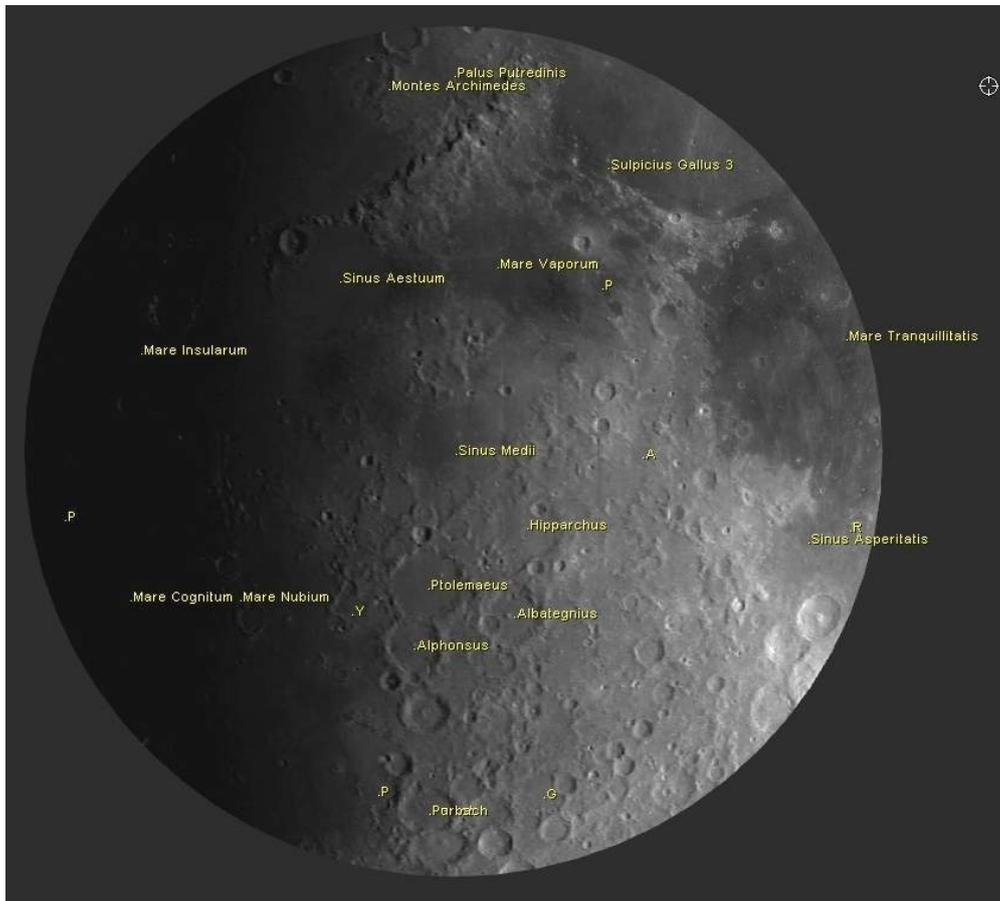


Phase without "Dynamic shadows" display on the terminator

With display "Not texture", blank globe that can receive a single scientific layer

Phase with regular "Dynamic shadows" display on the terminator

This option gives a more realistic view, but doesn't permit a high power zoom. The use of the new « Digital Elevation Model » coming from LRO probe datas has improved the shadows on terminator compared to our previous DEL.



Eyepiece field with special "LRO dynamic shadows" display on the terminator.

You don't dream. This is a computer generated view, not a digital picture taken at the eyepiece of an instrument !

Beware : remind that it's not possible to use scientific overlays when using dynamic shadows.

Textures selection

This tab presents a matrix for selecting textures according to the applied zoom level. This new function is a very useful way for choosing the textures display.

The program will detect automatically which textures are present (High Resolution or Very High Resolution) and will permit access to the maximum zoom level available with them.

You can choose to keep the same texture for all zoom range or select as above a progressive change parallel to the zoom change.

You have just to select the wished radio button. There can only have one texture chosen for a given zoom level

If you don't want to see any texture, fill the "No texture / To use with an overlay alone"

We think that it's better to use textures with increasing resolutions according to increasing zoom level. This is the chosen solution in the above exemple. There are 6 resolution levels for the texture. The software loads automatically the levels indicated according to the zoom applied to the map.

The Clementine texture goes up to 4 levels.

The USGS Geological La texture goes up to 3 level

The LRO, LOPAM, LRO-Kaguya and Chang'è 2 texture have 6 levels.

The textures "Airbrush with albedo", "Airbrush without albedo" show the details visible in amateur telescopes up to 200 mm in diameter.

The textures "Clementine photographic" and "Chang'è 2 photographique" are used to show the aspect of the formations under the highest possible solar lighting.

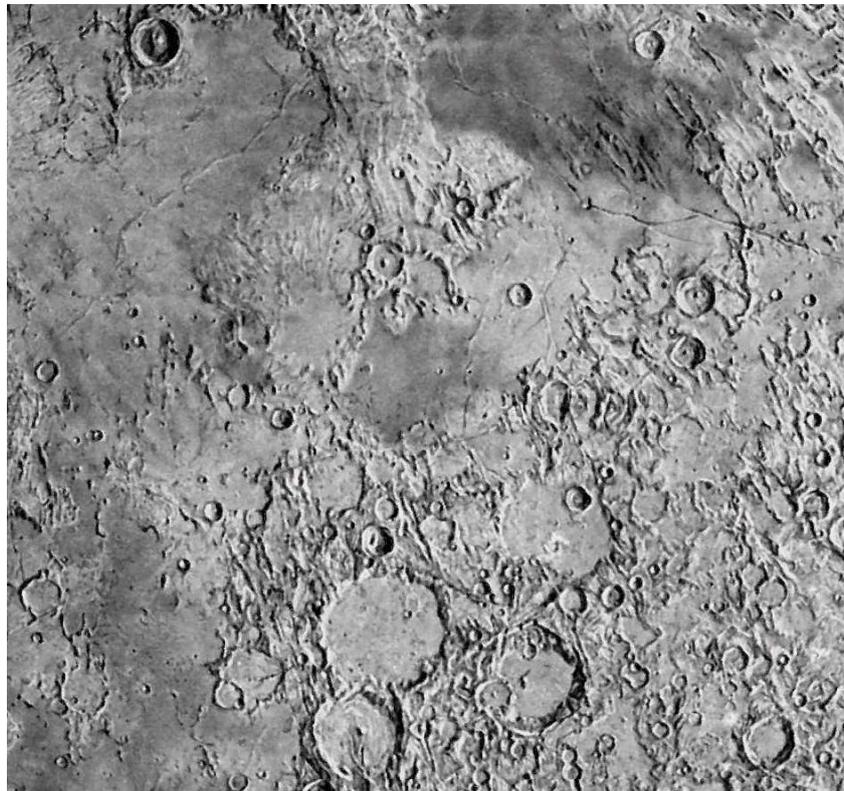
The "LRO-Kaguya" texture is particularly suitable for displaying scientific layers.

« Topographic textures » choice

The following screen captures show you the Alphonsus crater area with maximum possible zooming with each texture as in the above exemple. Six textures are available :

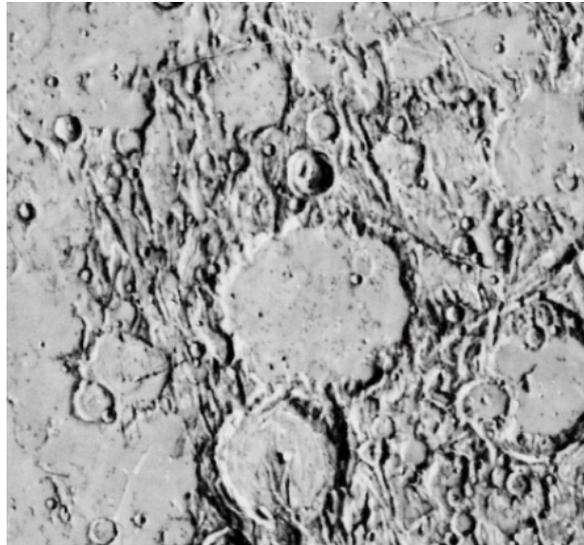
- "Aerographe with albedo"

(USGS aerograph drawing realized from Clementine probe pictures with a uniform shadow, by David Seal from JPL and his team). In this "Expert" version, maximal resolution "Full" is 1 km / Pixel.



- "Airbrush relief map"

(Aerograph drawing without albedo hues realized from Clementine probe pictures realized by US geological Survey / USGS team, copyright USGS / Astrogeology). Improved by ChristianLegrand. This texture reaches a definition of 500 m / pixel. It is now of less interest given the addition of the LOLA-Kaguya-Shaded texture (See below).



- "Clementine Photographic"

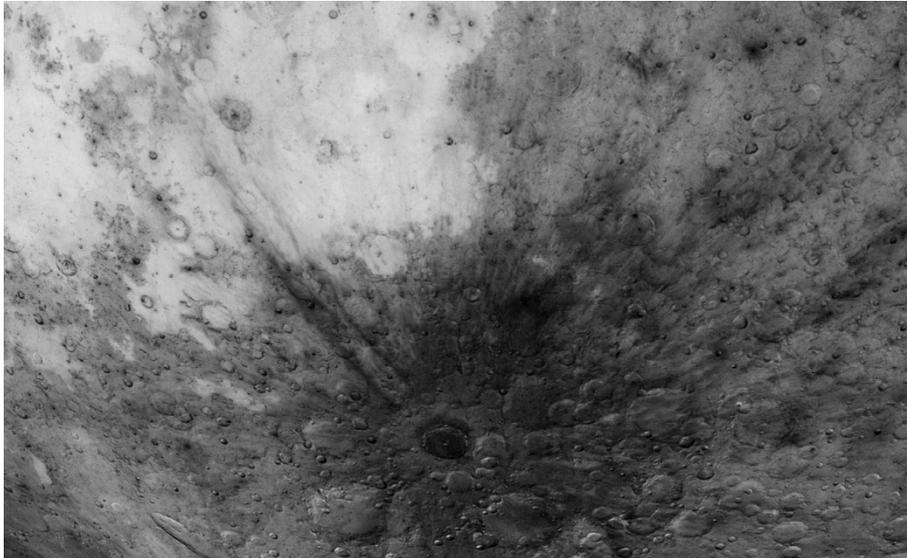
(Mosaic of Clementine probe pictures realized by professor Mark S. Robinson, and his team of "Northwestern University", copyright USGS / Astrogeology). This texture has a 200 m resolution. It's the most precise "**albedo texture**" presently available in computer lunar atlases. It's the only textures showing lunar formations without any shadow.



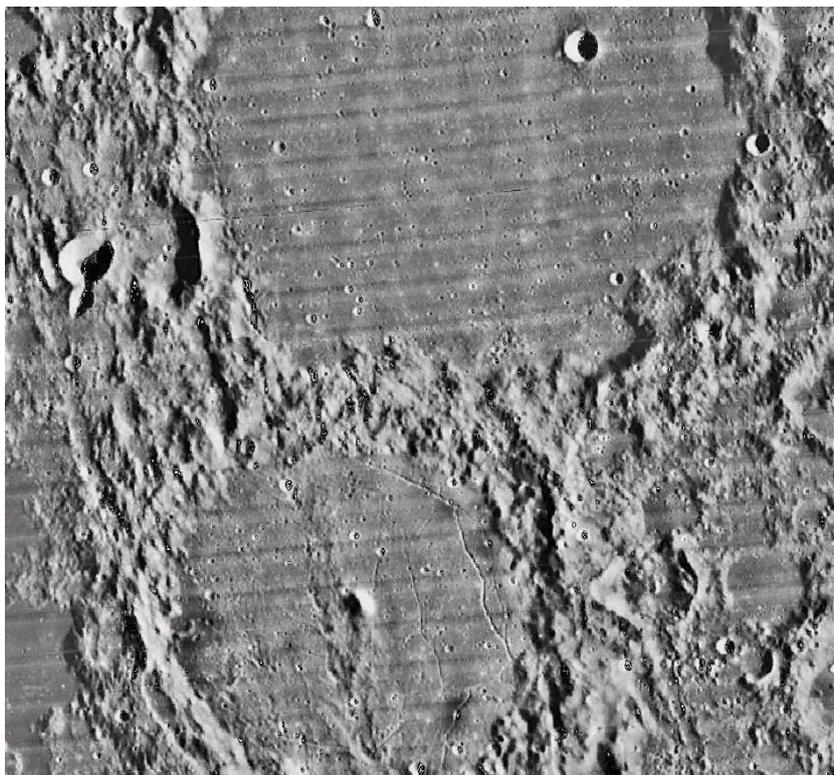
Important note : This texture has been built from Clementine original pictures treated by USGS. This is a remarkable work according to the amount of difficulties that have been encountered. This treatment can induce some formations distortion at the borders of the plates. Also the position of some formations can be shifted slightly from its real place. We suggest you to confirm the exact aspect of a formation with the aerograph texture if you want to realize a precise survey..

- "Clementine Negative"

Mosaic of original photographs of the Clementine probe produced by Professor Mark S. Robinson, with his team from "Northwestern University", copyright USGS / Astrogeology. The texture obtained was then "inverted". This texture reaches a definition of 200 m / pixel. It is the only texture showing the "negative" formations, making it easier to visualize certain formations, in particular the ejecta of craters or recent craters.



- "**Lunar Orbiter Photographic VHR / LOPAM**" (Mosaic of Lunar Orbiters 1, 2, 3 and 4 probes pictures based on new USGS release, (copyright USGS). In this "**Pro**" version, this texture has a variable resolution that goes to 60 m/pixel resolution on the best places . It is a "texture with "shaded relief" benefiting from solar lighting at about 45 °.



Important note : This texture has been built from Lunar Orbiter original pictures that have been partially "destripped", redimensioned and rotated by USGS. This is a remarkable work according to the amount of difficulties that have been encountered. This heavy treatment can induce some formations distortion at the borders of the plates. Also the position of some formations can be shifted slightly from their real place. We suggest you to confirm the exact aspect of a formation with the aerograph texture if you want to realize a precise survey.

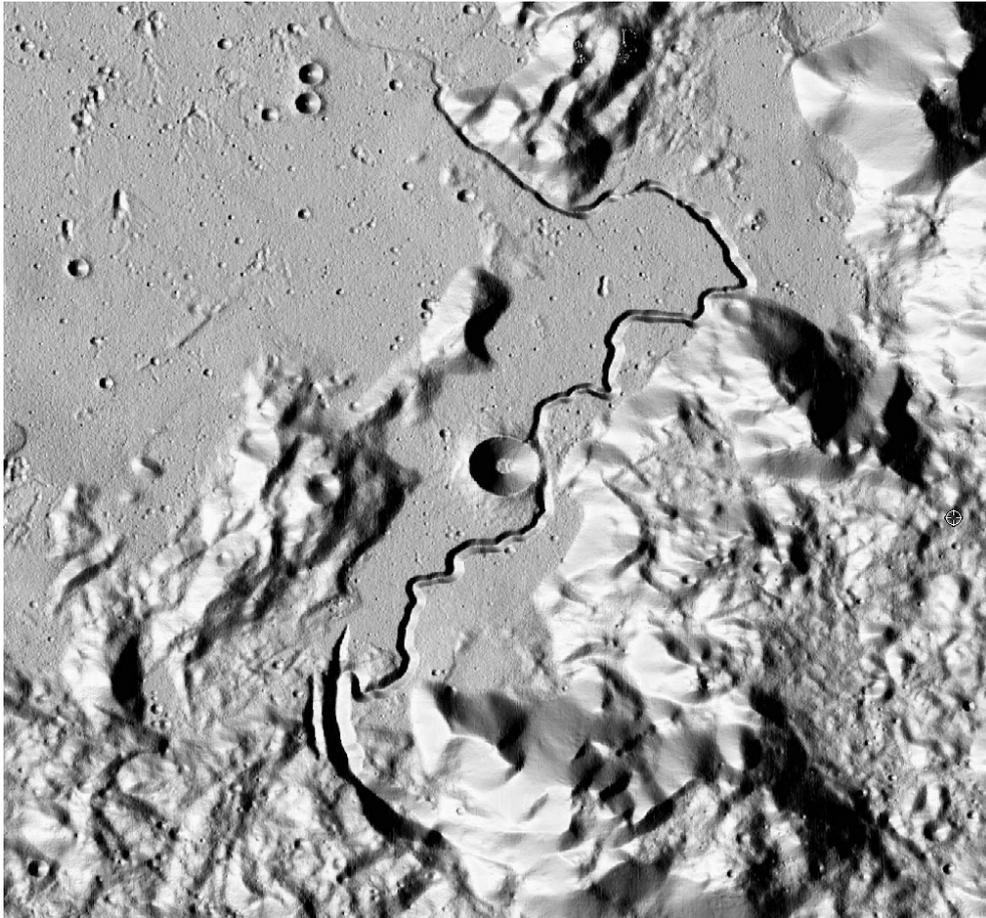
- "**Lunar Reconnaissance Orbiter Photographic VHR / LRO**" : Mosaic of original Lunar reconnaissance Orbiter pictures based on new USGS release, (copyright USGS). In this "**Pro**" version, this texture has a variable resolution that goes to 60 m/ pixel resolution on the best places . It's a "**shaded relief texture**" realized with a more vertical lighting than the previous LOPAM.



Important note : This texture has been built from Lunar Reconnaissance Orbiter original pictures. It has the very big advantage to be calibrated with the most precise lunar coordinates system available (Better than ULCN 2005) and this coordinates are also used in the new IAU lunar formations nomenclature now included in the VMA Pro 6 databases. So lunar formations are well centered with their labels on this texture.

- "**Lunar Reconnaissance Orbiter - Kaguya Shaded**"

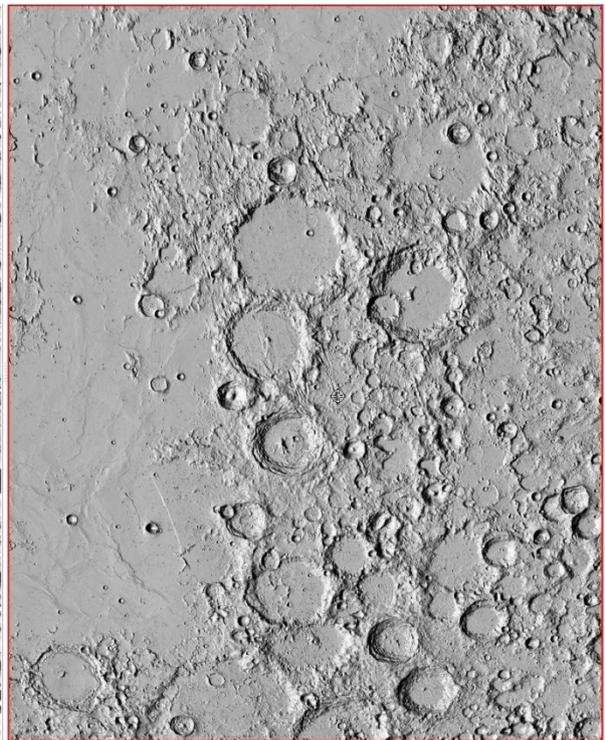
Mosaic of the original images of the Lunar Reconnaissance Orbiter (USA) and Kaguya (Japan) probes from USGS data, copyright USGS. In this version 7, this texture has a variable resolution reaching 60 m / pixel in the best places. It is a "texture with shaded relief". It is not a photograph, it was established by computer from the altimetric data collected by the two probes to create a DEM (Digital Elevation Model). The initial texture only includes areas between -60 ° and + 60 ° latitude. Patrick Chevalley has reconstructed the polar zones from other LRO data.



This texture now advantageously replaces the "Aerograph ss albedo" texture.



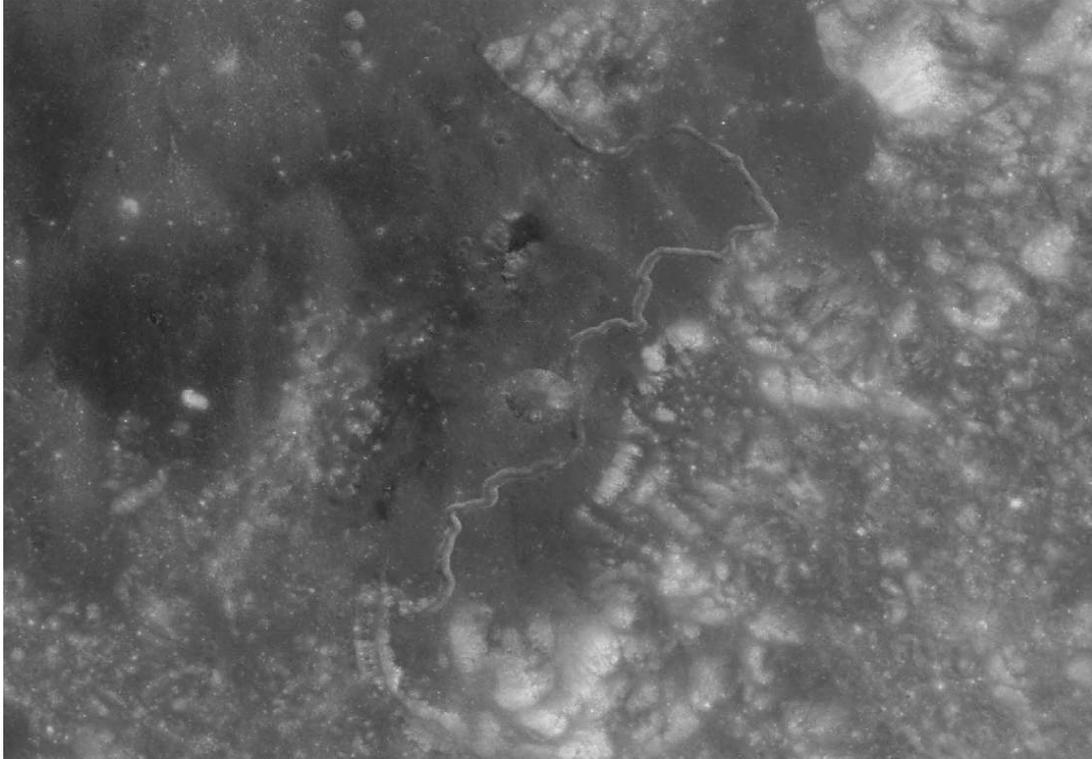
"Aerograph ss albedo"



"LOLA-Kaguya-Shaded"

- "Chang'é 2 photographic VHR"

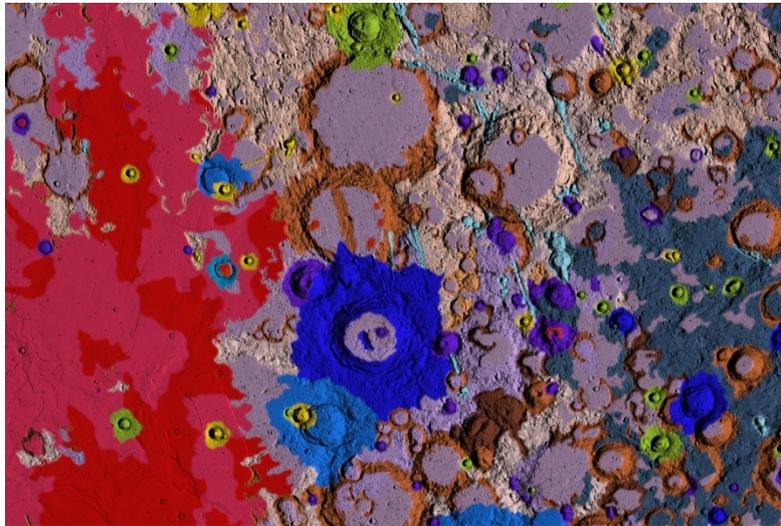
Mosaic of original Chang'é 2 probe published by chinese authorities in february 2012 pictures based on new USGS releas, (Copyright China National Space Agency / CNSA). In this "**Pro**" version, this texture has a variable resolution that goes to 50 m resolution on the best places . It's a "**not shaded relief texture**" as that of Clementine. It's the most resoluted texture available without stripes (Not as LOPAM).



Important note : This texture has been built from Chang'é 2 original pictures. This texture is not associated to the new lunar coordinates system of IAU. CNSA has brought very attention so that this mosaic will be the most precise possible with their own datas. Nevertheless, some formations labels can be slightly shifted from their image.

- "USGS Unified geological Map of the Moon"

Compilation of datas collected by various probes on the age and composition of lunar terrans realized on 2019. This map drawn by Corey M. Fortezzo (USGS), Paul D. Spudis (LPI), and Shannon L. Harrel (SD Mines) for the U.S. Geologic Survey / Astrogeology Science Center in Flagstaff makes différence of the terrans types by colors. It's the most precise geological of the Moon today. We have applied it on the "LOLA / Kaguya Shaded" texture to associate it to the relief.



The caption is the following :

Cc Ccc	Copernican Crater - Rim, wall and floor deposits of craters with sharp prominent rims, circular to polygonal outlines. High relative brightness and rays. Crater, Catena - Elongated linear clusters of overlapping circular to semi-circular.
Csc	Copernican Crater, Secondary - Small to very small diameter craters, densely spaced near and/or on the ejecta blanket of craters. <i>Interpretation:</i> Impact crater forms derived from blocky material ejected from the primary impact.
Ec	Erastosthenian Crater - Non-rayed, circular craters with sharp to partially subdued crater rim crests, partial circumferential ejecta present, and lower albedo compared to unit Cc. <i>Interpretation:</i> Morphology and material from a primary impact event.
Ecc	Erastosthenian Crater, Catena - Elongated linear to elliptical clusters of circular to semi-circular depressions, often overlapping. <i>Interpretation:</i> Impact crater clusters derived ejecta from large, basin forming impacts. Possibly primary impacts.
Esc	Erastosthenian Secondary Crater - Small to very small diameter craters, densely spaced near and/or on the ejecta blanket of craters. <i>Interpretation:</i> Impact crater forms derived from blocky material ejected from the primary impact.
Em	Erastosthenian Mare - Low relative brightness plains with relatively few craters large enough to map, patches of small domes, sharp-crested ridges, observable flow fronts. <i>Interpretation:</i> Relatively thin, young volcanic flows or pyroclastic material.
Elp	Erastosthenian Imbrian Plateau - Forms high standing plateaus (relative to the mare surfaces in Oceanus Procellarum) with domes, cones, and dark mantling materials. <i>Interpretation:</i> Volcanic constructs, flows, and pyroclastic materials.
Ic	Imbrian Crater, Undivided - Subdued topographic relief compared to younger impact features, generally less than 40 km in diameter, with broad flat floors, and little to no ejecta present. <i>Interpretation:</i> Subdued morphology and material from a primary impact event.
Ic1	Imbrian Crater, Lower - Similar description to unit Ic, craters mantled by materials of the Orientale group. <i>Interpretation:</i> Subdued morphology and material from a primary impact event, younger than Imbrium group materials but older than Orientale group materials.
Ic2	Imbrian Crater, Upper - Similar description to unit Ic, craters superpose materials of the Orientale group. <i>Interpretation:</i> Subdued morphology and material from a primary impact event, younger than Orientale group materials but older than unit Im2.
Icc	Imbrian Crater, Catena - Subdued and mantled elongated linear to elliptical clusters of circular to semi-circular depressions, often overlapping. <i>Interpretation:</i> Impact crater clusters derived ejecta from large, basin forming impacts. Possibly primary impacts.
Isc	Imbrian Crater, Secondary - Small diameter craters, densely spaced near and/or on the ejecta blanket of craters. <i>Interpretation:</i> Impact crater forms derived from blocky material ejected from the primary impact.
Icf	Imbrian Crater, Fracture Floor - Crater floors typically domed, with furrows and/or linear to curvilinear fractures with variable widths and depths. Blocks and material between the fractures sometimes reoriented. <i>Interpretation:</i> Brittle materials uplifted and extended.
Ib	Imbrian Basin, Undivided - Gently rolling to hilly terrain containing aggregates of subdued irregular to circular craters. Also forms outer basin and ejecta of crater Shrodingier. <i>Interpretation:</i> Materials emplaced during the formation of multi-ringed impact basins.
Ibm	Imbrian Basin, Massif - Rugged blocks forming arcuate raised ridges within crater Shrodingier. <i>Interpretation:</i> Material uplifted during basin formation, representing the inner ring of a multi-ringed impact basin.
Id	Imbrian Dark Mantle - Some of the lowest albedo material mapped, generally occurs near the outer margins of larger basins. Scalloped, smooth textures with small craters. <i>Interpretation:</i> Pyroclastic material.
Ig	Imbrian Grooved - Covers craters and other terrae of pre-Nectarian through Imbrian age. Craters have radial grooves on rims and walls with some mounds. <i>Interpretation:</i> Origin uncertain. Possibly Imbrium ejecta or result of seismic shaking.
Iia	Imbrian Imbrium Alpes Formation - Angular blocky and knobby with smooth, mantled surface. Closely spaced hills and hummocks, ~2-5 km in diameter. <i>Interpretation:</i> Possibly eroded ejecta, structurally deformed bedrock, or both.
Iiap	Imbrian Imbrium Apenninus Formation - Coarse blocks of material parallel to scarp bordering Imbrium basin. Smooth to undulating interblock materials. <i>Interpretation:</i> Intensely fractured bedrock with interstitial Imbrium ejecta.
Iic	Imbrian Imbrium Crater - Individual craters <25 km diam., clusters and chains of craters <10 km diam. radial to Imbrium. Moderately subdued topographic features. <i>Interpretation:</i> Secondaries and crater chains emplaced during Imbrium basin formation.
Iif	Imbrian Imbrium Fra Mauro Formation - Sinuous, curvilinear, and straight ridges draping the surface below. Surface texture locally hummocky. <i>Interpretation:</i> Ejecta from Imbrium basin and materials of the substrate.
Im1	Imbrian Mare, Lower - Forms flat, smooth surfaces. Relatively higher albedo compared to unit Im2 but lower albedo than unit Ip. High density of superposed craters. <i>Interpretation:</i> Old basaltic lava, perhaps as old as Orientale basin.
Im2	Imbrian Mare, Upper - Forms flat, smooth surfaces. Lower albedo and crater density than unit Im1. Numerous ridges. Difficult to distinguish from unit Id. <i>Interpretation:</i> Basaltic lava flows
Imd	Imbrian Mare, Dome - Steeply sloping, high-relief, rough domical or conical shaped edifices, sometimes with pitted summits. <i>Interpretation:</i> Volcanic edifices or laccoliths

lohi	Imbrian Orientale Hevelius Formation, Inner Facies - Curvilinear to swirly ridges and troughs mostly radial and subradial to Orientale basin. <i>Interpretation:</i> Continuous ejecta blanket emplaced during outwar flow of hot, turbulent, mobile materials.
loho	Imbrian Orientale Hevelius Formation, Outer Facies - Swirly, lineated, hummocky and smooth materials forming a discontinuous and irregular boundary. <i>Interpretation:</i> Thinning distal margins of Orientale basin ejecta.
los	Imbrian Orientale Hevelius Formation, Secondary Crater Facies - Overlapping crater chains and clusters radial and peripheral to the basin. <i>Interpretation:</i> Secondary impact craters formed by ejected blocks..
lom	Imbrian Orientale Mauser Formation - Smooth to rolling, intensely fractured plains with broad linear ridges and smooth domes. <i>Interpretation:</i> Mostly impact melt. Ridges and domes likely original floor material compressionally modified.
lork	Imbrian Orientale Montes Rook Formation, Knobby Facies - Knobby, hummocky, rolling and chaotic materials with interstitial irregular gooves and depressions <i>Interpretation:</i> Uppermost part of overturned flap of the ejecta sequence of Orientale basin.
lorm	Imbrian Orientale Montes Rook Formation, Massif Facies - High-relief, smooth blocks marking the second and third rings of the basin. <i>Interpretation:</i> Structurally uplifted bedrock, thickly veneered with late arriving ejecta.
lp	Imbrian Plains - Smooth, flat to undulatory terrain of intermediate albedo occurring mostly in topographic lows and crater floors of Imbrian and older age. <i>Interpretation:</i> Ambiguous origin, likely Orientale and other large impact crater ejecta.
lt	Imbrian Terra - Low relief, low crater density, moderate to high albedo, moderately smooth surface. <i>Interpretation:</i> Complex mixture of local erosional debris and crater and basin ejecta; megaregolith.
ltd	Imbrian Terra, Dome - Outlines and characteristics similar to main-sequence craters, with smooth inner flanks, paucity of ejecta, inner terracing, secondary cratering. <i>Interpretation:</i> Possibly target material differences, or ash-flow calderas.
INp	Imbrian Nectarian Plains - Smooth, flat to undulating surface, moderate to high density of superposed craters. <i>Interpretation:</i> Possibly materials emplaced by the formation of Imbrian and Nectarian basins.
INt	Imbrian Nectarian Terra - Gently rolling terrain, moderate to high density of craters <i>Interpretation:</i> Complex mixture of local erosional debris and crater and basin ejecta; megaregolith.
Nc	Nectarian Crater - Considerably muted topographic relief compared to younger impact features, with broad flat floors typically another unit, and very little to no ejecta present. <i>Interpretation:</i> Muted morphology and material from a primary impact event.
Nb	Nectarian Basin, Undivided - Material of raised walls and slumped blocks of basins, as well as aggregates of closely spaced subdued hills and ridges. <i>Interpretation:</i> Impact related structures and ejecta material.
Nbl	Nectarian Basin, Lineated - Sharp, raised ridges, intervening flat areas or deep troughs and smooth whaleback-shaped hills with narrow grooves. <i>Interpretation:</i> Bedrock pervasively faulted by Imbrium impact.
Nbm	Nectarian Basin, Massif - Rugged blocks most commonly 10 to 30 km across, forms highest and most rugged parts of arcuate raised ridges. <i>Interpretation:</i> Uplifted bedrock during the formation of Nectarian basins.
Nbsc	Nectarian Basin, Secondary Crater - Grouped in clusters, chains and groove-like chains, mostly peripheral and approximately radial to Nectarian basins. <i>Interpretation:</i> Secondary impact craters of Nectarian basins.
Nnj	Nectarian Nectaris Janssen Formation - Rolling subdued terrain having numerous linear features including ridges, acarpis, and grooves radial to Nectaris basin. <i>Interpretation:</i> Nectaris basin ejecta equivalent to, but more degraded than, units lif, lohi, and loho.
Np	Nectarian Plains - Generally flat, moderate albedo terrain with dense population of large, old craters. <i>Interpretation:</i> Ambiguous origin, possible ejecta from large impacts and basin forming events.
Nt	Nectarian Terra - Moderately rough surface, rolling to moderately rugged oval relief, with diverse ages of superposed and buried craters. <i>Interpretation:</i> Complex mixture of local erosional debris and crater and basin ejecta; megaregolith.
Ntp	Nectarian Terra-Mantling and Plains - Light colored, wavy or rolling surfaces more heavily cratered than unit lp. <i>Interpretation:</i> Primary and secondary ejecta of Nectarian basins and large craters equivalent to units loho and lp, with more erosional degradation.
pNb	pre-Nectarian Basin - Subdued, eroded mountain rings and arcuate segments of rings, rim, walls, and inner-ring materials. <i>Interpretation:</i> Erosionally degraded impact related structures and ejecta materials.
pNbm	pre-Nectarian Basin Massif - Large mountainous landforms commonly lying along arc, both continuous and discontinuous, gradational with generally finer-scale topography. <i>Interpretation:</i> Uplifted bedrock during the formation of basins.
pNc	pre-Nectarian Crater - Discontinuous, subdued rim crests and rounded, curved or straight rim remnants. <i>Interpretation:</i> erosionally degraded morphology and material from a primary impact event.
pNt	pre-Nectarian Terra - Rugged, diverse terrain, degraded partial crater rims, gradational with smoother unit Nt, and rougher units pNbm and pNc. <i>Interpretation:</i> Complex mixture of local erosional debris and crater and basin ejecta; megaregolith.

 Volcanic channel (rille)	 Crest of crater rim (hachures point inside crater)	 Lineament (ambiguous origins)
 Crest of buried crater rim	 Graben axis (dashed where approximate)	 Wrinkle ridge crest (dashed where approximate)

- "**LAC / LPI / O'Brien**" Texture realized when assembling of the « Lunar Aeronautical Charts" realized by the United States Air Force (USAF) and published by the Lunar and Planetary Institute (LPI). This texture has been built by David O'Brien of the Planetary Science Institute (PSI) who prosed kindly to the VMA authors to use it in the Atlun module. LPI has also given the authorization to use these reproduction of their maps.

The best drawn maps of the Moon ever published are the "Lunar Aeronautical Charts" (LAC) and the "Lunar Maps" (LM). Their scale is 1/1 000 000 th. Most of them include altitude levels curves giving instantly an estimation of the height or depth of the formations.

They have been built to survey the lunar areas according to the future Apollo missions. You will notice that they don't use an uniform colors set. Sure, they only show the Moon Visible Face since they are based on observations and pictures taken from the Earth.



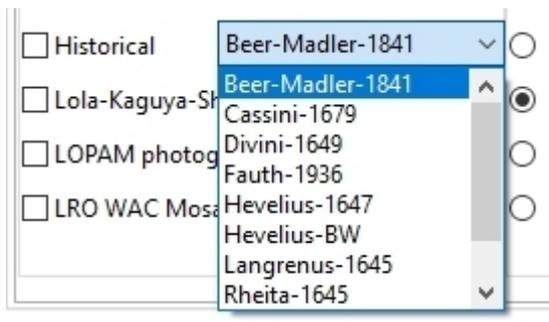
This remarkable maps collection can be seen on the site :

<http://www.lpi.usra.edu>

We thank a lot David O'Brien and the LPI for permitting us to use their work in VMA.

Available historical textures list

The box "Historical" gives access to a scrolling list of the historical textures used by VMA Pro 6.



The following screen captures show you old maps extracts adapted to VMA. Four textures are available today and several others will be processed soon.

Important note: These textures realized from old maps without any coordinates system induce sometimes large shift between some formations and their labels. More, as they are Nearside maps, when applied on the whole Moon globe, the Farside is not drawn.

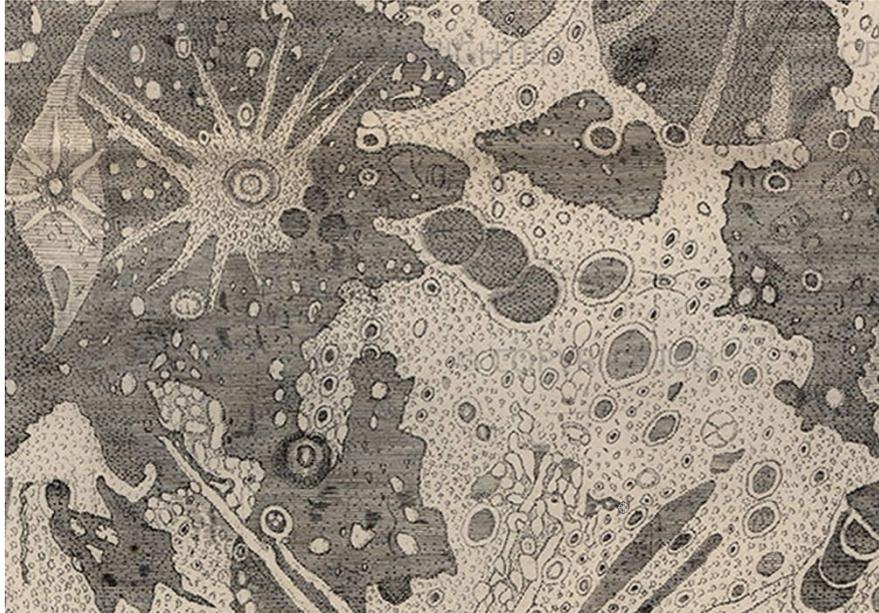
"Langrenus 1645"

Texture from a map established by Michael Florentius Langrenus on 1645 and called : "Plenilunii - Lumina Austriaca Philippica". Note the completely different names compared to the present IAU nomeclature but some of them.



"Divini 1649"

Texture realized from the map established by Eustachio Divini in 1649. It is an extrapolation of the map of Hévélius and not an own creation.



"Riccioli 1651"

Texture realized from the map established by Francesco Grimaldi in 1651 which incorporated the nomenclature of Giovanni Riccioli, nomenclature which is still widely used today.



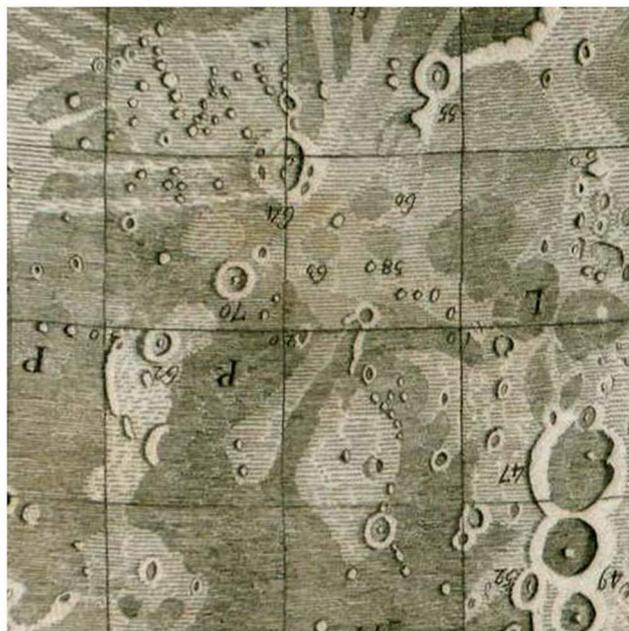
"Cassini 1679"

Texture drawn on the basis of the map of Giovanni Domenico Cassini (Jean-baptiste Cassini I) on the basis of observations with measures to the eyepiece and presented to the French Academy of Sciences on 1679. It was the most precise lunar map in its era. It was 52 cm in diameter and have been engraved on the basis of drawings by Sébastien Leclerc and Jean Patigny.



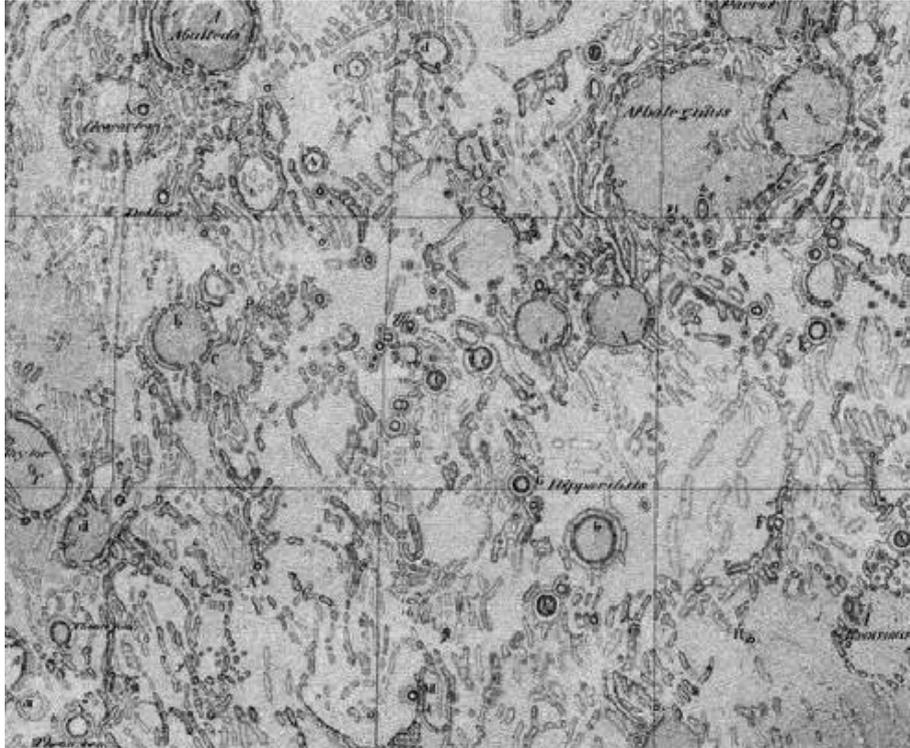
"Tobias Mayer 1791"

Texture built from the map of Tobias Mayeri on 1791 and published under the name of "Tob. Mayeri Tabula Selenographica".



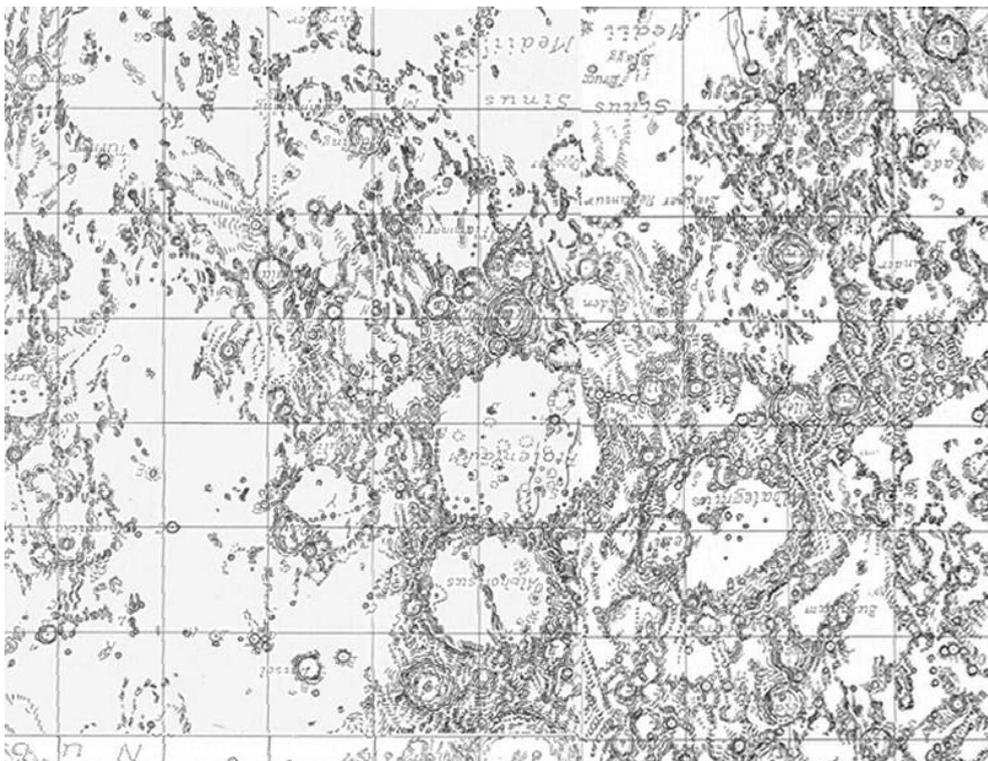
"Beer & Madler 1845"

Texture established from the map drawn up by Wilhelm Beer & Johann Heinrich Mädler in 1841 and published under the name of "Mappa Selenographica".

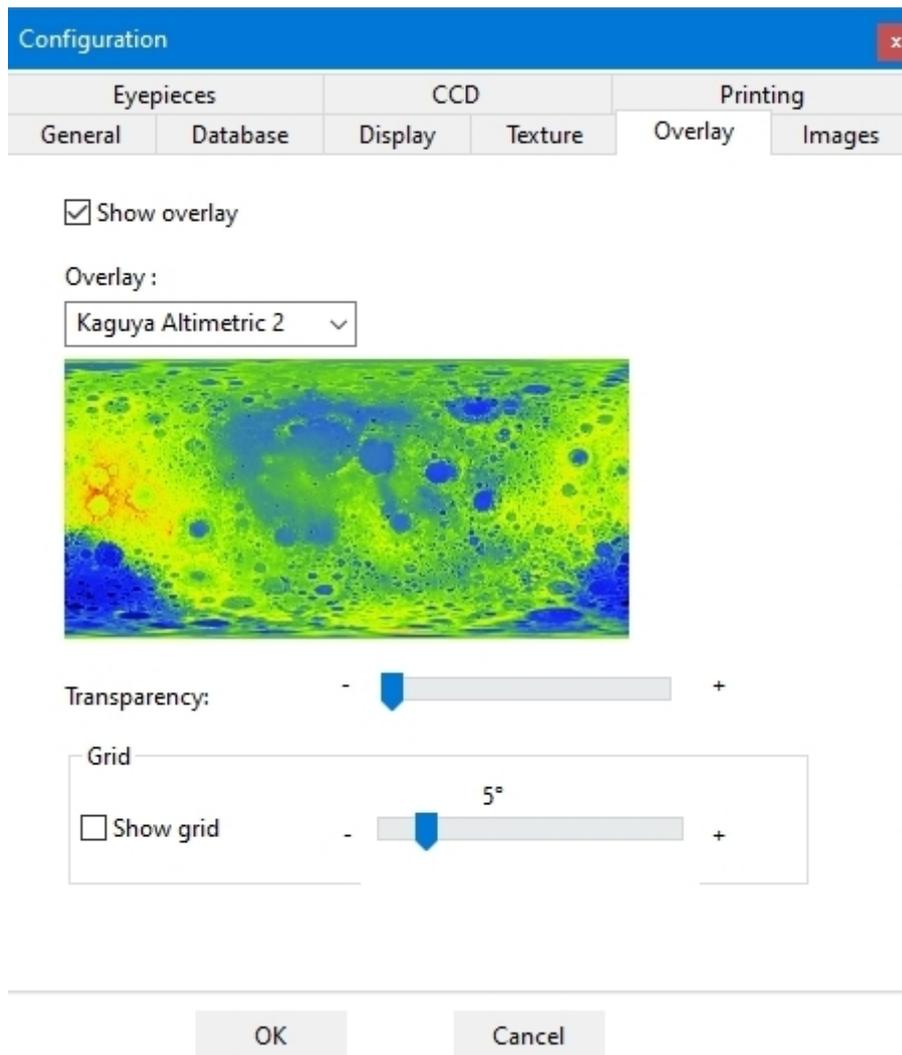


"Fauth 1936"

Texture established from the map established by Fauth in 1936 and published under the name of "Unser Mond".



"Overlays" tab



The VMA includes the possibility of applying an overlay over the texture chosen in the "**Textures**" tab, the transparency of which can be adjusted to continue to see the texture used below. These overlays are maps for transposing scientific data from space missions (Clementine, Lunar Prospector, Kaguya, Lunar Reconnaissance Orbiter (LRO), Gravity Recovery and Interior Laboratory (GRAIL), Chandrayann 1, Chang'é), but also layers of colors and finally, the geological map of the entire lunar globe. This technique makes it possible to show for each lunar formation, its relationship with the available scientific data.

The texture "LRO - Kaguya - Shaded" is recommended for the application of scientific layers. You can also choose not to display a texture in the "Textures" tab of the "Configuration" menu.

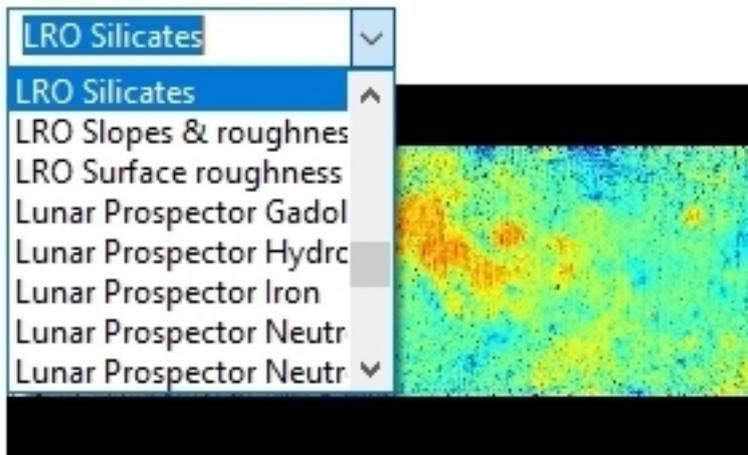
We are continually looking for new data posted online that can be incorporated into the AVL.

"Show overlay" Box

If you fill the "**Show overlay**" box, you display the overlay chosen with the scrolling list below over the chosen texture.

"Overlays" Scrolling list

Couche :

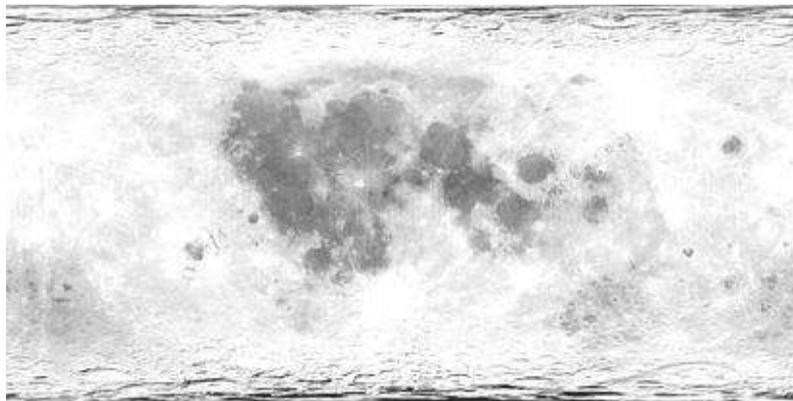


If you activate the scrolling list, you can choose in the list the overlay that you need. Here are the list of the overlays presently involved in VMA. We will add on our site new overlays to download as soon as they will be available. You'll find :

- Colors and albedo overlays
- Geological overlay
- Topographical overlays
- Elements concentration overlays
- Neutrons emissions overlays
- Gravity measurement overlays

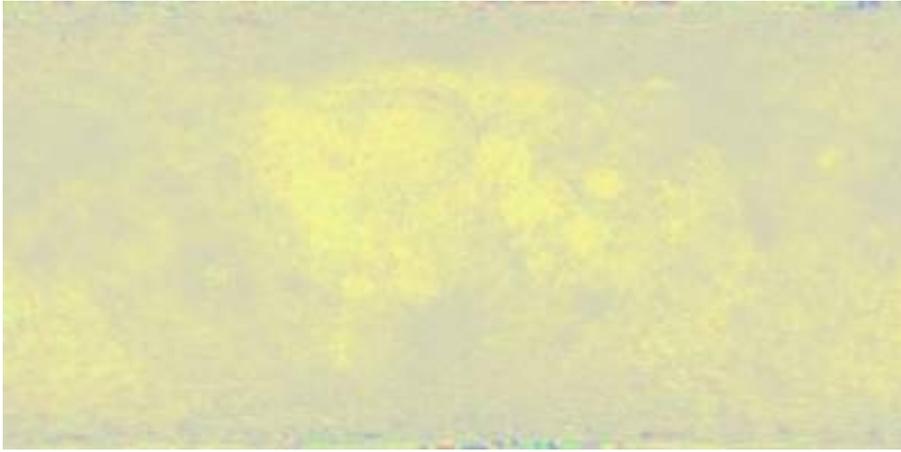
Colors and albedos overlays presentation

"Albedo" overlay



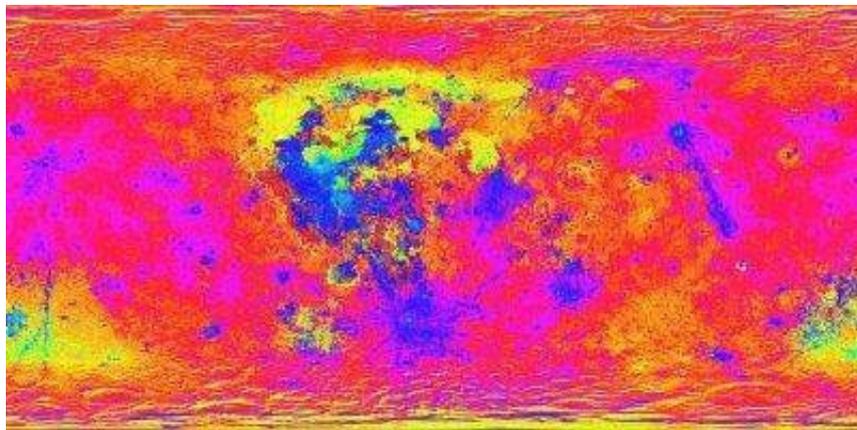
This overlay shows the Moon surface albedo. It's extracted from Clementine datas. This overlay id very useful with the "Aerograph without albedo" texture because this one doesn't present the albedo display. There is no caption since it's only an overlay.

"Natural colors" overlay



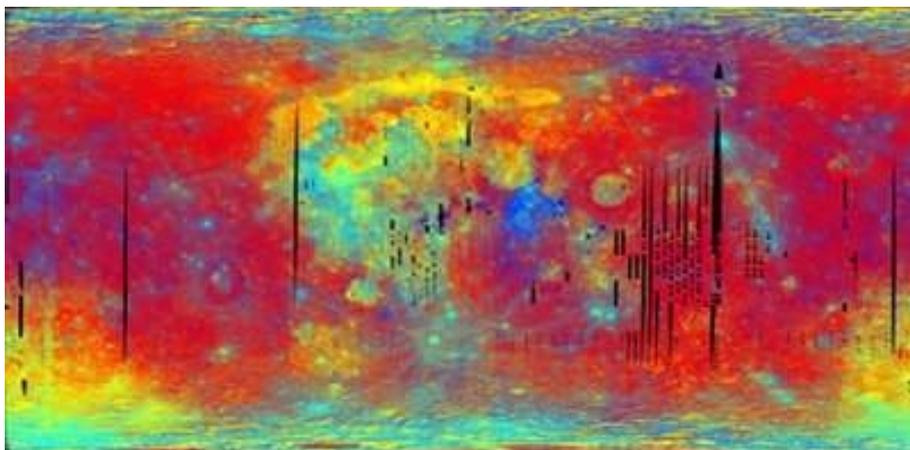
This overlay tries to show the Moon globe natural color. It's extracted from a color mosaic realized with Clementine filtered pictures with an equilibrium between the 3 RGB channels.. There is no caption since it's only a color.

"Enhanced colors" overlay



This overlay has been obtained while pushing to maximum color contrast enhancement in the three primal spectral colors. There is no caption since it's only a color. It shows subtle colors variations between highlands and mare surface and also shows different lavas flows in these marias.

"Clementine color ratio" overlay



This overlay has been obtained from the Clementine maps of the "PDS Map A Planet" site. Colors variations indicate lunar surface composition variations.

The Clementine Ratio ("false color") views of the Moon are created by generating ratio images using 3 of the 5 Clementine UV/Vis camera bands and combining these into the red, green, and blue channels of a color image:

Channel Ratio (band/band)

Red 750 nm/415 nm

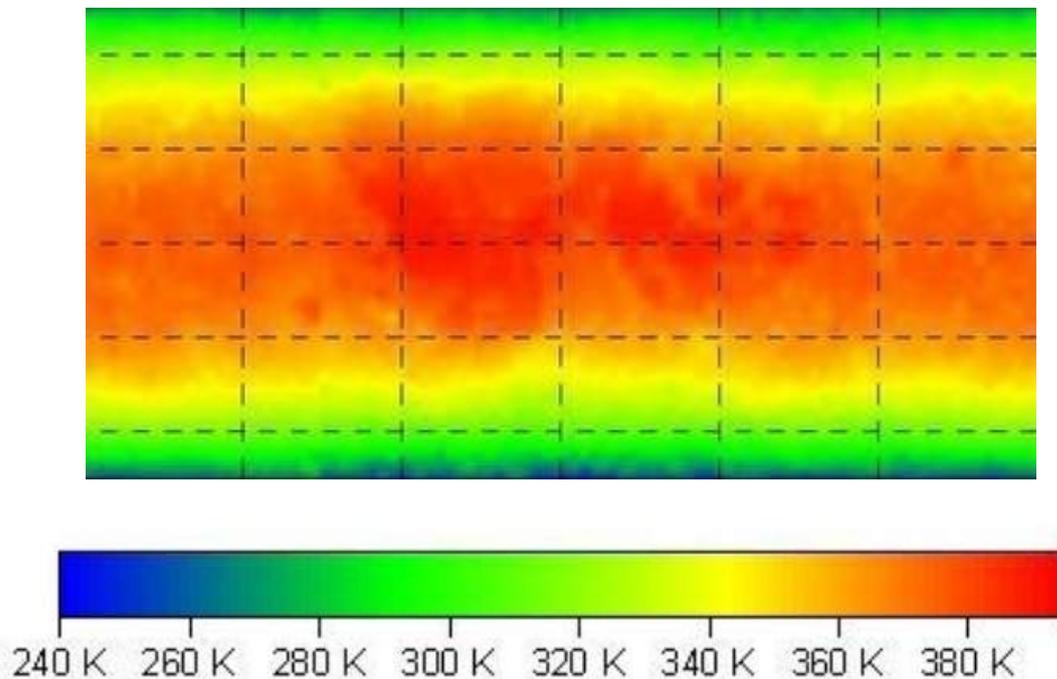
Green 750 nm/950 nm

Blue 414 nm/750 nm

The color ratio image product serves to cancel out the dominant brightness variations of the scene (controlled by albedo variations and topographic shading) and enhances color differences related to soil mineralogy and maturity. The lunar highlands, mostly old (~4.5 billion years) gabbroic anorthosite rocks, are depicted in shades of red (old) and blue (younger). The lunar maria (~3.9 to ~1 billion years), mostly iron-rich basaltic materials of variable titanium contents, are portrayed in shades of yellow/orange (iron-rich, low titanium) and blue (iron-rich, higher titanium). Superimposed on and intermingled with these basic units are materials from basins and craters of various ages, ranging from the dark reds and blues of ancient basins to the bright blue crater rays of younger craters. (Reference: Pieters, C.M., M.I. Staid, E.M. Fischer, S. Tompkins, and G. He, 1994, A sharper view of impact craters from Clementine data, Science, 266, 1844-1848)

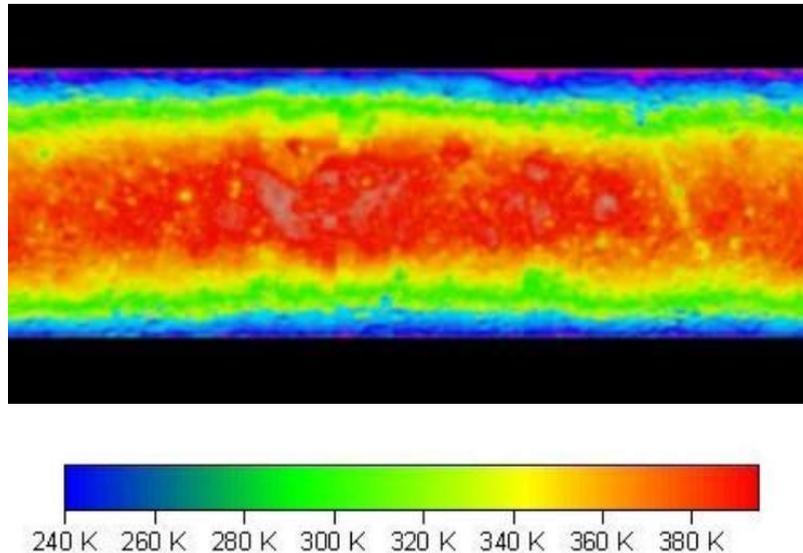
"Physical characteristics" overlays presentation

"Daytime surface temperature Chang'é 2 " overlay



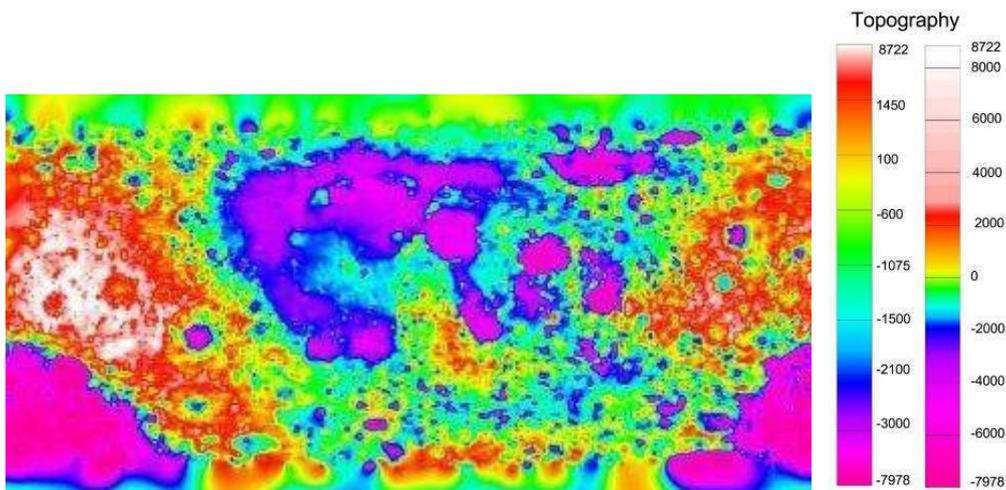
This overlay has been realized with Chang'é 2 datas. It shows lunar surface temperature with the sun at the higher point in the sky. It doesn't shows real time surface temperature. The caption shows that temperatures range is between 240 °K (-33 °C) at poles to 400 °K (127 °C) at the equator.

"Night time surface temperature Chang'é 2 " overlay



This overlay has been realized with Chang'é 2 datas. It shows lunar surface temperature on the obscure part of lunar globe. It doesn't shows real time surface temperature. The caption shows that temperatures range is between 240 °K (-33 °C) at poles to 400 °K (127 °C) at the equator.

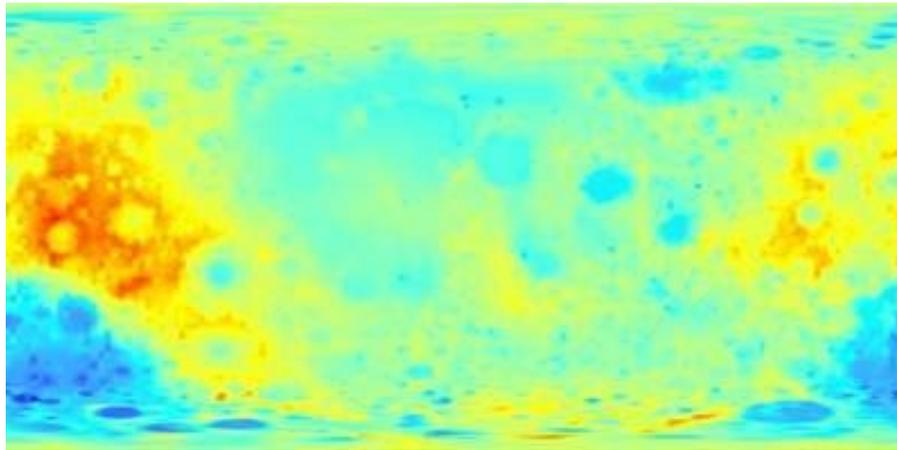
"Clementine Altitude" overlay



The captions are in feet. The left column is based on a linear scale for color spectra, while the right one is based on a linear scale for altitudes.

This overlay is conceived with altimetric datas recorded by Clementine probe and compiled by Maria T. Zuber and her LPI team. The overlay allows you to locate relative altitudes. It has been used to confirm the existence of the "South Pole / Atkei" impact basin in the Southern part of the Farside.

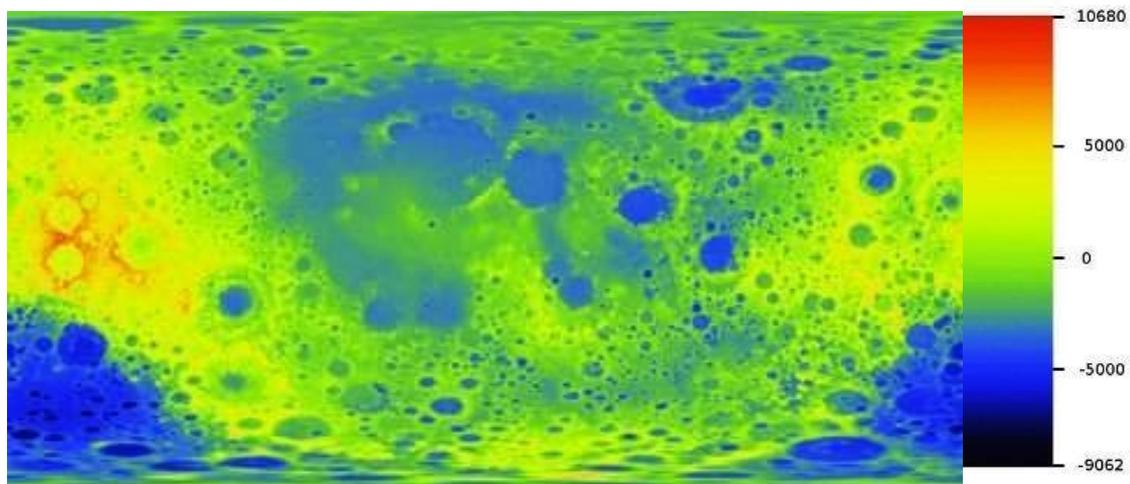
Altitude "ULCN 2005" overlay



This overlay is realized with a combination of altimetric datas recorded by Apollo missions, Clementine and Lunar Prospector probes and Earth based datas, specially with radiotelescopes in radar mode. They are online at the USGS site maintained by Brent Archinal and his team . It gives relatives altitudes of formations.

It's recommended to use this overlay with the texture « Aerograph without albedo ». There is no caption found for this overlay. So it's only indicative informations.

"Kaguya Altitude" overlay



This overlay is a second one realized with altimetric datas recorded by the japanese probe Kaguya and put online by JAXA team. It gives relatives altitudes of formations. It's presently the most precise altimetric lunar planisphere.

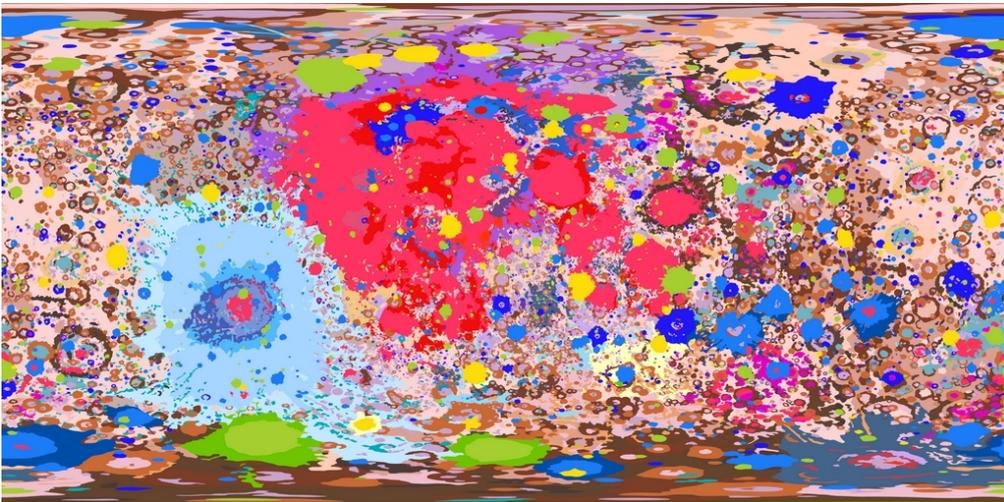
« Geological and gravity » overlay presentations

"Geological" overlay



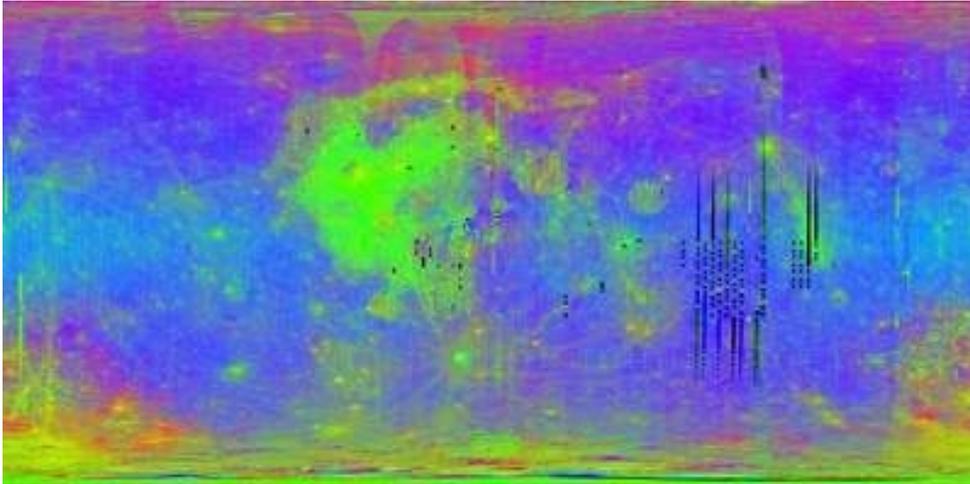
This overlay has been realized with data available on the USGS "Astrogeology / Webgis" and gathers several different Moon geological maps. Because each of the composing map has its own caption, the global caption, difficult to conceive, is not available presently.

"USGS Geological 2020" layer



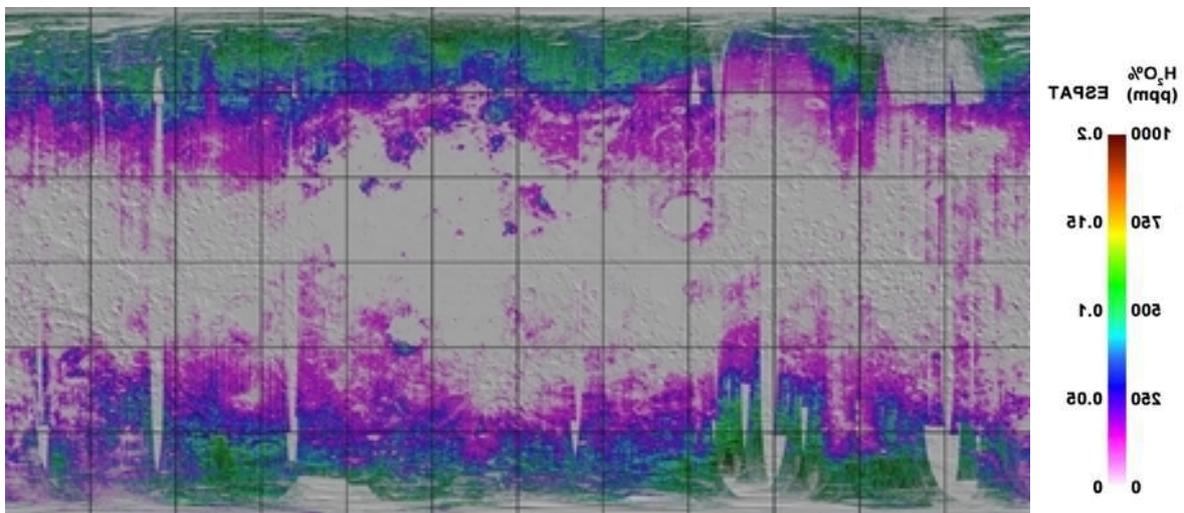
This overlay has been realized with data available on the USGS "Astrogeology / Webgis" and gathers several different Moon geological maps in 2020. It's like the equivalent texture and have the same caption. We recommend to use it with **no texture**

"Rocks types" overlay



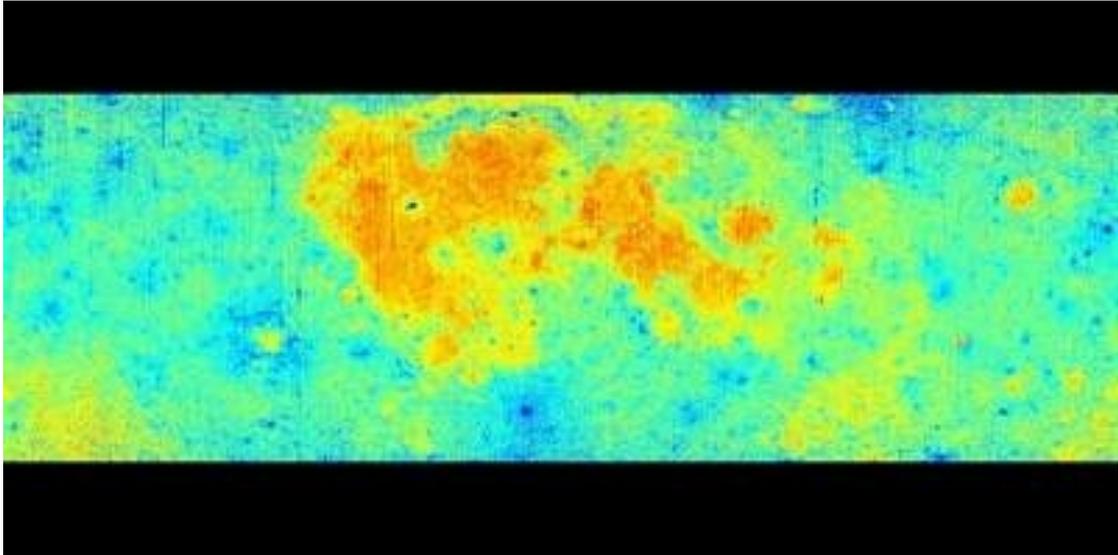
This overlay is realized with Clementine probe orbital data compiled by Dr Maria T. Zuber and her USGS team. It shows differences between surface rocks compositions. There is no caption found for this overlay.

"Water / Chandrayann" overlay



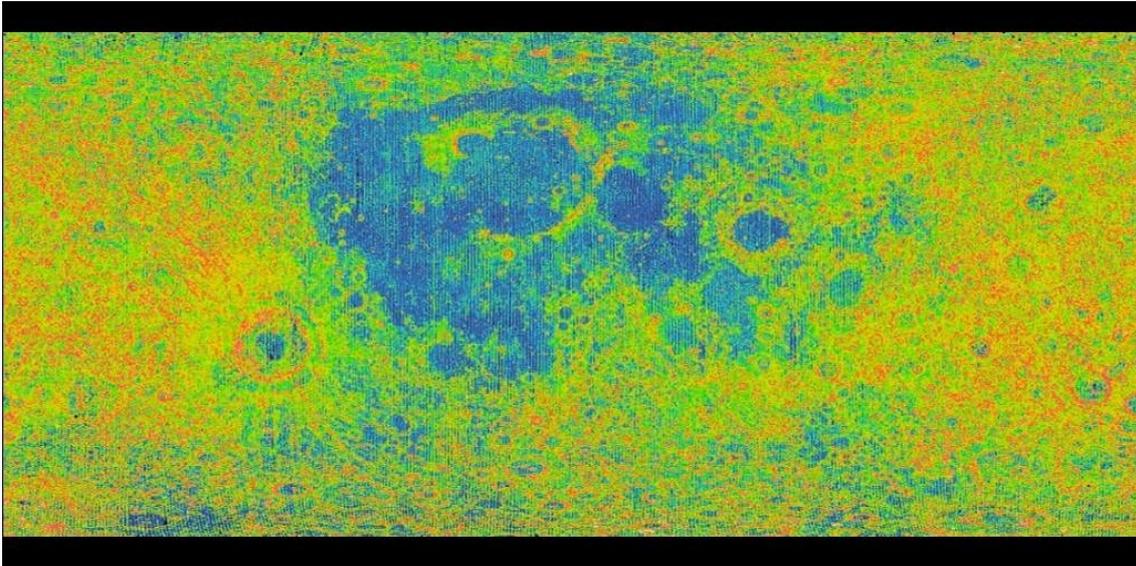
This layer is made from orbital data recorded by the Indian Chandrayann 1 probe and compiled by ISRO and Shuai Li and Ralph E. Milliken in 2017. It allows to visualize the presence of water in the surface rocks.

"Silicates LRO" overlay



This overlay has been realized with datas from **LRO** probe compiled by Dr Mark Robinson and its team. It shows the silicates percentage in the surface lunar rocs.

"Surface roughness LRO" overlay



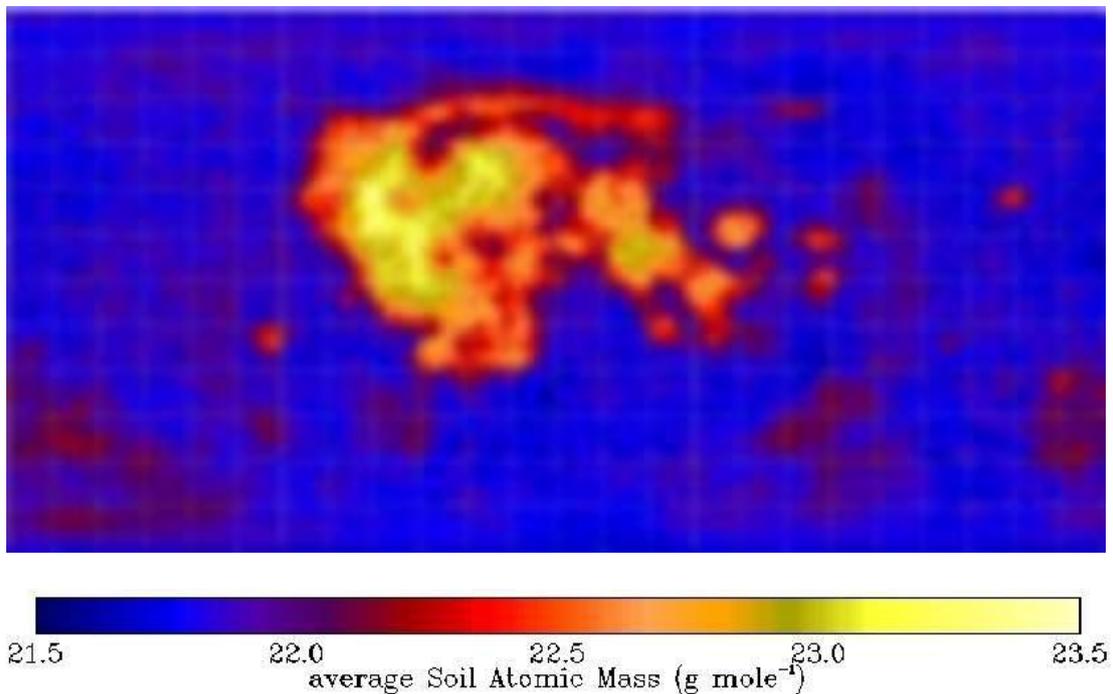
This overlay has been realized with datas from **LRO** probe compiled by Dr Mark Robinson and its team. It shows the lunar surface roughness.

"Slope & surface roughness LRO" overlay



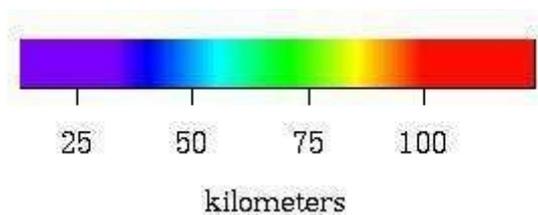
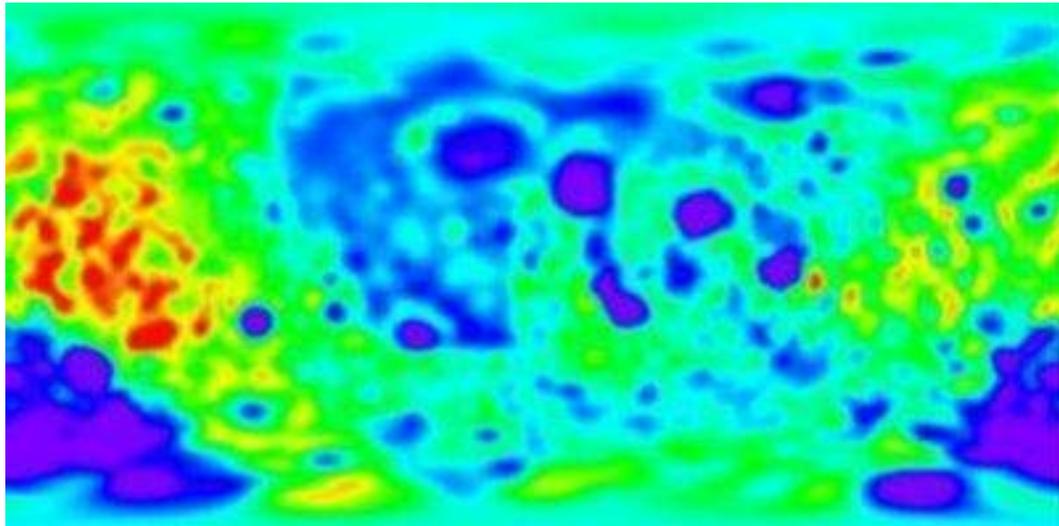
This overlay has been realized with datas from **LRO** probe compiled by Dr Mark Robinson and its team. It shows the lunar surface roughness associated to the terrans slopes. It's useful to determine probes landing surfaces

"Soil atomic mass" overlay



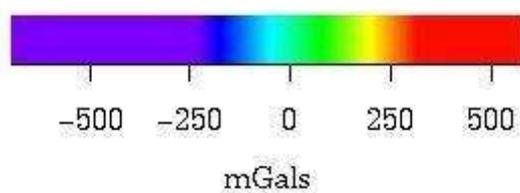
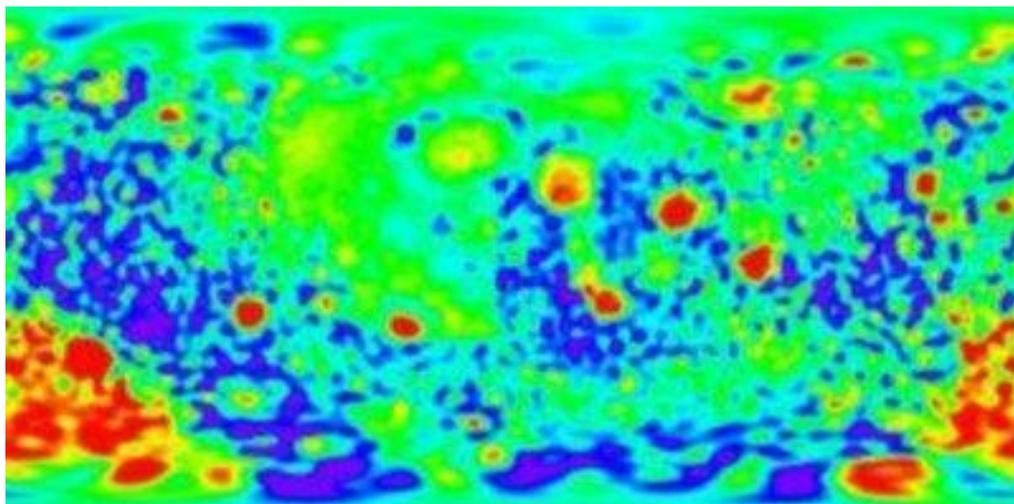
This overlay is realized with Lunar Prospector probe datas compiled by Dr Alan Binder and his team. It shows soil atomic mass. It's visible that Nearside seas have higher atomic mass showing heavy elements presence. The caption is in grams / mole.

"Crust thickness" overlay



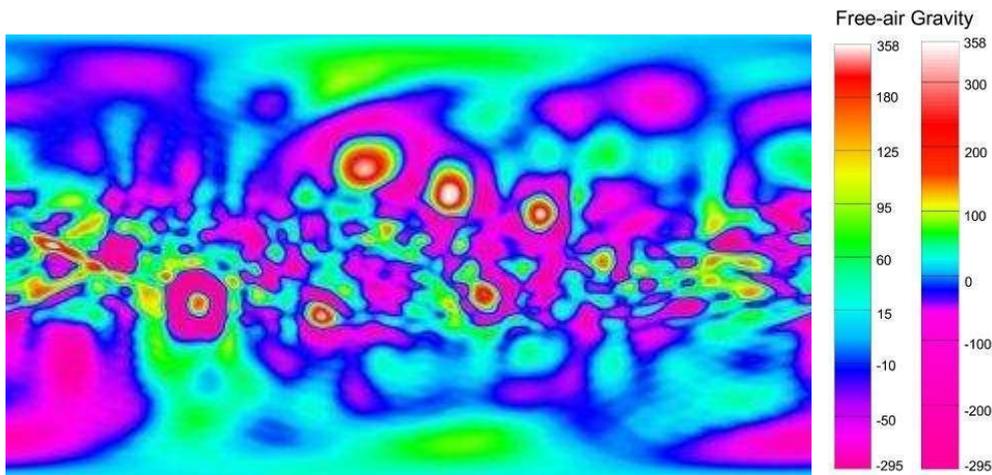
This overlay is conceived with orbital variations data recorded by Clementine probe and compiled by Maria T. Zuber and her LPI team. The overlay allows you to visualize the lunar crust thickness under the formations. It will confirm you that this one is the lowest under the maria and the thickest on the Moon Farside.

"Bouger Gravity" overlay



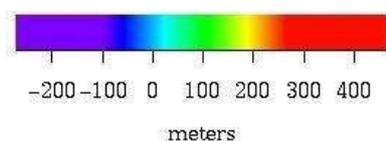
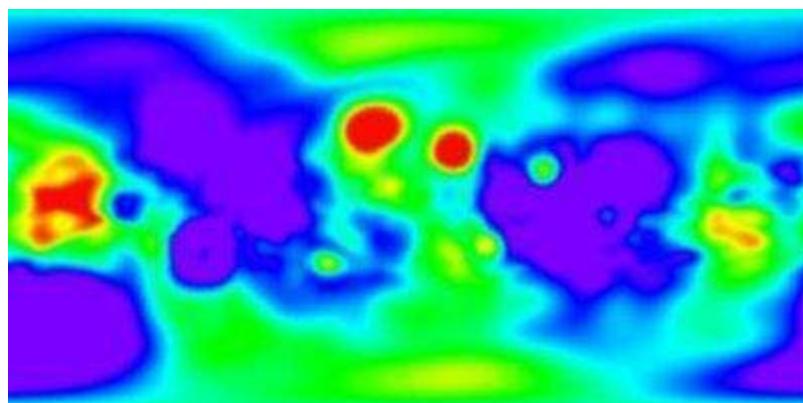
This overlay is conceived with gravimetric datas recorded by Clementine probe and compiled by Maria T. Zuber and her LPI team. They have been completed with Dr Alan Binder and his team results from Lunar Prospector probe. overlay allows you to visualize gravitic anomalies under the formations. The unit is milligals. The biggest anomalies are under the marias showing the famous "mascons" presence. These datas are corrected with the Bouguer method taking account of the soil density in the measurement site.

"Free Air Gravity" overlay



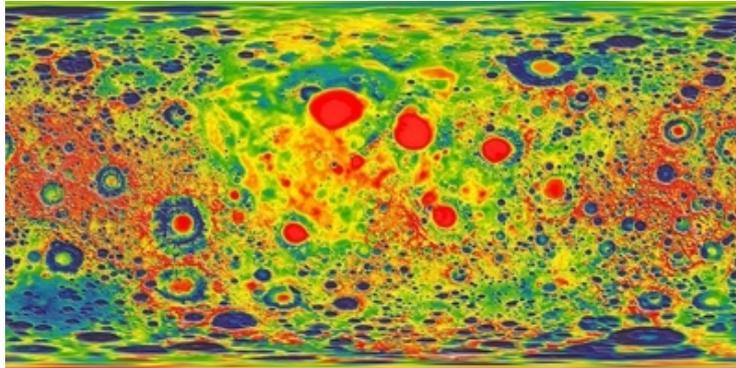
This overlay is conceived with gravimetric datas recorded by Clementine probe and compiled by Maria T. Zuber and her LPI team. They have been completed with Dr Alan Binder and his team results from Lunar Prospector probe. overlay allows you to visualize gravitic anomalies under the formations. The unit is milligals. The biggest anomalies are under the marias showing the famous "mascons" presence. These datas are corrected with the "Free air" method taking account of the altitude above the measurement site.

"Geoid anomalies" overlay



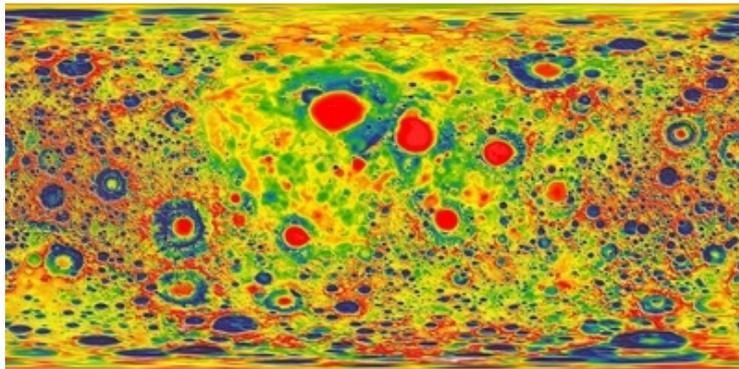
This overlay is conceived with gravimetric data recorded by Clementine probe and compiled by Maria T. Zuber and her LPI team. They have been completed with Dr Alan Binder and his team results from Lunar Prospector probe. overlay allows you to visualize Moon globe shape anomalies which is not perfectly spherical. It whows that the Farside is less round than the Nearside.

"Free Air Gravity / GRAIL degree 2 to 700" overlay ("Free Air gravimetry with harmonic degrees less than 700")



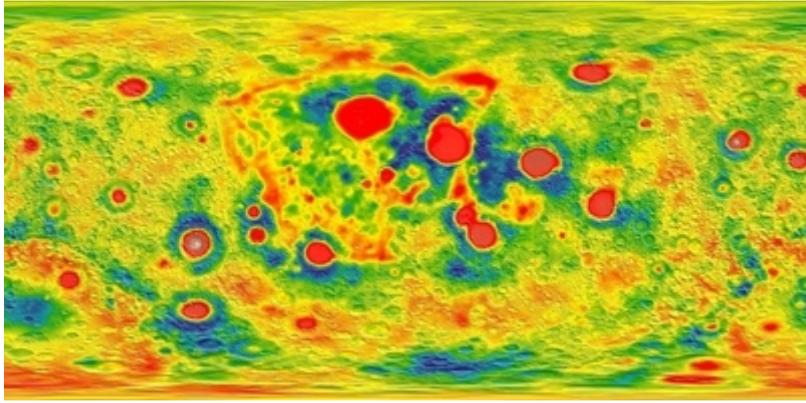
This overlay is produced from gravimetric data recorded by the two GRAIL Ebb & Flow probes and compiled by Dr Maria T. Zuber and his team from the USGS. It is expressed in milligals. It allows you to view gravity anomalies in the area of formations. We thus realize that strong anomalies correspond to the seas and betray the presence of the famous "mascons". These data are corrected according to the "Free air" method which takes into account the altitude of the formations at the measurement right. We have not found a legend for this overlay.

"Free Air Gravity / GRAIL degree 7 to 700" overlay ("Free Air gravimetry with harmonic degrees between 7 & 700")



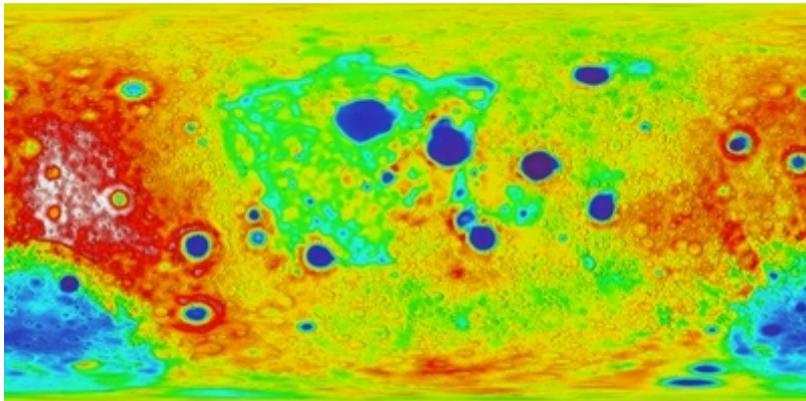
This overlay is produced from gravimetric data recorded by the two GRAIL Ebb & Flow probes and compiled by Dr Maria T. Zuber and his team from the USGS. It is expressed in milligals. It allows you to view gravity anomalies in the area of formations. We thus realize that strong anomalies correspond to the seas and betray the presence of the famous "mascons". These data are corrected according to the "Free air" method which takes into account the altitude of the formations at the measurement right. We have not found a legend for this layer.

"Bouguer Gravity / GRAIL" overlay ("Bouguer" Gravimetry)



This overlay is produced from gravimetric data recorded by the two GRAIL Ebb & Flow probes and compiled by Dr Maria T. Zuber and his team from the USGS. It allows you to view gravity anomalies in the area of formations. It is expressed in milligals. We thus realize that the strong anomalies correspond to the seas and betray the presence of the famous "mascons". These data are corrected according to the Bouguer method which takes into account the density of the soil at the right of the measurement. We have not found a legend for this overlay.

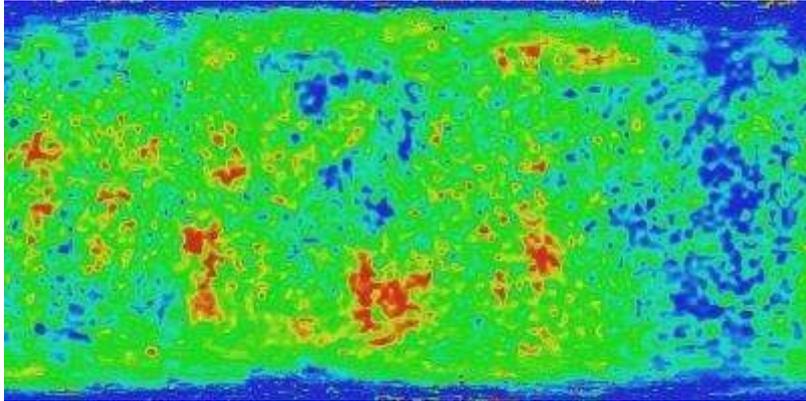
"Crustal thickness / GRAIL degree 1 to 700" overlay



This overlay is produced from gravimetric data recorded by the two GRAIL Ebb & Flow probes and compiled by Dr Maria T. Zuber and his team from the USGS. It is expressed in km. It makes it possible to visualize the variations in the thickness of the crust at the level of the formations. We thus realize the strong under-thicknesses corresponding to the seas which betray the presence of the famous "mascons".

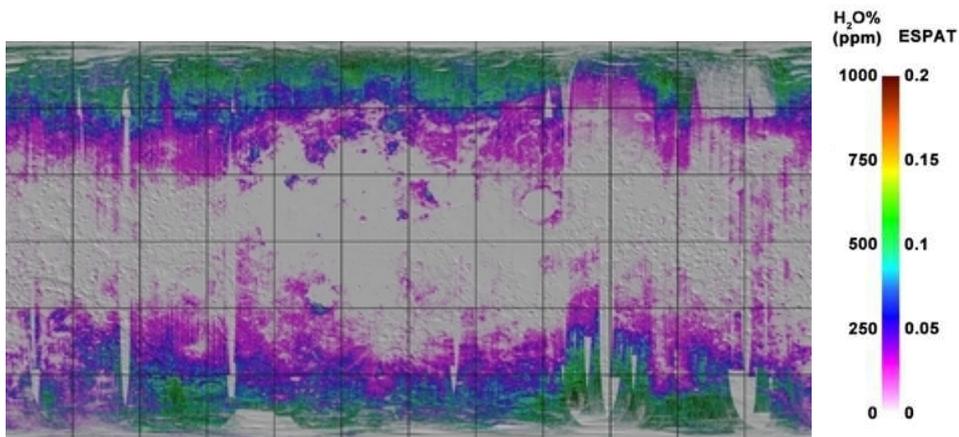
« Elements presence » overlays presentation

"Hydrogen" overlay



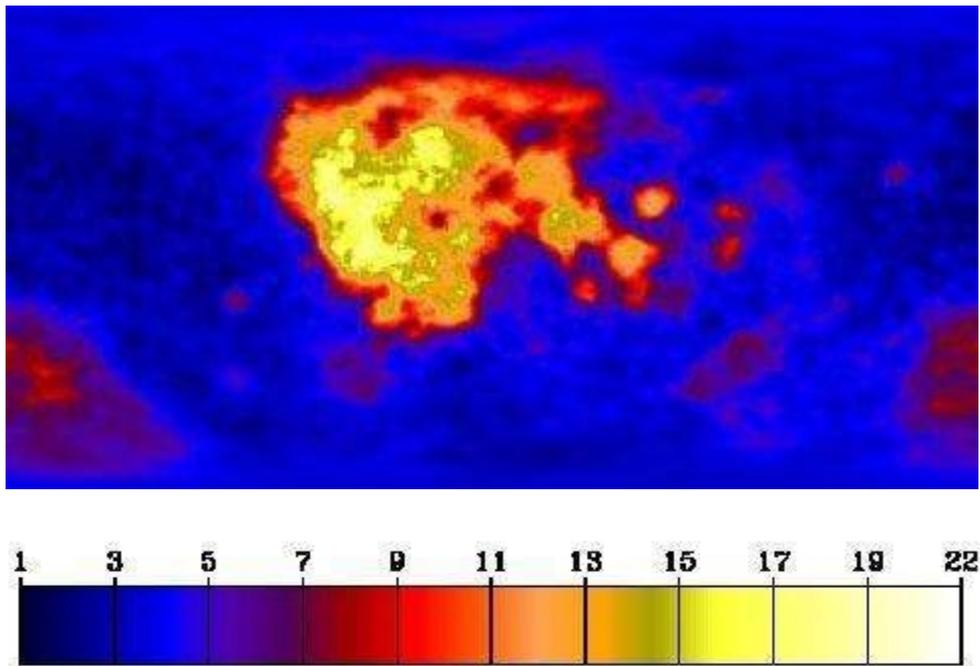
This overlay is conceived with Dr Alan Binder and his team results from Lunar Prospector probe. This overlay allows you to visualize hydrogen repartition on the surface. There is no caption available presently, but red is for high hydrogen concentrations and blue for the lowest.

"Chandrayann 1 / Water" overlay



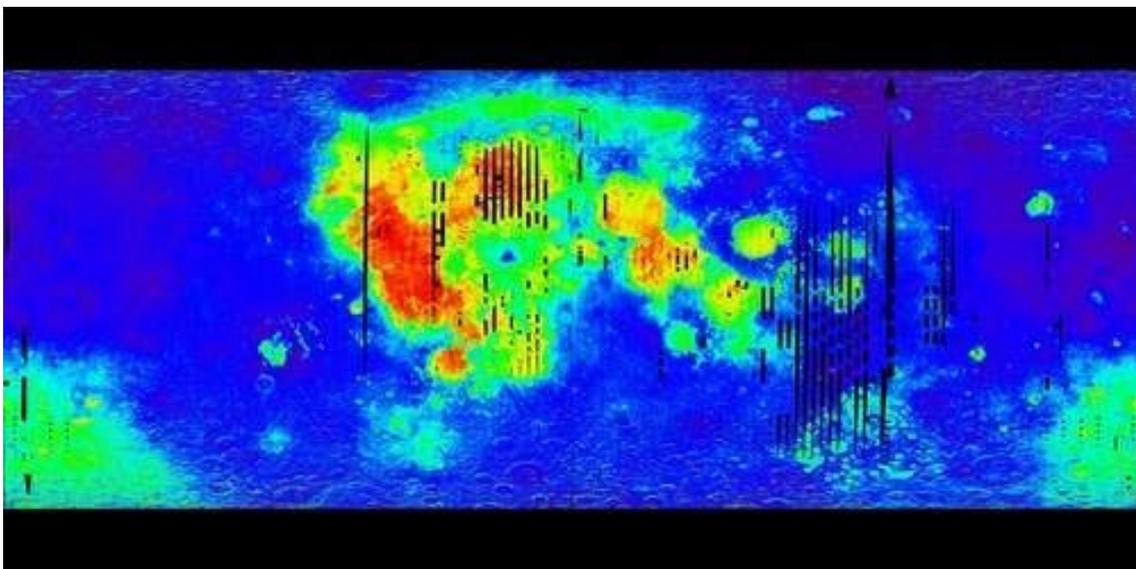
This overlay is conceived with ISRO results from Chandrayann 1 probe. This overlay allows you to visualize waterrepartition on the surface.

"Iron" overlay



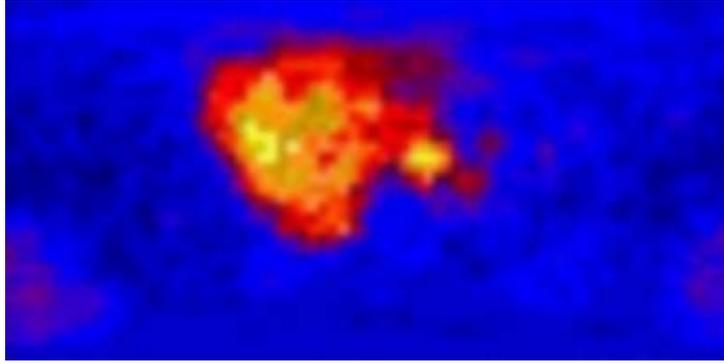
This overlay is conceived with Dr Alan Binder and his team results from Lunar Prospector probe. This overlay allows you to visualize iron repartition on the surface. Immediately, you can see that Nearside maria are rich with iron.

"Iron oxyde / FeO" overlay



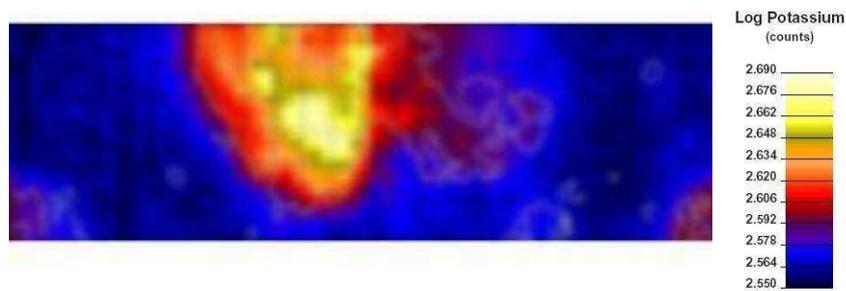
This overlay is conceived from Clementine probe datas. FeO (Iron oxydes) values can be useful in identifying basalt-excavating craters, and so possible cryptomares (Basalt seas covered by more recent materials).

"Titane" overlay



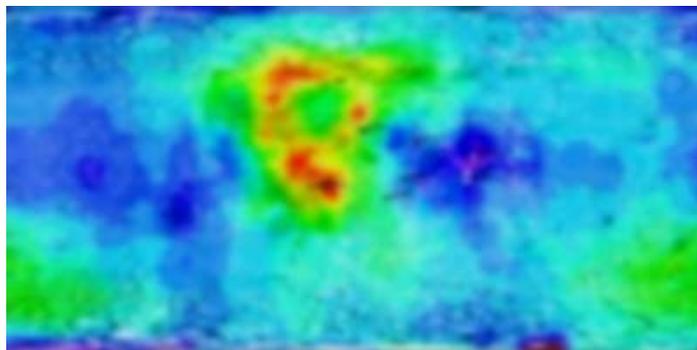
This overlay is conceived with Dr Alan Binder and his team results from Lunar Prospector probe. This overlay allows you to visualize titane repartition on the surface. Immediatly, you can see that Narside marias are rich with this metal.

"Potassium" overlay



This overlay is conceived with Dr Alan Binder and his team results from Lunar Prospector probe. This overlay allows you to visualize potassium repartition on the surface. The measurement unit is based on detection counts. Immediatly, you can see that Narside marias are rich with this element.

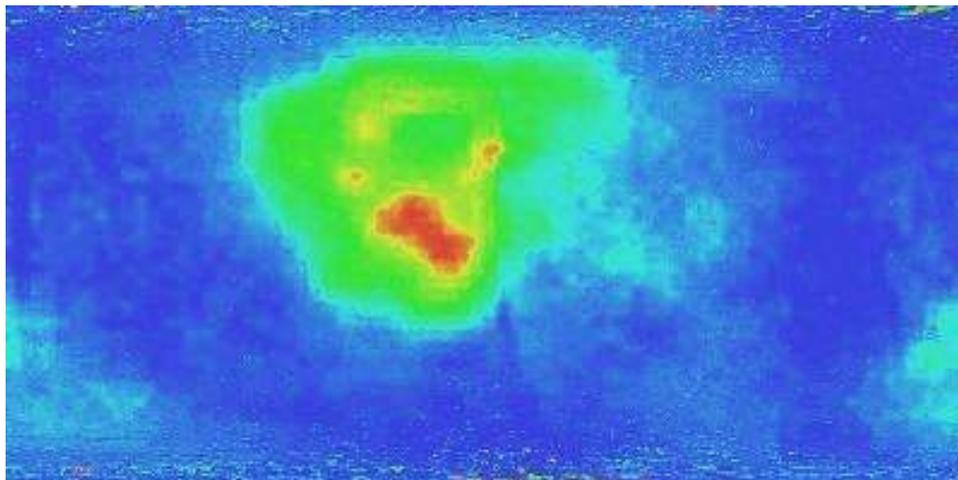
"Gadolinium" overlay



This overlay is conceived with Dr Alan Binder and his team results from Lunar Prospector probe. This overlay allows you to visualize gadolinium repartition on the surface. Immediatly, you can see that Narside marias are rich with this element.

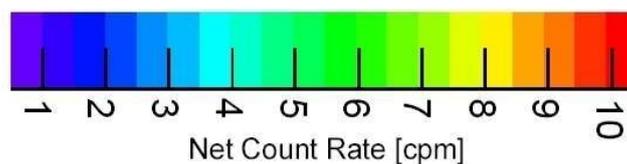
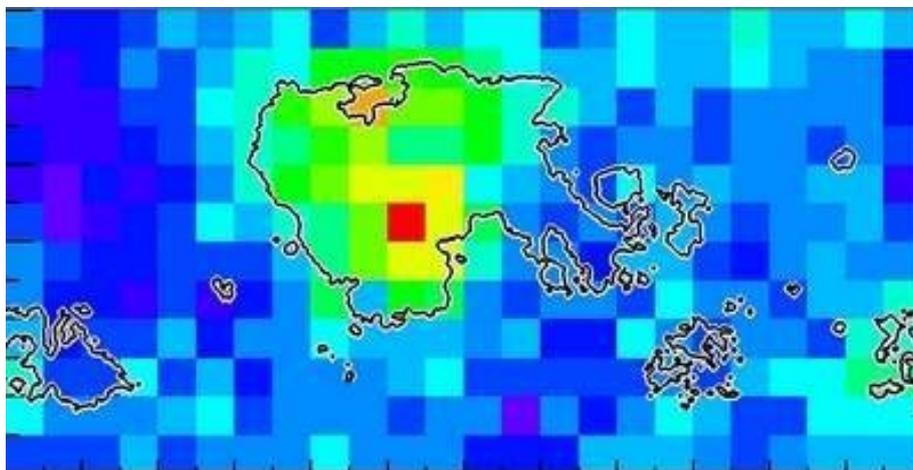
« Radioactive elements repartition" overlays

"Thorium" overlay



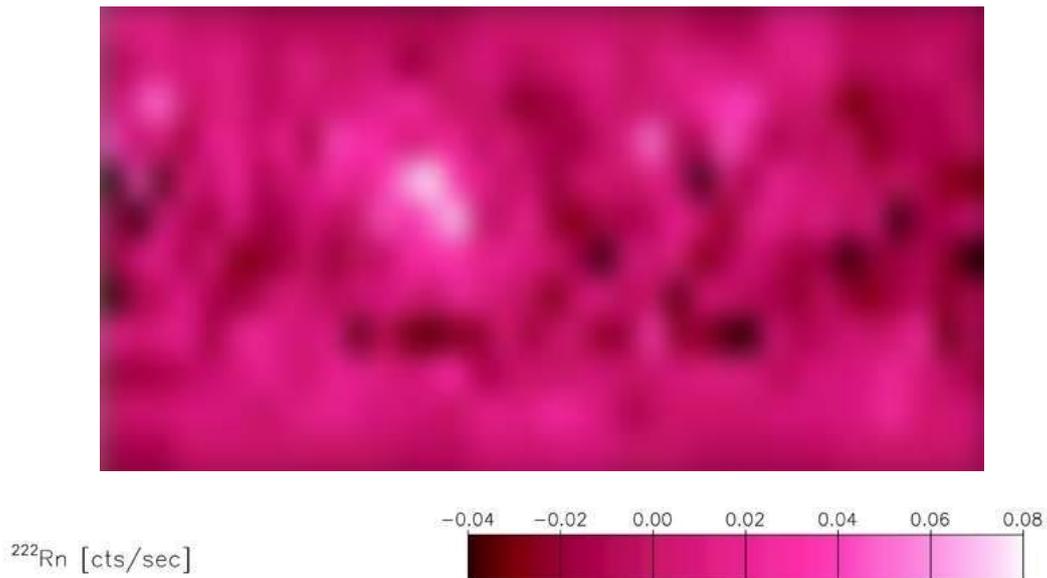
This overlay is conceived with Dr Alan Binder and his team results from Lunar Prospector probe. This overlay allows you to visualize potassium repartition on the surface. No caption is available presently, but red is for high hydrogen concentrations and blue for the lowest. Immediately, you can see that Nearside maria are also rich with this element.

"Uranium" overlay



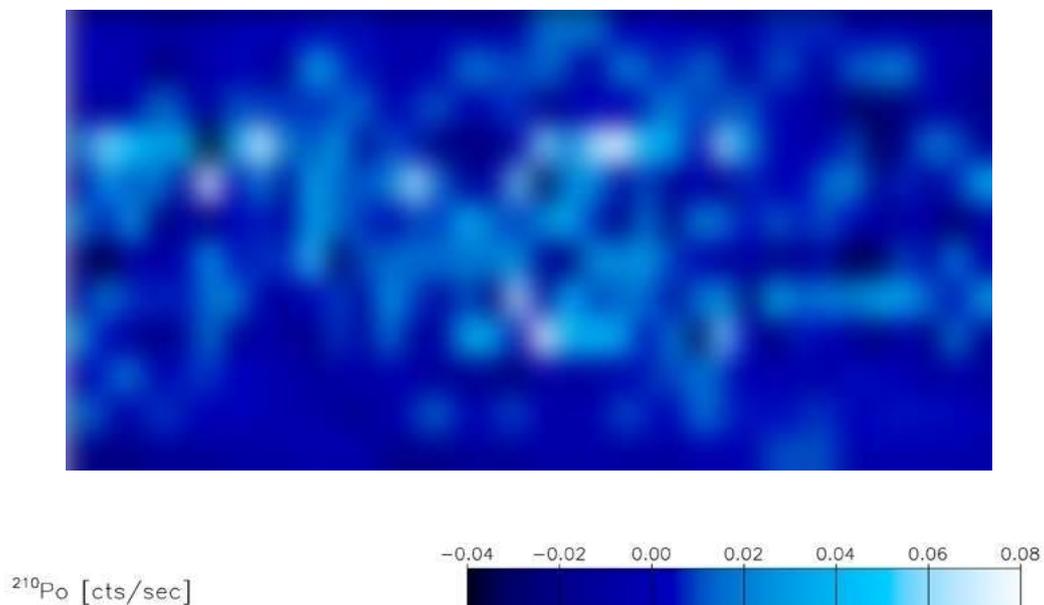
This overlay is realized with japanese probe datas compiled by JAXA team. The caption is based on uranium emitted particles count. It can visualize roughly uranium in formations. It's easily seen that Nearside seas are rich with this element.

"Radon" overlay



This overlay is conceived with Dr Alan Binder and his team results from Lunar Prospector probe. This overlay allows you to visualize radon repartition on the surface. The caption is based on radon emitted particles count. It can visualize roughly radon in formations.

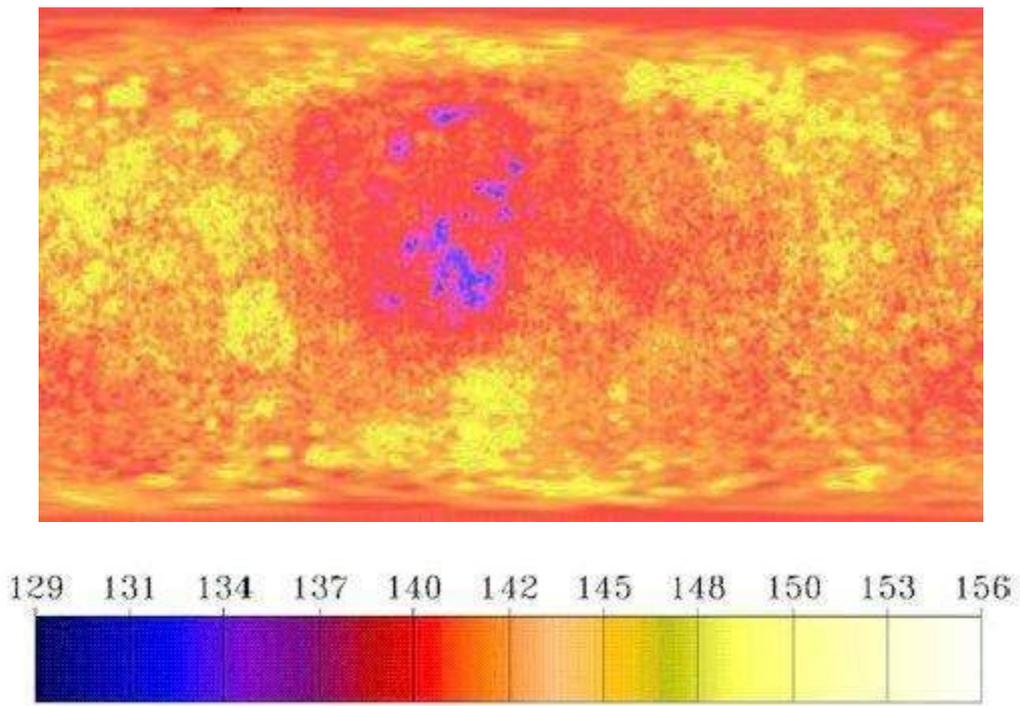
"Polonium" overlay



This overlay is conceived with Dr Alan Binder and his team results from Lunar Prospector probe. This overlay allows you to visualize polonium repartition on the surface. The caption is based on polonium emitted particles count. It can visualize roughly radon in formations.

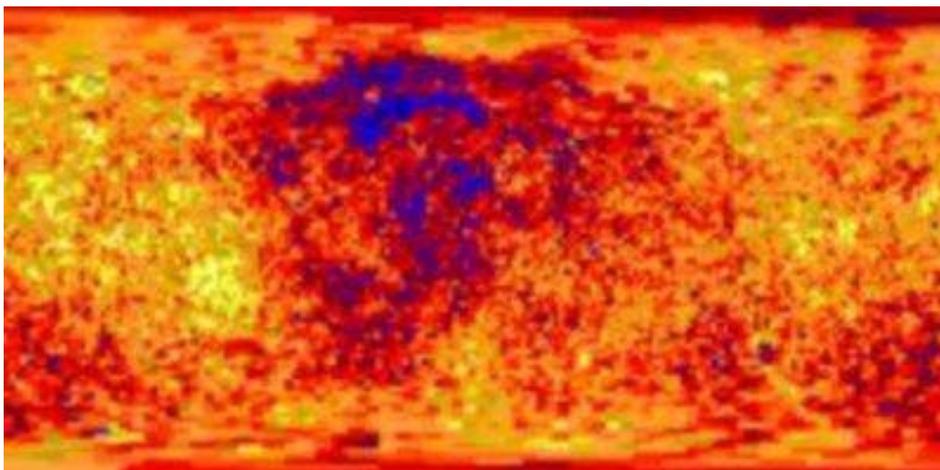
« Neutrons emissions» overlay presentation

"Neutrons epithermal" overlay



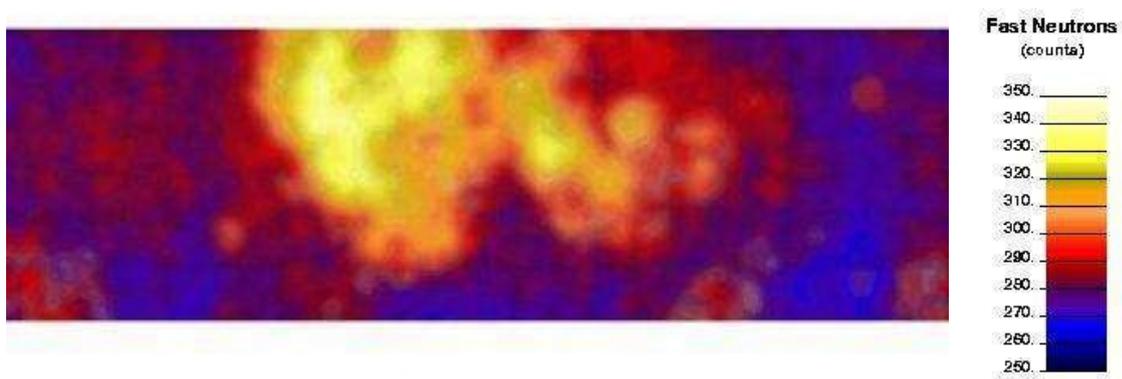
This overlay is conceived with Dr Alan Binder and his team results from Lunar Prospector probe. This overlay allows you to visualize number of detected "epithermal" neutrons on the surface. The measurement unit is based on detection counts. Immediately, you can see that Nearside maria are powerful emitters.

"Neutrons broadband" overlay



This overlay is conceived with Dr Alan Binder and his team results from Lunar Prospector probe. This overlay allows you to visualize number of detected "broadband" neutrons on the surface. The measurement unit is based on detection counts. Immediately, you can see that Nearside maria are powerful emitters.

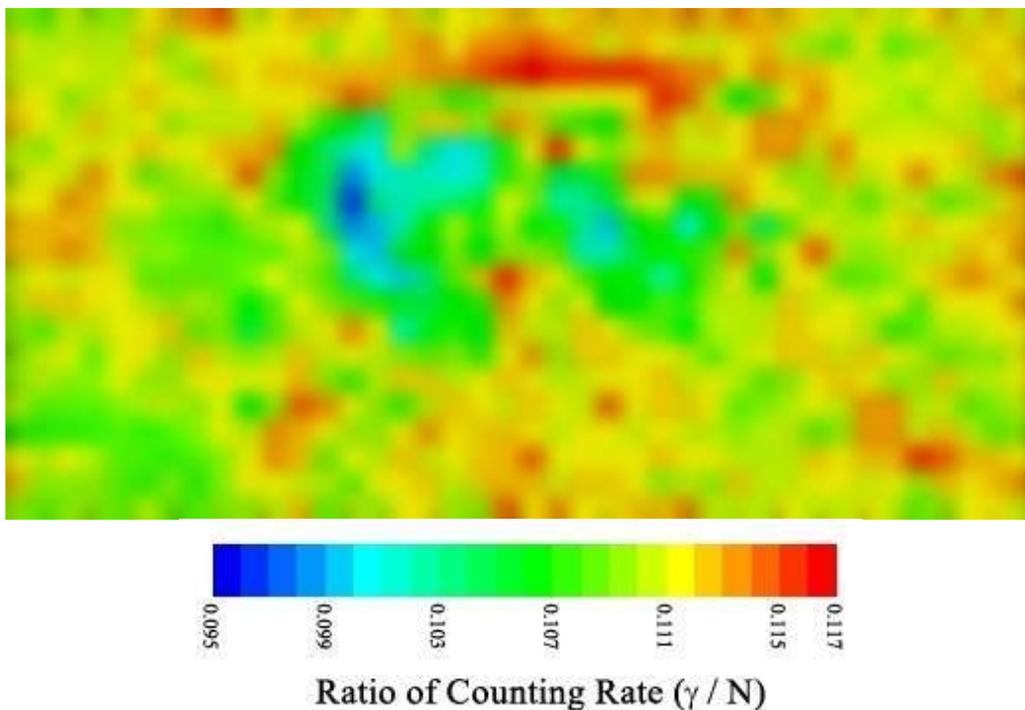
"Neutrons fast" overlay



This overlay is conceived with Dr Alan Binder and his team results from Lunar Prospector probe. This overlay allows you to visualize number of detected "fast" neutrons on the surface. The measurement unit is based on detection counts. Immediately, you can see that Nearside maria are also powerful neutrons emitters.

« Radiations emissions" overlays presentation

"Gamma rays" overlay

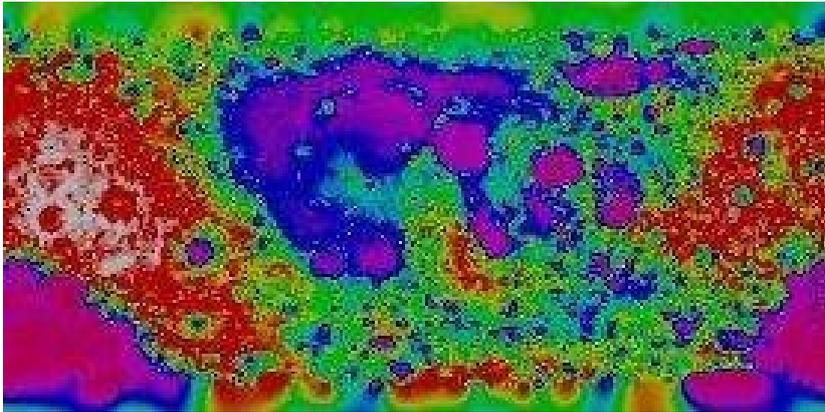


This overlay is realized with Japanese probe Kaguya data compiled by the JAXA team. The caption is based on the gamma ray level detected by the probe. It can visualize roughly gamma ray levels in formations. It's easily seen that this repartition is rather uniform.

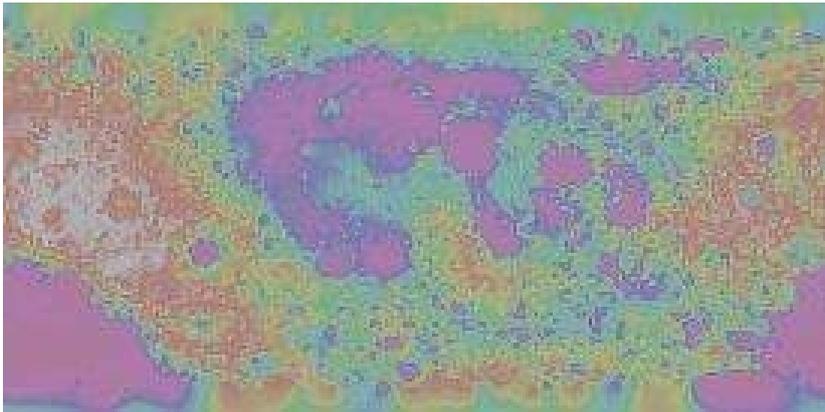
"Transparency" cursor



This cursor allows you to choose the transparency degree of the overlay applied above the texture. It doesn't operate on the texture. When the cursor is on the right, the overlay very visible. On left, the underlying texture is almost invisible. Choose what degree you would apply to be able to see all the details together. (Example shown without underlying texture).

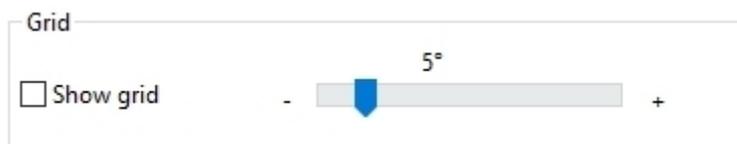


< Non transparent overlay



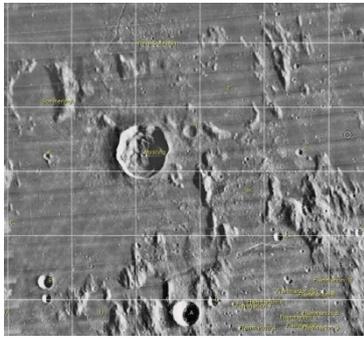
< Transparent overlay

"Grid " frame

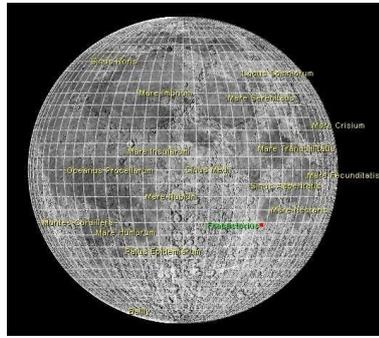


The radio button « Show grid » displays or not a white grid with meridians and parallels on the lunar globe surface.

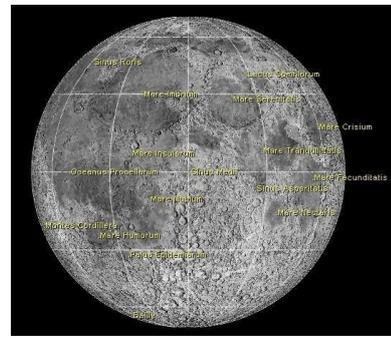
The cursor changes grid density. This one varies from 1° until 30 °.



1° Grid



5° Grid



30° Grid

"Pictures" tab

Configuration

Eyepieces		CCD		Printing	
General	Database	Display	Texture	Overlay	Images

Image folders:

Name	Folder
LOPAM	C:\Program Files (x86)\VirtualMoon 6\Lopam
Apollo	C:\Program Files (x86)\VirtualMoon 6\Apollo
My Images	C:\Program Files (x86)\VirtualMoon 6\My Images
Clementine	C:\Program Files (x86)\VirtualMoon 6\Clementine
Probes	C:\Program Files (x86)\VirtualMoon 6\Probes
LunaStars	C:\Program Files (x86)\VirtualMoon 6\LunaStars
CLA	C:\Program Files (x86)\VirtualMoon 6\CLA
LAC_LM	C:\Program Files (x86)\VirtualMoon 6\LAC_LM
Apollo Mapping Can	C:\Program Files (x86)\VirtualMoon 6\ApolloMapping
Best of Amateurs	C:\Program Files (x86)\VirtualMoon 6\BestOfAmateurs
Best of Higgins	C:\Program Files (x86)\VirtualMoon 6\BestOfHiggins

Check for optional features

OK Cancel

This tab is used to sort the available pictures in the library because their number will increase constantly, and the pictures display setup.

Pictures directories list

You can edit the list of the "picture directories". In addition to the "LOPAM", "Clementine", "Probes", "Apollo", "Apollomapping", "CLA" and "My images" downloadable pictures, you can create one or more new directories to put in your own webcam or CCD pictures, or pictures coming from other sources and legally acquired, such as the "Best of amateurs series" present on VMA Web site..

"Eyepieces" tab

Configuration

General Database Display Texture Overlay Images

Eyepieces CCD Printing

Telescope focal length [mm]

Eyepiece focal length [mm]

Eyepiece apparent field of vision [°]

Power x => [°]

Eyepiece Name	Field in minutes	<->	N/S
SCT 8" + Plossl 20mm	30		
SCT 8" + Plossl 10mm	15		
SCT 8" + Plossl 5mm	0		
	0		
	0		
	0		
	0		
	0		
	0		
	0		
	0		

This tab is used to setup parameters of your own eyepieces so that, you could display the real Moon aspect when observed in your instrument with "**Eyepiece**" context menu function ("LUN" is for "LUNETTE" = "REFRACTOR" in french).

Eyepieces list

You can enter directly your eyepieces parameters in list fields if you know them, as shown by the exemple which can be erased. "**Name of the eyepiece**" is in the left column and the "**apparent field**" in arc minutes in the right column. You can enter up to 10 eyepieces. It's better to enter them in the increasing magnification way.

Eyepieces parameters computation

Eyepieces parameters can be computed with the help of our calculator. First enter the "**Instrument focal length**". Then enter the "**Eyepiece focal length**". Then enter the "**Apparent eyepiece field of view**" in the third field. This field is that indicated in eyepieces advertisements. For example, Plossl eyepieces apparent field is about 50° and Ultra Wide Angle eyepiece is 82°.

Push the "**Compute**" button. In the "**Real eyepiece field**" frame, the area diameter is displayed in arc minutes. In the "**Eyepiece magnification**" frame, the magnification of the choosen eyepiece is indicated. After that, you have just to copy these two values in the two columns of the lower table.

You can also input directly the orientation view effects according to your instrument type by clicking in the boxes of the "<->" (Right - left inversion) and "N/S" (North / South inversion). If the rectangle is green, so the effect is activated. If it's red, so the effect is not activated. For example : if you use a Schmidt-Cassegrain or a refractor, the "<->" rectangle of the eyepiece must be green, but the "N/S" must be red. For a Newtonian telescope, the "<->" rectangle must be green and the "N/S" must be green too.

"CCD" tab

CCD name	Width	Height	Rotation
SCT 8" + TUC webcam	6.20	4.60	0.0
SCT 8" + ZWO ASI 124MC	0.00	0.00	0.0
	0.00	0.00	0.0
	0.00	0.00	0.0
	0.00	0.00	0.0
	0.00	0.00	0.0
	0.00	0.00	0.0
	0.00	0.00	0.0
	0.00	0.00	0.0
	0.00	0.00	0.0

This tab allows you to enter parameters of your CCDs cameras or others pictures makers to view their real field on the lunar map according to your instrument specifications.

Cameras list

You can enter directly your cameras specifications in the list fields if you know them :

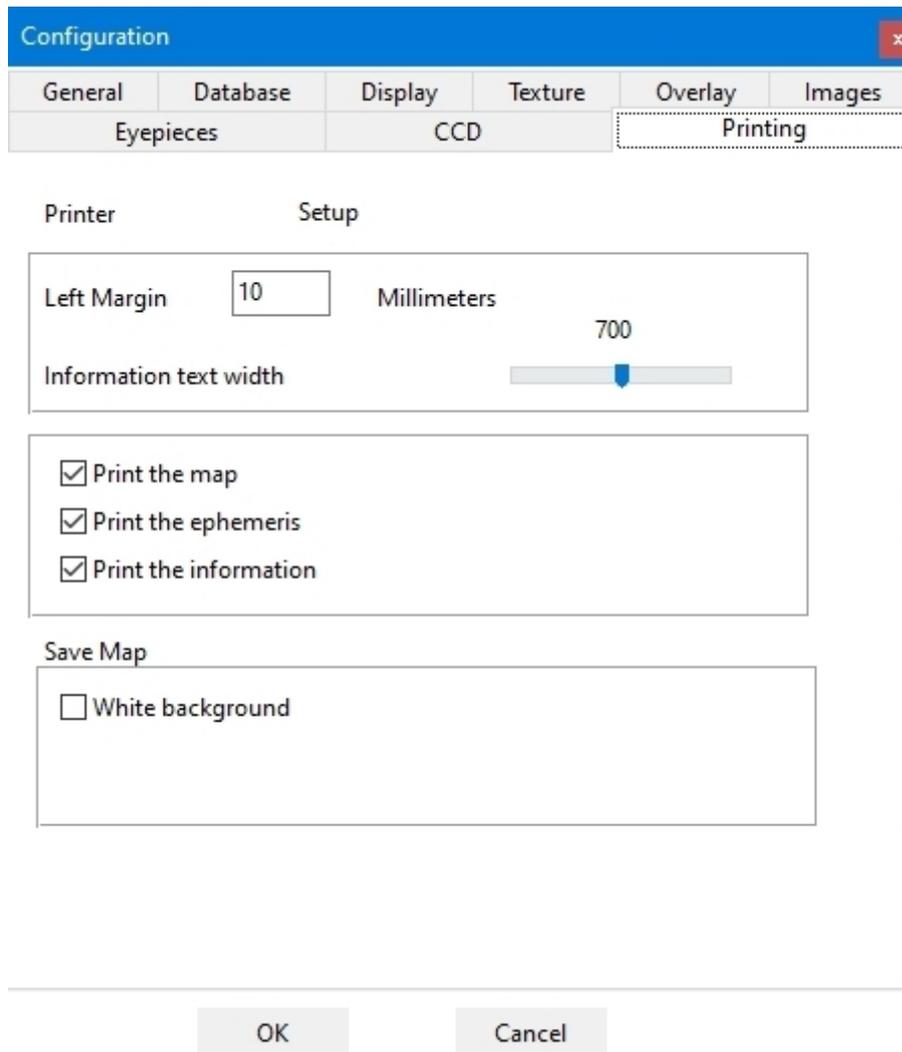
Description in the left column "CCD Name" and field dimensions in pixels. An exemple is shown by default. You can enter 10 products at maximum. It's better to enter them with their increasing magnification.

Computing cameras parameters

If you don't know your cameras parameters, a small calculator can help you. Just enter the instrument focal length and capteur dimensions in pixels.

push the "compute" button. In the real field cases you will see the dimensions of the lunar area that will be imaged.

"Printing" tab



The image shows a screenshot of a software configuration window titled "Configuration". The window has a blue header bar with a close button (X) on the right. Below the header are several tabs: "General", "Database", "Display", "Texture", "Overlay", and "Images". The "Printing" tab is selected and highlighted with a dashed border. Underneath the tabs, there are three main sections: "Printer Setup", "Print the map", and "Save Map".

Printer Setup

Left Margin: Millimeters

Information text width:

Print the map

- Print the map
- Print the ephemeris
- Print the information

Save Map

- White background

At the bottom of the dialog are two buttons: "OK" and "Cancel".

This tab is used to setup map printing parameters.

"Setup" button

This button shows the standard Windows printing setup window.

Printing format

This area is used to choose printing margins width and change the Description text width.

Printed documents

These boxes are used to select the documents that will be printed. The printed map is that of the last window map. Topographic maps are black and white and geologic map are colored with color names in both types. Maybe you will have to change the Description text width to better see printed names.

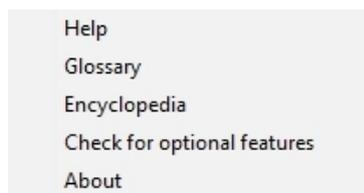
"**Ephemeris**" text contains orbital, phase and libration information according to the last date and hour selected in the "Ephemeris" window.

"**Description**" text contains the information page of the last chosen formation on the map.

"Save map" frame

Displayed map can be printed on paper with white background around the lunar disk to speed up printing and save ink!

"Help" MENU

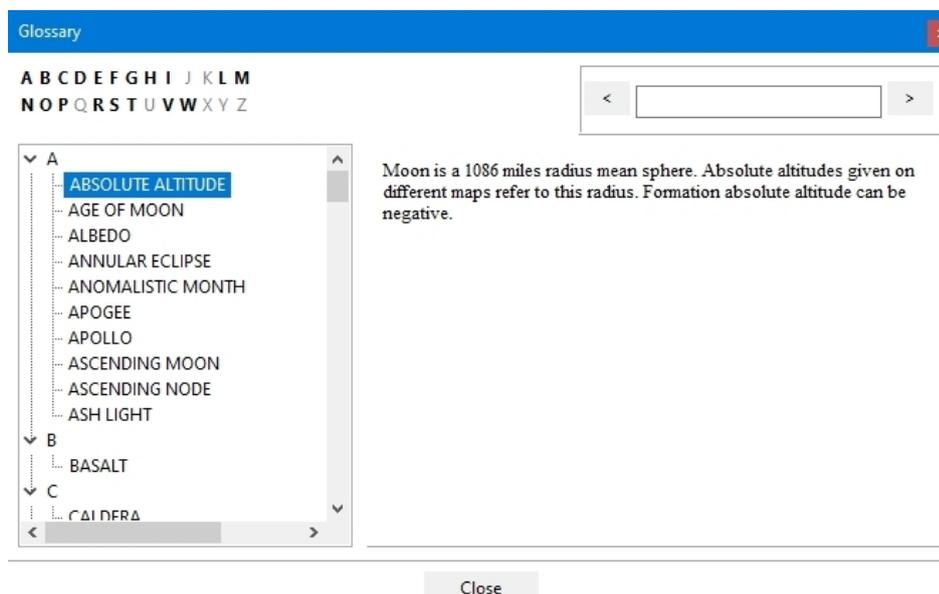


This menu brings up help tools to aid using the atlas.

"Help" choice

This choice displays the present manual in an independent window.

"Glossary" choice



This choice gives access to a glossary containing more than 100 words and expressions linked to the Moon and its observation.

The glossary is also in an independent window which is divided in three distinct parts

Upper part contains alphabet letters. Clicking on one of them gives access to the words beginning with this selected letter.

Left lower part is a tree of letters and associated words.

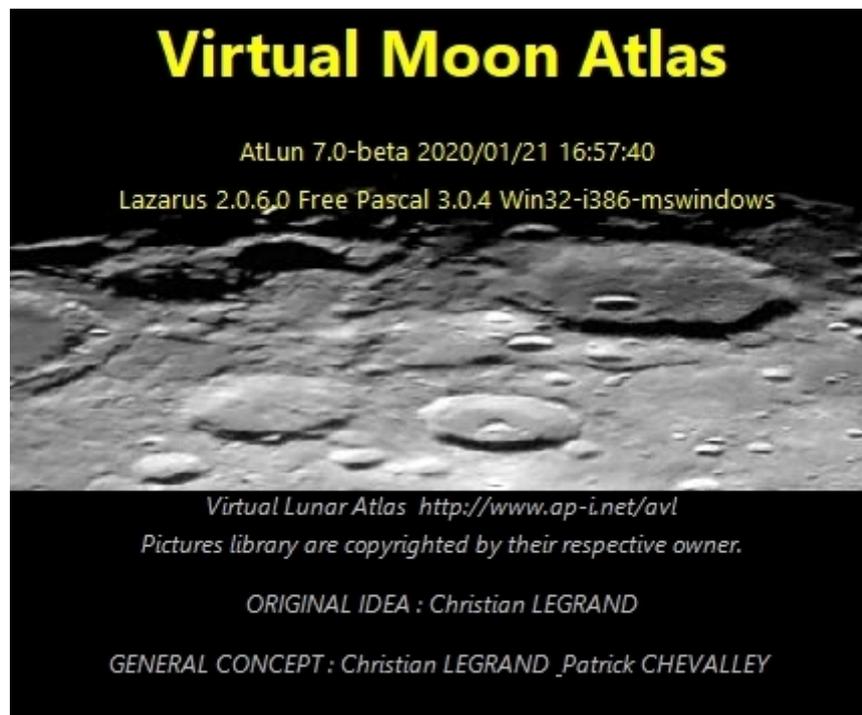
Right lower part contains an explanation of the selected word or expression.

"Encyclopedia" choice

This choice shows you a page with main dimensions of Moon globe and orbit.

"About" choice

This choice shows the version of the program, and indicates how Christian Legrand and Patrick Chevalley divide their work in the creation and development of this atlas.



ZOOM CURSOR

Zoom: 

Sliding this cursor from left to right increase zoom magnifying power of the map (See "[Map window](#)").

If cursor is on left, lunar globe is entirely visible. Moving it to the right increases zoom power (zooms in).

Depending on the resolution textures chosen in the settings (See "[Settings tab](#)"), zoom will not show new details and map display can become fuzzy.

Display of labels and marks is a function of zoom factor and of labels density (See "[labels and marks](#)").

It can be increased or decreased with the label cursor further to the right on the button bar.

"1:1" BUTTON

1:1

Clicking on this button returns the map to the whole lunar globe display in the "**Map window**".

"Center" BUTTON



Clicking on this button will make the lunar globe center displayed on the center of your screen when zoom is 1/1. It also centers the formation you have selected.

"North / South " BUTTON



If you click on this button, you immediately invert the North - South in the "Map" window. It must be used with the "East - West" button below to change from naked eye view to Newtonian view.

"East / West " BUTTON



If you click on this button, you immediately invert the East - West in the "Map" window. It must be used to change from naked eye view to refractor or catadioptric telescope view.

"Full globe / Rotation" button



When clicking on this button, you access to the most powerful function of **ATLUN** (c). If the button is Up, the map window shows you the Near Side visible from the Earth with phase and libration applied if you checked the boxes in the "**Display**" tab of the "**Configuration**" menu.

But if you click down on this button, you go to "**Full globe**" mode and the map window displays a complete globe in three dimensions that you will be able to observe on all its faces.

"Libration" BUTTON



If you click on this button, you display or remove the libration effect on the Moon globe of the "Map" window.

"Grid" BUTTON



When clicking on this button, the grid chosen in the "Overlays" tab of the "Configuration" menu is displayed on the lunar globe. The space between parallels and meridians is that has been chosen in the tab, from 1 to 30 °.

"Phase" BUTTON



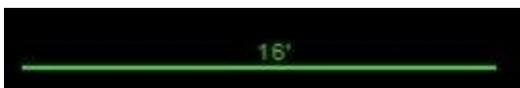
If you click on this button, you display or remove the phase display on the Moon globe of the "Map" window.

If the "Dynamic shadows" option has been selected in the "Textures" tab of the "Configuration" menu, it's displayed.

"Scale" BUTTON



When clicking on this button, a scale in angular dimension is displayed at the left bottom of the map window.



Beware ! This scale indicates the "visual" angular size. It doesn't indicate the dimensions on the lunar globe. For measuring distances on the globe, you must use the "distance measure" tool comprised in the "Tools" tab.

"Labels" BUTTON



This button allows you to access the color choice window for map labels. Its use helps a lot to adapt quickly the labels colours to the map hues context, specially with scientific overlays use.

THE LABEL CURSOR



By adjusting this slider, you can adjust the number of labels displayed at the same time on the selected "Map" window.

Completely to the left, the lunar globe is entirely devoid of labels. By moving the cursor to the right, we increase the number of visible labels. This number also varies depending on the zoom level.

Depending on the number of databases used, the display can be very crowded, even at maximum zoom.

"Neighbor" BUTTON



When clicking on this button, a new picture that contains the names of the formations in the neighborhood of the selected formation. You can click on one of them to go directly there.



"Picture" BUTTON

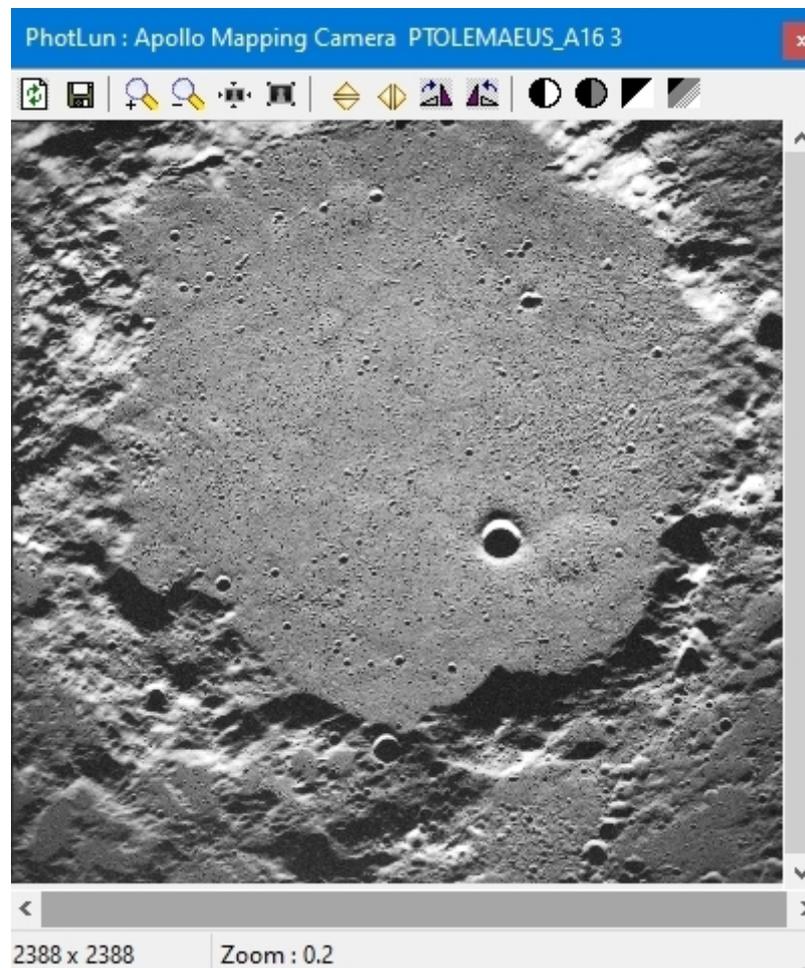


The "Picture" button gives now access to **PHOTLUN (c)**, the VMA Pro pictures manager.

The "PhotLun" (c) window

The miniatures band appears with the menu bar.

This module allows a more easier choice for displaying pictures because of the pre-visualization miniatures pictures. You get the original image of the tab you clicked on in a separate window.

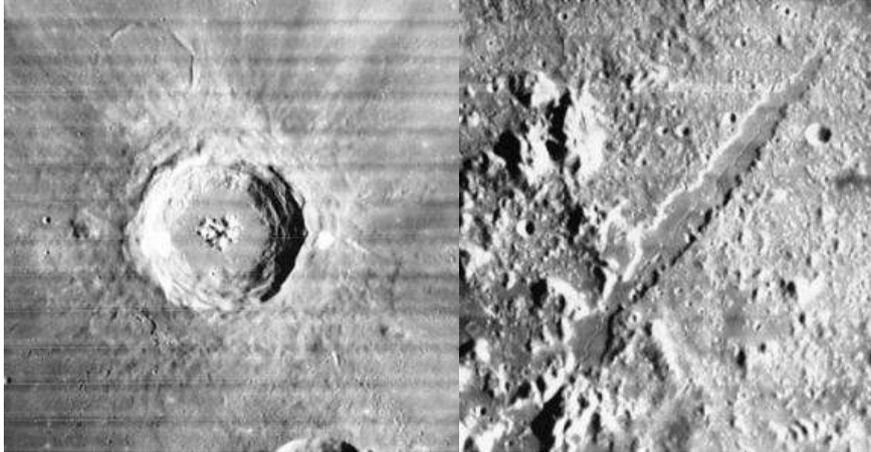


We send you back to the specific **PHOTLUN (c)** documentation to discover all its possibilities and specially the pictures treatment functions (Rotation, zoom, contrast and luminosity).

The pictures library

The pictures library is modular, so you can add a number of sources. You can download for this version picture files coming from various sources. These files have obtained the necessary authorizations to be used **only** in VMA.

"LUNAR ORBITER PHOTOGRAPHIC ATLAS OF THE MOON" PICTURES



"Aristillus" and "Vallis Alpes"

These pictures have been extracted from the electronic version of the "**Lunar Orbiter Photographic Atlas of the Moon**" (LOPAM) realized by **Jeff Gillis** and his team at the **Lunar and Planetary Institute**. This remarkable atlas can be consulted on the site http://www.lpi.usra.edu/resources/lunar_orbiter/

Christian Legrand has extracted from each of the more than 200 LOPAM photos, pictures of each named formation. He compiled about 3000 pictures. Then, he chose the best one for each formation. For some formations, which were spread on several photos, it was necessary to cut and join several peaces. Some others need a new orientation. All these pictures were then compressed so that small size for downloading that doesn't alter quality.

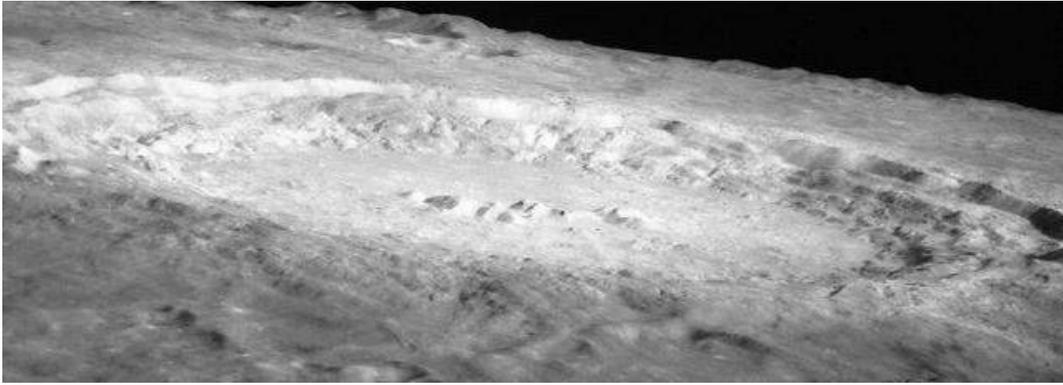
Please note that these pictures have been "**lines removed**" using the powerful software provided by **Niels Noordhoek**

Despite of this important work, about 150 formations haven't been recovered in the LOPAM photos because Lunar Orbiter 4 didn't photography the entire visible face with sufficient resolution. For those who don't wish to download all the pictures, Christian Legrand has selected the more famous lunar formations (130) and has gathered them in the "**Lunar stars**" library.

These pictures are under "Lunar and Planetary Institute" copyright and cannot be used outside VMA.

LOPAM pictures are in the "LOPAM" sub-directory.

APOLLO MISSIONS PICTURES



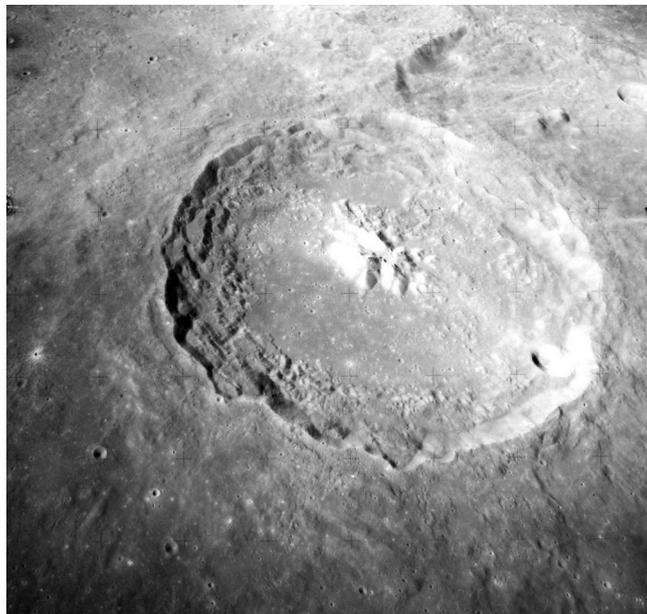
With the goal to provide the most complete image of each lunar formation, Christian Legrand has also selected in the Apollo missions pictures more than 400 pictures related to more than 300 different formations. These pictures are very often from the hand-held Hasselblad pictures.

These pictures are provided under the general copyright of the "National Air and Space Administration" (NASA) which own reproduction rights (<http://www.nasa.gov>) and they can't be used outside of the atlas.

Picture name indicates the formation name and the Apollo mission that took the picture when it's known : so COPERNICUS_A12.JPG is the name of a picture of Copernicus taken during Apollo 12 mission.

APOLLO pictures are in the "**Apollo**" sub-directory.

APOLLO MAPPING CAMERAS MISSIONS



Theophilus seen by Apollo 16 Mapping Camera.

Put online by the "**Lunar and Planetary Institute**", "**Apollo Mapping Cameras**" pictures, who were on board "Apollo Service Modules", are among the most detailed

ever realized. Christian Legrand has selected among hundreds of published frames, those which give the most interesting views of Nearside formations as those above.

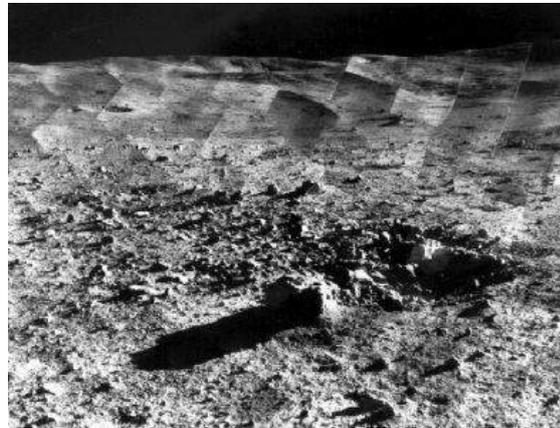
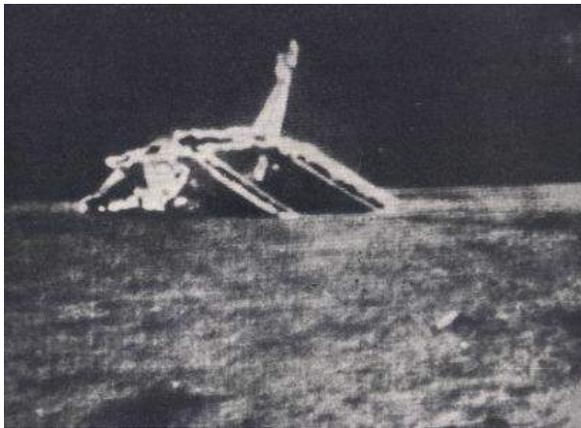
Christian Legrand has extracted about 1000 pictures and has chosen about 700 ones.

These pictures are provided under the general copyright of the "Lunar and Planetary Institute" and they can't be used outside of the atlas.

Picture name indicates the formation name and the Apollo mission that took the picture when it's known : so COPERNICUS_A12.JPG is the name of a picture of Copernicus taken during Apollo 12 mission.

APOLLO MAPPING pictures are in the "**Apollomapping**" sub-directory.

LUNAR PROBES PICTURES



Soviet **Luna 17** pictured by mobile robot Lunakhod 1 (Left) and Tycho crater walls panorama taken by american probe **Surveyor 7** (Right).

Many other automatic probes than Lunar Orbiter 4 have measured and photographed the Moon. These are american Ranger, Lunar Orbiter 1,2,3,5 and Surveyor. In the historical "Moon race" context, ex USSR has also launched a great number of Luna probes.

This picture library realized by Christian Legrand contains about 120 pictures taken by these probes. Found on the Web, these pictures are provided under the general copyright of the "National Air and Space Administration" (NASA) which own reproduction rights (<http://www.nasa.gov>) and they can't be used outside of the atlas. Soviet probes pictures have no identified copyright owners.

Picture name indicates the formation name and the probe or Apollo mission that took the picture when it's known : The following code is used associated with XX as the mission number :

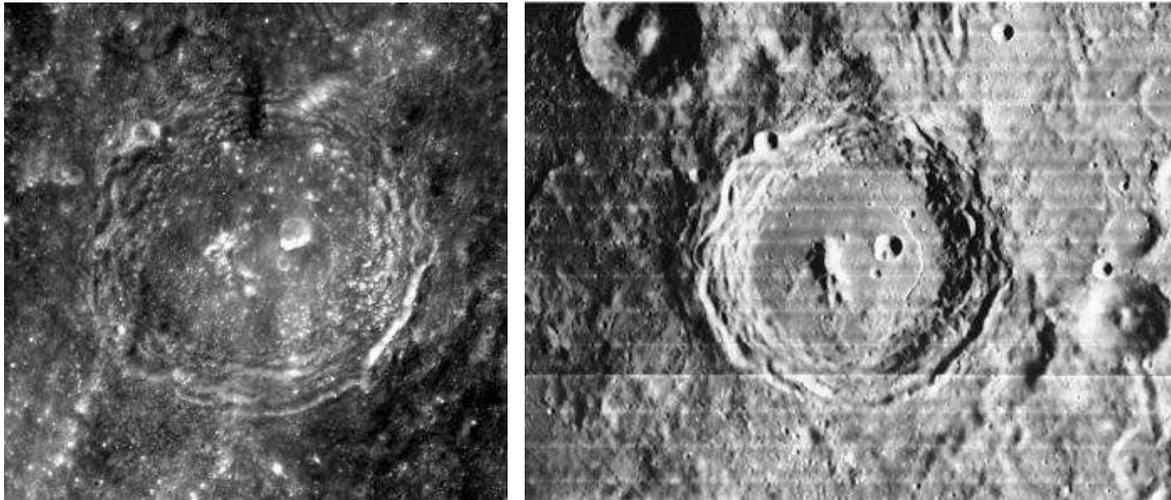
- AXX : Apollo
- LOXX : Lunar Orbiter
- LUXX : Luna
- RAXX : Ranger
- SUXX : Surveyor

For example, LUNA 9_LU9.jpg is a picture of Luna 9 site taken by Luna 9 probe itself.

These pictures are provided under the general copyright of the "National Air and Space Administration" (NASA) which own reproduction rights (<http://www.nasa.gov>) and they can't be used outside of the atlas.

Probes pictures are in the "**Probes**" sub-directory.

CLEMENTINE PROBE PICTURES



Arzachel crater picture taken by Clementine (Left) compared to that of LOPAM (Right).

The other great source of lunar formations pictures is the american Clementine mission. This small probe has mapped the lunar surface with à 100 to 200 m per pixel. Christian Legrand works on the general files and extracts pictures of each formation.

Clementine pictures are complementary to those of LOPAM. If their resolution and general quality are better, they have a big defect for terrestriels observers. They were taken with Meridian passing Sun, with the most vertical possible lighting that erases shadows and gives the formation albedo.

For formations situated in a + 45 ° North and - 45 ° South, Pictures show first the albedo. Compare for example with Bessarion LOPAM and Clementine pictures to see the difference. For formations above these latitudes, shadows reappeared and many pictures are better than LOPAM. Compare with Anaxagoras for example.

These pictures are provided under the general copyright of the "National Air and Space Administration" (NASA) which own reproduction rights (<http://www.nasa.gov>) and they can't be used outside of the atlas.

Clementine pictures are in the "**Clementine**" sub-directory.

JAPANESE PROBE KAGUYA PICTURE



Rupes Recta photographed by Kaguya (c) JAXA

These pictures have been obtained from data returned by the Japanese probe KAGUYA and put online on the **Japan Aerospace Exploration Agency (JAXA) Web site**. You can see the original pictures here :

http://wms.selene.jaxa.jp/index_e.html

Christian Legrand has extracted from each original picture, a picture of each present formation. 160 useful pictures have been collected today. The pictures are taken with an angle from the surface. This feature brings new information about the real shape of the formations. (see Rupes Recta above)

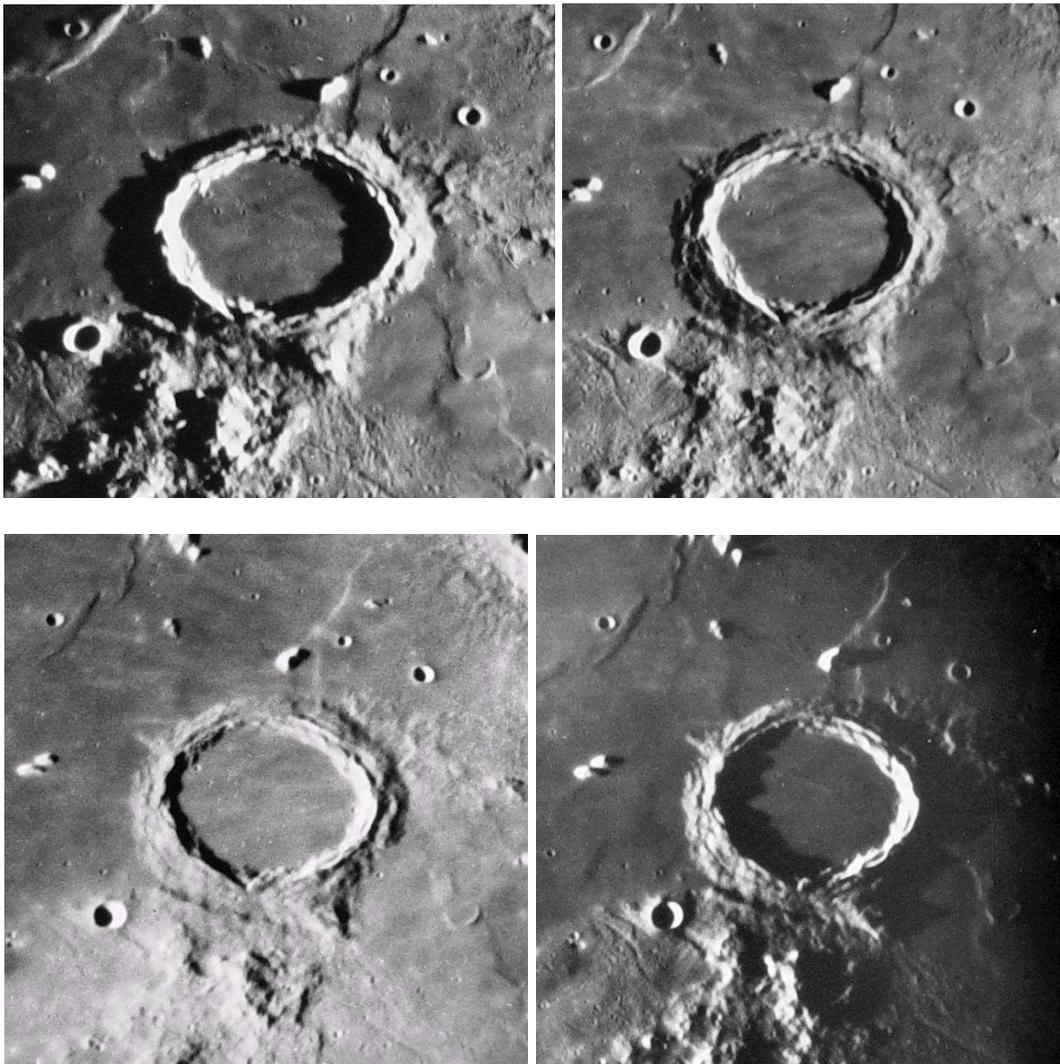
These pictures are provided under the general copyright of "Japan Aerospace Exploration Agency" which owns the copyright. The pictures can't be used outside of the present software.

CONSOLIDATED LUNAR ATLAS PICTURES

The best ever published lunar atlas for the lunar observer is the "Consolidated Lunar Atlas" by Gerard Kuiper and al. It compiles the best Moon pictures taken from Earth by some great observatories as Catalina and Pic du Midi. Resolution of some pictures are about 1 km. Only since little time, amateurs equipped with webcams and large telescopes begin to have better results than those ones.

This atlas has an invaluable value because, as "Georges Viscardi's Photographic Atlas", it shows the formations under several sun lightings and at the Full Moon.

For example, here are the pictures extracted for Archimedes :



These pictures allows you to see the aspects of a given formation related to the observing day. This library is presently not complete. It contains more than 2000 pictures and will be updated regularly. Priority is given to CLA pictures above Clementine pictures because they are more useful for terrestrial observers. And our "Clementine 500 m resolution" texture replaces them momentarily. Check regularly our Web site to see if CLA library updates are available.

These pictures are under "Lunar and Planetary Institute" copyright and cannot be used outside VMA.

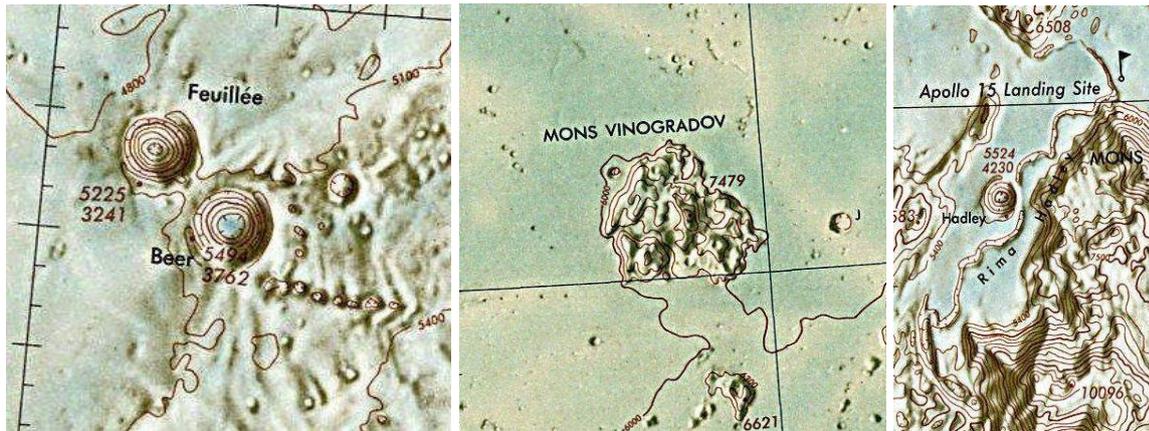
This fabulous work is visible on the site :

<http://www.lpi.usra.edu>

The CLA pictures are in the "CLA" sub-file.

LUNAR ASTRONAUTICAL CHARTS AND LUNAR MAPS PICTURES

The best drawn Moon maps ever published are the "Lunar Astronautical Charts" and the "Lunar Maps". Their scale is 1 / 1 000 000. Most of them include altimetric levels curves allowing to determine heights or depths of formations.



Christian Legrand has extracted from LAC / LM more than 800 formations pictures of the Nearside. Because of their precision and their colors, these pictures have not been compresses. This library is then heavy to download.

These pictures are under "Lunar and Planetary Institute" copyright and cannot be used outside VMA.

This fabulous work is visible on the site :

<http://www.lpi.usra.edu>

The Lunar Astronautical Charts and the Lunar Maps pictures are in the "**LAC / LM**" sub-file.

All this unique set of pictures librairies provides you numerous views of formations for comparing or studying them.

"BEST OF AMATEURS" LIBRARIES

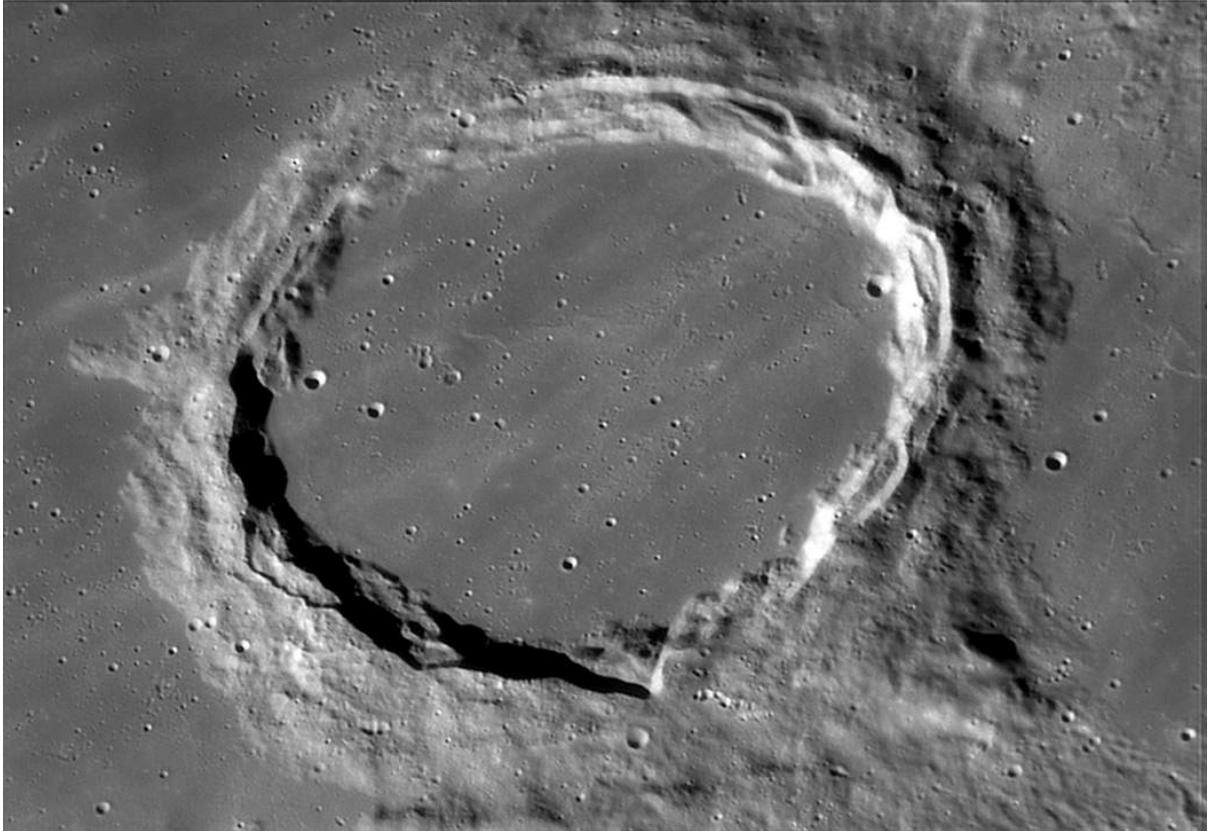
Some of the world best lunar imagers have accepted to show their pictures in a special VMA pictures library only usable with VMA.. Compiled by Christian Legrand, this new library contains presently more than 350 images from **Craig Zerbe, Mike Wirths, Wes Higgins, Zac Pujic and Paolo Lazzarotti**. Others amateurs have been contacted and their pictures will be added in this library whose pictures are very often better than those of Consolidated Lunar Atlas, and which rival sometimes with lunar automatic probes.

Because of the great numbers of pictures they provided, pictures by Paolo Lazzarotti and Wes Higgins ar in separate libraries.

Christian Legrand has treated, with the authorization of the authors some of the pictures for harmonicizing contraste and luminosity to boost the resolution.

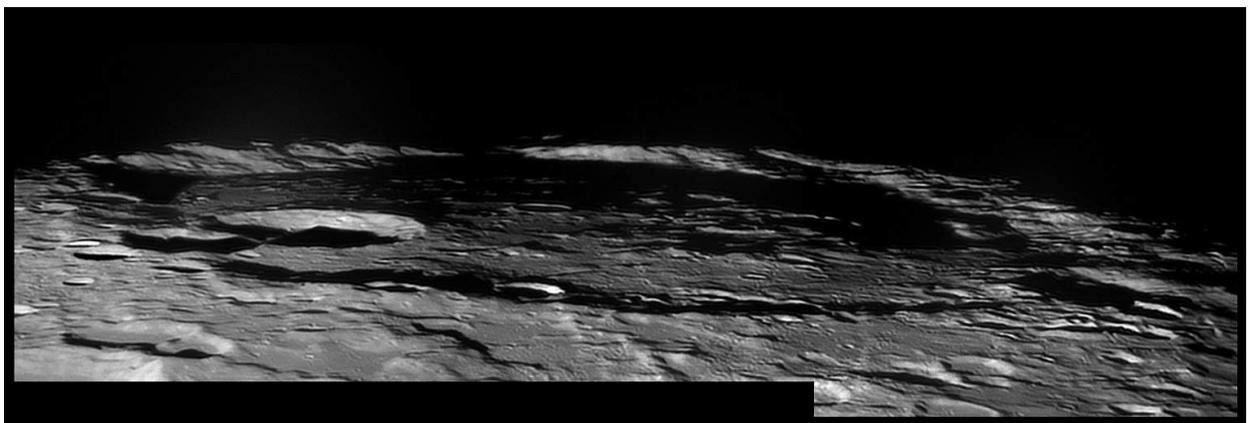
- T1MPDM / 1 meter Pic du Midi telescope

It contains pictures realized by JL Dauvergne , F. Colas, C. Mansion, T. Legault and C. Villadrich with the 1 m Pic du Midi telescope which are the lunar pictures taken from the surface of Earth (Archimedes below).



- Best of Peach

It contains pictures taken by Damian Peach with his Celestron 14 et un Celestron 9,25 (Bailly below). It's one of the most important amateur pictures library.

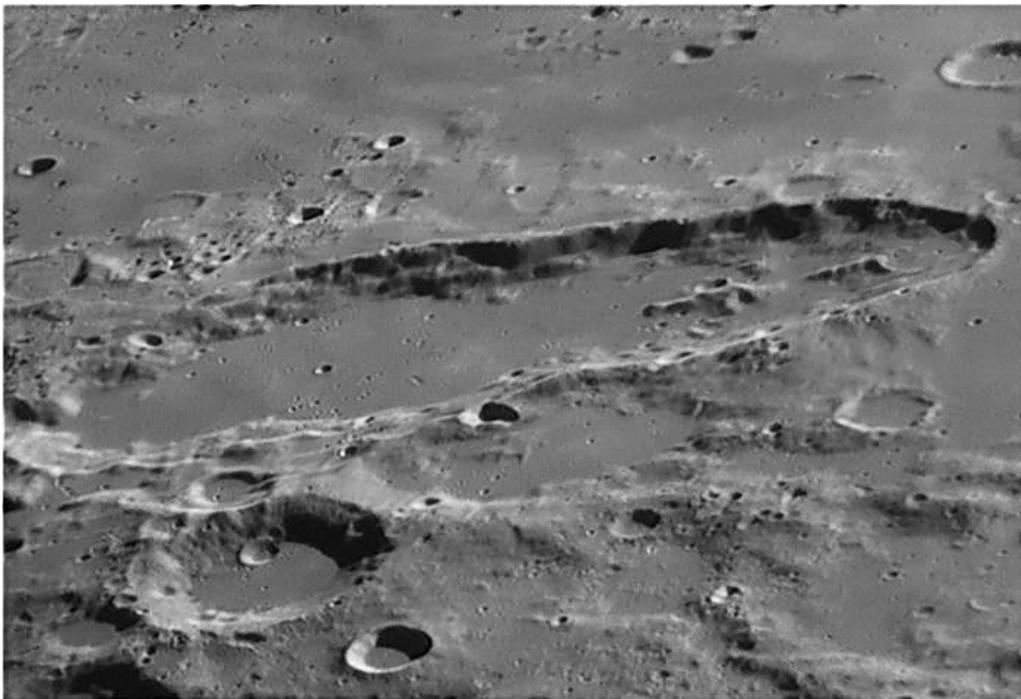


Best of Lazzarotti

Contains pictures realized by Paolo Lazzarotti with his 12" Gladius (Aristoteles here)

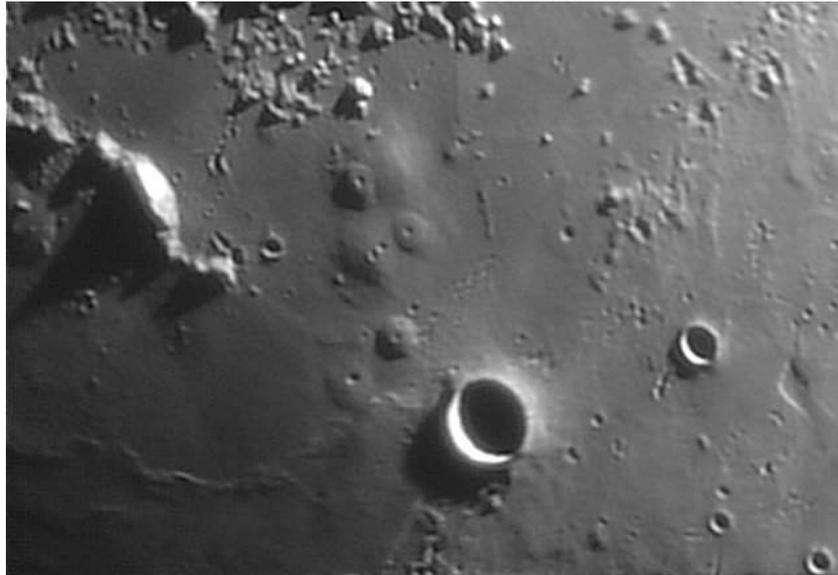


- **Best of Higgins** : Contains pictures realized by Wes Higgins with his 18" Dobson (Schiller here)



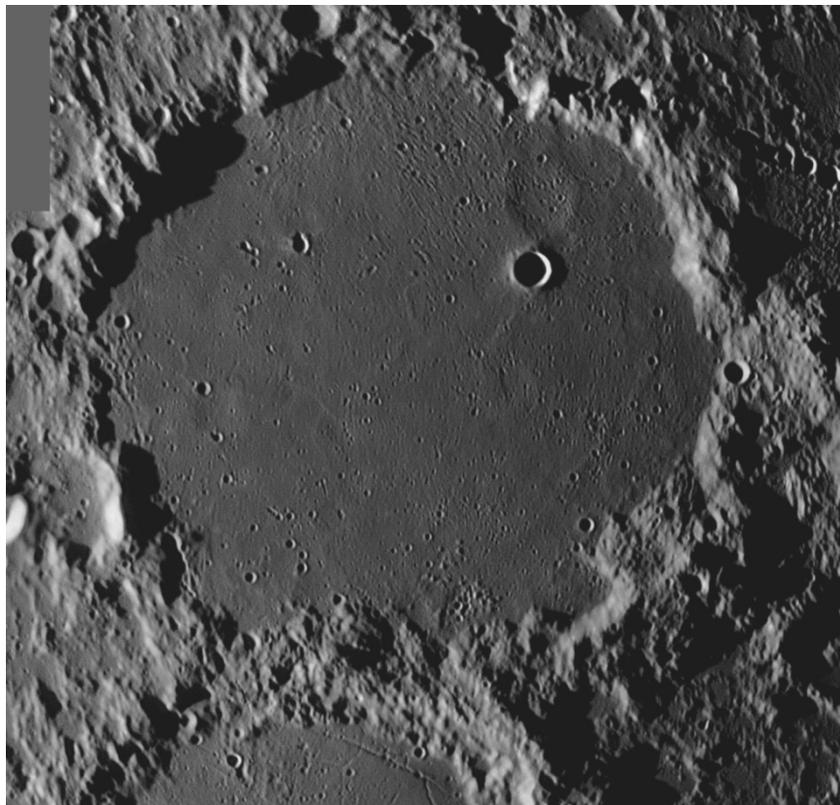
- **Best of Amateurs**

Contains picture realized by Mike Wirths (Hortensius domes here) and Craig Zerbe



Best of Cathala

It contains the images taken by Luc Cathala with a motorized Dobson telescope of personal manufacture of 625 mm in diameter with a QHYSIII178M camera. It is the most supplied "amateur astronomer" library with nearly 700 very high resolution images.



Pictures name indicate the formation name and that of the author. For example, Plato_Lazzarotti.jpg is a picture of Plato crater taken by Paolo Lazzarotti.

These pictures are under the general copyright of Christian Legrand and each copyright of the author and cannot be used outside of VMA.

All these libraries give now more than 7 000 formations pictures available to VMA users.

"DATLUN " Button



If you click on this button, you can open the "DATLUN" (c) window, which is the VMA database manager :

DBN	NAME	LUN	LUN_REDUCED	NAME_TYPE	TYPE	TYPE_IAU	SUBTYPE	PROCESS	PERIOD
NSN	ABBE	AA5758S17477E	5758S17477	AA	Crater				
NSN	ABBOT	AA0556N05474E	0556N05474	AA	Crater				Imbrian (From -3.85
NSN	ABEL	AA3463S08578E	3463S08578	AA	Crater				Pre-Nectarian (Fron
NSN	ABENEZRA	AA2099S01189E	2099S01189	AA	Crater				Upper Imbrian (Fron
NSN	ABETTI	AA2011N02782E	2011N02782	AA	Crater				Imbrian (From -3.85
NSN	ABUL WAFÄ	AA0096N11663E	0096N11663	AA	Crater				
NSN	ABULFEDA	AA1387S01391E	1387S01391	AA	Crater				Typical Nectarian (I
NSN	ACOSTA	AA0565S06014E	0565S06014	AA	Crater				Copernician (From -
NSN	ADAMS	AA3189S06839E	3189S06839	AA	Crater				Nectarian (From -3.
NSN	AEPINUS	AA8796N10969W	8796N10969	AA	Crater. craters				
NSN	AGATHARCHIDES	AA1985S03111W	1985S03111	AA	Crater				Pre-Imbrian (From -<
NSN	AGRIPPA	AA0410N01047E	0410N01047	AA	Crater				Eratosthenian (Fron
NSN	AIRY	AA1814S00561E	1814S00561	AA	Crater				Pre-Imbrian (From -<
NSN	AITKEN	AA1644S17296E	1644S17296	AA	Crater				
NSN	AKIS	AA2001N03176W	2001N03176	AA	Crater. craters				
NSN	AL BIRUNI	AA1807N09262E	1807N09262	AA	Crater				
NSN	AL-BAKRI	AA1434N02025E	1434N02025	AA	Crater				Imbrian (From -3.85
NSN	AL-KHWARIZMI	AA0702N10701E	0702N10701	AA	Crater				

You can discover all the potential of this new software conceived by Christian Legrand and written by Patrick Chevalley if you consult its [user's manual](#).

"WEBLUN " Button



If you click on this button, you open the "WEBLUN" (c) window containing the lunar Web sites database manager.

Site name	Language	Theme	Sub-theme	Adresse	Description
CIEL ET ESPACE	French	Astronomy maga:	Lunar exploration	http://www.cieletespace.fr/	The most important french e
SKY AND TELESCOPE	English	Astronomy maga:	Lunar exploration	http://www.skyandtelescope.com/	The most important US ama
FRENCH LPOD	French	Blog	Professional astronomer	http://iluj.wikispaces.com	French translation of Charles
LPOD / LUNAR PICTURE OF THE DAY	English	Blog	Professional astronomer	http://lpod.wikispaces.com/	Charles Wood (Head of the l
LUNAR PIONEER / JOEL RAUPE 'S BLOG	English	Blog	Professional astronomer	http://lunarnetworks.blogspot.fr/	Joel Raupe 's blog presenti
THE MOON WIKI / LE WIKI DE LA LUNE	English	Blog	Professional astronomer	http://the-moon.wikispaces.com/Intr	Moon Wiki created by Charl
THE ONCE AND FUTURE MOON / PAUL SPUDI	English	Blog	Professional astronomer	http://blogs.airspacemag.com/moon/	Paul Spudis 's blog. One of t
ASTRONOMINSK	English	Lunar pictures site	Lunar amateurs imagers	http://www.astronominsk.org/Moon/	Marvelous lunar pictures of .
CHRISTIAN VILADRICH 'S WEB SITE	Multilangua	Lunar pictures site	Lunar amateurs imagers	http://viladric.club.fr/index.html	Marvelous lunar pictures of
DAMIAN PEACH WEB SITE	English	Lunar pictures site	Lunar amateurs imagers	http://www.damianpeach.com/	Marvelous lunar pictures of
MIKE WIRTHS WEB SITE	English	Lunar pictures site	Lunar amateurs imagers	http://ottawa-rasc.ca/wiki/index.php:	Marvelous lunar pictures of
PAOLO LAZZAROTTI 'S WEB SITE	Multilangua	Lunar pictures site	Lunar amateurs imagers	http://www.lazzarotti-hires.com/index	Marvelous lunar pictures of l
THIERRY LEGAULT 'S WEB SITE	Multilangua	Lunar pictures site	Lunar amateurs imagers	http://perso.club-internet.fr/legault/i	Marvelous lunar pictures of
WES HIGGINS 'S WEB SITE	English	Lunar pictures site	Lunar amateurs imagers	http://higginsandsons.com/astro/	Marvelous lunar pictures of
NASA LUNAR TIMELINE	English	Lunar probes	All countries probes	http://lunar.arc.nasa.gov/history/time	NASA informations on all lu
ISRO / CHANDRAYAAN 1	English	Lunar probes	Chandrayaan 1	http://www.chandrayaan-i.com/index	Official site of Chandrayaan
CNSA / CHANG'E 1	English	Lunar probes	Chang'e 1	http://www.cnsa.gov.cn/n615709/n77	Official site of Chang'e 1 mis
LPI / THE CLEMENTINE MISSION	English	Lunar probes	Clementine	http://www.lpi.usra.edu/expmoon/cle	Clementine mission descript
NSSDC / CLEMENTINE 1994	English	Lunar probes	Clementine	http://nssdc.gsfc.nasa.gov/planetary/	Clementine mission descript
THE CLEMENTINE MISSION	English	Lunar probes	Clementine	http://www.cmf.nrl.navy.mil/clement	Clementine mission descript
USFS ASTROGEOLOGY SCIENCE CENTER / CLE	English	Lunar probes	Clementine	http://astrogeology.usgs.gov/Mission	Clementine mission descript

54 selected sites.

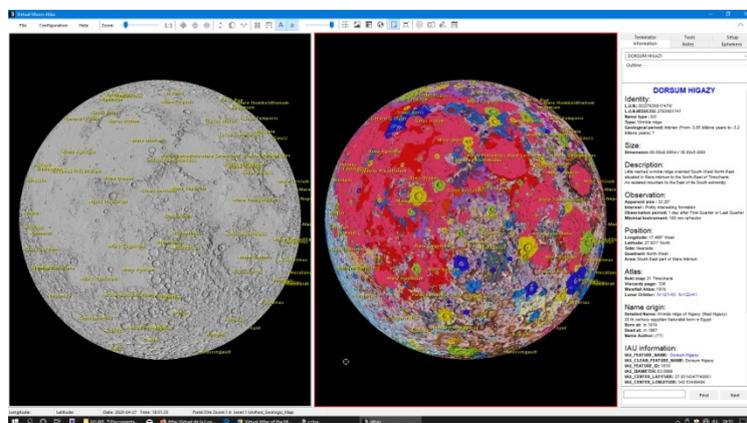
You can discover all the potential of this new software conceived by Christian Legrand and written by Patrick Chevalley if you consult its user's manual.

"2nd Window" BUTTON



If you click on this button, the "Map" window separates in two windows with equal width. This new window has the same properties as the main window. You obtain the "map" window, the "configuration" menu, the tabs and the buttons bar. To make active one of the 2 windows and access to its setup, click in it. The active window is then surrounded by a red border

This new window opens with the same lunar area as the first. So, you can easily compare the two windows and you can apply in this second window textures and overlays different from those of the first window.



Screen capture showing VMA one window with "altitude" overlay and second window with "iron" overlay.

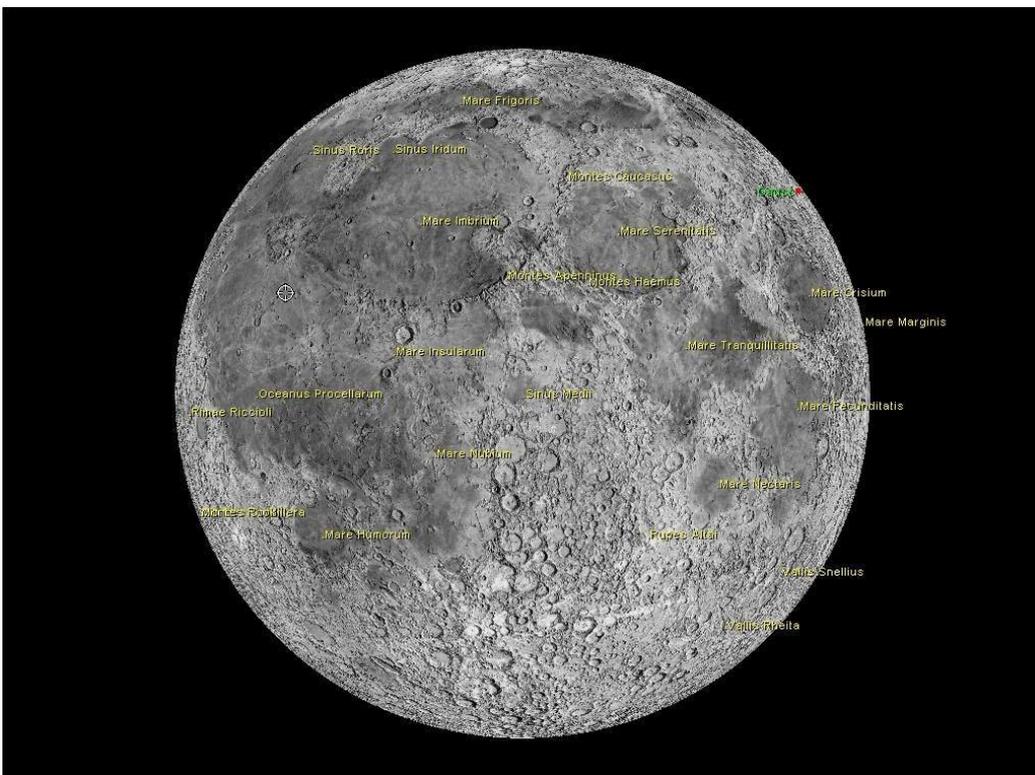
The "Mother" window which is affected by the cursor is surrounded by a red border. Just click on the other window so that it becomes active in turn and surrounded by red.

Beware ! This new function needs a powerful computer to be exploited with all its possibilities (If possible, processor frequency above 2 GHz, 512 Mb RAM and a graphic card supporting OpenGL with 64 Mb video RAM)

"Full Screen" BUTTON



If you click on this button, the tabs on the right, the title bar and the status bar all disappear, leaving only the map window or the double map window only on the screen.



Fabulous for large monitors, LCD and plasma TV, and videoprojector !!!

It's also a very useful tool for lectures and planetariums about the Moon !

A click on the left button selects a formation.

Pressing the left button and moving the mouse moves the map. The mouse wheel drives the zoom.

You have still access to the right click menu for managing the views.

To find menus & tabs, simply press the "Esc" key or go to the context menu of the "Right click" and click on "Back window".

"EYEPIECE" BUTTON



By clicking on this button, you can directly open the "Eyepieces" tab of the "Configuration" menu with direct access to the list of eyepieces that you have entered.

"CCD" BUTTON



By clicking on this button, you can directly open the "CCD" tab of the "Configuration" menu with direct access to the list of cameras that you have entered.

"NOTES" BUTTON



By clicking on this button, you can directly open the "Notes" tab) on the right with direct access to the note taking tool.

"EPHEMERISIS" BUTTON

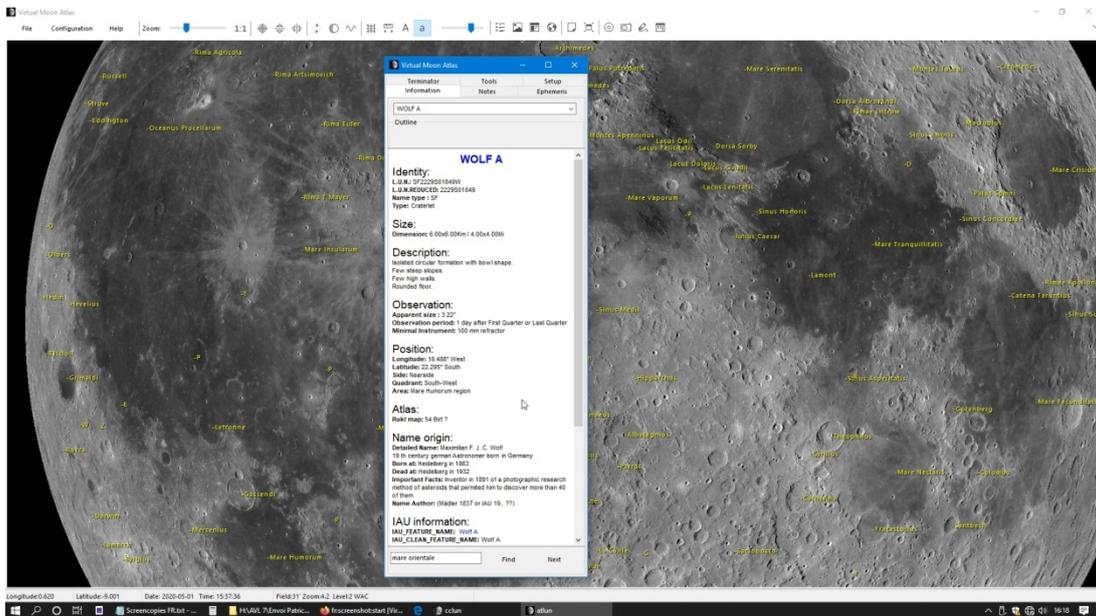


By clicking on this button, you can directly open the "Ephemeris" tab with direct access to the date & time scanning tool.

"TABS" BUTTON



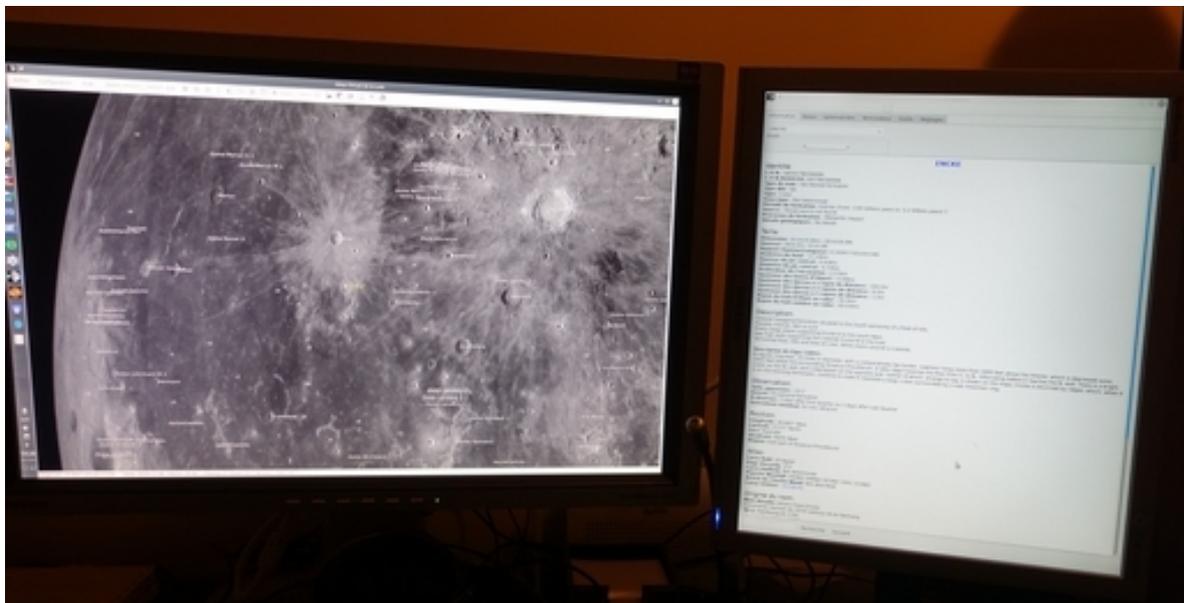
By clicking on this button, you can temporarily "detach" the tabs on the right to enlarge the "Map" window (s) (in two-window mode). You can then position them where you want as in the screenshot below. The "Tabs" window has the "Windows" buttons to put it in full screen (Global view of the "Information" data, for example "or delete it. The arrow of the" Tabs "button will change direction and by clicking a second time on it , you can redisplay the tabs.



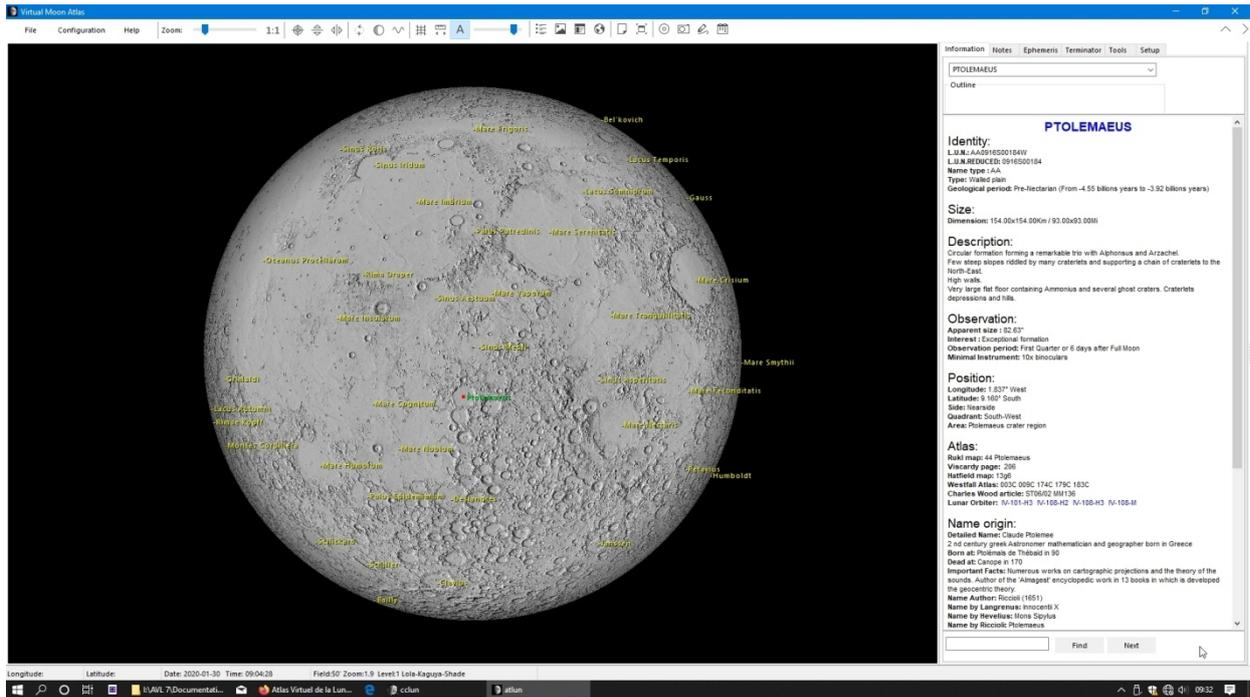
"2ND MONITOR" BUTTON

If you have two monitors connected to your computer as in the photo below, by clicking on this button, you can temporarily display the tabs on the right on this second monitor to maximize the window or windows on your main screen "Map" (In two-window mode) without losing the tab information. Your mouse should be able to move around on both monitors.

The arrow of the button will change direction and by clicking a second time on it, you will be able to redisplay the tabs on the first monitor.



THE MAP WINDOW



"Map" window is on the left of general window. At opening, it shows Nearside according to the options selected (See "[Map display](#)"). This window can't be removed and is now independently sizable. Go with the pointer on the separation line with the right tabs. A new pointer appears. Stay with the mouse left button pushed and move it. The "Map" window width will be set.



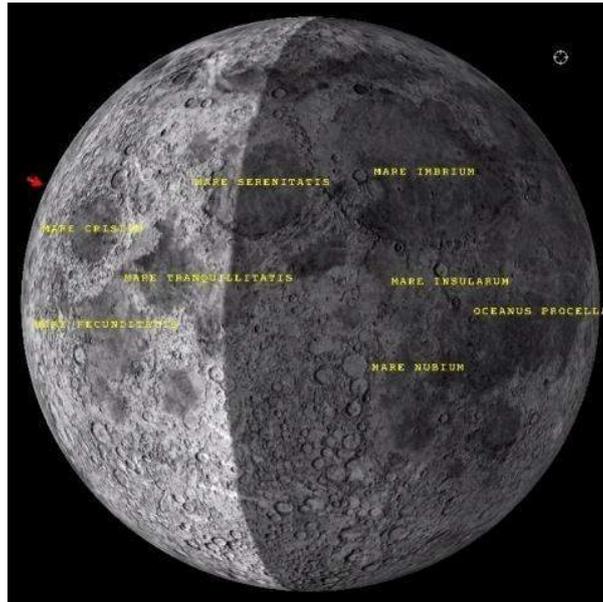
Slide bars appear according to the applied zoom factor (See "[Zoom cursor](#)").

THE GLOBE MAP

It's oriented in the same direction as Moon seen with naked eye or binoculars.

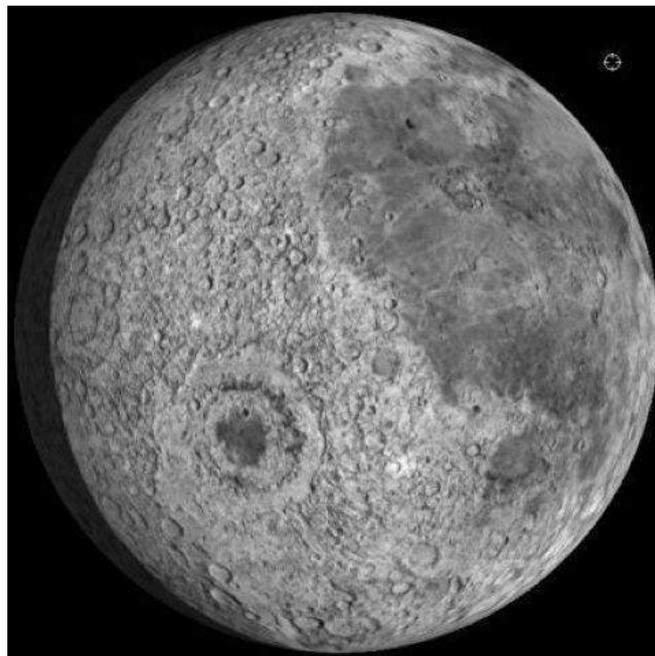
You can turn the map around its center to copy the eyepiece vision in a Newtonian. You can display the map as in a mirror to see it as in a refractor or a Schmidt-Cassegrain instrument (See "[Tools](#)" tab).

"Near Side" map with inversion "<->"



If the "**Libration**" option (See ["Configuration menu"](#)) is chosen, center of the map is not absolutely the center of the presented drawing because of libration. "Expert" version texture has been configured by Patrick Chevalley for an optimal display, specially for libration zones. The "**aerograph**" map in the window is provided by **David Seals** and his team from "**Jet propulsion Laboratory**" of NASA. it shows only the Near Side and corresponds to the details visible in a 120 mm (5") instrument applied on a 3D sphere with move limited to libration and managed by Open GL.

"Full globe" map



It permits to view a complete lunar globe and to study the Far Side invisible from the Earth (On the above screen capture, you can remark Mare Orientale). It's always the same "David Seals" texture presenting details visible in a 120 mm (5") instrument applied on a 3D sphere, but in that case with no limited move.

If the options "**Display libration**" and "**Display phase**" (See "[Configuration menu](#)") are checked, the lighting of the lunar globe is as the real one, for the date and hour chosen in the "**Ephemeris**" tab.

Map move

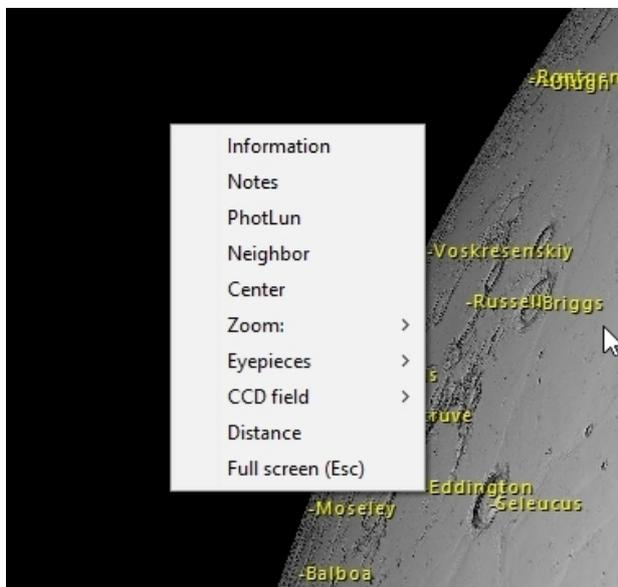
As a zoom factor is applied to map, you will be able to move into it.

In the "**Near Side**" mode, you can also "grab" the map in left clicking on it and keeping left button clicked while moving the mouse.

In the "**Full Moon**" mode, you can also "grab" the globe with a mouse left click and while keeping left button click, you can *turn* the globe in the East or West direction when moving the mouse.

Mouse right click

A right click on the mouse and a context menu appear with several choices.



Information : Sends you to the information database window.

Notes : Send you to the "Notes" tab

Picture : Displays the pictures list or the LOPAM picture of the selected formation.

Neighbour : Displays in a new window the formations list in the neighbourhood of the selected formation.

Center : Centers the map on the selected formation.

Zoom : Can setup directly the zoom factor to 1/1, 1/2 or 1/4.

Eyepieces : Allows you to choose the used eyepiece and have the exact view in the associated instrument. A black mask with a round centered hole appears on the "**Map**" window. To cancel, just click the "**None**" option.

CCD : Allows you to choose your electronic camera and to visualize its field on the Moon. A colored frame appear. If you want to remove it, just click on the "none" option.

Distance : Activate the mode "**Distance measurement**" (Voir "[Distance measurement](#)")

Full screen : Allows you to remove the menus and tabs to assign the one or two "Map" windows (In two-window mode) to the entire screen area.

Orbit the Moon : Activated only in the "**Full globe**" mode. Activate an automatic rotation to "scroll" the globe as in the case of a simulated "satellisation". Indicated speeds are in "degree of longitude per second", or the manual rotation with "**Direction**".

Overlay caption : Activated only when one overlay is displayed above the texture. Note that some overlays don't have a caption as indicated above.

THE "INFORMATION" tab

The screenshot shows a software interface with a menu bar at the top containing 'Information', 'Notes', 'Ephemeris', 'Terminator', 'Tools', and 'Setup'. The 'Information' tab is active, and a dropdown menu shows 'LANSBERG'. Below the menu is an 'Outline' section with a diagram showing a dashed line between two points labeled 'A'. The main content area is titled 'LANSBERG' and contains the following information:

Identity:
L.U.N.: AA0031S02663W
L.U.N.REDUCED: 0031S02663
Name type : AA
Type: Crater
Geological period: Upper Imbrian (From -3.8 billions years to -3.2 billions years)

Size:
Dimension: 40.00x40.00Km / 24.00x24.00Mi
Height: 3110.0m / 9400.0ft
Height/Wide ratio: 0.0797

Description:
Isolated circular formation.
Steep slopes.
High walls with terraces.
Few extensive and flat floor. Central mountain doubles. Craterlets.

Observation:
Apparent size : 21.46"
Interest : Exceptional formation
Observation period: 2 days after First Quarter or 1 day after Last Quarter
Minimal Instrument: 50 mm refractor

Position:
Longitude: 26.627° West
Latitude: 0.312° South
Side: Nearside
Quadrant: South-West
Area: South-East of Oceanus Procellarum region

Atlas:
Rukl map: 42 Fra Mauro
Viscardy page: 248
Hatfield map: 5g2 / 7a3 / 9e8
Westfall Atlas: 024C 029C 036C 040C 201C 205C
Lunar Orbiter: IV-125-H3 IV-126-H1 IV-132-H3 IV-133-H1

Name origin:
Detailed Name: Philippe van Lansberge
16 th century belgian Doctor and astronomer born in Belgium
Born at: in 1561
Dead at: in 1632
Important Facts: Author of works on the gnomon and the astrolabe.
Name Author: Riccioli (1651)
Name by Langrenus: Kinschotti
Name by Hevelius: insula Malta
Name by Riccioli: Lansberg

IAU information:

At the bottom of the window, there is a search box and two buttons labeled 'Find' and 'Next'.

SEARCH SCROLLING LIST

You can enter in this scrolling list some letters of the name of the formation you want to find. It will accept "wildcards", so "*tri" will include in the scrolling list "Triesnecker" and "Rimae Triesnecker", for example.

"Outline" FRAME



In this frame, outline of the formation selected within your search and whose description is in the "Database window" is displayed (See "[Outline](#)" for more information on the display). Here is a semi-graphic field presenting the formation profile. This information is only provided when height is known.

Profile has not be constructed for some formations types :

- Sea
- Lake
- Gulf
- Marsh
- Ocean
- Probe
- Human mission

The profile is generated according to the following description :

Crater outline :

Crater is presented so :

A _____ A
< n characters >

"A" characters show the slope height. The number of "_" characters shows the crater width with the same scale as height.

Because the "A" character is twice high than wide on an html screen, in the above example, the width / height crater ratio is 1/8.

The central mountain of crater has not been represented because their height has often not been found.

Don't forget that each formation has its own profile. You can't compare two craters dimensions using their profile representation.

A _____ A Profile of (Length =20 km & height = 4000 m)

A _____ A Profile of (Length = 5 km & height = 1000 m)

On screen, these two profiles are identical, but as you can see, dimensions are different.

Relief outline :

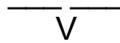
For mountains, mountains ranges, wrinkle ridges or domes, an other viewing mode is selected :



"A" character shows the formation maximum height. The number of "_" characters shows the formation width with the same scale as height.

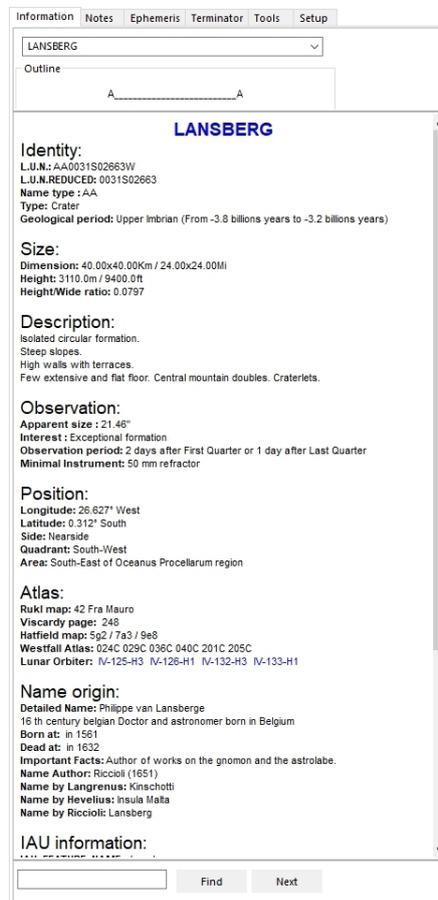
Rille outline :

For rilles, rilles system and valleys, profile is shown like this :



"V" character shows the formation maximum depth. The number of "_" characters shows the formation width with the same scale as depth.

THE DATABASE WINDOW



Information Notes Ephemeris Terminator Tools Setup

LANSBERG

Outline

A.....A

LANSBERG

Identity:
L.U.N.: AA0031S02663W
L.U.N.REDUCED: 0031S02663
Name type : AA
Type: Crater
Geological period: Upper Imbrian (From -3.8 billions years to -3.2 billions years)

Size:
Dimension: 40.00x40.00Km / 24.00x24.00Mi
Height: 3110.0m / 9400.0ft
Height/Wide ratio: 0.0797

Description:
Isolated circular formation.
Steep slopes.
High walls with terraces.
Few extensive and flat floor. Central mountain doubles. Craterlets.

Observation:
Apparent size : 21.46"
Interest : Exceptional formation
Observation period: 2 days after First Quarter or 1 day after Last Quarter
Minimal Instrument: 50 mm refractor

Position:
Longitude: 26.627° West
Latitude: 0.312° South
Side: Nearside
Quadrant: South-West
Area: South-East of Oceanus Procellarum region

Atlas:
Rukl map: 42 Fra Mauro
Viscardy page: 248
Hartfield map: 5g2 / 7a3 / 9e8
Westfall Atlas: 024C 029C 036C 040C 201C 205C
Lunar Orbiter: IV-125-H3 IV-126-H1 IV-132-H3 IV-133-H1

Name origin:
Detailed Name: Philippe van Lansberge
16 th century belgian Doctor and astronomer born in Belgium
Born at: in 1561
Dead at: in 1632
Important Facts: Author of works on the gnomon and the astrolabe.
Name Author: Riccioli (1651)
Name by Langrenus: Kinschotti
Name by Hevelius: insula Malta
Name by Riccioli: Lansberg

IAU information:

Find Next

The Database window is organized to display formation information extracted from the database. It has a slide bar on the right if not all the data can be displayed in the window.

The version 7 database is the largest existing lunar database to date. The files represent nearly 300 MB of text in French and as much in English! It contains the descriptive files of more than 1 million lunar formations with varying amounts of data depending on the official bases from which they originate.

It is separated into eight distinct bases:

- **NAMED FORMATIONS** : The formations of the visible & hidden faces which have a specific name validated by the UAI (ex: Clavius, Rima Hyginus, Montes Alpes ...): (1,800 entries approximately)

- **SATELLITE FORMATIONS**: The formations of the visible & hidden faces which do not have a specific name, but a lettered index backed by an official name and which are validated by the UAI (ex: Clavius D, Hyginus A .. .): (Around 7000 entries)

- **SALAMUNICCAR UNNAMED FORMATIONS**: The formations of the visible & hidden faces which do not have a specific name or an index and which are not validated by the UAI. These are from the work carried out by Goran Salamuniccar of the Faculty of Electrical Engineering and Computing, University of Zagreb and his team (Base LU 78 287) who gave us permission to include them in the VMA (Thanks to him!) . The name of these courses is represented by the LUN (Lunar Universal Number) developed by Christian Legrand specially for the VMA: (approximately 69,600 entries)

- **ROBBINS UNNAMED FORMATIONS**: The formations of the visible & hidden faces which do not have a specific name or an index and which are not validated by the UAI. These are from the work of Stuart J. Robbins of the Southwest Research Institute (Robbins Lunar Crater Database 2018-08-15) who gave us permission to include them in the AVL (Thanks to him!). The name of these courses is represented by the LUN (Lunar Universal Number) developed by Christian Legrand specially for the AVL: (approximately 1,300,000 entries). This base contains only 4 fields taken from the base of S. J. Robbins so as not to weigh down the display performance of the VMA.

- **HISTORICAL SITES** : Historical sites on both sides: The sites of all voluntary or accidental impacts of human origin compiled specially for VMA by Christian Legrand (ex: Apollo 15 Base, Ranger 7, Luna 9, Apollo 17 S-IVB, Chang'é, Chandrayann 2 ...) (59 entries)

- **PYROCLASTICS FORMATIONS** : The list of pyroclastic deposits compiled by Lisa Gaddis and her team (80 entries)

- **DOMES**: A list of lunar volcanic domes compiled by the members of the ALPO association (700 entries)

- **NELIOTA**: The list of contemporary meteoritic impacts on the lunar surface listed by the Athens National Observatory as part of the NELIOTA (Near Earth objects Lunar Impacts and Optical TrAnsients) program piloted by the European Space Agency (ESA). Periodically updated.

For each formation, available information is :

- the formation name origin.
- the main lunar atlases for amateur astronomers page where to find the formation.
- the formation location on the lunar disc.
- the formation description.
- various useful information for serious observing.
- official 2012 IAU datas about this formation

Given the mixed sources of the various databases, certain information may not be available in a given database.

Warning : In such detailed work, the data will certainly contain some mistakes - mainly input mistakes. You can also report them to [Christian Legrand](#) so that he can correct the database.

The authors thank you in advance for your cooperation. They will be corrected as soon as possible.

Informations of the VMA databases are copyrighted "(c) Christian Legrand" and can't be used outside of the software. For any other use, please contact [the author](#).

DATABASE DETAILED INFORMATION PRESENTATION

You can find more detailed informations about the databases in the **DATLUN** (c) [user's manual](#), the database manager of VMA.

OFFICIAL NAME :

This field presents the formation main name in Latin used officially by the International Astronomical Union in capital letters.

In the "**Historical sites**" database, it's the name of the mission (eg : Apollo 15 Base, Ranger 7, Luna 9, Apollo 17 S IV B...)

For anonymous craters, the "name" begins with the 3 letters AVL and uses after the reduced LUN (c) defined below. For domes and pyroclastics deposits, it's the name in the original database.

LOCAL NAME :

The main name of the formation translated into the language of the program when it exists (Example: Platon / French name for Plato / Official UAI name)

LUNAR UNIVERSAL NUMBER / L.U.N. © :

In order to be able to recognize formations that do not yet have an official name and to standardize the names used in the new databases, Christian Legrand has developed the "Lunar Universal number" (LUN) allowing to know the nature and the position training just by reading it.

Here are the LUN description :

The LUN is composed by the assembling of the following characters chain :

XX : 2 letters corresponding to the "Descriptor term" of IAU. These 2 letters are officially used by IAU. Attention, they are less numerous than the original VMA formations types, so several VMA types can have the same "descriptor term".

Here is the official list of IAU Descriptor Terms (Some of them are not used on the Moon presently) :

Albedo Feature (AL)	Geographic area distinguished by amount of reflected light
Arcus, arcūs (AR)	Arc-shaped feature
Astrum, astra (AS)	Radial-patterned features on Venus
Catena, catenae (CA)	Chain of craters
Cavus, cavi (CB)	Hollows, irregular steep-sided depressions usually in arrays or clusters
Chaos, chaoses (CH)	Distinctive area of broken terrain
Chasma, chasmata (CM)	A deep, elongated, steep-sided depression
Collis, colles (CO)	Small hills or knobs
Corona, coronae (CR)	Ovoid-shaped feature
Crater, craters (AA)	A circular depression
Dorsum, dorsa (DO)	Ridge
Eruptive center (ER)	Active volcanic centers on Io
Facula, faculae (FA)	Bright spot
Farrum, farra (FR)	Pancake-like structure, or a row of such structures
Flexus, flexūs (FE)	A very low curvilinear ridge with a scalloped pattern
Fluctus, fluctūs (FL)	Flow terrain
Flumen, flumina (FM)	Channel on Titan that might carry liquid
Fossa, fossae (FO)	Long, narrow depression
Insula, insulae (IN)	Island (islands), an isolated land area (or group of such areas) surrounded by, or nearly surrounded by, a liquid area (sea or lake).
Labes, labēs (LA)	Landslide
Labyrinthus, labyrinthi (LB)	Complex of intersecting valleys or ridges.
Lacuna, lacunae (LU)	Irregularly shaped depression on Titan having the appearance of a dry lake bed
Lacus, lacūs (LC)	"Lake" or small plain; on Titan, a "lake" or small, dark plain with discrete, sharp boundaries
Landing site name (LF)	Lunar features at or near Apollo landing sites
Large ringed feature (LG)	Cryptic ringed features

Lenticula, lenticulae (LE)	Small dark spots on Europa
Linea, lineae (LI)	A dark or bright elongate marking, may be curved or straight
Lingula, lingulae (LN)	Extension of plateau having rounded lobate or tongue-like boundaries
Macula, maculae (MA)	Dark spot, may be irregular
Mare, maria (ME)	"Sea"; large circular plain; on Titan, large expanses of dark materials thought to be liquid hydrocarbons
Mensa, mensae (MN)	A flat-topped prominence with cliff-like edges
Mons, montes (MO)	Mountain
Oceanus, oceani (OC)	A very large dark area on the moon
Palus, paludes (PA)	"Swamp"; small plain
Patera, paterae (PE)	An irregular crater, or a complex one with scalloped edges
Planitia, planitiae (PL)	Low plain
Planum, plana (PM)	Plateau or high plain
Plume, plumes (PU)	Cryo-volcanic features on Triton
Promontorium, promontoria (PR)	"Cape"; headland promontoria
Regio, regiones (RE)	A large area marked by reflectivity or color distinctions from adjacent areas, or a broad geographic region
Reticulum, reticula (RT)	reticular (netlike) pattern on Venus
Rima, rimae (RI)	Fissure
Rupes, rupēs (RU)	Scarp
Satellite Feature (SF)	A feature that shares the name of an associated feature. For example, on the Moon the craters referred to as "Lettered Craters" are classified in the gazetteer as "Satellite Features."
Scopulus, scopuli (SC)	Lobate or irregular scarp
Serpens, serpentes (SE)	Sinuuous feature with segments of positive and negative relief along its length
Sinus, sinūs (SI)	"Bay"; small plain
Sulcus, sulci (SU)	Subparallel furrows and ridges
Terra, terrae (TA)	Extensive land mass
Tessera, tesserae (TE)	Tile-like, polygonal terrain
Tholus, tholi (TH)	Small domical mountain or hill
Unda, undae (UN)	Dunes
Vallis, valles (VA)	Valley
Vastitas, vastitates (VS)	Extensive plain
Virga, virgae (VI)	A streak or stripe of color

YYYYYN or YYYYYS for the digital value of latitude in 1/1000 ° deg. N and S indicate North or South and are used to deparate latitude and longitude to clarify the characters chain. The last 3 digits on the right are those of the 1/1000 ° deg and are always present, even if they are zeros. The first 2 left digits are absent if the latitude is 00 °.

ZZZZZZ for the digital value of longitude in 1/1000 ° deg. The last 3 digits on the right are those of the 1/1000 ° deg and are always present, even if they are zeros. The first 3 left digits are absent if the longitude is 000 °.

Here are two examples of LUN (AAYYYYYYNZZZZZZ) :

- AA2741S114220 : Crater located at 02,741° South and 114,220° East

- RI85000N000 : Rill which middle is situated about at 85,00° North et 0,00° East.

With all these features, the LUN is always the shorter possible and it's always easily "readable". and this structure guarantees always a lone LUN for each formation.

>>>> With the L.U.N. , you can find each lunar formation and this allows you to share observations of this formation with others colleagues without any error

LUNAR UNIVERSAL NUMBER / L.U.N. REDUIT © :

For craters, it exists a "Reduced LUN" which is the LUN with the « descriptor term » for craters (AA).

NAME TYPE :

This field contains the category of the type of formation among:

- Named formation
- Satellite training
- Registered formation
- Anonymous formation (not named)

FORMATION TYPE :

This field contains formation type according with tradition or International Astronomical Union, **plus some specific additions** :

- Cape
- Cliff
- Crater
- Craterlet
- Crater chain
- Dome
- Gulf
- Lake
- Marsh
- Mountain
- Mountains range
- Plain
- Probe
- Rille
- Rilles system
- Sea

- Tray
- Valley
- Walled plain
- Wrinkle ridge
- Wrinkle ridges system

The "**Historical site**" database contains specific types given that these sites are not officially listed by the International Astronomical Union :

- Human mission / soft landing
- Inert equipment / voluntary impact
- Inert equipment / unvoluntary impact
- Probe / voluntary impact
- Probe / unvoluntary impact
- Probe / soft landing

TYPE OF UAI:

This field contains the abstract of the type of formation in accordance with the definitions of the International Astronomical Union (Cf "Descriptor term" of the LUN) or traditional plus some specific adaptations:

- TH (Tholus) was chosen to characterize the volcanic domes.
- Pyroclastic deposits have no type of UAI formations that can be applied directly. They have been assigned the added type PD (Pyroclastic deposit).
- "Historical" sites have no type of UAI formation that can be applied directly. They have been assigned the added type HS (Historical Site).

SUB-TYPE:

This field contains categories of types specific to each type of formation (Example: Craterlet / Crater / Plain walled for craters). This field has not yet been fully documented in version 7.

FORMATION PROCESS:

This field contains information on the geological process at the origin of the formation (Example: Meteoritic impact / Extrusive volcanism / Tectonic extension ...)

FORMATION PERIOD :

This field contains information on the lunar geological period which saw the appearance of the formation concerned. This information is for the most part from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team which allow the re-use of this data (Thanks to them).

The 6 periods generally accepted in current literature are:

The Pre-Nectarian: (-4550 MA to -3920 MA)

The Nectarian: (-3920 MA to -3850 MA)

Lower Imbrian: (-3850 MA to -3800 MA)

Upper Imbrian: (-3800 MA to -3200 MA)

The Eratosthenian: (-3200 MA to -1100 MA)

The Copernician: (-1100 MA to the present day)

MA = Millions of years

For some formations, it was not possible to find information concerning the implementation period.

"Formation period not found" is then indicated.

For the "Historical sites" database, the mission launch date is indicated in this field.

SOURCE OF THE FORMATION PERIOD :

This field contains information on the source which cites the probable lunar geological period which saw the appearance of the formation considered. This information is for the most part from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team which allow the reuse of this data.

GEOLOGY :

This field contains interesting geological information on the formation concerned found in various sources.

SIZE :

The following four fields contain data relating to the dimensions of the formations. These vary from source to source. We can therefore find values different from those of other works. Priority was given to data from the International Astronomical Union, then to data from other sources when they seemed plausible. Finally, certain dimensions were directly measured on maps or atlases when they could not be found in the literature. In the "Historic sites" database, these fields are empty.

Dimensions:

This field gives the length in kilometers of the formation and the width. In the case of crater-like formations, the length is in most cases equal to the width since it is in fact the average diameter of the formation.

This field has been revised with the values from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team which allow the reuse of this data. Many thanks to them!

Height :

You find here relative altitudes, not absolute ones referring to the mean lunar sphere. It gives the formation height when it's known.

For craters, it's the difference between the upper part of the internal slopes and the floor.

For other formations, it's the difference between the formation summit and surrounding land.

For mountains and mountain ranges, it's a mean height and higher summits height is generally detailed in description fields.

For rilles and scarps, it's the difference between surrounding lands and the formation lower floor.

The field has been revised with the values from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team.

Ratio :

This data is only indicated for formations whose height is known. It's very often given for craters where it means the diameter / height ratio.

Bottom diameter:

In the case of craters, this field contains information on the size of the bottom of the crater. This information comes from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team.

Height of the central peak:

In the case of craters, this field contains information on the height of the central peak of the crater if it has one. This information comes from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team.

Depth of excavation:

In the case of craters, this field contains information on the difference in altitude between the top of the rampart of the crater and the bottom of it. This information comes from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team.

Impact font thickness:

In the case of craters, this field contains an estimate of the thickness of the rocks melted on impact and which fill the bottom of the crater. This information comes from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team.

Thickness of ejecta at 1 radius away:

In the case of craters, this field contains an estimate of the thickness of the rocks ejected during impact and deposited on the outer slopes of the crater at a distance from the top of the rampart corresponding to a radius of this same crater. This information comes from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team.

Thickness of the ejecta at 3 radii away:

In the case of craters, this field contains an estimate of the thickness of the rocks ejected during impact and deposited on the outer slopes of the crater at a distance from the top of the rampart corresponding to three times the radius of this same crater. This information comes from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team.

Thickness of the ejecta at 5 radii away:

In the case of craters, this field contains an estimate of the thickness of the rocks ejected during impact and deposited on the outer slopes of the crater at a distance from the top of the rampart corresponding to five times the radius of this same crater. This information comes from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team.

Radiant halo radius on radar:

In the case of craters, this field contains an estimate of the radius of the halo giving a brilliant radar image on the immediate periphery of the top of the crater rampart. This information comes from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team.

Radius of the dark halo on radar:

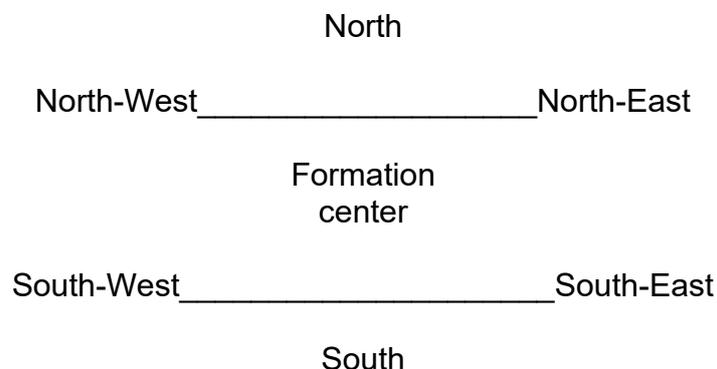
In the case of craters, this field contains an estimate of the radius of the halo giving a dark radar image at the periphery of the crater. This information comes from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team.

DESCRIPTION :

This field is divided in four sections for the formation detailed description. But this division is not really visible when consulting the formation form on screen or printing it.

Cardinal points are reference to indicate where the different details are situated according to formation center. For a crater, reference point is the area center.

If observed with naked eye, on the Moon, North is up, South is down, West is left and East is right.



For example, a craterlet located on a crater wall down left will be described as "Walls ridden by a craterlet at South-West".

Craters are the most numerous formations. Their description is well divided in four parts.

General description

First, information about shape, location and preservation of the formation.

External slopes description

Then, the external "slopes" are described. Generally, the comments are about their inclination. If radial valleys are present, slopes are described as "tormented". This part also indicates craters and craterlets situated on external slopes.

Internal walls description

The "walls" which are described are the internal ones. They link the upper rim of the slopes to the crater floor. The walls are described as "little high when the altitude difference is less than 2,000 m, "pretty high" between 2,000 and 3,000 m, "high" between 3,000 and 4,000 m and "very high" if more than 4,000 m. The indicated information is that which seem the most believable according to important variations in different bibliographical sources. This part also indicates craters and craterlets situated on internal slopes.

Crater floor

The crater "floor" is described as "flat" if no hills can be found to "tormented" if it's very irregular. The non circular shape is mentioned. If lava seems to have flooded the crater floor, it has been indicated. This part also indicates craters and craterlets situated on the floor.

Historical sites

In the "**Historical sites**" database, specific descriptions includes :

- Launch date and hour
- Astronauts names for a human mission
- Probe or spaceship description
- Mission main phases dates and hours
- Scientific results

ELGER DESCRIPTION

This field contains the description of the formation as it has been published by Thomas Gwynn Elger in his book "THE MOON, A FULL DESCRIPTION AND MAP OF ITS PRINCIPAL PHYSICAL FEATURES" released in 1895. All formations aren't described in this book. This description contains often interesting observational details.

OBSERVATION

Interest :

This field will help you to determine which formations to observe. It gives you information on the formation interest. It has been defined by the authors according to their own experience. Sure, you can disagree with them.

Formations are indicated as :

- Low interest formation
- Pretty interesting formation
- Very interesting formation
- Exceptionally interesting formation

Lunar month day for evening observation :

This expression means "Day of lunar month permitting an evening observation of the formation". It has been observed that Eastern limb formations can only be well observed 2 days after New Moon.

The indicated day is the one for a null libration. It has been computed from formation longitude. According of the real libration value, it can be shifted by one day more or less.

Lunar month day for morning observation :

This expression means "Day of lunar month permitting a morning observation of the formation". It has been observed that Western limb formations can only be well observed 2 days before New Moon.

The indicated day is the one for a null libration. It has been computed from formation longitude. According of the real libration value, it can be shifted by one day more or less.

Useful instrument :

This field presents the smallest instrument needed to comfortably observe the formation. It has been computed from the formation width and from practical resolution power (PRP) of the instruments defined as the double of TRP. It is supposed to be obtained when using a magnification equal to instrument diameter in centimeters.

This data is provided for a Moon mean distance of 202,000 miles. An arc second is then about 1 mile on the Moon.

This data depends on other external criteria such as instrument quality, observer's eye health, seeing...).

- Naked eye (PRP = 100 miles)
- x10 binoculars (PRP = 20 miles)
- 2" refractor (PRP = 5 miles)
- 4" reflector (PRP = 2.5 miles)

- 6" reflector (PRP = 1.6 miles)
- 8" reflector (PRP = 1.2 miles)
- 10" reflector (PRP = 1 mile)
- 12" reflector (PRP = 0.8 mile)

POSITION :

Longitude :

You can find here the selenographic longitude of the formation with a tenth of degree precision. This data is provided by International Astronomical Union. Longitude is negative to the West of central meridian. About craters, it's the center longitude. For lengthened or irregular formations, it's an internal point the closest to central.

Latitude :

You can find here the selenographic latitude of the formation with a tenth of degree precision. This data is provided by International Astronomical Union. Latitude is negative to the South of lunar Equator. About craters, it's the center longitude. For lengthened or irregular formations, it's an internal point the closest to central.

Quadrant :

Information has been included to make easier the location of the formation on the lunar disk. The location system is that of the International Astronomical Union since 1988. When you look at the lunar disk with the naked eye, the North is up and the East is right.

This first field indicates the lunar quadrant where is situated the formation according to the "Lunar Quadrant Charts" by Arthur and Agnieray published by the University of Arizona :

- North-East
- South-East
- North-West
- South-East

Area :

This field indicates clearly the lunar region where can be found the formation according to a more known one (sea, mountain or large crater) or according to the position on the edge of the lunar disk (limb) or according to the center of the lunar disk.

ATLAS :

This field contains pages, maps or picture of the main paper atlases presently available on which the selected formation is indicated.

Rükl :

In honor to its author for his contribution to Astronomy popularization, we have mentioned the map number of the "**Atlas of the Moon**" by **Antonin Rükl** on which is found the formation.

Viscardy :

Also in honor to its author for his contribution to Astronomy popularization, we have also mentioned the page number of the "**Photographic Atlas of the Moon**" by **Georges Viscardy** on which the formation is found with a text on it, or on which a photograph shows the place where is situated the formation.

For this last work, when the formation does not figure on at least one photograph, there is no page indicated. Similarly, if the formation appears on, at least, a photograph, but is not described in the text, it is the page of the best photograph where it is normally visible that is indicated.

Hatfield :

In honor to its author for his contribution to Astronomy popularization, we have mentioned the map number of the "**Hatfield Atlas of the Moon**" republished by **Jeremy Cook** on which the formation is found.

Westfall :

In honor to its author for his unique work, we have mentioned the maps numbers of the "**Atlas of the Lunar Terminator**" from **Professor John E. Westfall** on which the formation is found, because it's the only one that shows all librations variations.

Wood :

We mentioned **Charles Wood's articles on numerous** formations edited in **Sky and Telescope** and the number of his "**Lunar 100 list**", with his courtesy.

LOPAM :

Adding to downloadable picture of the LOPAM, we have indicated numbers of "**Lunar Orbiter Photographic Atlas of the Moon**" pages on which you can find the selected formation. Just click on this link and go to the Internet site of **Jeff Gillis** of **Lunar and Planetary Institute** and you will admire the entire picture from which was extracted the picture.

Nevertheless, if you are not permanently connected to the Internet, another possibility is offered.

NAME ORIGIN :

Real name :

This field presents the real name of the person whose name has been given to the formation. When it also exists, a nickname is indicated between parentheses.

For other formations than craters, the official name is first translated in English, and then you can find the real name of the person whose name has been given to the formation.

Works :

This field indicates, for craters, the activities of the person whose name has been given to the formation.

Here is the list of the "works" you can find in the database:

- Agronomist
- Alchemist
- Admiral
- Anthropologist
- Archaeologist
- Archbishop
- Architect
- Artist
- Astronaut
- Astronomer
- Astrophysicist
- Aviator
- Banker
- Biologist
- Botanist
- Calif
- Cartographer
- Chemist
- Clockwork
- Consul
- Cosmographer
- Egyptologist
- Engineer
- Engraver
- Explorer
- Geodesist
- Geographer
- Geologist
- Geometer
- Geophysicist
- God
- Hero
- Historian
- Humanistic
- Hydrographer

- Inventor
- Jurist
- King
- Manufacturer
- Mathematician
- Meteorologist
- Mineralogist
- Missionary
- Mythological fame
- Naturalist
- Navigator
- Oceanographer
- Optician
- Paleontologist
- Pharmacist
- Philologist
- Philosopher
- Physicist
- Physiologist
- Poet
- Political man
- Priest
- Printer
- Professor
- Scientist
- Sailor
- Saint
- Sismologist
- Sponsor
- Stateman
- Technician
- Theologian
- Writer
- Zoologist

Please note that some people have been credited with 2 or 3 works.

Nation :

This field indicates the nationality generally attributed to the person whose name has been given to the formation. It can be the birth nationality. You can also find nationalities no longer in existence.

Here is the list of nationalities present in the database:

- American
- Arabian
- Australian
- Austrian
- Babylonian
- Belgian
- British
- Byzantine
- Brazilian

- Canadian
- Carthaginian
- Castilian
- Chinese
- Cretian
- Dalmatian
- Danish
- Dutch
- Egyptian
- English
- Finnish
- French
- Greek
- German
- Hungarian
- Indian
- Irish
- Italian
- Japanese
- Jewish
- Macedonian
- Mexican
- Norwegian
- Persian
- Polish
- Portuguese
- Roman
- Russian
- Scottish
- Soviet
- South African
- Spanish
- Swedish
- Swiss
- Czech
- Venetian

Birth place :

This field indicates the birth place of the person whose name has been given to the formation when it has been possible to find it. If not found, it is indicated " ? ". Please note that for imaginary persons, there is no birth place.

Birth year :

This field indicates the birth year of the person whose name has been given to the formation if it has been possible to find it. If not found, it is indicated " ? ". Please note that for imaginary persons, there is no birth year.

Death place :

This field indicates the place of death for the person whose name has been given to the formation when it has been possible to find it. If not found, it is indicated " ? ". Please note that for imaginary persons, there is no place of death.

Death year :

This field indicates the year of death for the person whose name has been given to the formation if it has been possible to find it. If not found, it is indicated " ? ". Please note that for imaginary persons, there is no year of death.

Prominent facts :

This field describes prominent facts during the life of the person whose name has been given to the formation if it has been possible to find it. If not found, it has been indicated " ?? " .

This information is adapted from information given by the International Astronomical Union, and additional data coming from various bibliographical sources.

Generally, you can find the discoveries, inventions and important works attributed to the person, as well as distinctions obtained during life (nominations, price. ...) with associated dates when they have been found.

Name author :

This field indicates, when it's known or supposed, the organization or person name that has given the name to the formation. Also included in this chapter is the year of nomination when it has been found. In this paragraph, IAU means " International Astronomical Union ". You can find mainly 3 origins:

- Hevelius
- Riccioli
- IAU

When the origin has not been found, the field contains (??). Additionally, some uncertain origins end with "?".

These name origins are purely indicative and are not to be held as rigorously exact because of numerous additions made during all periods to the lunar nomenclature.

In the "**Historical sites**" base, it's the country and the agency which conceived the mission that are indicated.

Name given by Langrenus:

This field indicates the name given by Michel Florent Van Langren on his Moon map in 1644. When the formation has not received a name, "Not named" is indicated.

Name given by Hevelius :

This field indicates the name given by Johannes Hevelius on his Moon map in 1647. When the formation has not received a name, "Not named" is indicated.

Name given by Riccioli :

This field indicates the name given by Riccioli on the Moon map drawn in 1651 by Francesco Grimaldi. When the formation has not received a name, "Not named" is indicated.

INTERNATIONAL ASTRONOMICAL UNION DATAS

IAU Feature Name :

Official name given by IAU to the formation with all the additives on letters (Accents, tilde, etc...) as they have been given to the honored character.

IAU Clean Feature Name

It's official IAU name above without all the additives on letters (Accents, tilde, etc...) so that they can be managed internationally by computers.

IAU Diameter

Approximate diameter or biggest dimension in kilometers.

IAU Center Latitude

Latitude of the center of the formation. Positive numbers indicates that the formation is localized in northern hemisphere and negative numbers indicate that the formation is localized in the southern hemisphere.

IAU Center Longitude

Longitude of the center of the formation. On the Moon, positive numbers indicates longitudes towards East and negative numbers indicate longitudes towards West.

IAU Northern Latitude

Latitude the most on North of the formation. Positive numbers indicates that the formation is localized in northern hemisphere and negative numbers indicate that the formation is localized in the southern hemisphere.

IAU Southern Latitude

Latitude the most on South of the formation. Positive numbers indicates that the formation is localized in northern hemisphere and negative numbers indicate that the formation is localized in the southern hemisphere.

IAU Eastern Longitude

Longitude the most on the East of the formation. On the Moon, positive numbers indicates longitudes towards East and negative numbers indicate longitudes towards West.

IAU Western Longitude

Longitude the most on the West of the formation. On the Moon, positive numbers indicates longitudes towards East and negative numbers indicate longitudes towards West.

IAU Coordinates System

Coordinates system used for latitudes and longitudes. For the Moon, it's planetographic with east longitudes as positive and counted from 0 to -180° and from 0 to 180° from the meridian 0. It's ULCN 2005(Unified lunar coordinates network de 2005). Mean lunar sphere is considered with a radius of 1737,4 km

IAU Continent

Continent or great geographic division associated to the name.

Africa (AF)
Antarctica (AN)
Asia (AS)
Europe (EU)
North America (NA)
Oceania (OC)
South and Central America (SA)

IAU Ethnicity

Ethnic or cultural or nationality associated to the name.

AFRICA

Algeria	AL
Angola	AN
Bantu	BA
Benin	BE
Botswana	BT
Burkina Faso (Upper Volta)	BF
Burundi	BR
Bushman	BU
Bushongo	BH
Cameroon	CR
Canary Is.	CI
Dahomean	DH

Egypt	EG
Ethiopia	ET
Gabon	GB
Gambia	GA
Ghana	GH
Gold Coast	GC
Guinea	GU
Hottentot	HO
Ivory Coast	IC
Kenya	KY
Lesotho	LE
Liberia	LI
Libya	LB
Madagascar	MD
Malawi	MW
Mali	ML
Mande	MN
Mauritania	MU
Mauritius	MA
Mbundu	MB
Mende	ME
Morocco	MR
Mozambique	MZ
Namibia	NM
Niger	NG
Nigeria	NI
Pygmy	PY
Republic of Chad	CH
Republic of Seychelles	SY
Rwanda	RW
Semitic	SE
Senegal	SN
Sierra Leone	SL
Somalia	SO
South Africa	SA
Sudan	SU
Swaziland	SW
Tanzania	TA
Togo	TO
Tunisia	TN
Uganda	UG
Unknown	--
Yao	YA
Zaire	ZA
Zambia	ZM
Zimbabwe	ZI
Zulu	ZU

ASIA

Afghanistan	AF
Akkadian (Accadian)	AK
Altai	AL
Arabian	AR
Armenian	AM
Assyrian	AY
Assyro-Babylonian	AB
Azerbaijan	AZ
Babylon	BY
Bangladesh	BA
Bhutan	BH
Buriat	BR
Burma	BU
Cambodia	CM
China	CH
Chukchi	CU
Elamite	EL
Evenki	EV
Georgia	GE
Hebrew	HE
Hindu	HI
India	IN
Indonesia	ID
Iran	IR
Iraq	IQ
Israel	IS
Itelmen	IT
Japan	JA
Jewish	JW
Jordan	JO
Kashmir	KA
Kazakhstan	KZ
Ket	KT
Korea	KR
Kuwait	KU
Kyrgyzstan	KY
Laos	LA
Lebanon	LE
Malaysia	MA
Mansi	MS
Mesopotamian	ME
Minyong	MY
Mongolia	MO
Monguor	MG
Nanai	NA
Neghidhian	NG
Nepal	NE
Nganasan	NS
Oman	OM

Ostyak	OS
Pakistan	PK
Persian	PE
Philippines	PH
Phoenician	PO
Sanskrit	SA
Saudi Arabia	SB
Scythian	SC
Semitic	SE
Siberia	SI
Sri Lanka	SR
Sumerian	SU
Syria	SY
Taiwan	TW
Tajik	TJ
Thailand	TH
Tibet	TB
Tungu	TN
Turkey	TU
Turkmenistan	TK
Tuva	TV
Ulcı	UL
Unknown	--
Urartu	UR
Uzbekistan	UZ
Vietnam	VT
Yakutian	YK
Yemen	YE

EUROPA

Albania	AL
Andorra	AN
Austria	AS
Bashkir	BS
Belarus	BL
Belgium	BE
Bosnia-Herzegovina	BH
Bulgaria	BU
Byzantine	BZ
Caucasus	CC
Celtic	CE
Chuvash	CH
Croatia	CR
Cyprus	CY
Czechoslovakia	CZ
Denmark	DE
England	EN
Eskimo (Greenland)	EK

Estonia	ES
Finland	FI
Flemish	FL
France	FR
Germany	GE
Great Britain	GB
Greek	GR
Greenland	GL
Gypsy	GY
Hungary	HU
Iceland	IC
Ireland	IR
Italy	IT
Kalmyk	KL
Karelia	KA
Komi	KO
Lapp	LP
Latin	LA
Latvia	LV
Liechtenstein	LE
Lithuania	LI
Luxembourg	LU
Macedonian	MA
Malta	ML
Mari	MR
Moldova	MD
Mordvinian	MO
Netherlands (Dutch)	DU
Norse	NS
Norway	NO
Oscan	OS
Ostrogoth	OG
Poland	PO
Portugal	PG
Roman	RM
Romania (Rumania)	RO
Russia	RU
Scandinavian	SD
Scotland	SC
Scythia	SY
Slavic	SL
Slovakia	SV
Slovenia	SI
Soviet	SO
Spain	SP
Sweden	SW
Switzerland	SZ
Tartar	TT
Teutonic	TU

Udmurtian	UD
Ukraine	UK
Unknown	--
Wales	WA
Yugoslavia	YU

NORTH AMERICA

Aleutian	AU
Algonquin	AL
American	AM
Arikara	AR
Blackfoot	BL
Canada	CA
Cherokee	CE
Cheyenne	CY
Chickasaw	CH
Chinook	CI
Choktaw	CO
Chumash	CU
Creek	CR
Dakota	DA
Dominica	DO
Eskimo	ES
Hopi	HO
Iroquois	IR
Klamath	KL
Lakota	LA
Mandan	MA
Mexico	ME
Navajo	NV
Osage	OS
Pawnee	PW
Pequot	PE
Potawatomi	PO
Pueblo	PU
Salish	SA
Seneca	SE
Shoshoni	SH
Sioux	SX
Tlingit	TL
United States	US
Unknown	--
Zuni	ZU

OCEANIA

Australia	AU
Caroline Is.	CI
Cook Islands	CO

Fiji	FJ
Guam	GM
Hawaii	HA
Marquesas Islands	MA
Marshall Is.	MI
Melanesia	ME
Micronesia	MC
Nauru	NA
New Britain	NB
New Guinea	GU
New Zealand	NZ
Papua New Guinea	PN
Polynesia	PO
Republic of Palau	PA
Samoa	SA
Society Is.	SI
Toamotu	TU
Tonga	TO
Unknown	--
Vanuatu	VA

CENTRAL AND SOUTH AMERICA

Argentina	AR
Auracanian	AC
Aztec	AZ
Barbados	BB
Bolivia	BO
Bororo	RR
Brazil	BR
Chile	CH
Chimalateco	CI
Colombia	CO
Costa Rica	CR
Cuba	CU
Dominican Republic	DR
Ecuador	EC
El Salvador	ES
Falkland Islands	FI
French Guiana	FG
Grenada	GR
Guatemala	GU
Guyana	GY
Haiti	HA
Honduras	HO
Inca	IN
Jamaica	JM
Mayan	MY
Nahuatl	NA
Netherland (Dutch) Antilles	DA

Nicaragua	NI
Panama	PM
Paraguay	PA
Peru	PE
Puerto Rico	PR
Suriname	SU
Unknown	--
Uruguay	UR
Venezuela	VE
Virgin Islands	VI

IAU Feature Type

IAU descriptor term in greek or latin (cf Lunar Universal Number above)

IAU Feature Type Code

Code in two letters of the IAU descriptor term (cf Lunar Universal Number above)

IAU Quad Name

Specific quadrant where is localized the formation center.

IAU Quad Code

Two letters code of the specific quadrant where the formation center is localized.

IAU Approval Status

Approval level of the formation in 2011.

- 1 Proposed (not currently used)
- 2 Task Group approval (not currently used)
- 3 WGPSN approval (not currently used)
- 4 Executive Committee approval (not currently used)
- 5 Adopted by IAU
- 6 Dropped, no longer in use
- 7 Never approved by the IAU

IAU Approval date

Date when the name has been approved by IAU. Complete dates begin at half september 2006 and are recorded as (YYYY-MM-DD).

IAU Reference

Reference book from where the origin and the orthograph of the name are given.

IAU Origin

Short explanation of the formation name.

IAU Link

Internet link towards the official IAU site formation page.

THE "EPHEMERIS" tab

When you click on the "**Ephemeris**" tab, the right frame window fills with Moon sky and orbit position data: This position can be set entering some parameters. You can also continuously manage time with the "tape recorder" buttons.

The screenshot shows the 'Ephemeris' tab of a software interface. At the top, there are tabs for 'Information', 'Notes', 'Ephemeris', 'Terminator', 'Tools', and 'Setup'. Below the tabs, there are input fields for 'Date' (2020, 1, 30) and 'Time' (9, 4, 28). A 'Now' button is next to the time fields, and a 'Compute' button is below them. To the right of the input fields is a vertical column of four circular images showing the Moon's terminator at different times: 2020-01-24 22:42, 2020-02-02 02:42, 2020-02-09 08:33, and 2020-02-15 23:17. Below the input fields and terminator images is a table with the following data:

Ephemeris:	DE421
Observatory:	+49°54' E01°06' Tz: 1h00m
Date:	2020-01-30 09:04:28
Date (TT):	2020-01-30 08:05:39
(J2000) Right Ascension:	00h45m53.59s
(J2000) Declination:	-01°36'18.5"
(Date) Right Ascension:	00h46m53.64s
(Date) Declination:	-01°29'56.4"
Distance:	407451Km
Apparent diameter:	29.33'
Phase:	119.8°
Lunation:	5.43 days
Illumination:	25.2%
Colongitude:	332.1°
Sub-solar latitude:	-0.8°
Libration in Latitude:	+07°33'
Libration in Longitude:	-01°40'
Position angle:	-23.0°
Azimuth	+66°43'
Altitude	-19°46'
Rise:	11h10m
Transit:	17h18m
Set:	23h38m
Rise azimuth:	+90°43'
Transit Altitude:	+38°
Set azimuth:	+273°06'

DATE AND TIME INPUT

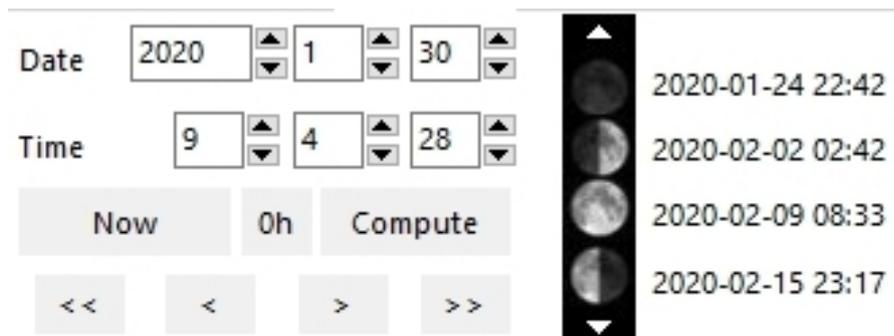
Observation **date** and **hour** can be set with upper case, either clicking and entering them directly or using the arrows. The "**Compute**" button displays the map with the chosen date and hour.

The **"Now"** button can show directly the Moon aspect at the current time. Date and hour used are those of your operating system. Verify if it's on time. This setting is very useful when using the software "in the field".

The **"Compute"** button display the Moon as it looks like to the date and hour selected with the previous paragraph.

The **"Oh"** button shows you the Moon at 0 h on the date selected with the previous paragraph.

"VIDEO RECORDER" BUTTONS



"Video recorder" buttons are a powerful provision meant for real Moon aspect changes. They are very useful when using Open gL 3D display with the "Phase" and "Lib ration" options activated.

">>" and "<<" buttons can increase or decrease date with a one day rate. ">" and "<" buttons increase or decrease hour with a one hour rate.

These buttons allow you to observe the phase and librations evolution during time. They can be used to detect best observing periods of formations which are near or inside the librations zones.

"PHASES CALENDAR"



This is a tool to help you for preparing next observing sessions. This part of the frame shows you a Moon phases calendar. It contains the next four phases. But, with the white arrows, you can navigate in the list and retrieve old or future phases dates.

THE "EPHEMERIS" WINDOW

Ephemeris:	DE421
Observatory:	+49°54' E01°06' Tz: 1h00m
Date:	2020-01-30 09:04:28
Date (TT):	2020-01-30 08:05:39
(J2000) Right Ascension:	00h45m53.59s
(J2000) Declination:	-01°36'18.5"
(Date) Right Ascension:	00h46m53.64s
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Apparent diameter:	29.33'
Phase:	119.8°
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Libration in Latitude:	+07°33'
Libration in Longitude:	-01°40'
Position angle:	-23.0°
Azimuth	+66°43'
Altitude	-19°46'
Rise:	11h10m
Transit:	17h18m
Set:	23h38m
Rise azimuth:	+90°43'
Transit Altitude:	+38°
Set azimuth:	+273°06'

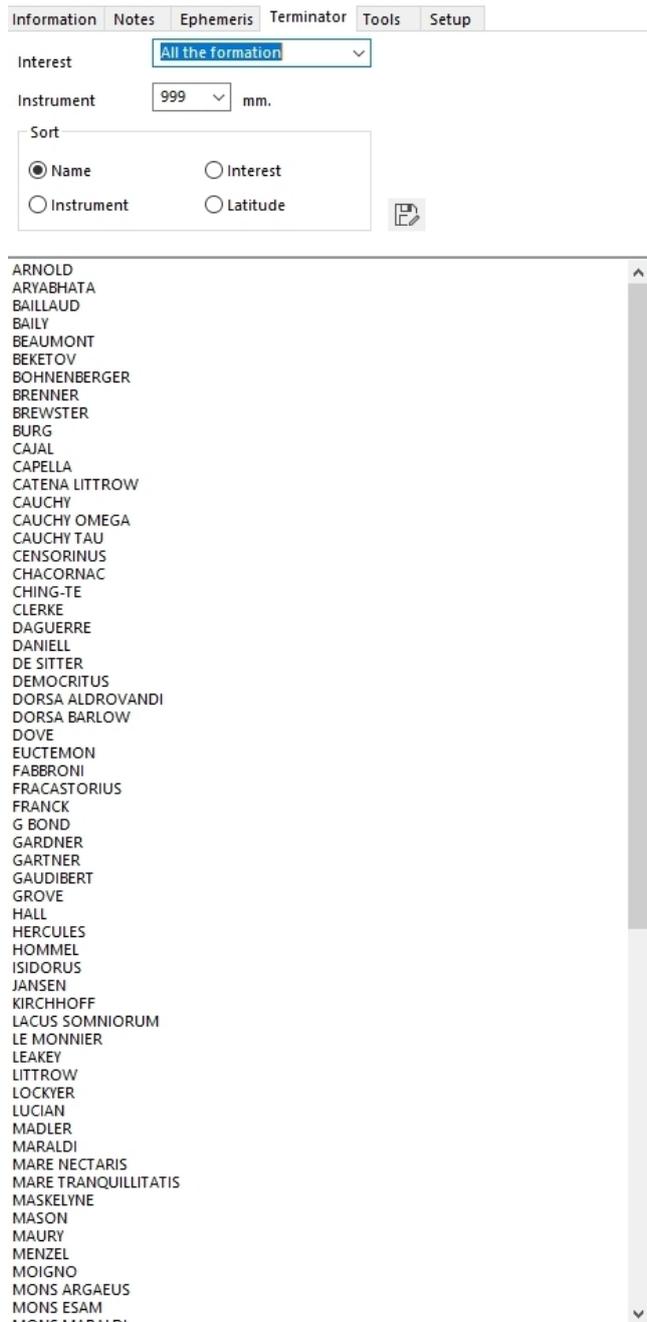
The right frame window contains the following information on Moon position :

Moon right ascension
Moon declination
Distance :
Apparent diameter:
Phase angle
Lunation day
Illumination percentage
Solar inclination
Latitude libration value
Longitude libration value
Maximum libration position on limb
Moon rise hour
Moon meridian transit hour
Moon set hour
Moon rise azimuth
Moon set azimuth

The following informations are not displayed if you check the box "**Geocentric coordinates**" in the "**General**" tab of the "**Configuration**" menu.

Moon rise hour
Moon meridian transit hour
Moon set hour
Moon rise azimuth
Moon set azimuth

THE "TERMINATOR" TAB



This option can list in the right frame window, a list of formations visible along the terminator according to date selected in the "[Ephemeris tab](#)". And more, you can extract and sort these formations using some choices.

"INTEREST" SCROLLING LIST

You can set with the scrolling list "Interest" a filter for limiting your choice. You can choose between :

- All the formations
- The pretty interesting formations
- The very interesting formations
- The exceptional formations (The best ones)

"INSTRUMENT" SCROLLING LIST

A second filter can be set to limit the listed formations to those which are visible in a given instrument (See "[Useful instruments](#) "). You can choose this one in the scrolling list. "999" doesn't limit the list (No applied filter).

You can see that most of the formations can yet be observable in a 100 mm (4 ") instrument.

"SORT" BUTTONS



Sort

Name Interest

Instrument Latitude



These selections choose the presentation mode of the extracted formations list

- Name

Clicking this point sorts formations by alphabetical order

- Latitude

Clicking this point sorts formations by latitude from equator to North pole and then, from equator to South pole.

- Interest

Clicking this point sorts formations by interest.

- Instrument

Clicking this point sorts formations by instrument capability

THE "NOTES" TAB



Information Notes Ephemeris Terminator Tools Setup

PETAIVIUS

Update Export

01/29/2020 18h15

N114/900 at x60

Rille not seen because of lack of contrast

It's in this tab that you can input all your notes written during an observation of the selected formation. Each formation has its "notes sheet" waiting your commentaries. These are stored in a personal special database.

The **"Update"** button is used to input the notes you have just written in the database.

Don't forget to click it or your notes will be lost, but there is a security window before closing the "Notes" tab.

THE "TOOLS" TAB

"Tools" tab in "Telescope" mode

"Normal mode / Distance measure" BUTTON

This button changes cursor action mode on the map. It's a toggle button. Its caption changes to allow you to go back to the other mode.

"Normal mode"

When in normal mode, the cursor is like a round bull's eye and is used to select formations.

"Distance measure"

Distance	
Real Distance	<input type="text" value="98.8Km"/>
Apparent Distance	<input type="text" value="00'49.2"/>
Standard cursor mode	
Centre L	<input type="text" value="-9.3"/>
B	<input type="text" value="51.8"/>

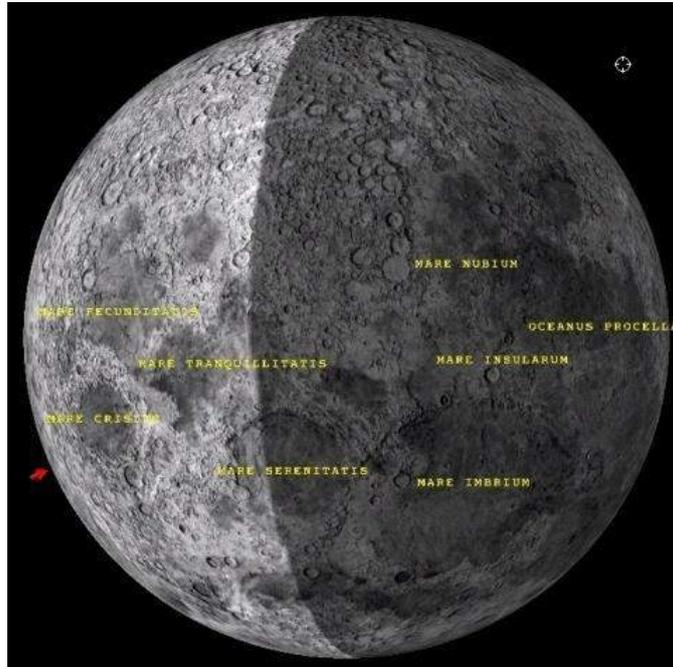
When in this second mode, the cursor changes its shape and is used for measuring distances between lunar formations or for measuring dimensions of a selected formation.

Put the cursor on the beginning of the distance to measure. Click with the left button and hold it down. Move the mouse. A color line originating at the first point appears. You just have to go to the end of the distance you want to measure by moving the mouse. Once there, release the mouse button. The line stays visible.

Up in the "Tools" panel, a box indicates the length of the drawn line in km and in arc minutes. Spherical shape of the Moon is included in the computing method. So, near the lunar limb, two perpendiculars lines with the same apparent length will indicate different dimensions.

MAP ROTATION

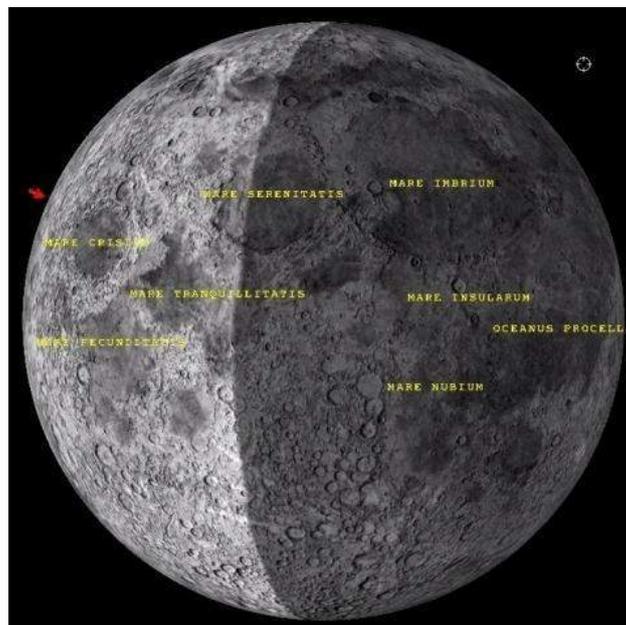
You can turn the map so that it matches what you are observing through the eyepiece of a Newtonian telescope.



When clicking the **"East"** or **"West"** button, you rotate the map display with a slight angle in the chosen direction.

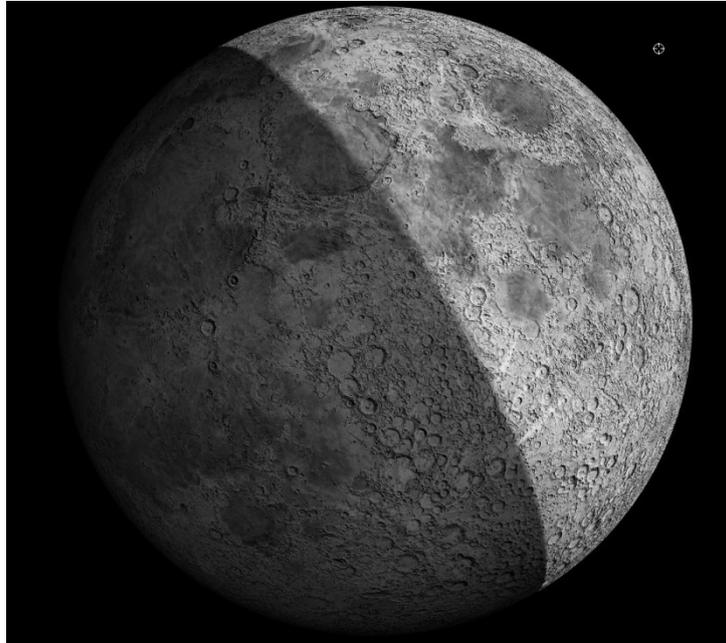
"Mirror" BOX

When you select this box and the **"North"** box together, the Moon map will show you what you will see in an instrument as a refractor or catadioptric reflector as Cassegrain, Schmidt-Cassegrain or Maksutov telescope.



"Local zenith up" BOX

When you select the box "**Local Zénith up**", the Moon drawing will be that you can observe in an instrument on an altazimutal mount. You will have to check also the "**Mirror**" box if your instrument is a refractor or a Schmidt-Cassegrain. If it's a Newtonian, you will have also to turn the map, but without checking the "**Mirror**" box.



"Telescope" Frame

This frame allows you to setup your "Goto" mount.

Telescope

ASCOM

Track position

If you own a such computerized mount which accepts the ASCOM protocol, the Virtual Atlas of the Moon will track it directly on the Moon. First of all be sure that you have installed the good ASCOM drivers on your computer. If not, go on the internet to the site

<http://ascom-standards.org/>

to download them. Install them.

Connect your mount to your computer. Start your computer and the version of the software.

First initialize your telescope as usual, then use the pad or a planetarium software to point the Moon.

Click on the "**Show menu**" button and launch the connection.

Begin centering a well known formation in the eyepiece field and select it on the map. Push the "**Sync selection**" button for initializing telescope coordinates on this position.

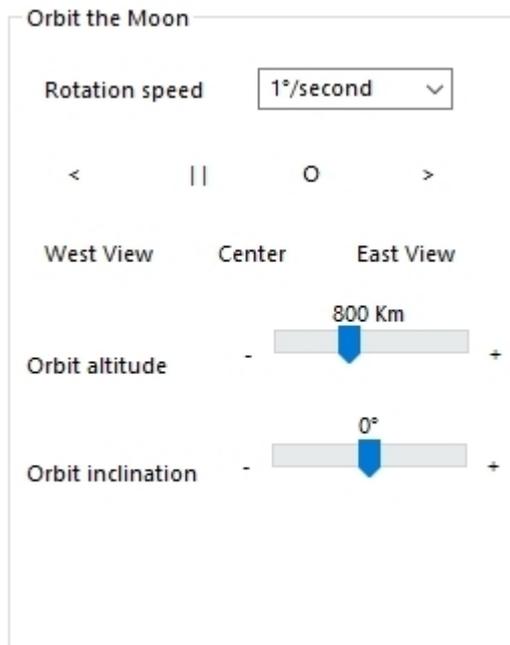
It's also possible to make this operation on a star near the Moon with the planetarium program.

After, check the box "**Track position**" so that the map displays always the telescope position.

If your telescope can do automatic pointing, you can now click on a formation on the map, or choose it with the "**Search**" function of the "**Information**" tab and then click on the "**Goto selected**" button

If you check the "**Correct the Moon motion**" box, you can choose the period correction with the choice box below.

"Orbit the Moon" Frame



This frame can simulate the view you should have from a spaceship orbiting around the Moon.

Choose the automatic rotation speed in the scrolling list.

"<" et ">" buttons allows you to choose the rotation direction.

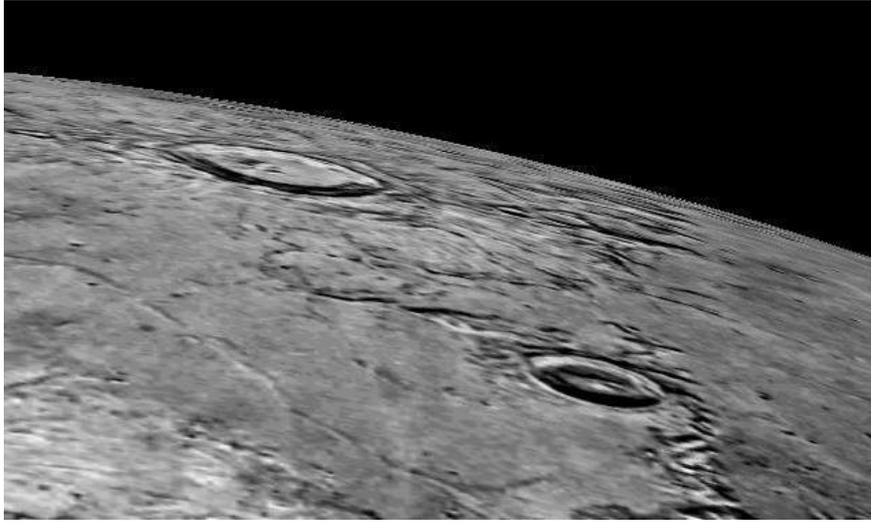
" || " button stops the automatic rotation.

"**East view**", "**Center**" et "**West view**" buttons send you to the Moon Equator on the East or West limb or on the center of the Moon disk.

Names display is only effective when rotation is stopped.

"**Orbit altitude**" can be chosen from 100 to 2000 km by moving the cursor.

"Orbit inclination" compared to the lunar equator can be chosen from 0° (on the equator) to 90° (Passing on the two poles). The negative side of the cursor gives retrograde motion.



Above : Copernicus rise simulation

THE "SETTINGS" TAB

Information Notes Ephemeris Terminator Tools Setup

Lighting

Penumbra - [Slider] +

Diffuse - [Slider] +

Specular - [Slider] +

Default

Performance

Smoothness - [Slider] +

Refresh rate 0.21 FPS

Options valid at next startup

Force texture compression

Anti-Alias

This tab will allow you to choose the special settings for the display.

"PENUMBRA" CURSOR

This cursor sets the transparency of the "night" part of the Moon globe when the box " when the **Show the phase**" box in the **"Display"** tab of the **"Configuration"** menu is activated. We think it's better to choose an intermediate setting to give an "Ashen Light" appearance to the rest of the globe. Cursor at left gives a night part completely black. But if you want to use VMA as an atlas, put the the cursor to right or uncheck the **"Show the phase"** box in the **"Display"** tab of the **"Configuration"** menu

"DIFFUSE" CURSOR

This cursor sets the general quality of the map.

"DIRECT" CURSOR

This cursor manages the transition zone between light and shadow width. At left, it's maximal but not too realist. Ce curseur sert à gérer la largeur de la zone de transition entre la partie éclairé et la partie nocturne de la face visible. Complètement à gauche, cette largeur est minimale. A droite, la transition est maximale, mais peu réaliste. Il vous est conseiller d'adopter un réglage intermédiaire.

"RESOLUTION" CURSOR

This cursor manages the 3D sphere when textures is applied precision. At left, it's not a sphere but a rough polyedra with visible flat faces.

Moving the cursor at right increases the faces number, but this needs a more powerful computer.

An image number indicator (fps) shows you the performance of your configuration.

Don't go under 4 fps to keep a sufficiently speedy display when handling the map.

But, going to a better spherical resolution also slightly increases the formations place precision on the map.

"OPEN GL INFO" BUTTON

This button displays a window giving informations on your graphic card. Use it to know what options are available on your computer and to check if it workw well.

"OPTIONS VALID AT NEXT STARTUP" FRAME

As indicated , changing one of the following options will be taken account only at next computer startup.

"Force texture compression" :

Normally, this option must be checked to avoid display flickering. Removing it can nevertheless improve performances with some graphic cards types.

"Anti Alias" :

Try this option to remove scale effects on map window. Beware, only some graphic cards can handle this option.

THE SEARCH ZONE

THE "TYPING SEARCH ZONE"



The image shows a search interface. It consists of a horizontal line at the top, followed by a text input field on the left, a 'Find' button in the middle, and a 'Next' button on the right.

Elle vous permet de chercher de nouvelles formations en y entrant leur nom ou de resélectionner une formation recherchée récemment. Vous pouvez entrer dans cette liste des lettres figurant dans le nom d'une formation et employer des "jokers". Ainsi, "*tri*" inclura dans la liste déroulante "Triesnecker" et "Rimae Triesnecker"

THE "FIND" BUTTON

When you click on this button, you display the first formation alphabetically corresponding to the search criteria choosen in the "Search" field".

THE "NEXT" BUTTON

When you click on this button, you display the next formation alphabetically corresponding to the search criteria choosen in the "Search" field".

THE STATUS BAR

"COORDINATES" DISPLAYS

Latitude and longitude of the pointer on the moon globe are displayed on the left side of the status bar. Don't mix them with your observing site coordinates

"DATE AND HOUR" DISPLAY

The date and time in the status bar corresponds to the time selected in the "Ephemeris" tab. It should not be confused with the date and time of your system!!!

"FIELD" DISPLAY

The field value corresponds to the visual apparent field of the map window selected.

"TEXTURE AND OVERLAY" DISPLAY

The used texture and its definition level, and the overlay eventually used are clearly indicated in the status bar.

DATLUN

Databases manager of the Virtual Moon Atlas

Documentation for the version
available on May 15th 2020

Welcome in "DATLUN" (c) the "Virtual Moon Atlas" databases manager.

As amateur astronomers, we continue to improve VMA for conceiving a useful software for lunar observer also efficient "on the field". We try to add new functions and a user friendly interface. This is why Patrick Chevalley has coded a database manager called "**DATLUN**" (copyrighted name) that allows you to select precisely lunar formations that seems you interesting for your own studies and that allows you to localize them on the **VMA** map.

These extended possibilities are permitted by the fact that Christian Legrand processes "formatted" databases, that allows specific extractions based on precise terms or expressions.

This version includes the functions that have seemed us the more useful. Sure, we are yet thinking to new possibilities that will be included in the next versions.

"**DATLUN**" (c) is a dedicated to the Moon software which is very powerful since it uses **SQL requests**. This manual is necessary to discover all its possibilities. We advice you to read it carefully while testing the described functions.

Good use and we haope that you will appreciate this new software and recommand it around you.

Thank you very much for your confidence.

Christian Legrand & Patrick Chevalley

DATLUN SCREEN

ID	NAME	LUN	LUN_REDUCED	NAME TYPE	TYPE	SUBTYPE	PERIOD	PROCESS	GEOLOGY	NAME DETAIL	NAME ORIGIN	LANGRENUIS	HEVELIUS
NSN	ABBOT	AA0596N05474E	0596N05474	AA	Crater		Inbian (From 3.85			Charles Greeley Abbot	(?)	Not named	Not named
NSN	ABEL	AA3463S08578E	3463S08578	AA	Crater		Pre-Nectarian (From			Niels Henrik Abel	Franz (1913)	Not named	Not named
NSN	ABENEZIA	AA2099S01189E	2099S01189	AA	Crater		Upper Inbian (From			Abraham Bar Rabbai	Riccoci (1951)	Schley	Not named
NSN	ABETTI	AA2011N02782E	2011N02782	AA	Crater		Inbian (From 3.85			Antonio Abetti	(?)	Not named	Not named
NSN	ABULFEDA	AA1387S01391E	1387S01391	AA	Crater		Typical Nectarian (F			Isma'il Abu al-Fida	Riccoci (1951)	Delikenni	Not named
NSN	ACOSTA	AA0565S06014E	0565S06014	AA	Crater		Copernician (From -			Cristobal Acosta (ex	(?)	Not named	Not named
NSN	ADAMS	AA3189S06839E	3189S06839	AA	Crater		Nectarian (From 3.5			John Couch Adams	Birt / Lee (1865)	Not named	Not named
NSN	AGATHARCHIDES	AA1985S03111W	1985S03111	AA	Crater		Pre-Inbian (From 4			Agatharchides	Mader (1937)	Not named	Not named
NSN	AGRIPPA	AA0410N01047E	0410N01047	AA	Crater		Eratosthenian (From			Agrippa	Riccoci (1951)	Ursell	Mons Ida
NSN	AIRY	AA1814S00561E	1814S00561	AA	Crater		Pre-Inbian (From 4			Sir George Biddell Airy	Mader (1937)	Clequi	Not named
NSN	AKIS	AA2001N03176W	2001N03176	AA	Crater, crater					Greek female name	IAU		
NSN	AL-BARFI	AA1429N02025E	1429N02025	AA	Crater		Inbian (From 3.85			Abu Ubayd Abd Alla	(?)	Not named	Not named
NSN	AL-HAFIRAKUSHI	AA1045S05677E	1045S05677	AA	Craterlet		Copernician (From -			Abd Manakufi (ex Lu	(?)	Not named	Not named
NSN	ALAH	AA1093S00617W	1093S00617	AA	Crater, crater					Isah male name	IAU		
NSN	ALBATEGNUS	AA1124S00401E	1124S00401	AA	Walled plain		Nectarian (From 3.5			Muhammad Ibn al-B	Riccoci (1951)	Ferdinand III Imp. R	Mons Didym
NSN	ALBERT	AA3630N02500W	3630N02500	AA	Crater, crater					Male name of Germ	IAU		
NSN	ALDIFIN	AA0141N02209E	0141N02209	AA	Craterlet		Birth period not four			Edwin E. Aldrin (ex	(?)	Not named	Not named
NSN	ALEXANDER	AA4029N01369E	4029N01369	AA	Walled plain		Pre-Inbian (From 4			Alexandre le Grand	Birt / Lee (1865)	Mons Aenus	Not named
NSN	ALFRAGANUS	AA0542S01897E	0542S01897	AA	Crater		Copernician (From -			Muhammad Ibn Kall	(?)	Not named	Not named
NSN	ALHAZEN	AA1591N01716E	1591N01716	AA	Crater		Lower Inbian (From			Ibn al-Haytham (ex F	Schroter (1902)	Not named	Not named
NSN	ALLACENSIS	AA3060S00513E	3060S00513	AA	Crater		Typical Nectarian (F			Pierre d'Ally	Riccoci (1951)	Elisabethae Palak	Mons Aniba
NSN	ALMANDON	AA1688S01514E	1688S01514	AA	Crater		Nectarian (From 3.5			Abd Allah al-Mahmur	Riccoci (1951)	Izenburg	Mons Aniba
NSN	ALQHA	AA2979N05388W	2979N05388	AA	Crater, crater					Hawaiian female (ex	IAU		
NSN	ALPETRAGIUS	AA1605S00451W	1605S00451	AA	Crater		Nectarian (From 3.5			Nur ed-din al-Betrug	Riccoci (1951)	Mazarini	Mons Phoe
NSN	ALPHONSUS	AA1339S00289W	1339S00289	AA	Crater		Nectarian (From 3.5			Alphonse-X (ex Alph	Riccoci (1951)	Ludovici-VN Reg F	Mons Masic
NSN	AMEGHINO	AA0330N05704E	0330N05704	AA	Craterlet		Birth period not four			Florentino Ameghino	(?)	Not named	Not named
NSN	AMMONIUS	AA0825S00083W	0825S00083	AA	Craterlet		Copernician (From -			Ammoneo di Sacco	(?)	Not named	Not named
NSN	AMONTONS	AA0534S04678E	0534S04678	AA	Craterlet		Inbian (From 3.85			Gulbaume Amontons	(?)	Not named	Not named

DATLUN screen is in a Windows frame. As all the Windows frames, you can minimize, maximize or adapt its size if you click on the upper right buttons in the title bar.

It's possible to open together **ATLUN** (c) and **DATLUN** (c) modules allowing formations localisation on the map, while accessing to all the datas about these formations.. You can also launch **DATLUN** (c) from the **ATLUN** (c) module in clicking on the associated button on buttons bar.

DATLUN (c) window features :

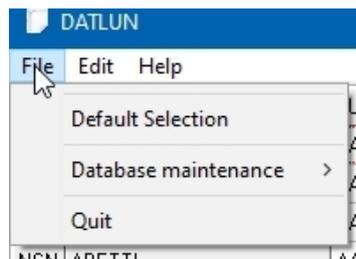
- The **menus bar**
- The window "**List**"
- The **state bar**

THE MENUS BAR



This bar contains the menus giving access to functions lists.

THE "FILES" MENU



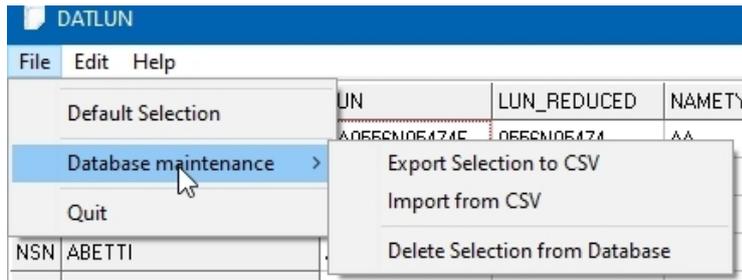
As a tradition in all Windows (r) softwares, in **DATLUN** it's used to select and maintain the databases and to exit the software.

"Default selection" FUNCTION

This function allows you to come back to the maximum selection which is the "default" selection. All the databases and all the columns are selected and there is no SQL request running in background.

"Database maintenance" FUNCTION

This function conducts to a new sub-menu :



"Export selection to CSV" FUNCTION

This function allows you to export the selected formations list which is visible in the "List" window into a CSV file usable in the major calc softwares as Microsoft Excel (r)

The classic Windows "record files" window will appear. Record your extraction in the directory you have chosen.

Beware, databases informations are copyrighted and can be used only for personal use and not in a commercial goal.

"Import selection from CSV" FUNCTION

This function allows you to import a personal formations list compiled in a CSV file and import it as a VMA database.

Please, have a look at the detailed description [here](#) to see how it works.

"Delete selection from database" FUNCTION **BE CAREFUL WHEN USING THIS FUNCTION !**

If you click on this function, the selection realized in "DATLUN" will be immediately deleted from the involved databases and cannot be recovered, but if you reinstall VMA Pro.

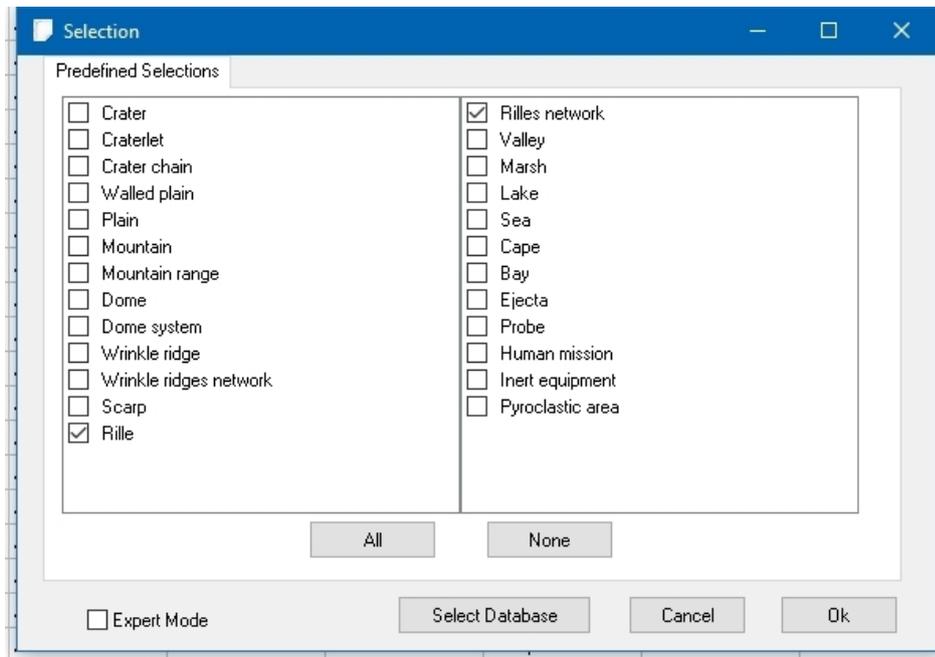
"Quit" function

This function allows you to quit "DATLUN" and closes all the databases. The setup about selected databases, columns and selection will be kept for your next session.

THE "SELECTION" MENU

This menu opens a window which permits you :

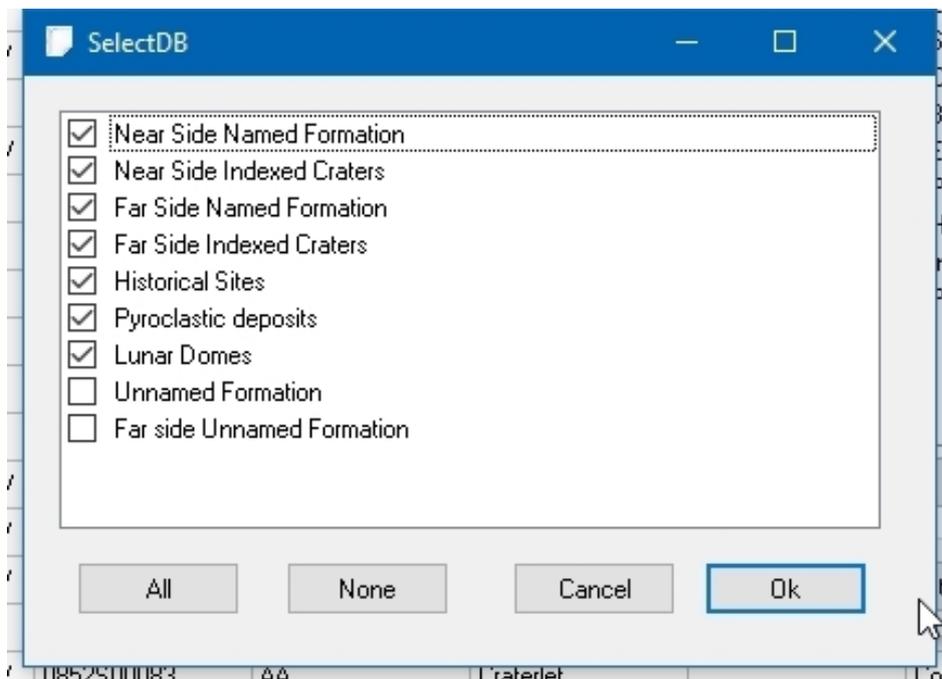
- to select the databases to be used.
- to select formations types that you want to study.
- to select a formations list based on a specific value in a single field.
- to select a formations list based on several crossed criterias.



On first time, the window opens in **"basic" mode**. After that, it's possible to use the **"Expert" mode**.

"Select databases" function

When pressing the **"Select database"** button opens a new window :



Fill boxes of all the databases you want to open. The more opened, the more longer for managing them. If your computer is not too powerful, select useful minimum.

It's, sure, necessary to have downloaded and / or installed these databases before. New databases are on work and could be incorporated in VMA and DATLUN in the future.

The version 7 database is the largest existing lunar database to date. The files represent nearly 300 MB of text in French and as much in English! It contains the descriptive files of more than 1 million lunar formations with varying amounts of data depending on the official bases from which they originate. It is separated into eight distinct bases:

- **NAMED FORMATIONS** : The formations of the visible & hidden faces which have a specific name validated by the UAI (ex: Clavius, Rima Hyginus, Montes Alpes ...): (1,800 entries approximately)

- **SATELLITE FORMATIONS**: The formations of the visible & hidden faces which do not have a specific name, but a lettered index backed by an official name and which are validated by the UAI (ex: Clavius D, Hyginus A .. .): (Around 7000 entries)

- **SALAMUNICCAR UNNAMED FORMATIONS**: The formations of the visible & hidden faces which do not have a specific name or an index and which are not validated by the UAI. These are from the work carried out by Goran Salamuniccar of the Faculty of Electrical Engineering and Computing, University of Zagreb and his team (Base LU 78 287) who gave us permission to include them in the VMA (Thanks to him!) . The name of these courses is represented by the LUN (Lunar Universal Number) developed by Christian Legrand specially for the VMA: (approximately 69,600 entries)

- **ROBBINS UNNAMED FORMATIONS:** The formations of the visible & hidden faces which do not have a specific name or an index and which are not validated by the UAI. These are from the work of Stuart J. Robbins of the Southwest Research Institute (Robbins Lunar Crater Database 2018-08-15) who gave us permission to include them in the AVL (Thanks to him!). The name of these courses is represented by the LUN (Lunar Universal Number) developed by Christian Legrand specially for the AVL: (approximately 1,300,000 entries). This base contains only 4 fields taken from the base of S. J. Robbins so as not to weigh down the display performance of the VMA.

- **HISTORICAL SITES :** Historical sites on both sides: The sites of all voluntary or accidental impacts of human origin compiled specially for VMA by Christian Legrand (ex: Apollo 15 Base, Ranger 7, Luna 9, Apollo 17 S-IVB, Chang'é, Chandrayann 2 ...) (59 entries)

- **PYROCLASTICS FORMATIONS :** The list of pyroclastic deposits compiled by Lisa Gaddis and her team (80 entries)

- **DOMES:** A list of lunar volcanic domes compiled by the members of the ALPO association (700 entries)

- **NELIOTA:** The list of contemporary meteoritic impacts on the lunar surface listed by the Athens National Observatory as part of the NELIOTA (Near Earth objects Lunar Impacts and Optical TrAnsients) program piloted by the European Space Agency (ESA).

For each formation, available information is :

- the formation name origin.
- the main lunar atlases for amateur astronomers page where to find the formation.
- the formation location on the lunar disc.
- the formation description.
- various useful information for serious observing.
- official 2012 IAU datas about this formation

Given the mixed sources of the various databases, certain information may not be available in a given database.

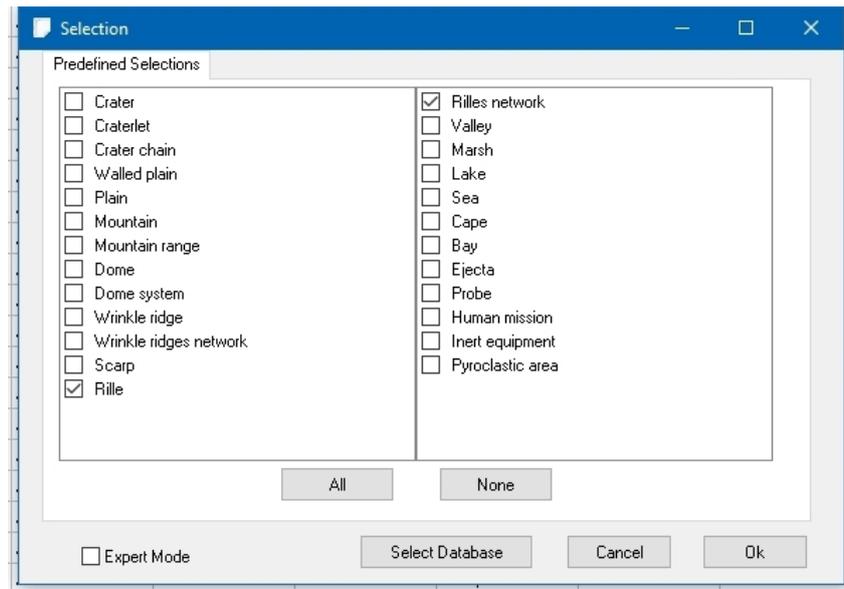
Warning : In such detailed work, the data will certainly contain some mistakes

- mainly input mistakes. You can also report them to [Christian Legrand](#) so that he can correct the database.

The authors thank you in advance for your cooperation. They will be corrected as soon as possible.

Informations of the VMA databases are copyrighted "(c) Christian Legrand" and can't be used outside of the software. For any other use, please contact [the author](#).

"Predefined selections" THUMBNAIL

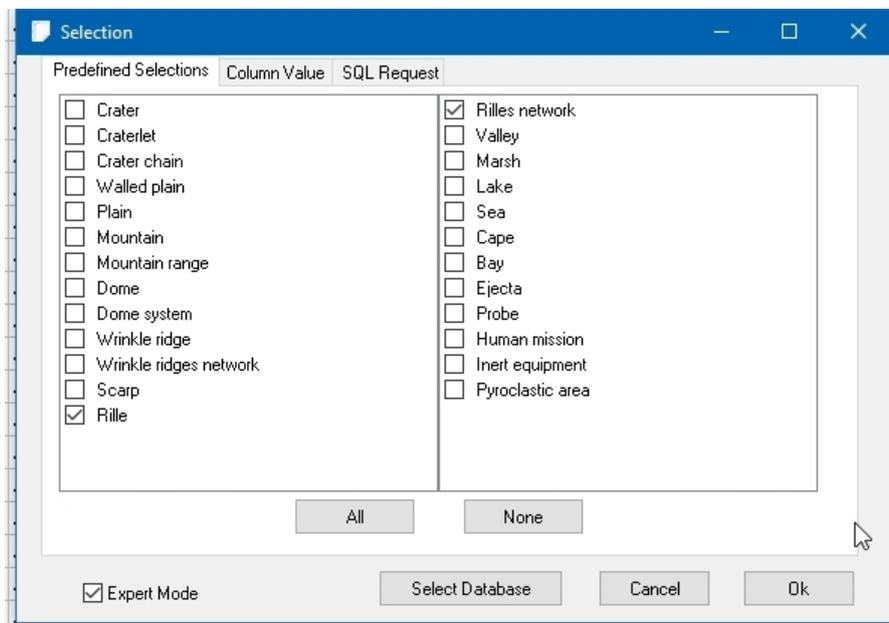


Fill boxes of all the formations types that you want to select. The more selected, the more longer for managing them. If your computer is not too powerful, select useful minimum.

The "**All**" button select all the types in a single operation and the button "**None**" is for the reversed operation.

"Expert" mode

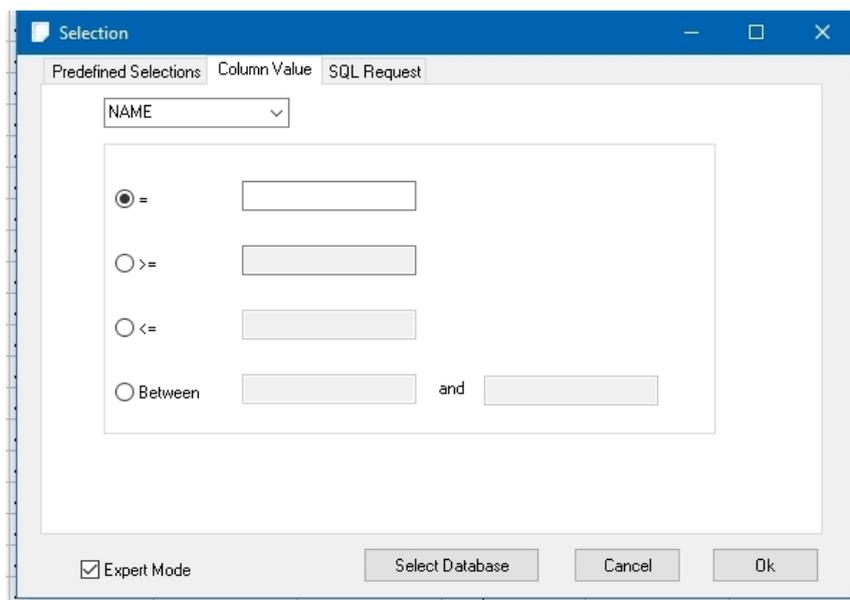
If you fill the "**Expert**" mode box, two new thumbnails appear.



"Column value" THUMBNAIL

When you click on this thumbnail, you can select all the formations that incorporate

the **EXACT** value that you specify in the field that you have chosen.



The upper scrolling list allows you to choose the column.

Then fill the box corresponding to your single request :

- "=" is for "**Chosen column value equal to**". For example, if you choose the **RUKLN** column that corresponds to the map number in the Antonin Růkl, "**Atlas of the Moon**", you will see in the "List" window, only the formations that are on this map of that Atlas.

- ">=" is for "**Chosen column value upper or equal to**"

- "<=" is for "**Chosen column value lower or equal to**"

- "**Between**" allows you to enter a value interval to respect in the chosen column.

Exemple : if you choose the LENGTHKM column that is the formation length in km, that after you fill the box "**Between**" and that you enter 30 in the field to the right of "Between" and 40 in the field to the right of "and", you will see in the "List" window only the formations that are between 30 and 40 km length.

Beware : there must have an exact correspondance between your extraction writing and the field value. This function does not allows you to build a selection on a part of the value of a field. This is the following "SQL Request" goal.

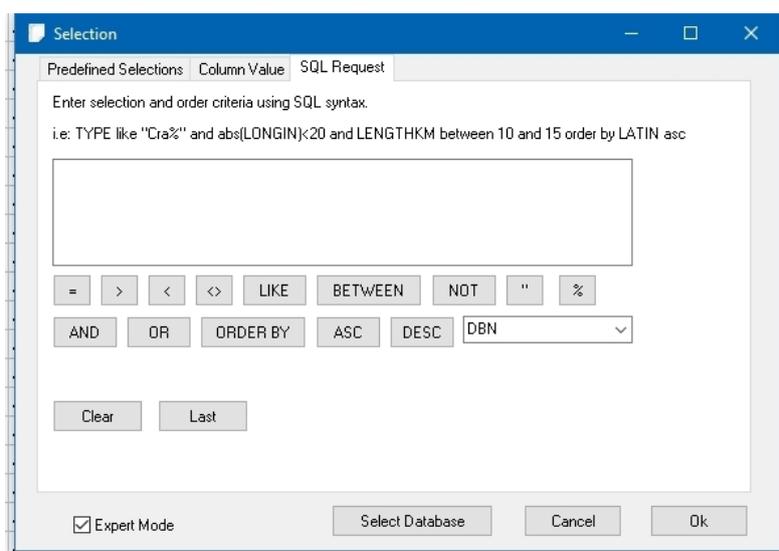
"SQL Request" THUMBNAIL

When clicking on this thumbnail, you can select formations whose datas include values or extracts you will specify in one or several fields that you have chosen. You will have to know a minimum about SQL syntax language.

The buttons under the typing window make easier the request writing and avoid

syntax mistakes.

The scrolling list at lower right allows you to choose a column.



- "=" is for "equal to".
- ">" is for "upper than"
- "<" is for "lower than"
- "<>" is for "is different of"
- "<=" is for "Chooosen column value lower or equal to"
- ">=" is for "Chooosen column value upper or equal to"
- "LIKE" is for "contains".
- "BETWEEN" is for "between".
- "NOT" is for "not".
- The "quotes" are use to delimit an alphanumerical chain.
- % is a "joker" that is used to replace a part of an alphanumerical chain
- "AND" is for "and".
- "OR" is for "or".
- "ORDER BY" is for "ordered by".
- "ASC" is for "ASCII", that's to say an alphanumerical chain.
- "DESC" signifie "".

Beware : there must have an exact correspondance between your request text

and the SQL language syntax, or mistakes notes will appear.

For example, the following request :

```
TYPE LIKE "Cra%" AND LENGTHKM BETWEEN 30 AND 35 ORDER BY LATIN
```

will select IN ALL THE DATABASES PREVIOUSLY CHOSEN, the formations for which the field TYPE contains the letters "Cra" (as the cra-ters and the cra-terlets), with the field LENGTHKM (length in km) value is comprised between 30 and 35 (km) and will sort them according to growing LONGIN field value (growing longitude).

The following request :

```
COUNTRY = "France" AND WORK LIKE "%ician"
```

will select IN ALL THE DATABASES PREVIOUSLY CHOSEN, the formations for which the field COUNTRY (Origin country of the character of the name) is equal to France and whose work field will contain "ician" (And mathematicians, geophysicians, musicians...)

These two examples show well the power of the SQL request on correctly formatted databases. To use completely this power, we have to remain the fields databases contents :

Quick description of fields names (The link conducts to a detailed description) :

DBN = Name of the database containing the formation

NAME = Official name of the formation

LUN = Identification number of the formation in VMA

LUN_REDUCED : Reduced identification number for craters in VMA

TYPE = Type of the formation

PERIOD = Creation period of the formation

GEOLOGY = Special geological features of the formation

NAMEDETAIL = Detailed name of the formation

NAMEORIGIN = Name of the creator of the name of the formation

LANGRENUS = Name given by Langrenus to the formation

HEVELIUS = Nom given by Hevelius to the formation

RICCIOLI = Nom given by Riccioli to the formation

WORK = Work of the character whose name has been given to the formation

COUNTRY = Nation of the character whose name has been given to the formation

NATIONALTY = Nationalty of the character whose name has been given to the formation

CENTURYN = Century (Number) of living of the character whose name has been given to the formation

CENTURYC = Century (Letters) of living of the character whose name has been given to the formation

BIRTHPLACE = Birth place of the character whose name has been given to the formation

BIRTHDATE = Birth year of the character whose name has been given to the formation

DEATHPLACE = Death place of the character whose name has been given to the formation

DEATHDATE = Death year of the character whose name has been given to the formation

FACTS = Important facts during the life of the character whose name has been given to the formation

LONGIN = numerical value of the longitude of the formation

LONGIN_360 = numerical value of the longitude of the formation computed on 360°

LONGIC = Alphanumerical value of the longitude of the formation

LATIN = numerical value of the latitude of the formation

LATIC = Alphanumerical value of the latitude of the formation

QUADRANT = Lunar quadrant where is situated the formation

AREA = Large Moon area where is situated the formation

RUKL = Number of the map of Rühl's atlas where is situated the formation

RUKLC = Title of the map of Rühl's atlas where is situated the formation

VISCARDY = Number of the map of Viscardy's atlas where is situated the formation

HATFIELD = Number of the map of Hatfield's atlas where is situated the formation

WESTFALL = Number of the map of Westfall's atlas where is situated the formation

WOOD = Indication of Charles Wood articles about the formation

LOPAM = Number of the map of the atlas of Lunar Orbiter where is situated the formation

LENGTHKM = Formation length in km

LENGTHMI = Formation length in miles

WIDEKM = Formation width in km

WIDEMI = Formation width in miles

HEIGHTM = Formation height in m

HEIGHTFE = Formation height in feet

RAPPORT = numerical ratio Length / Height of the formation

PROFIL = Visualization of the profile of the formation

GENERAL = General description of the formation

SLOPES = Description of the surroundings of the formation

WALLS = Description of the interior of the formation

FLOOR = Description of the bottom of the formation

INTERESTN = numerical value of the interest of the observation of the formation

INTERESTC = Description of the interest of the observation of the formation

LUNATION = Lunation day making easier observation of the formation

MOONDAYE = Lunation day making easier observation of the formation on the evening

MOONDAYM = Lunation day making easier observation of the formation on the morning

DIAMINST = Diameter in mm of the theoretical instrument necessary to observe the formation

THINSTRU = Name of the theoretical instrument necessary to observe the formation

PRINSTRU = Name of the practical instrument necessary to observe the formation

IAU_FEATURE_NAME = Formation name given by International Astronomical Union (IAU)

IAU_CLEAN_FEATURE_NAME = Formation name given by International Astronomical Union without accents, umlaut, tildes...

IAU_FEATURE_ID = Formation number given by International Astronomical Union

IAU_DIAMETER = Formation diameter

IAU_CENTER_LATITUDE = Formation center latitude

IAU_CENTER_LONGITUDE = Formation center longitude

IAU_NORTHERN_LATITUDE = Formation North latitude

IAU_SOUTHERN_LATITUDE = Formation South latitude
IAU_EASTERN_LONGITUDE = Formation East longitude

IAU_WESTERN_LONGITUDE = Formation West longitude
IAU_COORDINATE_SYSTEM = Official lunar coordinates system used
IAU_CONTINENT = Continent name from which comes formation name.
IAU_ETHNICITY = Native nationality of official name
IAU_FEATURE_TYPE = Formation type in IAU nomenclature
IAU_FEATURE_TYPE_CODE = Code of formation type in IAU nomenclature
IAU_QUAD_NAME = Lunar disk quadrant where is the formation
IAU_QUAD_CODE = Code of lunar disk quadrant where is the formation
IAU_APPROVAL_STATUS = Name approval by IAU status
IAU_APPROVAL_DATE = Date de l'approbation du nom par l'UAI
IAU_REFERENCE = Reference book having given name of the formation
IAU_ORIGIN = Datas about name origin with an abstract of charcater's life
IAU_LINK = Link towards formation page on Web site of IAU

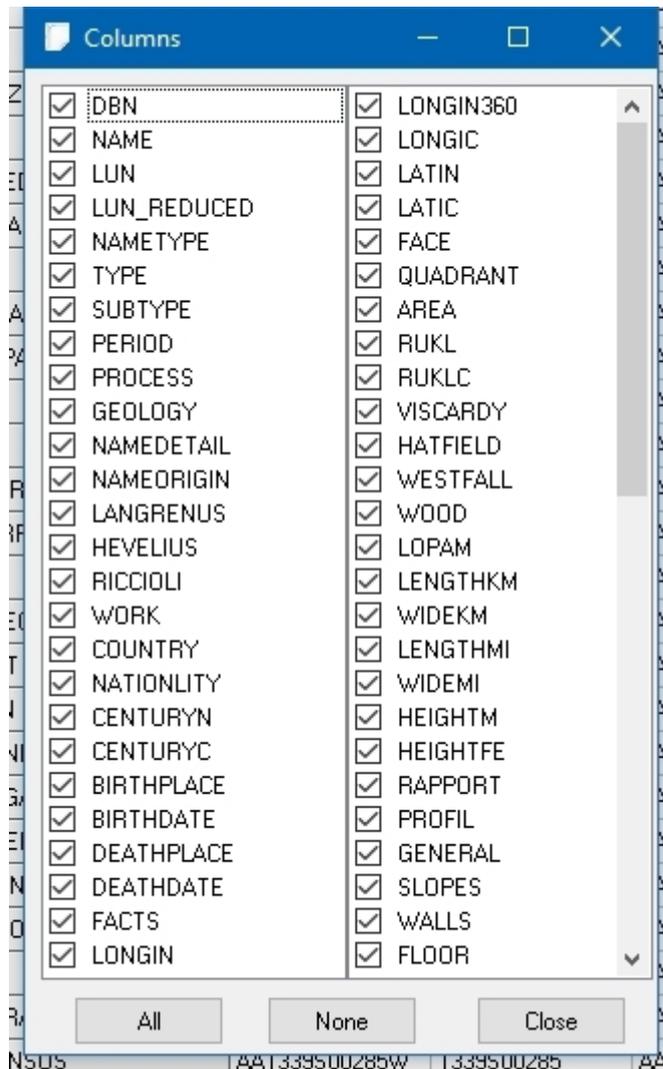
When a selection criteria is based on a numerical field (ex : RUKL, LENGTHKM, INTRESTN, etc...), the value to find must be in the request without quotes (ex : RUKL = 45). When a selection criteria is based on an alphanumerical field (ex : COUNTRY, FACTS, GENERAL, INTERESTN, etc...), the value to find must be in the request with quotes and jokers (ex : GENERAL LIKE = "%flat floort%").

Upper or lower case letters must be also respected (Ex : "%Flat%" is different of "%flat%").

For a detailed description of the databases fields contents, please go to the [special chapter](#) at the end of this manual.

THE "COLUMNS" MENU

This menu opens a special window for selecting the columns to be displayed for the selection list. It's possible that some kinds of informations don't interest you and that you don't wish to scan all the "width" of the list to see those that you are looking for.



Fill the boxes of the columns that you want to display. The more you select, the more important for the display delay. If your computer is not too powerful, select the useful minimum.

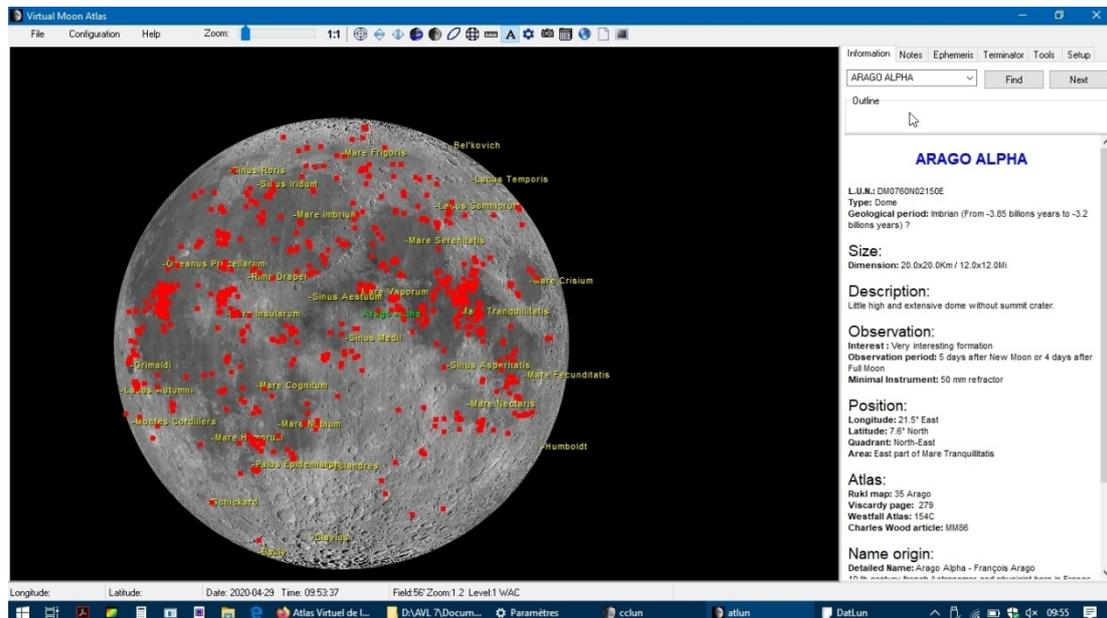
The "**All**" button select all the columns in a single operation and the button "**None**" is for the reversed operation.

Close the window once the selection operation is done with the button "**Close**"

THE "MARK SELECTION ON MAP" MENU

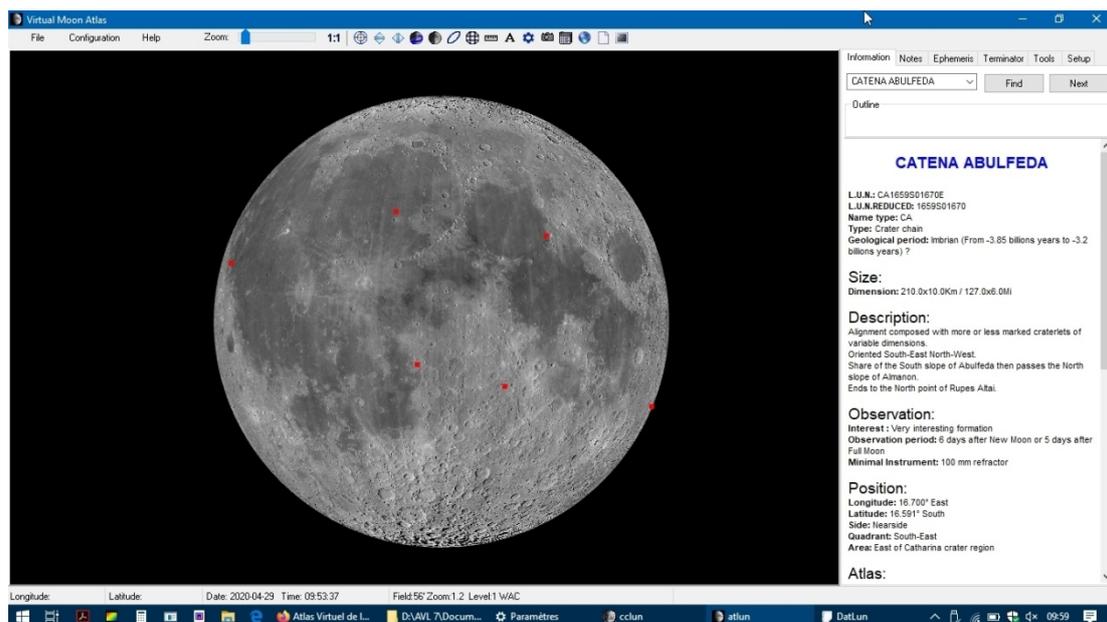
This menu is not really a menu, but a direct command that will show you the power of the association between **DATLUN** and **VMA**. When you click on it, you will open the **Virtual Moon Atlas** and see all the formations that you have selected in **DATLUN** on the displayed map marked with big squares.

For example, if you have selected the Nearside volcanic domes here is what you obtain:



Other example :

You can also, for example select for study (because you can't observe them, all the craters chains (CATENA) of the Nearside and mark them on the map :



After that, when clicking on one of the squares, this formation will be selected in VMA and you will be able to access all its informations and pictures.

This two exemples have certainly showed you the possible studies because of the unique informations contained in the databases of VMA compiled by Christian Legrand.

THE "HELP" MENU

As a classic in all the Windows (c) software, it's used in **DATLUN** to launch the present documentation with "**Help**" and display the credits with "**About**".

THE "SELECTION LIST" WINDOW

The list window owns some functions that improve the previous ones.

DBN	NAME	TYPE	PERIOD	NAMEDETAIL	NAMEORIGIN	LANGRENUS	HEVELIUS	RICCIOLI	WDRK	COUNTRY
NSN	ARAGO ALPHA	Dome	Imbrian (From -3 85	Arago Alpha - Franç	(??)	Not named	Not named	Not named	Astronomer and phys	France
NSN	ARAGO BETA	Dome	Imbrian (From -3 85	Arago Beta - Franç	(??)	Not named	Not named	Not named	Astronomer and phys	France
NSN	CAUCHY OMEGA	Dome	Imbrian (From -3 85	Cauchy Omega - Au	(??)	Not named	Not named	Not named	Mathematician	France
NSN	CAUCHY TAU	Dome	Imbrian (From -3 85	Cauchy Tau - Augus	(??)	Not named	Not named	Not named	Mathematician	France
NSN	DDME KIES PI	Dome	Imbrian (From -3 85	Dôme de Kies Pi - Jo	(??)	Not named	Not named	Not named	Mathematician and	Germany
NSN	DDME LANSBERG D	Dome	Imbrian (From -3 85	Dome of Lansberg D	(??)	Not named	Not named	Not named	Doctor and astron	Belgium
NSN	DDME MAIRAN T	Dome	Imbrian (From -3 85	Mairan T - Jean-Jacc	(??)	Not named	Not named	Not named	Astronomer	France
NSN	DDME MILICHIUS	Dome	Imbrian (From -3 85	Milichius Pi - Jacob	(??)	Not named	Not named	Not named	Doctor philosopher	Germany
NSN	DDMES GAMBART C	Dome system	Imbrian (From -3 85	Domes of Gambart C	(??)	Not named	Not named	Not named	Astronomer	France
NSN	DDMES MARIUS	Dome system	Imbrian (From -3 85	Domes of Marius - Si	(??)	Not named	Not named	Not named	Astronomer	Germany
NSN	HERODOTUS OMEGA	Dome	Imbrian (From -3 85	Herodote omega - H	(??)	Not named	Not named	Not named	Historian	Greece
NSN	HORTENSIUS OMEGA	Dome system	Imbrian (From -3 85	Dômes d'Hortensius	(??)	Not named	Not named	Not named	Astronomer	Netherlands
NSN	MONS GRUITHUISEN	Dome	Imbrian (From -3 85	Mount Gruithuisen G	(??)	Not named	Not named	Not named	Astronomer and natu	Germany
NSN	MONS RUMKER	Dome	Imbrian (From -3 85	Mount Rümker (Karl	Schmidt (1878)	Not named	Not named	Not named	Astronomer	Germany
NSN	TOBIAS MAYER DZETA	Dome system	Imbrian (From -3 85	Tobias Mayer Dzeta	(??)	Not named	Not named	Cusanus	Astronomer	Germany

First, you can note the two left columns in grey. They are mandatory and cannot be deleted. Horizontal and vertical lifters allows you to "travel" in the list..

If you click on the greyed title of one columns in the upper line, this liste will be sorted in the numerical **growing** order (if the field is numerical) or alphanumerical (if the field is alphanumeric). If you click a second time on the same title, the list will be sorted in the **decreasing** order.

"COLUMN WIDTH" FUNCTION

You can also adjust the columns width when you put the cursor on grey titles bar, to the border between two columns. A new cursor then appears.

NAMEDETAIL	NAMEORIGIN
Charles Greeley Abbr	(??)
Niels Henrik Abel	Franz (1913)

Click on the left mouse button, stay clicked and go on left or right to increase or decrease the column width.

OTHER FUNCTIONS

If you can't display all the length of a field because it's too long (FACTS, GENERAL...), put the cursor on it. A bubble will appear with all the field text in it.

In the list, you can select in grey, by clicking one time on it, one line so that you will

not loose it when you go on the right of the list.

If after that, you double_click on the selected line, VMA will shows you directly the selected formation.

THE STATE BAR

Row: 1/9 Selection: DBN in (3)AND NAME LIKE "CATENA%"

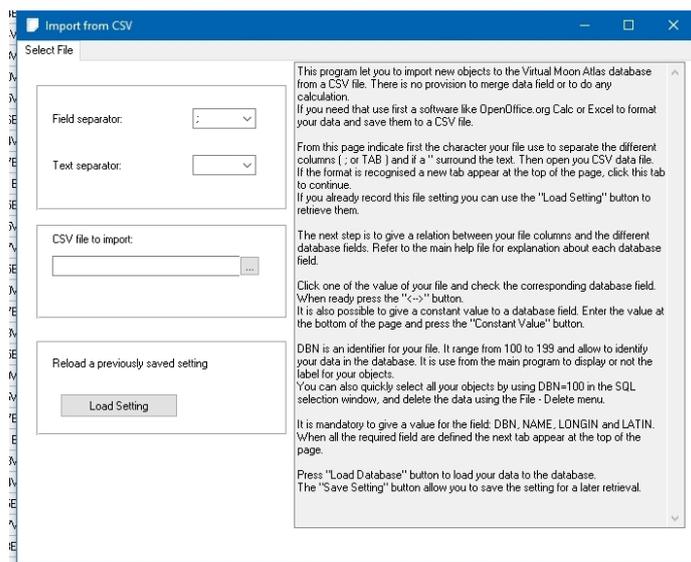
The state bar indicates you several things :

It can be the number of the line of the selected line compared to total number of lines of the selection list

Or it can be the text of the SQL request that generates the list.

DETAILED DESCRIPTION OF THE DATABASE IMPORT OPERATION

This function allows you to import a personal formations list compiled in a CSV file and import it as a VMA database. When selecting this function, a new window appears :

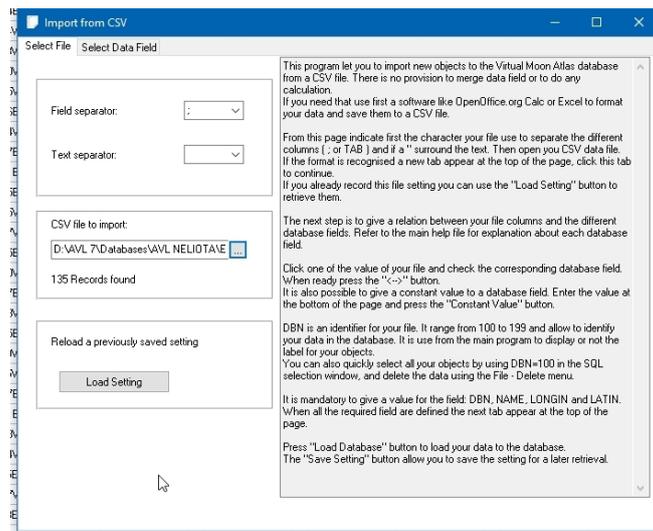


This program let you to import new objects to the Virtual Moon Atlas database from a CSV file.

There is no provision to merge data field or to do any calculation. If you need that use first a software like OpenOffice.org Calc or Excel to format your data and save them to a CSV file.

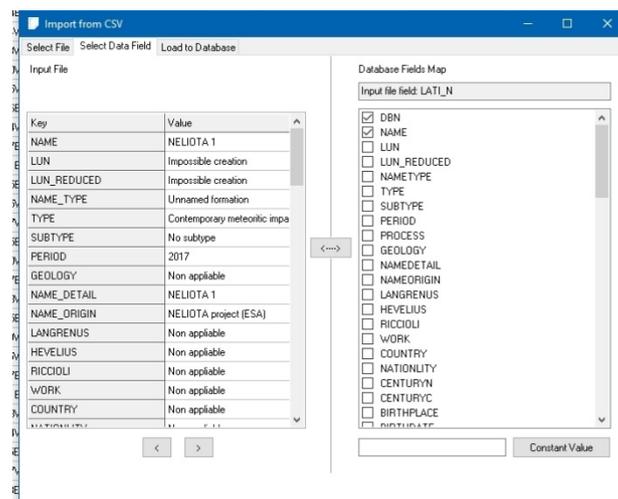
From this page indicate first the character your file use to separate the different columns (; or TAB) and if a " surround the text. We suggest to record the file with the "csv" format and "Unicode (UTF-8)".

If you have precedently recorded prameters for one file, you can use the "**Load setting**" button. If it's not the case, you must open the file with your personal datas. Indicate the directory of the file to import in the frame :



When the file is found, its records number is indicated. If the format is recognised a new thumbnail appear at the top of the page :

Click this tab to display the "**Select data field**" window".



The next step is to give a relation between your file columns and the different database fields. Refer to "**Databases fields**" lower for explanations about each database field.

Click one of the value of your file to mark it in the left frame :

Key	Value
NAME	LUNA 2
TYPE	Probe / Voluntary impact
PERIOD	12/09/59
NAMEDETAIL	Luna 2 / Lunik 2 (Class E-1A)
NAMEORIGIN	(USSR / Korolev)
LANGRENUS	Non existent in this period
HEVELIUS	Non existent in this period
RICCIOLI	Non existent in this period
WORK	No character
COUNTRY	
NATIONLITY	
CENTURYN	
CENTURYC	
BIRTHPLACE	

and check the corresponding database field in the right frame :

Database Fields Map

<input checked="" type="checkbox"/> DBN	<input type="checkbox"/> HATFIELD
<input type="checkbox"/> NAME	<input type="checkbox"/> WESTFALL
<input type="checkbox"/> TYPE	<input type="checkbox"/> WOOD
<input type="checkbox"/> PERIOD	<input type="checkbox"/> LOPAM
<input type="checkbox"/> NAMEDETAIL	<input type="checkbox"/> LENGTHKM
<input type="checkbox"/> NAMEORIGIN	<input type="checkbox"/> WIDEKM
<input type="checkbox"/> LANGRENUS	<input type="checkbox"/> LENGTHMI
<input type="checkbox"/> HEVELIUS	<input type="checkbox"/> WIDEMI
<input type="checkbox"/> RICCIOLI	<input type="checkbox"/> HEIGHTM
<input type="checkbox"/> WORK	<input type="checkbox"/> HEIGHTFE
<input type="checkbox"/> COUNTRY	<input type="checkbox"/> RAPPORT
<input type="checkbox"/> NATIONALITY	<input type="checkbox"/> PROFIL
<input type="checkbox"/> CENTURYN	<input type="checkbox"/> GENERAL
<input type="checkbox"/> CENTURYC	<input type="checkbox"/> SLOPES
<input type="checkbox"/> BIRTHPLACE	<input type="checkbox"/> WALLS
<input type="checkbox"/> BIRTHDATE	<input type="checkbox"/> FLOOR
<input type="checkbox"/> DEATHPLACE	<input type="checkbox"/> INTERESTN
<input type="checkbox"/> DEATHDATE	<input type="checkbox"/> INTERESTC
<input type="checkbox"/> FACTS	<input type="checkbox"/> LUNATION
<input type="checkbox"/> LONGIN	<input type="checkbox"/> MOONDAYS
<input type="checkbox"/> LONGIC	<input type="checkbox"/> MOONDAYM
<input type="checkbox"/> LATIN	<input type="checkbox"/> DIAMINST
<input type="checkbox"/> LATIC	<input type="checkbox"/> THINSTRU
<input type="checkbox"/> QUADRANT	<input type="checkbox"/> PRINSTRU
<input type="checkbox"/> AREA	
<input type="checkbox"/> RUKL	
<input type="checkbox"/> RUKLC	
<input type="checkbox"/> VISCARDY	

. When ready press the button.

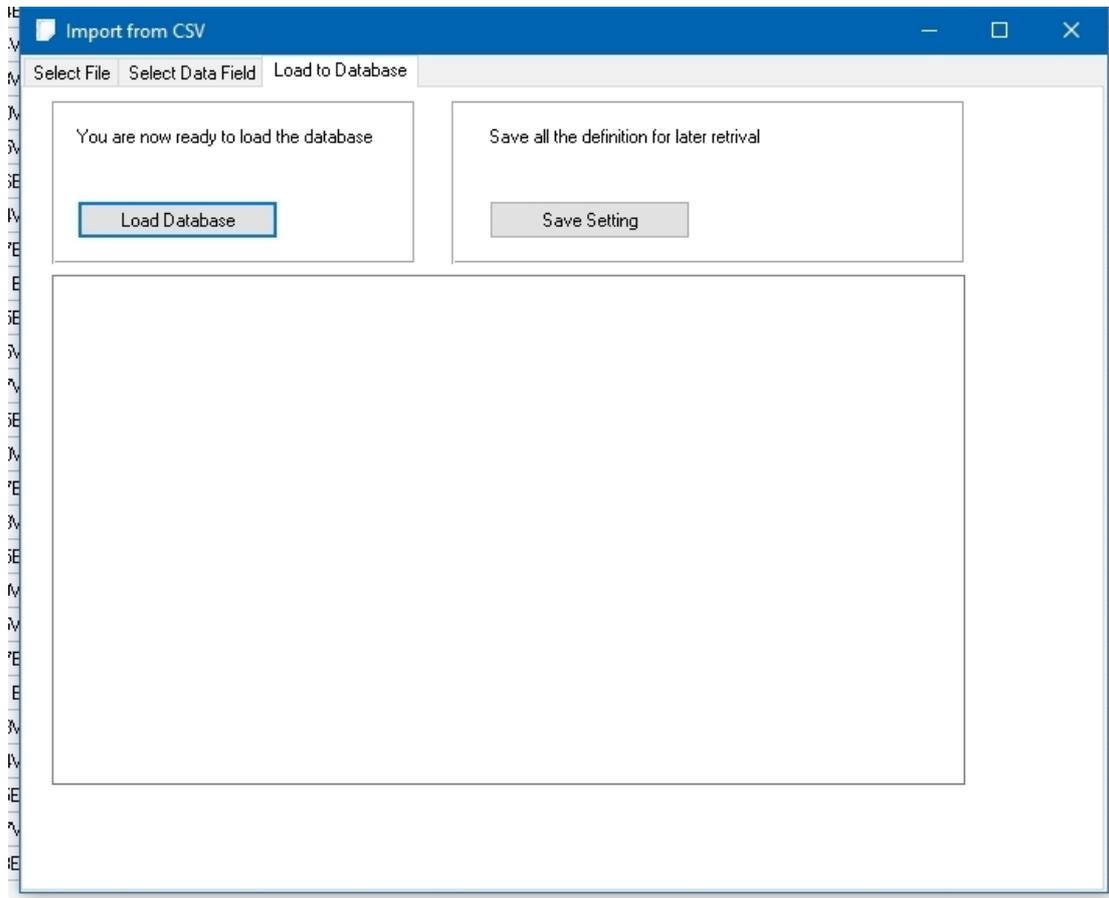
It is also possible to give a constant value to a database field. Enter the value at the bottom of the page and press the "**Constant Value**" button.

DBN is an identifier for your file. It range from 10 to 99 and allow to identify your data in the database. It is use from the main program to display or not the label for your objects. You can also quickly select all your objects by using DBN=10 in the **SQL selection window**, and delete the data using the File - Delete menu.

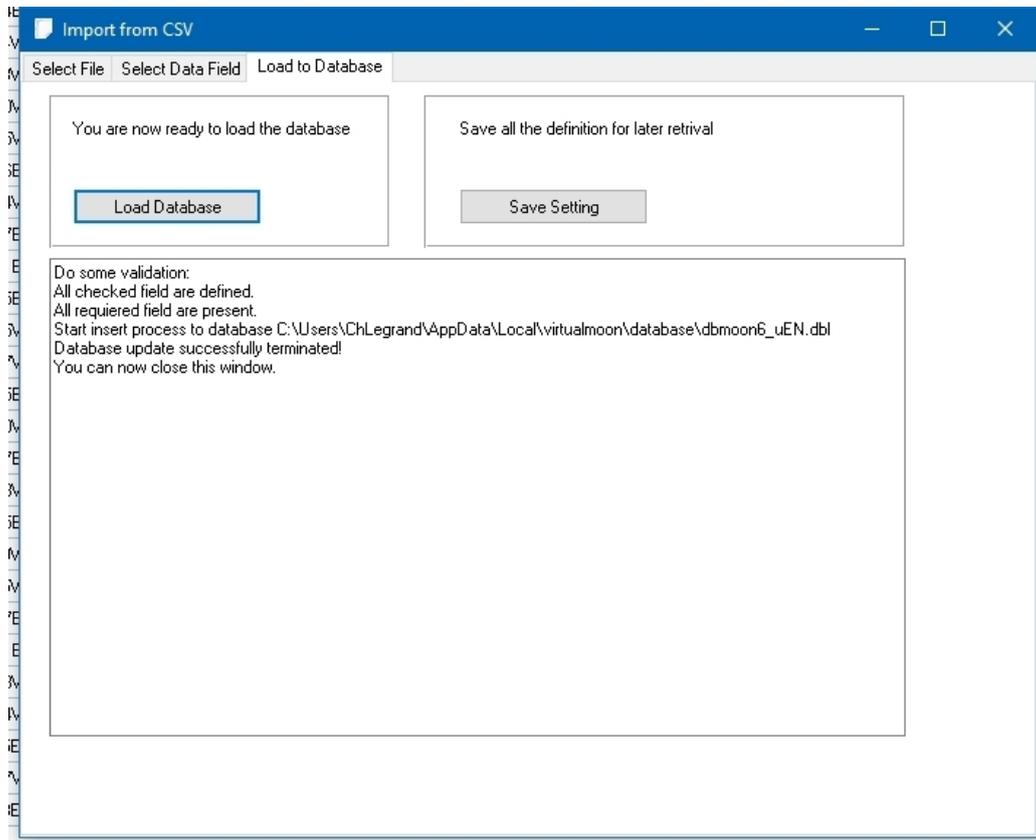
It is **mandatory** to give a value for the field: DBN, NAME, LONGIN and LATIN. When all the required field are defined the next tab "Load to Database" appear at the top of the page.

Select File | Select Data Field | Load to Database

Click on it to display the backup frame :



Press "**Load Database**" button to load your data to the database.
The "Save Setting" button allow you to save the setting for a later retrieval.
The software informs you of the operations during them.



Import operation is then finished..

DETAILED DESCRIPTION OF THE DATABASES INFORMATIONS

DBN = DATABASE NAME :

It's a short name for each name of databases uses by **DATLUN**.

- **NSN** = "**Nearside named**", for named formations of Nearside.
- **FSN** = "**Farside named**", for named formations of Farside.
- **NSI** = "**Nearside indexed**", for named with letters formations of the Nearside.
- **FSI** = "**Farside indexed**", for named with letters formations of Farside.

About the personal databases that you would have imported, **DBN** is a number comprised between 10 to 99 permitting their identification. It's also used to choose the label display of your objects. It allows also to visualize your objects if entering DBN = 10 to 99 in the SQL request, and to delete your datas with the "**File - Delete**" menu.

NAME = OFFICIAL NAME :

This field presents the formation main name in Latin used officially by the International Astronomical Union in capital letters. In the "**Historical sites**" database, it's the name of the mission (eg : Apollo 15 *Base*, Ranger 7, Luna 9, Apollo 17 *S IV B...*)

LUNAR UNIVERSAL NUMBER / L.U.N. © :

Here are the LUN description :

The LUN is composed by the assembling of the following characters chain :

XX : 2 letters corresponding to the "Descriptor term" of IAU. These 2 letters are officially used by IAU. Attention, they are less numerous than the original VMA formations types, so several VMA types can have the same "descriptor term".

Here is the official list of IAU Descriptor Terms (Some of them are not used on the Moon presently) :

Albedo Feature (AL)	Geographic area distinguished by amount of reflected light
Arcus, arcūs (AR)	Arc-shaped feature
Astrum, astra (AS)	Radial-patterned features on Venus
Catena, catenae (CA)	Chain of craters
Cavus, cavi (CB)	Hollows, irregular steep-sided depressions usually in arrays or clusters
Chaos, chaoses (CH)	Distinctive area of broken terrain
Chasma, chasmata (CM)	A deep, elongated, steep-sided depression
Collis, colles (CO)	Small hills or knobs
Corona, coronae (CR)	Ovoid-shaped feature
Crater, craters (AA)	A circular depression
Dorsum, dorsa (DO)	Ridge
Eruptive center (ER)	Active volcanic centers on Io
Facula, faculae (FA)	Bright spot
Farrum, farra (FR)	Pancake-like structure, or a row of such structures
Flexus, flexūs (FE)	A very low curvilinear ridge with a scalloped pattern
Fluctus, fluctūs (FL)	Flow terrain
Flumen, flumina (FM)	Channel on Titan that might carry liquid
Fossa, fossae (FO)	Long, narrow depression
Insula, insulae (IN)	Island (islands), an isolated land area (or group of such areas) surrounded by, or nearly surrounded by, a liquid area (sea or lake).
Labes, labēs (LA)	Landslide
Labyrinthus, labyrinthi (LB)	Complex of intersecting valleys or ridges.
Lacuna, lacunae (LU)	Irregularly shaped depression on Titan having the appearance of a dry lake bed
Lacus, lacūs (LC)	"Lake" or small plain; on Titan, a "lake" or small, dark plain with discrete, sharp boundaries
Landing site name (LF)	Lunar features at or near Apollo landing sites

Large ringed feature (LG)	Cryptic ringed features
Lenticula, lenticulae (LE)	Small dark spots on Europa
Linea, lineae (LI)	A dark or bright elongate marking, may be curved or straight
Lingula, lingulae (LN)	Extension of plateau having rounded lobate or tongue-like boundaries
Macula, maculae (MA)	Dark spot, may be irregular
Mare, maria (ME)	"Sea"; large circular plain; on Titan, large expanses of dark materials thought to be liquid hydrocarbons
Mensa, mensae (MN)	A flat-topped prominence with cliff-like edges
Mons, montes (MO)	Mountain
Oceanus, oceani (OC)	A very large dark area on the moon
Palus, paludes (PA)	"Swamp"; small plain
Patera, paterae (PE)	An irregular crater, or a complex one with scalloped edges
Planitia, planitiae (PL)	Low plain
Planum, plana (PM)	Plateau or high plain
Plume, plumes (PU)	Cryo-volcanic features on Triton
Promontorium, promontoria (PR)	"Cape"; headland promontoria
Regio, regiones (RE)	A large area marked by reflectivity or color distinctions from adjacent areas, or a broad geographic region
Reticulum, reticula (RT)	reticular (netlike) pattern on Venus
Rima, rimae (RI)	Fissure
Rupes, rupēs (RU)	Scarp
Satellite Feature (SF)	A feature that shares the name of an associated feature. For example, on the Moon the craters referred to as "Lettered Craters" are classified in the gazetteer as "Satellite Features."
Scopulus, scopuli (SC)	Lobate or irregular scarp
Serpens, serpentes (SE)	Sinuuous feature with segments of positive and negative relief along its length
Sinus, sinūs (SI)	"Bay"; small plain
Sulcus, sulci (SU)	Subparallel furrows and ridges
Terra, terrae (TA)	Extensive land mass
Tessera, tesserae (TE)	Tile-like, polygonal terrain
Tholus, tholi (TH)	Small domical mountain or hill
Unda, undae (UN)	Dunes
Vallis, valles (VA)	Valley
Vastitas, vastitates (VS)	Extensive plain
Virga, virgae (VI)	A streak or stripe of color

YYYYYN or YYYYYS for the digital value of latitude in 1/1000 ° deg. N and S indicate North or South and are used to separate latitude and longitude to clarify the characters chain. The last 3 digits on the right are those of the 1/1000 ° deg and are always present, even if they are zeros. The first 2 left digits are absent if the latitude is 00 °.

ZZZZZZ for the digital value of longitude in 1/1000 ° deg. The last 3 digits on the right are those of the 1/1000 ° deg and are always present, even if they are zeros. The first 3 left digits are absent if the longitude is 000 °.

pour la longitude numérique en millièmes de degrés comptée vers l'Est jusqu'à 359,999°. Les trois derniers chiffres de droite pour les millièmes de degrés sont toujours présents, même s'ils s'agit de zéros. Les trois premiers chiffres de gauche sont absents si la longitude est de 000°

Here are two examples of LUN (AAYYYYYYNZZZZZZ) :

- AA2741S114220 : Crater located at 02,741° South and 114,220° East

- RI85000N000 : Rill which middle is situated about at 85,00° North et 0,00° East.

Avec all these features, the LUN is always the shorter possible and it's always easily "readable". and this structure guarantees always a lone LUN for each formation.

>>>> With the L.U.N. , you can find each lunar formation and this allows you to share observations of this formation with others colleagues without any error

LUNAR UNIVERSAL NUMBER / L.U.N. REDUIT © :

For craters, it exists a reduced LUN which is the LUN with the « descriptor term » for craters (AA).

TYPE = FORMATION TYPE :

This field contains formation type according with tradition or International Astronomical Union, **plus some specific additions** :

- Cape
- Cliff
- Crater
- Craterlet
- Crater chain
- Dome
- Gulf
- Lake
- Marsh
- Mountain
- Mountains range
- Plain
- Probe
- Rille
- Rilles system
- Sea
- Tray
- Valley
- Walled plain
- Wrinkle ridge

- Wrinkle ridges system

The "**Historical site**" database contains specific types :

- Human mission / soft landing
- Inert equipment / voluntary impact
- Inert equipment / unvoluntary impact
- Probe / voluntary impact
- Probe / unvoluntary impact
- Probe / soft landing

FORMATION PERIOD :

This field contains information on the lunar geological period which saw the appearance of the formation concerned. This information is for the most part from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team which allow the re-use of this data (Thanks to them).

The 6 periods generally accepted in current literature are:

The Pre-Nectarian: (-4550 MA to -3920 MA)

The Nectarian: (-3920 MA to -3850 MA)

Lower Imbrian: (-3850 MA to -3800 MA)

Upper Imbrian: (-3800 MA to -3200 MA)

The Eratosthenian: (-3200 MA to -1100 MA)

The Copernician: (-1100 MA to the present day)

MA = Millions of years

For some formations, it was not possible to find information concerning the implementation period.

"Formation period not found" is then indicated.

For the "Historical sites" database, the mission launch date is indicated in this field.

SOURCE OF THE FORMATION PERIOD :

This field contains information on the source which cites the probable lunar geological period which saw the appearance of the formation considered. This information is for the most part from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team which allow the reuse of this data.

GEOLOGY :

This field contains interesting geological information on the formation concerned found in various sources.

SIZE :

The following four fields contain data relating to the dimensions of the formations. These vary from source to source. We can therefore find values different from those of other works.

Priority was given to data from the International Astronomical Union, then to data

from other sources when they seemed plausible. Finally, certain dimensions were directly measured on maps or atlases when they could not be found in the literature. In the "Historic sites" database, these fields are empty.

Dimensions:

This field gives the length in kilometers of the formation and the width. In the case of crater-like formations, the length is in most cases equal to the width since it is in fact the average diameter of the formation.

This field has been revised with the values from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team which allow the reuse of this data. Many thanks to them!

Height :

You find here relative altitudes, not absolute ones referring to the mean lunar sphere. It gives the formation height when it's known.

For craters, it's the difference between the upper part of the internal slopes and the floor.

For other formations, it's the difference between the formation summit and surrounding land.

For mountains and mountain ranges, it's a mean height and higher summits height is generally detailed in description fields.

For rilles and scarps, it's the difference between surrounding lands and the formation lower floor.

The field has been revised with the values from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team.

Ratio :

This data is only indicated for formations whose height is known. It's very often given for craters where it means the diameter / height ratio.

Bottom diameter:

In the case of craters, this field contains information on the size of the bottom of the crater. This information comes from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team.

Height of the central peak:

In the case of craters, this field contains information on the height of the central peak of the crater if it has one. This information comes from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team.

Depth of excavation:

In the case of craters, this field contains information on the difference in altitude between the top of the rampart of the crater and the bottom of it. This information comes from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team.

Impact font thickness:

In the case of craters, this field contains an estimate of the thickness of the rocks melted on impact and which fill the bottom of the crater. This information comes from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team.

Thickness of ejecta at 1 radius away:

In the case of craters, this field contains an estimate of the thickness of the rocks ejected during impact and deposited on the outer slopes of the crater at a distance from the top of the rampart corresponding to a radius of this same crater. This information comes from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team.

Thickness of the ejecta at 3 radii away:

In the case of craters, this field contains an estimate of the thickness of the rocks ejected during impact and deposited on the outer slopes of the crater at a distance from the top of the rampart corresponding to three times the radius of this same crater. This information comes from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team.

Thickness of the ejecta at 5 radii away:

In the case of craters, this field contains an estimate of the thickness of the rocks ejected during impact and deposited on the outer slopes of the crater at a distance from the top of the rampart corresponding to five times the radius of this same crater. This information comes from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team.

Radiant halo radius on radar:

In the case of craters, this field contains an estimate of the radius of the halo giving a brilliant radar image on the immediate periphery of the top of the crater rampart. This information comes from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team.

Radius of the dark halo on radar:

In the case of craters, this field contains an estimate of the radius of the halo giving a dark radar image at the periphery of the crater. This information comes from the "Improved lunar craters database" produced by Charles Byrne, Don E. Wilhelms (USGS) and their team.

NAME ORIGIN :

NAMEDETAIL = Real name :

This field presents the real name of the person whose name has been given to the formation. When it also exists, a nickname is indicated between parentheses.

For other formations than craters, the official name is first translated in English, and then you can find the real name of the person whose name has been given to the formation.

NAMEORIGIN = Name author :

This field indicates, when it's known or supposed, the organization or person name that has given the name to the formation. Also included in this chapter is the year of nomination when it has been found. In this paragraph, IAU means "International Astronomical Union ". You can find mainly 3 origins:

- Hevelius
- Riccioli
- IAU

But also others selenographers as Schröter, Schmidt...

When the origin has not been found, the field contains (??). Additionally, some uncertain origins end with "?".

These name origins are purely indicative and are not to be held as rigorously exact because of numerous additions made during all periods to the lunar nomenclature.

In the "**Historical sites**" base, it's the country and the agency which conceived the mission that are indicated.

LANGRENUS = Name given by Langrenus:

This field indicates the name given by Michel Florent Van Langren on his Moon map in 1644. When the formation has not received a name, "Not named" is indicated.

HEVELIUS = Name given by Hevelius :

This field indicates the name given by Johannes Hevelius on his Moon map in 1647. When the formation has not received a name, "Not named" is indicated.

RICCIOLI = Name given by Riccioli :

This field indicates the name given by Riccioli on the Moon map drawn in 1651 by Francesco Grimaldi. When the formation has not received a name, "Not named" is indicated.

WORK = Works :

This field indicates, for craters, the activities of the person whose name has been given to the formation.

Here is the list of the "works" you can find in the database:

- **Agronomist**
- **Alchemist**
- **Admiral**
- **Anthropologist**
- **Archaeologist**
- **Archbishop**
- **Architect**
- **Artist**
- **Astronaut**
- **Astronomer**
- **Astrophysicist**
- **Aviator**
- **Banker**
- **Biologist**
- **Botanist**
- **Calif**
- **Cartographer**
- **Chemist**
- **Clockwork**
- **Consul**
- **Cosmographer**
- **Egyptologist**
- **Engineer**
- **Engraver**
- **Explorer**
- **Geodesist**
- **Geographer**
- **Geologist**
- **Geometer**
- **Geophysicist**
- **God**
- **Hero**
- **Historian**
- **Humanistic**
- **Hydrographer**
- **Inventor**
- **Jurist**
- **King**
- **Manufacturer**
- **Mathematician**
- **Meteorologist**
- **Mineralogist**
- **Missionary**
- **Mythological fame**
- **Naturalist**
- **Navigator**
- **Oceanographer**

- Optician
- Paleontologist
- Pharmacist
- Philologist
- Philosopher
- Physicist
- Physiologist
- Poet
- Political man
- Priest
- Printer
- Professor
- Scientist
- Sailor
- Saint
- Sismologist
- Sponsor
- Stateman
- Technician
- Theologian
- Writer
- Zoologist

Please note that some people have been credited with 2 or 3 works.

COUNTRY = Country:

This field contains the country where has lived the character whose name has been given to the formation. You can find disapeared countries. See also the list of nationalities here below. Ce champ indique le pays d'origine du personnage ayant servi à nommer la formation. On peut trouver des nations disparues aujourd'hui. Cf la liste des nationalités ci-dessous.

NATIONALTY = Nationalty :

This field indicates the nationality generally attributed to the person whose name has been given to the formation. It can be the birth nationality. You can also find nationalities no longer in existence. Here is the list of nationalities present in the database:

- American
- Arabian
- Australian
- Austrian
- Babylonian
- Belgian
- British
- Byzantine
- Brazilian
- Canadian
- Carthaginian
- Castillan
- Chinese

- Cretian
- Dalmatian
- Danish
- Dutch
- Egyptian
- English
- Finnish
- French
- Greek
- German
- Hungarian
- Indian
- Irish
- Italian
- Japanese
- Jewish
- Macedonian
- Mexican
- Norwegian
- Persian
- Polish
- Portuguese
- Roman
- Russian
- Scottish
- Soviet
- South African
- Spanish
- Swedish
- Swiss
- Czech
- Venetian

CENTURYN = Number of life century :

This field indicates the number of the century during which the character whose name has been given to the formation most spent most of his life. For example : 19 for "19 th century".

CENTURYC = Life century :

This field indicates clearly the century during which the character whose name has been given to the formation most spent most of his life. For example : "19 th century".

BIRTHPLACE = Birth place :

This field indicates the birth place of the person whose name has been given to the formation when it has been possible to find it. If not found, it is indicated " ? ". Please note that for imaginary persons, there is no birth place.

BIRTHDATE = Birth year :

This field indicates the birth year of the person whose name has been given to the

formation if it has been possible to find it. If not found, it is indicated " ? ". Please note that for imaginary persons, there is no birth year.

DEATHPLACE = Death place :

This field indicates the place of death for the person whose name has been given to the formation when it has been possible to find it. If not found, it is indicated " ? ". Please note that for imaginary persons, there is no place of death.

DEATHDATE = Death year :

This field indicates the year of death for the person whose name has been given to the formation if it has been possible to find it. If not found, it is indicated " ? ". Please note that for imaginary persons, there is no year of death.

FACTS = Prominent facts :

This field describes prominent facts during the life of the person whose name has been given to the formation if it has been possible to find it. If not found, it has been indicated " ?? " .

This information is adapted from information given by the International Astronomical Union, and additional data coming from various bibliographical sources.

Generally, you can find the discoveries, inventions and important works attributed to the person, as well as distinctions obtained during life (nominations, price. ..) with associated dates when they have been found.

POSITION :

LONGIN = Numerical longitude :

This field gives the numerical value of the selenographic longitude of the formation with a tenth of degree precision. This data is provided by **International Astronomical Union**. Longitude is negative to the West of central meridian. About craters, it's the center longitude. For lengthened or irregular formations, it's an internal point the closest to central.

LONGIC = Alphanumeric longitude :

You can find here the alphanumeric selenographic longitude of the formation with a tenth of degree precision. This data is provided by International Astronomical Union. Longitude is negative to the West of central meridian. About craters, it's the center longitude. For lengthened or irregular formations, it's an internal point the closest to central.

LATIN = Numerical latitude :

You can find here the numerical selenographic latitude of the formation with a tenth

of degree precision. This data is provided by **International Astronomical Union**. Latitude is negative to the South of lunar Equator. About craters, it's the center longitude. For lengthened or irregular formations, it's an internal point the closest to central.

LATIC = Alphanumerical latitude :

You can find here the alphanumerical selenographic latitude of the formation with a tenth of degree precision. This data is provided by International Astronomical Union. Latitude is negative to the South of lunar Equator. About craters, it's the center longitude. For lengthened or irregular formations, it's an internal point the closest to central.

QUADRANT = Quadrant :

Information has been included to make easier the location of the formation on the lunar disk. The location system is that of the International Astronomical Union since 1988. When you look at the lunar disk with the naked eye, the North is up and the East is right.

This first field indicates the lunar quadrant where is situated the formation according to the "Lunar Quadrant Charts" by Arthur and Agnieray by the University of Arizona :

- **North-East**
- **South-East**
- **North-West**
- **South-East**

AREA = Area :

This field indicates clearly the lunar region where can be found the formation according to a more known one (sea, mountain or large crater) or according to the position on the edge of the lunar disk (limb) or according to the center of the lunar disk.

ATLAS :

This field contains pages, maps or picture of the main paper atlases presently available on which the selected formation is indicated.

RUKL = Number of the page of "Atlas of the Moon" by Antonin Růkl :

In honor to its author for his contribution to Astronomy popularization, we have mentioned the map number of the "**Atlas of the Moon**" by **Antonin Růkl** on which is found the formation.

RUKLC = Title of the page of "Atlas of the Moon" by Antonin Růkl :

We have also mentioned the map number of the "Atlas of the Moon" by Antonin Růkl on which is found the formation.

VISCARDY = Page of the "Atlas photographique lunaire à haute résolution" by Georges Viscardy :

Also in honor to its author for his contribution to Astronomy popularization, we have also mentioned the page number of the "**High resolution photographic Atlas of the Moon**" by **Georges Viscardy** on which the formation is found with a text on it, or on which a photograph shows the place where is situated the formation.

For this last work, when the formation does not figure on at least one photograph, there is no page indicated. Similarly, if the formation appears on, at least, a photograph, but is not described in the text, it is the page of the best photograph where it is normally visible that is indicated.

HATFIELD = Page of the "Photographic Atlas of the Moon" by Hatfield :

In honor to its author for his contribution to Astronomy popularization, we have mentioned the map number of the "**Hatfield Atlas of the Moon**" republished by **Jeremy Cook** on which the formation is found.

WESTFALL = Page of the "Atlas of the lunar terminator" by Westfall :

In honor to its author for his unique work, we have mentioned the maps numbers of the "**Atlas of the Lunar Terminator**" from **Professor John E. Westfall** on which the formation is found, because it's the only one that shows all librations variations.

WOOD = Articles and books by Charles Wood :

We mentioned **Charles Wood's articles on numerous** formations edited in **Sky and Telescope** and the number of his "**Lunar 100 list**", with his courtesy.

LOPAM = Lunar Orbiter Photographic Atlas of the Moon :

Adding to downloadable picture of the LOPAM, we have indicated numbers of "**Lunar Orbiter Photographic Atlas of the Moon**" pages on which you can find the selected formation. Just click on this link and go to the Internet site of **Jeff Gillis** of **Lunar and Planetary Institute** and you will admire the entire picture from which was extracted the picture.

Nevertheless, if you are not permanently connected to the Internet, another possibility is offered.

You can modify the "**lopamidx.txt**" file which is in the "**Database**" sub-directory of the "**Virtualmoon**" install directory with a text editor as "**Windows notepad**". After, you can access directly to the LOPAM pages copied on your hard drive or on a recorded CD.

In this file, you have just to indicate after "Local URL=" the path of your support where are stored your LOPAM pages, and the pictures type after "SUFFIX=". For

example :

Local:URL=c:\Program files\Virtualmoon\LOPAM pages\SUFFIX=.jpg

can access to LOPAM pages stored in the sub-directory "LOPAM pages" of the install directory "Virtual moon" as ".jpg" files.

New example :

Local: URL=d:\ SUFFIX=.bmp

can access to LOPAM pages stored in the root of a CD placed in a CD reader called "d:" as ".bmp" files.

SIZE :

The four following fields contain data about formation dimensions. These vary from different bibliographic sources.

First indicated is data provided by International Astronomical Union, then those coming from other sources when they seem more accurate.

Some of them have been also directly measured on atlases or photographs when they were not found in literature.

In the "Historical sites" database, these fields are empty.

LENGTHKM = Length in km :

This first field indicates the formation length in km. For craters, length is very often equal to width because it's the mean diameter.

WIDEKM = Width in km :

This first field indicates the formation width in km. For craters, length is very often equal to width because it's the mean diameter.

LENGTHMI = Length in miles :

This first field indicates the formation length in miles. For craters, length is very often equal to width because it's the mean diameter.

WIDEMI = Width in miles :

This first field indicates the formation width in miles. For craters, length is very often

equal to width because it's the mean diameter.

HEIGHTM = Height in meters :

You find here relative altitudes, not absolute ones referring to the mean lunar sphere. It gives the formation height in meters when it's known.

For craters, it's the difference between the upper part of the internal slopes and the floor.

For other formations, it's the difference between the formation summit and surrounding land.

For mountains and mountain ranges, it's a mean height and higher summits height is generally detailed in description fields.

For rilles and scarps, it's the difference between surrounding lands and the formation lower floor.

HEIGHTFE = Height in feet :

You find here relative altitudes, not absolute ones referring to the mean lunar sphere. It gives the formation height in feet when it's known.

For craters, it's the difference between the upper part of the internal slopes and the floor.

For other formations, it's the difference between the formation summit and surrounding land.

For mountains and mountain ranges, it's a mean height and higher summits height is generally detailed in description fields.

For rilles and scarps, it's the difference between surrounding lands and the formation lower floor.

RATIO = Ratio :

This data is only indicated for formations whose height is known. It's very often given for craters where it means the diameter / height ratio.

PROFIL = Formation profile visualization :

In this frame, outline of the formation selected within your search and whose description is in the "Database window" is displayed. Here is a semi-graphic field presenting the formation profile. This information is only provided when height is

known. Profile has not be constructed for some formations types :

- Sea
- Lake
- Gulf
- Marsh
- Ocean
- Probe
- Human mission

The profile is generated according to the following description :

Crater outline :

Crater is presented so :

A_____A
< n characters>

"A" characters show the slope height. The number of "_" characters shows the crater width with the same scale as height.

Because the "A" character is twice high than wide on an html screen, in the above example, the width / height crater ratio is 1/8.

The central mountain of crater has not been represented because their height has often not been found.

Don't forget that each formation has its own profile. You can't compare two craters dimensions using their profile representation.

A_____A Profile of (Length =20 km & height = 4000 m)

A_____A Profile of (Length = 5 km & height = 1000 m)

On screen, these two profiles are identical, but as you can see, dimensions are different.

Relief outline :

For mountains, mountains ranges, wrinkle ridges or domes, an other viewing mode is selected :

___A___

"A" character shows the formation maximum height. The number of "_" characters shows the formation width with the same scale as height.

Rille outline :

For rilles, rilles system and valleys, profile is shown like this :



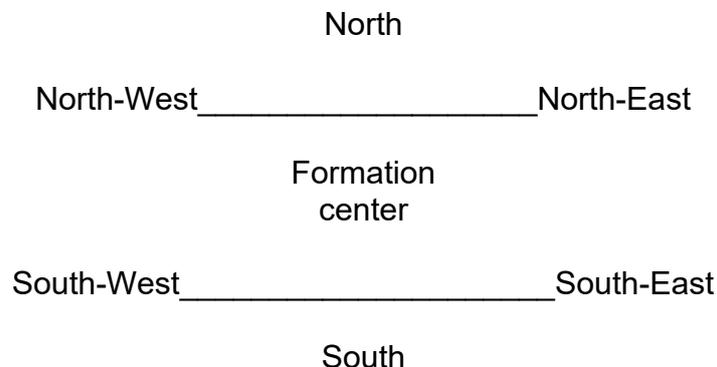
"V" character shows the formation maximum depth. The number of " _ " characters shows the formation width with the same scale as depth

DESCRIPTION :

This field is divided in four sections for the formation detailed description. But this division is not really visible when consulting the formation form on screen or printing it.

Cardinal points are reference to indicate where the different details are situated according to formation center. For a crater, reference point is the area center.

If observed with naked eye, on the Moon, North is up, South is down, West is left and East is right.



For example, a craterlet located on a crater wall down left will be described as "Walls ridden by a craterlet at South-West".

Craters are the most numerous formations. Their description is well divided in four parts.

GENERAL = General description

First, information about shape, location and preservation of the formation.

In the "Historical sites" database, specific description are present :

- Launch date and hour
- Names of astronauts if it's a human mission

- Spaceship or probe description
- Main dates and hours of the mission
- Main scientific results

SLOPES = External slopes description

Then, the external "slopes" are described. Generally, the comments are about their inclination. If radial valleys are present, slopes are described as "tormented". This part also indicates craters and craterlets situated on external slopes.

WALLS = Internal walls description

The "walls" which are described are the internal ones. They link the upper rim of the slopes to the crater floor. The walls are described as "little high when the altitude difference is less than 2,000 m, "pretty high" between 2,000 and 3,000 m, "high" between 3,000 and 4,000 m and "very high" if more than 4,000 m. The indicated information is that which seem the most believable according to important variations in different bibliographical sources. This part also indicates craters and craterlets situated on internal slopes.

FLOOR = Crater floor description

The crater "floor" is described as "flat" if no hills can be found to "tormented" if it's very irregular. The non circular shape is mentioned. If lava seems to have flooded the crater floor, it has been indicated. This part also indicates craters and craterlets situated on the floor.

OBSERVATION

INTERESTN = Interest cotation :

This field gives a numerical indication on the interest of the formation. It will help you to determine which formations to observe. It gives you information on the formation interest. It has been defined by the authors according to their own experience. Sure, you can disagree with them.

Formations are indicated as :

- Low interest formation (1)
- Pretty interesting formation (2)
- Very interesting formation (3)
- Exceptionally interesting formation (4)

INTERESTC = Text of interest cotation :

This field gives a numerical indication on the interest of the formation. It will help you to determine which formations to observe. It gives you information on the formation

interest. It has been defined by the authors according to their own experience. Sure, you can disagree with them.

Formations are indicated as :

- Low interest formation
- Pretty interesting formation
- Very interesting formation
- Exceptionally interesting formation

LUNATION = Lunar month day :

This gives an indication on the day of the first half (From New Moon to Full Moon) during which, a favorable observation of the selected formation on the terminator is possible. It's built on the formation longitude.

"3" is for "3 days after New Moon"

"7" is for "7 days after New Moon", it's First Quarter

"14" is for "14" days after New Moon", it's Full Moon

MOONDAYS = Lunar month day for evening observation :

This expression means "Day of lunar month permitting an evening observation of the formation". It has been observed that Eastern limb formations can only be well observed 2 days after New Moon.

The indicated day is the one for a null libration. It has been computed from formation longitude. According of the real libration value, it can be shifted by one day more or less.

MOONDAYM = Lunar month day for morning observation :

This expression means "Day of lunar month permitting a morning observation of the formation". It has been observed that Western limb formations can only be well observed 2 days before New Moon.

The indicated day is the one for a null libration. It has been computed from formation longitude. According of the real libration value, it can be shifted by one day more or less.

DIAMINST = Diamètre de l'instrument théorique :

This field gives a numerical value of the diameter of the theoretical instrument needed to observe the whole selected formation. It's built on the formation diameter and the theoretical resolution of the instruments based on the Dawes formula.

THINSTRU = Theoretical instrument :

This field presents the smallest instrument needed to theoretically observe the formation. It has been computed from the formation width and from theoretical resolution power (TRP) of the instruments. It is supposed to be obtained when using a magnification equal to instrument diameter in centimeters.

This data is provided for a Moon mean distance of 202,000 miles. An arc second is then about 1 mile on the Moon.

- Naked eye (PRP = 50 miles)
- x10 binoculars (PRP = 10 miles)
- 2" refractor (PRP = 2.5 miles)
- 4" reflector (PRP = 1.5 miles)
- 6" reflector (PRP = 1.1 miles)
- 8" reflector (PRP = 0.9 mile)
- 10" reflector (PRP = 0.6 mile)

PRINSTRU = Useful instrument :

This field presents the smallest instrument needed to comfortably observe the formation. It has been computed from the formation width and from practical resolution power (PRP) of the instruments defined as the double of TRP. It is supposed to be obtained when using a magnification equal to instrument diameter in centimeters.

This data is provided for a Moon mean distance of 202,000 miles. An arc second is then about 1 mile on the Moon.

This data depends on other external criteria such as instrument quality, observer's eye health, seeing...).

- Naked eye (PRP = 100 miles)
- x10 binoculars (PRP = 20 miles)
- 2" refractor (PRP = 5 miles)
- 4" reflector (PRP = 2.5 miles)
- 6" reflector (PRP = 1.6 miles)
- 8" reflector (PRP = 1.2 miles)
- 10" reflector (PRP = 1 mile)

INTERNATIONAL ASTRONOMICAL UNION DATAS

IAU Feature Name :

Official name given by IAU to the formation with all the additives on letters (Accents, tilde, etc...) as they have been given to the honored character.

IAU Clean Feature Name

It's official IAU name above without all the additives on letters (Accents, tilde, etc...) so that they can be managed internationally by computers.

IAU Diameter

Approximate diameter or biggest dimension in kilometers.

IAU Center Latitude

Latitude of the center of the formation. Positive numbers indicates that the formation is localized in northern hemisphere and negative numbers indicate that the formation is localized in the southern hemisphere.

IAU Center Longitude

Longitude of the center of the formation. On the Moon, positive numbers indicates longitudes towards East and negative numbers indicate longitudes towards West.

IAU Northern Latitude

Latitude the most on North of the formation. Positive numbers indicates that the formation is localized in northern hemisphere and negative numbers indicate that the formation is localized in the southern hemisphere.

IAU Southern Latitude

Latitude the most on South of the formation. Positive numbers indicates that the formation is localized in northern hemisphere and negative numbers indicate that the formation is localized in the southern hemisphere.

IAU Eastern Longitude

Longitude the most on the East of the formation. On the Moon, positive numbers indicates longitudes towards East and negative numbers indicate longitudes towards West.

IAU Western Longitude

Longitude the most on the West of the formation. On the Moon, positive numbers indicates longitudes towards East and negative numbers indicate longitudes towards West.

IAU Coordinates System

Coordinates system used for latitudes and longitudes. For the Moon, it's planetographic with east longitudes as positive and counted from 0 to -180° and from 0 to 180° from the meridian 0. It's ULCN 2005(Unified lunar coordinates network de 2005). Mean lunar sphere is considered with a radius of 1737,4 km

IAU Continent

Continent or great geographic division associated to the name.

Africa (AF)

Antarctica (AN)

Asia (AS)

Europe (EU)

North America (NA)

Oceania (OC)

South and Central America (SA)

IAU Ethnicity

Ethnic or cultural or nationality associated to the name.

AFRICA

Algeria	AL
Angola	AN
Bantu	BA
Benin	BE
Botswana	BT
Burkina Faso (Upper Volta)	BF
Burundi	BR
Bushman	BU
Bushongo	BH
Cameroon	CR
Canary Is.	CI
Dahomean	DH
Egypt	EG
Ethiopia	ET
Gabon	GB
Gambia	GA
Ghana	GH
Gold Coast	GC
Guinea	GU
Hottentot	HO
Ivory Coast	IC
Kenya	KY
Lesotho	LE
Liberia	LI

Libya	LB
Madagascar	MD
Malawi	MW
Mali	ML
Mande	MN
Mauritania	MU
Mauritius	MA
Mbundu	MB
Mende	ME
Morocco	MR
Mozambique	MZ
Namibia	NM
Niger	NG
Nigeria	NI
Pygmy	PY
Republic of Chad	CH
Republic of Seychelles	SY
Rwanda	RW
Semitic	SE
Senegal	SN
Sierra Leone	SL
Somalia	SO
South Africa	SA
Sudan	SU
Swaziland	SW
Tanzania	TA
Togo	TO
Tunisia	TN
Uganda	UG
Unknown	--
Yao	YA
Zaire	ZA
Zambia	ZM
Zimbabwe	ZI
Zulu	ZU

ASIA

Afghanistan	AF
Akkadian (Accadian)	AK
Altai	AL
Arabian	AR
Armenian	AM
Assyrian	AY
Assyro-Babylonian	AB
Azerbaijan	AZ
Babylon	BY
Bangladesh	BA
Bhutan	BH

Buriat	BR
Burma	BU
Cambodia	CM
China	CH
Chukchi	CU
Elamite	EL
Evenki	EV
Georgia	GE
Hebrew	HE
Hindu	HI
India	IN
Indonesia	ID
Iran	IR
Iraq	IQ
Israel	IS
Itelmen	IT
Japan	JA
Jewish	JW
Jordan	JO
Kashmir	KA
Kazakhstan	KZ
Ket	KT
Korea	KR
Kuwait	KU
Kyrgyzstan	KY
Laos	LA
Lebanon	LE
Malaysia	MA
Mansi	MS
Mesopotamian	ME
Minyong	MY
Mongolia	MO
Monguor	MG
Nanai	NA
Neghidhian	NG
Nepal	NE
Nganasan	NS
Oman	OM
Ostyak	OS
Pakistan	PK
Persian	PE
Philippines	PH
Phoenician	PO
Sanskrit	SA
Saudi Arabia	SB
Scythian	SC
Semitic	SE
Siberia	SI
Sri Lanka	SR

Sumerian	SU
Syria	SY
Taiwan	TW
Tajik	TJ
Thailand	TH
Tibet	TB
Tungu	TN
Turkey	TU
Turkmenistan	TK
Tuva	TV
Ulci	UL
Unknown	--
Urartu	UR
Uzbekistan	UZ
Vietnam	VT
Yakutian	YK
Yemen	YE

EUROPA

Albania	AL
Andorra	AN
Austria	AS
Bashkir	BS
Belarus	BL
Belgium	BE
Bosnia-Herzegovina	BH
Bulgaria	BU
Byzantine	BZ
Caucasus	CC
Celtic	CE
Chuvash	CH
Croatia	CR
Cyprus	CY
Czechoslovakia	CZ
Denmark	DE
England	EN
Eskimo (Greenland)	EK
Estonia	ES
Finland	FI
Flemish	FL
France	FR
Germany	GE
Great Britain	GB
Greek	GR
Greenland	GL
Gypsy	GY
Hungary	HU
Iceland	IC

Ireland	IR
Italy	IT
Kalmyk	KL
Karelia	KA
Komi	KO
Lapp	LP
Latin	LA
Latvia	LV
Liechtenstein	LE
Lithuania	LI
Luxembourg	LU
Macedonian	MA
Malta	ML
Mari	MR
Moldova	MD
Mordvinian	MO
Netherlands (Dutch)	DU
Norse	NS
Norway	NO
Oscan	OS
Ostrogoth	OG
Poland	PO
Portugal	PG
Roman	RM
Romania (Rumania)	RO
Russia	RU
Scandinavian	SD
Scotland	SC
Scythia	SY
Slavic	SL
Slovakia	SV
Slovenia	SI
Soviet	SO
Spain	SP
Sweden	SW
Switzerland	SZ
Tartar	TT
Teutonic	TU
Udmurtian	UD
Ukraine	UK
Unknown	--
Wales	WA
Yugoslavia	YU

NORTH AMERICA

Aleutian	AU
Algonquin	AL
American	AM

Arikara	AR
Blackfoot	BL
Canada	CA
Cherokee	CE
Cheyenne	CY
Chickasaw	CH
Chinook	CI
Choktaw	CO
Chumash	CU
Creek	CR
Dakota	DA
Dominica	DO
Eskimo	ES
Hopi	HO
Iroquois	IR
Klamath	KL
Lakota	LA
Mandan	MA
Mexico	ME
Navajo	NV
Osage	OS
Pawnee	PW
Pequot	PE
Potawatomi	PO
Pueblo	PU
Salish	SA
Seneca	SE
Shoshoni	SH
Sioux	SX
Tlingit	TL
United States	US
Unknown	--
Zuni	ZU

OCEANIA

Australia	AU
Caroline Is.	CI
Cook Islands	CO
Fiji	FJ
Guam	GM
Hawaii	HA
Marquesas Islands	MA
Marshall Is.	MI
Melanesia	ME
Micronesia	MC
Nauru	NA
New Britain	NB
New Guinea	GU

New Zealand	NZ
Papua New Guinea	PN
Polynesia	PO
Republic of Palau	PA
Samoa	SA
Society Is.	SI
Toamotu	TU
Tonga	TO
Unknown	--
Vanuatu	VA

CENTRAL AND SOUTH AMERICA

Argentina	AR
Auracanian	AC
Aztec	AZ
Barbados	BB
Bolivia	BO
Bororo	RR
Brazil	BR
Chile	CH
Chimalateco	CI
Colombia	CO
Costa Rica	CR
Cuba	CU
Dominican Republic	DR
Ecuador	EC
El Salvador	ES
Falkland Islands	FI
French Guiana	FG
Grenada	GR
Guatemala	GU
Guyana	GY
Haiti	HA
Honduras	HO
Inca	IN
Jamaica	JM
Mayan	MY
Nahuatl	NA
Netherland (Dutch) Antilles	DA
Nicaragua	NI
Panama	PM
Paraguay	PA
Peru	PE
Puerto Rico	PR
Suriname	SU
Unknown	--
Uruguay	UR
Venezuela	VE
Virgin Islands	VI

IAU Feature Type

IAU descriptor term ein greek or latin (cf Lunar Universal Number above)

IAU Feature Type Code

Code in two letters of the IAU descriptor term (cf Lunar Universal Number above)

IAU Quad Name

Specific quadrant where is localized the formation center.

IAU Quad Code

Two letters code of the specific quadrant where the formation center is localized.

IAU Approval Status

Approval level of the formation in 2011.

- | | |
|---|---|
| 1 | Proposed (not currently used) |
| 2 | Task Group approval (not currently used) |
| 3 | WGPSN approval (not currently used) |
| 4 | Executive Committee approval (not currently used) |
| 5 | Adopted by IAU |
| 6 | Dropped, no longer in use |
| 7 | Never approved by the IAU |

IAU Approval date

Date when the name has been approved by IAU. Complete dates begin at half september 2006 and are recorded as (YYYY-MM-DD).

IAU Reference

Reference book from where the origin and the orthograph of the name are given.

IAU Origin

Short explanation of the formation name.

IAU Link

Internet link towards the official IAU site formation page.

PHOTLUN

Pictures manager of the Virtual Moon Atlas

Documentation for the version
available on May 15th 2020

Welcome in "PHOTLUN" (c) the "Virtual Moon Atlas" pictures libraries manager.

As amateur astronomers ourselves, we continue to improve VMA for designing a useful software for lunar observers easy to use on the field.. We always try to define new functionalities and a more user-friendly interface.

This is why we have decided to include in the **VMA "Pro"** version, a pictures libraries manager called "**PHOTLUN**" (Copyrighted name) that allows you to select precisely pictures of lunar formations interesting you, that allows you to link them to the corresponding datas with "**DATLUN**" and that allows you to localize them directly on the "**Virtual Moon Atlas**" map

This first version include the functions that have seemed us the most useful. Sure, we are yet thinking to other ones that will be included in future versions.

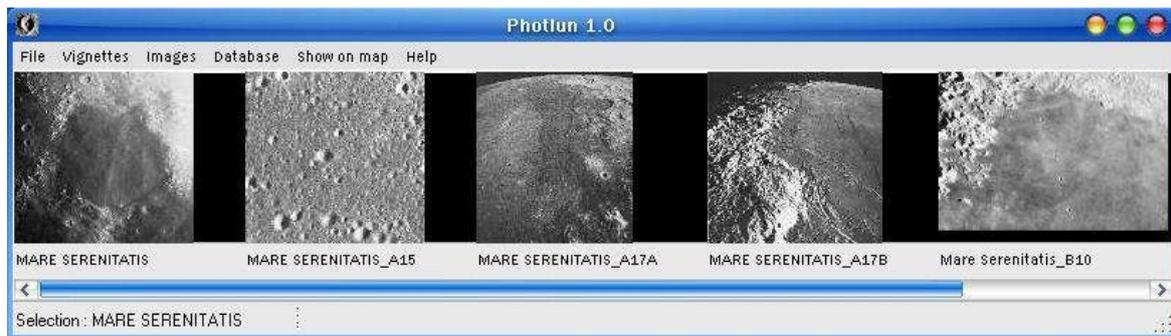
"**PHOTLUN**" is a powerful software dedicated to Moon survey and very powerful because it gives you the possibility to apply a personal processing for each picture of all the libraries. This manual is necessary for discovering all its possibilities panel. We recommend to read it carefully while using the described functions.

Good use and we hope you will appreciate this new software and recommend it to your lunar observers friends.

Thank you very much for your confidence.

Christian Legrand & Patrick Chevalley

THE PHOTLUN SCREEN



The basic **PHOTLUN** screen takes place in a "Windows" reduced window which size can be modified with limits.

It's possible to open simultaneously **VMA**, **DATLUN** and **PHOTLUN**, this allowing you for pictures visualization on the map and database informations reading.

PHOTLUN window includes :

- The **Menu bar**
- The "**Vignettes**" window
- The **State bar**

THE MENUS BAR

This bar includes different menus accessing various functions lists.

THE "FILE" MENU



Traditional in every Windows (r) software, it's used in **PHOTLUN** to select the pictures libraries, to search for pictures of a selected lunar formation in the libraries and to exit the software.

"Library" FUNCTION

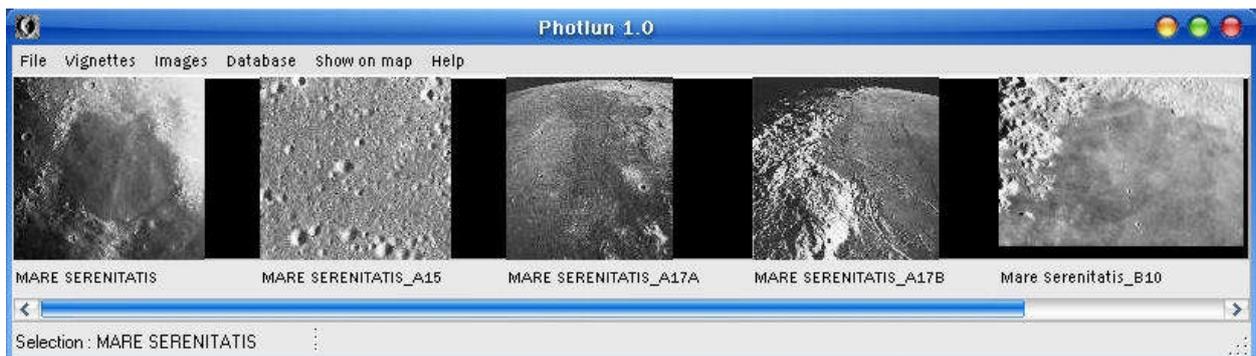


This function displays a list of the usable pictures libraries in which you can choose a special one or the totality.

"Search" FUNCTION

This function allows you to display vignettes concerning a specific lunar formation.

Example : Here, only Mare Serenitatis pictures are visible.

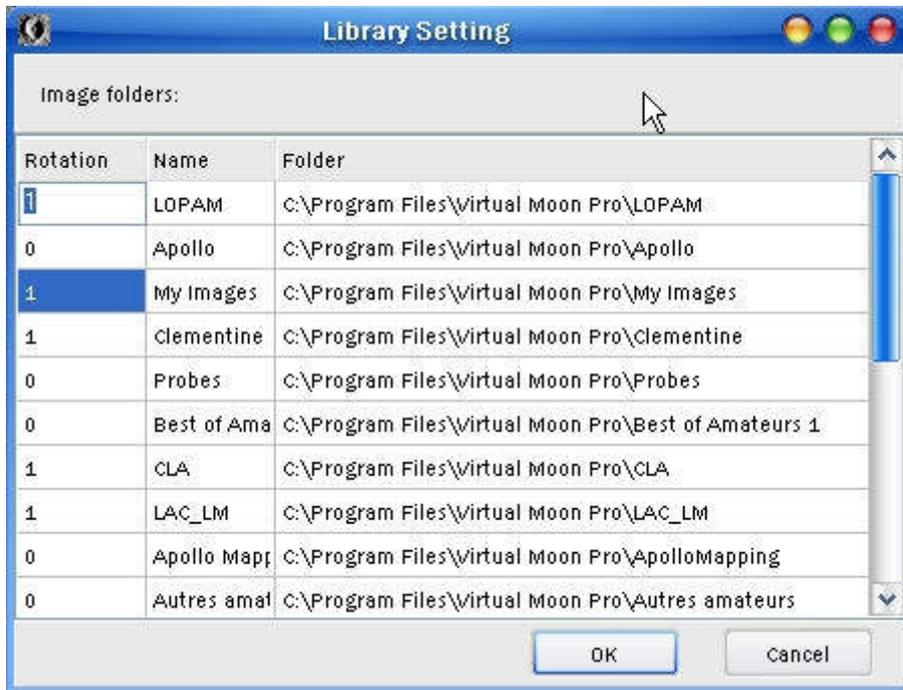


" Libraries setup" FUNCTION

This function indicates to PHOTLUN the download or personal pictures librairies. You must enter successively the boxes from left to right :

- Rotation : This number indicates the general orientation of the pictures in the library..
- Name : The generic name you wish to attribute to the library to remember it easily. This name appears in the "Search" list..
- Directory : The access way to the directory containing the pictures of the library.

To enter these datas, click on the box with the mouse left button and type the datas.



"Exit" FUNCTION

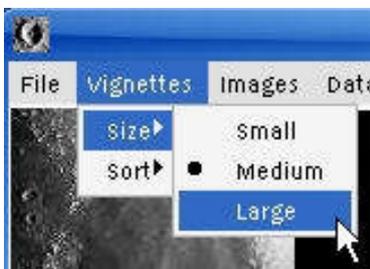
This function exits **PHOTLUN** and closes all the pictures libraries, keeping all the individual specific setups for each picture and its miniature.

"VIGNETTES" MENU



This menu is used to setup the vignettes size and to sort them :

"Size" FUNCTION



In the sub-menu that appears, you can choose among three vignettes sizes

:

- The small ones



- The median ones

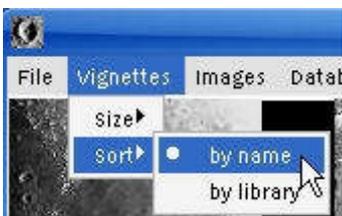


- The biggest ones



Please note that the picture name is not displayed with the small vignettes.

"Sort" FUNCTION



This function is used to sort the vignettes within two possible choices :

- Vignettes sorted by name
- Vignettes sorted by pictures libraries

THE "PICTURES" MENU

Three new functions can be accessed by this menu. You can setup the general pictures orientation, the maximal number of pictures windows opened and close all the opened pictures windows.

" Mirror picture" FUNCTION



With this function, you can choose how to rotate the pictures when you open them.

- "No" Shows pictures as seen with the naked eye or binoculars.
- "East <> West" reverses East and West in the pictures.
- "North <> South" reverses North and South in the pictures.

So, you can visualize pictures as seen in your instrument

"Windows number" FUNCTION

This function determines the the maximal number of pictures windows opened simultaneously (until 10) Windows are displayed side by side.



"Close all" FUNCTION

As the name indicates, this function allows you to close all the opened pictures together to clean your screen.

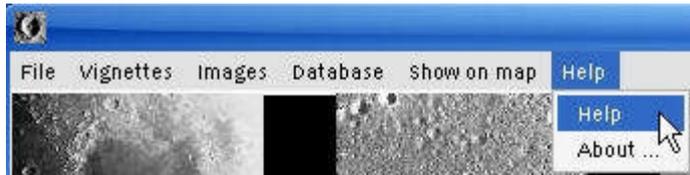
THE "DATABASE" MENU

This is not a menu, but a direct command that will show you the powerful association between **PHOTLUN** and **DATLUN**. If you click it, you open **DATLUN** and will see in the sheet the selected formation and if you have selected the "indexed" databases, the "indexed" formations will be also displayed.

THE MENU "SEE ON MAP"

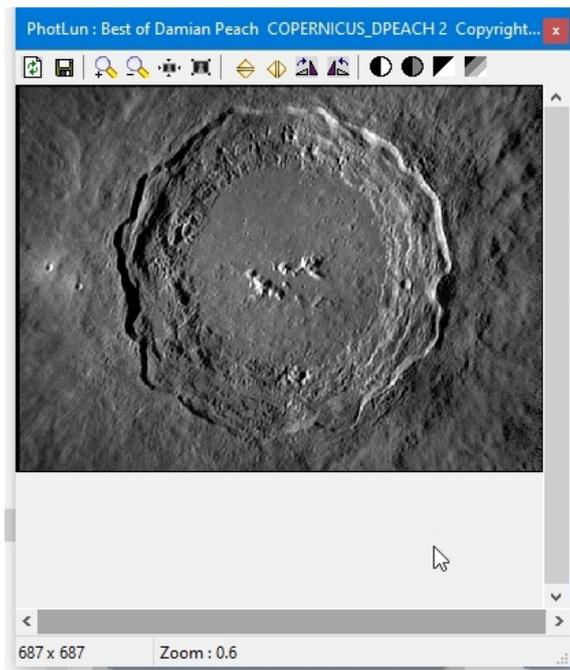
This is not a menu, but a direct command that will show you the powerful association between **PHOTLUN** and **VMA**. If you click it, you open the "**Virtual Moon Atlas Pro**" and you will see on the map the formations selected in **PHOTLUN**. .

THE "HELP" MENU



Traditional in all Windows software, in **PHOTLUN**, it shows you this documentation with "**Help**" and displays credits in "**About**".

THE "PICTURE" WINDOWS



The "Picture" windows are independent and are put over the others opened windows. You can resize them as a regular "Windows" window.

In the Title bar, the picture name is displayed.

In the Status bar, you can see the picture size and the picture zoom factor. This one is set to "1:1" when opening the picture, but if picture is too large to be contained in the screen.

The "Picture" windows present a buttons bar with 14 buttons accessing processing functions on the picture. These buttons are associated with info-bubbles remaining their function when staying above them some seconds with the mouse pointer. Here is the detail of the functions of these buttons from left to right :

The "Default setup" button

This button shows you the original setup of the picture.

The "Record picture" button

This button records the setup of the picture if you modified its orientation, its lighting or its contrast. The pictures personal setup are recorded in a special file and you will recover the same picture with its own setup when you will reopen it. These setups are also applied to the picture miniature.

The "Zoom +" button

The "Zoom +" button increases the picture magnification.

The "Zoom -" button

The "Zoom -" button decreases the picture magnification.

The "Real size" button

This button shows the picture in its real size. If it's larger than the window, lifters appear to be used with the mouse.

The "Fill screen" button

This button adapts the picture size so that it will be completely shown in the window.

The "Up / Down " button

This button reverses Up / Down the picture to match the view in your instrument eyepiece.

The "Left / Right" button

This button reverses Right / Left the picture to match the view in your instrument eyepiece. To see the picture as in a refractor or a SCT, you only activate this button. For a Newtonian, you activate this button and the "Up / Down" button.

The "Turn left" button

This button turns the picture on the left with a 15° angle until 165° .

The "Turn right" button

This button turns the picture on the right with a 15° angle until 165° .

The "Brighter picture" button

This button brightens the picture for better seeing details in dark parts.

The "Darker picture" button

This button darkens the picture for better seeing details in bright parts.

The "More contrast" button

This button increases the contrast for better seeing peculiar details.

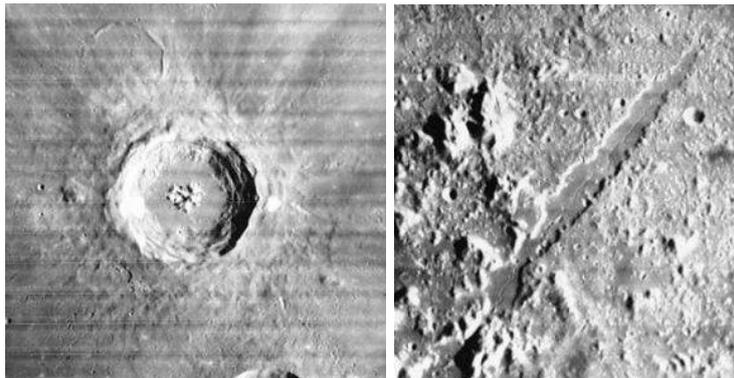
The "Less contrast" button

This button decreases the contrast for better seeing peculiar details.

THE "PICTURE" LIBRARIES

You can download for this version picture files coming from various sources. These files have obtained the necessary authorizations to be used **only** in VMA.

"LUNAR ORBITER PHOTOGRAPHIC ATLAS OF THE MOON" PICTURES



These pictures have been extracted from the electronic version of the "**Lunar Orbiter Photographic Atlas of the Moon**" (LOPAM) realized by **Jeff Gillis** and his team at the **Lunar and Planetary Institute**. This remarkable atlas can be consulted on the site

http://www.lpi.usra.edu/resources/lunar_orbiter/

Christian Legrand has extracted from each of the more than 200 LOPAM photos, pictures of each named formation. He compiled about 3000 pictures. Then, he chose the best one for each formation. For some formations, which were spread on several photos, it was necessary to cut and join several peaces. Some others need a new orientation. All these pictures were then compressed so that small size for downloading that doesn't alter quality.

Please note that these pictures have been "**lines removed**" using the powerful software provided by **Niels Noordhoek**

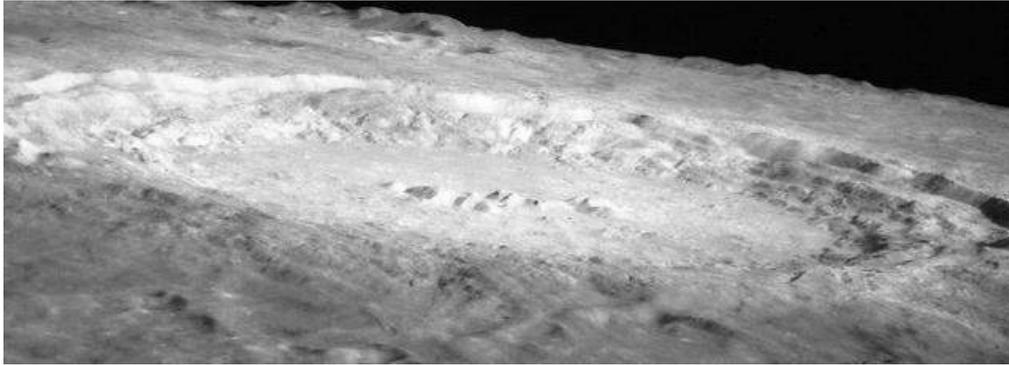
Despite of this important work, about 150 formations haven't been recovered in the LOPAM photos because Lunar Orbiter 4 didn't photography the entire visible face with sufficient resolution.

For those who don't wish to download all the pictures, Christian Legrand has selected the more famous lunar formations (130) and has gathered them in the "**Lunar stars**" library.

These pictures are under "Lunar and Planetary Institute" copyright and cannot be used outside VMA.

LOPAM pictures are in the "LOPAM" sub-directory.

APOLLO MISSIONS PICTURES



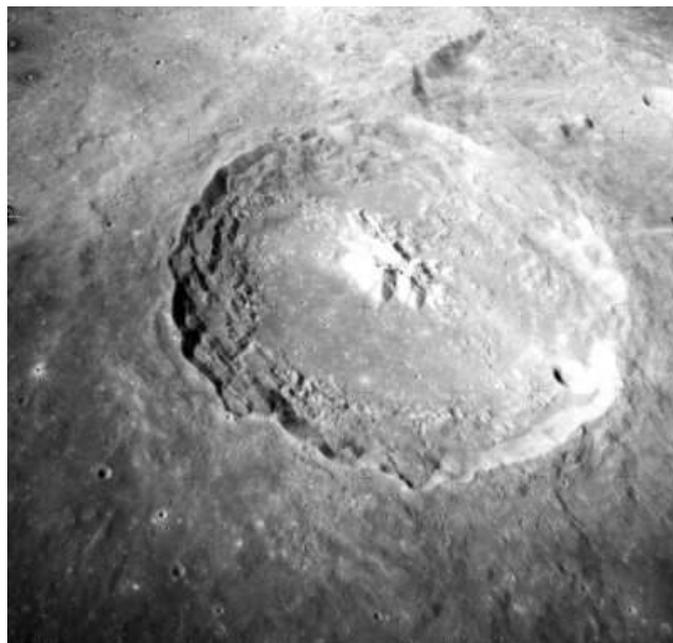
With the goal to provide the most complete image of each lunar formation, Christian Legrand has also selected in the Apollo missions pictures more than 400 pictures related to more than 300 different formations. These pictures are very often from the hand-held Hasselblad pictures.

These pictures are provided under the general copyright of the "National Air and Space Administration" (NASA) which own reproduction rights (<http://www.nasa.gov>) and they can't be used outside of the atlas.

Picture name indicates the formation name and the Apollo mission that took the picture when it's known : so COPERNICUS_A12.JPG is the name of a picture of Copernicus taken during Apollo 12 mission.

APOLLO pictures are in the "**Apollo**" sub-directory.

APOLLO MAPPING CAMERAS MISSIONS



Theophilus seen by Apollo 16 Mapping Camera.

Put online by the "**Lunar and Planetary Institute**", "**Apollo Mapping Cameras**" pictures, who were on board "Apollo Service Modules", are among the most detailed ever realized. Christian Legrand has selected among hundreds of published frames, those which give the most interesting views of Nearside formations as those above.

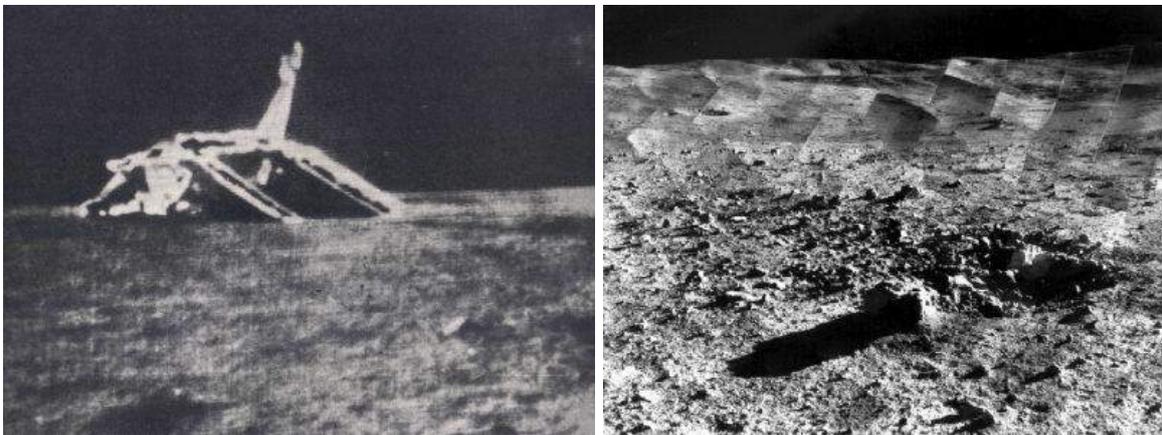
Christian Legrand has extracted about 1000 pictures and has chosen about 700 ones.

These pictures are provided under the general copyright of the "Lunar and Planetary Institute" and they can't be used outside of the atlas.

Picture name indicates the formation name and the Apollo mission that took the picture when it's known : so COPERNICUS_A12.JPG is the name of a picture of Copernicus taken during Apollo 12 mission.

APOLLO MAPPING pictures are in the "**Apollomapping**" sub-directory.

LUNAR PROBES PICTURES



Soviet **Luna 17** pictured by mobile robot Lunakhod 1 (Left) and Tycho crater walls panorama taken by american probe **Surveyor 7** (Right).

Many other automatic probes than Lunar Orbiter 4 have measured and photographed the Moon. These are american Ranger, Lunar Orbiter 1,2,3,5 and Surveyor. In the historical "Moon race" context, ex USSR has also launched a great number of Luna probes.

This picture library realized by Christian Legrand contains about 120 pictures taken by these probes. Found on the Web, these pictures are provided under the general copyright of the "National Air and Space Administration" (NASA) which own reproduction rights (<http://www.nasa.gov>) and they can't be used outside of the atlas. Soviet probes pictures have no identified copyright owners.

Picture name indicates the formation name and the probe or Apollo mission that took the picture when it's known : The following code is used associated with XX as the mission number :

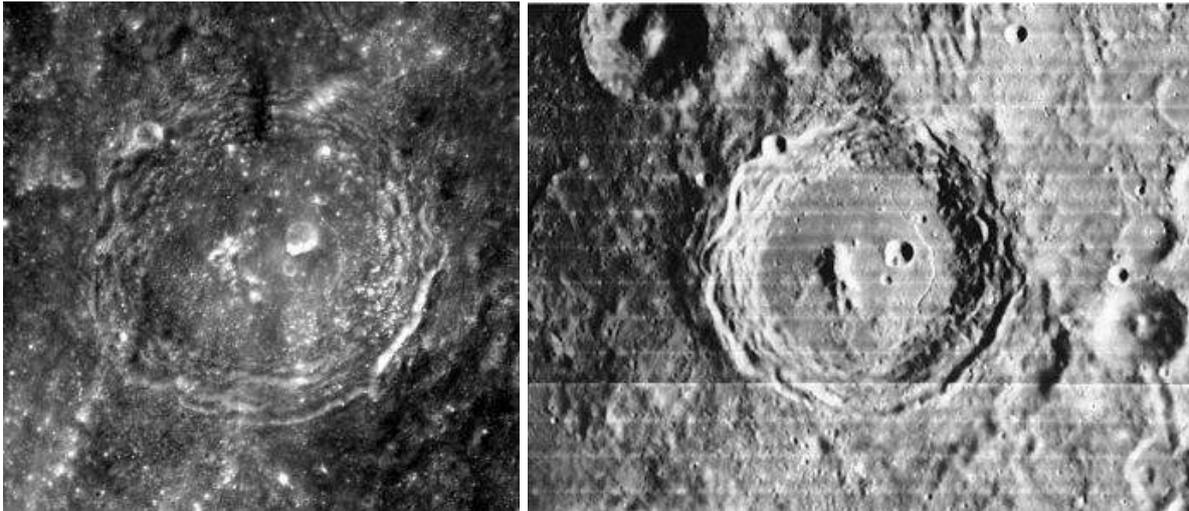
- AXX : Apollo
- LOXX : Lunar Orbiter
- LUXX : Luna
- RAXX : Ranger
- SUXX : Surveyor

For example, LUNA 9_LU9.jpg is a picture of Luna 9 site taken by Luna 9 probe itself.

These pictures are provided under the general copyright of the "National Air and Space Administration" (NASA) which own reproduction rights (<http://www.nasa.gov>) and they can't be used outside of the atlas.

Probes pictures are in the "**Probes**" sub-directory.

CLEMENTINE PROBE PICTURES



Arzachel crater picture taken by Clementine (Left) compared to LOPAM (Right).

The other great source of lunar formations pictures is the american Clementine mission. This small probe has mapped the lunar surface with à 100 to 200 m per pixel.

Christian Legrand works on the general files and extracts pictures of each formation.

Clementine pictures are complementary to those of LOPAM. If their resolution and general quality are better, they have a big defect for terrestriels observers. They were taken with Meridian passing Sun, with the most vertical possible lighting that erases shadows and gives the formation albedo.

For formations situated in a + 45 ° North and - 45 ° South, Pictures show first the albedo. Compare for example with Bessarion LOPAM and Clementine pictures to see the difference.

For formations above these latitudes, shadows reappeared and many pictures are better than LOPAM. Compare with Anaxagoras for example. Connect periodically to our site to discover the new additions.

These pictures are provided under the general copyright of the "National Air and Space Administration" (NASA) which own reproduction rights (<http://www.nasa.gov>) and they can't be used outside of the atlas.

Clementine pictures are in the "**Clementine**" sub-directory.

JAPANESE PROBE KAGUYA PICTURE



Rupes Recta photographed by Kaguya (c) JAXA

These pictures have been obtained from datas returned by the japanese probe KAGUYA et put online on the **Japan Aerospace eXploration Agency (JAXA) Web site**. You can see the original pictures here :

http://wms.selene.jaxa.jp/index_e.html

Christian Legrand has extracted from each original picture, a picture of each present formation. 160 useful pictures have been collected today. The pictures are taken with an angle from the surface. This feature brings new informations about the real shape of the formations. (see Rupes Recta above)

These pictures are provided under the general copyright of "Japan Aerospace eXploration Agency" which owns the copyright. The pictures can't be used outside of the present software.

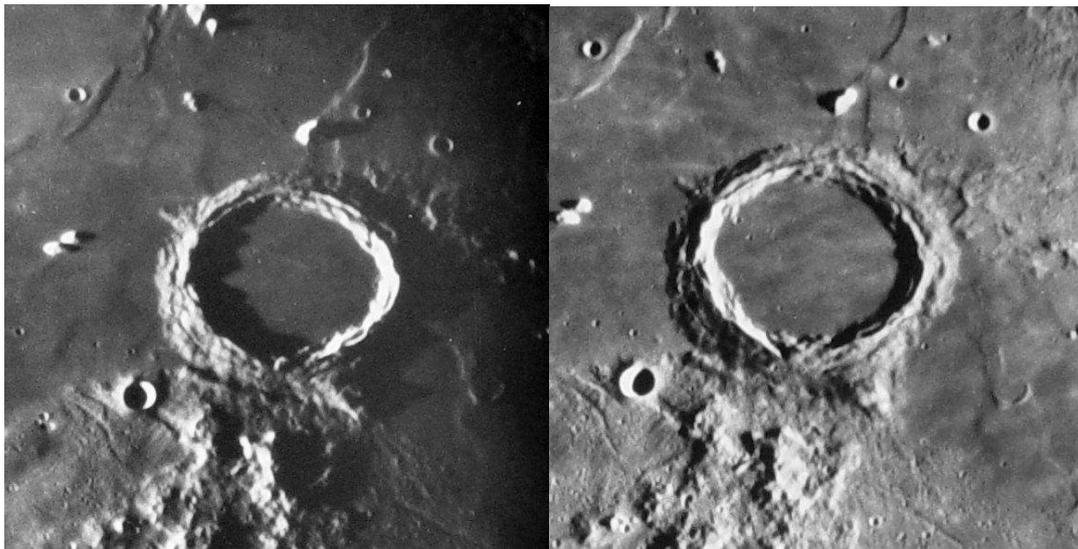
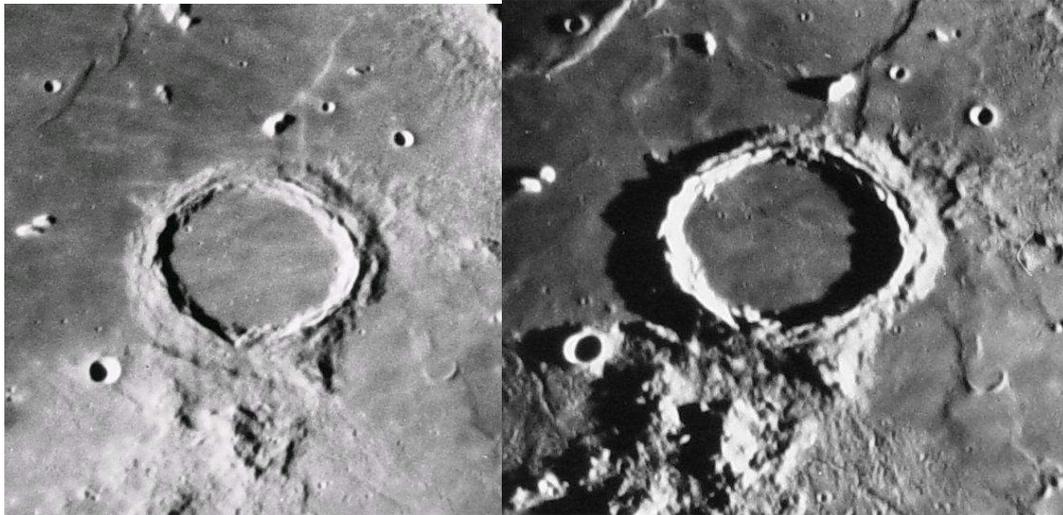
CONSOLIDATED LUNAR ATLAS PICTURES

The best ever published lunar atlas for the lunar observer is the "Consolidated Lunar Atlas " by Gerard Kuiper and al.

It copiles best Moon pictures taken from Earth by some great observatories as Catalina and Pic du Midi. Resolution of some pictures are about 1 km. Only since little time, amateurs equipped with webcams and large telescope begin to have better results than those ones.

This atlas has an unvaluable value because, as "Georges Viscardy's Photographic Atlas", it shows the formations under several sun lightings and at the Full Moon.

For example, here are the pictures extracted for Archimedes :



These pictures allows you to see the aspects of a given formation related to the observing day. This library is presently not complete. It contains more than 2000 pictures and will be updated regularly. Priority is given to CLA pictures above Clementine pictures because they are more useful for terrestrial observers. And our "Clementine 500 m resolution" texture replaces them momentarily. Check regularly our Web site to see if CLA library updates are available.

These pictures are under "Lunar and Planetary Institute" copyright and cannot be used outside VMA.

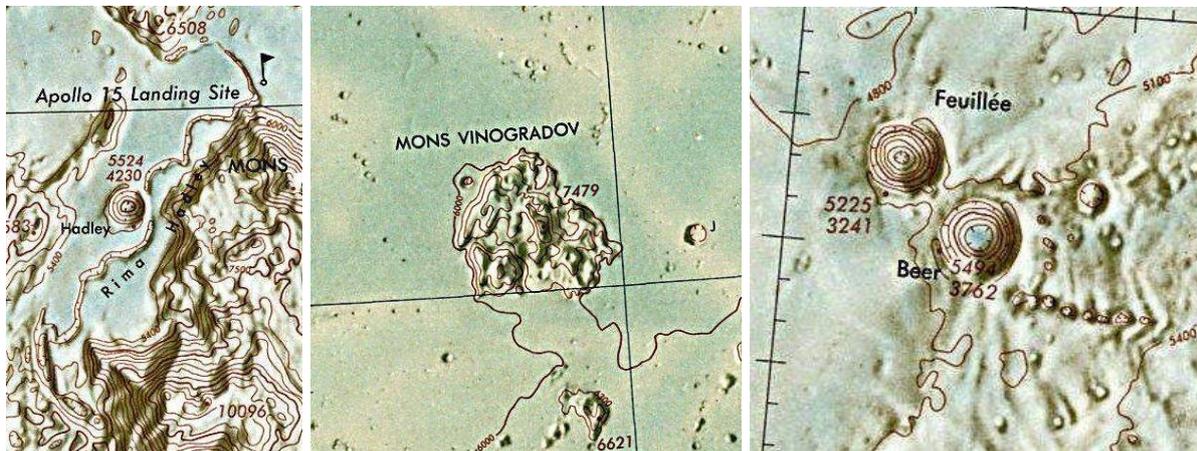
This fabulous work is visible on the site :

<http://www.lpi.usra.edu>

The CLA pictures are in the "**CLA**" sub-file.

LUNAR ASTRONAUTICAL CHARTS AND LUNAR MAPS PICTURES

The best drawn Moon maps ever published are the "Lunar Astronautical Charts" and the "Lunar Maps". Their scale is 1 / 1 000 000. Most of them include altimetric levels curves allowing to determine heights or depths of formations.



Christian Legrand has extracted from LAC / LM more than 800 formations pictures of the Nearside. Because of their precision and their colors, these pictures have not been compresses. This library is then heavy to download.

These pictures are under "Lunar and Planetary Institute" copyright and cannot be used outside VMA.

This fabulous work is visible on the site :

<http://www.lpi.usra.edu>

The Lunar Astronautical Charts and the Lunar Maps pictures are in the "**LAC / LM**" sub-file.

All this unique set of pictures librairies provides you numerous views of formations for comparing or studying them.

"BEST OF AMATEURS" LIBRARIES

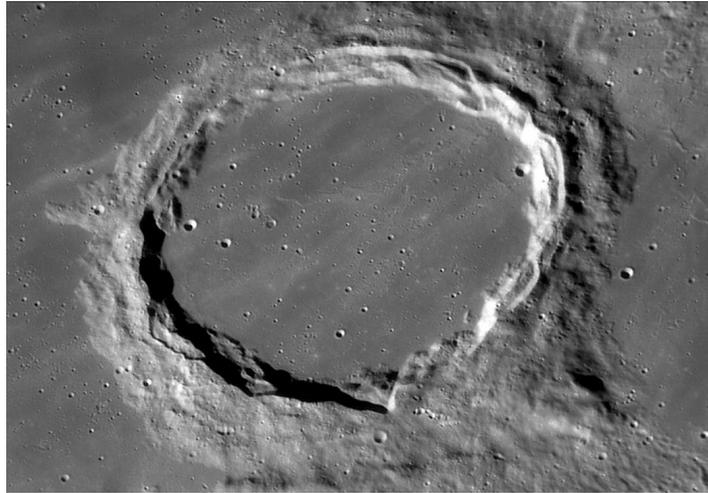
Some of the world best lunar imagers have accepted to show their pictures in a special VMA pictures library only usable with VMA.. Compiled by Christian Legrand, this new library contains presently more than 350 images from **Craig Zerbe, Mike Wirths, Wes Higgins, Zac Pujic, Paolo Lazzarotti, Damian Peach, Luc Cathalla and the 1m Pic du Midi telescope team**. Others amateurs have been contacted and their pictures will be added in this library whose pictures are very often better than those of Consolidated Lunar Atlas, and which rival sometimes with lunar automatic probes.

Because of the great numbers of pictures they provided, pictures by Paolo Lazzarotti, Wes Higgins, Damian Peach and Luc Cathala are in separate libraries.

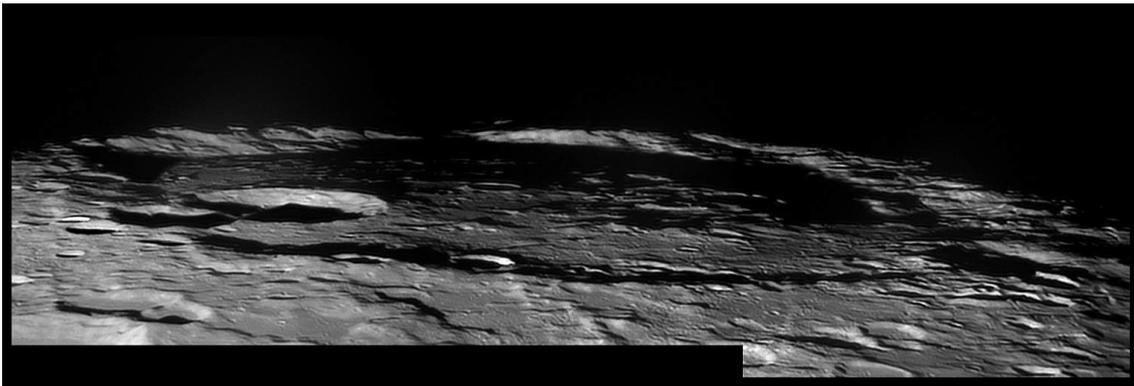
Christian Legrand has treated, with the authorization of the authors some of the pictures for harmonicizing contraste and luminosity to boost the resolution.

ATTENTION : These pictures are provided under the copyright of the original author who have the reproduction rights and can't be used outside the VMA. Any other use needs an explicit demand to the original author. All our thanks to these authors for permitting us to use their pictures in the VMA.

- **T1MPDM / 1 meter Pic du Midi telescope** : It contains pictures realized by JL Dauvergne , F. Colas, C. Mansion, T. Legault and C. Villadrich with the **1 m** Pic du Midi telescope which are the lunar pictures taken from the surface of Earth (Archimedes below).



Best of Peach: It contains pictures taken by Damian Peach with his Celestron 14 et un Celestron 9,25 (Bailly below). It's one of the most important amateur pictures library.



Best of Lazzarotti : it contains pictures realized by Paolo Lazzarotti with his 12" Gladius (Aristoteles here)



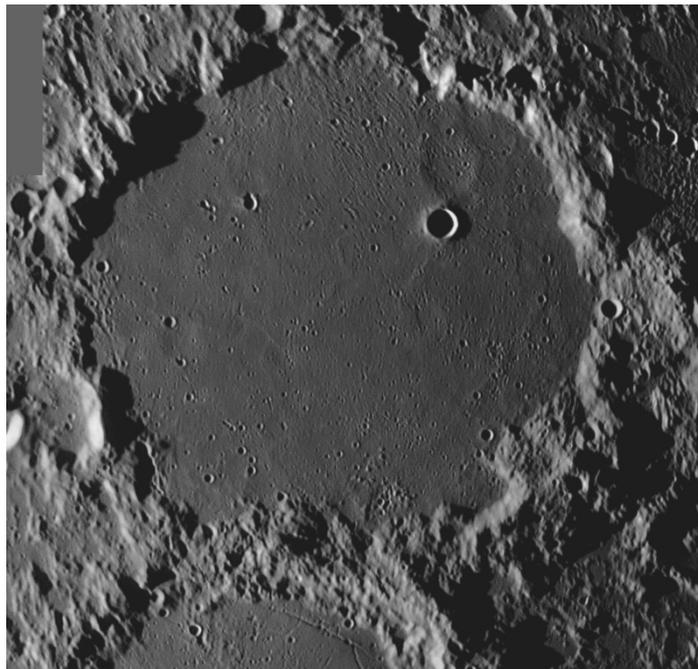
- **Best of Higgins** : Contains pictures realized by Wes Higgins with his 18" Dobson (Schiller here)



- **Best of Amateurs** :Contains picture realized by Mike Wirths (Hortensius domes here) and Craig Zerbe



Best of Cathala : It contains the images taken by Luc Cathala with a motorized Dobson telescope of personal manufacture of 625 mm in diameter with a QHYSIII178M camera. It is the most supplied "amateur astronomer" library with nearly 700 very high resolution images.



Pictures name indicate the formation name and that of the author. For example, Plato_Lazzarotti.jpg is a picture of Plato crater taken by Paolo Lazzarotti.

These pictures are under the general copyright of Christian Legrand and each copyright of the author and cannot be used outside of VMA.

All these libraries give now more than 7 000 formations pictures available to VMA users.

"PHOTLUN" USER'S MANUAL END

Copyright Christian LEGRAND & Patrick CHEVALLEY / 2020

The authors thank users for indicating all found mistakes in this manual using the VMA Web site forum..

WEBLUN 1.0 ©

Web sites manager of the Virtual Moon Atlas

Documentation for the version available on May 15th 2020

Welcome in "WEBLUN », the lunar Web sites management module incorporated into the "Virtual Moon Atlas".

As amateur astronomers, we continue to improve the VMA in the mean of conceiving an always more useful software for lunar observers easy to use "in the field".

We always try to define the more easy to use abilities and interface. Here is why we have incorporated in this new VMA Pro version, a database manager called "**WEBLUN**" (Copyrighted name) that allows you if you have an Internet link to connect to lunar specialized Web sites.

This first version contains the most useful functionalities. We think to other ones that will be included in the future versions. We wish you to read this documentation while using the module to discover all the functions.

Good use and we hope that you will appreciate this new software and that you will promote it around you.

Thank you very much for your confidence.

Christian Legrand & Patrick Chevalley

THE WEBLUN MODULE :

WEBLUN © is a module of the "**Virtual Moon Atlas**" managing a specialized lunar Web sites database.

It can be launched from the "**Command Center**" if you click on the **WEBLUN** button or in the **ATLUN** module if you use the **WEBLUN** button in the buttons bar. You can also launch it with the context menu "**Right click**".

THE WEBLUN DATABASE :

DATABASE PRESENTATION

This database is certainly and presently the most complete possible. Inside, you will find interesting Web sites for Moon observing and survey with also sites telling the lunar exploration.

The database is continuously update by Christian Legrand.

We are listening our VMA users that could indicate us new lunar Web sites, but we can't guarantee that it would be included in the database.

DATABASE DESCRIPTION

You will find the following fields :

SITE_NAME :

A concise name of the site briefly describing the site if possible

NOM_SITE :

French translation of SITE_NAME

LANGUAGE :

Native language of the site. If another language version exists, it will be indicated as « Japanese / english » for example. If several languages are available, it will be indicated as "Multilingual".

LANGUE :

French translation of LANGUAGE

THEME_EN :

The main theme of the site. The main themes list is :

- General site
- Lunar atlas
- Lunar probe
- Lunar pictures site
- Official organism
- Non official organism
- Online books

- Astronomy magazine
- Lunar software

THEME_FR :

French translation of THEME_EN

SUB_THEME :

For some themes, it's possible to sort the sites with sub-themes. For example, the "Lunar probe" Theme has been subdivided for each of the lunar probes existing. In the same way, the theme "SpDans certains thèmes, il est possible de classer les sites en sous-thèmes. Ainsi le thème « Sonde lunaire » est subdivisé pour chacune des sondes lunaires. De même, le thème « Site spécialisé » est subdivisé dans les sous-thèmes suivants :

- General
- Observing guides
- Volcanism
- Mineralogy
- Anomalies and LTP
- Selenography
- Nomenclature
- Eclipses
- Links list

The complete list of sub-themes will be given when the database will be stabilized.

SOUS_THEME :

French translation of SUB_THEME

ADDRESS :

The web site address as it has been recovered at the mentioned date in RECORDING_DATE. It's an Internet link directly clickable.

DESCRIPTION_EN :

A brief description of the site introducing the main informations that make it attractive

DESCRIPTION_FR :

French translation of DESCRIPTION_EN

RECORDING_DATE :

The recording date in the database of the Web site ADDRESS. This permits to actualize more easily the oldest addresses

DATE_ENREGISTREMENT :

Franch translation of RECORDING_DATE.

RECORDING NEW WEB SITES IN WEBLUN

You have realized an Internet site about the Moon and it's not in the WEBLUN © database ?

You can indicate it to us so that we can evaluate the interest for placing it in the database.

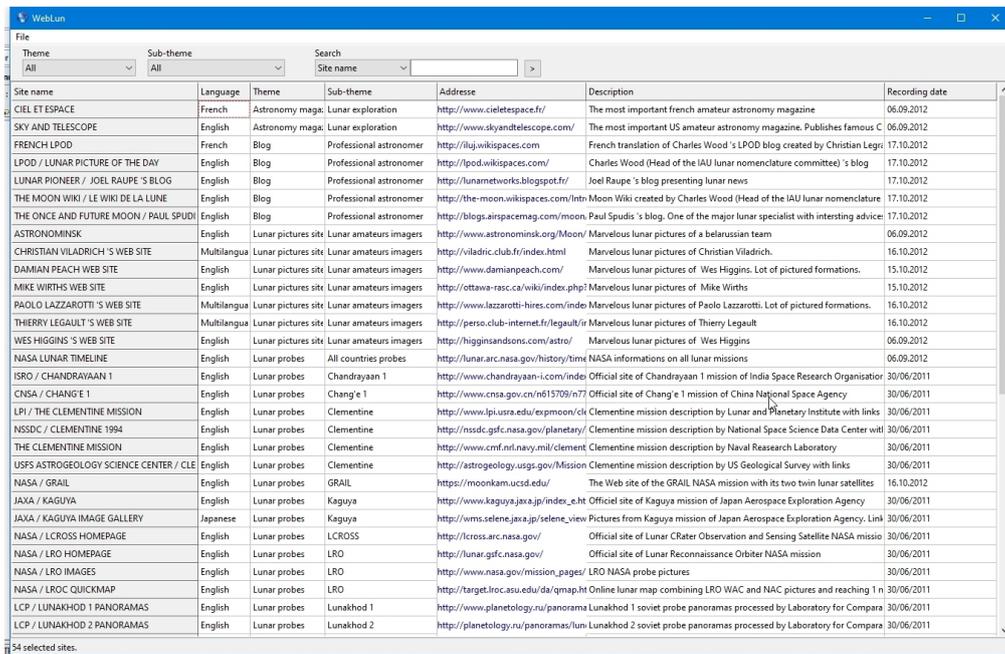
Please contact Ch. Legrand at chlegrand@free.fr.

We are looking for sites with the following themes :

- Site presenting lunar images with a high resolution (about 1 to 2 km/pix)présentant des images lunaires à haute définition
- Site describing lunar formations

The authors will decide the inclusion or not in the database. If not, suggestions will be indicated to you to conform to the **WEBLUN** needs..

THE WEBLUN SCREEN



Site name	Language	Theme	Sub-theme	Adresse	Description	Recording date
CIEL ET ESPACE	French	Astronomy maga.	Lunar exploration	http://www.cielletespace.fr/	The most important french amateur astronomy magazine	06.09.2012
SKY AND TELESCOPE	English	Astronomy maga.	Lunar exploration	http://www.skyandtelescope.com/	The most important US amateur astronomy magazine. Publishes famous C	06.09.2012
FRENCH LPOD	French	Blog	Professional astronomer	http://luj.wikispaces.com	French translation of Charles Wood 's LPOD blog created by Christian Legri	17.10.2012
LPOD / LUNAR PICTURE OF THE DAY	English	Blog	Professional astronomer	http://lpod.wikispaces.com/	Charles Wood (Head of the IAU lunar nomenclature committee) 's blog	17.10.2012
LUNAR PIONEER / JOEL RAUPE 'S BLOG	English	Blog	Professional astronomer	http://lunametworks.blogspot.fr/	Joel Raupe 's blog presenting lunar news	17.10.2012
THE MOON WIKI / LE WIKI DE LA LUNE	English	Blog	Professional astronomer	http://the-moon.wikispaces.com/ln/n	Moon Wiki created by Charles Wood (Head of the IAU lunar nomenclature	17.10.2012
THE ONCE AND FUTURE MOON / PAUL SPUDIS	English	Blog	Professional astronomer	http://blogs.aipacemag.com/moon	Paul Spudis 's blog. One of the major lunar specialist with interesting advice:	17.10.2012
ASTRONOMINSK	English	Lunar pictures site	Lunar amateurs imagers	http://www.astronominsk.org/Moon/	Marvelous lunar pictures of a belarusian team	06.09.2012
CHRISTIAN VILADIRICH 'S WEB SITE	Multilangua	Lunar pictures site	Lunar amateurs imagers	http://viladic.club.fr/index.html	Marvelous lunar pictures of Christian Viladrich.	16.10.2012
DAMIAN PEACH WEB SITE	English	Lunar pictures site	Lunar amateurs imagers	http://www.damianpeach.com/	Marvelous lunar pictures of Wes Higgins. Lot of pictured formations.	15.10.2012
MIKE WIRTHS WEB SITE	English	Lunar pictures site	Lunar amateurs imagers	http://ottawa-rasc.ca/wiki/index.php?	Marvelous lunar pictures of Mike Wirths	15.10.2012
PAOLO LAZZAROTTI 'S WEB SITE	Multilangua	Lunar pictures site	Lunar amateurs imagers	http://www.lazzarotti-hires.com/index	Marvelous lunar pictures of Paolo Lazzarotti. Lot of pictured formations.	16.10.2012
THIERRY LEGAULT 'S WEB SITE	Multilangua	Lunar pictures site	Lunar amateurs imagers	http://perso.club-internet.fr/legault/ir	Marvelous lunar pictures of Thierry Legault	16.10.2012
WES HIGGINS 'S WEB SITE	English	Lunar pictures site	Lunar amateurs imagers	http://higginsandsons.com/astro/	Marvelous lunar pictures of Wes Higgins	06.09.2012
NASA LUNAR TIMELINE	English	Lunar probes	All countries probes	http://lunar.arc.nasa.gov/history/time	NASA informations on all lunar missions	06.09.2012
ISRO / CHANDRAYAAN 1	English	Lunar probes	Chandrayaan 1	http://www.chandrayaan-1.com/index	Official site of Chandrayaan 1 mission of India Space Research Organisation	30/06/2011
CNSA / CHANG'E 1	English	Lunar probes	Chang'e 1	http://www.cnsa.gov.cn/n615709/n7	Official site of Chang'e 1 mission of China National Space Agency	30/06/2011
LPI / THE CLEMENTINE MISSION	English	Lunar probes	Clementine	http://www.lpi.usra.edu/espmoon/cl/	Clementine mission description by Lunar and Planetary Institute with links	30/06/2011
NSSDC / CLEMENTINE 1994	English	Lunar probes	Clementine	http://nssdc.gsfc.nasa.gov/planetary/	Clementine mission description by National Space Science Data Center with	30/06/2011
THE CLEMENTINE MISSION	English	Lunar probes	Clementine	http://www.cmf.nit.navy.mil/clement	Clementine mission description by Naval Research Laboratory	30/06/2011
USFS ASTROGEOLOGY SCIENCE CENTER / CLE	English	Lunar probes	Clementine	http://astrogeology.usgs.gov/Mission	Clementine mission description by US Geological Survey with links	30/06/2011
NASA / GRAIL	English	Lunar probes	GRAIL	https://moonkam.ucsd.edu/	The Web site of the GRAIL NASA mission with its two twin lunar satellites	16.10.2012
JAXA / KAGUYA	English	Lunar probes	Kaguya	http://www.kaguya.jaxa.jp/index_e.ht	Official site of Kaguya mission of Japan Aerospace Exploration Agency	30/06/2011
JAXA / KAGUYA IMAGE GALLERY	Japanese	Lunar probes	Kaguya	http://wms.selene.jaxa.jp/selene_view	Pictures from Kaguya mission of Japan Aerospace Exploration Agency. Link	30/06/2011
NASA / LCROSS HOMEPAGE	English	Lunar probes	LCROSS	http://lcross.arc.nasa.gov/	Official site of Lunar Crater Observation and Sensing Satellite NASA missio	30/06/2011
NASA / LRO HOMEPAGE	English	Lunar probes	LRO	http://lunar.gsfc.nasa.gov/	Official site of Lunar Reconnaissance Orbiter NASA mission	30/06/2011
NASA / LRO IMAGES	English	Lunar probes	LRO	http://www.nasa.gov/mission_pages/	LRO NASA probe pictures	30/06/2011
NASA / LROC QUICKMAP	English	Lunar probes	LRO	http://target.lroc.asu.edu/daqmap.ht	Online lunar map combining LRO WAC and NAC pictures and reaching 1 n	30/06/2011
LCP / LUNAKHOD 1 PANORAMAS	English	Lunar probes	Lunakhod 1	http://www.planetology.ru/panorama	Lunakhod 1 soviet probe panoramas processed by Laboratory for Compar	30/06/2011
LCP / LUNAKHOD 2 PANORAMAS	English	Lunar probes	Lunakhod 2	http://planetology.ru/panoramas/lun	Lunakhod 2 soviet probe panoramas processed by Laboratory for Compar	30/06/2011

WEBLUN screen is in a "Windows" frame. As all the Windows frames, you can minimize or maximize its size with clicking on the buttons on the right of the menu bar.

It's possible to open simultaneously the **ATLUN** and **WEBLUN** modules, so that you can continue your lunar survey while connecting to the Web sites.

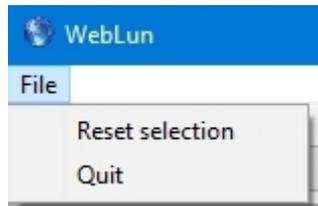
WEBLUN window presents :

- The **Menus bar**
- The **"List"** window
- The **Status bar**

THE MENUS BAR

THE "FILE" MENU

Traditional in all Windows (R) software, in **WEBLUN**, its role is only to come back to default settings and to quit **WEBLUN**.



"Reset selection" FUNCTION

Activating this function will come back to the complete database rather than the short list you have selected

"Quit" FUNCTION

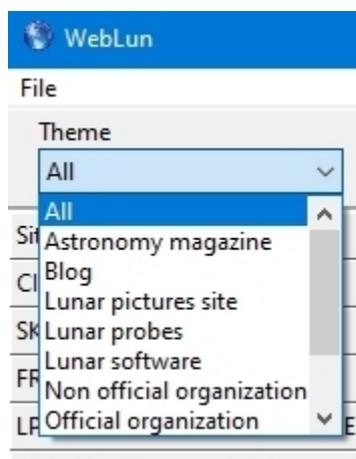
This allows you to quit **WEBLUN** while closing the database and keeping all the settings about the base, the columns and the selection you have previously done.

THE SORTING FIELDS

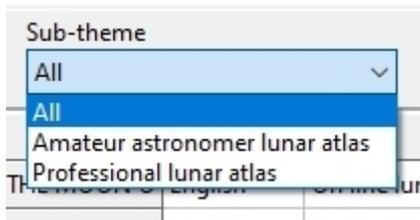
Three sorting fields allow you to select Web sites with common points in the following database fields :

- Theme
- Sub-theme
- Search

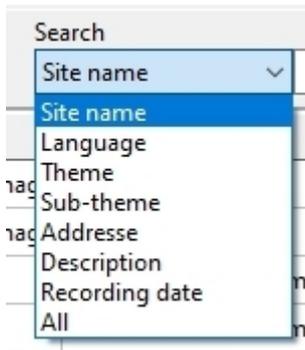
The field « **Theme** » allows you to select sites on a selected theme that you can choose in the scrolling list.



The field « **Sub-theme** » allows you to select sites on a selected theme that you can choose in the scrolling list.



The two "Search" fields allow you to select sites presenting in the field selected by the scrolling list and containing the alphanumeric chain that you enter in the right field.



THE "SELECTED LIST" WINDOW

The selected list window presents others functions useful for the datas sorting.

Site name	Language	Theme	Sub-theme	Adresse	Description	Recording date
CIEL ET ESPACE	French	Astronomy maga:	Lunar exploration	http://www.cieletespace.fr/	The most important french amateur astronomy magazine	06.09.2012
SKY AND TELESCOPE	English	Astronomy maga:	Lunar exploration	http://www.skyandtelescope.com/	The most important US amateur astronomy magazine. Publishes famous C	06.09.2012
FRENCH LPOD	French	Blog	Professional astronomer	http://fluj.wikispaces.com	French translation of Charles Wood 's LPOD blog created by Christian Legri	17.10.2012
LPOD / LUNAR PICTURE OF THE DAY	English	Blog	Professional astronomer	http://lpod.wikispaces.com/	Charles Wood (Head of the IAU lunar nomenclature committee) 's blog	17.10.2012
LUNAR PIONEER / JOEL RAUPE 'S BLOG	English	Blog	Professional astronomer	http://lunarnetworks.blogspot.fr/	Joel Raupe 's blog presenting lunar news	17.10.2012
THE MOON WIKI / LE WIKI DE LA LUNE	English	Blog	Professional astronomer	http://the-moon.wikispaces.com/Intr	Moon Wiki created by Charles Wood (Head of the IAU lunar nomenclature	17.10.2012
THE ONCE AND FUTURE MOON / PAUL SPUDI	English	Blog	Professional astronomer	http://blogs.airspacemag.com/moon	Paul Spudis 's blog. One of the major lunar specialist with interesting advice	17.10.2012
ASTRONOMINSK	English	Lunar pictures site	Lunar amateurs imagers	http://www.astronominsk.org/Moon/	Marvelous lunar pictures of a belarussian team	06.09.2012
CHRISTIAN VILADRICH 'S WEB SITE	Multilangua	Lunar pictures site	Lunar amateurs imagers	http://viladric.club.fr/index.html	Marvelous lunar pictures of Christian Viladrich.	16.10.2012
DAMIAN PEACH WEB SITE	English	Lunar pictures site	Lunar amateurs imagers	http://www.damianpeach.com/	Marvelous lunar pictures of Wes Higgins. Lot of pictured formations.	15.10.2012
MIKE WIRTHS WEB SITE	English	Lunar pictures site	Lunar amateurs imagers	http://ottawa-rasc.ca/wiki/index.php?	Marvelous lunar pictures of Mike Wirths	15.10.2012
PAOLO LAZZAROTTI 'S WEB SITE	Multilangua	Lunar pictures site	Lunar amateurs imagers	http://www.lazzarotti-hires.com/index	Marvelous lunar pictures of Paolo Lazzarotti. Lot of pictured formations.	16.10.2012
THIERRY LEGAULT 'S WEB SITE	Multilangua	Lunar pictures site	Lunar amateurs imagers	http://perso.club-internet.fr/legault/ir	Marvelous lunar pictures of Thierry Legault	16.10.2012
WES HIGGINS 'S WEB SITE	English	Lunar pictures site	Lunar amateurs imagers	http://higginsandsons.com/astro/	Marvelous lunar pictures of Wes Higgins	06.09.2012
NASA LUNAR TIMELINE	English	Lunar probes	All countries probes	http://lunar.arc.nasa.gov/history/time	NASA informations on all lunar missions	06.09.2012
ISRO / CHANDRAYAAN 1	English	Lunar probes	Chandrayaan 1	http://www.chandrayaan-1.com/index	Official site of Chandrayaan 1 mission of India Space Research Organisation	30/06/2011
CNSA / CHANG'E 1	English	Lunar probes	Chang'e 1	http://www.cnsa.gov.cn/n615709/n77	Official site of Chang'e 1 mission of China National Space Agency	30/06/2011
LPI / THE CLEMENTINE MISSION	English	Lunar probes	Clementine	http://www.lpi.usra.edu/expmoon/clk	Clementine mission description by Lunar and Planetary Institute with links	30/06/2011
NSSDC / CLEMENTINE 1994	English	Lunar probes	Clementine	http://nssdc.gsfc.nasa.gov/planetary/	Clementine mission description by National Space Science Data Center with	30/06/2011
THE CLEMENTINE MISSION	English	Lunar probes	Clementine	http://www.cmf.nrl.navy.mil/clement	Clementine mission description by Naval Research Laboratory	30/06/2011
USFS ASTROGEOLOGY SCIENCE CENTER / CLE	English	Lunar probes	Clementine	http://astrogeology.usgs.gov/Mission	Clementine mission description by US Geological Survey with links	30/06/2011
NASA / GRAIL	English	Lunar probes	GRAIL	https://moonkam.ucsd.edu/	The Web site of the GRAIL NASA mission with its two twin lunar satellites	16.10.2012
JAXA / KAGUYA	English	Lunar probes	Kaguya	http://www.kaguya.jaxa.jp/index_e.ht	Official site of Kaguya mission of Japan Aerospace Exploration Agency	30/06/2011
JAXA / KAGUYA IMAGE GALLERY	Japanese	Lunar probes	Kaguya	http://wms.selene.jaxa.jp/selene_view	Pictures from Kaguya mission of Japan Aerospace Exploration Agency. Link	30/06/2011
NASA / LCROSS HOMEPAGE	English	Lunar probes	LCROSS	http://lcross.arc.nasa.gov/	Official site of Lunar CRater Observation and Sensing Satellite NASA missio	30/06/2011
NASA / LRO HOMEPAGE	English	Lunar probes	LRO	http://lunar.gsfc.nasa.gov/	Official site of Lunar Reconnaissance Orbiter NASA mission	30/06/2011
NASA / LRO IMAGES	English	Lunar probes	LRO	http://www.nasa.gov/mission_pages/	LRO NASA probe pictures	30/06/2011
NASA / LROC QUICKMAP	English	Lunar probes	LRO	http://target.lroc.asu.edu/daqmap.ht	Online lunar map combining LRO WAC and NAC pictures and reaching 1 n	30/06/2011
LCP / LUNAKHOD 1 PANORAMAS	English	Lunar probes	Lunakhod 1	http://www.planetology.ru/panorama	Lunakhod 1 soviet probe panoramas processed by Laboratory for Compara	30/06/2011
LCP / LUNAKHOD 2 PANORAMAS	English	Lunar probes	Lunakhod 2	http://planetology.ru/panoramas/lun	Lunakhod 2 soviet probe panoramas processed by Laboratory for Compara	30/06/2011

First note that the left column displaying the site name on a gray background is mandatory and can't be removed. Lifters on the right and the bottom of the window allow the liste move.

If you click on the grey title of one column, the list is resorted by numerical (if the field is numerical) or alphabetical (if the field is alphabetical) order **increasing**. **If you click a second time, the list is resorted in decreasing order.**

"COLUMN WIDTH" FUNCTION

You can adjust columns width if you place the mouse cursor on its limit in the title bar. The cursor becomes a moving vertical line allowing the width setting..

Push the left mouse button, stay pushed and go on left or right to increase or decrease the column width.

OTHERS FUNCTIONS

If you can't display all the length of a field because it's too long (as DESCRIPTION_SITE...), place the mouse cursor on it. A "bubble" appears containing all the field.

Also, if you double-click a line, your Web browser is launched and it connects to the address of the site. ionné.

THE STATUS BAR



The status bar shows on the left the total number of selected lines.

Virtual Moon Atlas

Quick user's guide

[Manual general index](#)

The following examples will help you to well use the "Virtual Atlas of the Moon" and give you all informations needed for good settings. The versions compatible with the described actions are indicated:

[How to well set the "Virtual Atlas of the moon"](#)

[How to view the Moon for a given date and hour to prepare an observing session](#)

[How to find an unknown lunar formation that you just discover the existence](#)

[How to use a "Goto" mount](#)

[How to study a known formation and know how and when to observe it](#)

[How to search a formation of the libration zone and its next observing date](#)

[How to look at a formation in its geological context](#)

[How to generate documents usable "in the field"](#)

[How to study the Moon Far Side](#)

[And now, have a dream...](#)

[Scientific surveys of the Moon](#)

[How to study a specific type of lunar formations](#)

[How to study the origin of lunar names](#)

How to well set the "Virtual Atlas of the Moon"

A good setting of the "Virtual Atlas of the Moon" is necessary to better use all its

features. The authors have wished this software to be usable by the greatest number of people despite of the machine resources needed. This is why there are some settings to do.

Owners of the most powerful computers will access all the functions in great comfort. The speedier the microprocessor, the more graphic memory inside and better will be the resolution and shorter the computing time.

1) First settings

The "**Settings panel**" is managed in the **ATLUN** module.

Configuration

Eyepieces CCD Printing

General Database Display Texture Overlay Images

Observatory

Topocentric Geocentric

Latitude: 49.90 N Longitude: 1.10 E

Date / Time

Use Computer Date and Time

Country: France

Time Zone: Europe/Paris

Language: en English

Check for optional features

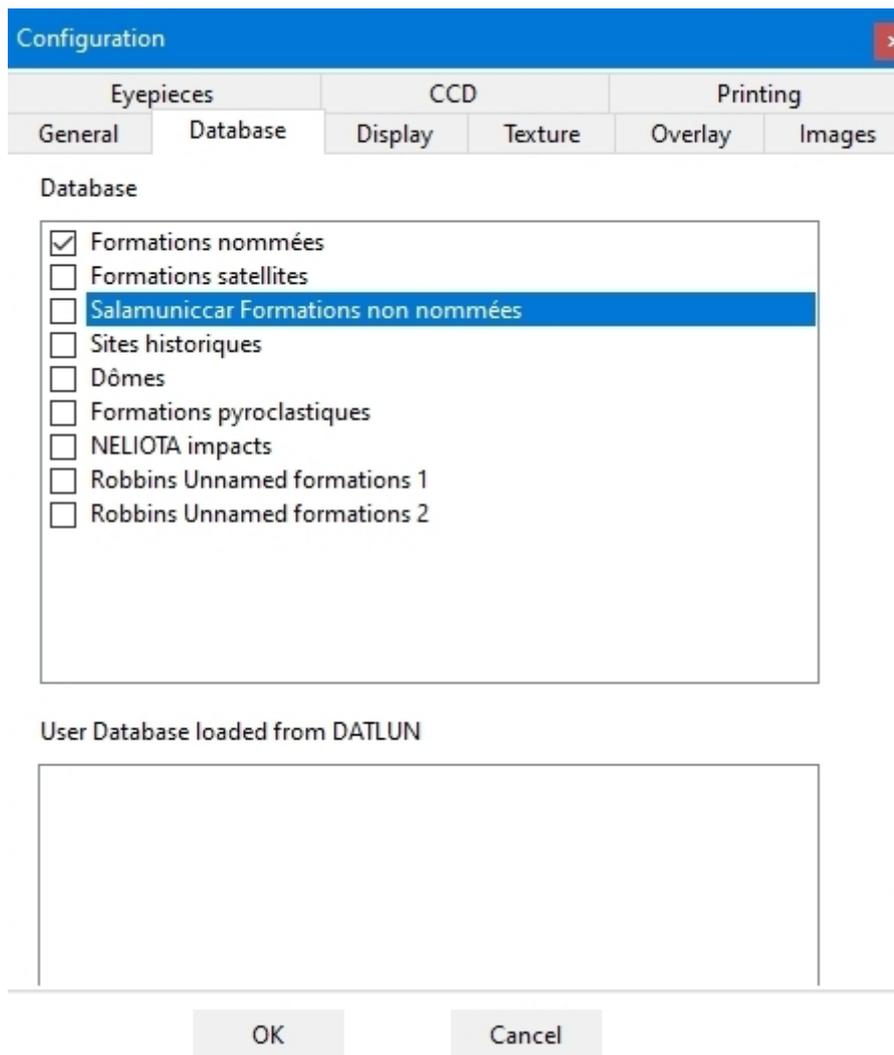
OK Cancel

After launching the **ATLUN** module, click on the "**Configuration**" menu. Click on the "**General**" thumbnail. Type your observation site coordinates, so that, librations could be computed.

Fill the case "**Use computer date and time**".

Then, choose the language. It's the language of the software and of the database and French and English are provided in the basic package. In the other languages available, versions produced by others voluntary colleagues, it's often only the software interface. Some databases have been translated too in some languages.

Click on the "**Databases**" thumbnail.

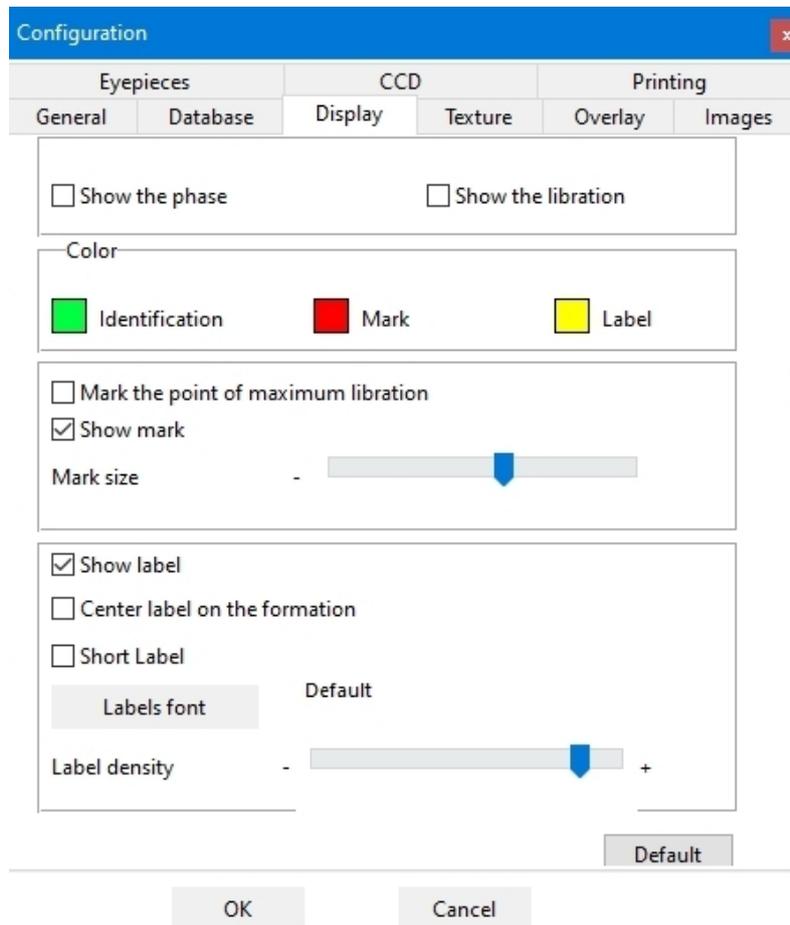


You have just to fill the cases corresponding to the databases that you wish to display on the map at the same time.

Attention : The more you selected databases, a more bigger number of formations must be managed by the module. When selecting the "**Salamuniccar**" and "**Robbins**" databases, this number can go up to more than 1 million ! So, this will slow down considerably the maps display performance.

In the "**User database loaded from DATLUN**" frame, your own databases will be displayed after you tranfered theme in the **VMA** using the **DATLUN** module.

Click on the "**Display**" thumbnail.



You can fill the "**Show the phase**" and/or "**Show the libration**" boxes if you wish it.

You can also apply your favorite color to the point showing the formation on the map, the name of the selected formation and the color of the name of the neighbourhood or principal formations. You can also decide if you want to display them if you fill or unfill the "**Show label**" and/or "**Show marks**" boxes.

If you fill the "**Mark the point of the maximum libration**", a well visible arrow will be displayed around the lunar disk to show you, where the libration will be maximum for the date and hour that you will select soon. You will notice soon that the arrow size is proportional to the libration intensity.

The "**Mark size**" cursor allows you to magnify or reduce size of the libration arrow and of the point showing the selected formation.

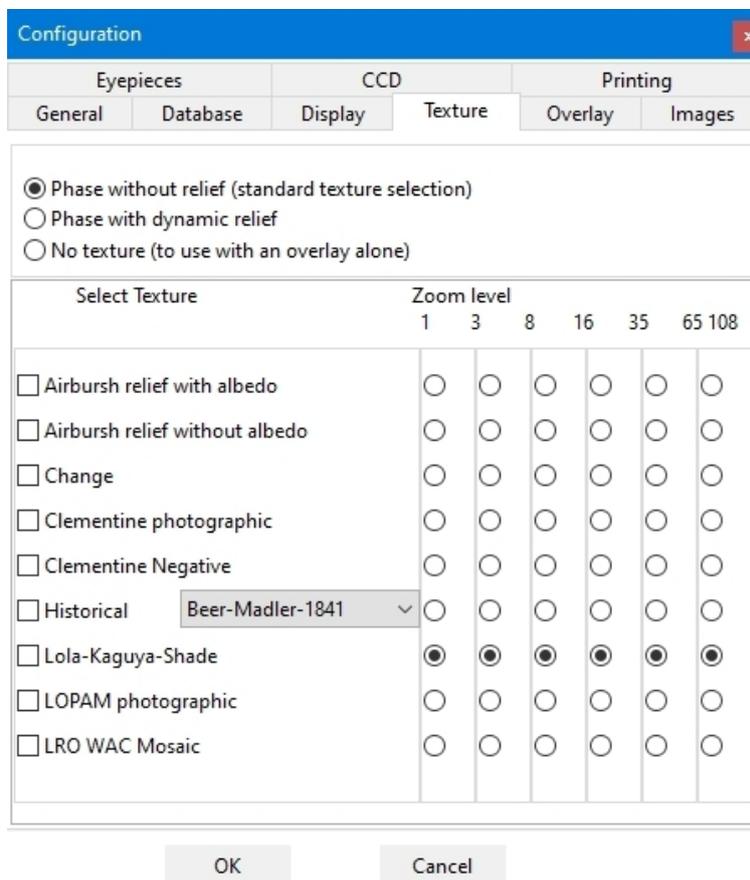
If you fill the "**Center label on formation**", the label will masks more the formation, but will be placed juste above it.

We recommand you to fill the "**Short label**" case if you use the "**Satellites formations**" and/or "**Unnamed formations**" databases, so that the display will not be covered with long names, according to the huge number of registered formations in these databases.

You can choose the labels font when clicking on the "Labels font" button. It will be certainly necessary to you to try several possibilities coupled with the labels density and their color to find the best display for you.

The "**Label density**" cursor allows you to increase or reduce the number of names formations displayed at the same time on the map.

Click on the "**Textures**" thumbnail.



The three alternative cases "**Phase without relief**", "**Phase with dynamic relief**" and "**No texture**" are used to activate or not the display of dynamic shadows on the lunar terminator.

If your computer has not a performing graphic card, fill the "Phase without relief" case and choose only the "**Airbrush relief with or without albedo**" textures or uses the other textures but with a limit to the 1 to 8 levels..

This tab presents a **selection matrix** for selecting textures according to the applied zoom level. This new function is a very useful way for choosing the textures display.

You can choose to keep the same texture for all zoom range or select as above a progressive change parallel to the zoom change. You have just to select the wished radio button. There can only have one texture chosen for a given zoom level.

If you don't want to see any texture, fill the "No texture / To use with an overlay alone"

We think that it's better to use textures with increasing resolutions according to increasing zoom level. There are 6 resolution levels for the texture. The software

loads automatically the levels indicated according to the zoom applied to the map :

The Clementine texture goes up to 4 levels.

The "**Unified geological map**" texture goes up to 3 levels

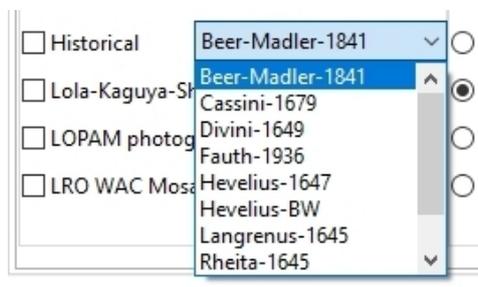
The **LRO, LOPAM, LRO-Kaguya and Chang'é 2** textures have 6 levels.

The textures "**Airbrush with albedo**", "**Airbrush without albedo**" go up to 3 level.

The textures "**Clementine photographic**" and "**Chang'é 2 photographic**" are used to show the aspect of the formations under the highest possible solar lighting.

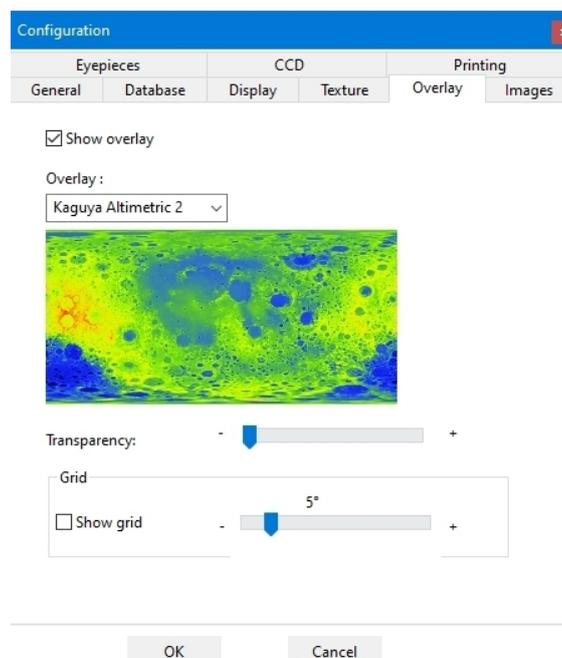
The "**LRO-Kaguya shaded**" texture is particularly suitable for displaying scientific layers.

If you wish to display an historical texture, you can choose one in the scrolling list juste at the right of the "Historique" case.



Choose the one you wish by clicking on it.

Click on the "**Overlay**" thumbnail.



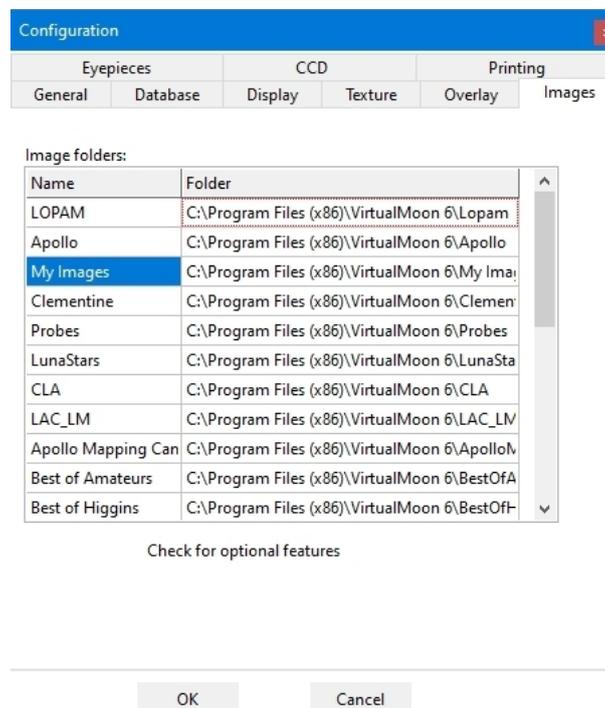
You can apply above the texture that you have chosen in the "**Textures**" thumbnail, a layer whose transparency can be set so that, you can continue to the texture below.

The "**Relief aerograph sans albedo**" and the "**LRO - Kaguya - Shaded**" textures are recommended to apply the overlays, according to the power of your computer. You can also choose not to display a texture in the "**Textures**" thumbnail of the "**Configuration**" menu (See above)

If you wish to display an overlay, fill the case "**Show overlay**" and choose one in the scrolling list below.

If you wish to display a coordinates grid, fill the case "**Show grid**" and choose the "step" of the grid with the cursor.

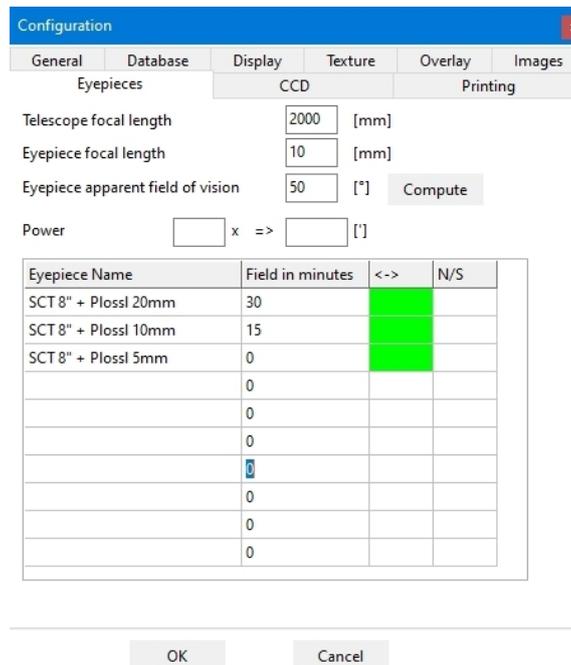
Click on the "**Images**" thumbnail.



Downside, you will find the images directories list. It will be possible for you to add new directories for your own images and others as you want.

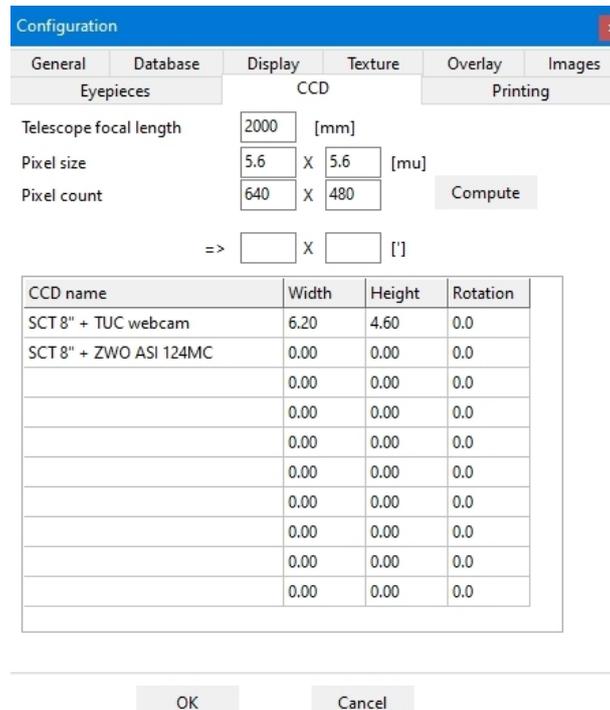
The "**Check for optional features**" allows to the module to determine if some of the pictures libraries stored on the VMA Web site have to be downloaded.

Click on the "**Eyepieces**" thumbnail.



Type the names of your eyepieces in the list. Fill the "Field" column and help yourself with the "Compute" button above. We think it's a good option to sort your eyepieces and combinations from the less to the more powerful. If you click on the right columns, you can activate (Green) or deactivate (Red) the "Left-right" (<->) inversion and the "Up-down" (N/S) inversion. So, if you own a Newtonian and a refractor, for example, you can program the exact views that each of these instruments will give you.

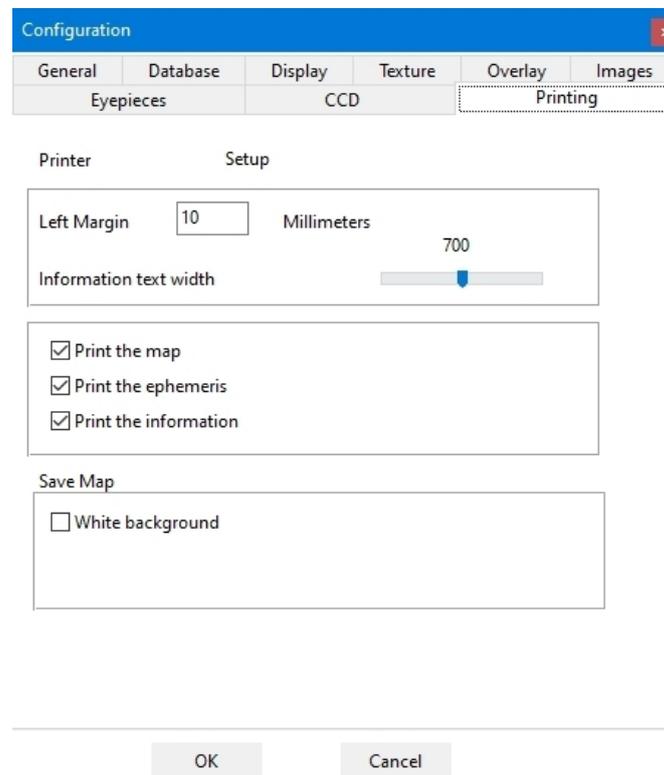
Click on the "CCD" thumbnail.



If you own a camera or a photographic body that you wish to take pictures of the Moon, type the names of these devices. Then fill the columns "Width" and "Height"

with the help of the "**Compute**" button and the associated fields above.

Click on the "**Printing**" thumbnail.



First, define the documents margin. We advise you to choose 10 mm, so that all the documents according to a single formation could be printed on a single page. The "**Information text width**" allows you to choose database datas printing police size. Here, we advise you to try several sizes and choose the best.

Fill the boxes of the documents you want to print. The three documents can be printed on the same page if you use a sufficiently small police size. We advise you to fill the "**White background**" box to reduce printing ink quantity when printing maps.

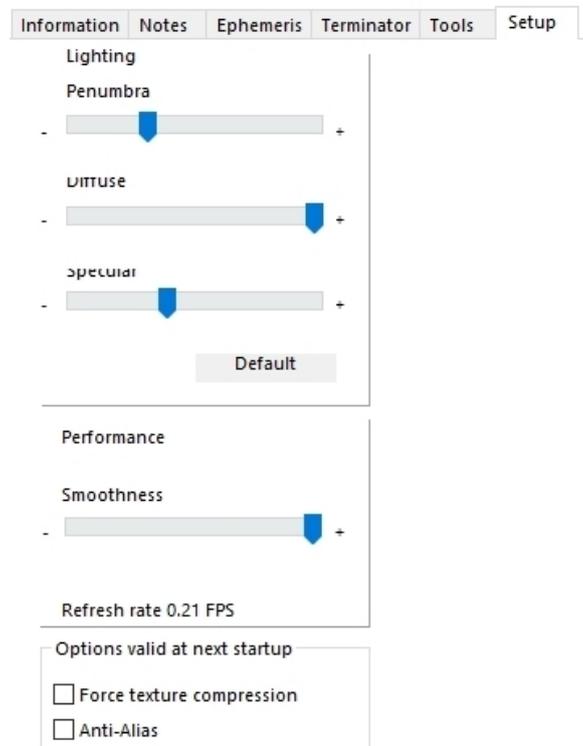
And now, validate your settings choices by clicking on the "OK" button. For some of these choices, you will be obliged to quit the module and relaunch it.

2) Other settings

Now observe how your graphic card manages the display when you zoom or when

you move the map. Is it slow or jerky ? If yes, you must improve the settings.

Click on the "**Setup**" thumbnail to the right of the screen.



It shows an interesting tool for the final configuration. At the bottom of the frame, you see an fps (Frames per second) counter called "**Refresh rate**". The higher the number, the smoothest the display.

Slide now the "**Penumbra**" cursor to choose the transparency degree of the night side. You must know that the display is speedier when the dark part is completely black. This permits also to mimic the "**Earthshine**" effect.

Slide the "**Diffuse**" cursor. It manages the general quality of the map.

Slide the "**Direct**" cursor. It manages the width of the blurred part at the terminator. The display is speedier when it' positionned on the left and in précision when slided on the right.

But, the setting that influences the most the display is the one managed by the "**Smoothness**" cursor. This cursor is used to manage the precision of the 3D sphere on which are applied texture and overlay. Completely on left, it's not a sphere but a polyhedra with faces.

Moving the cursor to the right will increase the number of faces, but this setting becomes more and more greedy in ressources. Going to a better spherical shape will improve the formations places precisions on the 3D map.

You have now to adjust this various cursors to obtain an acceptable compromise between smoothness and fluidity. It's not good to go below a 4 fps display rate since it can block the computer.

If you know well Open GL, can also try settings with the "**Force texture compression**" and "**Anti-Alias**" cases. You must restart your computer so that these modifications will be taken.

Click on the "**Tools**" thumbnail on the right.

Information	Notes	Ephemeris
Terminator	Tools	Setup

Distance

Real Distance

Apparent Distance

Measure the distance

Centre L B

Rotation

West East

Default Orientation

North South

Mirror

Celestial Pole on top

Local zenith on top

Telescope

ASCOM Show Menu

Goto selected Sync selected

Track position

Fill the "**South**" box if you use a Newtonian so that the map display will be as you can see the Moon in your telescope. Or fill the "**North**" and the "**Mirror**" boxes if you use a refractor or a Maksutov or a Schmidt-Cassegrain telescope.

Validate all your choices clicking on the "**OK**" button. You can now enjoy all the power of the **Virtual Moon Atlas** !

Have a good observation !

How to view the Moon for a given date and hour

to prepare an observing session

You wish to know the aspect of the Moon for a next day to prepare your observing session, maybe for two different reasons :

- You would like to observe "Deep Sky" objects and Moon presence is not wishable.
- You would like to observe the Moon and know visible formations on the terminator.

Once the software started, the "**Map window**" appears displaying a true 3D lunar globe. If you haven't yet done it, go inside the "**Configuration**" menu and fill the "**Phase**" and "**Libration**" boxes. press "**OK**". You can also click on the "**Phase**" and "**Libration**" buttons in the buttons bar on the top.

Click on the "**Ephemerisis**" thumbnail.

- If it's an immediate observing session, click on the "**Now**" button and the software will synchronize on the "**System**" date and hour of your operating system.
- If it's for a future observing session, set date and hour with the upper arrowed boxes and click on "**OK**" button.

The lunar globe shows you now phase and librations for choosen date and hour.

Clicking on the "Ephemerisis" thumbnail, you can see in the right window all the needed datas.

Then, click on "**Terminator**" thumbnail

In the right window, you can see now a list of formations visible on the **terminator**.

You can limit this liste with your interest level using the upper scrolling list. You can also reduce this list to the formations only easily observable in your instrument, choosing the nearer of yours in the "**Instruments**" scrolling list.

You can sort this list according to name or latitude formation activating the corresponding box.

Click now on the list first formation and its position is displayed on the lunar disk. Scrolling down in the list with arrowed keys will permit you to see the position of other formations and have a good idea of termiator and prepare your observing session.

How to find an unknown lunar formation

that you just discover the existence

You have just discover in a magazine or in a book about the Moon, the existence of an interesting lunar formation you just don't know the existence before. The Virtual Atlas of the Moon will indicate you its existence.

Start the **ATLUN** module. We will choose for our example "**Mons Rümker**" that your new information has just revealed you the existence.

Click on the "**Information**" thumbnail. In the "**Search**" input zone at the bottom of the frame, type with upper case letter and without any accent or " " :

MONS RUMKER

Then, click on the "**Search**" button. In a few seconds, you can see Mons Rümker position indicated on North - West part of the lunar disk.

Please, also note that this powerful search function is very powerful because you can use "jokers" : *

So, if you type

MONS*

You can see the positions of all formations whose official name begins with "MONS". You have just to click on the "**Next**" button to see them one after the other.

How to find an unknown lunar formation that you just discover the existence

You have just discover in a magazine or in a book about the Moon, the existence of an interesting lunar formation you just don't know the existence before. If you own a computerized "**Goto**" mount which accepts the **ASCOM** protocol, the **Virtual Atlas of the Moon** will track it directly on the Moon.

First of all be sure that you have installed the good ASCOM drivers on your computer. If not, go on the internet to the site <http://ascom-standards.org/>

Connect your mount to your computer

Start your computer and the **ATLUN** module. Go to the "**Tools**" thumbnail on the right.

Then use the telescope pad or a planetarium software to target the Moon.

Click on the "**Show menu**" button and launch the connection.

Begin centering a well known formation in the eyepiece field and select it on the map. Push the "**Sync selected**" button for initializing telescope coordinates on this position.

It's also possible to make this operation on a star near the Moon with the planetarium program.

After, check the box "**Goto selected**" so that the map displays always the telescope position.

If your telescope can do automatic pointing, you can now click on a formation on the map, or choose it with the "**Search**" function of the "**Information**" thumbnail and then click on the "**Goto selection**" button

How to study a known formation and know how and when observe it

You would like to observe a particularly interesting formation, or you have just discover in a magazine or a book about Moon, a special interest for this formation. The **Virtual Moon Atlas** will indicate you all the informations it contains and when you can observe it well.

Start the software. We will choose for our example the "**Alphonsus**" crater that your new information has just revealed you an interesting detail.

As you now well where is **Alphonsus**, just slide the upper zoom cursor to half its way. You can also use your mouse wheel if you own one. The lunar globe magnifies.

Click on the map or globe with left button, stay clicked and move the mouse to move simultaneously the map, as grabbing it, to center **Alphonsus**. It's is now visible and you click in its center. Its name is displayed confirming you that you were right. If you made a mistake, you have just to search it as described above.

When you identify **Alphonsus**, use the "**Center**" button. Then, map shows you that it's a not too old crater with a central peak and pretty high walls.

You can read all the detailed informations about it in the right window "**Information**". You will find here informations about the origin of its name, on its position, its dimensions, a complete description, observing advices and the official datas of the **International Astronomical Union** (IAU).

Note also the "**Profile**" frame above the right window that gives a good idea of a cut of this crater.

For a well understanding of the description, click on the "**Picture**" button. This will launch the **PHOTLUN** module. An horizonatl frame will show you pictures available in the various pictures libraries of the **VMA** that you have downloaded and installed. Remarkably detailed pictures show you morethan in every terrestrial instrument. Click on the one you want to display and it appears in an independant window.

You can adjust the picture size and definition using "**Zoom +**" and "**Zoom -**" buttons of its window. Lifters are used when it's too big to fit in the main window. You can also set light and contrast.

The picture shows you well the black dots, the central peak and the rilles indicated in the description and even more if you consider all the craterlets visible inside.

How to search a formation of the libration zone and its next observing date

Discover together now the last face of the power of the "Virtual Atlas of the Moon". The problem is to search a formation located in the librations zone which only periodically visible. We will use the famous "**MARE ORIENTALE**" ... which is on the East side of the visible face , but now on the West part since the **International Astronomical Union** has changed the orientation of lunar maps.

Start the program. Click on the "**Information**" thumbnail. In the input zone of the upper scrolling list, type with upper case letter and without any accent or " " :

MARE ORIENTALE or *ORIENT*

The, click on the "**Search**" button. In a few seconds, you can see **Mare Orientale** position indicated on South - West part of the lunar 3D globe. Maybe it's really visible according to the date taken by the software

Slide the zoom cursor in its middle. The 3D lunar globe becomes bigger.

Click on the globe with left button, stay clicked and move the mouse to move simultaneously the map, as grabing it, to center **Mare Orientale**.

You can read all the detailed informations about it in the right window. You will find here informations about the origin of its name, onits position, its dimensions, a complete description, observing advices and official datas of the **International Astronomical Union**.

These pictures show you **Mare Orientale** in a way impossible to observe from Earth, but how do we see it at the best from Earth ?

Close now the picture window with a click on its "**Close**" button to come back to the globe.

Click on the "**Configuration**" menu, than on the "**Display**" thumbnail and activate

"Phase" and "Libration" boxes if it's not yet done.

Click on the "**Ephemerisis**" thumbnail and with the ">>" button, go in the future to a one day per click rate.

You will then witness the slow move of the lunar globe and the terminator path. Note the arrow showing you the place where the libration is maximum and how its size varies with the libration intensity.

Observe as **Mare Orientale** is from times to times more visible. A good observing period will be when the position is good and on a Full Moon day. With a sufficient clicks number, you will find a such day in the future. it will be indicated in the date boxes above the videorecorder buttons. Look at the hour to confirm it's not during the day. Now, you have just to wish that you will be free on this night and that meteorology will be favorable !

You can also have a look to **Mare Orientale** as if you were orbiting the Moon, just above it. Click on the "**Full globe**" and the "**Center**" buttons in the buttons bar above. And you can see now an impossible view from Earth !

How to look at a formation in its geological context

With the **Virtual Atlas of the Moon**, you can also obtain informations on the geological history of the formations and their surroundings.

Go to the "**Configuration**" menu. Select the "**Textures**" thumbnail . Find the "**Unified Geologic map**" in the matrix and select it. You can choose the 1 to 8 zoom levels. Click on "**OK**". The geological map is displayed. We advice you to remove the phase.

Click on the "**Information**" thumbnail. In the field "**Search**" at the bottom, type the name of the wished formation. Click on the "**Find**" button.

The searched formation is shown on the map. Move the "**Zoom**" cursor to magnify the map as you want and click on the "**Center**" button to center the selected formation in the map window.

Click on the "**Information**" thumbnail at right to read the datas about the choosen formation.

How to generate documents usable "in the field"

The **Virtual Moon Atlas** allows you to generate printed documents usable "in the field". How to proceed ?

Open the "**Configuration**" menu. Click on the "**Printing**" thumbnail. You can choose the width margins of the printed documents, information page police size and what documents to print.

The two most important are the map to find a formation and the information page of this formation. Fill the two corresponding boxes. The two documents will be printed on the same page if you have chosen a sufficiently small fonts police.

Click on the "**Display**" thumbnail of the "**Configuration**" Menu. Move the "**Label size**" to the right to increase the printed names size and make them more readable. You will certainly have several tests to do before finding a good compromise..

We advise you to choose black or white colors for marks and labels if you own a black and white printer as laser ones.

Then, click on the "**Tools**" thumbnail. Fill the box "**Mirror**" to obtain a lunar map similar to what you will see in a refractor or in a Schmidt - Cassegrain, Cassegrain or Maksutov telescope.

But, if you own a newtonian telescope, unfill the box "**Mirror**" and fill the box "**South up**".

Then choose the magnifying factor. With "**Zoom**" cursor at left, the map shows the whole Moon as it's visible with a X100 magnification, filling nearly all the field of a classical eyepiece.

Right click on the mouse or use the "**Zoom**" cursor to choose the zoom factor to X 2 that corresponds to a X 200 magnification or X 4 which is for a magnification of about X 400.

Then, open the "**File**" menu. Setup your printer selecting "Print Setup". Choose your printer in the upper scrolling list and the alimentation mode. We recommend you to choose "**Portrait**" format. Then click on the "**OK**" button to validate your choices.

Re-open the "**File**" menu and choose "**Print**" selection to send to your printer the selected documents.

After printing, you obtain a document giving you all what you need to find a formation and understand its own history.

How to study the Far Side

With the VMA, you can view the Moon Far Side.

For that, press the "**Full Globe**" button in the upper bar. In this "**Full Globe**" mode,

mouse and lifters role change.

Mouse is for turning the globe around its polar axis and lifters are for area centering.

You can turn the globe and go viewing the Far Side relief. If, in the "**Databases**" thumbnail of the "**Configuration**" menu, you have filled the "**Far Side named formations**" box, names of formations will be indicated as on the visible face and you will have access to their informations in the "**Informations**" thumbnail on the right.

Mimic an astronaut

With the VMA, you can have a good idea of what was the show enjoyed by the Apollos missions astronauts when orbiting around the Moon.

Open the "**Display**" thumbnail of the "**Configuration**" menu. Unfill the "**Show label**", "**Show mark**" and "**Mark the point of maximum libration**" boxes for no landscape obstruction. But if you want to know the viewed formations, don't make that.

Open the "**Textures**" thumbnail to choose the "**LRO WAC mosaic**" texture.

After, you have just to press the "**Full Globe**" button in the upper bar.

In this "**Full Globe**" mode, mouse and lifters role change.

Mouse is for turning the globe around its polar axis and lifters are for area centering.

Click on the "**Tools**" thumbnail at right and click on the "**East**" or "**West**" buttons to rotate the globe as you want. Best is with the equator up.

Right click on the map and select your most powerful eyepiece. The circle simulates the "window" of your spaceship. Use the lifters to center the lunar limb or use the "**West view**", "**Center**" or "**East view**" button of the "**Satellisation**" frame to choose your area.

Select the satellisation speed in the scrolling list and press on the "<" or ">" button to choose the move direction. The "**II**" button is for stopping the move for displaying the formations names.

Select the speed you wish. And now, have a dream...

How to see a formation in a scientific context

You can also observe the repartition of different elements on the Moon surface or look at topographical datas on the full lunar globe with the "Pro" version.

Go to the "**Configuration**" menu. Select the "**Overlays**" thumbnail. Fill the "**Show overlay**" box and choose the scientific overlay in the scrolling list below. Set the

transparency with the cursor. Click on the **"OK"** button. We think it's better to remove the phase and libration effects by clicking on the **"Phase"** and **"Libration"** buttons. You can also access the Farside if you press the **"Full globe"** button.

If you press the **"2nd window"** button, you create a new window besides the first and you can set its display with another scientific overlay so that you can compare the same area with two parameters.

How to study a specific type of lunar formations

With **"DATLUN"** (c), the VMA databases manager, you can select a specific type of lunar formations that you wish to localize and study.

Patrick Chevalley has chosen to build **DATLUN** on **SQL** language so that it will be possible to generate elaborated multicriterias requests.

And more, the informations entered in the databases by Christian Legrand are always **"formatted"** permitting precise requests.

These two factors conjunction allows you to select, for example lists of formations such as :

- Rilles over 4 miles wide visible 2 days after First Quarter.
- Craters with central peaks and a diameter between 20 et 30 km (Diameters zone where the peaks appear)
- Craters with flat floor filled with somber lava visible in a 50 mm diameter instrument.

- Formations appearing on Antonin Rükl "Atlas of the Moon" chart 33 or on page 58 of Hatfield Atlas.
- Formations appearing on LOPAM IV-108-H2 picture around Alphonsus
- Formations created during erastosthenian period
- etc....

After that, the **"Mark selection on map"** will start **VMA** with all the selected formations clearly localized.

We propose you to read the illustrated **"DATLUN"** manual for more informations.

How to study the origin of lunar names

With **"DATLUN"** (c), the VMA databases manager, you can also study the origin of lunar names.

Patrick Chevalley has chosen to build **DATLUN** on **SQL** language so that it will be

possible to generate elaborated multicriterias requests.

And more, the informations entered in the databases by Christian Legrand are always "**formatted**" permitting precise requests.

These two factors conjunction allows you to select, for example lists of formations with characters names presenting the same features such as :

- Characters living during the 18th century.
- English mathematicians or physicists (Or from any other country).
- Characters who have study the light.
- Craters whose character's name has been applied by Schmidt.
- Characters who are born in a specific town.
- Formations present on Langrenus map.
- etc...

It's the first time that a such tool is proposed for lunar observers.

END OF ATLUN MODULE MANUAL OF THE VMA 7

(This english version has been partially corrected by **Jim Gartner**. Thanks to him !

The authors thank in advance users to inform them about every mistake encountered in this manual in using the VMA Internet site forum.

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