# PLANETARY IMAGING WITH AN ALTAZIMUTH DOBSONIAN
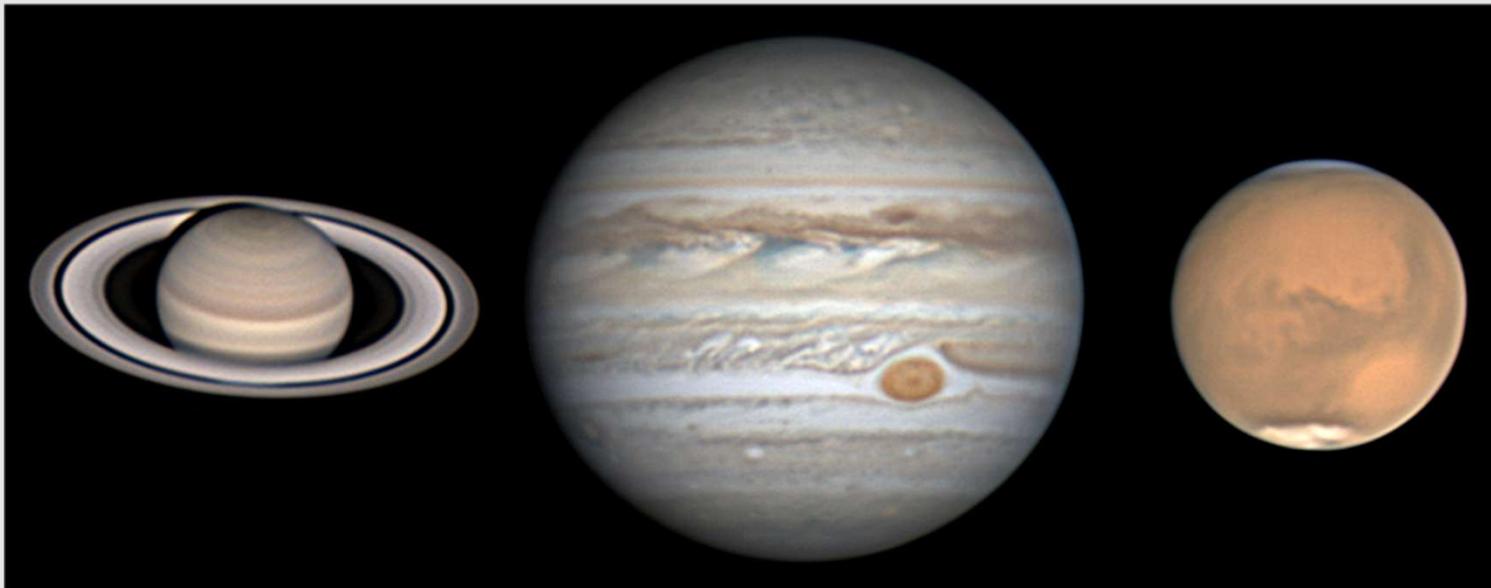
*Christophe Pellier*

**RCE – November 1st, 2018**

**Paris, Cité des sciences et de l'industrie**



LES RENCONTRES du ciel & de l'espace

1er, 2 ET 3 NOVEMBRE 2018

PLANETARY ASTRONOMY

*A website by Christophe Pellier*

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# EQUIPMENT USED



Skywatcher Flextube:
Newtonian telescope on
Dobson mount
D = 305 mm
F = 1500 mm
F/D = 4,9

Altazimutal tracking
with GOTO

With SynScan
commander

Bought used for €1250

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*Planetary imaging with an Altazimuth Dobsonian – C.Pellier – RCE 2018*

# EQUIPMENT USED

*Imaging setup : Barlow APM Comacorr 2,7x :*
*- Alone, with ASI290MM and filters: IR, UV, CH4*
*- With ADC for color imaging with ASI224MC*
*- With ADC and spacer tube in 2x2 binning for any filter requiring correction of atmospheric color dispersion (here I'm using a filter holder)*

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# EQUIPMENT USED

| Type of imagery | Camera | Photosite size | Ideal F/D ratio (photosite x 5) | Setup | Theorical separating power (SP) | Sampling | Number of photosite for the SP (ideal: between 2 and 3, close to 3) | Resulting F/D ratio |
|---|---|---|---|---|---|---|---|---|
| Color | ASI224 MC | 3,75 | 18,75 | Barlow APM+ADC | 0,39" | 0,14" | 2,77 | 18,11 |
| B&W | ASI290 MM | 2,9 | 14,5 | Barlow APM | | 0,14" | 2,83 | 14,01 |
| B&W | ASI290 MM | 2,9 | 14,5 | Barlow APM+ADC+Spacer and bin 2x | | 0,17" | 2,32 | 11,69 |

*The first two imaging setups are perfect. The third one would appear slightly under-sampled, but in practice with major planets at 15-25° elevation on my site in 2018, it worked very well.*

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1      2      3

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*(Images after resizing if needed)*
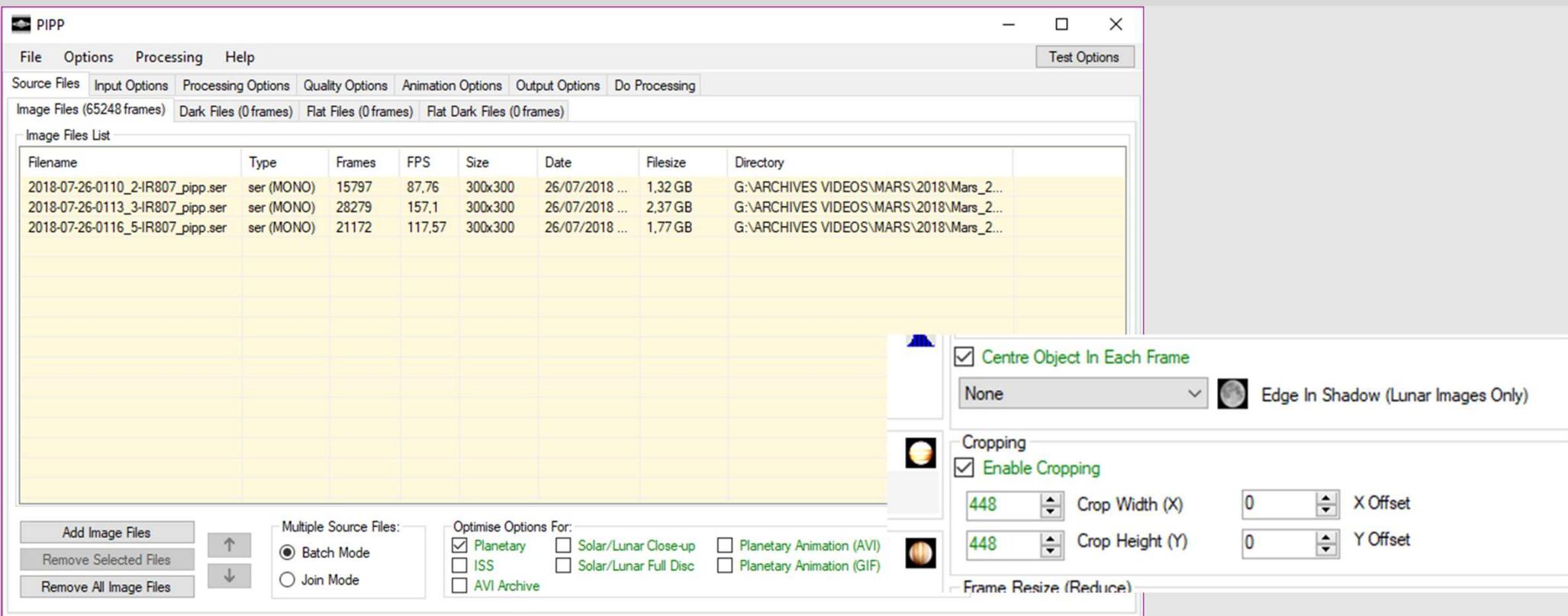
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# EQUIPMENT USED

*Tracking of the telescope is much less good than with an equatorial mount. It's not possible to use very narrow cropping during capture, this being a limit to the maximum framerate (in practice this was acceptable)*

*To improve tracking of features by processing softwares and save disk space, a secondary centering and cropping by PIPP software has become part of the whole pipeline.*
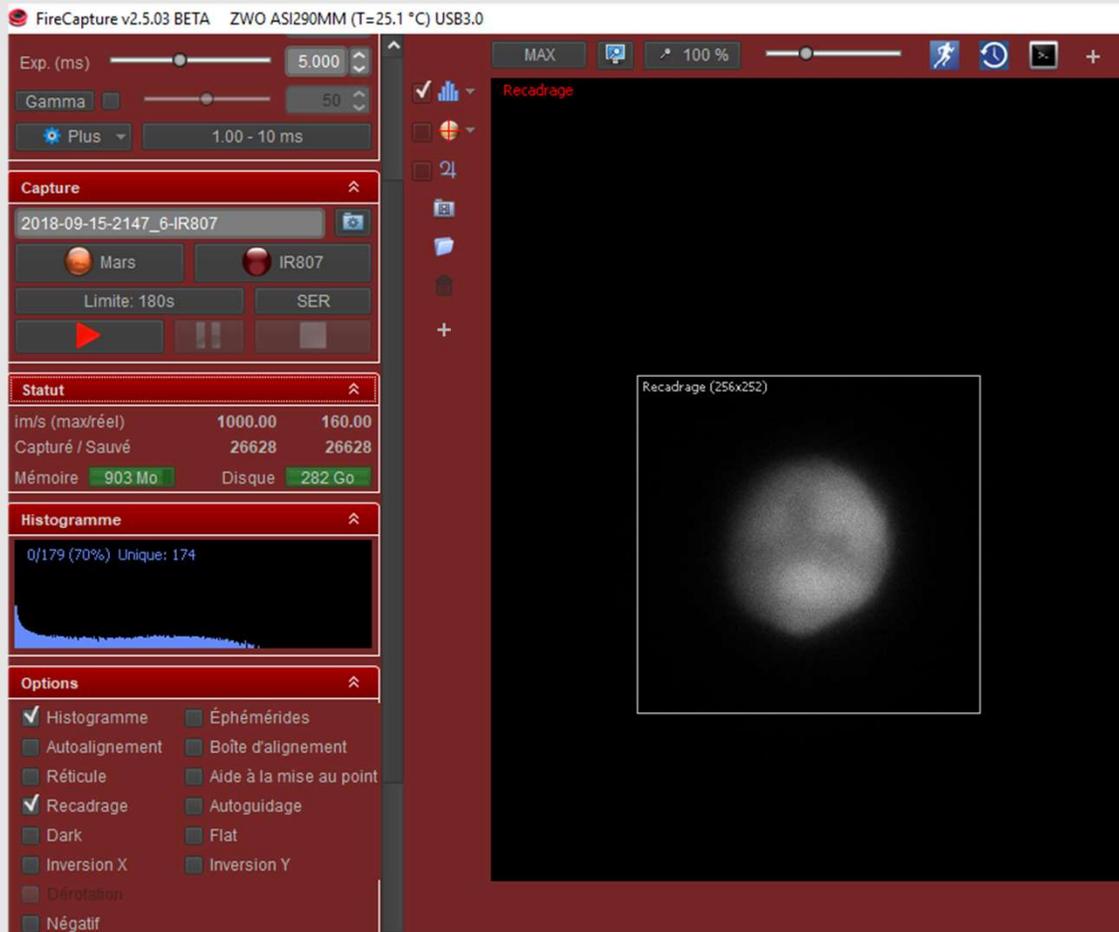
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# EQUIPMENT USED

It is as well possible to use some tools performed by the capturing softwares.
Here is a screen shot of FireCapture with live tracking and cropping. This solution is not perfect because it does not improve the frame rate (it's still necessary to use a large window of capture), however it does create an already centered and cropped video file.

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# FIELD ROTATION

As time is running, the astre rotates in the field of the eyepiece or the camera. This is not an issue for visual observing but while imaging, it will end with smearing of details at the edges.
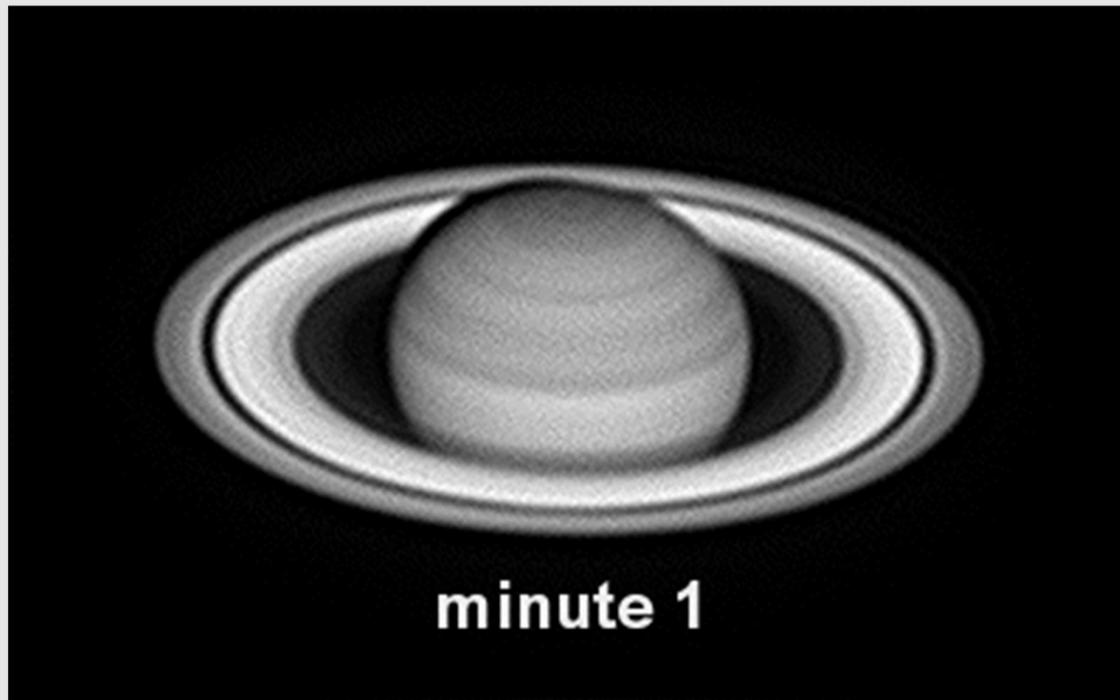


minute 1

Example of field rotation. This is an animation of the first, and last minute, of a 15 mn video file taken on Saturn. The measured angle of rotation between the two is 2,3°. Looks quite inacceptable for processing!

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# CORRECTING FIELD ROTATION



Copyright Marc Delcroix



Copyright: La Clef des Etoiles

*Usually two solutions can be considered to solve the problem of field rotation:*
*- The equatorial plateform, effectively transforming a Dobson into an equatorial Newtonian,*
*- A field rotator (or de-rotator) will correct the rotation at the eyepiece. These solutions work but are expensive and not free from constraints (the plateform requires to be reset again every hour or so)*



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# CORRECTING FIELD ROTATION



WinJUPOS
Grischa Hahn



AUTOSTAKKERT!
AS! Stacking Software – Lucky Imaging with an Edge – Emil Kraaikamp – AS!2, AS!3

*Modern softwares introduce solutions to correct field rotation with perfection. They are freeware (with no additional cost) and setting them is simple.*
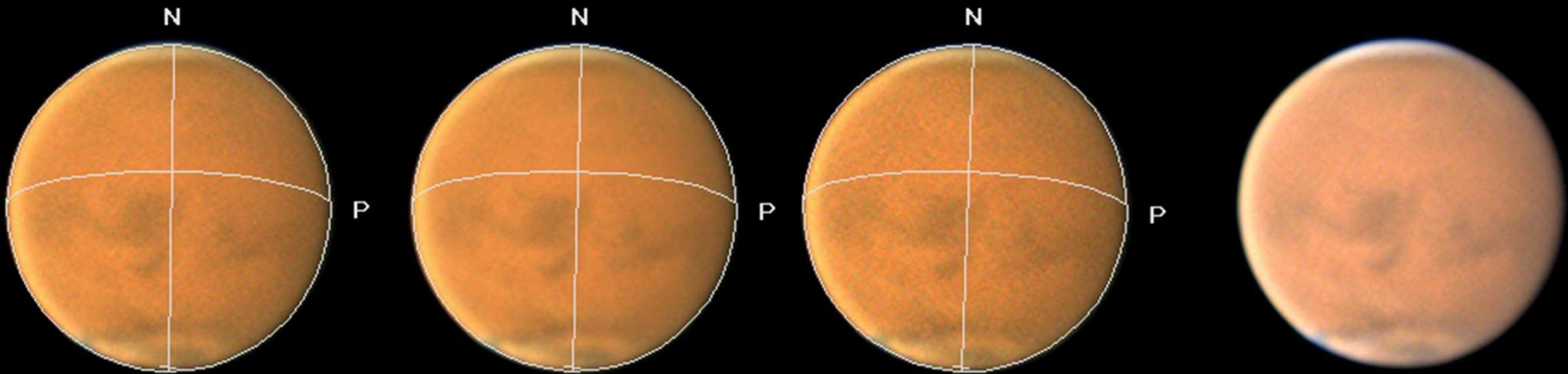


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# CORRECTING FIELD ROTATION

*1. Correcting field rotation with image de-rotation under WinJupos*
*The idea is the same as de-rotating images with an equatorial mount: use final, processed, images obtained from short videos.*
*Field rotation correction is performed by rotating the outline frame on each image in the same sense.*



*This method works but as for any derotation of images, the accuracy depends on the hability of the user to correctly set the outline frame.*
*…. While it will be very easy to do on Saturn, it was much more difficult in 2018 during the global dust storm on Mars! An approximate value of rotation was calculated and applied for each image. Not completely satisfaying…*
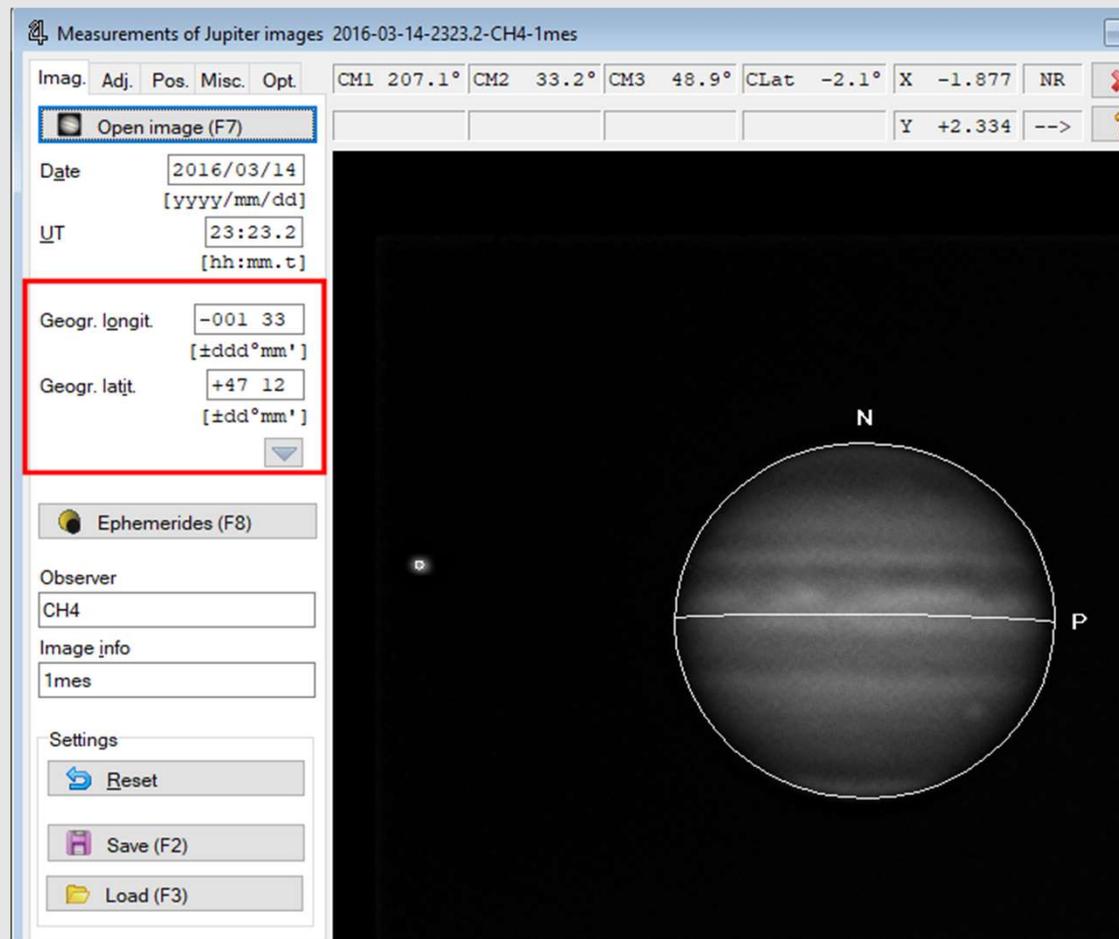
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# CORRECTING FIELD ROTATION

*2. Correction of field rotation by using the video de-rotation method with WinJupos*
*The method is strictly identical to derotate videos taken with an equatorial mount.*
*The field rotation correction is done by checking a simple box! And the accuracy of the software is amazing.*



When measuring the image of reference, just take care of writing the geographical coordinates of your observing site


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# CORRECTING FIELD ROTATION

*2. Correction of field rotation by using the video de-rotation method with WinJupos*
*The method is strictly identical to derotate videos taken with an equatorial mount.*
*The field rotation correction is done by checking a simple box! And the accuracy of the software is amazing.*



In the Video derotation window, just check: Compensation of field rotation in altitude over azimut mounts. You're done!

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# CORRECTING FIELD ROTATION
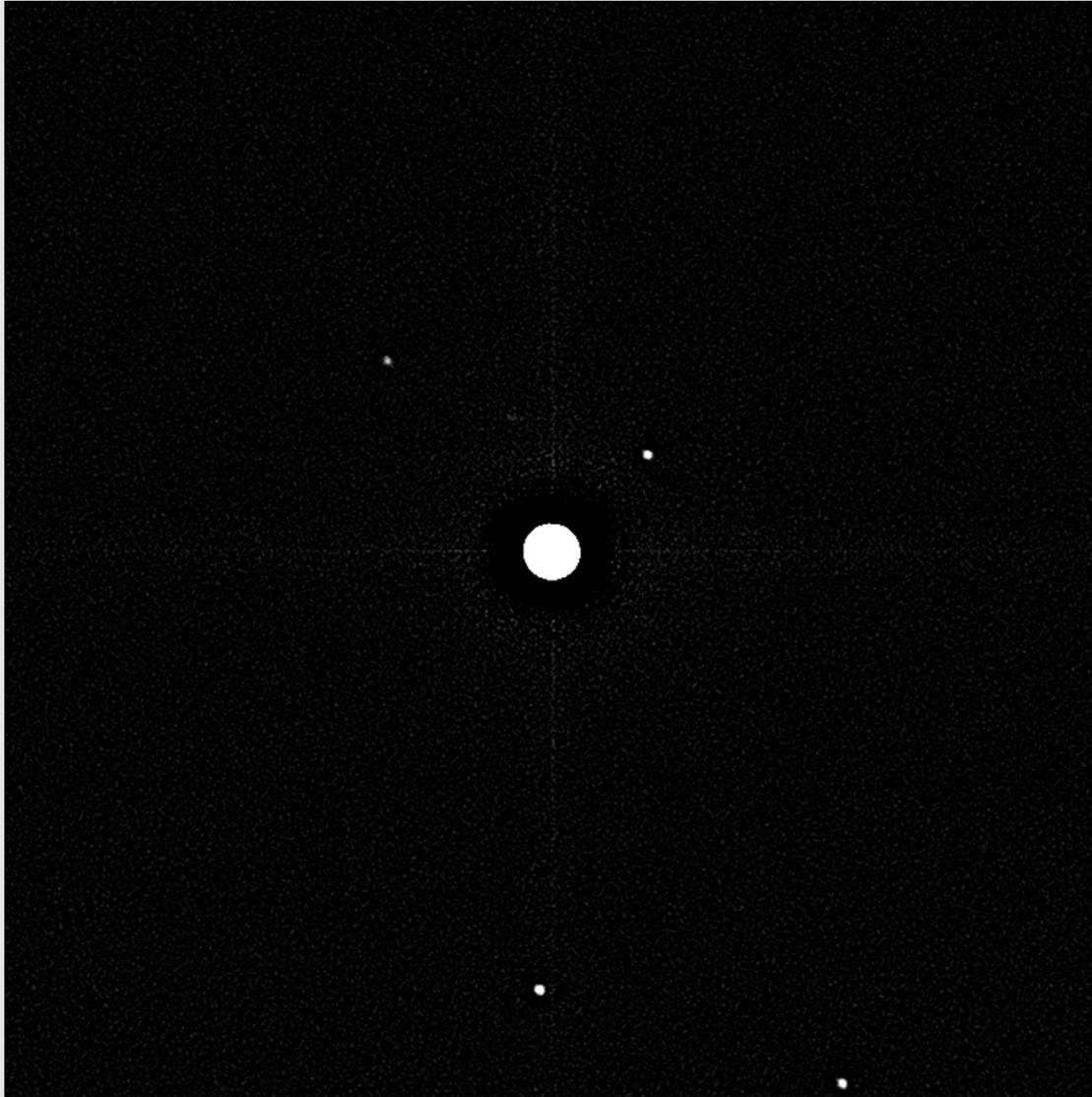


First test of field rotation correction with video derotation. This is a 15 mn video of Uranus. Not only the correction produces ponctual images of the moons, but it also have the diffraction spikes of the secondary spider reappear.
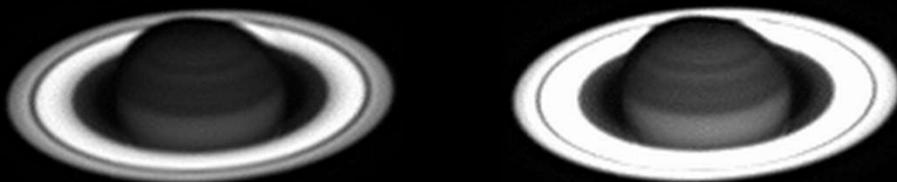
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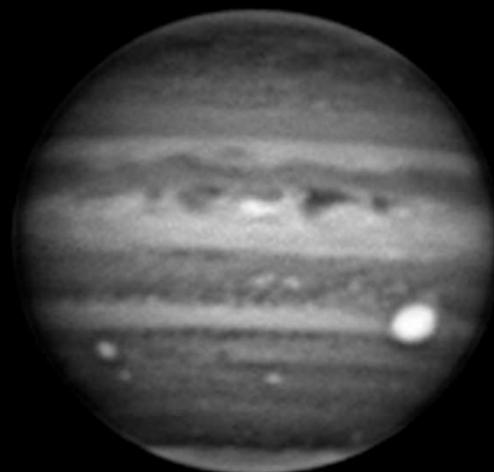
# CORRECTING FIELD ROTATION



SATURN

8 August 2018
Ls 104
Dia 17,8''
De +26,5
CH4 890/18 nm

21 H 39,8 UT
I 132  III 171
Video+Altaz derotation 30 mn

Christophe Pellier/SAN/AstroQueyras

*Umbriel*

*Ariel*

SW Flextube 305
ASI290MM

Christophe Pellier

243°
03 H 20,0 UT
Video+Altaz derotation 30 mn

JUPITER

19 June 2019
Dia 42,4''
CH4 890/18 nm

21 H 21,7 UT
I 339  II 335  III 211
Video+Altaz derotation 20 mn

SW Flextube 305 F/13,9
ASI290MM@0,28''/phot (bin 2x)

Examples of images
obtained from very long
videos, from 15 to 30
mn. They are perfect.

*Dobsonian – C.Pellier – RCE 2018*

**Experimental Features**

**Field Rotation** — Remembered in INI!!

| | | | |
|---|---|---|---|
| Observer | Latitude | 44 | deg. |
| Object | Altitude | 45 | deg. |
| | Azimuth | 26 | deg. |
| Recording | Duration | 900 | sec. |
| Rotation | First Frame | 0,00 | deg. |
| | Last Frame | 3,44 | deg. |

☑ Enable Field Derotation    Apply

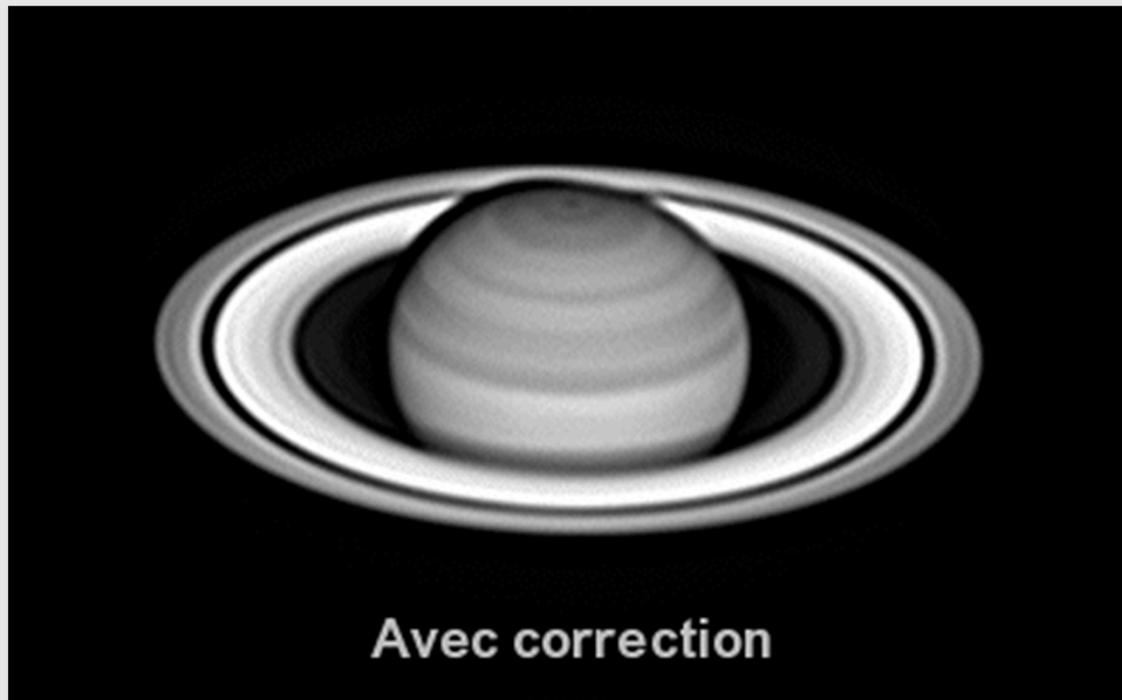The functions have not been tested much!!

Derotation:
Rotates input and output image between rotation first frame and rotation last frame. You can manually enter values under rotation as well, if first and last is the same, it will rotate each frame a fixed value! You can also measure a single rotation angle directly from the recording, by holding Alt + Left and Alt + Right to set the first and second point to describe the rotation angle!
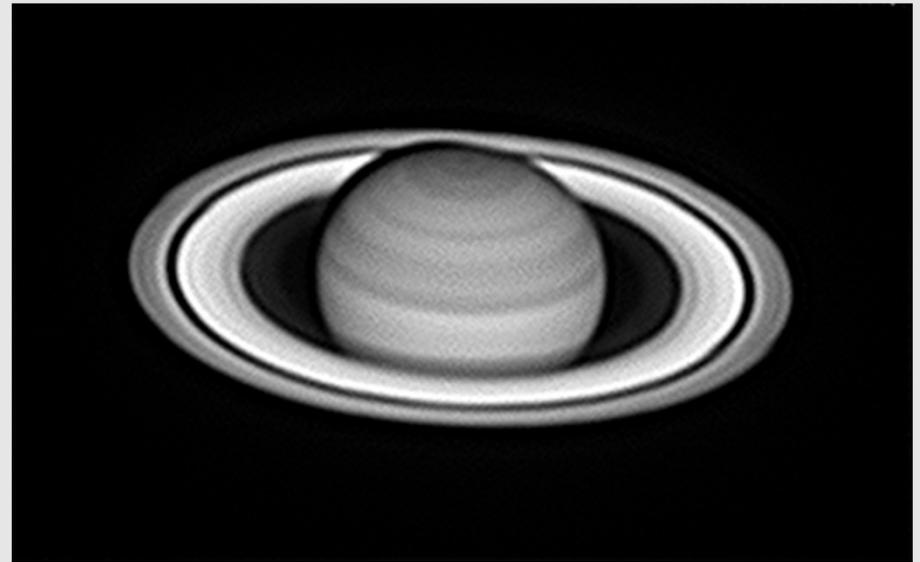
*3. Correcting field rotation with Autostakkert! (2 or 3)*
*This experimental function does not seam to give very good results. However, the strength of this software is out there..*
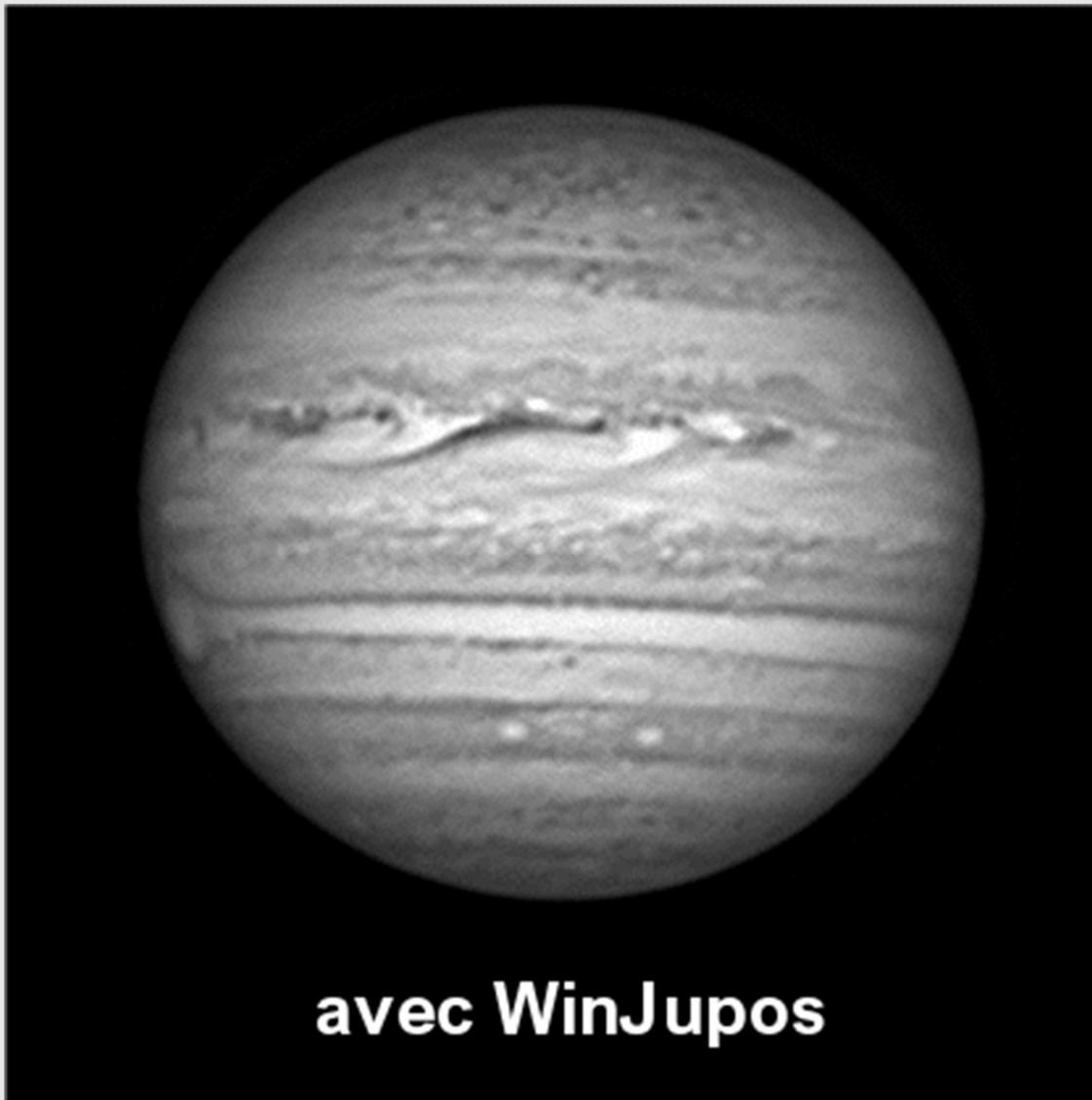
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# IS FIELD ROTATION REALLY NECESSARY ?



Avec correction

*The multipoint alignment of Autostakkert! Has in itself an amazing capacity to correct field rotation. Here is again the same 15 mn video of Saturn processed with (avec) or without (sans) WinJupos field correction (100 % of the frames are stacked to be sure of the result). Even without correction the rings are still perfectly aligned, so do the belts.*

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# IS FIELD ROTATION REALLY NECESSARY ?



avec WinJupos

*However we must take care of not abusing of Autostakkert!'s strength.*
*As for correction of globe rotation, there are some limits to the capacity of multipoint alignment, used alone.*
*AS! can be run on short videos of < 5 mn (depending on the planet) but only the association with WinJupos will produce real accuracy.*
*(look especially the upper left corner of this animation of a 5 mn Jupiter)*
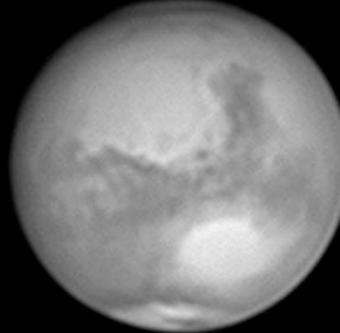
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# SOME RESULTS

Field correction performed with images derotation only.
2 to 4 individual frames combined.
Videos of 3/4 mn

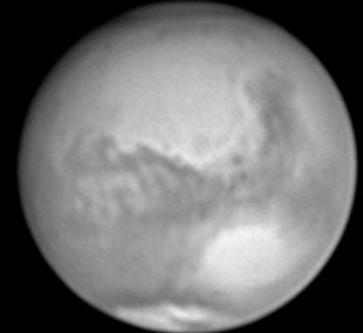**MARS**  6-7 August 2018  Ls 226 / Dia 24,1" / De -10,0

RGB — 334° / 00 H 10,5 UT / 2x3 mn
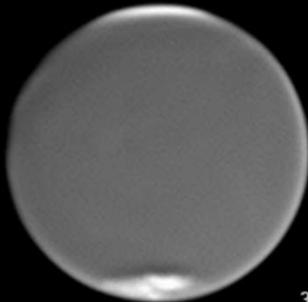
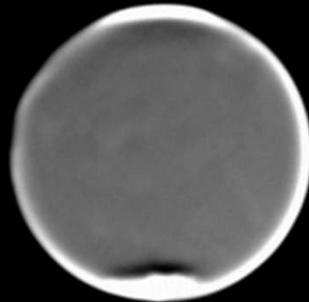IR 800 nm+ — 314° / 22 H 47,5 UT / 3x3 mn
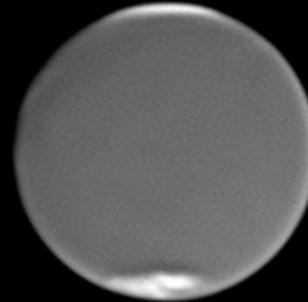
IR 740 nm+ — 323° / 23 H 26,2 UT / 2x3 mn
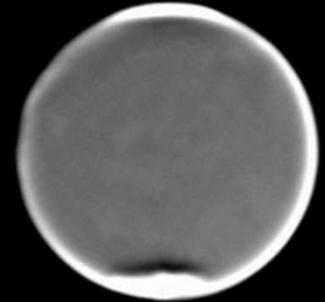
B 425/50 nm — 327° / 23 H 40,6 UT / 3x3 mn

B 436/10 nm — 330° / 23 H 52,7 UT / 3x3 mn

Christophe Pellier/SAN/AstroQueyras

SW Flextube 305
ASI224MC/ADC/IR-cut
ASI290MM (ADC for B)

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# SOME RESULTS



JUPITER — 19 June 2019 — Dia 42,4" — RGB
JUPITER
20 H 47,8 UT
I 318  II 315  III 190
Video+Altaz derotation 2x5 mn
Christophe Pellier — ASI224M

JUPITER — 19 June 2019 — Dia 42,4" — IR 740 nm+
26 June 2018 — Dia 41,6 — UV 350 nm
21 H 02,8 UT
I 327  II 324  III 200
Video+Altaz derotation 5 mn
SW Flextube 305 F/13,9
ASI290MM@0,14"/phot

21 H 11,8 UT
I 358  II 301  III 179
Video+Altaz derotation 15 mn
Christophe Pellier
SW Flextube 305 F/13,9
ASI290MM@0,28"/pnot (pin 2x)

Video derotation only for Jupiter.
5 mn for RGB and IR,
15 mn in UV

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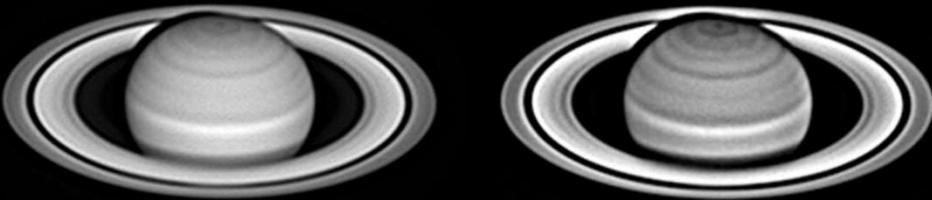
# SOME RESULTS



Video derotation only for Saturn.
Videos of 8 to 15 mn, depending on filter (30 mn for CH4)

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# SOME RESULTS
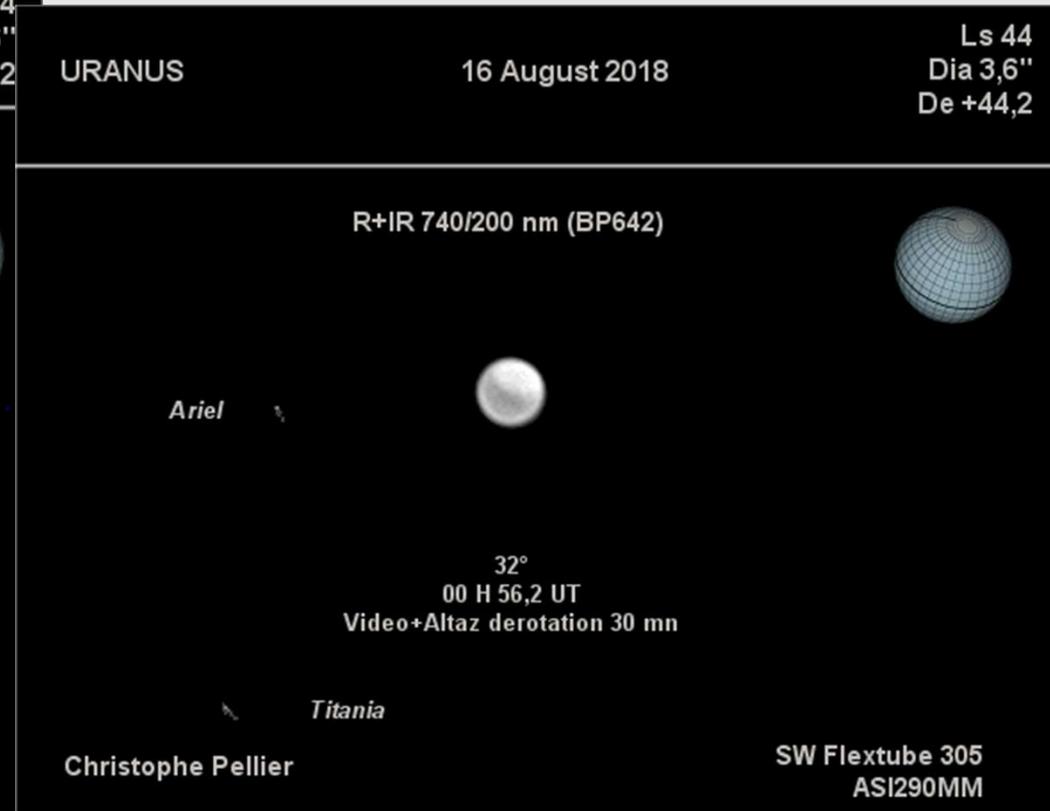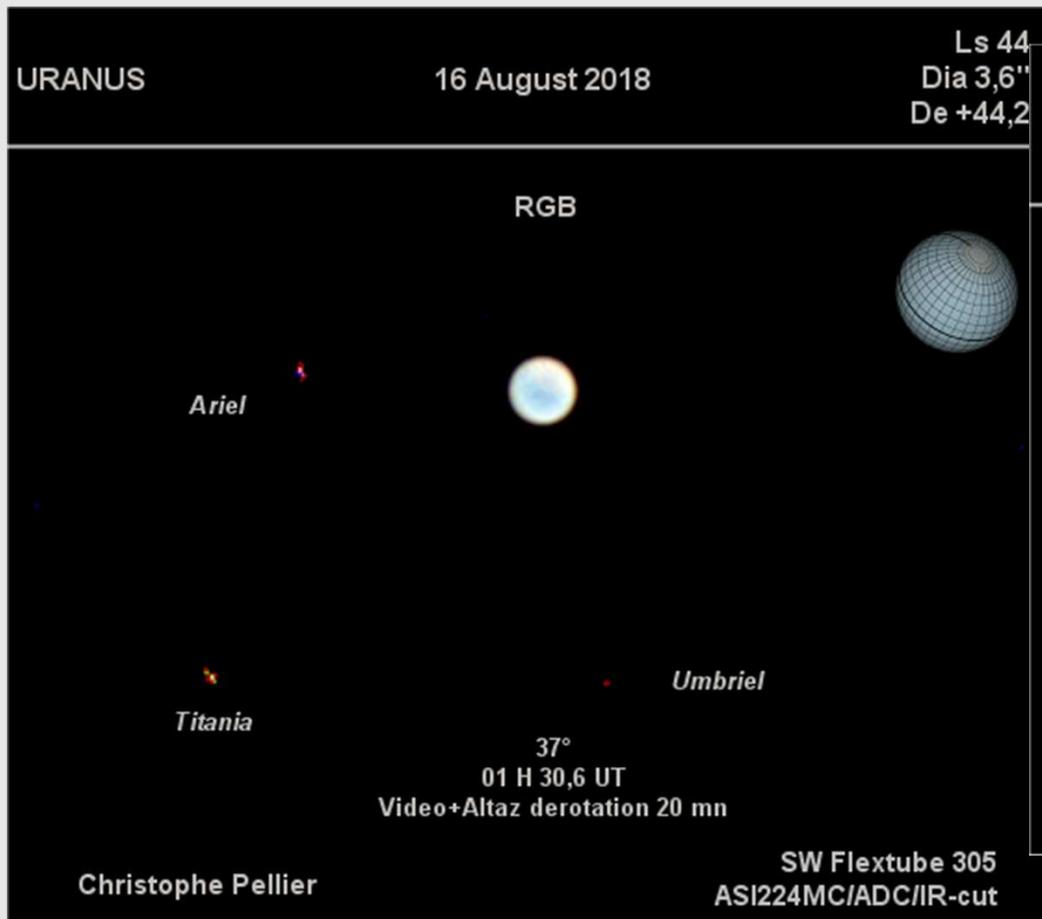


Video derotation only for Uranus.
Videos of 20 to 30 mn

# IS THE ALTAZIMUTH NEWTONIAN THE INSTRUMENT OF THE FUTURE?

*For planetary imaging, a field de-rotator or an equatorial plateform has become unuseful.*

*This can result in substantial budget savings:*

*- Hundreds of Euros for a de-rotator*

*- Thousands of Euros for a double axis equatorial plateform*

*Comparing the costs of an altaz Dobsonian with the average costs of the instruments usually chosen by amateurs to image planets, savings become even more important since an equatorial mount, necessary to support optical tubes of more than 300 mm (12") can easily outpasses 10k €.*

*The complete budget of an altaz, motorized, newtonian sometimes is not even able to cover the cost of the OTA alone of an equatorial setup.*

BACK TO SUMMARY

# IS THE ALTAZIMUTH NEWTONIAN THE INSTRUMENT OF THE FUTURE?

*A few comparison of complete telescopes (optical tube + motorized mount)*

| Mid-level | | Upper level | |
|---|---|---|---|
| Complete instrumentation | Cost | Complete instrumentation | Cost |
| Dobson altaz 305 | 2 000,00 € | Dobson altaz 400 | 8 000 – 10 000 € or+ |
| Schmidt Cassegrain 280/300 mm | 4 000-7 000 € | Planetary cassegrain 400 | 15 000 – 20 000 € or+ |

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