High Resolution Planetary Imaging Workflow

SUMMARY

Choosing the Right Equipment

Imaging Workflow

a. Preparation

b. Image Capture

c. Image Processing

d. Post Processing

e. Archiving

Monochrome or Color

Color CCD

Pro: Simple to Setup and Fast Processing. Very inexpensive setup.

Cons: Less sensitive CCD due to Bayer Layers. Needs to compensate for Atmospheric Dispersion.

Monochrome CCD

Pro: Very Sensitive CCD, better image quality, no problem with Atmospheric Dispersion.

Cons: Expensive and Complicated Setup.

Some Useful Accessories

Barlow	Increases the image scale of the object imaged
Motorized Filter Wheels	Allows vibration free changing of filters.
Filters:	
RGB Filters	To make colored image from monochrome camera.
UV, IR and Methane Band Filters	Special Filters to reveal atmospheric details on gas planets.
Flip Mirror	Time saver in centering an object to the CCD camera.
Motorized Focuser	Allows vibration free and fine focusing
Vibration Suppression Pads	Reduces high frequency vibration when imaging on hard surfaces

Preparations before Imaging

Location, Location, Location

- Best place to do planetary imaging is at the area close to the equator (where planets are higher), and close to the sea.
- **Stay away from heat sources (ie., air conditioning system, chimneys, hot asphalt, etc.)**
- **The three most important thing in getting quality planetary image are: seeing, seeing and seeing!**

COOL YOUR OTA

1. Setup early and cool down your OTA.
2. Use a cooling fan to reduce tube currents. The bigger the OTA the longer it requires to cool.

LOCK THE MIRROR

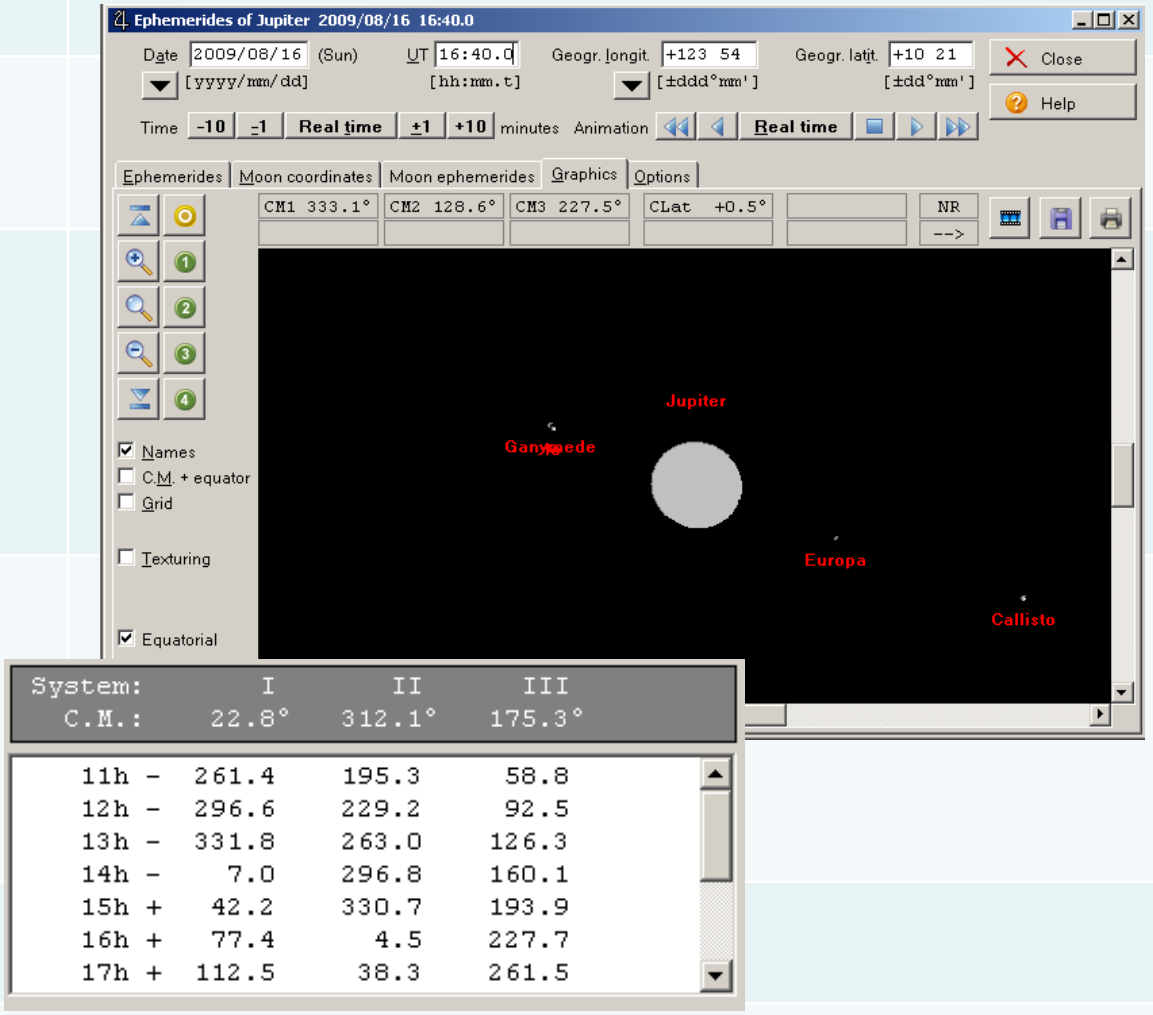
Lock the mirror after focusing to prevent focus shift!!

Plan your imaging with WinJupos

Use the Ephemerides function of Winjupos.

Check which side of the planet will be visible in your planned observing time.

Check the position of the moons of the planets to check for transits or eclipses.



If you do not plan, you might miss exciting events!!

IMAGE CAPTURE

FireCapture

Currently, one of the best capture software.

It supports a variety of cameras.

Feature rich. It can control the mount, filter wheel and focuser using ASCOM.

It’s Free!!

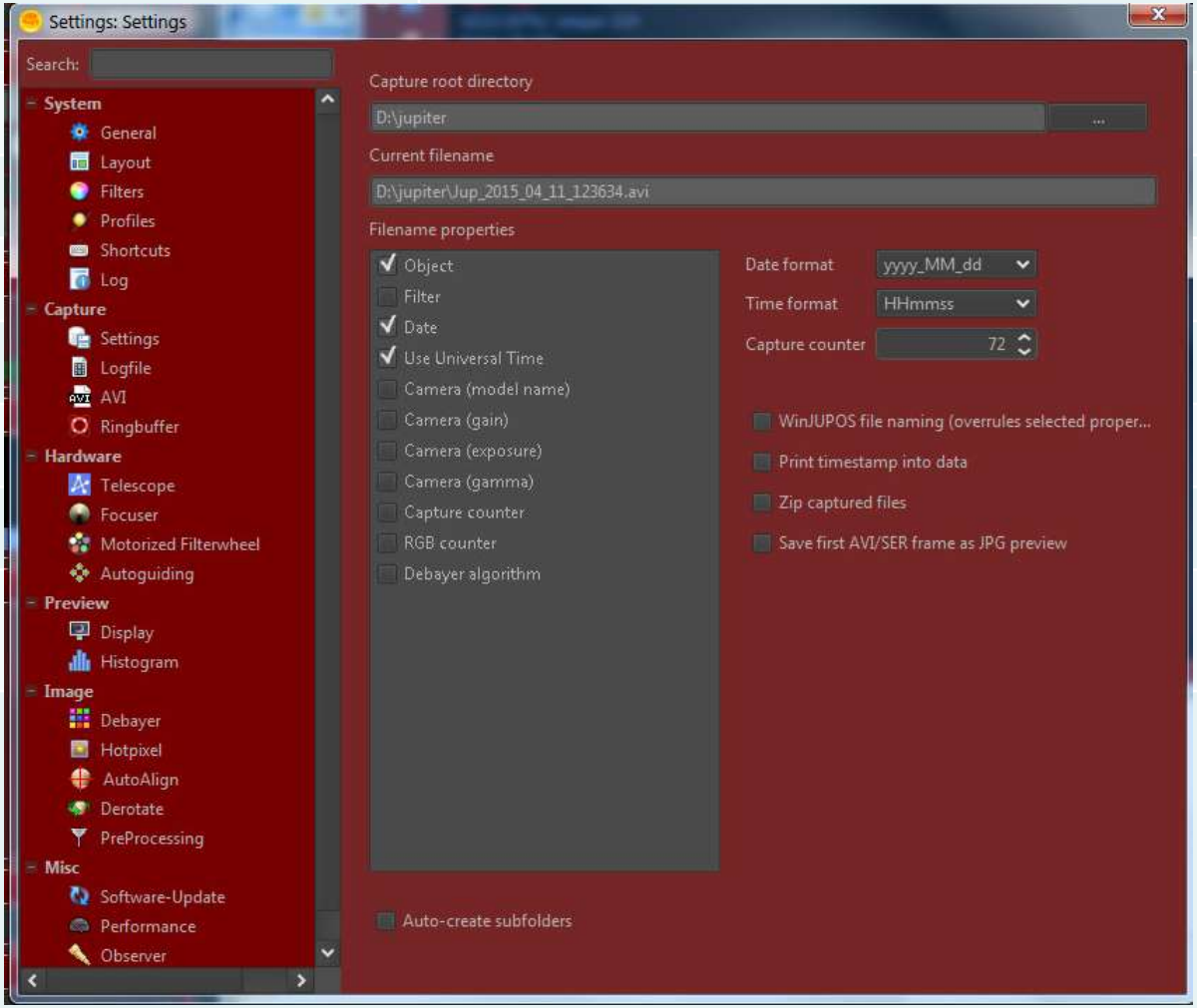
FireCapture Controls

Use Gain and Exposure time to increase brightness.

Set Exposure time limit with the limit function.

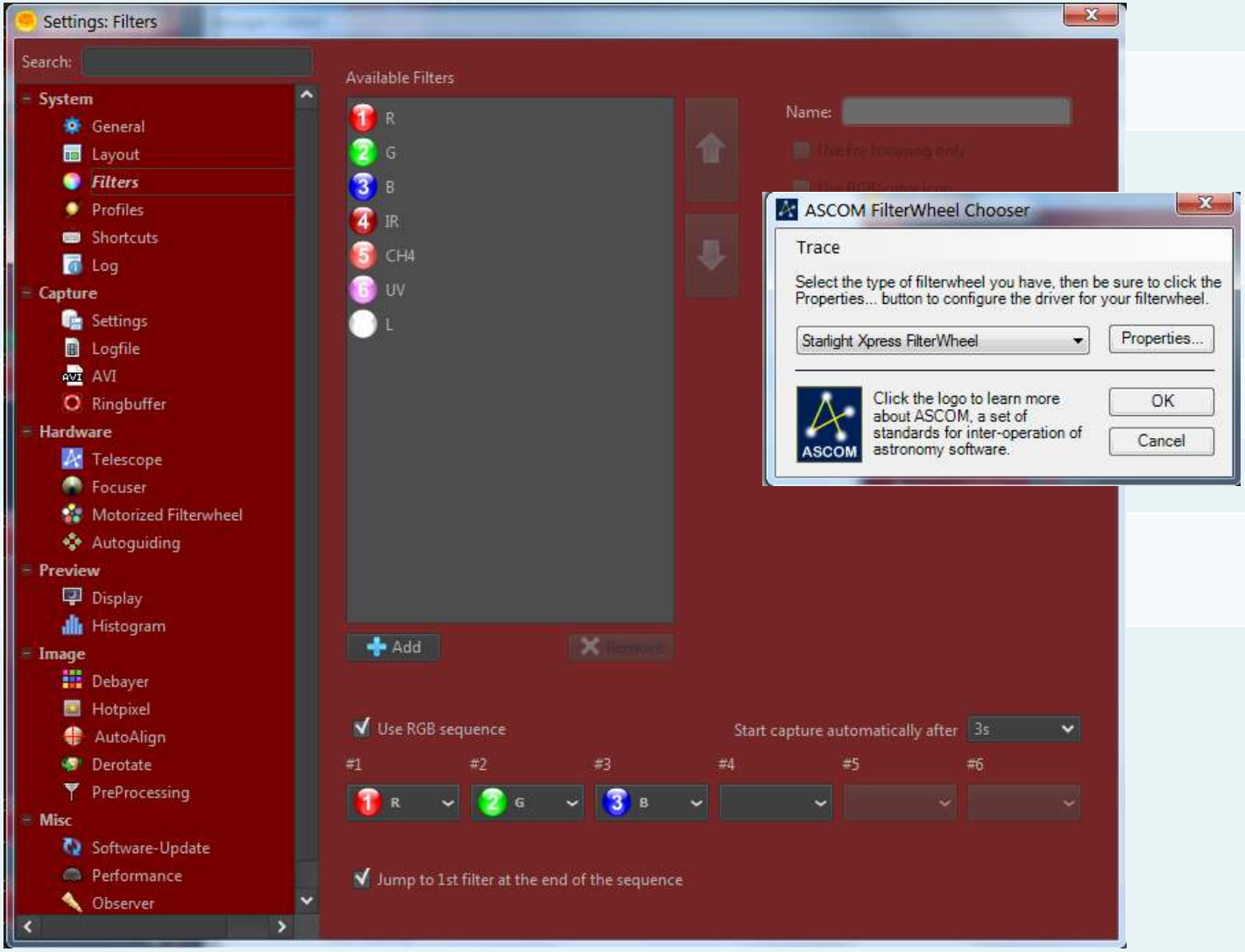
Set ROI to reduce file size, increase frame rate and for faster processing.

Important Setup



Make sure that Date and Universal Time is included in the filename!

Filter Wheel Automation



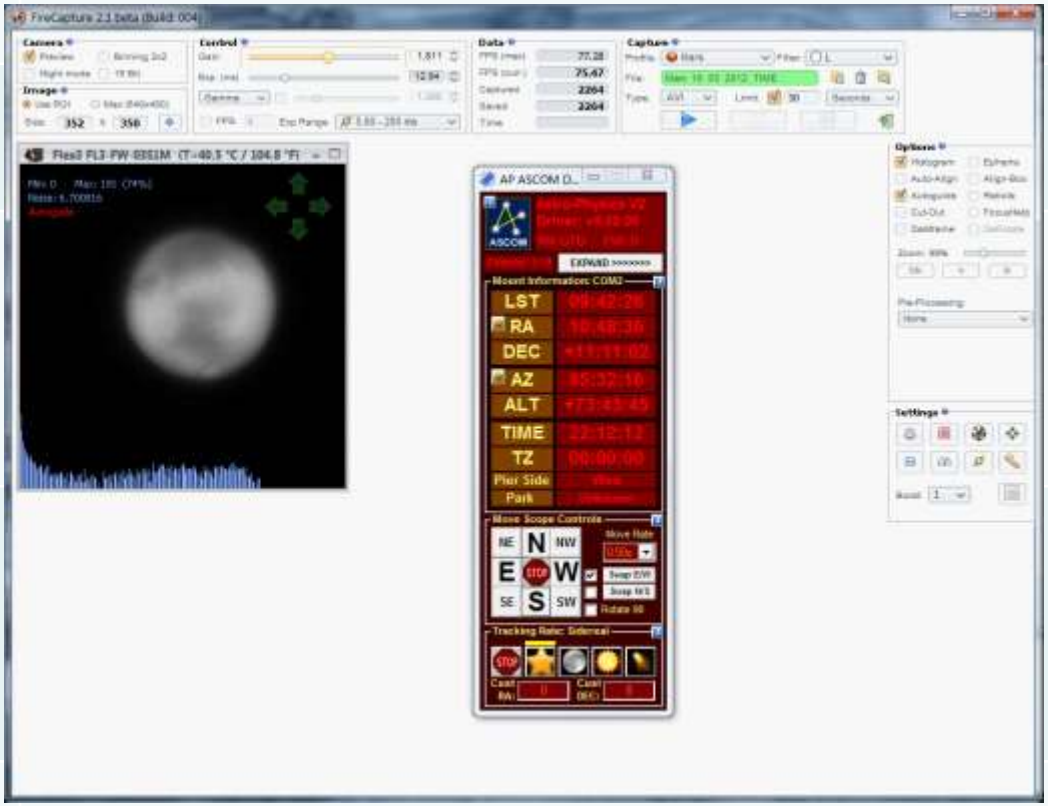
Firecapture Autoguide

Autoguide feature is used to keep the planet centered on the FOV.

It is compatible to all ASCOM compatible mounts.

When using autoguide make sure the planet's orientation is parallel to the motion of the mount.

Make sure that orientation of the green control arrows match the motion of the mount. Flip E-W or N-S to achieve this.



Capture Secrets

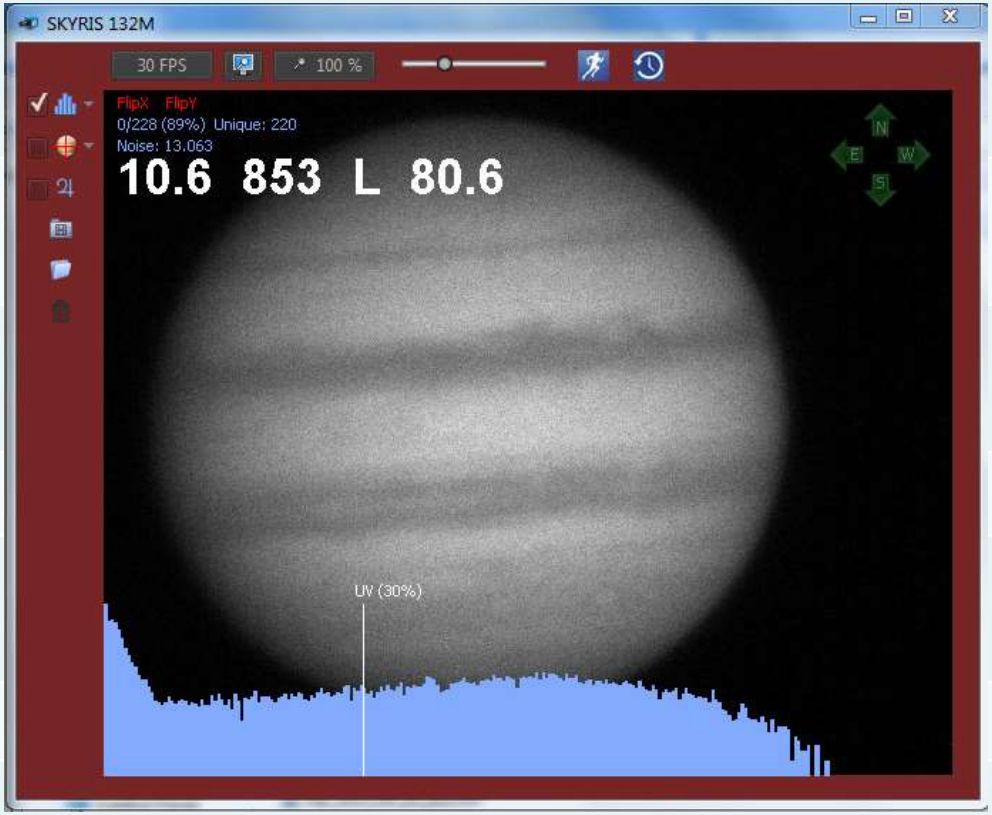
Find the sweet spot of your imaging system. Have a capture routine for each target object.

Use the fastest frame rate possible.

Don't be afraid to push gain to 100%.

Turn off Gamma!!

Spend time to focus the telescope.



Final Image Quality Depends on your capture quality. So be patient!

Jupiter

Keep histogram level around 80-90% on all channels.

Keep total integration time below 2 minutes.

Use focal length of around 30X of your aperture 5 micron pixel cameras and 20X the aperture for 3.75 micron cameras.

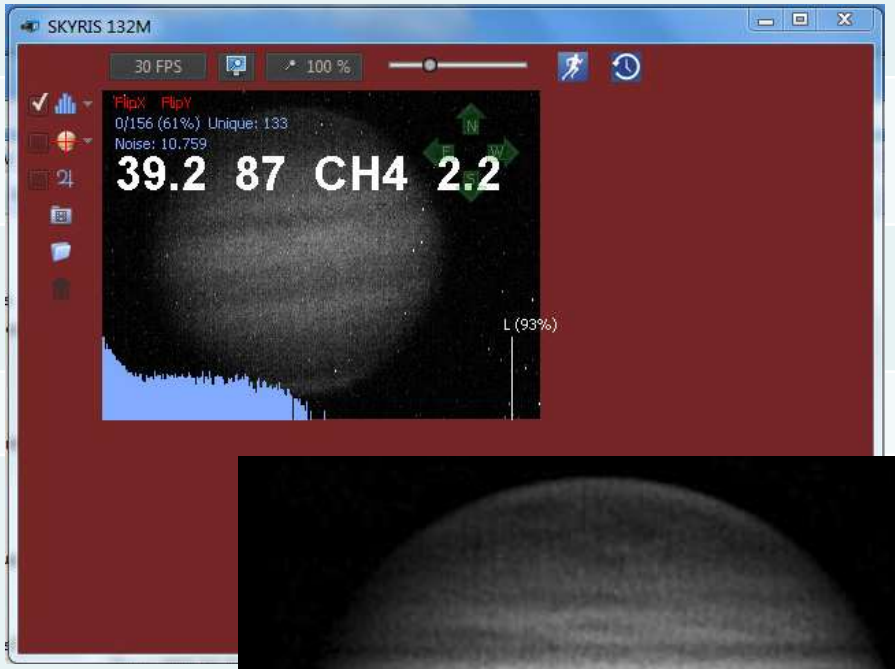
Jupiter Methane Band

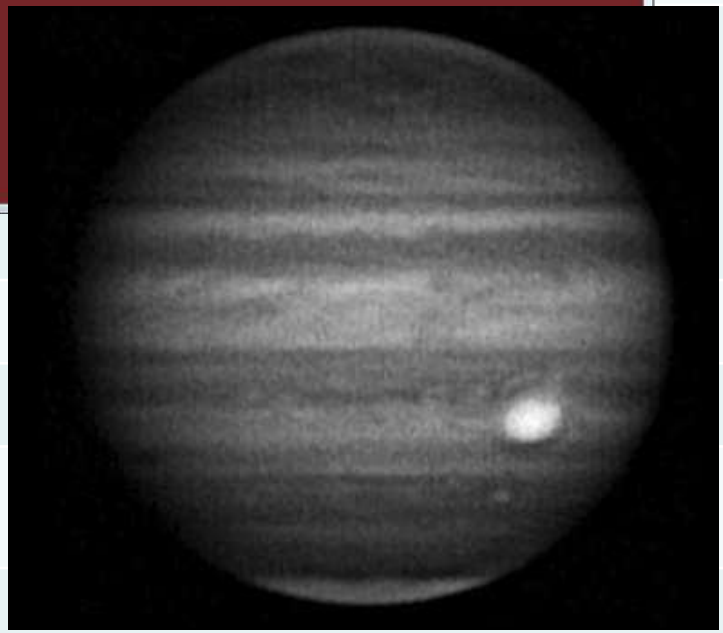
Methane Band shows high altitude clouds of Jupiter.

Because Image is very faint, use 2X2 binning.

Capture time of up to 2 minutes.

Take DARK FRAMES! Dark frames must be done by capture 5 frames and stacking this in Registax.





Saturn

Saturn has very low surface brightness.	Use 100% gain and variable frame rate.
Use 50% histogram level for red and green and 30% for blue.	Use Winjupos Derotation so that the final image will be smooth.
Keep total integration time to around 3 minutes.	

Mars

Use focal length around 50X the aperture for 5 micron pixel cameras and 30X the aperture for 3.75 micron cameras.

Keep histogram level of the Red Channel at around 80-90%. Keep Green at around 60-70% and Blue around 30-40%.

Total integration time can be as long as 4 minutes.

UV-IR should be blocked to get true colors. Make sure your blue channel has no IR leakage.

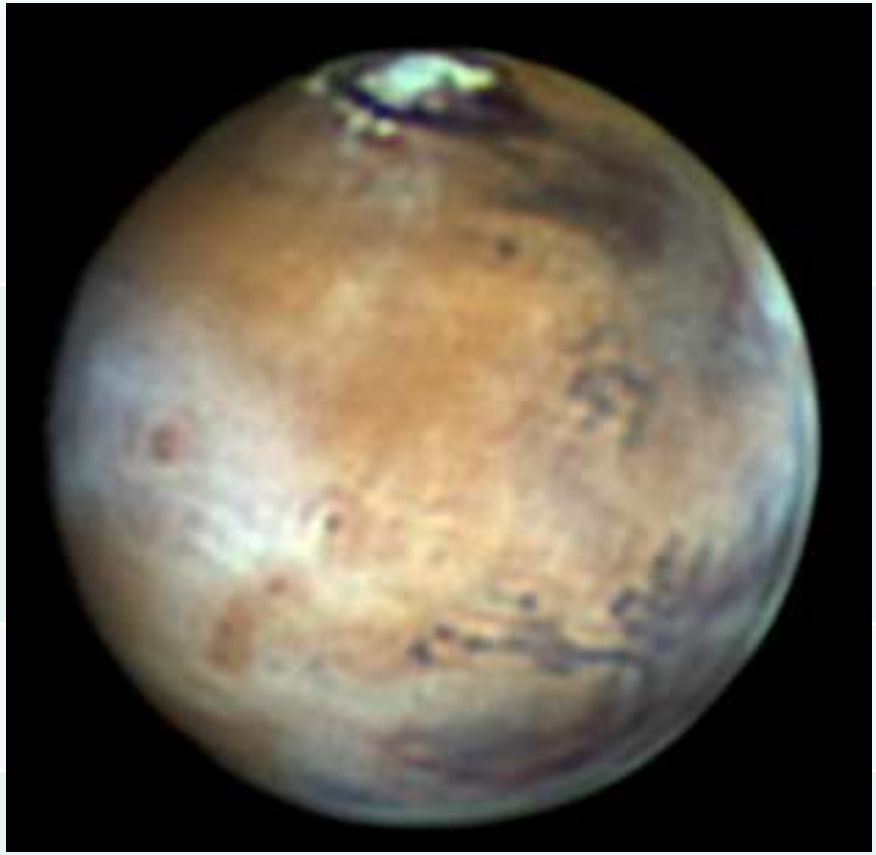
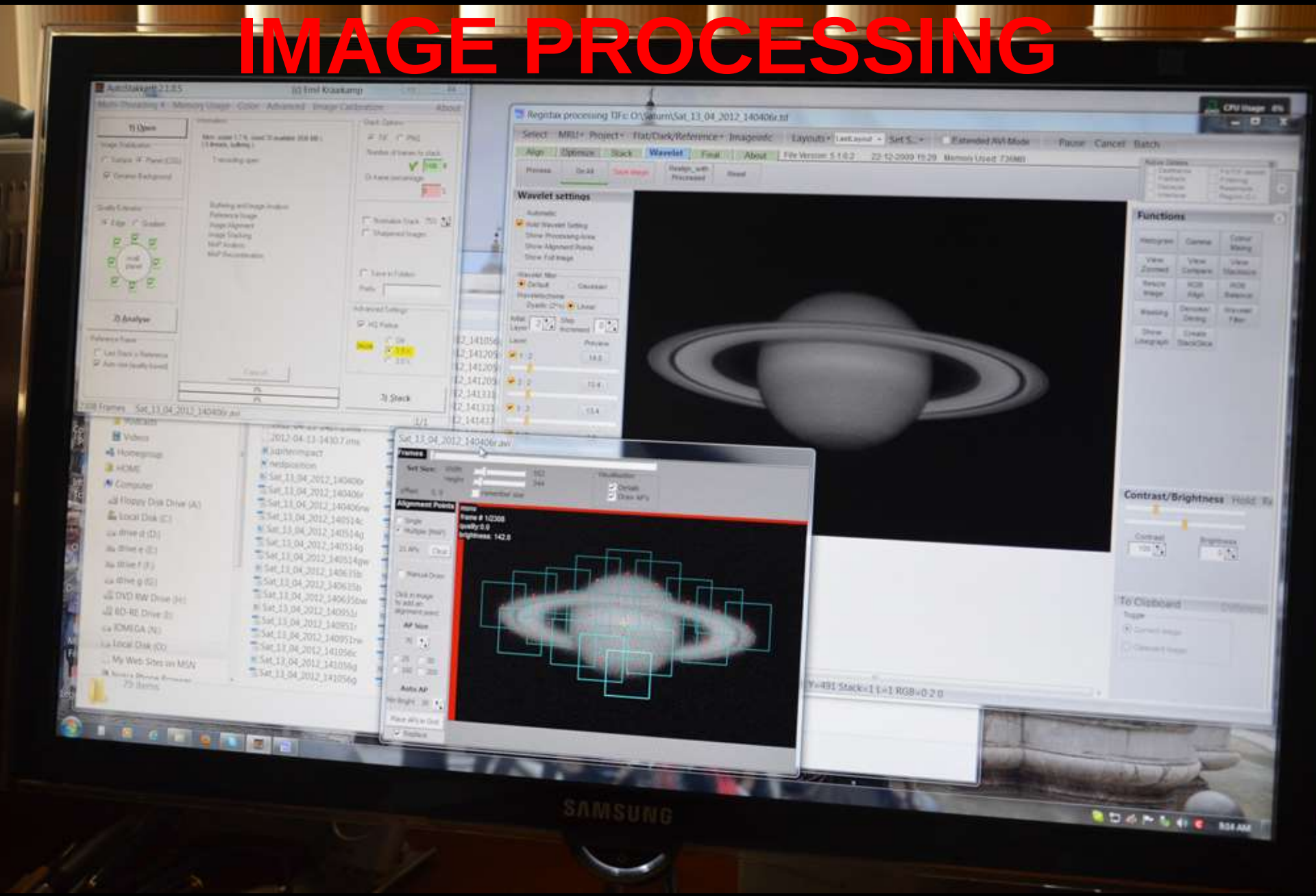
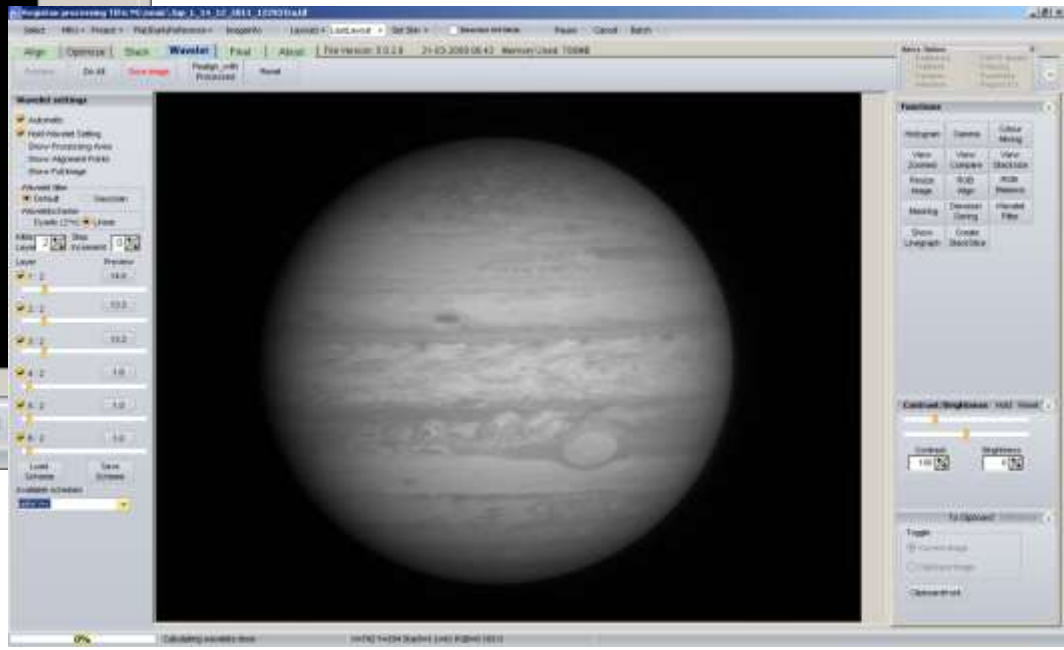


IMAGE PROCESSING

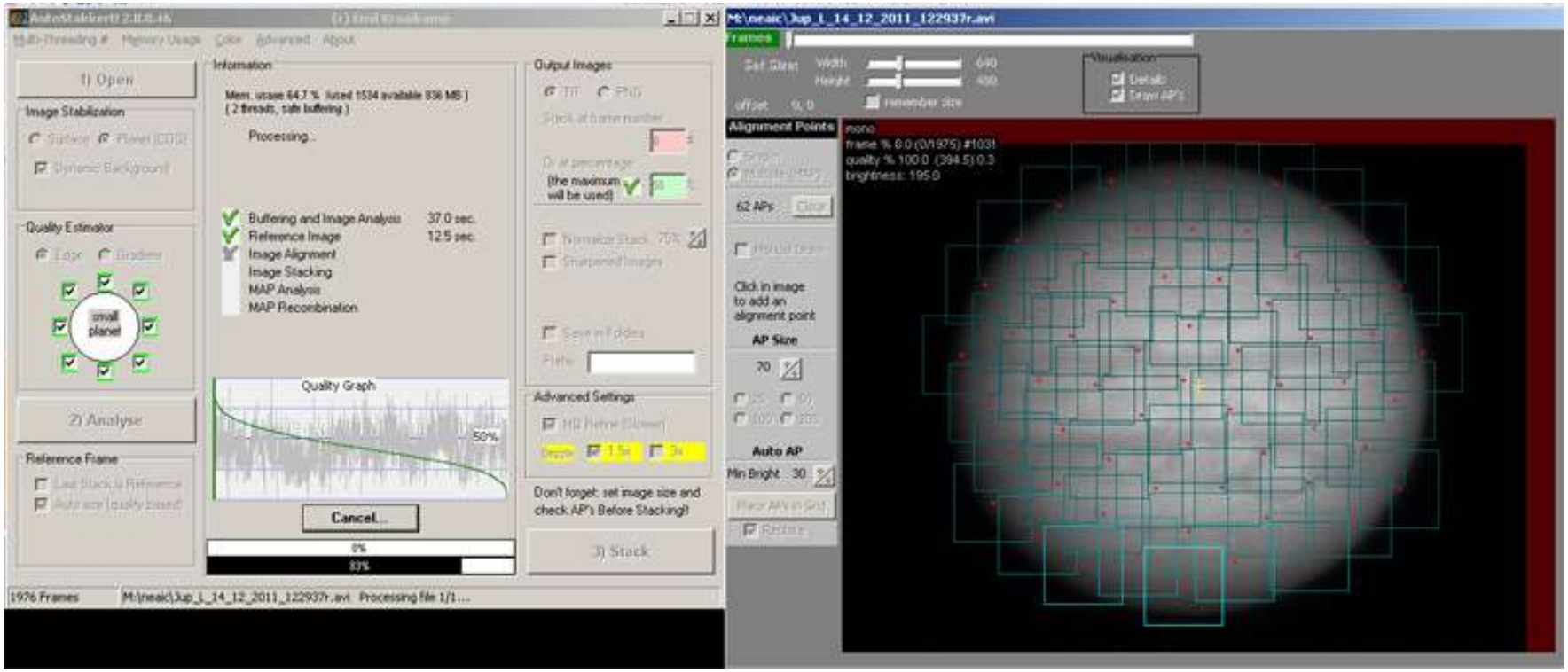


Registax



Getting the right wavelet settings is important in getting a sharp image.

AutoStakkert!!



Pro: AutoStakkert is easier to use and better results vs Registax. Process the image faster and automatically aligns the image.

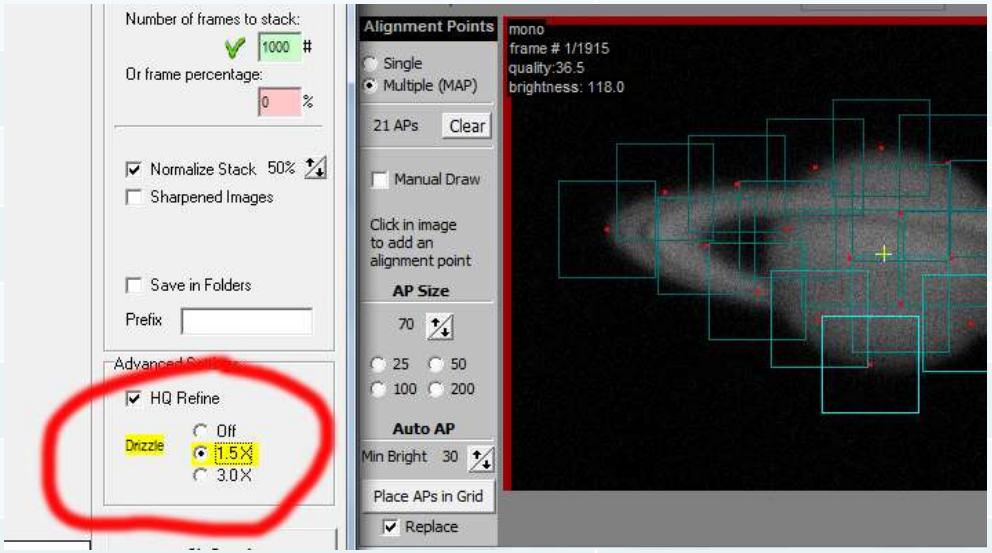
Con: Few controls. Not very intuitive to use.

Making Things Bigger

Resampling can be use to increase image size.

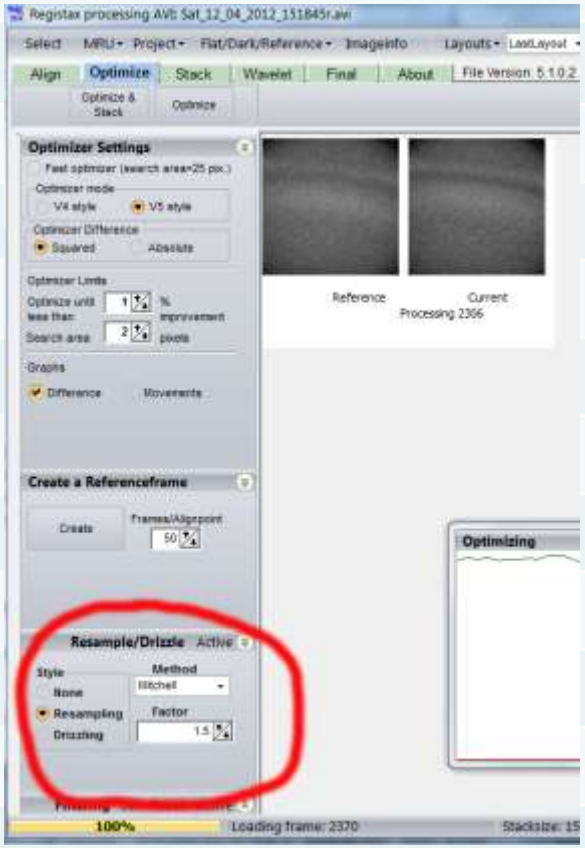
AutoStakkert

1.5X Drizzle



Registax

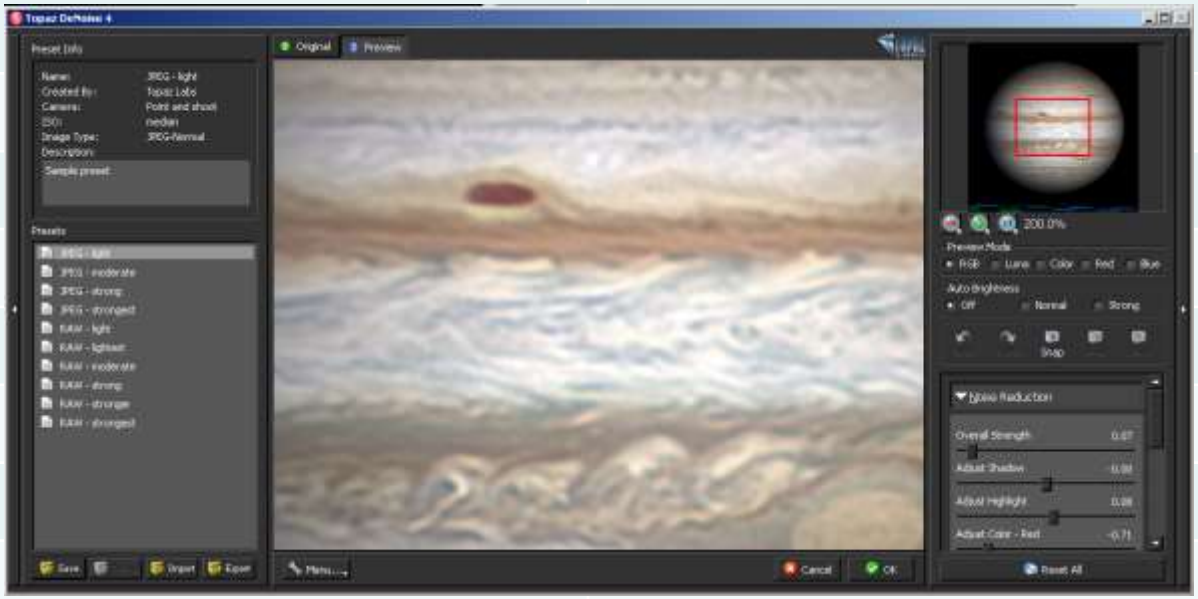
1.5X Mitchell



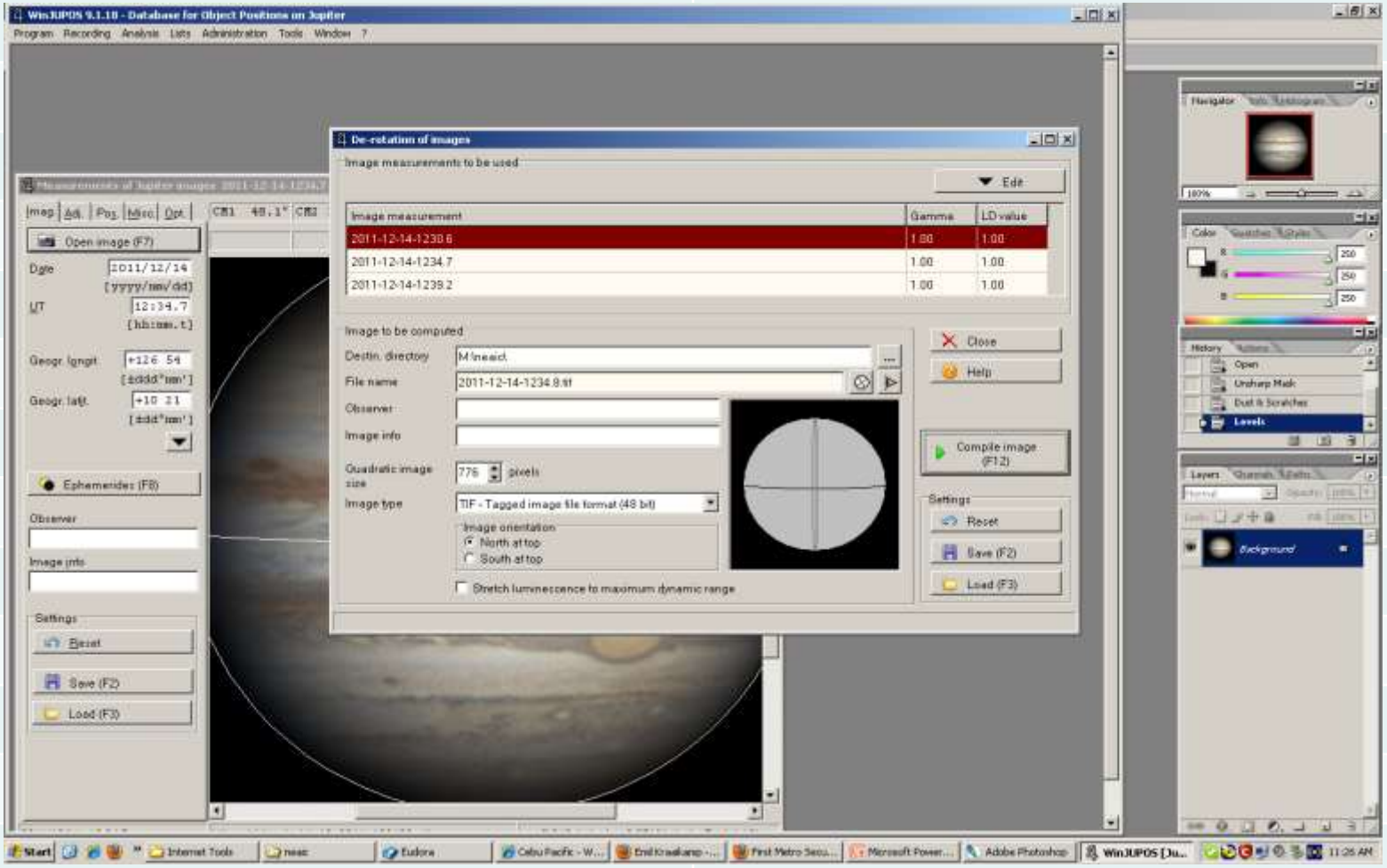
Sharpening vs Noise Reduction

Sharpening Tools	Noise Reduction Tools
Registax Wavelets	Despeckle Tool
Unsharp Masking	Dust and Scratches Tool
	Topaz Labs DeNoise Tool

Image Processing is an art form. Each person will have their own look.



WinJupos DeRotation: The Next Revolution in Planetary Imaging



WinJupos DeRotation module allows imagers to go past the time limits set my the rotation of the planets.

1. Image Measurement

a. Capture multiple image sequence for a span of 15-20 min.

b.Open Image in Image measurement window. Input the date and time the image was taken.

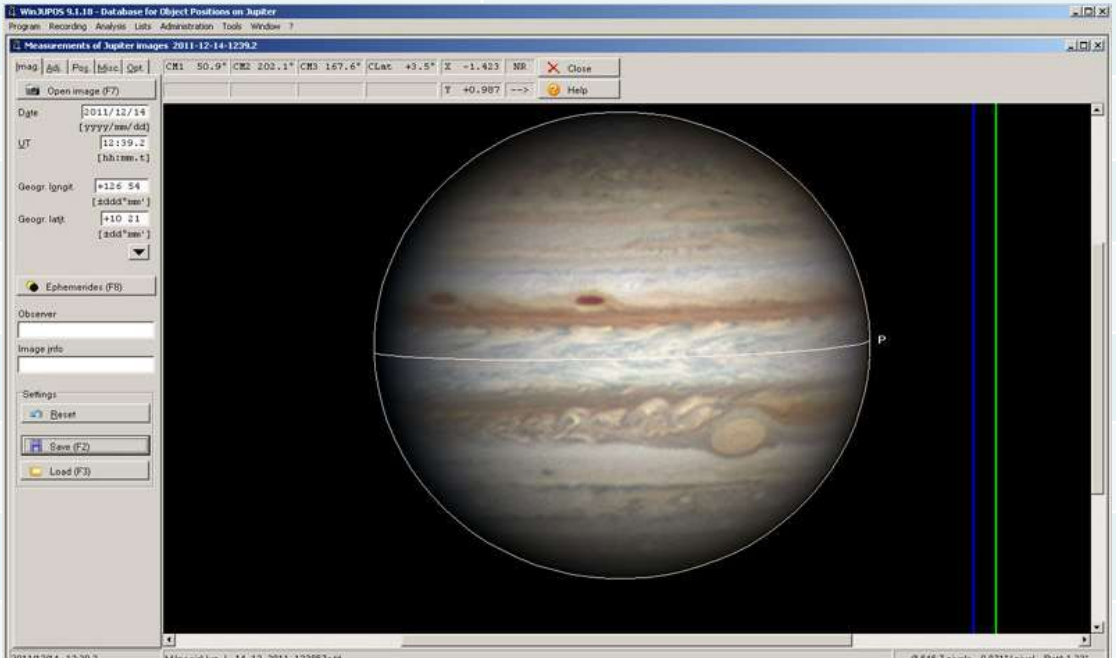
d. The outline has to be adjusted by:
-Use the Arrow Keys to go move the outline.
-N to rotate the outline clockwise and P to rate it counterclockwise.

-Use Page Up and Down to increase or decrease the size of the outline.

c. Press F11 to automatically adjust the outline.

e. Save the measurement in .ims file.

f. Repeat with all images.



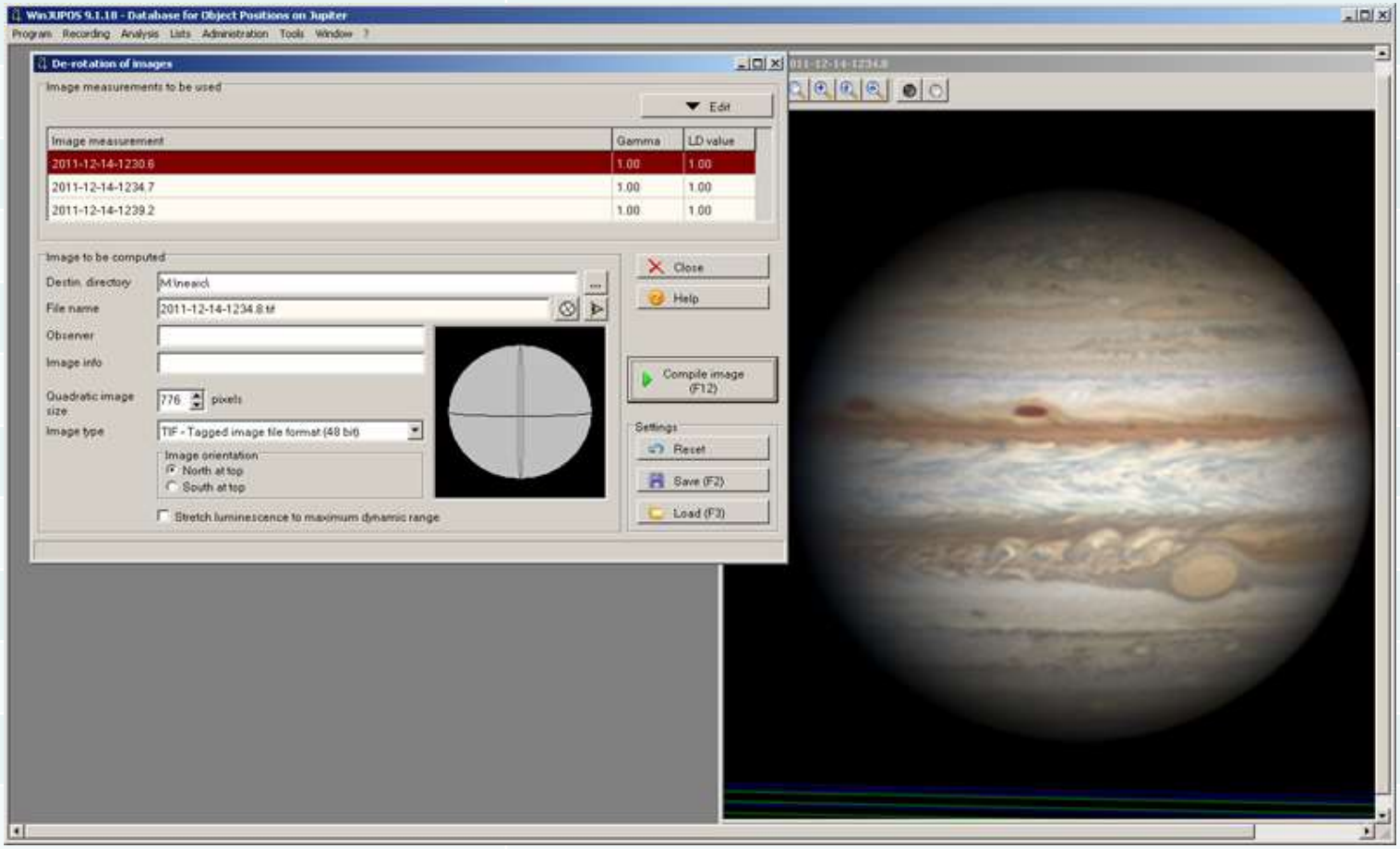
2. De-Rotation

a. The der-otation module can be found under the tools menu.

b. Press Edit and Add each of the IMAGE MEASUREMENT FILES you want to stack.

c. Choose the output file type and image orientation you want your final image to look.

d. Press COMPILE IMAGE.



Single vs Derotated

The Final Image

1. North or South up?
2. Use UT time of the green channel if your are doing RGB.
3. Include Central Meridian info. This info can be obtained with WinJupos Ephemerides Tool.

For Jupiter and Saturn Include the THREE Central Meridian Info.

4. Include observer information Name and Location.
5. When using De-Rotation indicate your total capture time.

Post Processing/Archiving

Review all Jupiter and Saturn videos for possible impacts. Play video with a media player or scan videos using Registax.

Archive your data! Use compression to reduce data volume.

Burn compressed archives on Blue-Ray Discs or store on removable hard drives.

Software Info

Capture Software	
FireCapture	http://firecapture.wonderplanets.de/
Stacking Software	
Registax	http://www.astronomie.be/registax/
AutoStakkert 2.0	http://www.autostakkert.com/
Winjupos	http://www.grischa-hahn.homepage.t-online.de/astro/winjupos/index.htm
Impact Detection Software	
JID	http://www.pvol.ehu.es/software/