CELESTRON

Perspective

on imaging

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THE PORTOFINO HOTEL & MARINA

REDONDO BEACH, CA

A Guide to Modern Planetary Imaging

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Fighting the Atmosphere

- Getting out of the Atmosphere
- Adaptive Optics
- Speckle/Lucky Imaging

Speckle Imaging: Feeling Lucky

Speckle or Lucky Imaging is the process of capturing planets using a video camera. A software is used to sort out the quality of the images. This takes allows one to take advantage of the fleeting good seeing.

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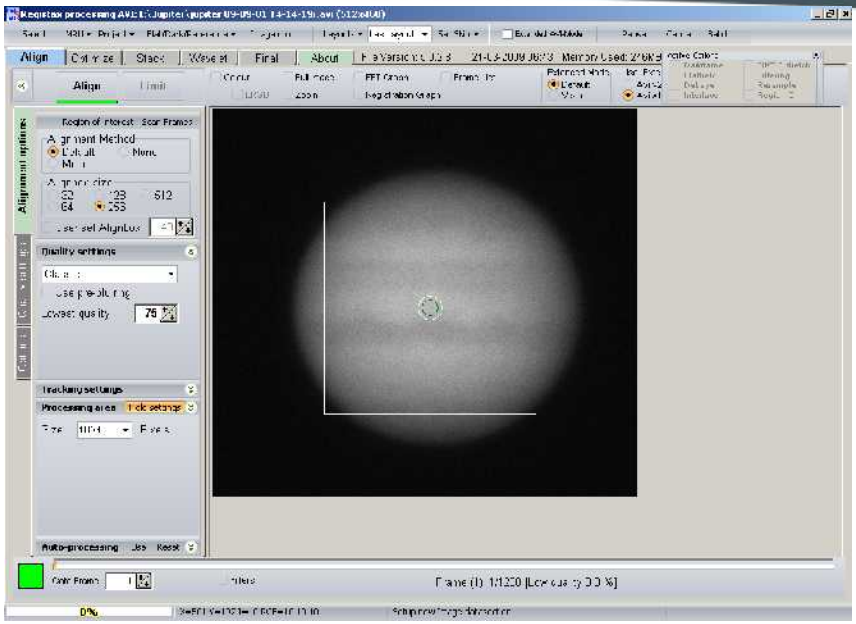
Amateurs doing Speckle/Lucky Imaging

- Development of inexpensive video capture devices
- The advances of computer hardware and interface.
- The development of processing and control software.



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Choosing the Right Equipment

- Telescope
- Camera
- Accessories

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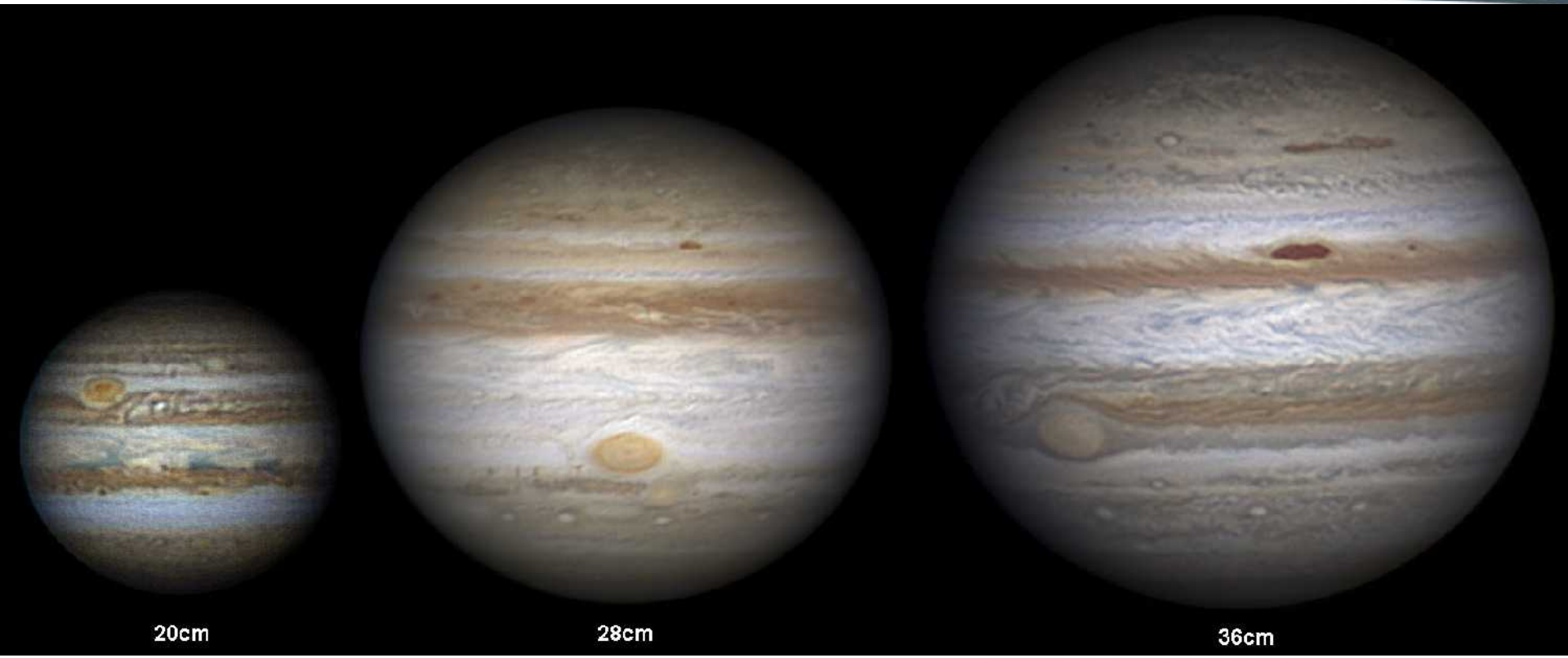
The Telescope: Aperture Rules!



The bigger the aperture, the higher the resolution.

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The Camera

Webcam	High Speed Camera
Pro: Cheap and Simple to use.	Pro: Can do high frame rate with no compression. Low noise circuit. Flexible imaging capabilities.
Cons: Noisy Interface and available only in color.	Cons: Expensive and requires a fast computer to run.

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Monochrome or Color

Color CCD	Monochrome CCD
Pro: Simple to Setup and Fast Processing. Very inexpensive setup.	Pro: Very Sensitive CCD, better image quality, no problem with Atmospheric Dispersion.
Cons: Less sensitive CCD due to Bayer Layers. Needs to compensate for Atmospheric Dispersion.	Cons: Expensive and Complicated Setup.

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Camera Interface:

USB  	USB 2.0 can do speeds of up to 480Mbps. USB 3.0 can run at speeds of up to 4Gbps. Does not require an external power source. Standard with all recent PCs.
Firewire 	Firewire A has speeds up to 400Mbps. While Firewire B has speed of up to 800Mbps. Might require an adapter and a power source.
Gigabit Ethernet 	Plugs into RJ45 socket. Requires external power source. Must have GigE compatible cable. Transfer rate of up to 1 Gbit/s.

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The Accessories

Barlow	**Increases the image scale of the object imaged**
Filter Wheels	**Allows vibration free changing of 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**

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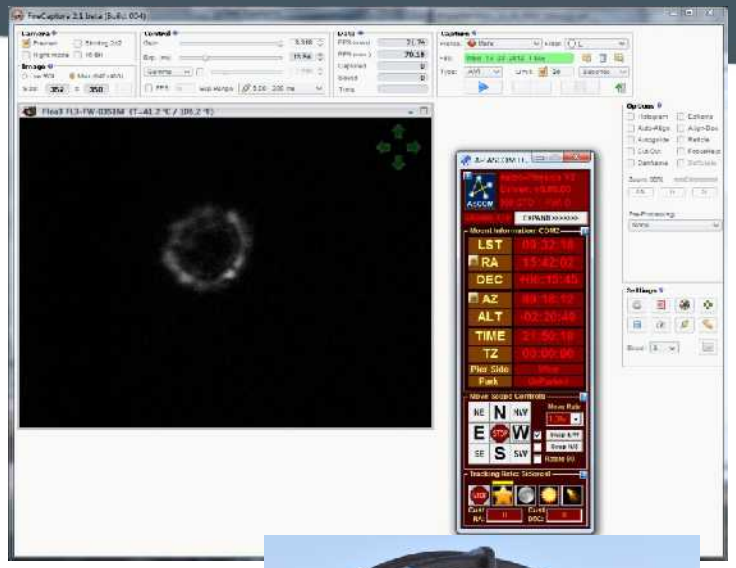
Preparations before Imaging

- Location, Location, Location
- Cool the OTA
- Collimate the OTA
- Plan your imaging session with Winjupos.



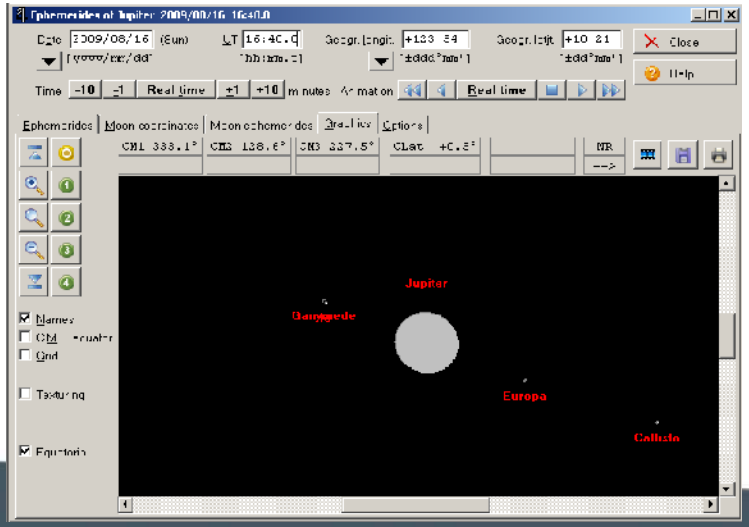


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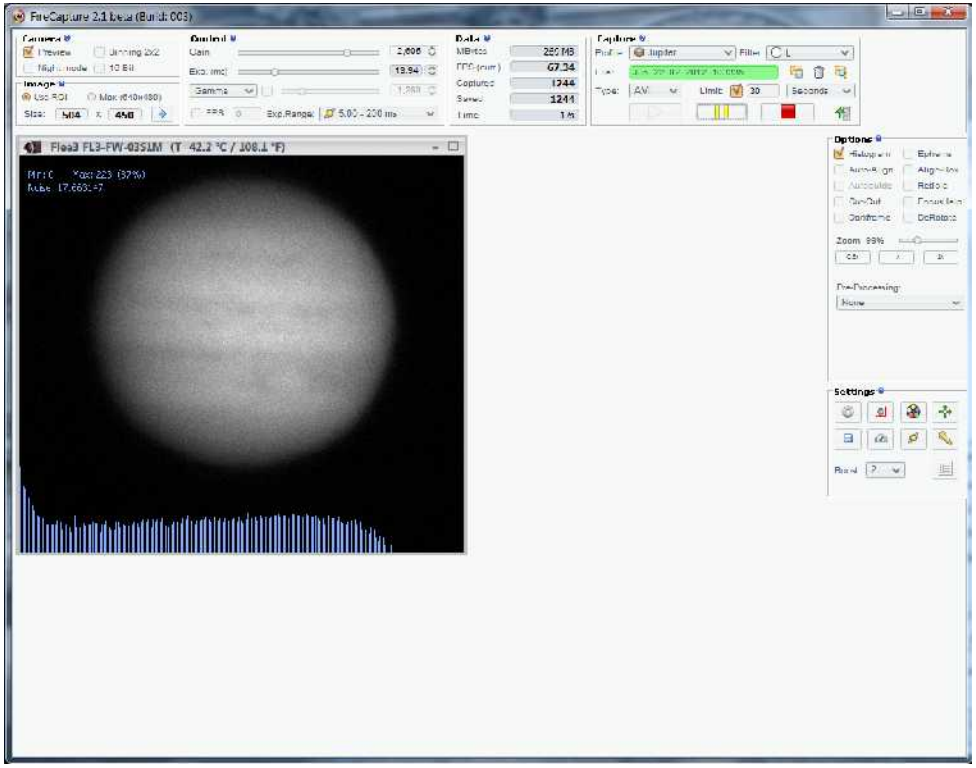
Image Capture: Firecapture

- Currently, the best capture software.
- It supports a variety of cameras.
- Feature rich. It as autoguide function and allows control of filter wheel.
- It’s Free!!



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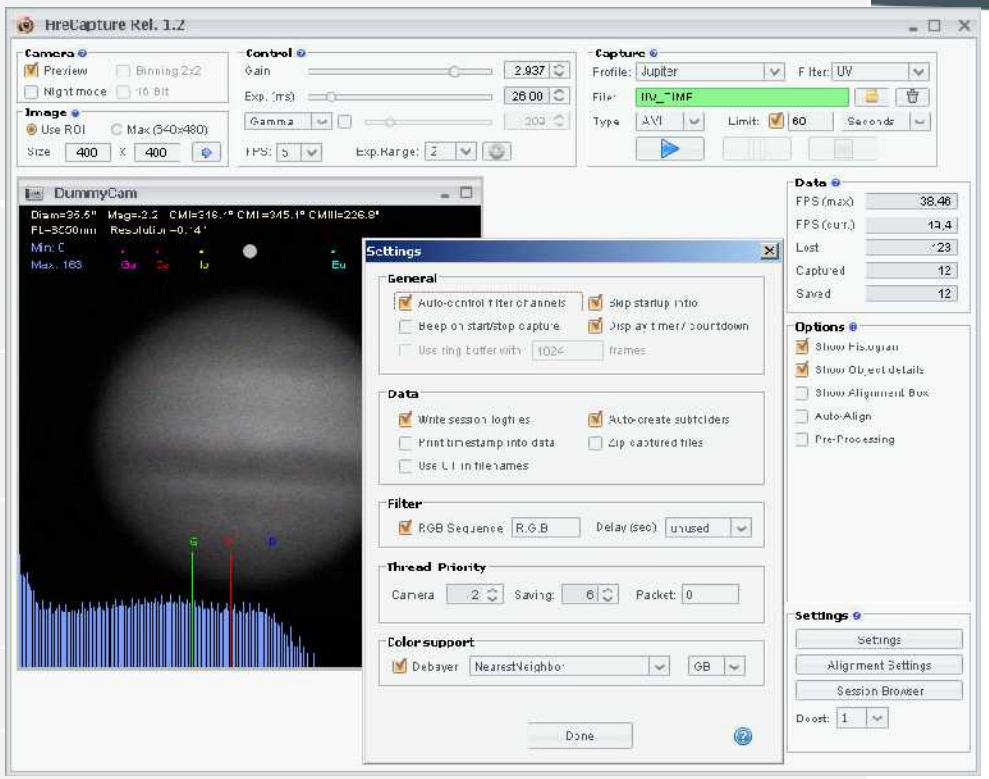
Capture Secrets

- Find the sweet spot of your imaging system. Have a capture routine for each target object.
- Make sure your filename includes the DATE and UNIVERSAL TIME.
- Use the fastest frame rate possible.
- Don't be afraid to push gain to 100%.
- Turn off Gamma!!
- Spend time to focus the telescope.



- Use Region of Interest (ROI) to reduce file size for faster processing.

Final Image Quality Depends on your capture quality.

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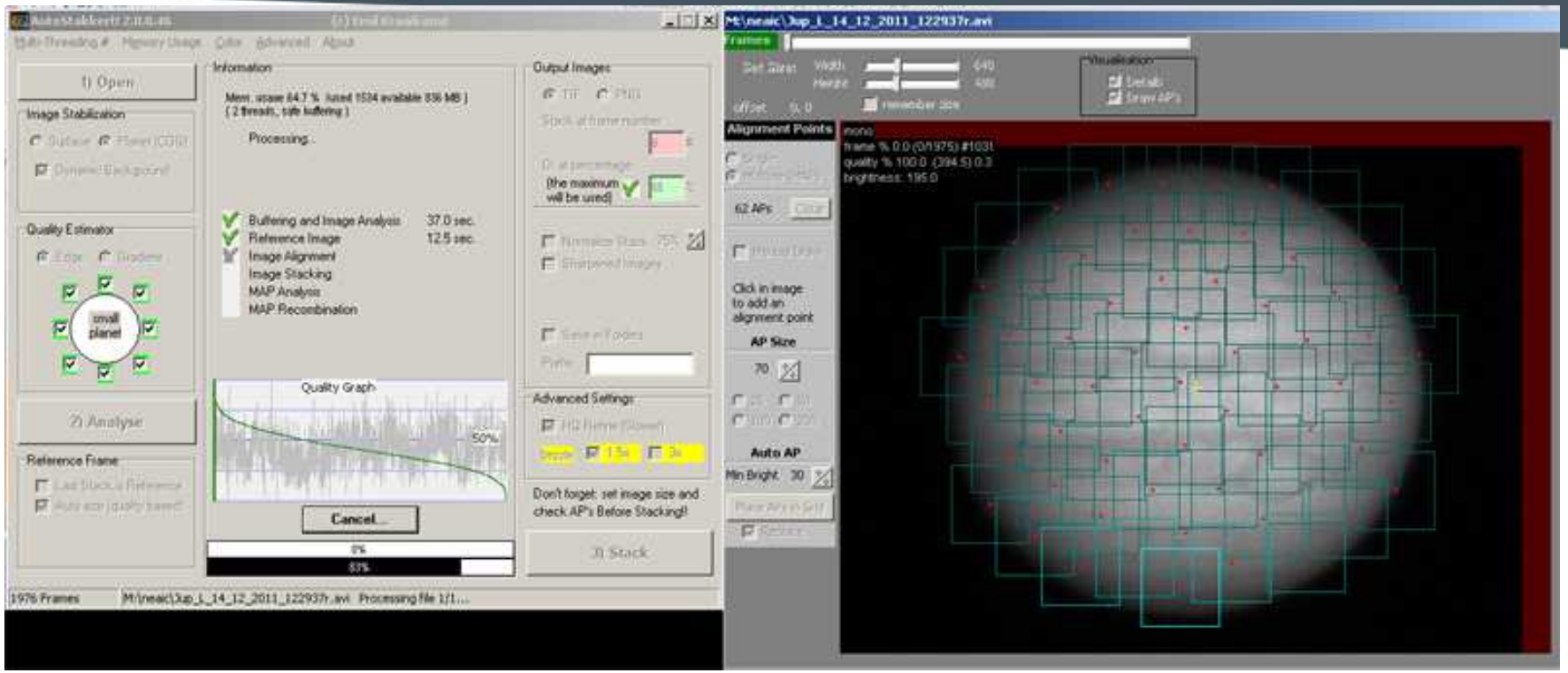
IMAGE PROCESSING: AUTOSTAKKERT



Autostakkert uses multipoint alignment.

Autostakkert is very easy to use and produces superior stacked results compared to Registax.

Autostakkert centers the final image making it easy to RGB align.

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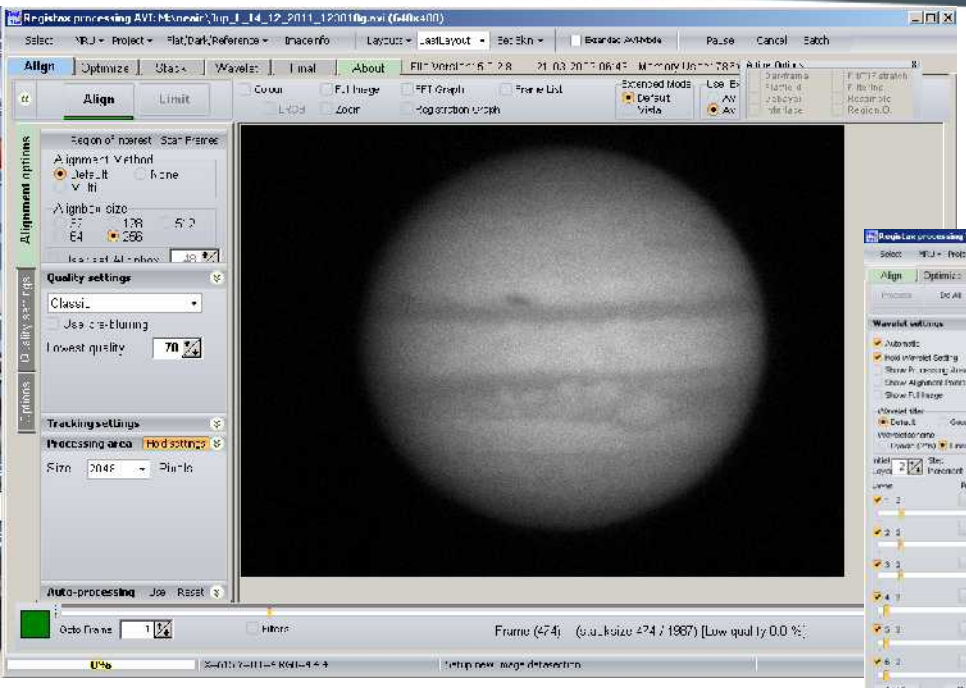
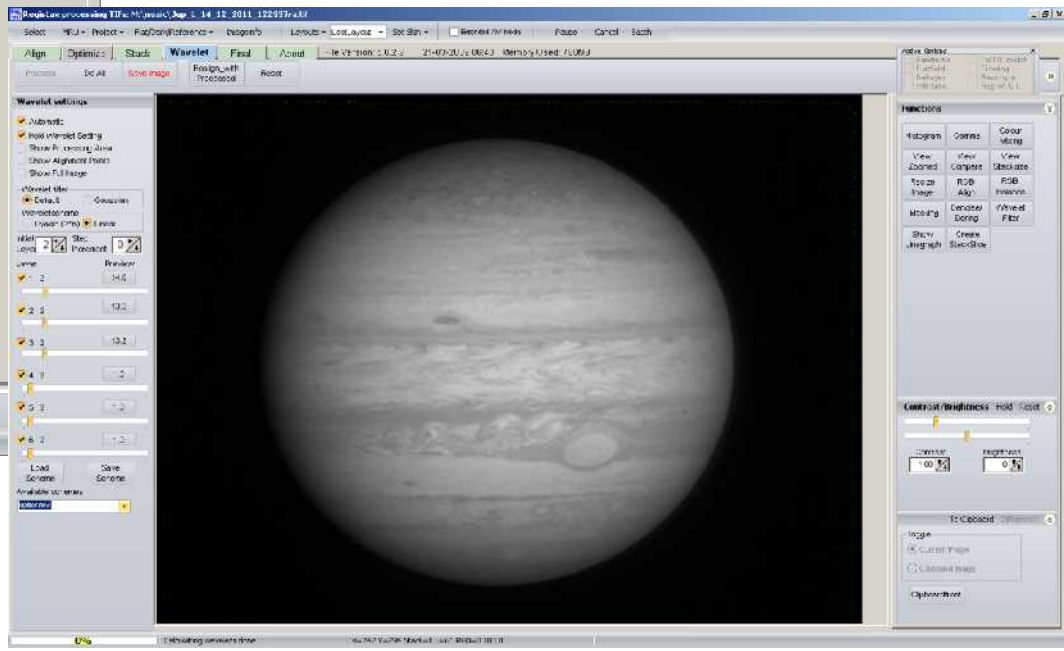
IMAGE PROCESSING: REGISTAX





This is the software that revolutionized Planetary Imaging. It has an excellent sharpening wavelet tool.

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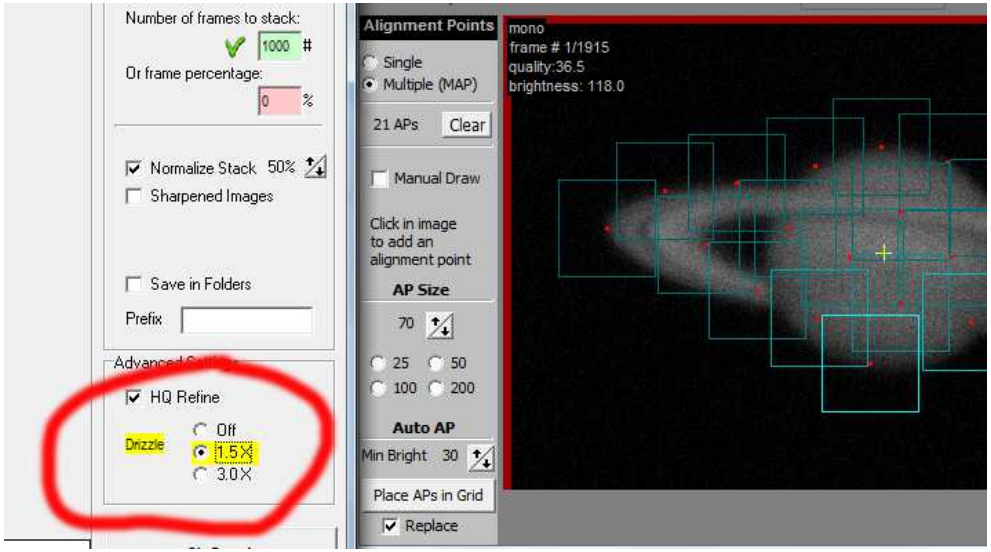
IMAGE PROCESSING: MAKING IT BIGGER

Resampling can be use to increase image size.

AutoStakkert	Registax
1.5X Drizzle	1.5X Mitchell



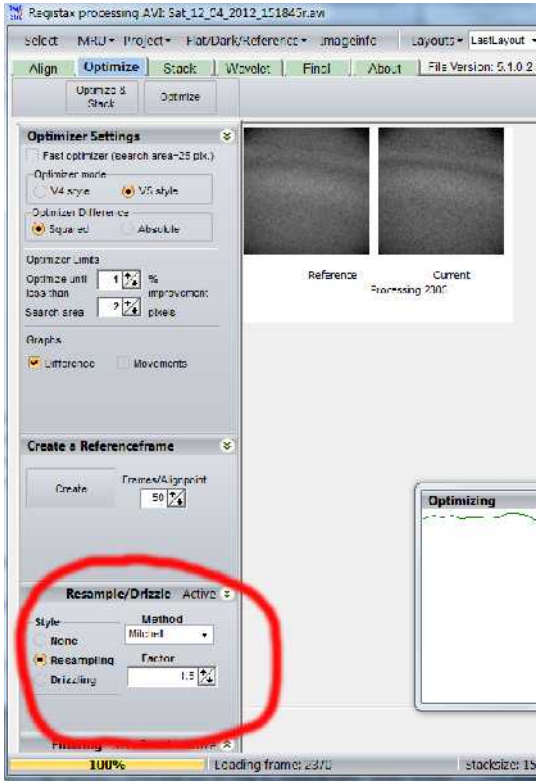


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IMAGE PROCESSING: Putting it all Together.

- Convert Images to Grey Scale.
- Use Channels/Merge Channels/RGB Color in Photoshop.
- Use green as the reference channel. Align Red and Blue to Green.

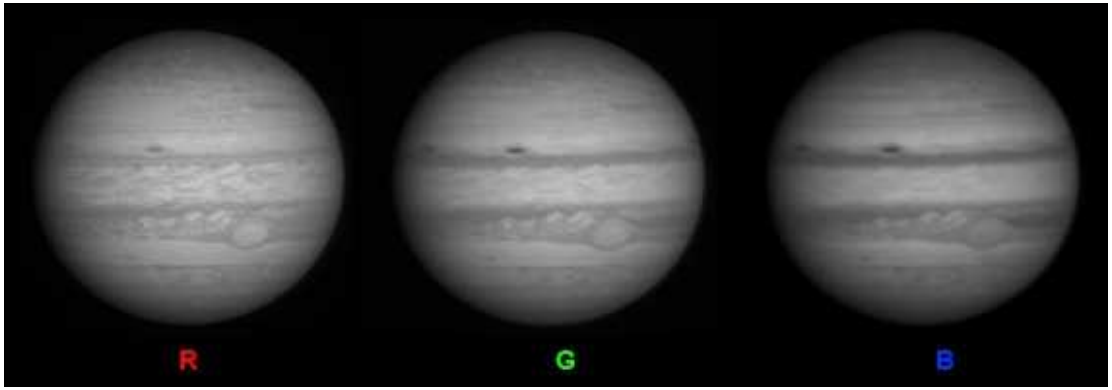

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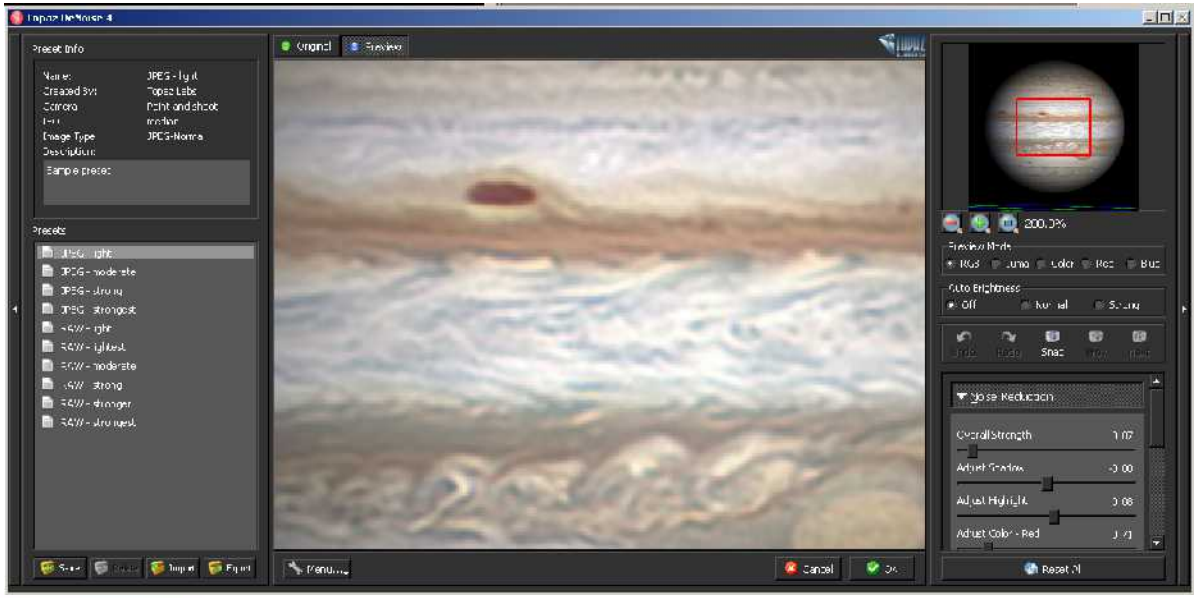
IMAGE PROCESSING: Sharpening vs Noise Reduction

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.



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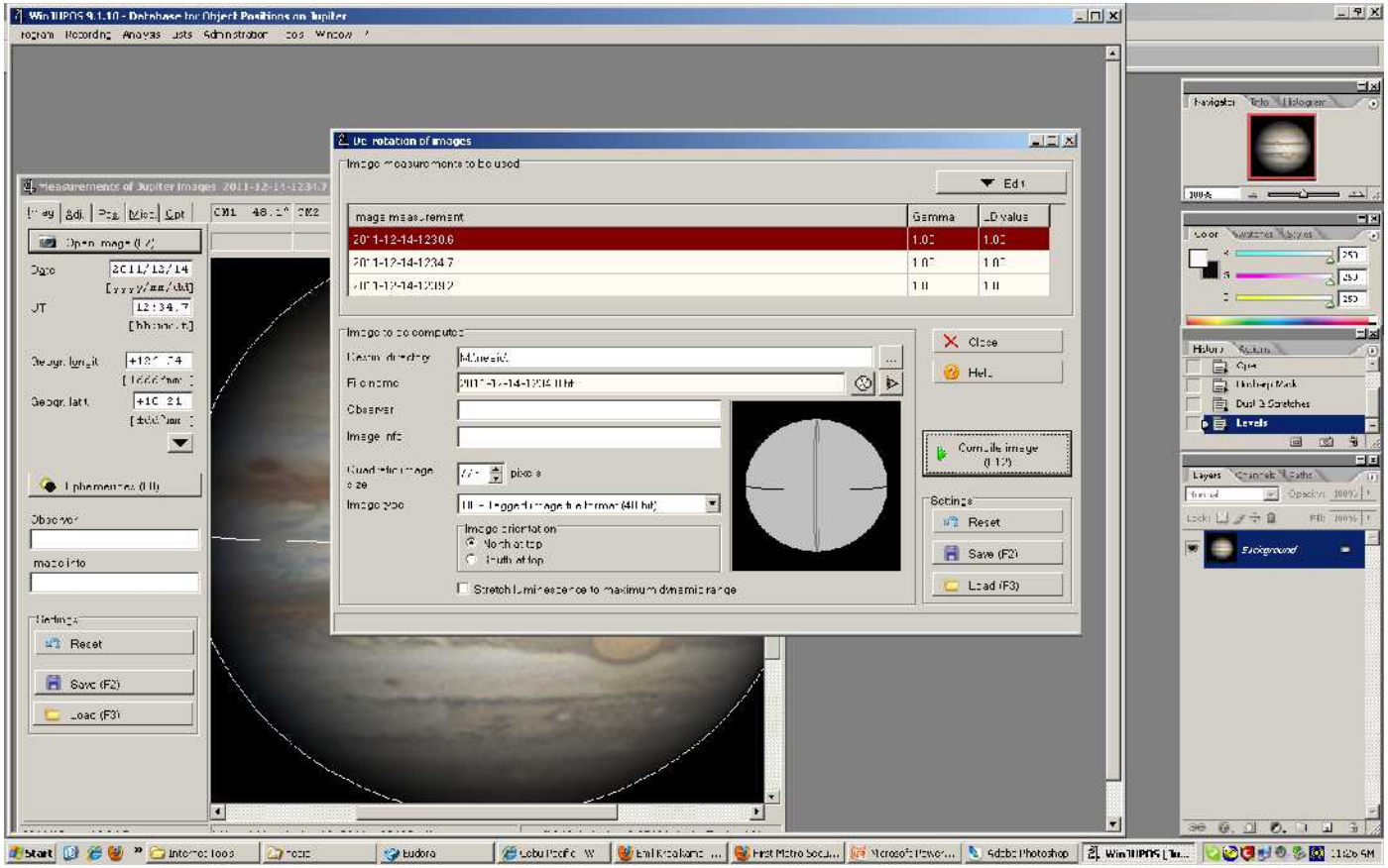
DeRotation: The Next Revolution in Planetary Imaging



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

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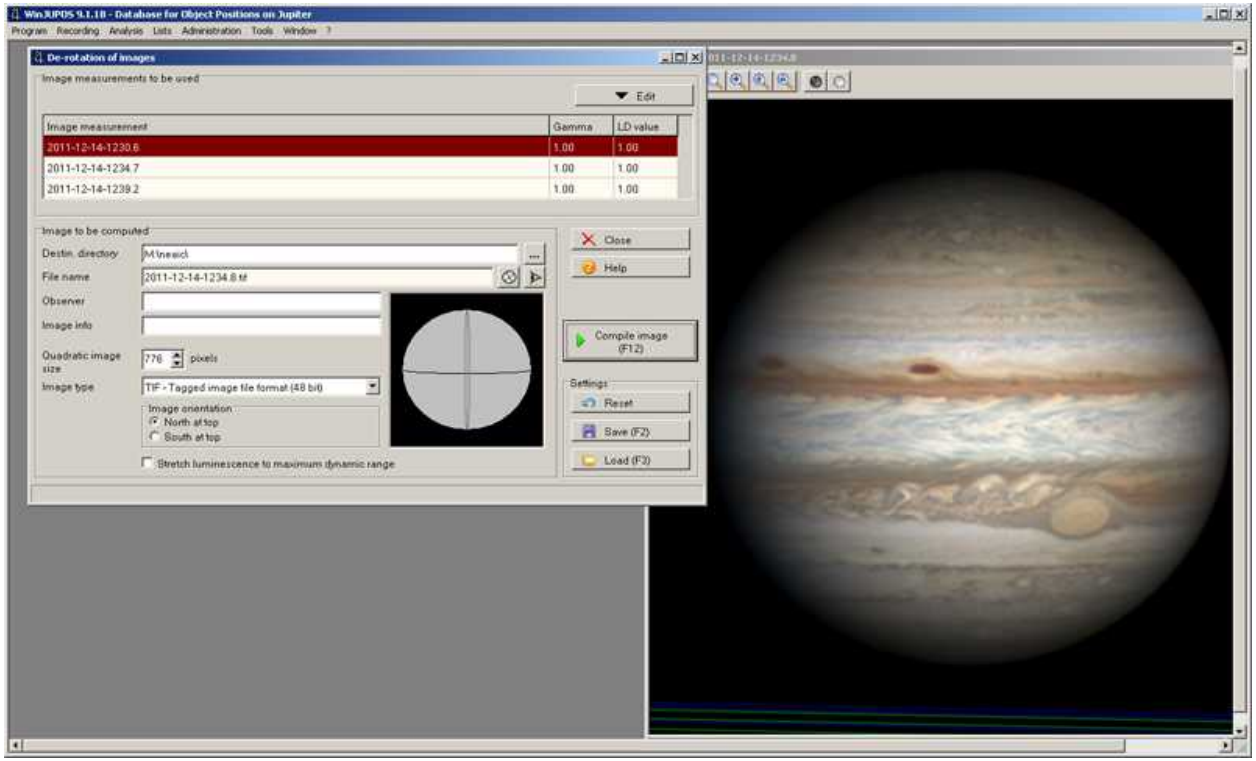
DE-ROTATION

1. Stacking beyond the limits of Planetary Rotation.
2. Capture usual RGB sequence within the limit of Planetary Rotation.
3. You can integrate even up to an hour of data.



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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.
4. *For Jupiter and Saturn Include the THREE Central Meridian Info.*
5. Include observer information Name and Location.
6. When using De-Rotation indicate your total capture time.

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Post Processing/Archiving

Review all Jupiter and Saturn videos for possible impacts. Run video using the Jupiter Impact Detection software.

Archive your data! Use compression to reduce data volume.

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

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Software Info

Capture Software	
FireCapture	http://firecapture.wonderplanets.de/
Stacking Software	
Registax	http://www.astronomie.be/registax/
AutoStakkert	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/

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Where to Submit Your Images

Join the ALPO Mailing List	
ALPO Jupiter	http://tech.groups.yahoo.com/group/ALPO_Jupiter/
ALPO Mars	http://tech.groups.yahoo.com/group/marsobservers/
ALPO Mercury	http://tech.groups.yahoo.com/group/ALPO_Mercury_Discussion/
ALPO Saturn	http://tech.groups.yahoo.com/group/Saturn-ALPO/
ALPO Venus	http://tech.groups.yahoo.com/group/Venus-ALPO/
ALPO Japan	http://alpo-j.asahikawa-med.ac.jp/indexE.htm
International Outer Planets Watch (IOPW)	http://www.ehu.es/iopw/

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