



# *MSRAL Planetary Imaging Workshop*



Presented by  
David Kolb  
June 3, 2012



# *Video Files and Applications*

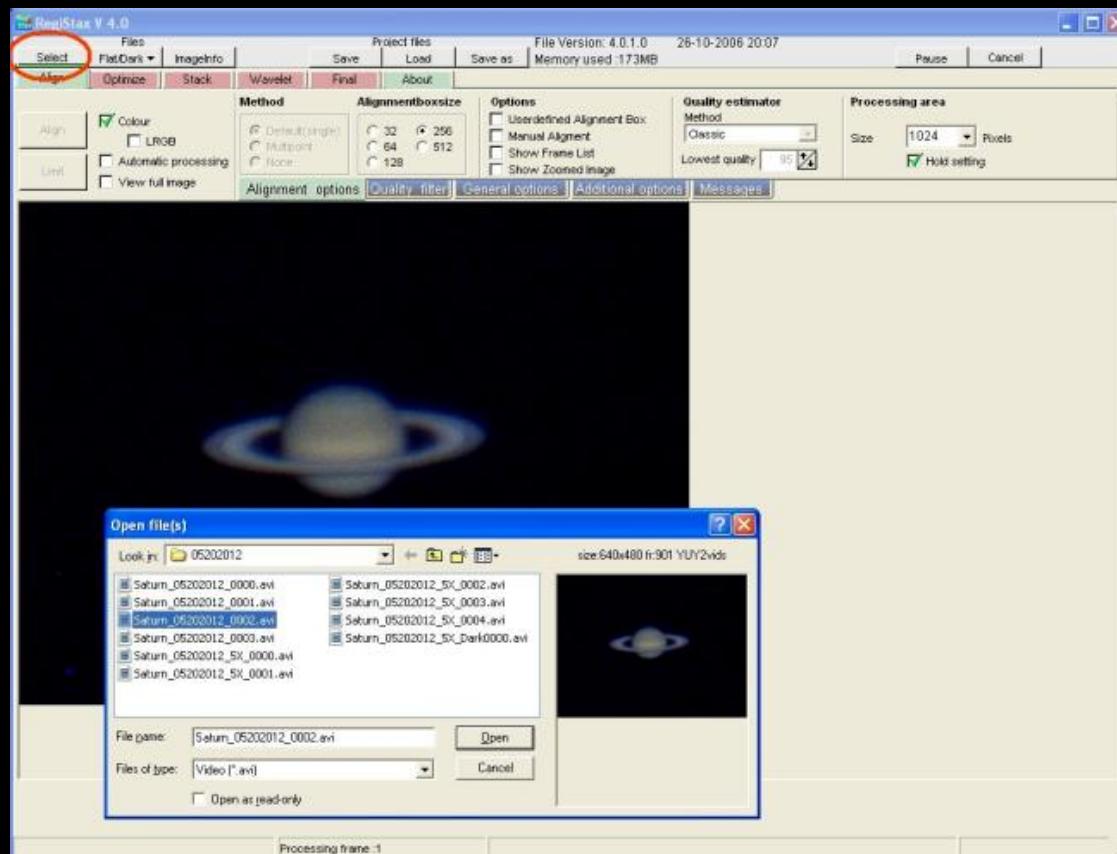
- Dark frame video (part 1 - <http://www.mediafire.com/?igc49fv5ukretir>,
- part 2 - <http://www.mediafire.com/?82iedg2ywmpte2b>,
- part 3 - <http://www.mediafire.com/?117l44i9e2x1emg>).
- Saturn Video (part 1 - <http://www.mediafire.com/?8icf12bjkgw4cxi>,
- part 2 - <http://www.mediafire.com/?7113929q1o0aqzo>).
- Each of the above are multi-part self-extracting archives. Download them into the same folder and run the EXE files.
- Registax version 4 (<http://www.astronomie.be/registax/>).
- ImageJ (<http://rsbweb.nih.gov/ij/>).
- AstraImage 3.0 SI -Demo (<http://www.phasespace.com.au/>).
- NeatImage version 6 - Demo (<http://tinyurl.com/6t576qv>). This URL links to my web site.
- Photoshop or The Gimp (<http://www.gimp.org/>).

## *Dark Frames*

- Open Registax and load the AVI named Saturn\_05202012\_Dark\_0000.avi
- Select Create Darkframe under the Flat/Dark menu.
- Save dark frame as Saturn\_05202012\_Dark.bmp.
- Select Load Darkframe under the Flat/Dark menu and load the dark frame that was just saved.
- The dark frame will be subtracted from the planetary video frames, which will remove hot pixels from the final stacked image.

# *Registax - Load Video File*

- Click the Select menu and load the video file named Saturn\_05202012\_0002.avi.



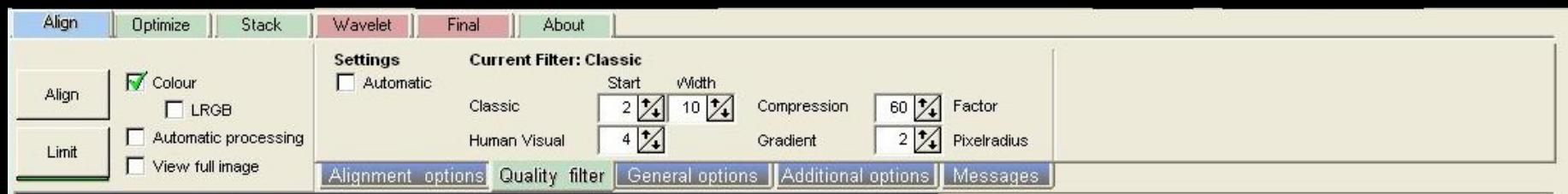
# *Registax - Alignment Options Tab*

- Method - select Default (single).
- Alignmentboxsize - select 256.
- Options - leave empty.
- Quality Estimator - select Classic and set the Lowest Quality to a value of 60 to 70.
- Processing Area - select 1024 pixels (anything larger than our video frames).



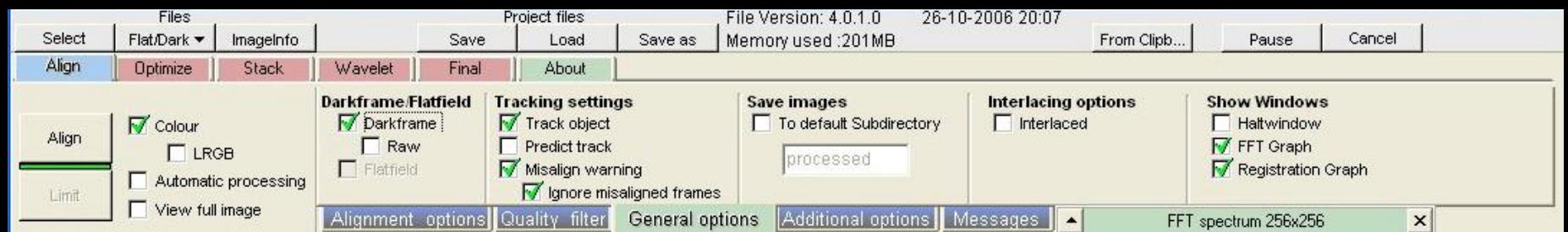
## *Registax - Quality Filter Tab*

- For the Classic filter set Start to a value of 2 and Width to a value of 10.



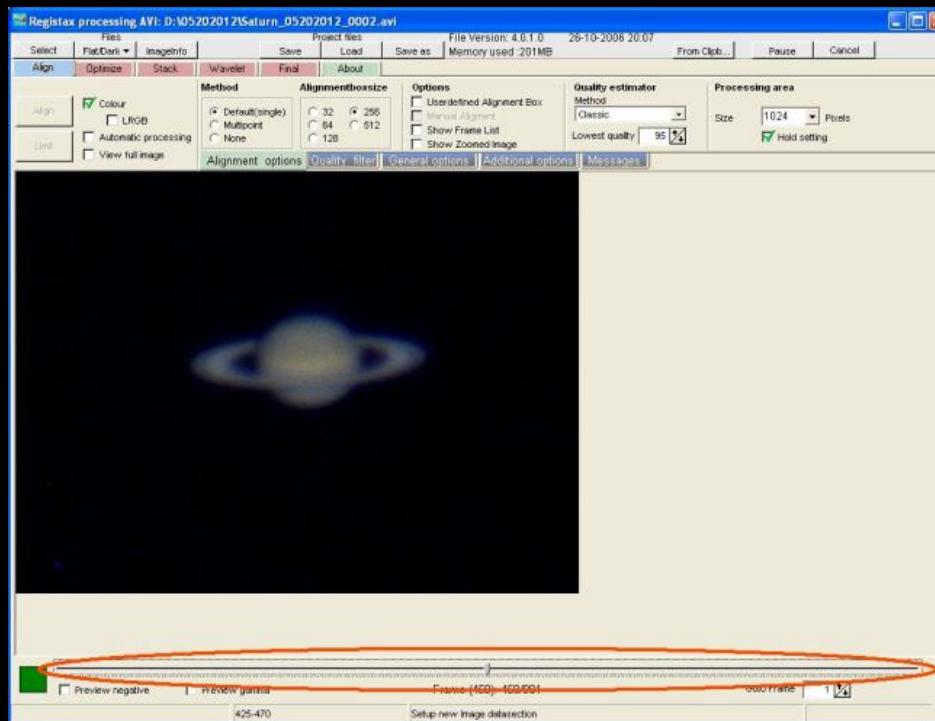
# *Registax - General Options Tab*

- Darkframe/Flatfield - The Darkframe checkbox should already be checked since we loaded a dark frame.
- Tracking Settings - Select the Track Object, Misalign Warning and Ignore Misaligned Frames checkboxes.
- Show Windows - Select the FFT Graph and Registration Graph checkboxes.



# *Registax - Select Frame*

- Use the slider at the bottom of the Registax window to position the program at the approximate center of the video file. We want to select a reference frame that is near the center of the video to reduce rotational blurring.



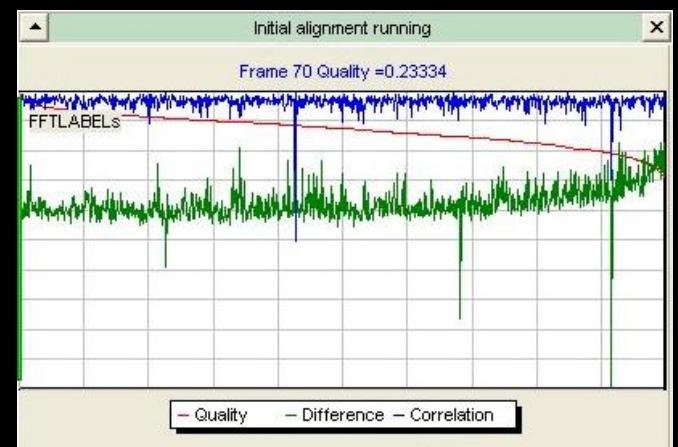
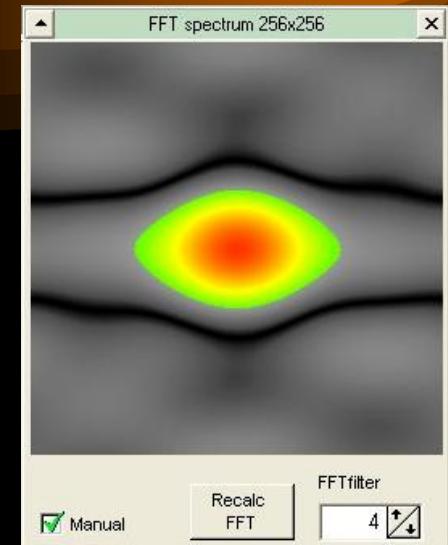
# Registax - Select Alignment Point

- Select an alignment point using an alignment box that encloses most or all of the planet (256 pixels).



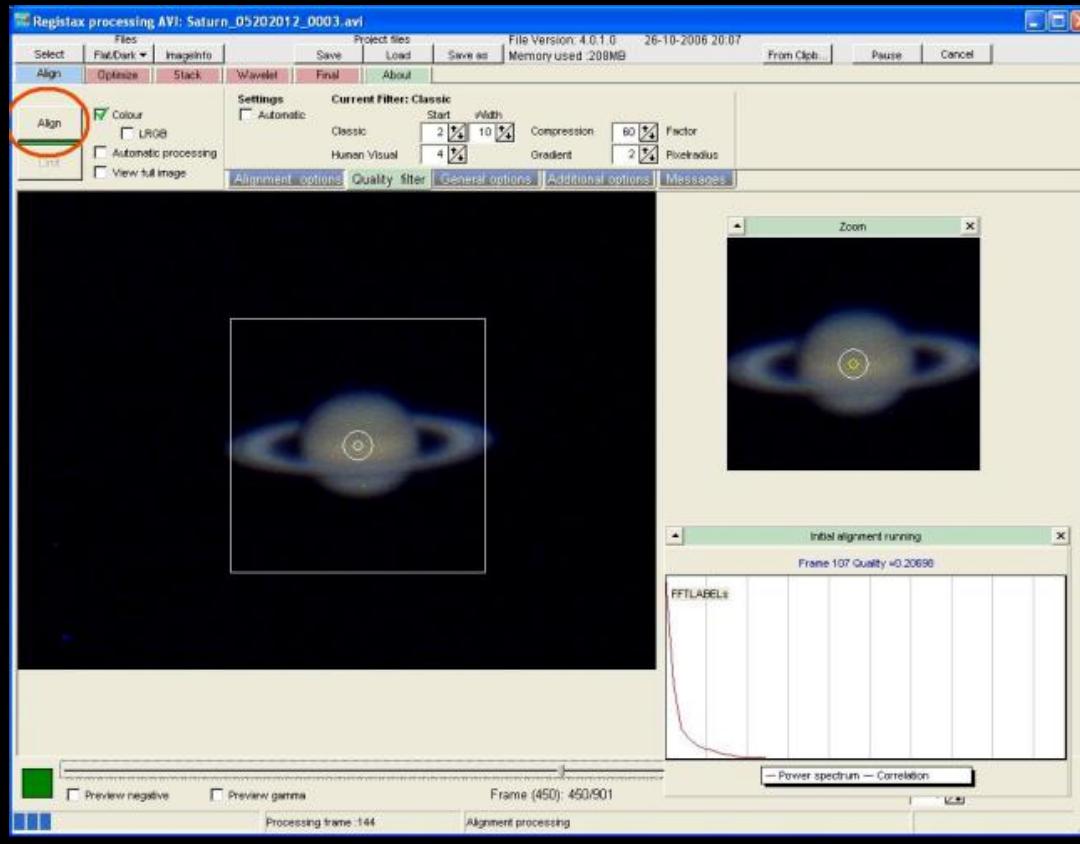
# *Registax - FFT and Registration Graphs*

- The FFT Filter width will control the quality of the alignment. I generally like to keep this to a value of around 4. The graph should show a colored spot in the middle with no color around the edges.
- The Registration Graph will show the quality of the images and how well the alignment went. In general, you will want the registration curve (green curve) to slope upward from left to right, and the image quality curve (red curve) to slope in the opposite direction.



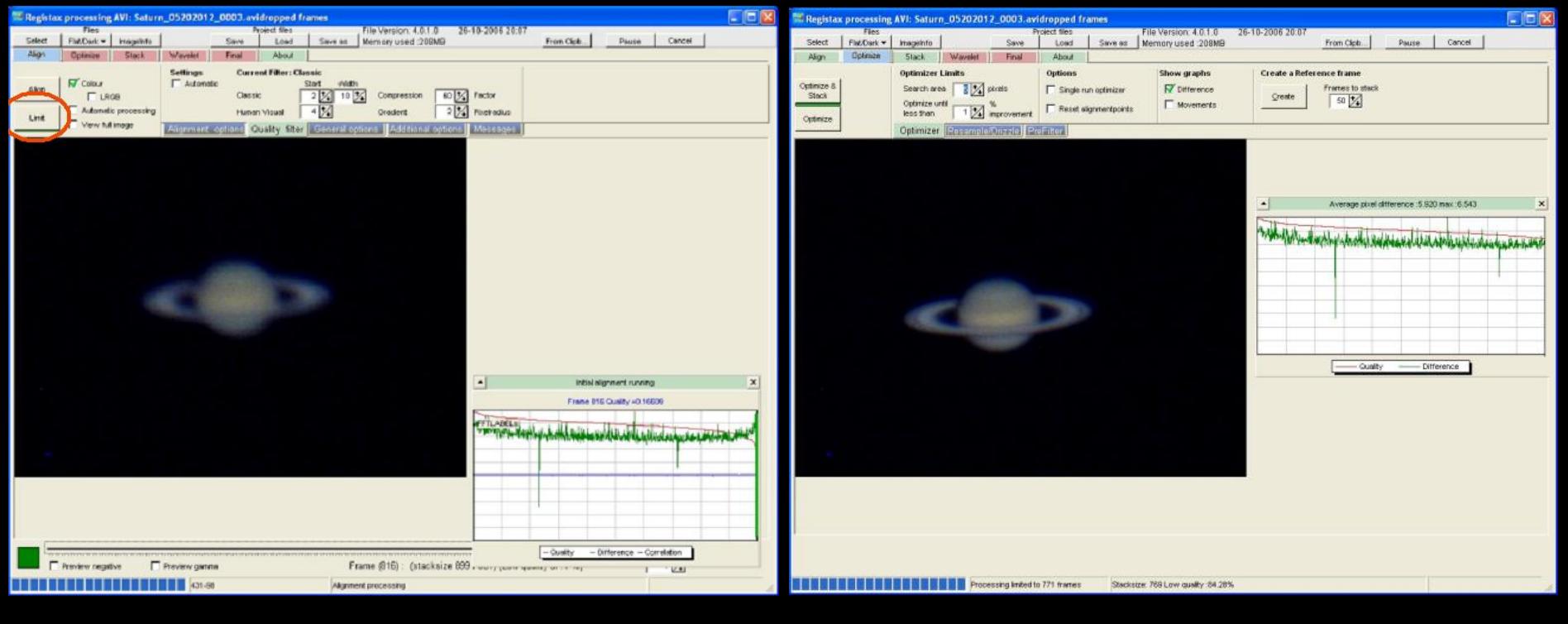
# *Registax - Alignment*

- Now that we have selected an alignment point and have our quality filter and FFT width set, it is time to press the Align button.



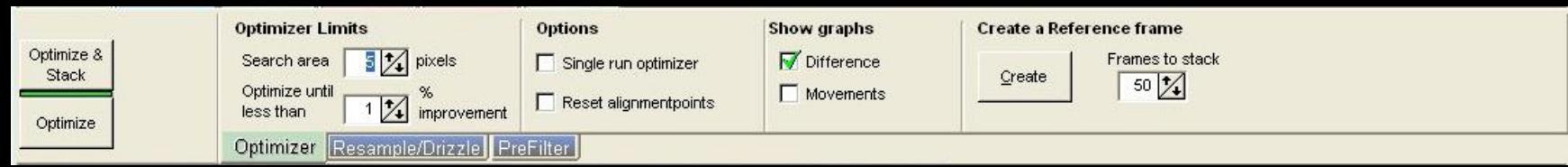
# *Registax - Optimize Tab*

- Use the scroll bar bar at the bottom to exclude unwanted frames and/or use the Framelist window to individually uncheck unwanted frames.
- Click the Limit button and Registax takes you to the Optimize Tab.



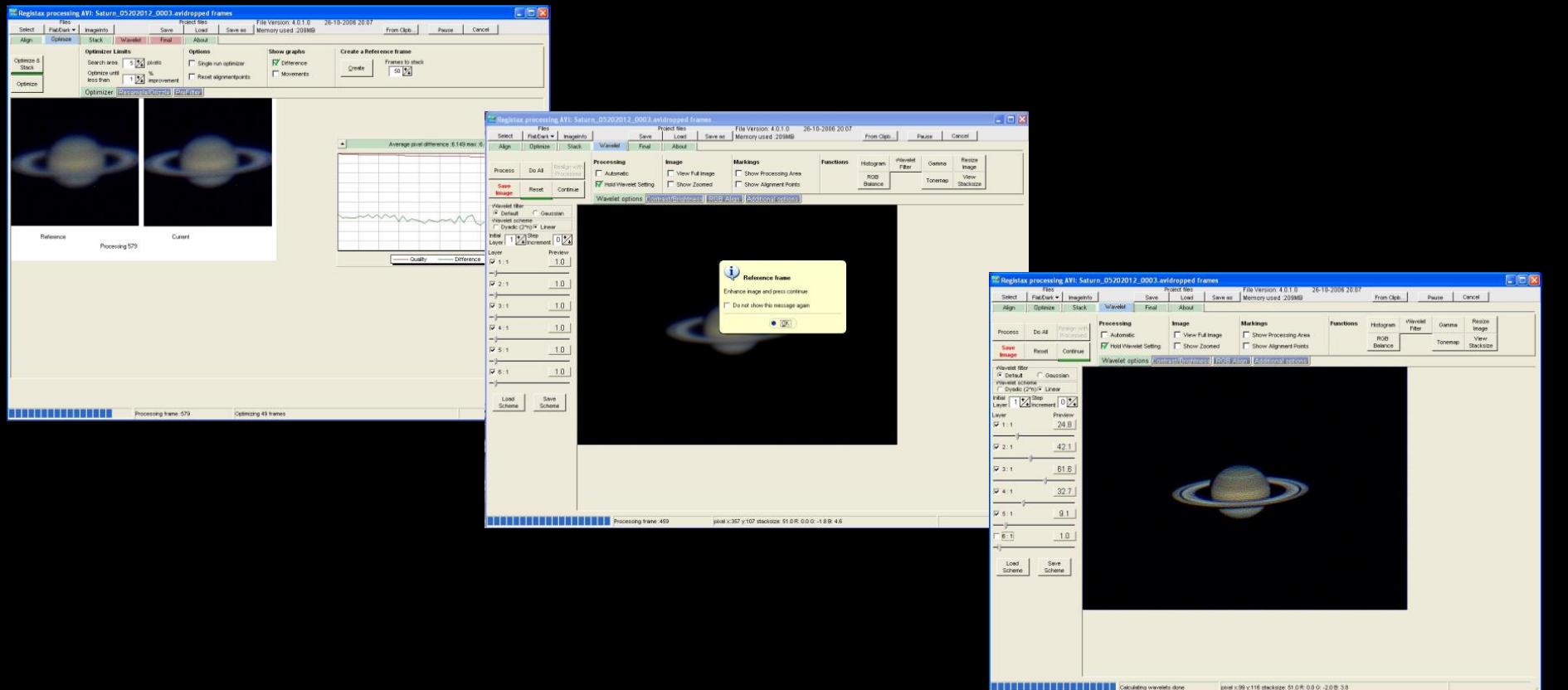
# *Registax - Optimize Settings*

- Optimizer Limits - Set the search area to 5 pixels.
- Optimize Until Less Than - set to 1%.
- Uncheck the Single Run Optimizer checkbox.
- Click the Create button to make a 50 frame reference image.



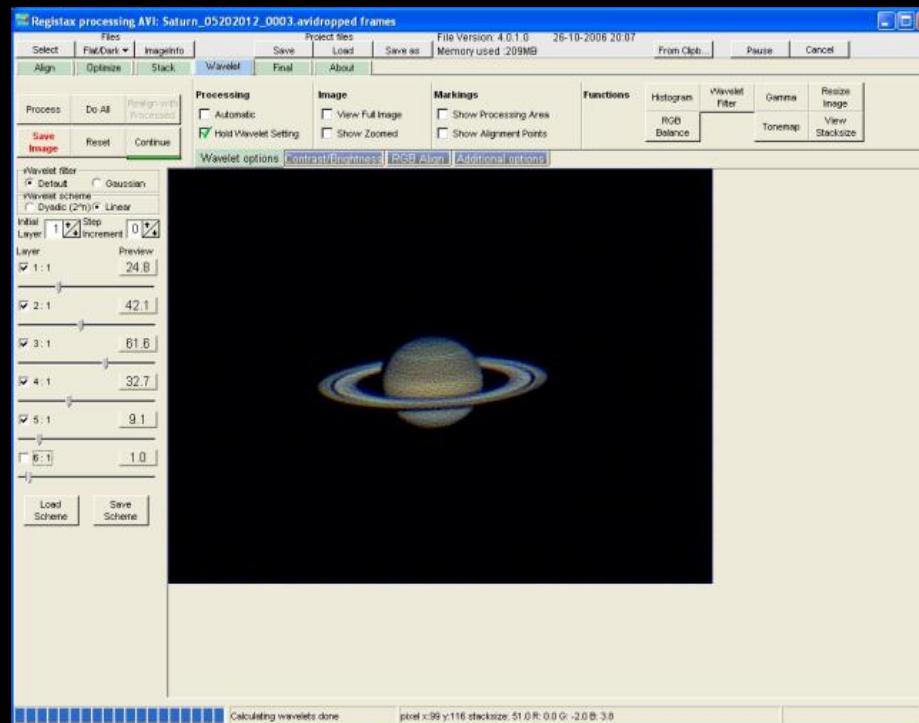
# Registax - Create Reference Frame

- Registax will optimize the 50 frames and then take you to the Wavelets tab to enhance the reference frame.



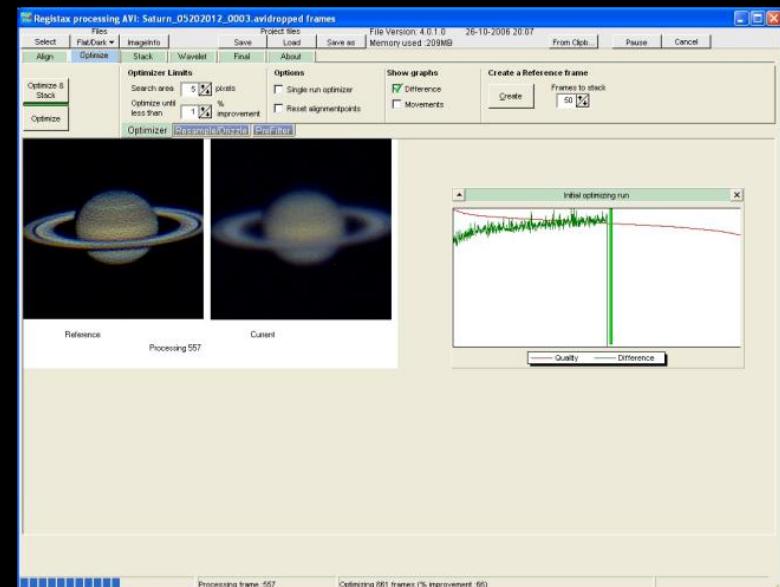
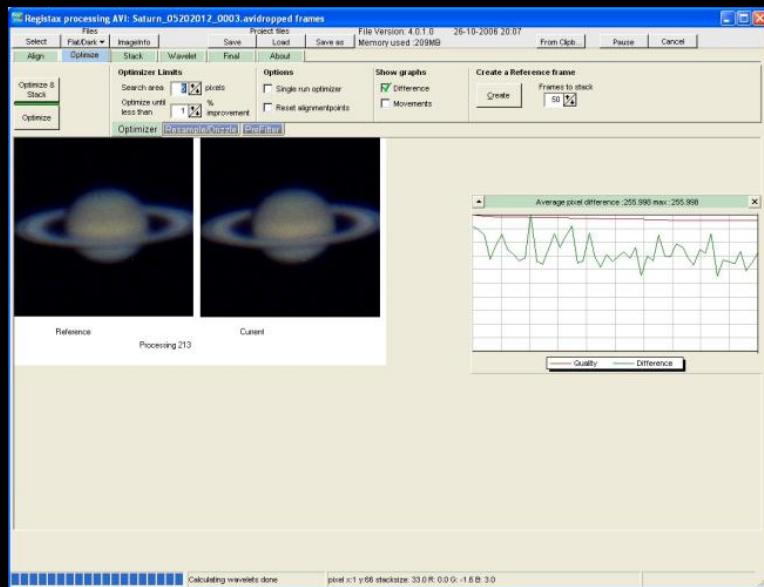
# *Registax - Wavelet Sharpening*

- Wavelets divide the image into layers of different spatial frequencies. Each slider then sharpens the corresponding layer much like when you apply an unsharp mask to an image in Photoshop, but in a more powerful way.



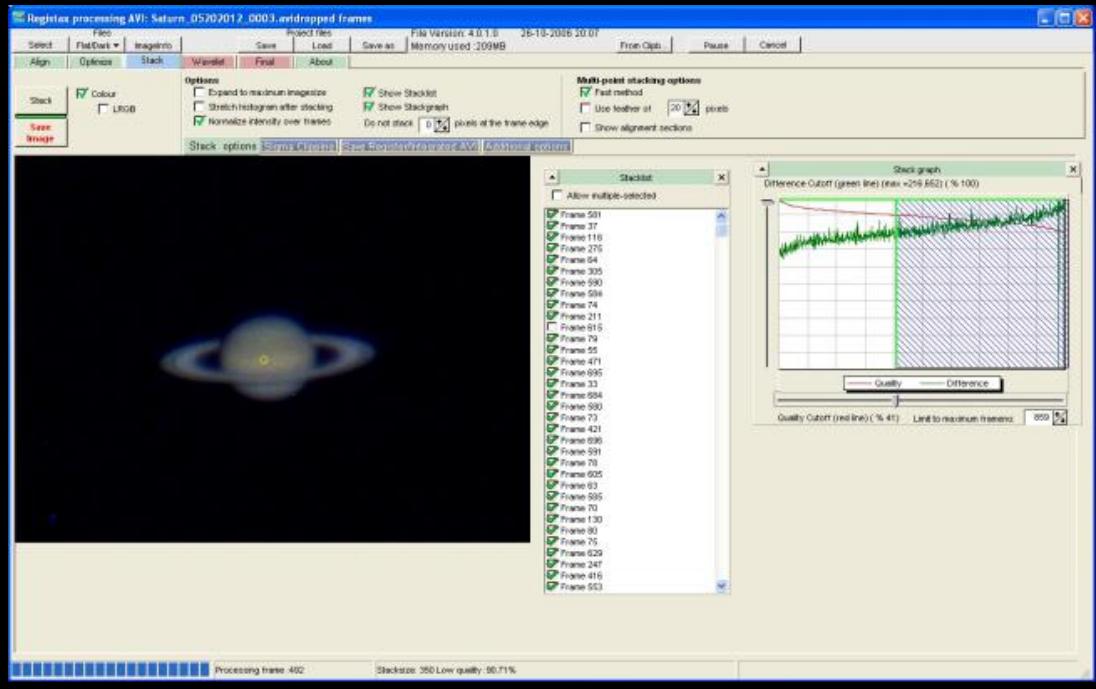
# *Registax - Optimize*

- Once the reference frame is sharpened to your satisfaction click the Continue button and you will be taken back to the Optimize tab.
- Click the Optimize button. Registax will now optimize the alignment of the video frames with the new reference frame.



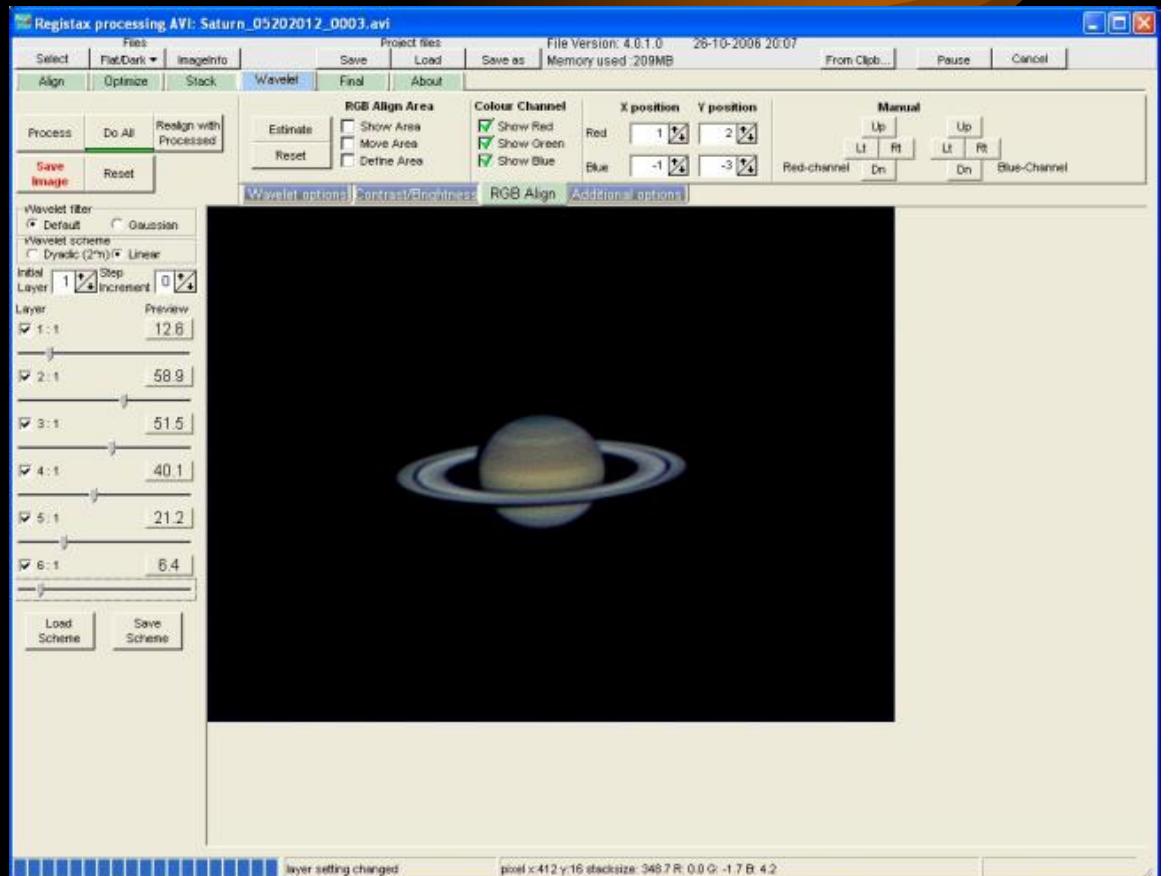
# *Registax - Stacking*

- Options - Select the Normalize Intensity Over Frames option.
- Select the Show Stacklist and Stackgraph options.
- Adjust the slider on the Stack Graph and/or the Stacklist window to exclude unwanted frames.
- Click the Stack button.



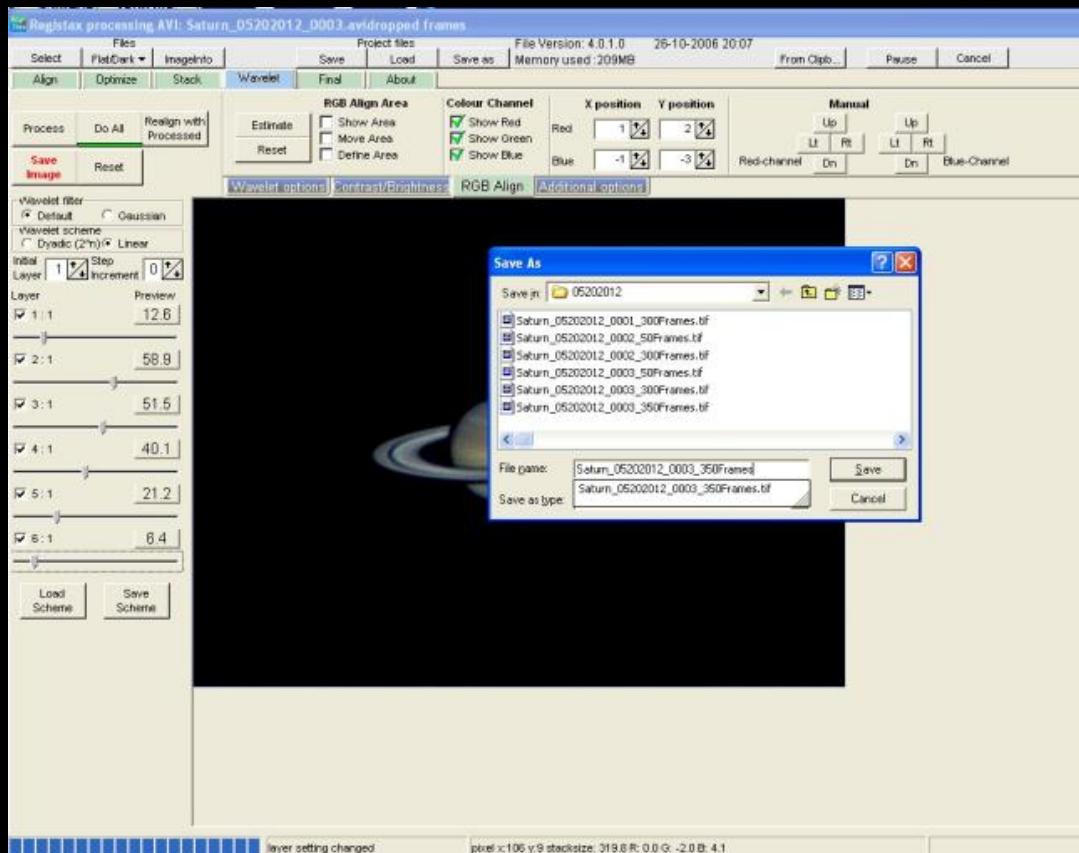
# *Registax - Wavelet Tab*

- RGB Align - Select the RGB tab and then uncheck each of the wavelet layers.
- Click the Estimate button.
- Recheck the wavelet layers.
- Adjust the wavelets layers as needed.



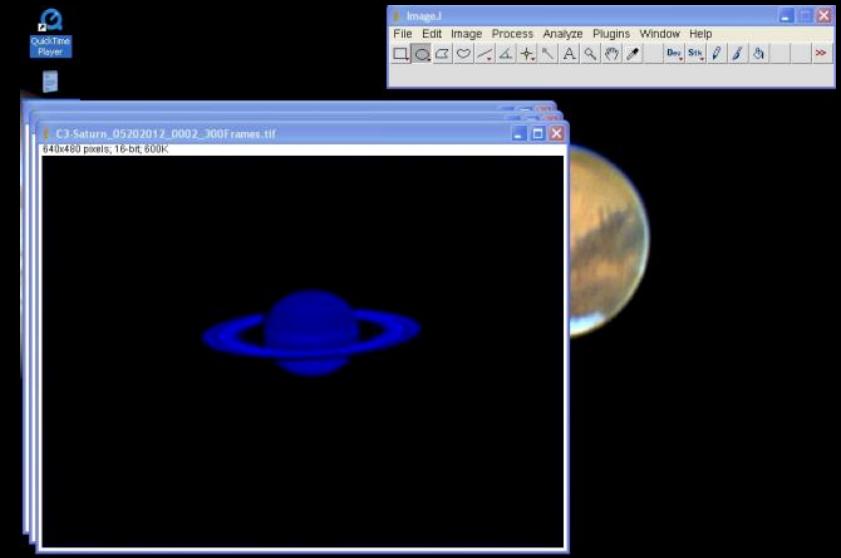
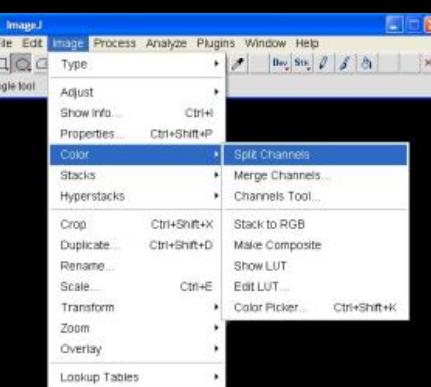
# *Registax - Save Image*

- Now save the image. Append the number of frames used in the stack to the end of the file name. Save in TIFF format.



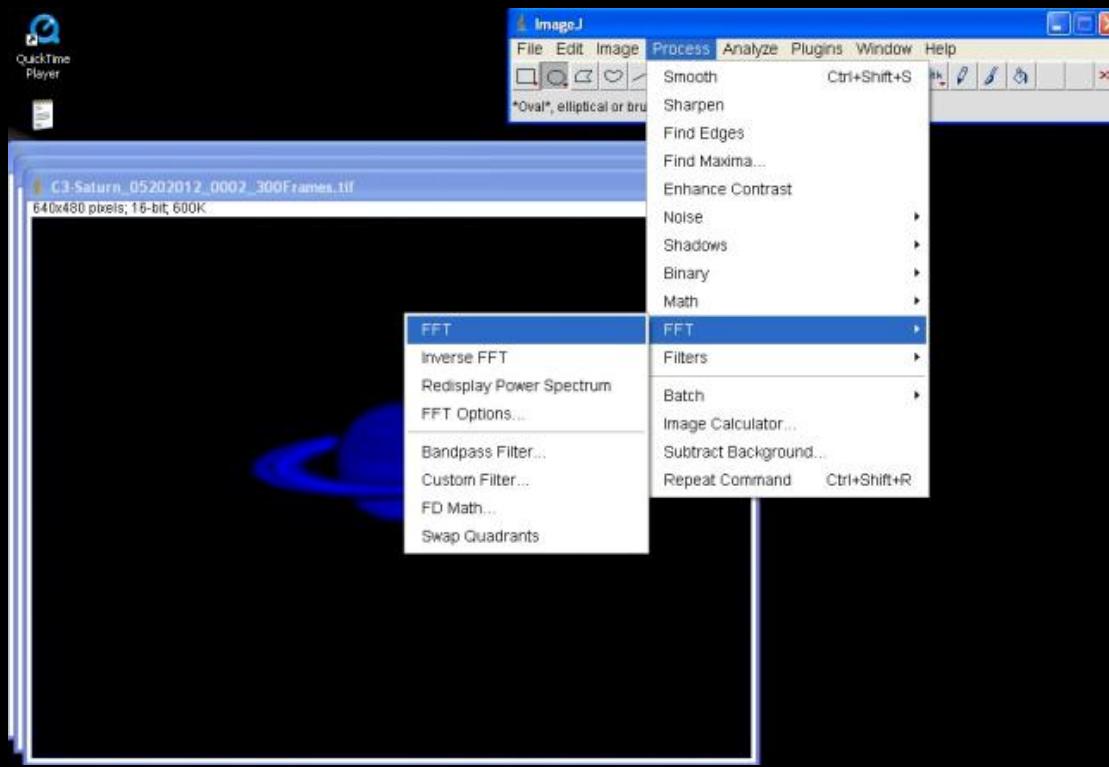
# ImageJ - *FFT Pattern Noise Removal*

- Some cameras have pattern noise (diagonal bands) that can ruin the image unless you have a way to remove them. An FFT editor will do the job..
- Open the image that was saved from Registax with ImageJ.
- Split the image into the RGB channels.



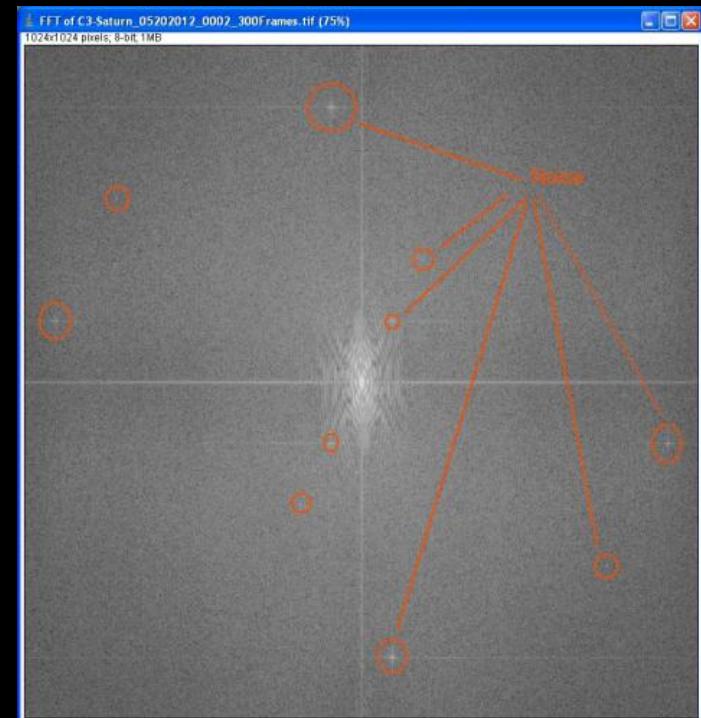
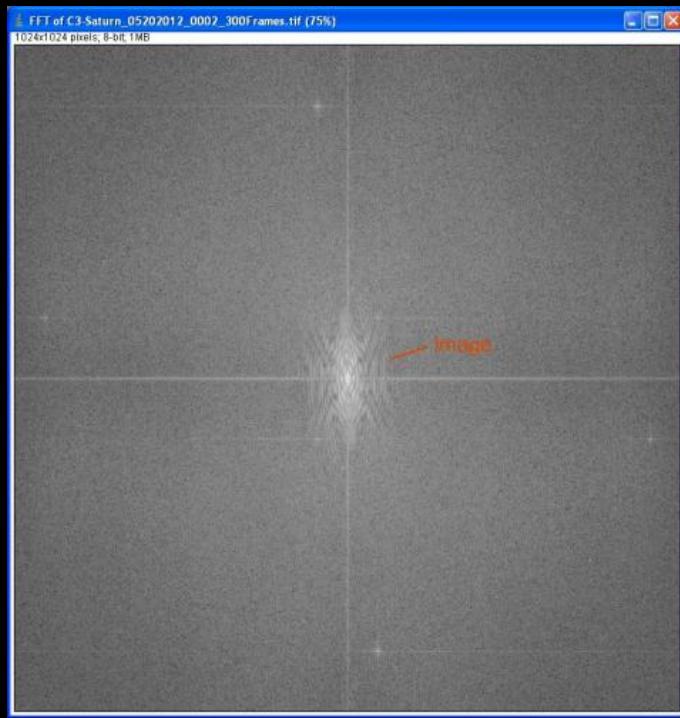
# ImageJ - *FFT Pattern Noise Removal*

- Select the blue channel window and then from the ImageJ Process menu select FFT.
- Repeat for the green and red channels.



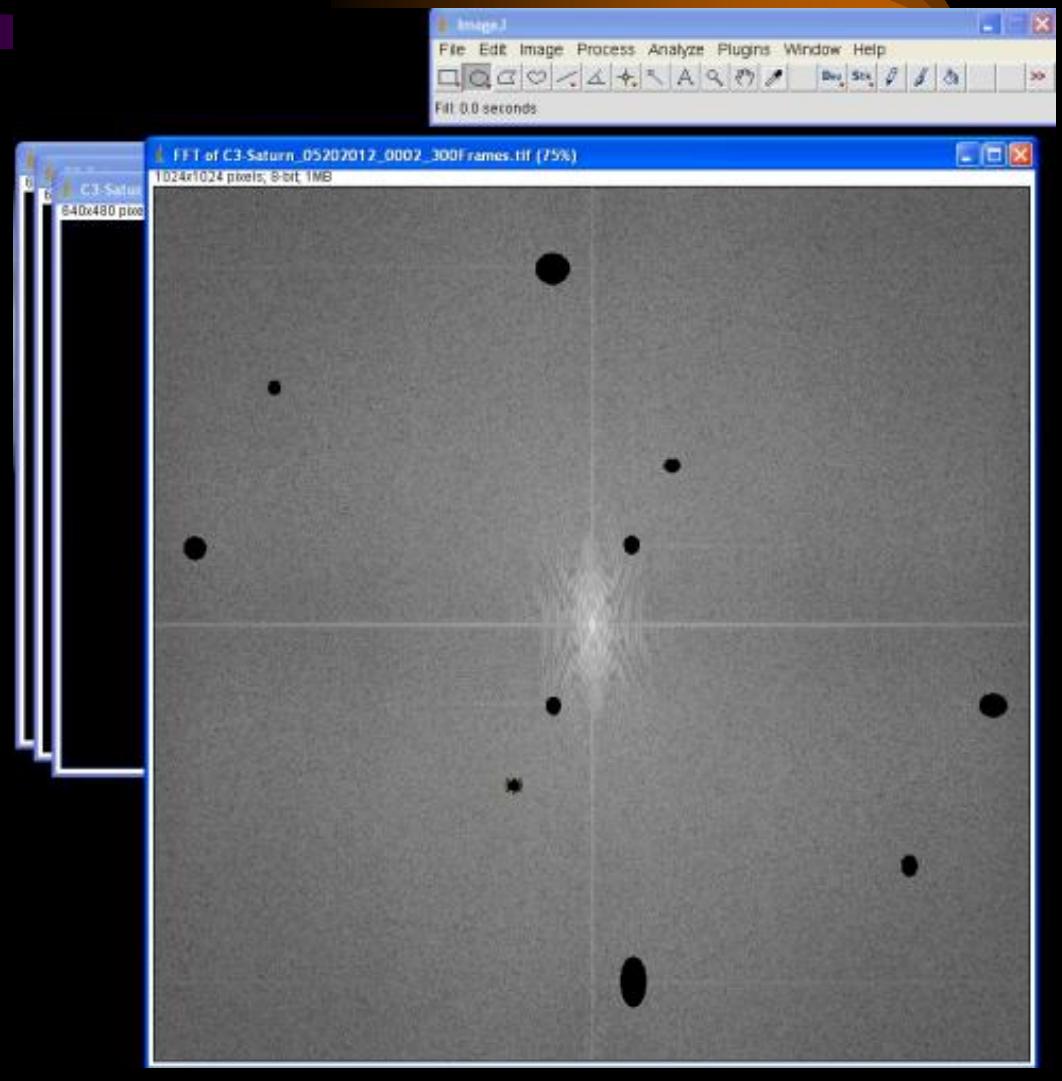
# ImageJ - *FFT Pattern Noise Removal*

- The FFT graph is a display showing the image frequencies.
- The central spot in the graph is a frequency representation of our image.
- Pattern noise is represented by the other spots.



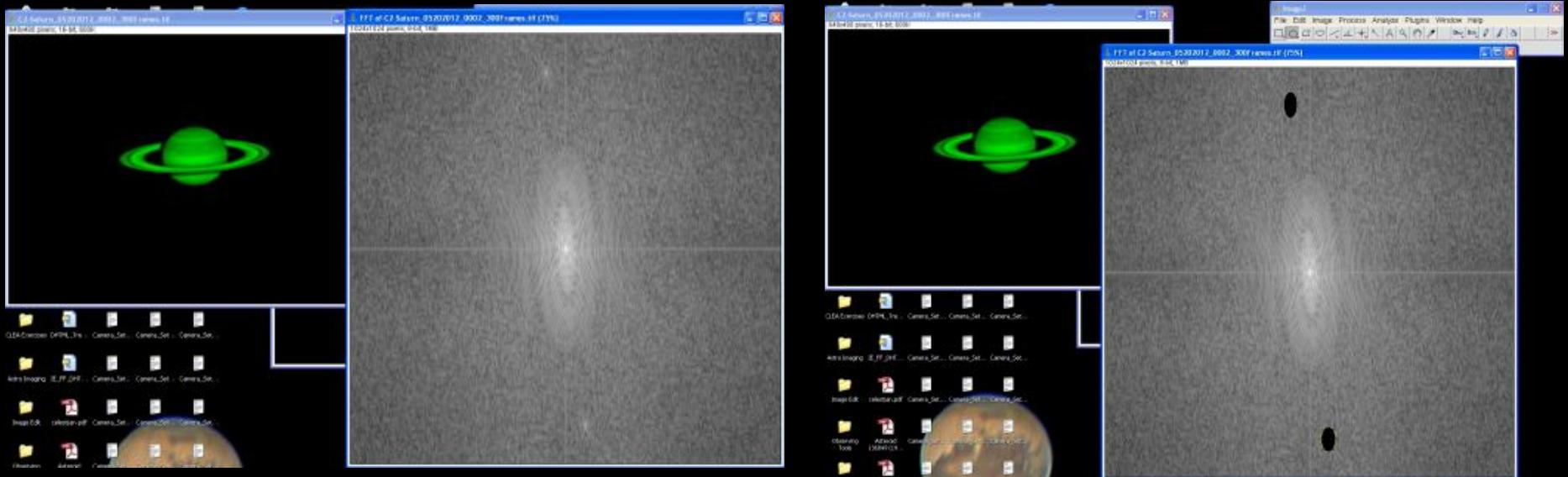
# ImageJ - *FFT Pattern Noise Removal*

- Select the ellipse tool on the ImageJ menu and then draw an ellipse around one of the noise spots to select it.
- Use **Ctrl+F** to fill the selection.
- Repeat for all of the other noise spots.



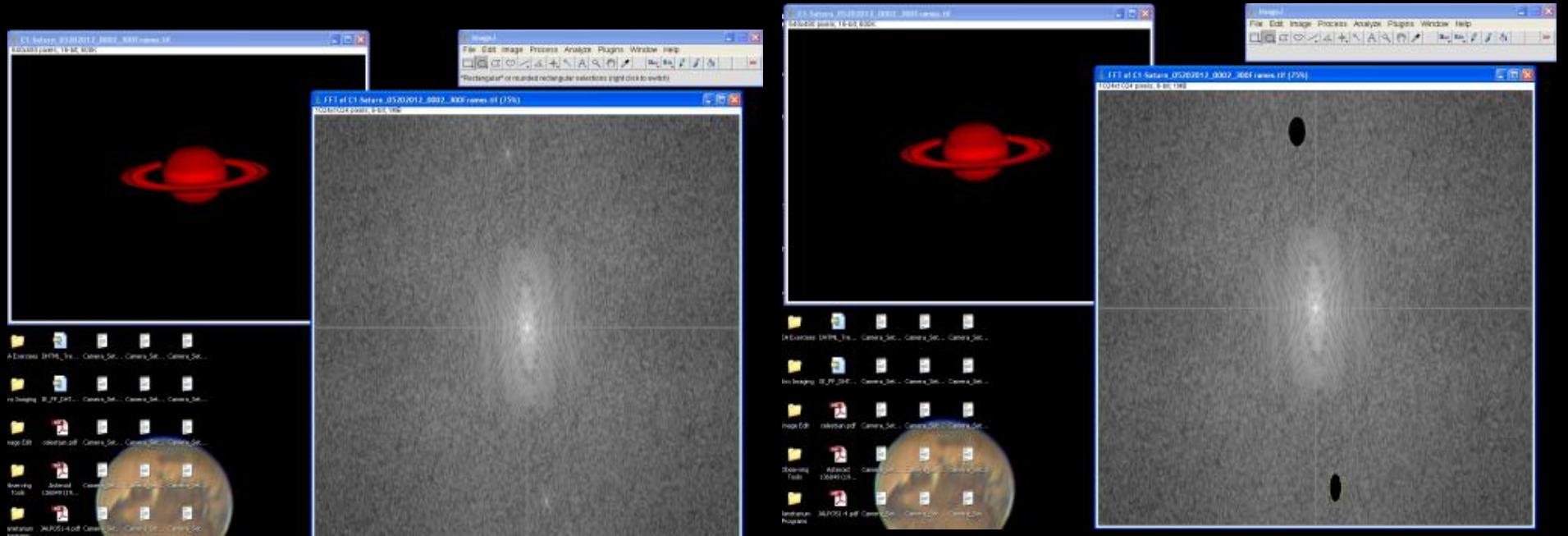
# ImageJ - *FFT Pattern Noise Removal*

- Green Channel.



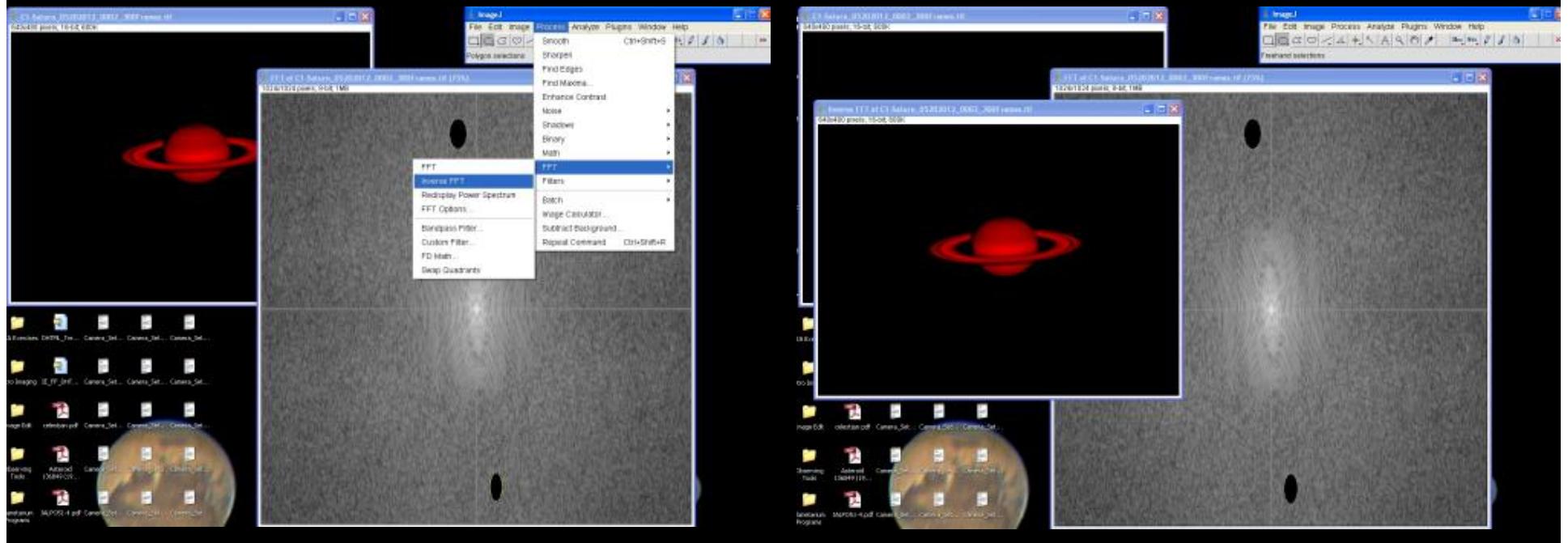
# ImageJ - *FFT Pattern Noise Removal*

- Red Channel.



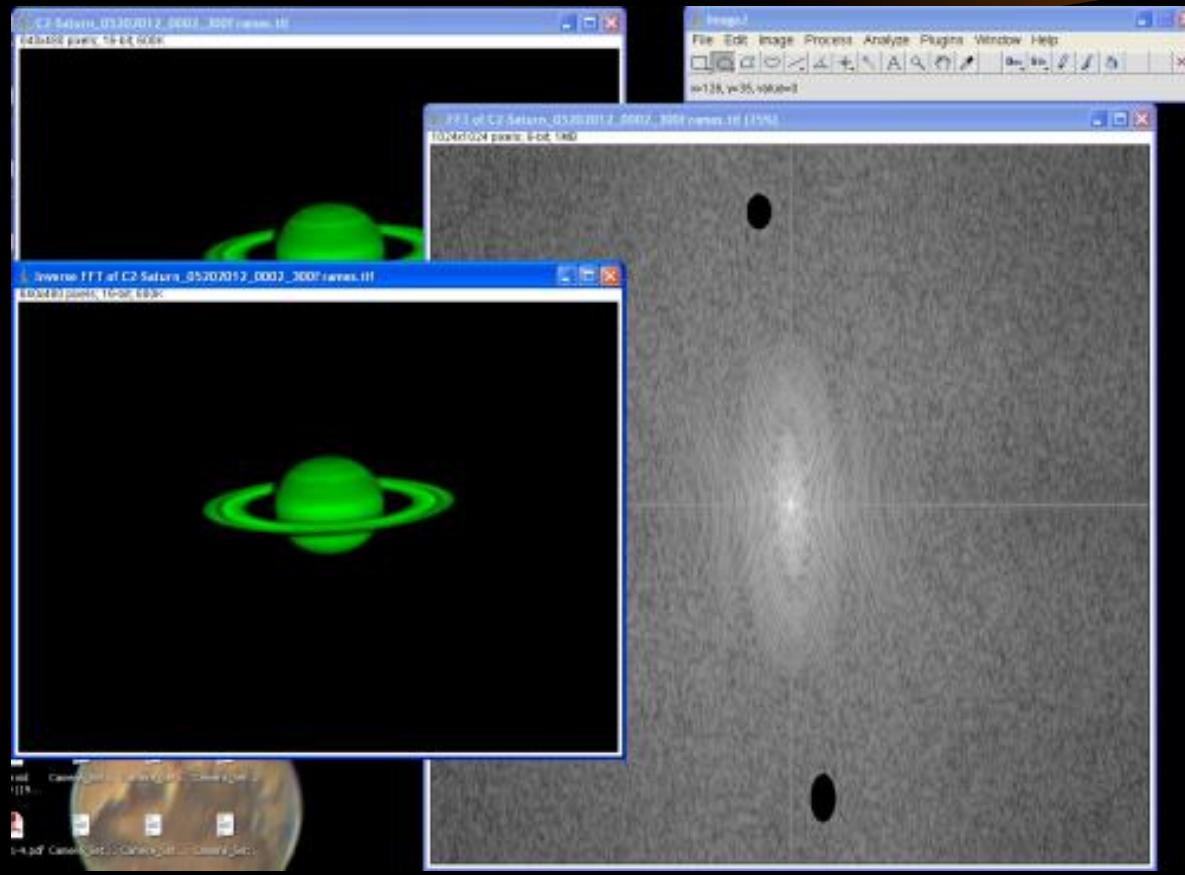
# ImageJ - FFT Pattern Noise Removal

- Now we will take the inverse transform of each of the edited FFTs, starting with the red channel. Make sure that the edited red FFT window is selected.
- Repeat for the green and blue FFT windows.



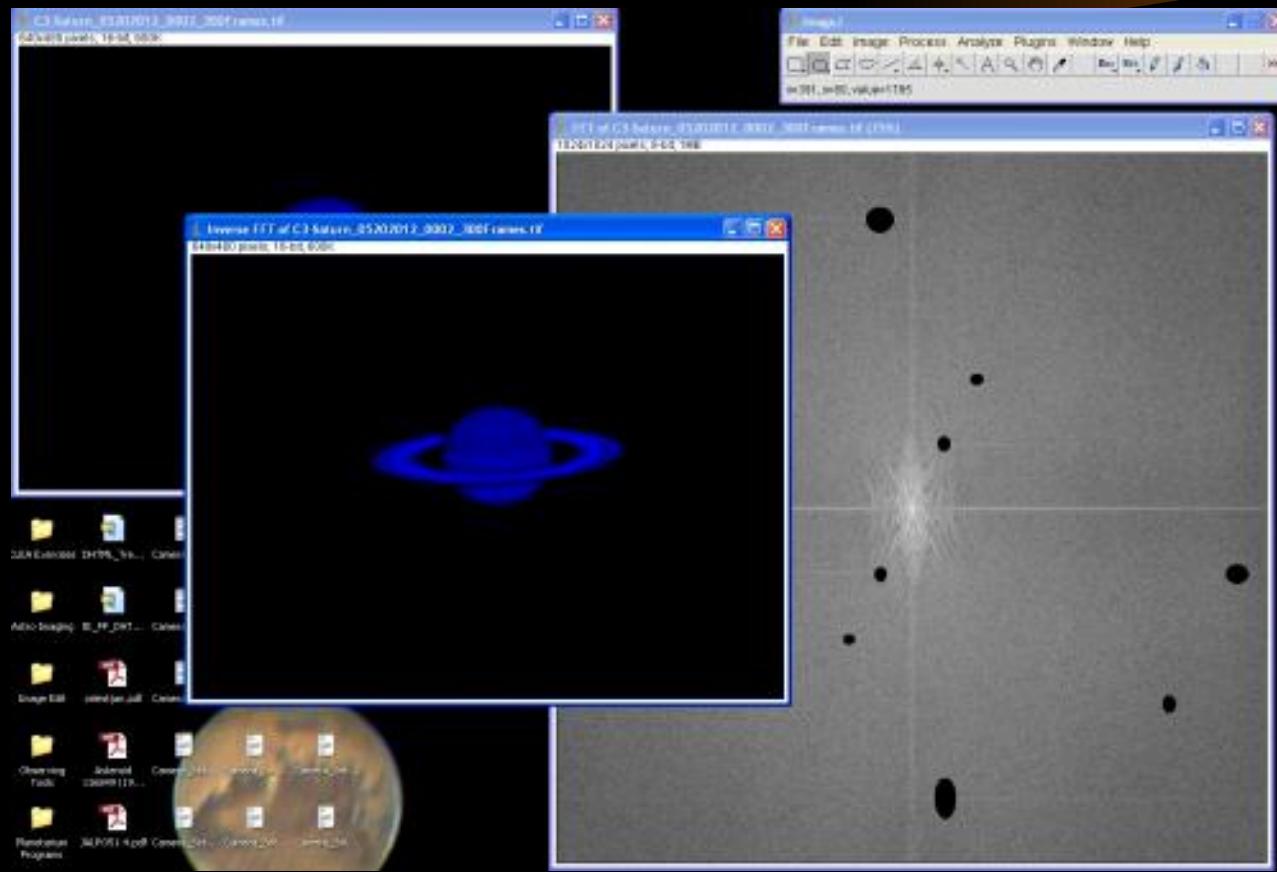
# ImageJ - *FFT Pattern Noise Removal*

- Green Inverse FFT.



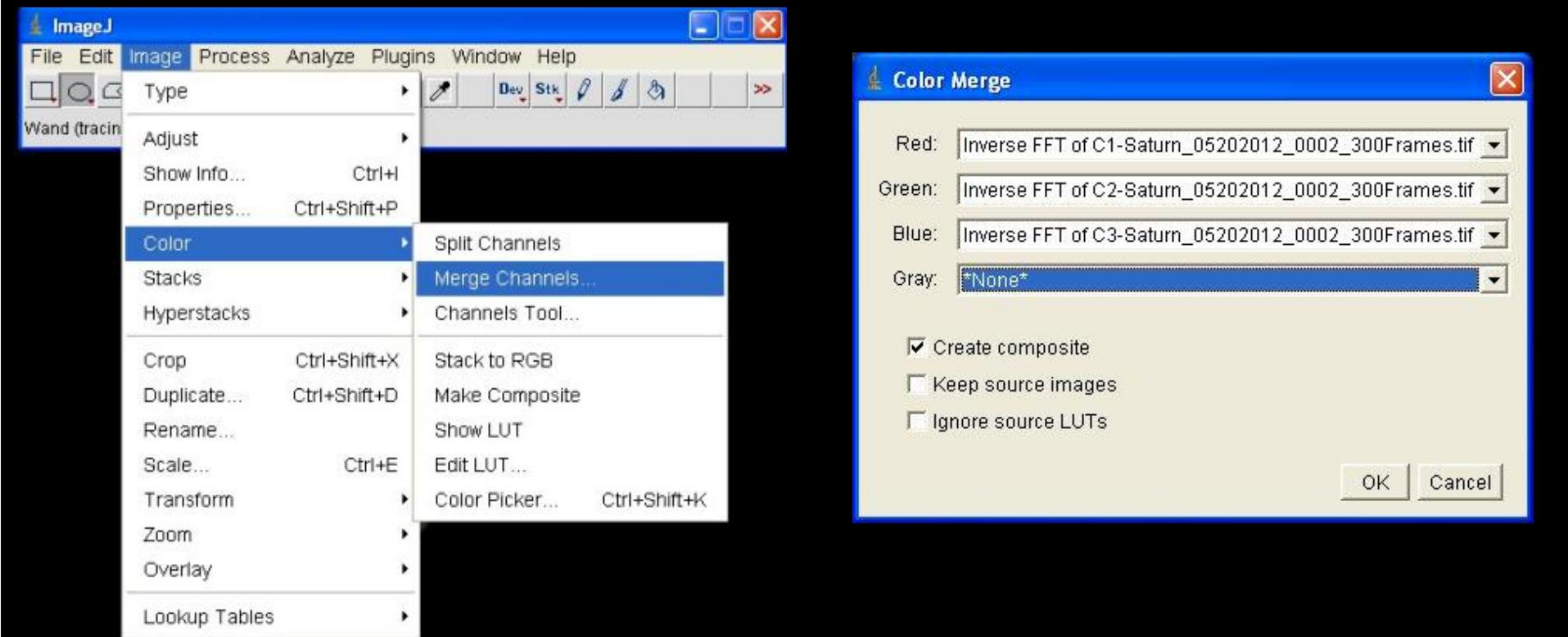
# ImageJ - *FFT Pattern Noise Removal*

- Blue Inverse FFT.



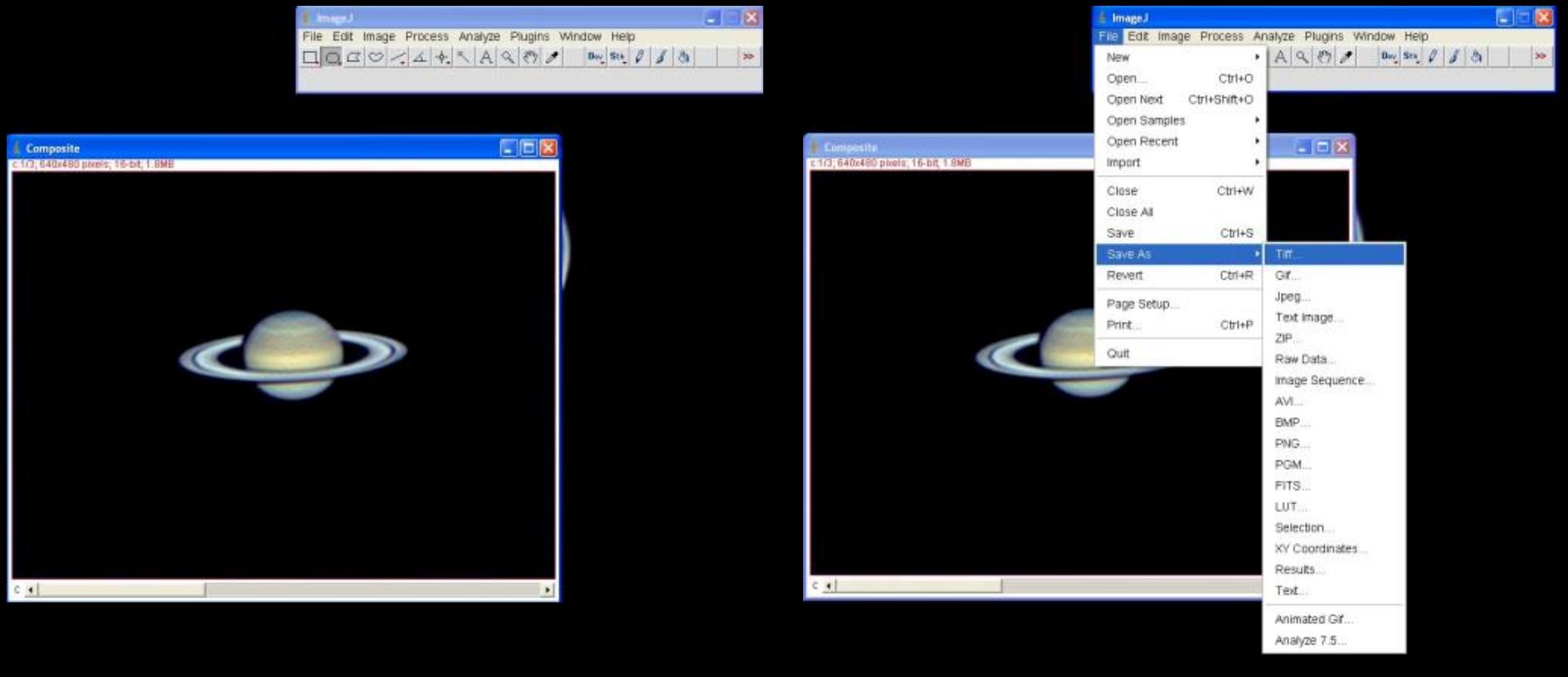
# ImageJ - *FFT Pattern Noise Removal*

- Recombine the inverse FFT RGB images using the Merge Channels dialog.
- ImageJ uses C1 for red, C2 for green and C3 for blue.



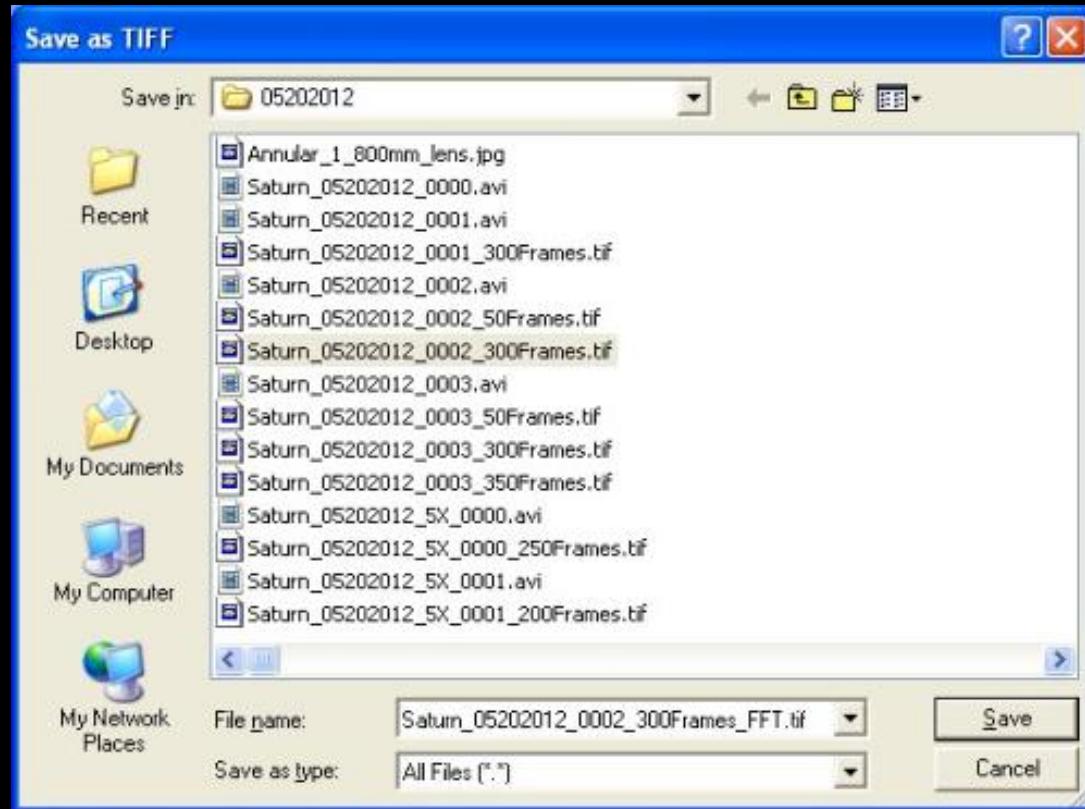
# ImageJ - *FFT Pattern Noise Removal*

- The final pattern noise free image.
- Save in TIFF format.



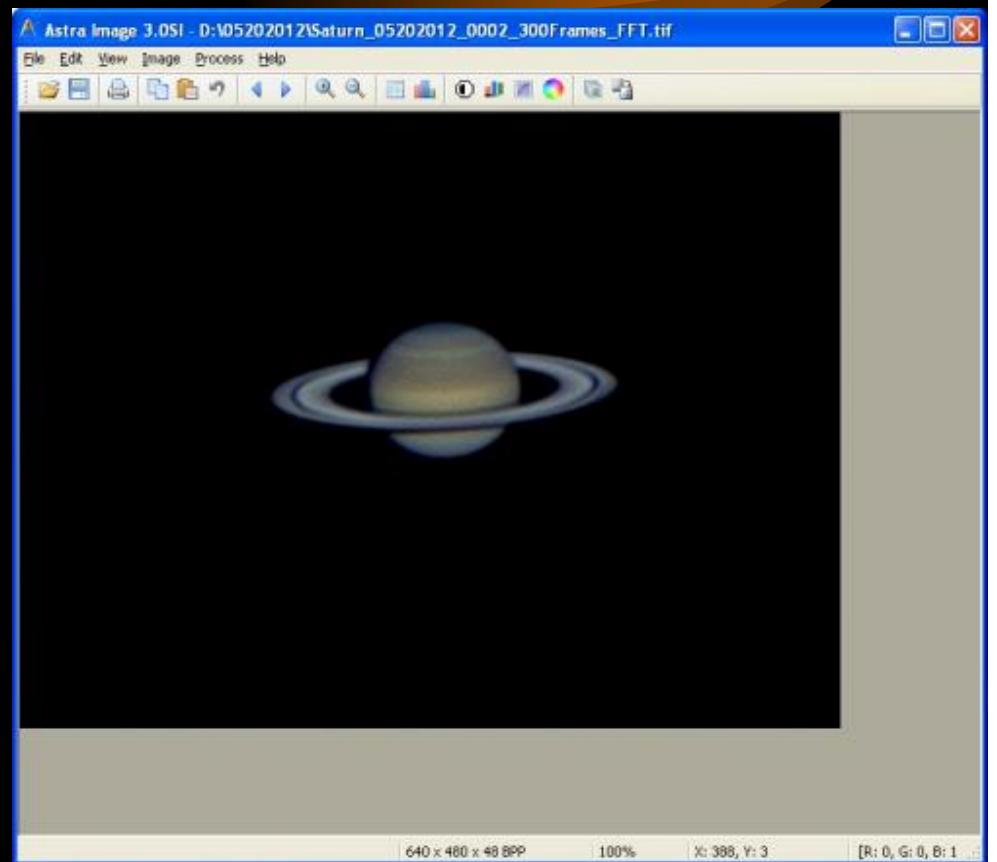
# ImageJ - FFT Pattern Noise Removal

- Append “\_FFT” to the end of the file name.



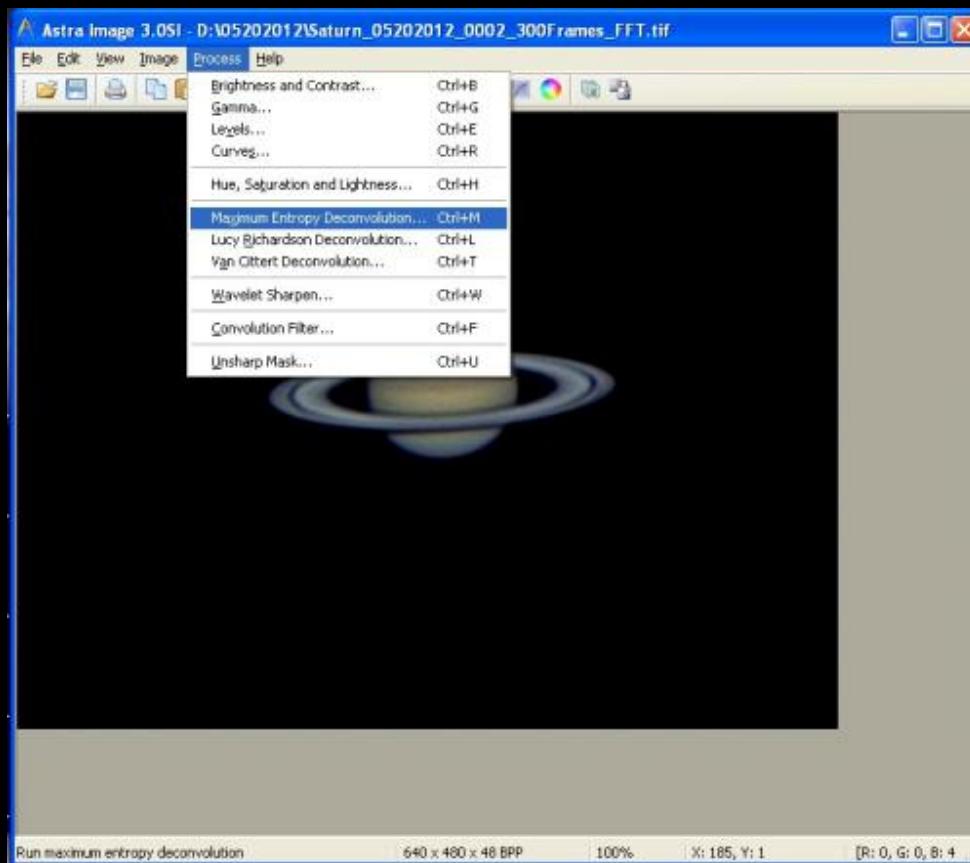
# *AstraImage - Deconvolution*

- Image quality can be improved by applying deconvolution.
  - slightly out of focus.
  - poor seeing.
  - optical defects.
- Open the output image from ImageJ with AstraImage.



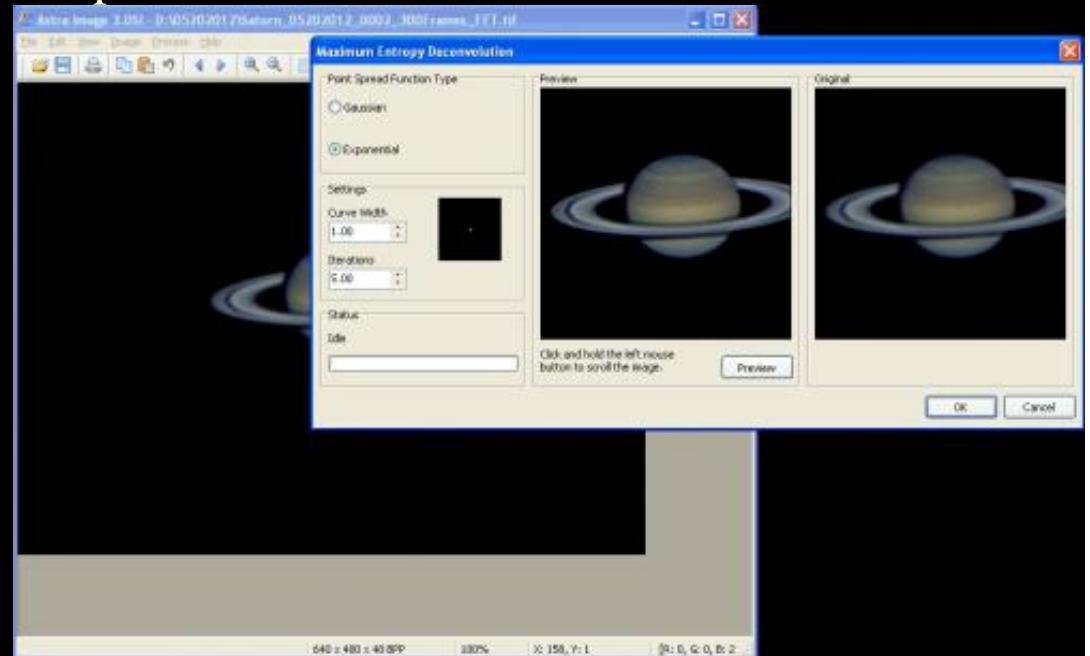
# *AstraImage - Deconvolution*

- Select the Maximum Entropy Deconvolution menu item from the Process menu.



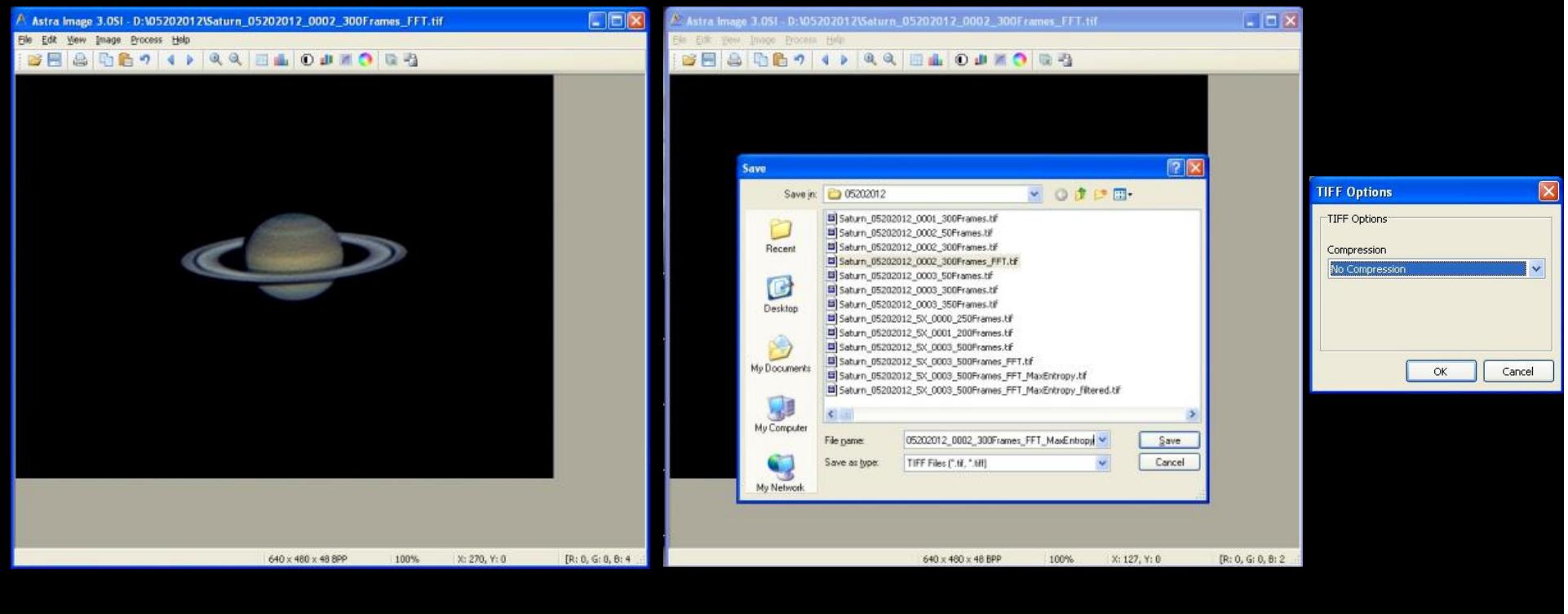
# *AstraImage - Deconvolution*

- From the Preview dialog change the point spread function type to exponential.
- Change the curve width to 1.
- Change the number of iterations to 5.
- Drag Saturn into the center of the preview window.
- Click Preview.
- Change settings as needed.
- Click Ok to apply.



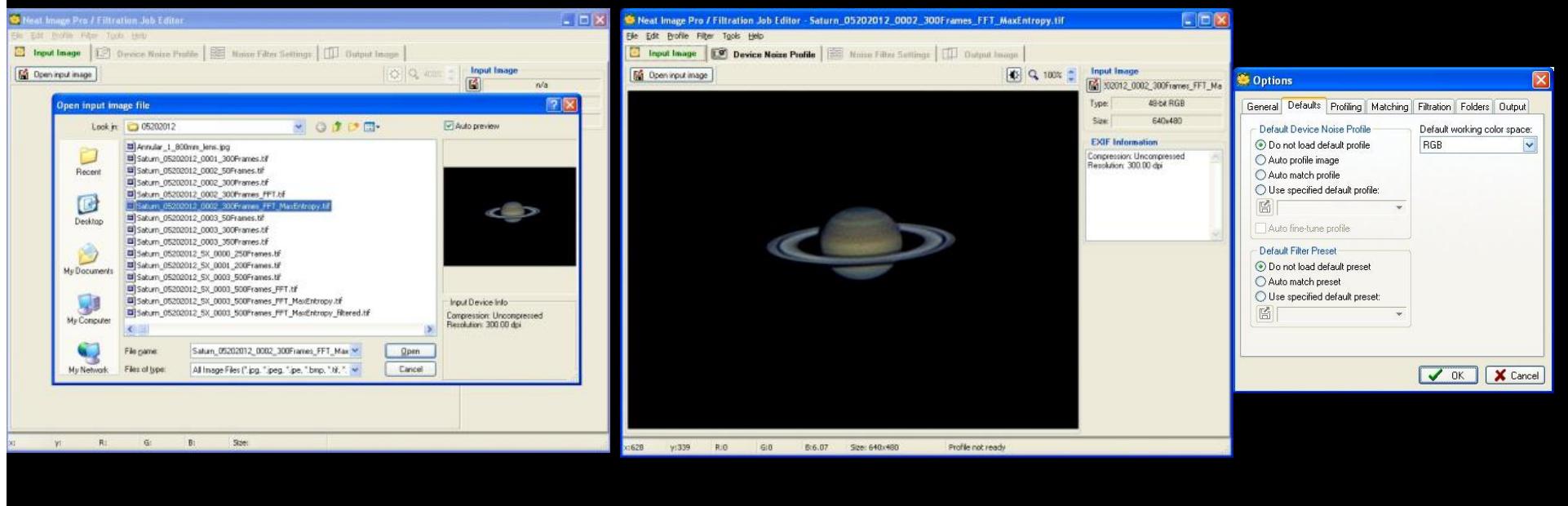
# *AstraImage - Deconvolution*

- Save the final image in TIFF format.
- Append “\_MaxEntropy” to the file name.
- Save as an uncompressed TIFF image.



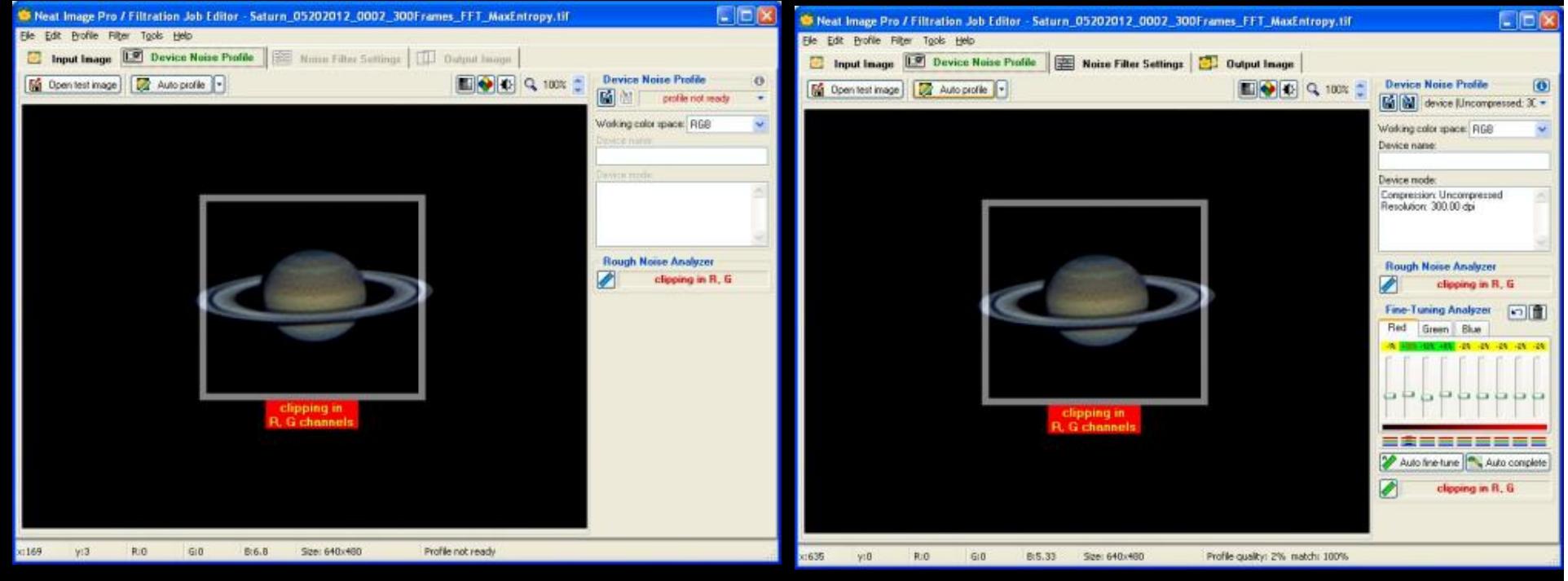
# *Neat Image - Digital Noise Removal*

- Open the output image from AstraImage with Neat Image.
- From the Tools menu select the Options item.
- On the Defaults tab select RGB as the working color space and click OK.



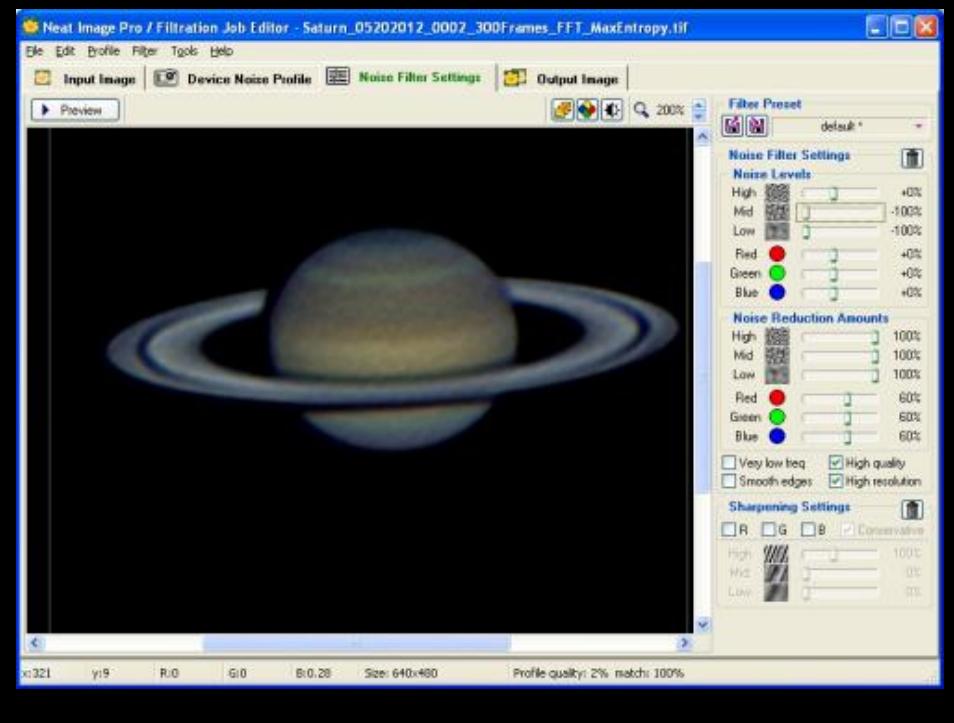
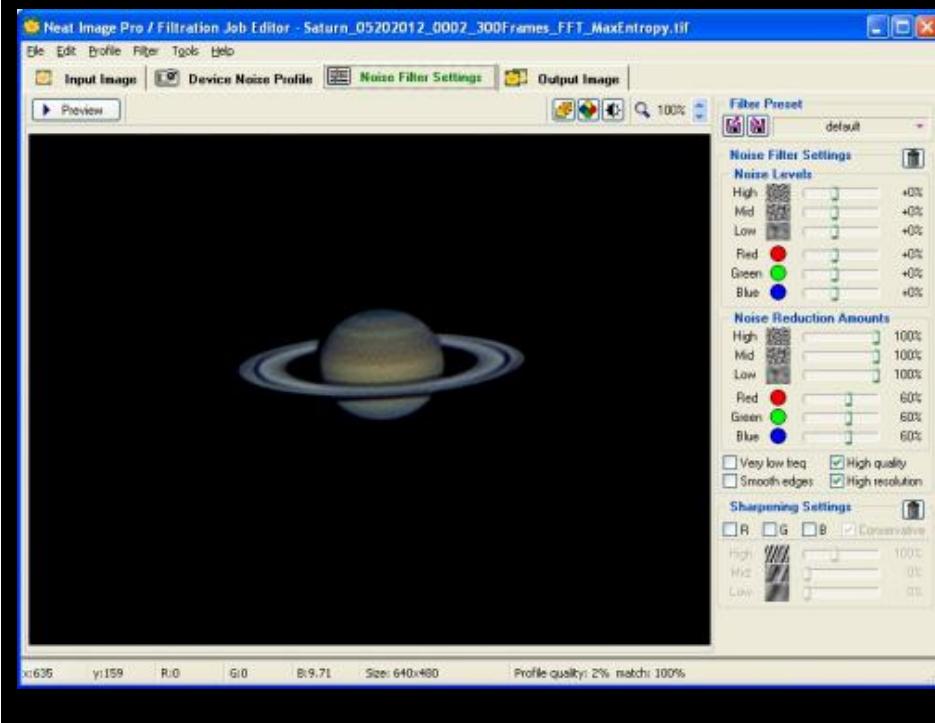
# *Neat Image - Digital Noise Removal*

- Select the Device Noise Profile tab.
- Draw a rectangle around Saturn.
- Click the Auto Profile button.



# *Neat Image - Digital Noise Removal*

- Select the Noise Filter Settings tab.
- Set the Noise Filter Settings sliders for Mid and High to zero.
- Set the Zoom level to 200% and click Preview.

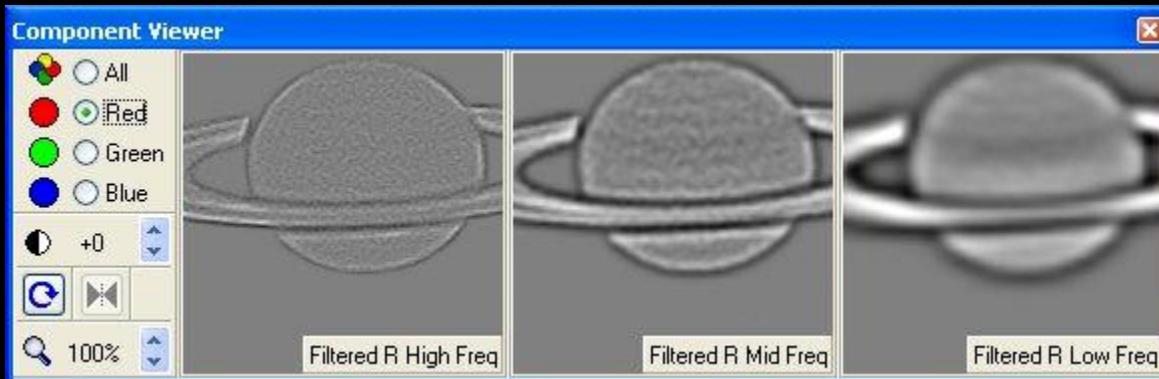


# *Neat Image - Digital Noise Removal*

- Click on the Component Viewer button.

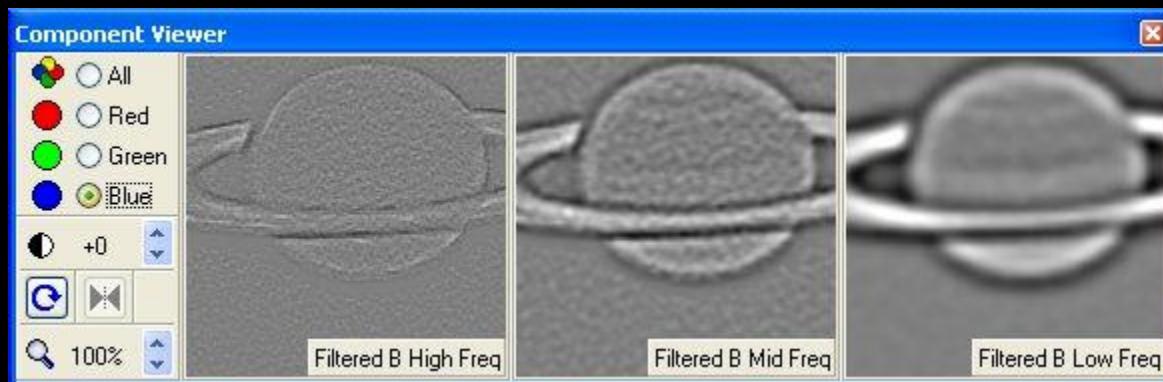
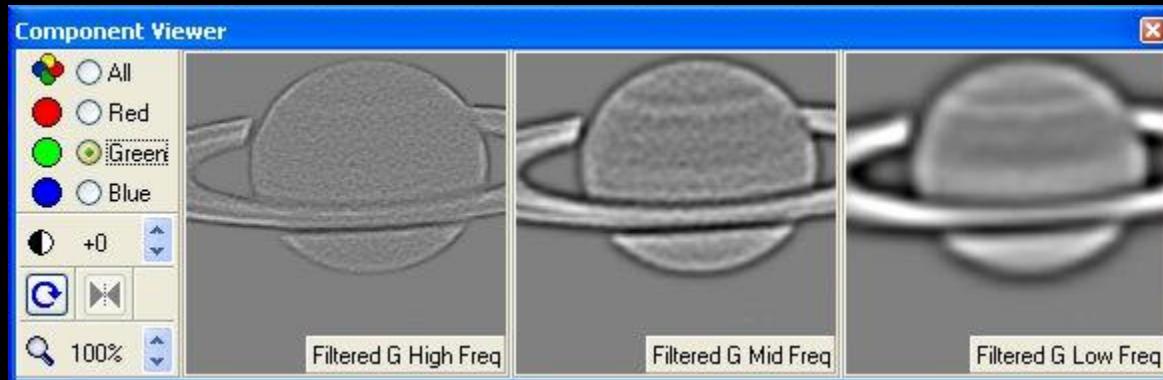


- The Component Viewer allows you to see the changes in each channel.
- Component Viewer - red channel.



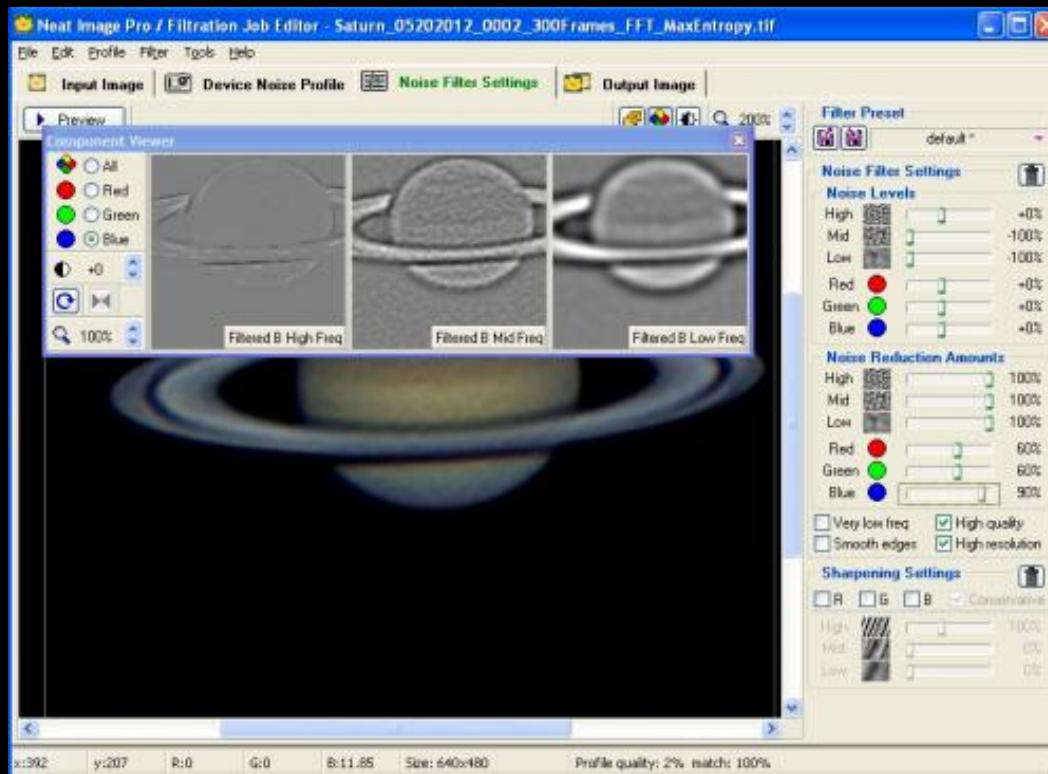
# *Neat Image - Digital Noise Removal*

- Component Viewer - green and blue channels.



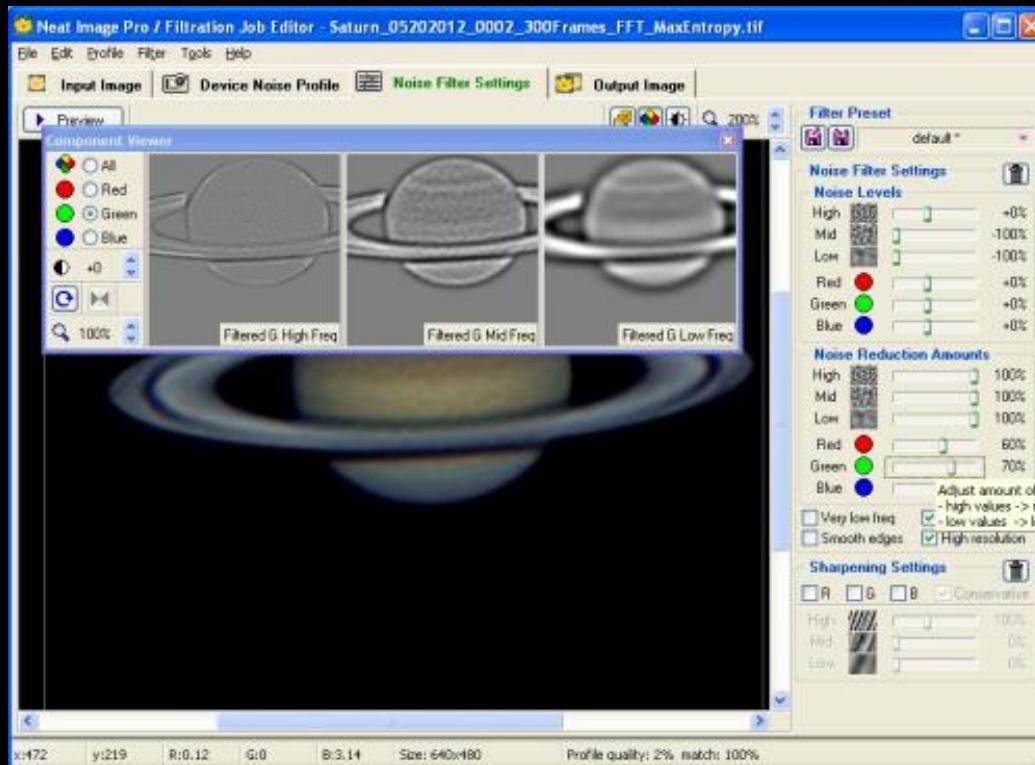
# *Neat Image - Digital Noise Removal*

- Select the blue channel in the Component Viewer.
- Move the blue noise reduction slider so that most of the high frequency blue noise is gone.



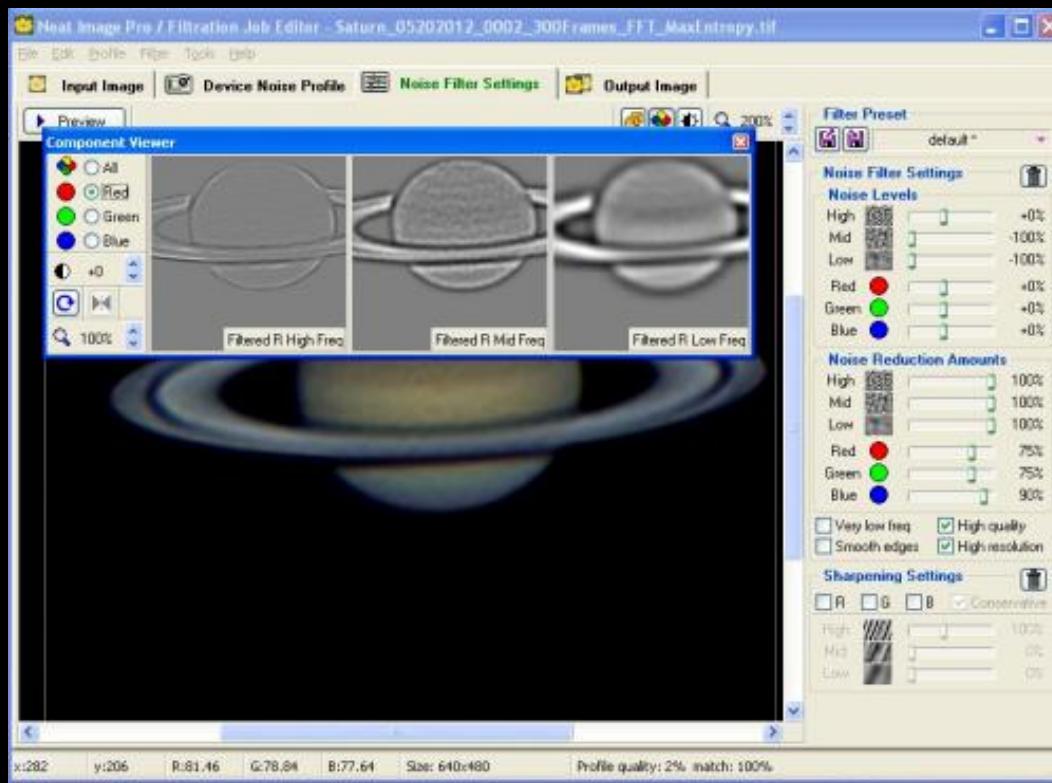
# *Neat Image - Digital Noise Removal*

- Select the green channel in the Component Viewer.
- Move the green noise reduction slider so that most of the high frequency green noise is gone.



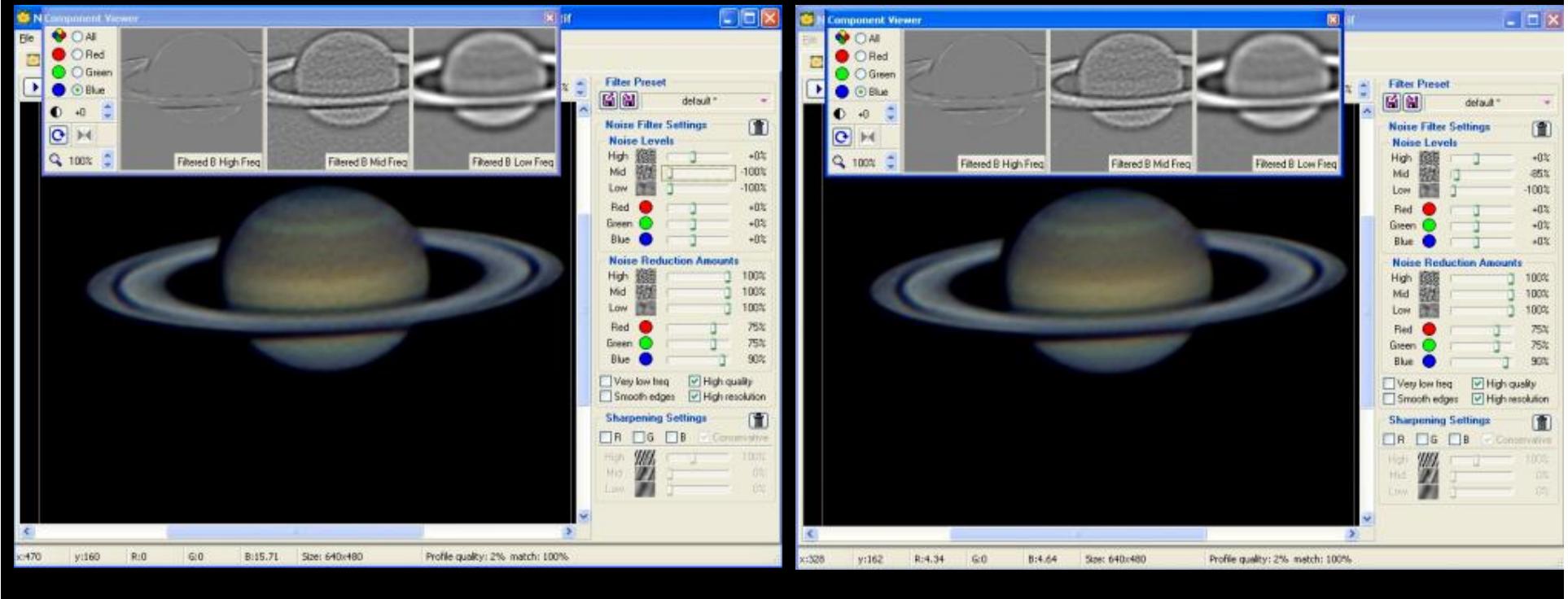
# *Neat Image - Digital Noise Removal*

- Select the red channel in the Component Viewer.
- Move the red noise reduction slider so that most of the high frequency red noise is gone.



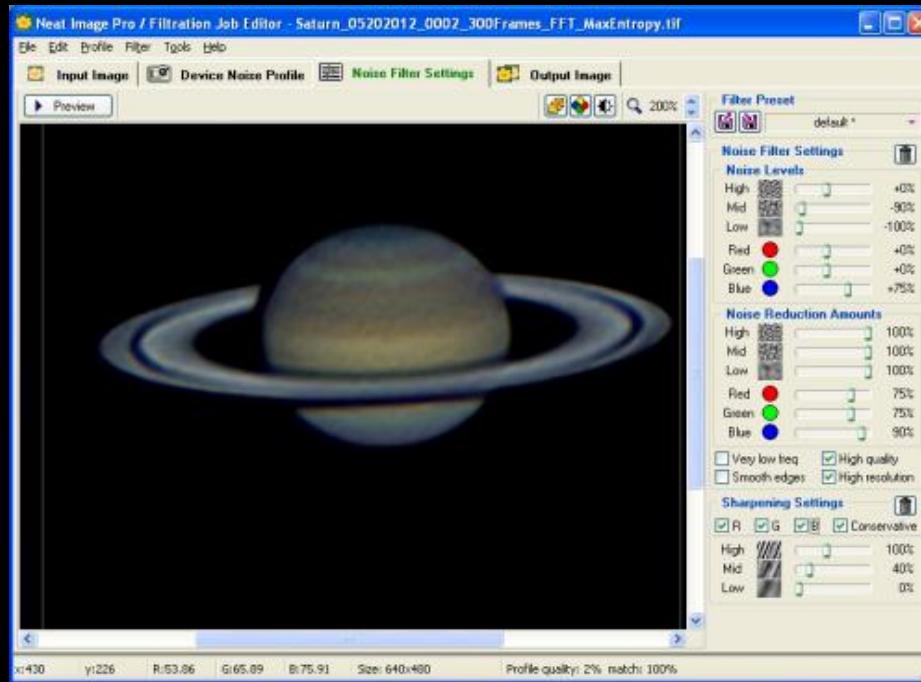
# *Neat Image - Digital Noise Removal*

- Go back to the blue channel in the Component Viewer.
- Move the Mid frequency Noise Filter Settings slider up a few notches so that you see the blue noise starting to go away.



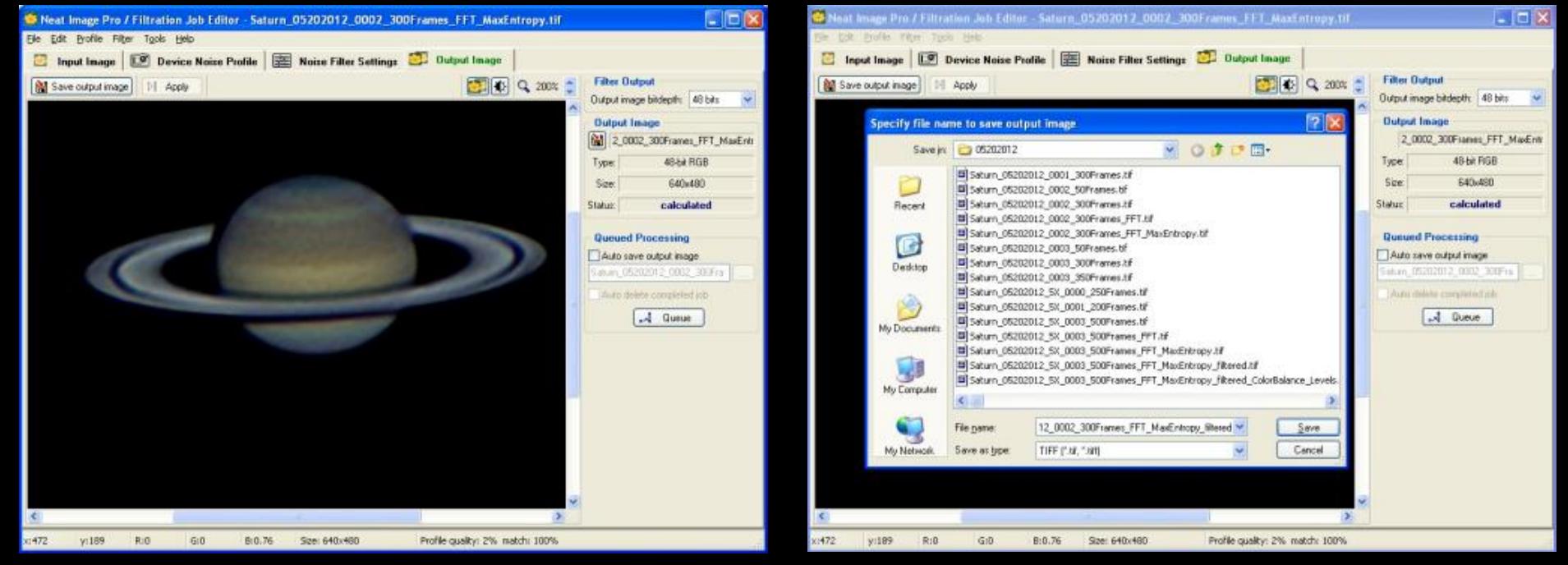
# *Neat Image - Digital Noise Removal*

- Adjust the Noise Filter Settings and Noise Reduction Amounts sliders until you are happy.
- Don't be overly aggressive.
- Apply a little bit of High and Mid sharpening.



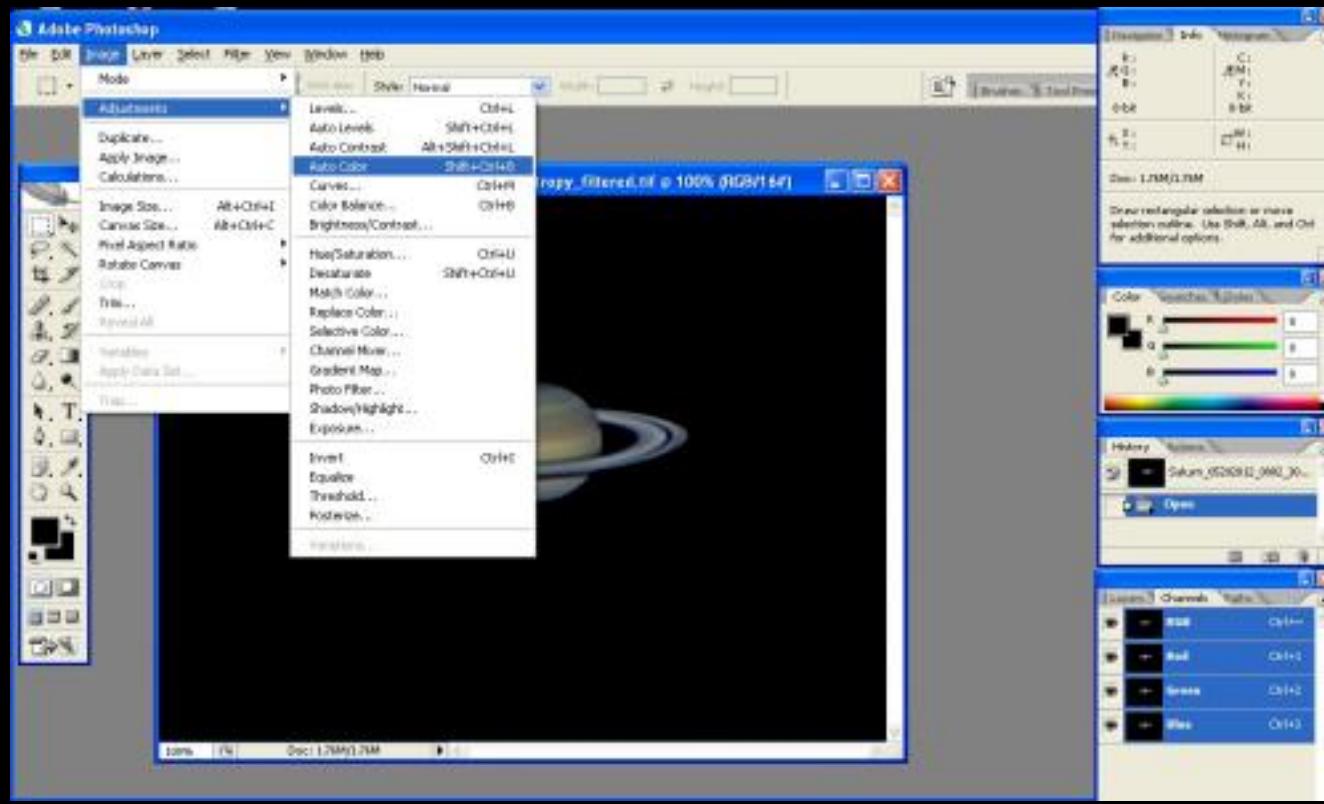
# *Neat Image - Digital Noise Removal*

- Click on the Output Image tab.
- Click the Save button.
- Save the file (TIFF - Pro version, JPEG - Demo version)
  - “\_filtered” is automatically appended to the file name.



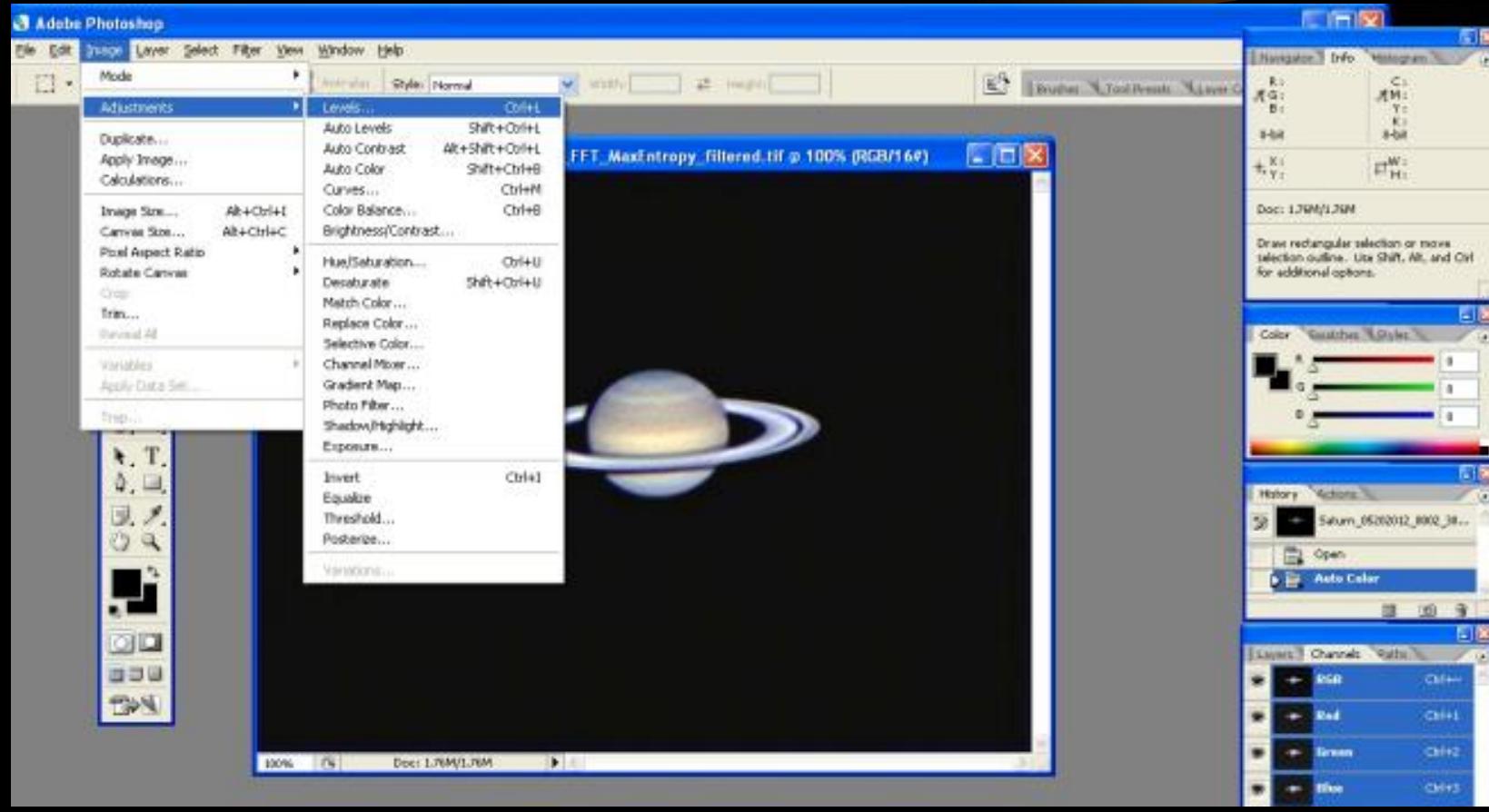
# *Photoshop - Color Balance, Levels, and Curves*

- Open the output image from Neat Image with Photoshop.
- Select the Auto Color option from the Image Adjustments menu.



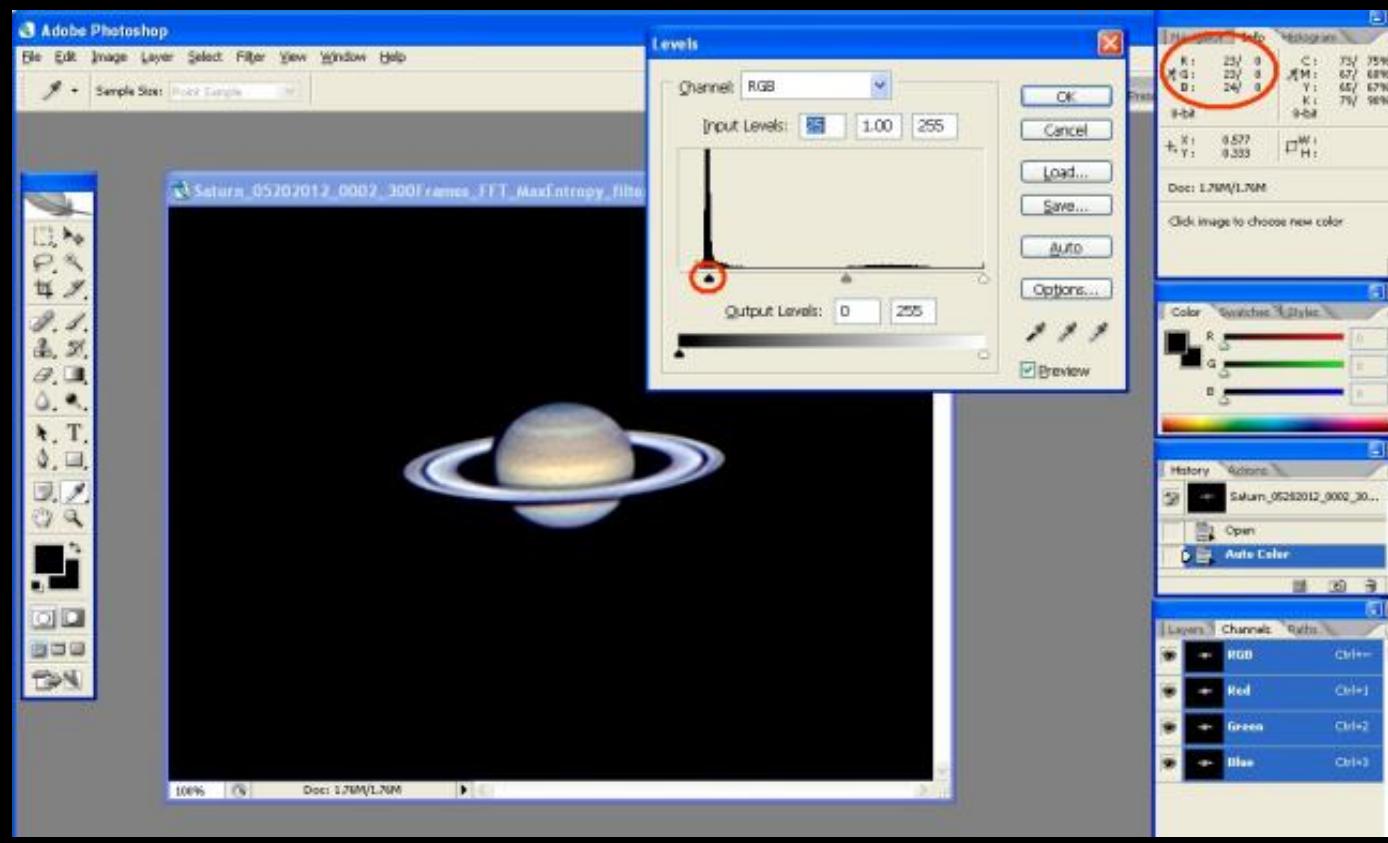
# *Photoshop - Color Balance, Levels, and Curves*

- Select the Levels option from the Image Adjustments menu.



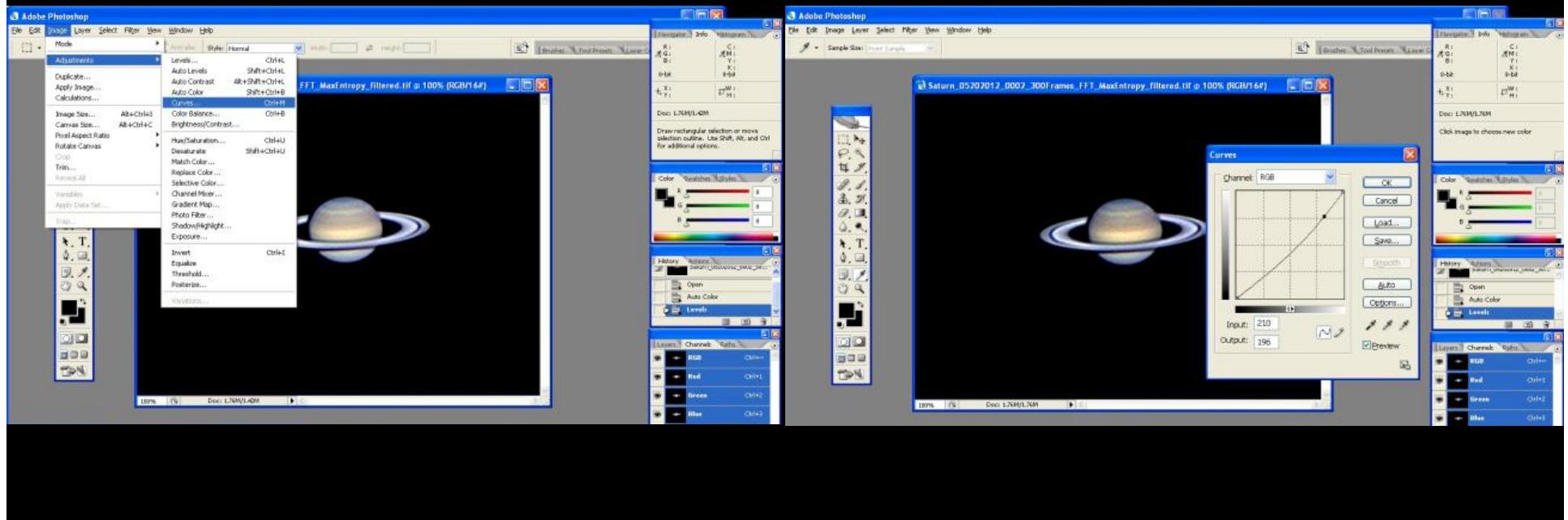
# *Photoshop - Color Balance, Levels, and Curves*

- Move the Black Point slider up so that the background becomes black. Click OK when done.



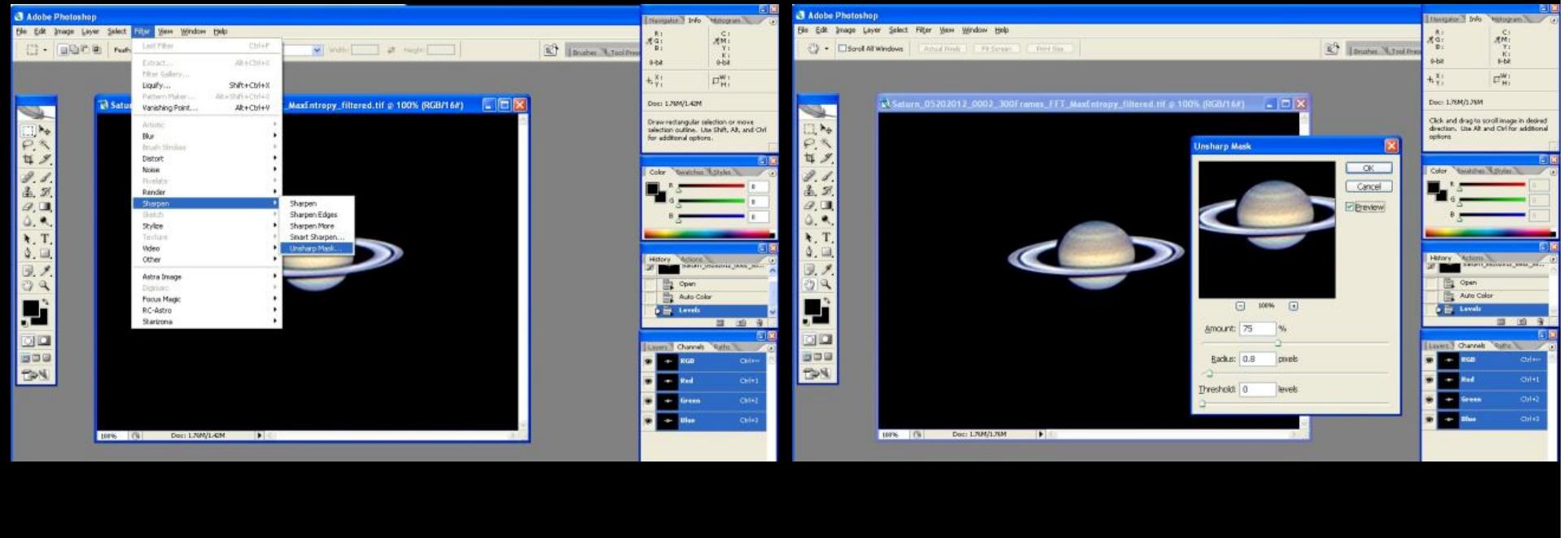
# Photoshop - Color Balance, Levels, and Curves

- Open the Curves dialog under the Image Adjustments menu.
- Pull the diagonal line down a little bit and click OK.



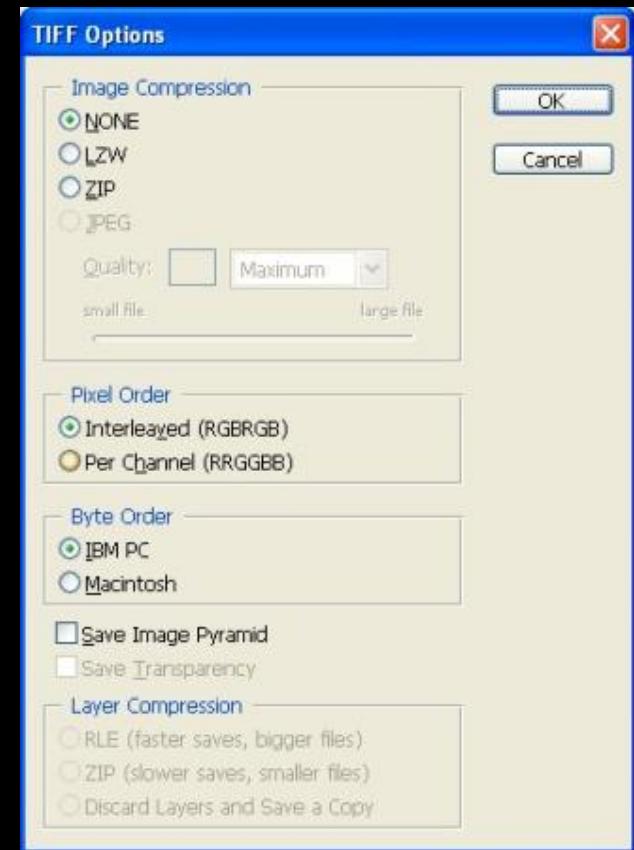
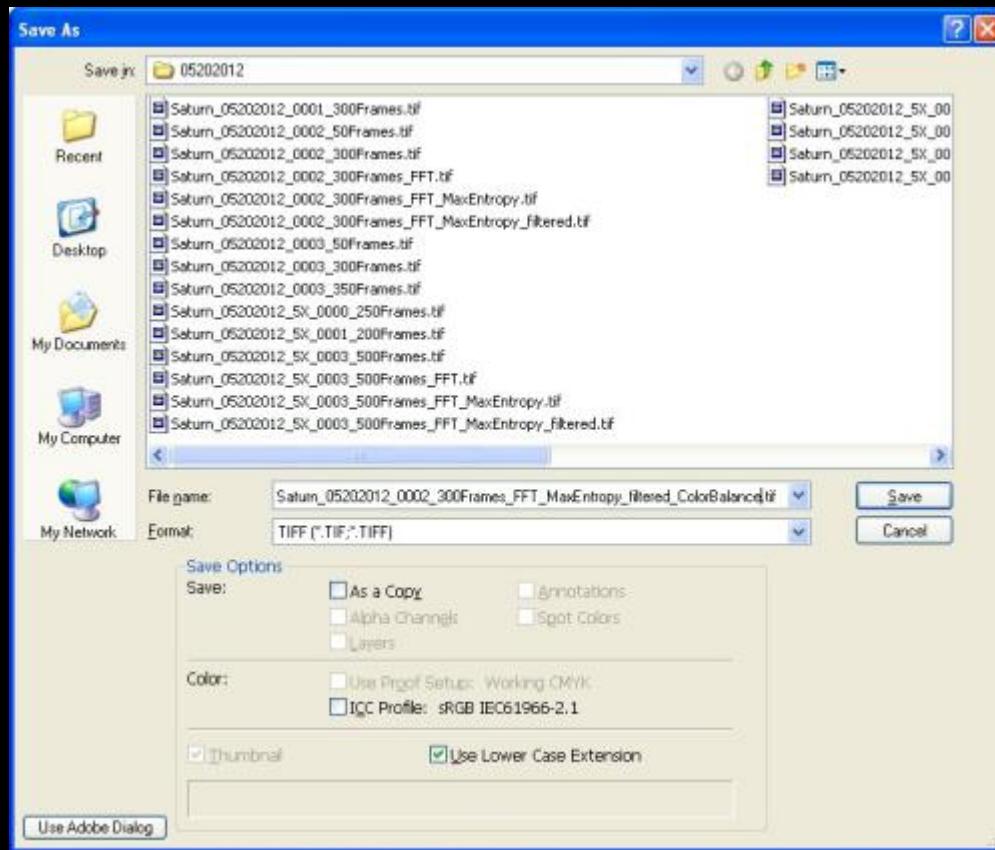
# *Photoshop - Color Balance, Levels, and Curves*

- Apply a mild Unsharp Mask.
- Use a radius under 1 and strength around 75%.



# *Photoshop - Color Balance, Levels, and Curves*

- Save the final image in TIFF format with no compression.



*The Final Image*



Before



After