Charlie Elliott Chapter
of the Atlanta Astronomy Club

OBSERVING AND IMAGING THE SUN

Theo Ramakers

PSSG 2011-09-30

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of the Atlanta Astronomy Club

OBSERVING AND IMAGING THE SUN

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Sun AR1277,79,80,81,82,83 2011-09-02 14:26 UT CR2114 SM40 DMK41AU02.AS Theo Ramakers Social Circle

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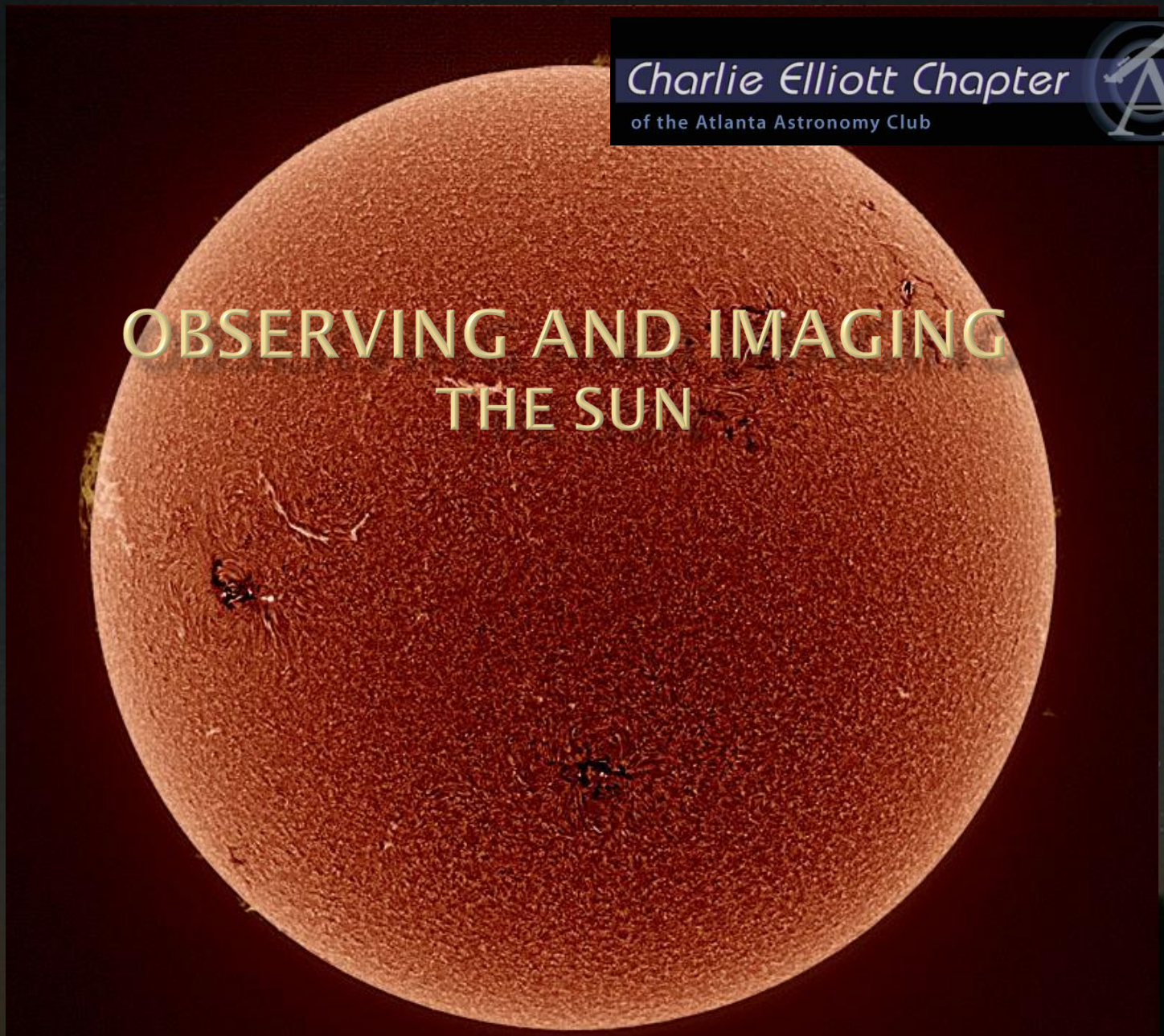
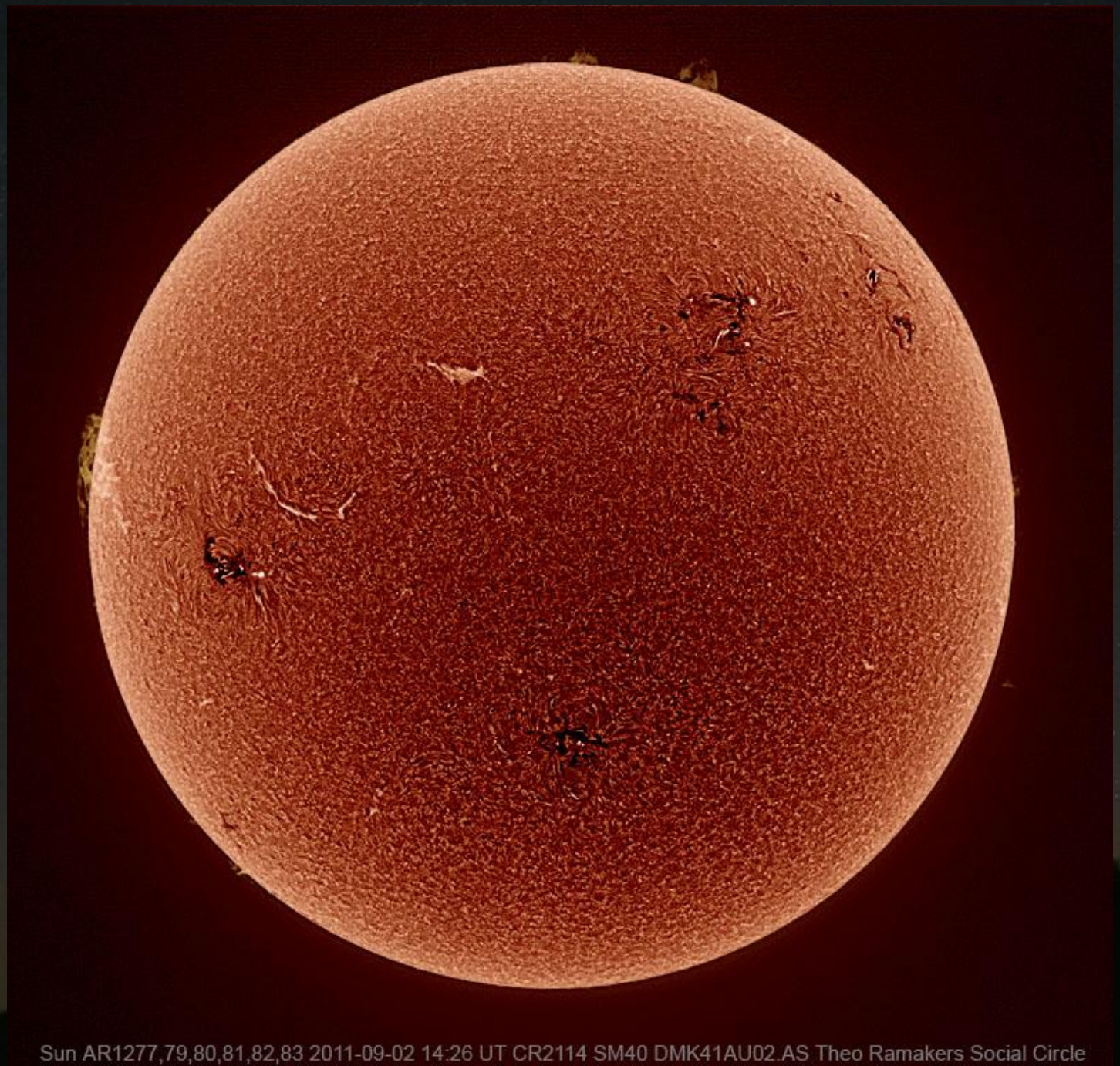
OBSERVING AND IMAGING THE SUN



Sun AR1277,79,80,81,82,83 2011-09-02 14:26 UT CR2114 SM40 DMK41AU02.AS Theo Ramakers Social Circle



Sun AR1277,79,80,81,82,83 2011-09-02 14:26 UT CR2114 SM40 DMK41AU02.AS Theo Ramakers Social Circle

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Composition of the Sun

	% atoms	% mass
Hydrogen	91.2	71.0
Helium	8.7	27.1
Oxygen	0.078	0.97
Carbon	0.043	0.40
Nitrogen	0.0088	0.096
Silicon	0.0045	0.099
Magnesium	0.0038	0.076
Neon	0.0035	0.058
Iron	0.0030	0.14
Sulfur	0.0015	0.040

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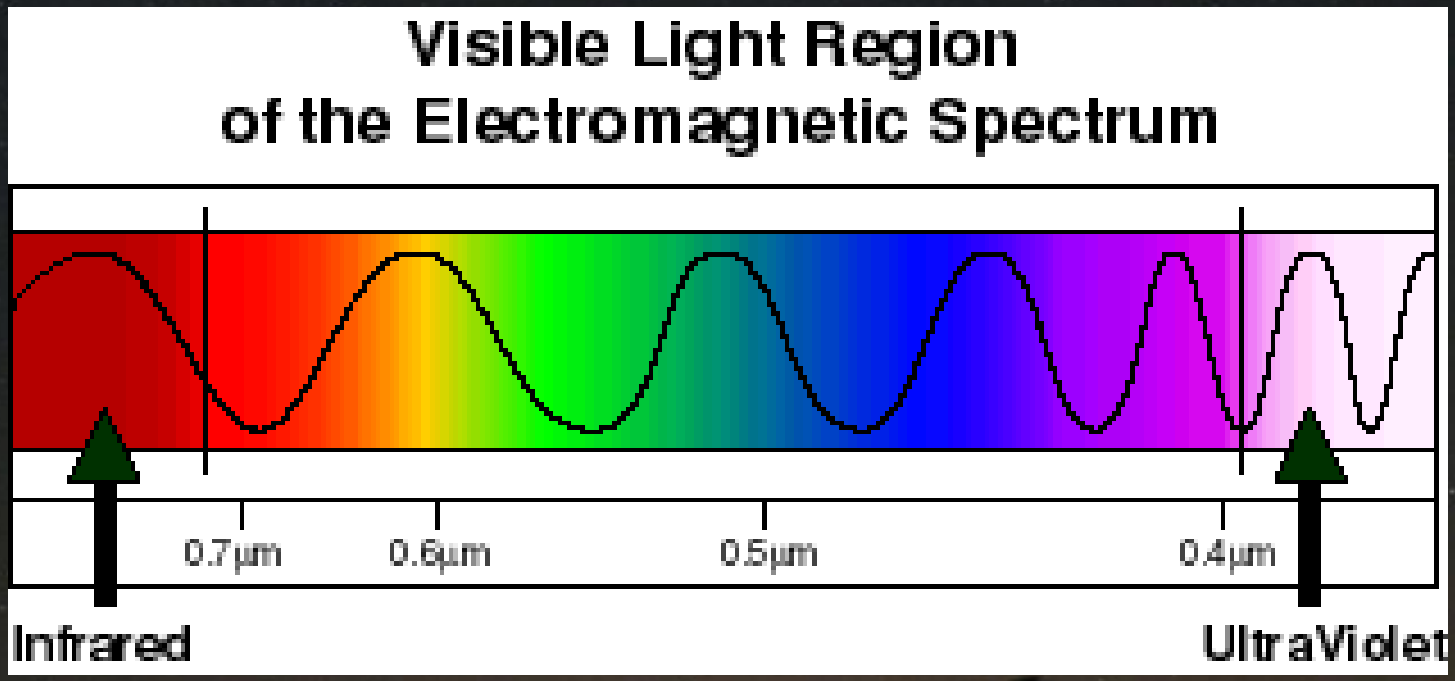

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Simplest way to observe the Sun: Eclipse Glasses

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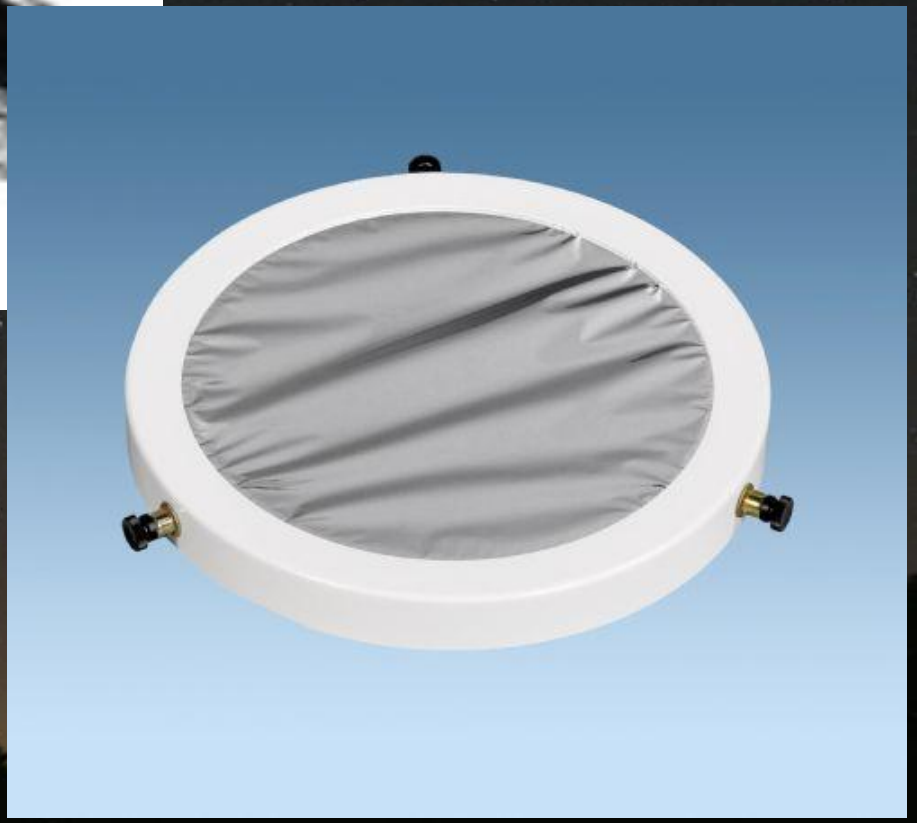
Visible Light Filters: Milar Film and Glass



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Visible Light Blocking Filters or Herschel Wedges

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Visible Light Solar Scope

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Visible Light Solar Scope

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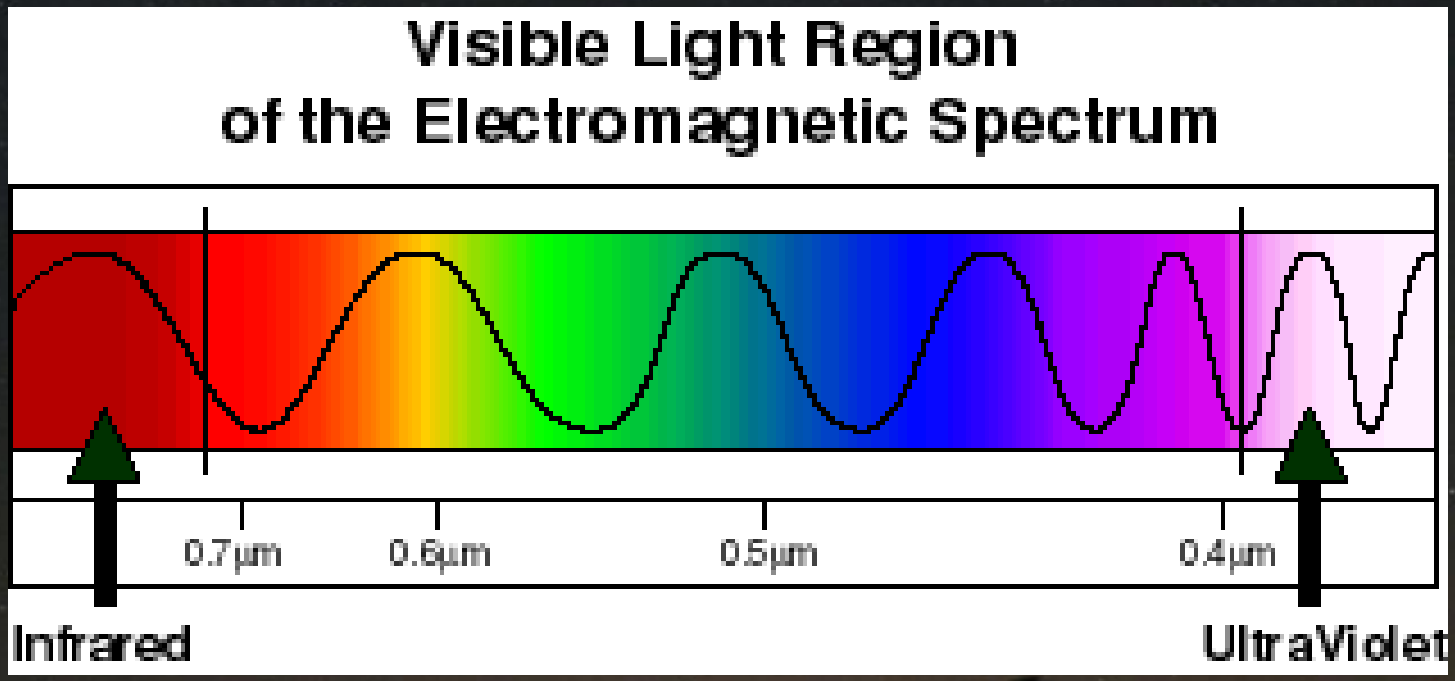

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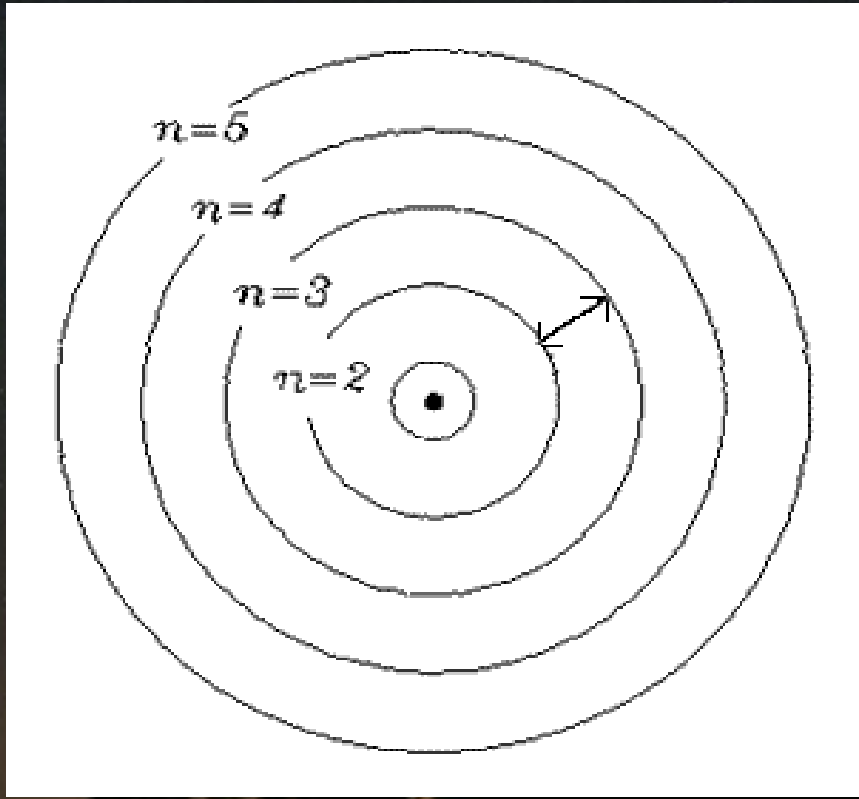
Main Source of energy and the main absorbsion/emission of light is caused by Hydrogen fusion



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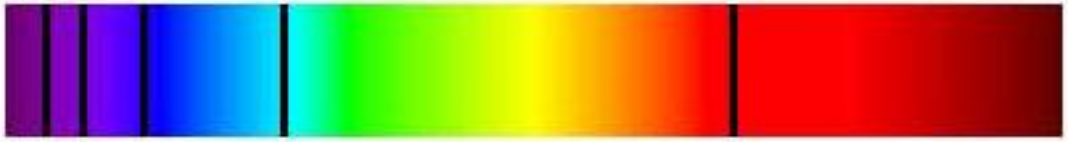
The Fraunhoffer Absorption lines for the element Hydrogen



The Emission lines for the element Hydrogen which correspond to the absoption lines for the same element

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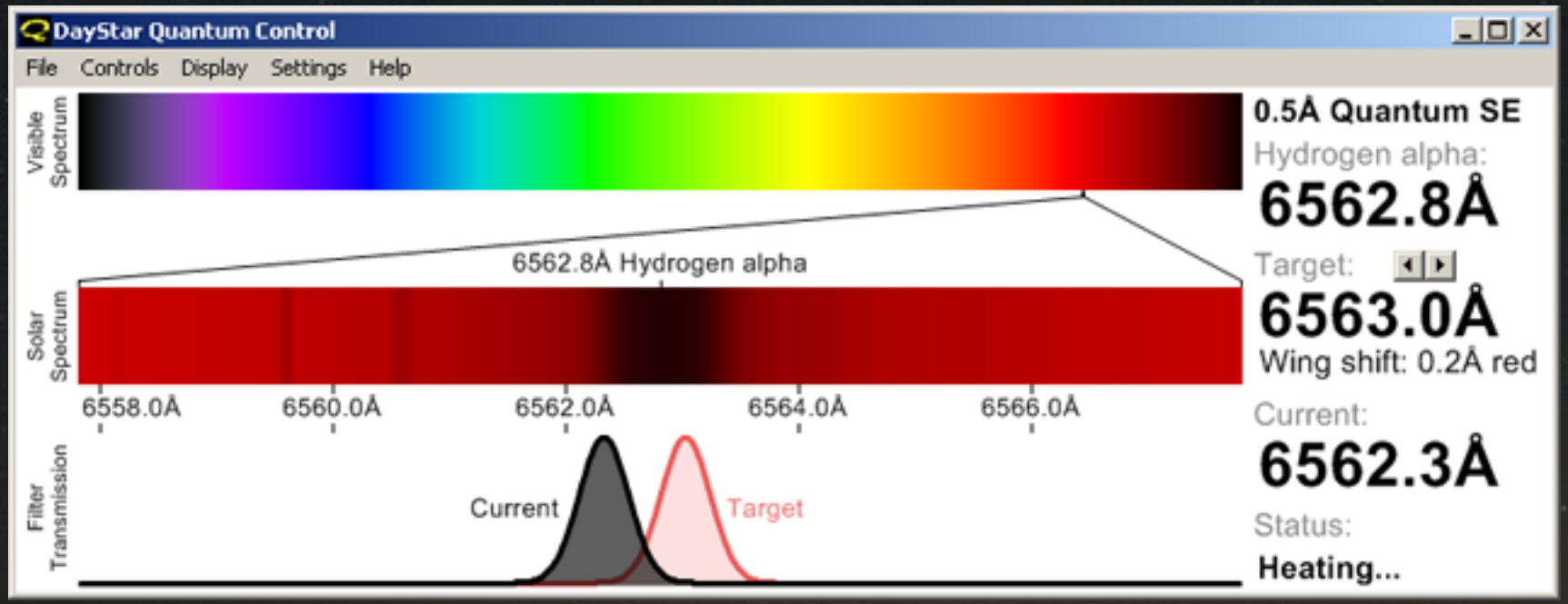

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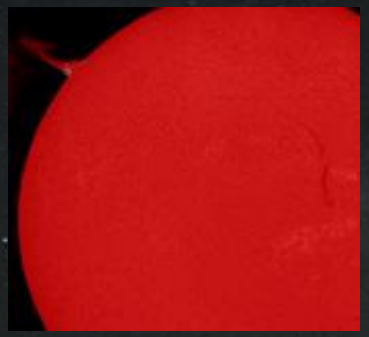
Band pass and visual effect of it

0.8



0.7

0.6

0.5

0.4

0.3

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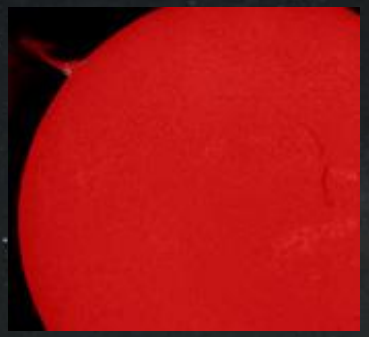
Band pass and visual effect of it

0.8



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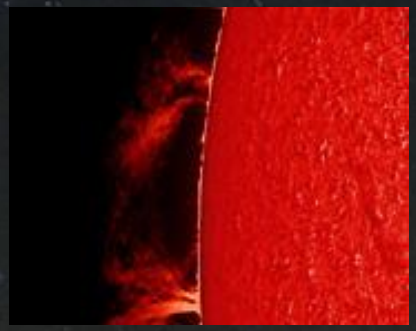

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0.5

0.4

0.3

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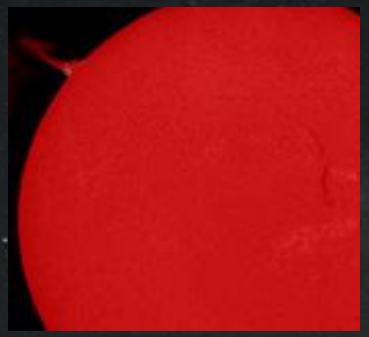
Band pass and visual effect of it

0.8



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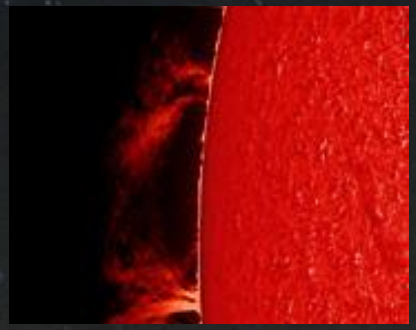

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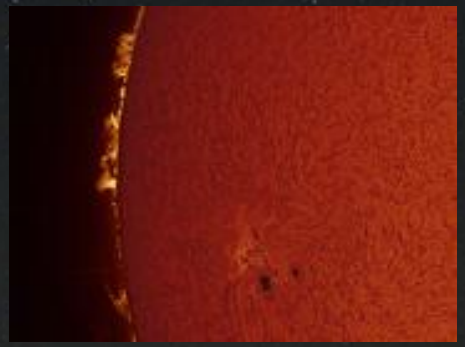

0.5

0.4

0.3

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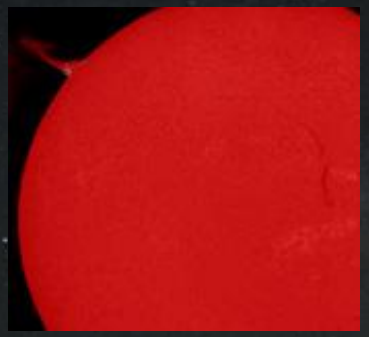
Band pass and visual effect of it

0.8



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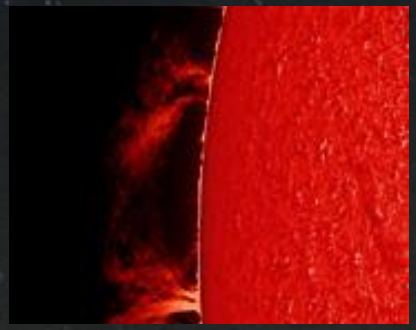

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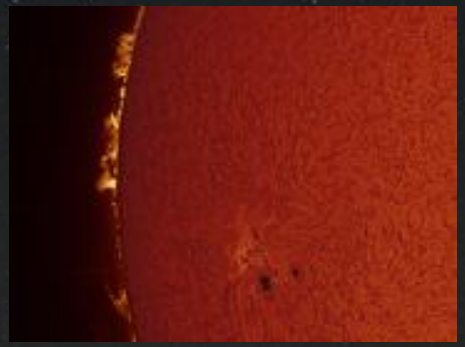

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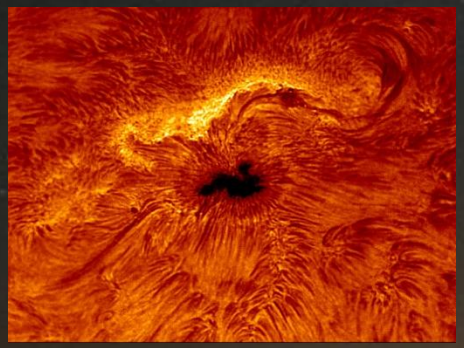

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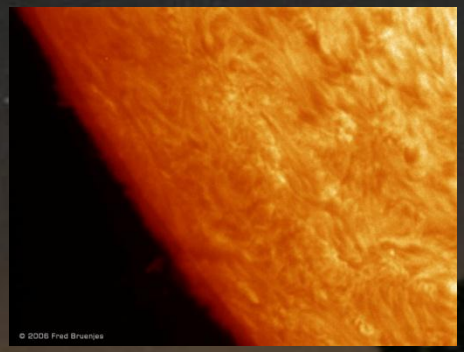
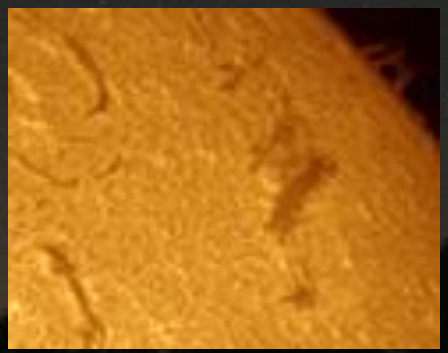


0.3



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Dedicated H-Alpha Solar Scopes

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Dedicated H-Alpha Solar Scopes

Lunt LS60Ha

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Dedicated H-Alpha Solar Scopes

Lunt LS60Ha

Coronado SolarMax 90

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Dedicated H-Alpha Solar Scopes

…. But if you are cost conscious…….

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Dedicated H-Alpha Solar Scopes

…. But if you are cost conscious…….

Coronado SolarMax40, PST-H-Alpha, or Lunt LS35-Ha

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Dedicated H-Alpha Solar Scopes

…. But if you are cost conscious…….

Coronado SolarMax40, PST-H-Alpha, or Lunt LS35-Ha

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Dedicated H-Alpha Solar Scopes

…. But if you are cost conscious…….

Use a H-alpha filters with a good blocking filter combination

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Dedicated H-Alpha Solar Scopes

…. But if you are cost conscious…….

My original blocking filter was mismatched with the aperture of my H-a filter. Observing was fine, but the detail for imaging was not there

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What about Calcium-K observing?

I can't see anything with the un-aided eye,
but my camera does very good at it. ☺

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Light from singly-ionized calcium ions in the Sun's upper photosphere and chromosphere (up to 2000 km altitude).

Because the blue Calcium K Line (393.3 nm) is sensitive to magnetic fields, magnetically active structures show up in high contrast against the surrounding chromosphere.

Places where moderate magnetic fields exist show up bright whereas images of high magnetic fields are dark

TWO strong absorption lines at 393.3nm and at 396.9nm, known as the K and H lines.

Researchers have previously avoided the H line for academic research, as it is very close to the Hydrogen Epsilon line.

However, as the visual spectrum ends at approximately 400nm, the further we venture below this wavelength, the more difficult it is for observers to visually see the image. The H line for visual observations, is much closer to the visual spectrum

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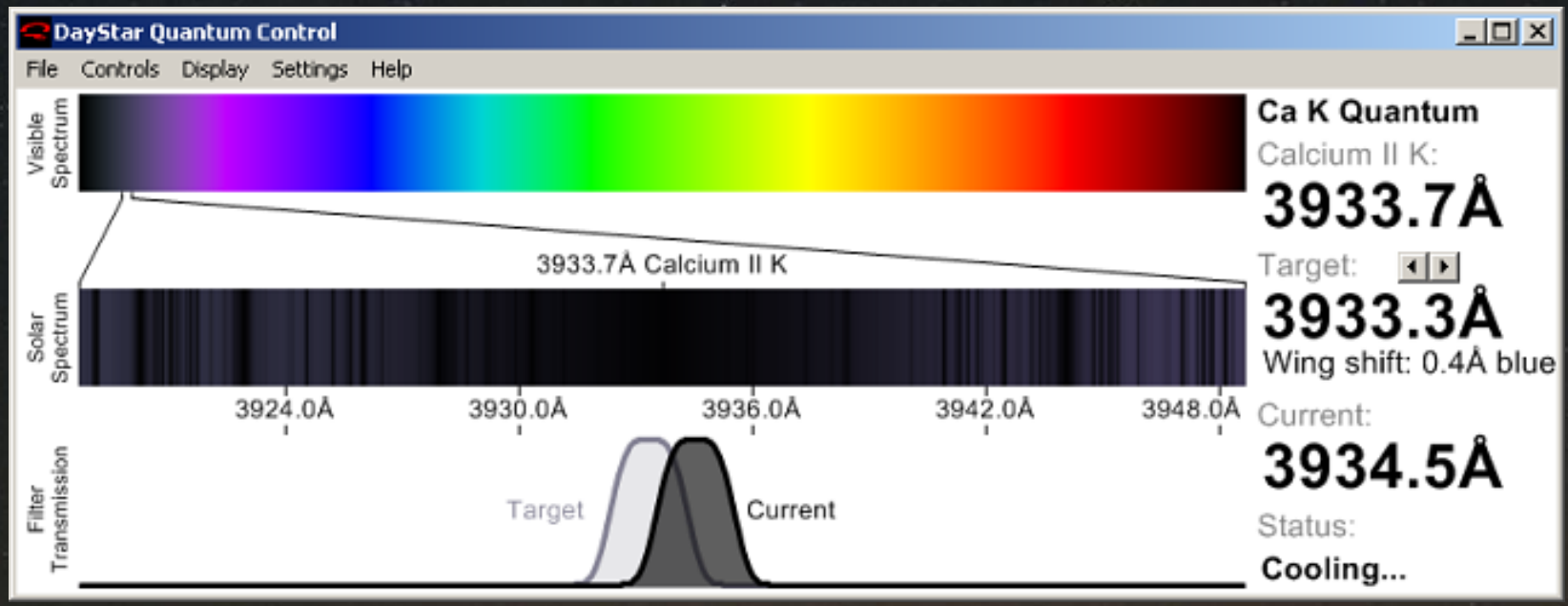

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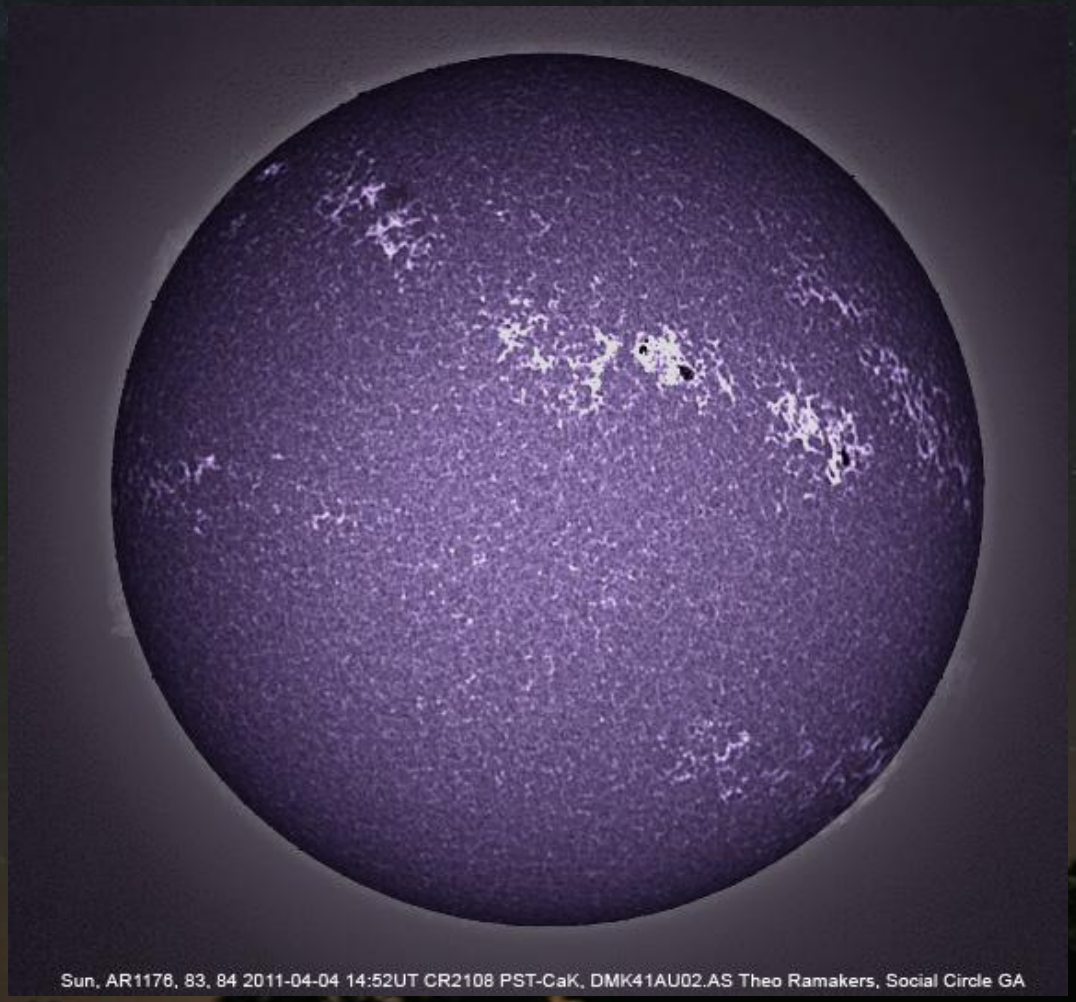

Sun, AR1176, 83, 84 2011-04-04 14:52UT CR2108 PST-CaK, DMK41AU02.AS Theo Ramakers, Social Circle GA

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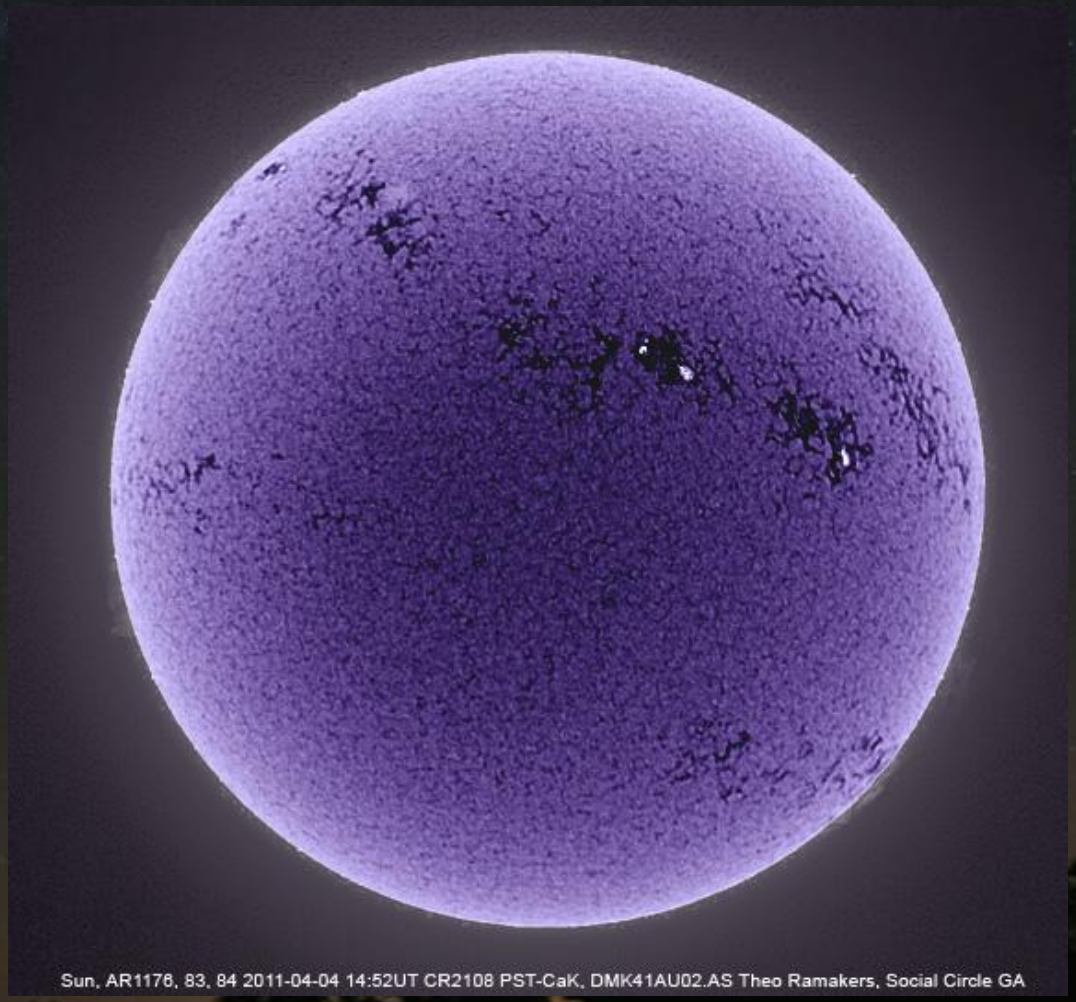
of the Atlanta Astronomy Club



Sun, AR1176, 83, 84 2011-04-04 14:52UT CR2108 PST-CaK, DMK41AU02.AS Theo Ramakers, Social Circle GA

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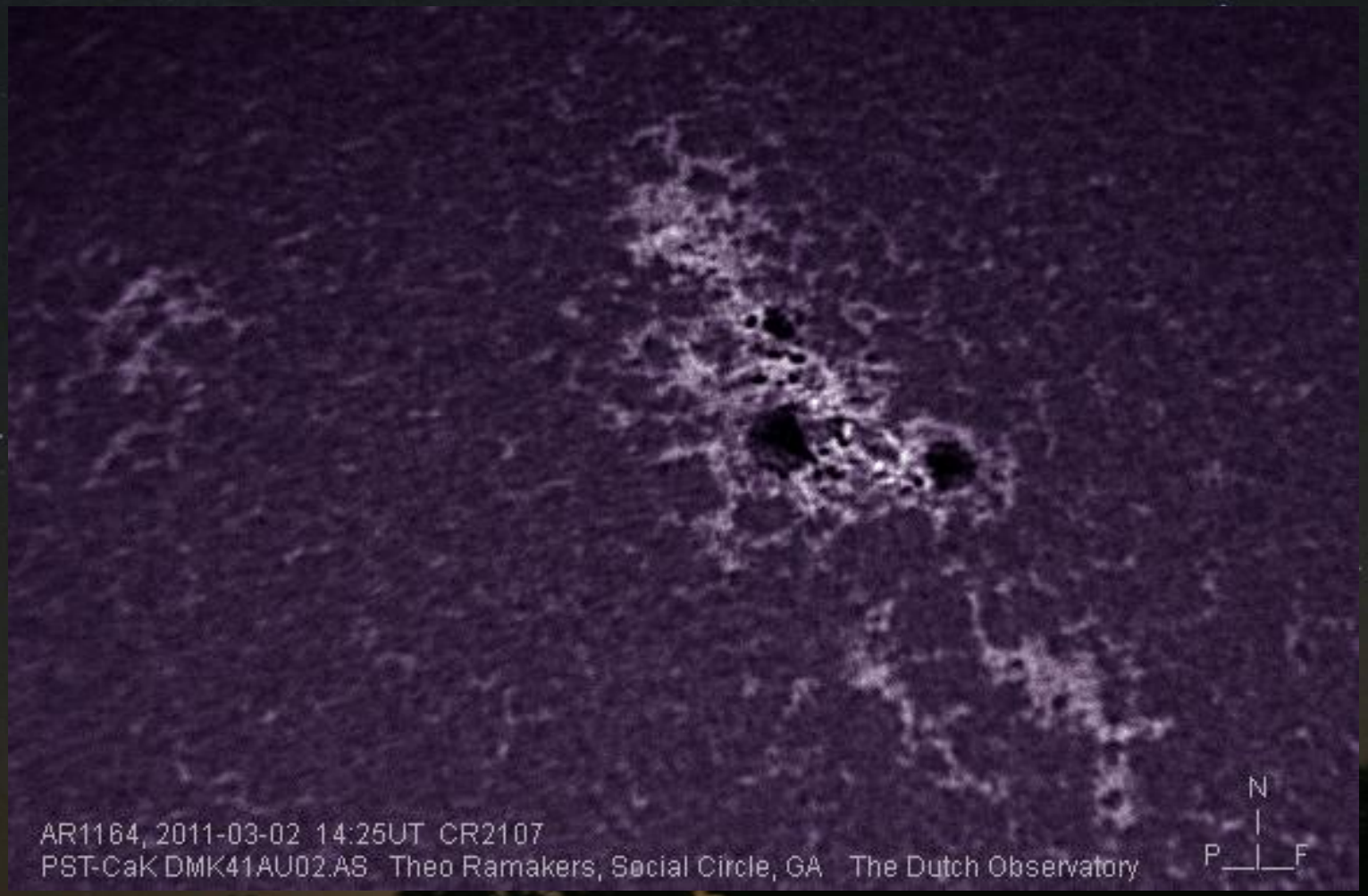

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What about imaging?

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What about imaging?

I image using the DMK21AU04.AS and DMK41AU02.AS monochrome cameras without any filters.

Use the loss-less codec Y800 in both fields.

Save the videos as AVI.

For the sun I capture between 300-500 frames.

I include camera settings in the file name

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What about imaging?

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What about imaging?

My standard camera settings for a whole disk image are:

Gamma: 046 Exposure: 625 Gain: 260

For a Prominence image:
Gamma: 158 Exposure: 625 Gain: 260

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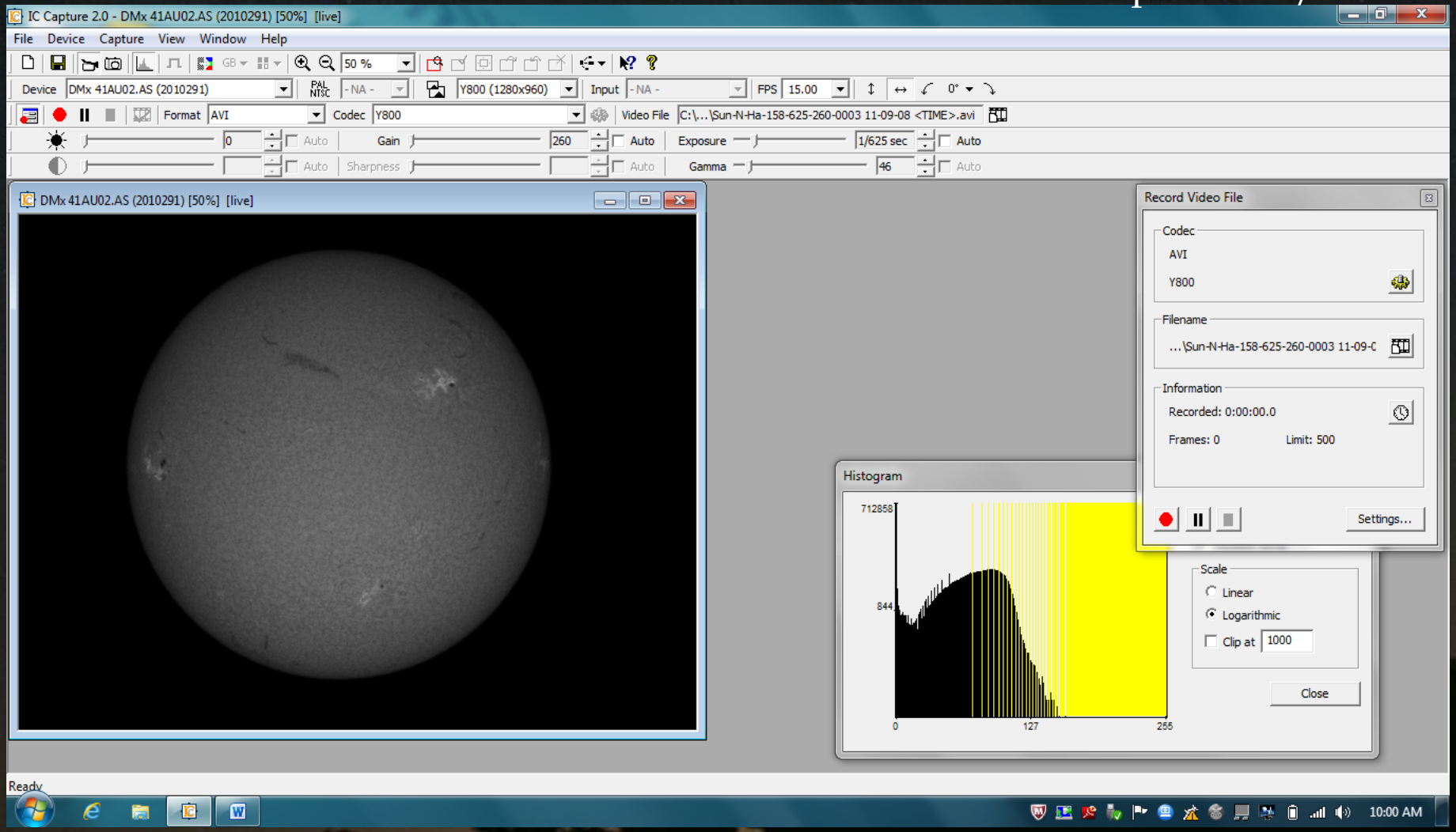
Gain:260 Gamma: 046 Exp. Time: 1/625



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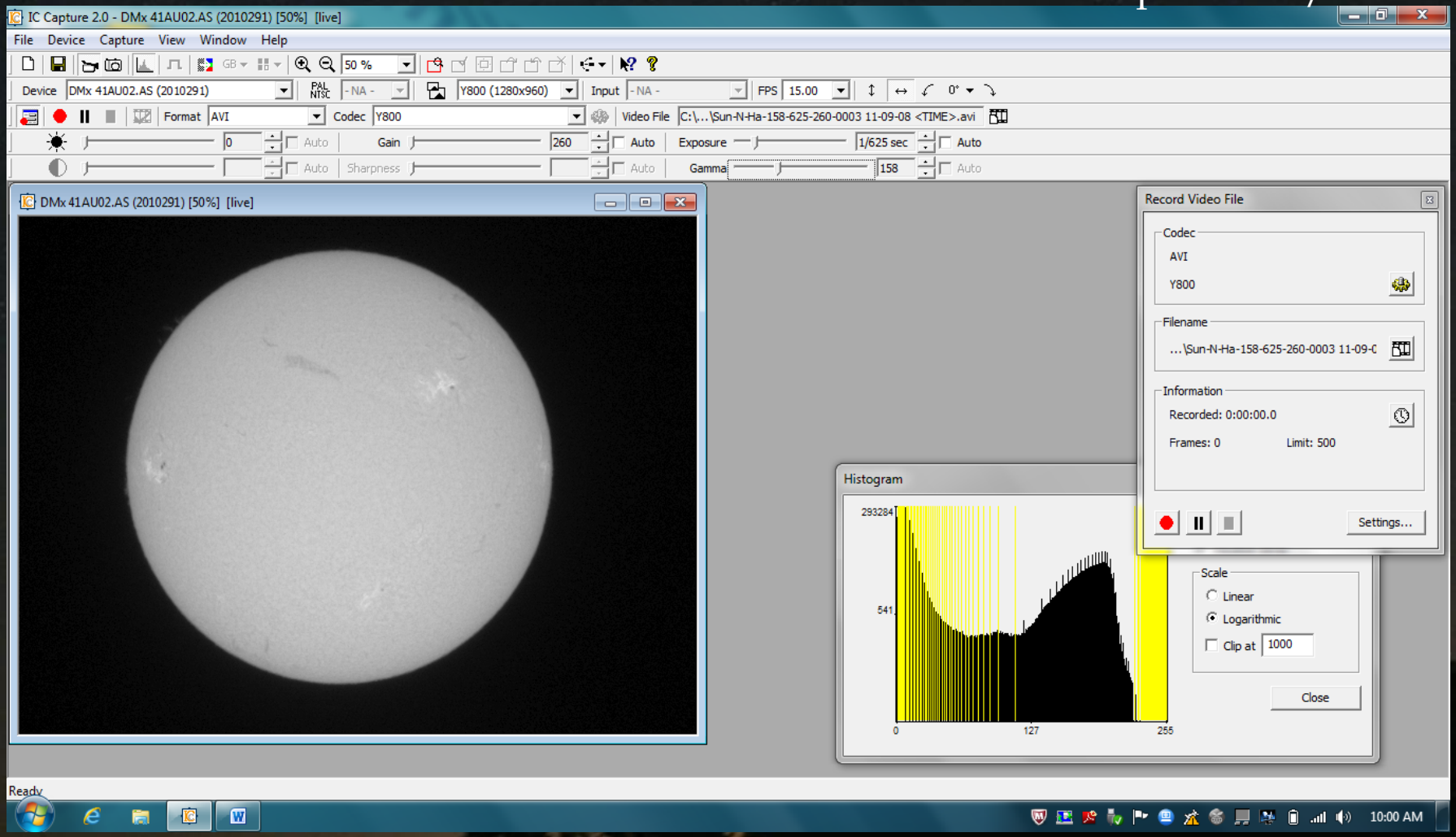
Gain:260 Gamma: 158 Exp. Time: 1/625



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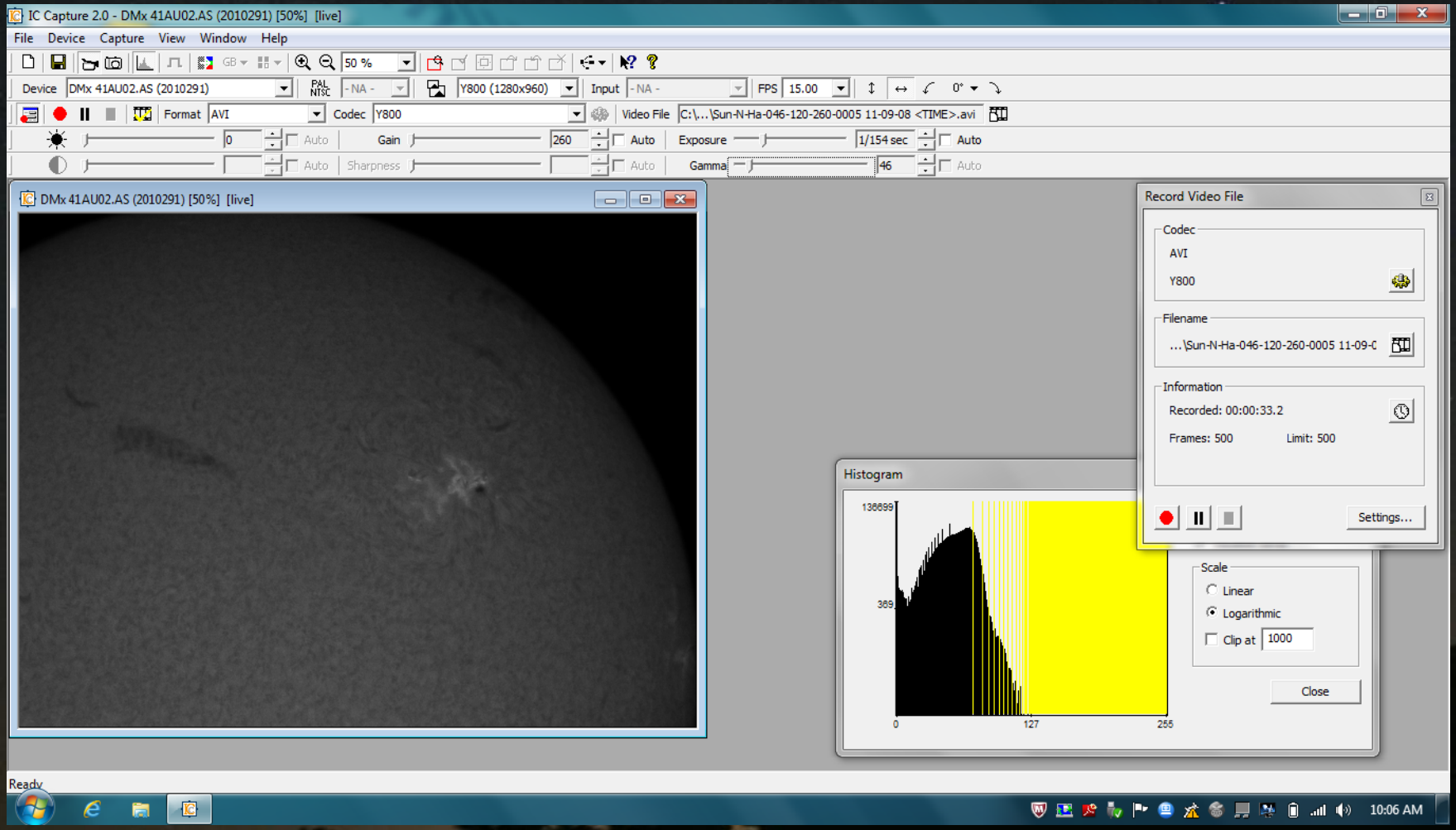
Gain:260 Gamma: 046 Exp. Time: 1/158



Exposure time 1/154 sec

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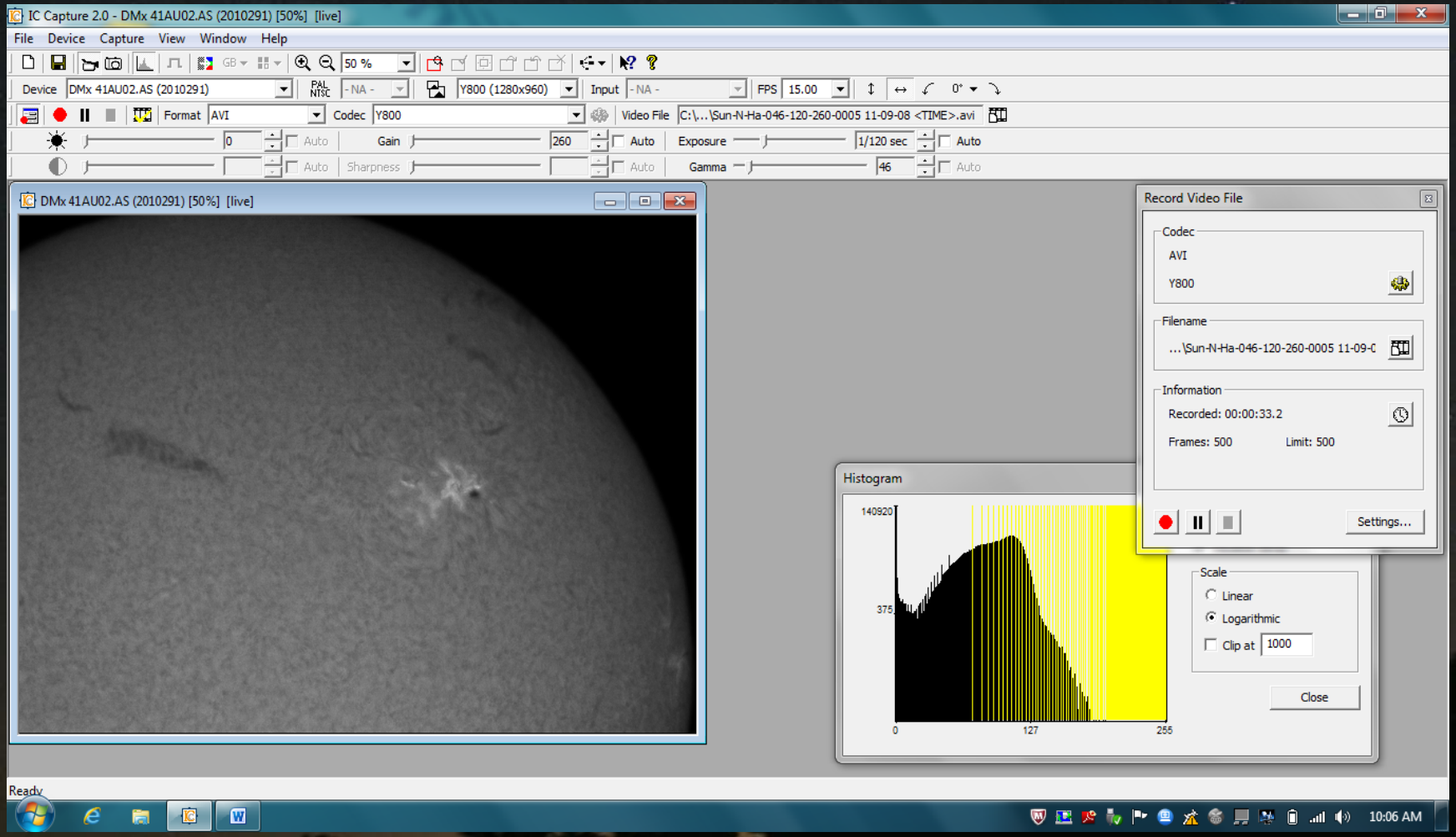
Gain:260 Gamma: 046 Exp. Time: 1/120



Exposure Time 1/120 sec.

Now I process the videos in Registax Version 6

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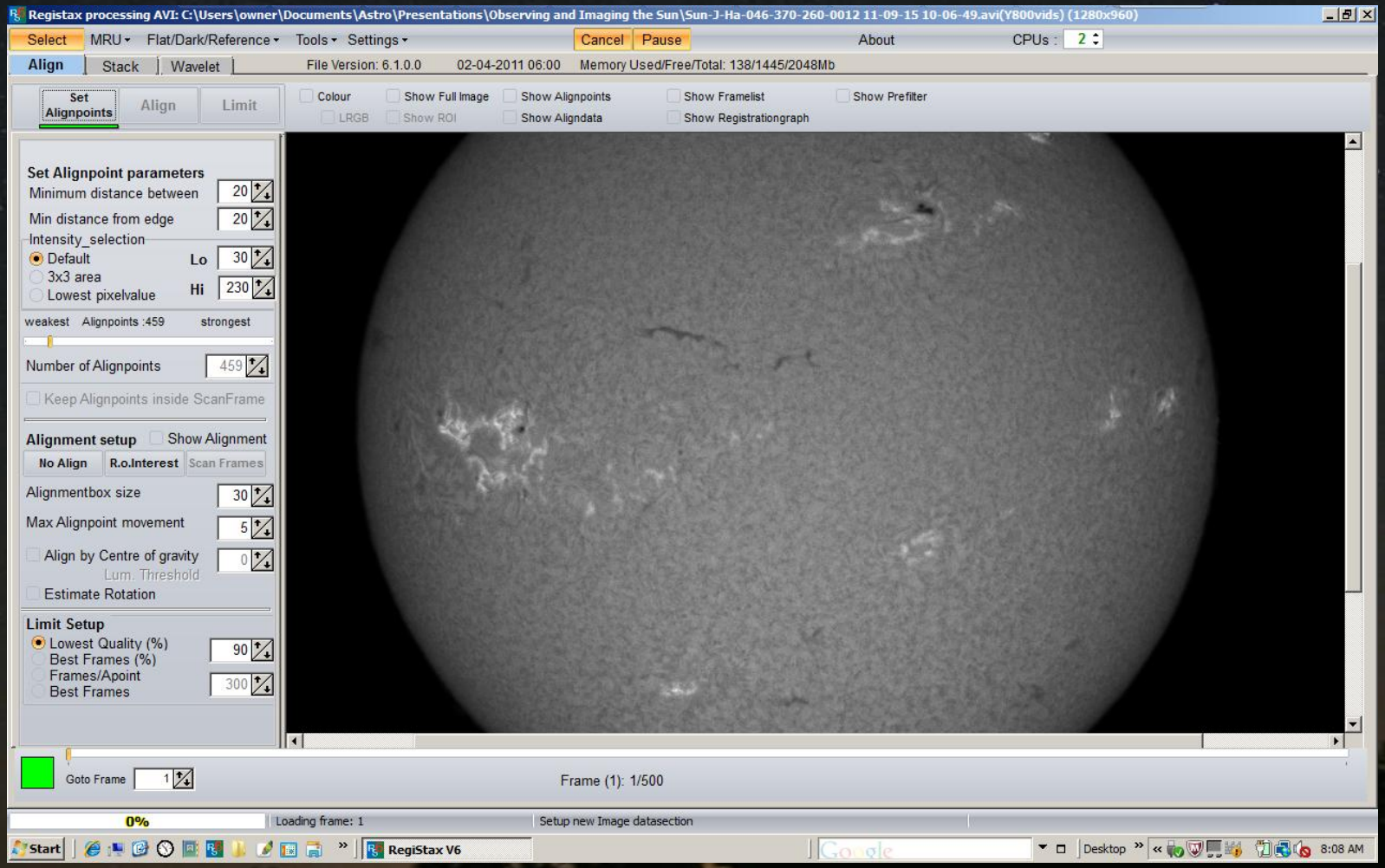
Load the AVI you want to process



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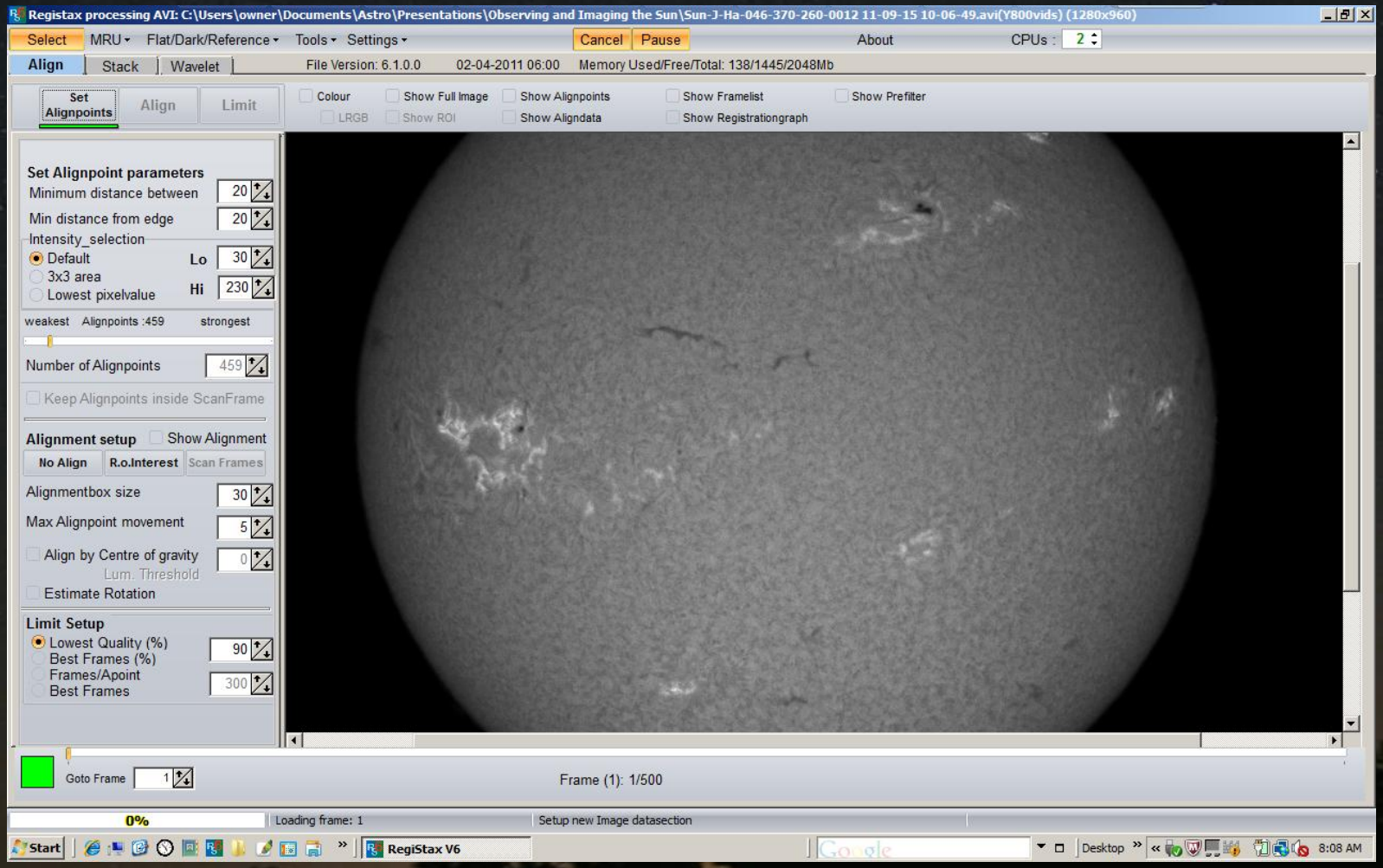

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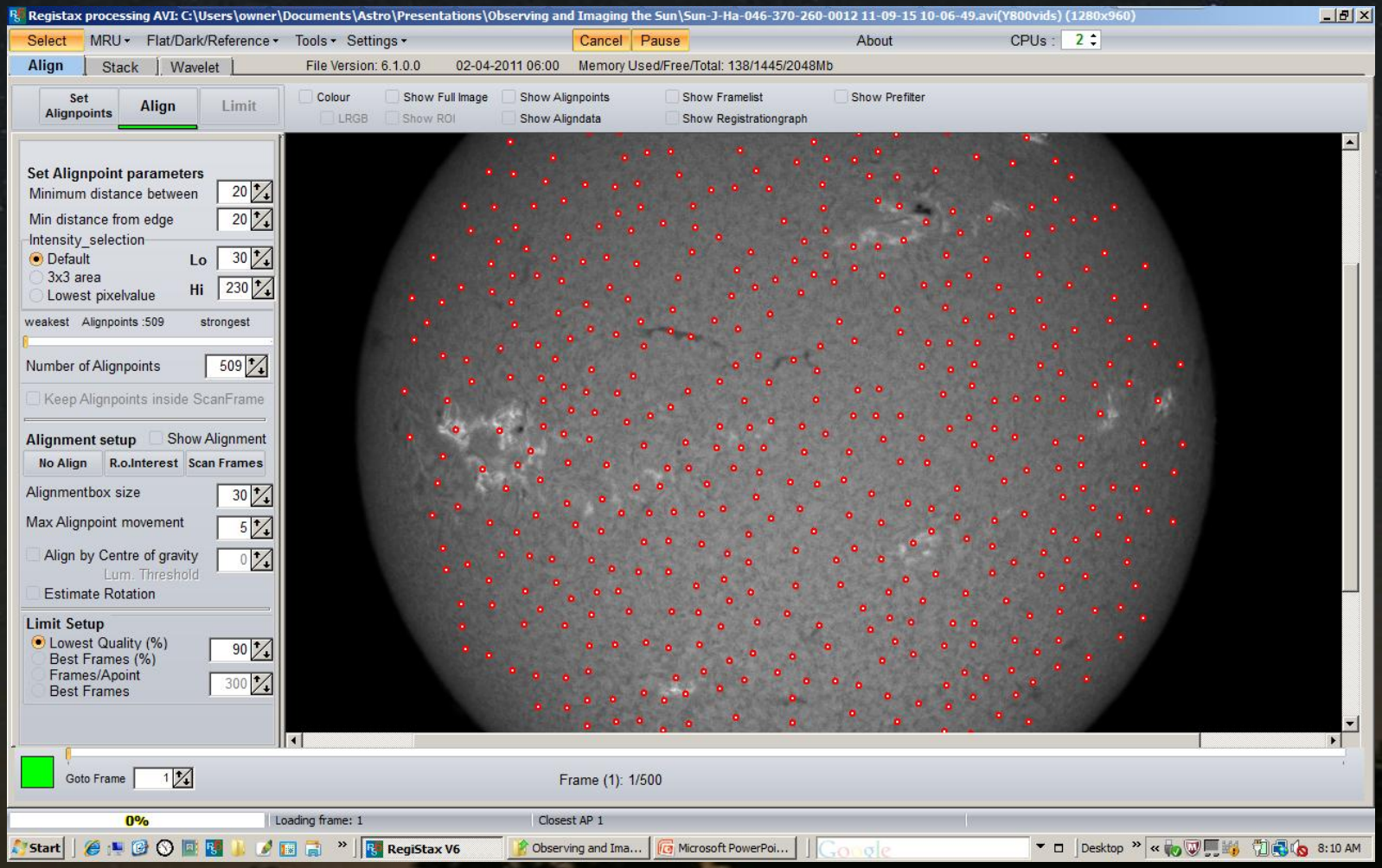
Set the quality to a low value, and select at least 500 – 600 alignment points



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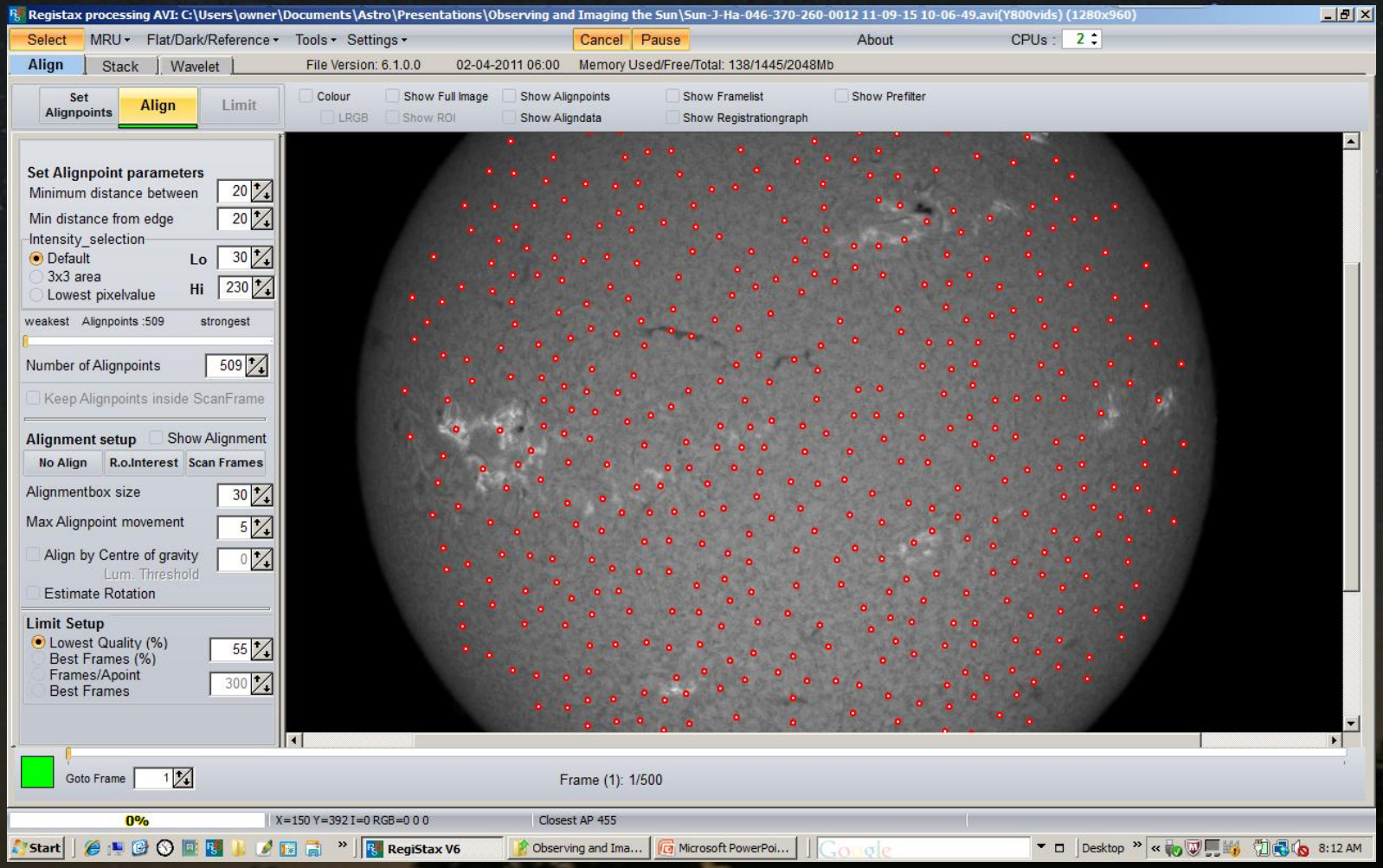
If required, change alignment point settings. Hit "Align"



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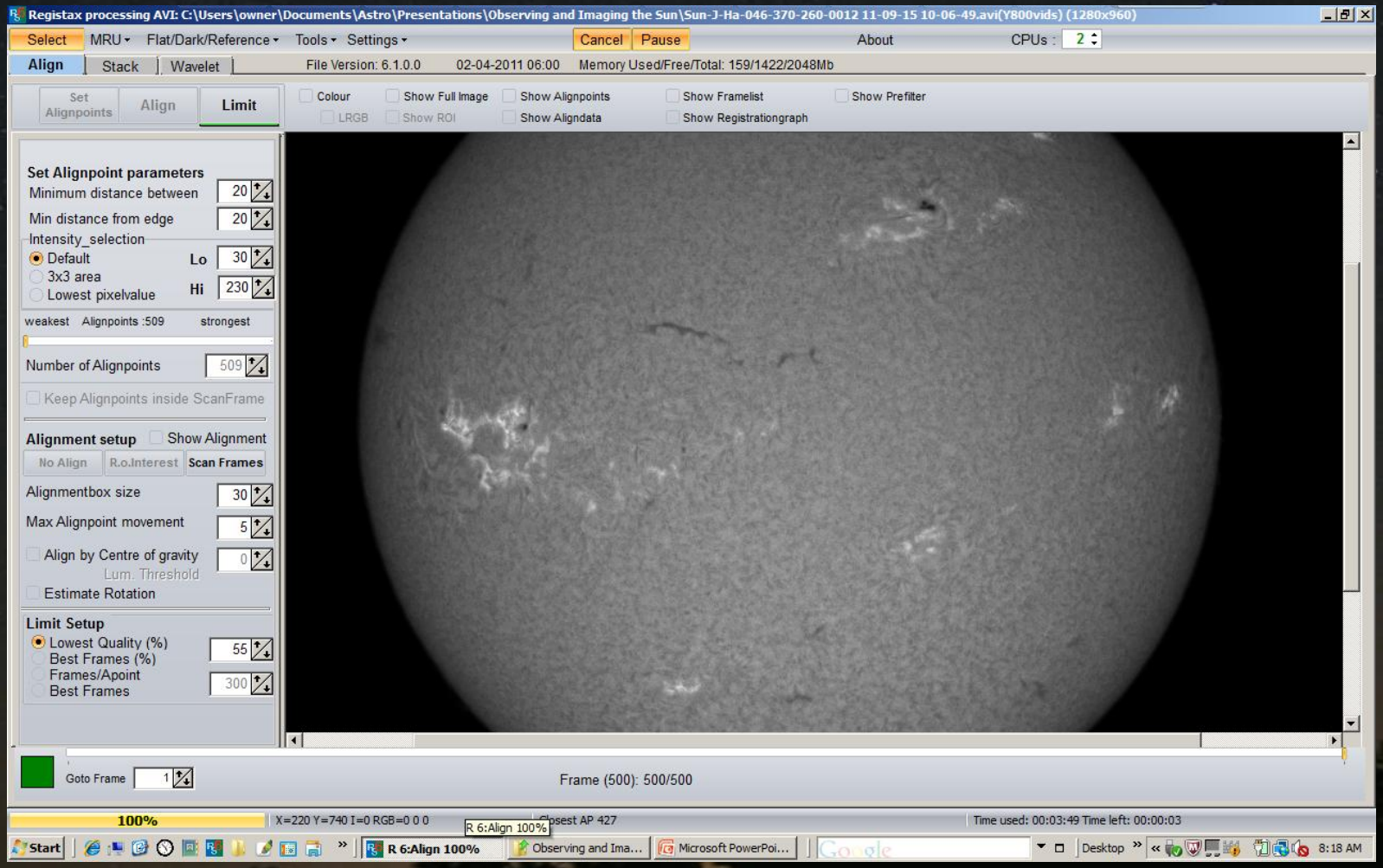

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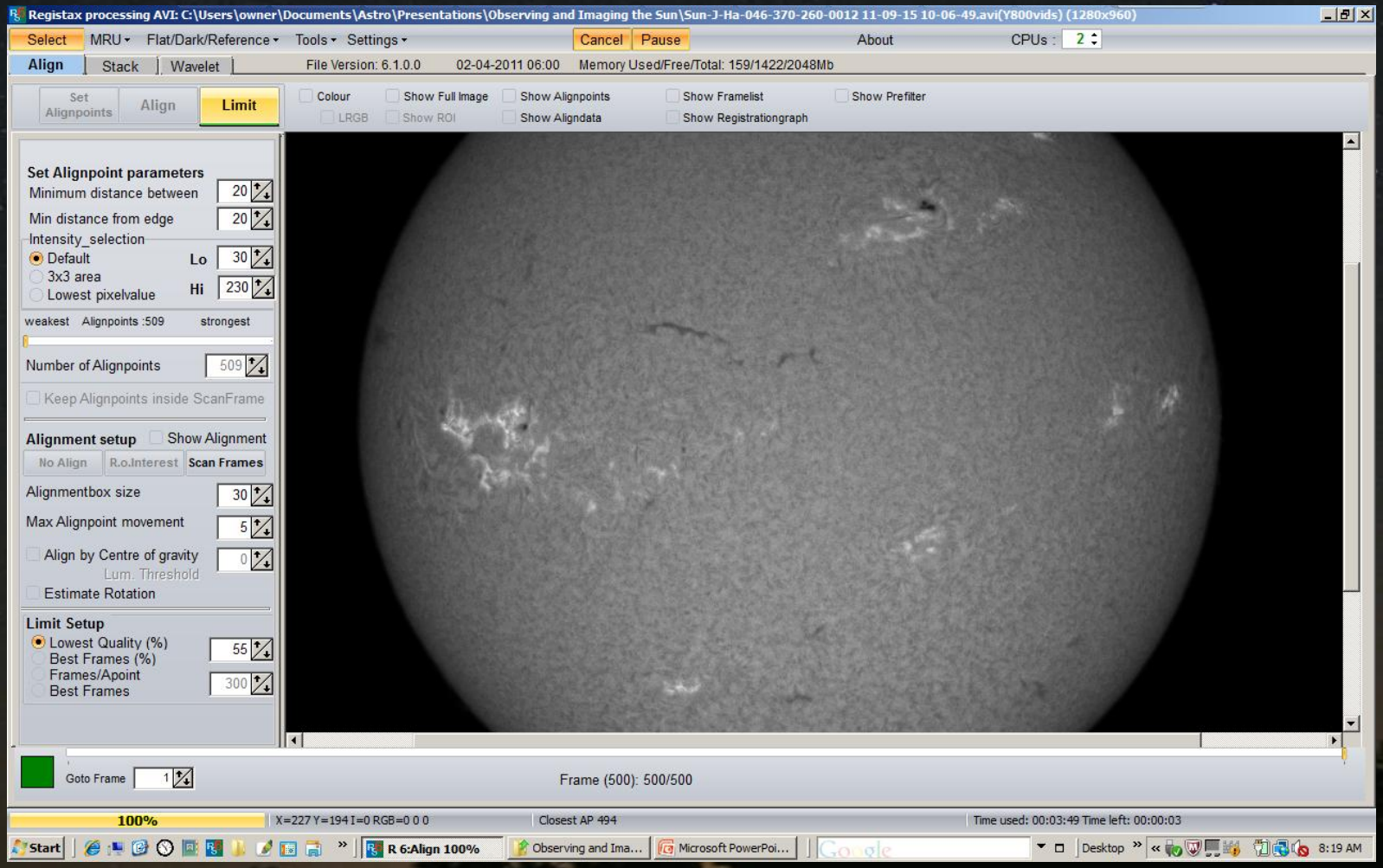
When finished select “Limit”. Than activate the “Show Stack graph checkbox”



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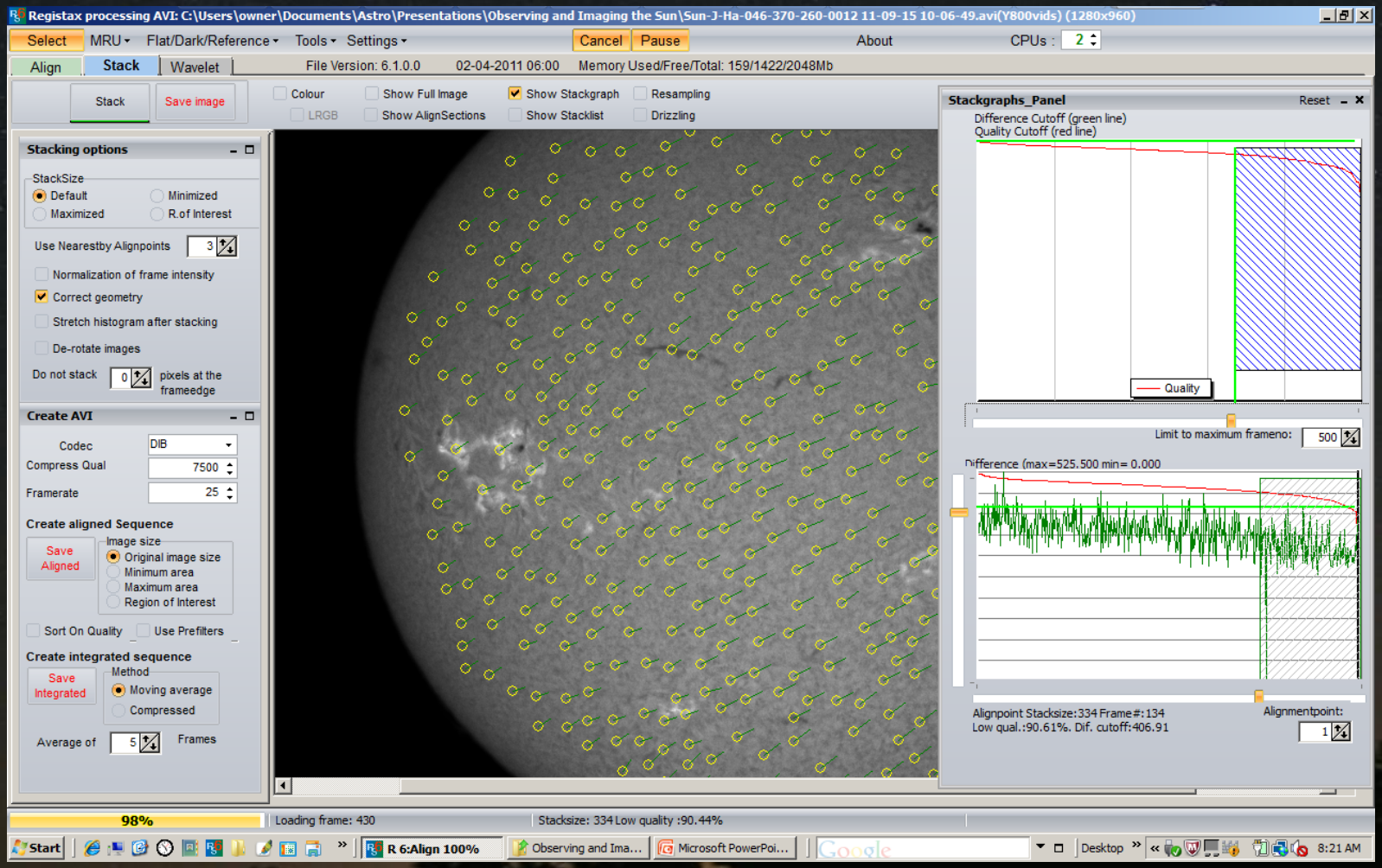
Move the levers for Quality and Difference to the desired level



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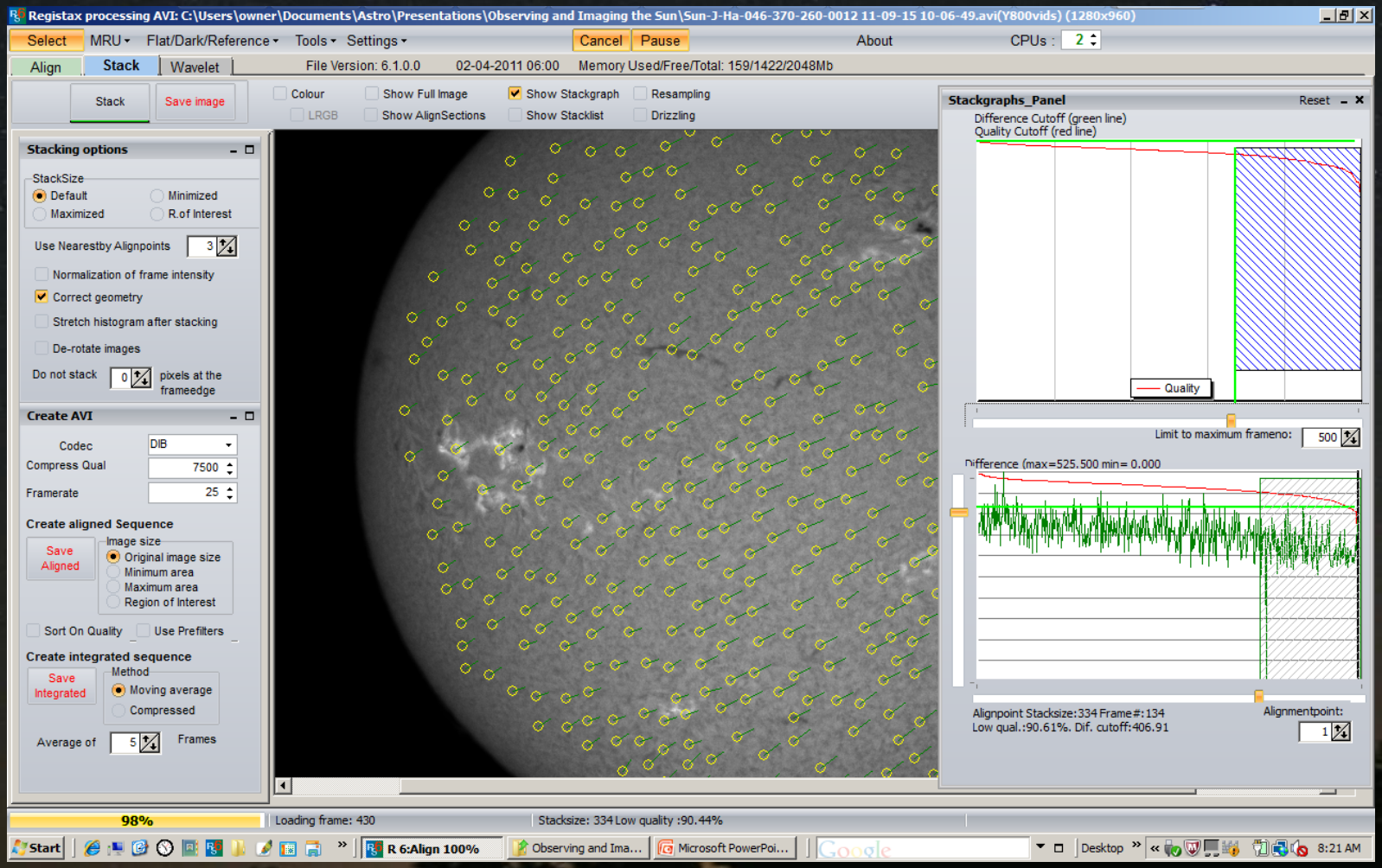
I stack 250-300 frames (approx 60%) Depress the "Stack" Button



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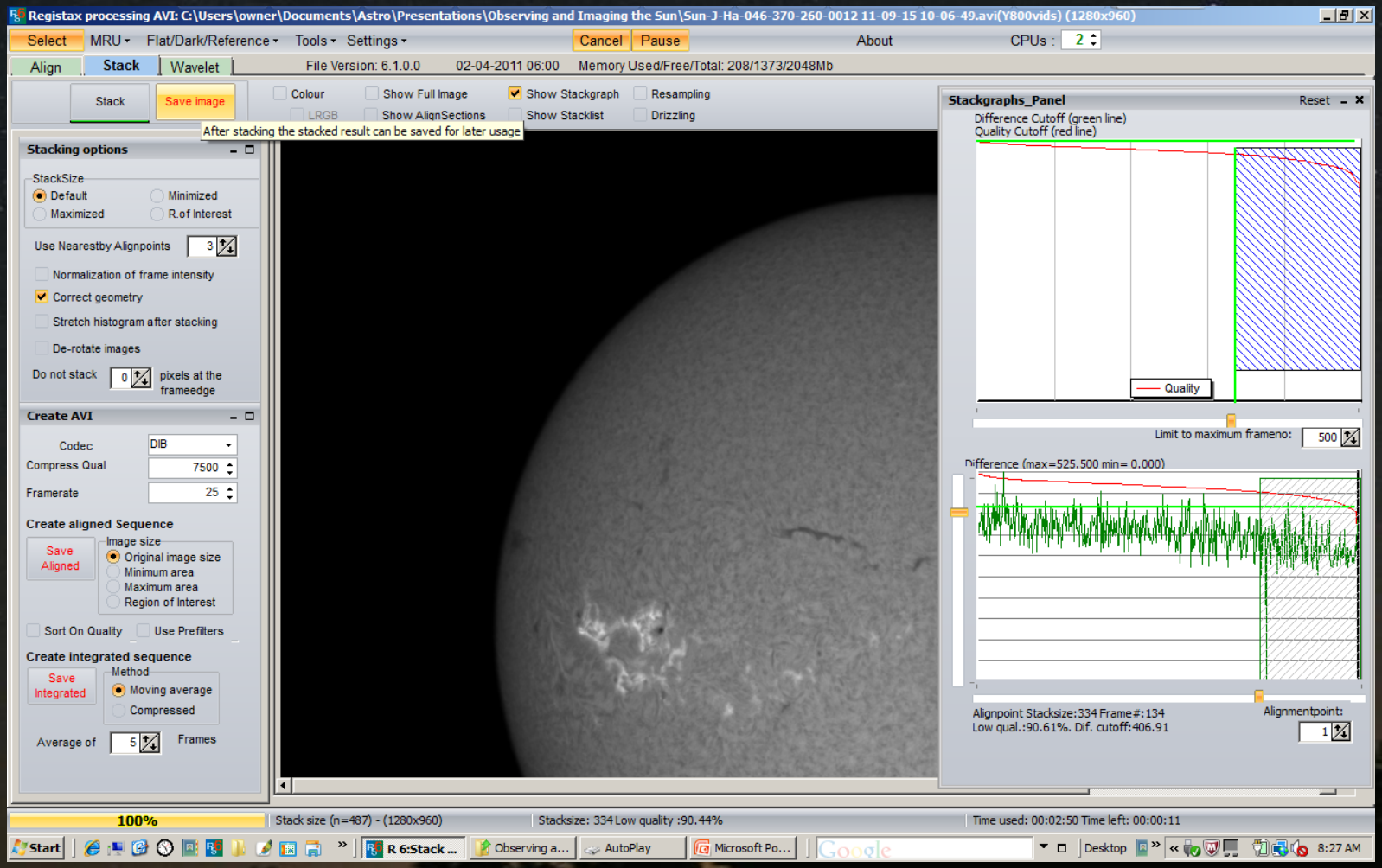
When Stacking is finished select “Save Image” and save as TIFF file



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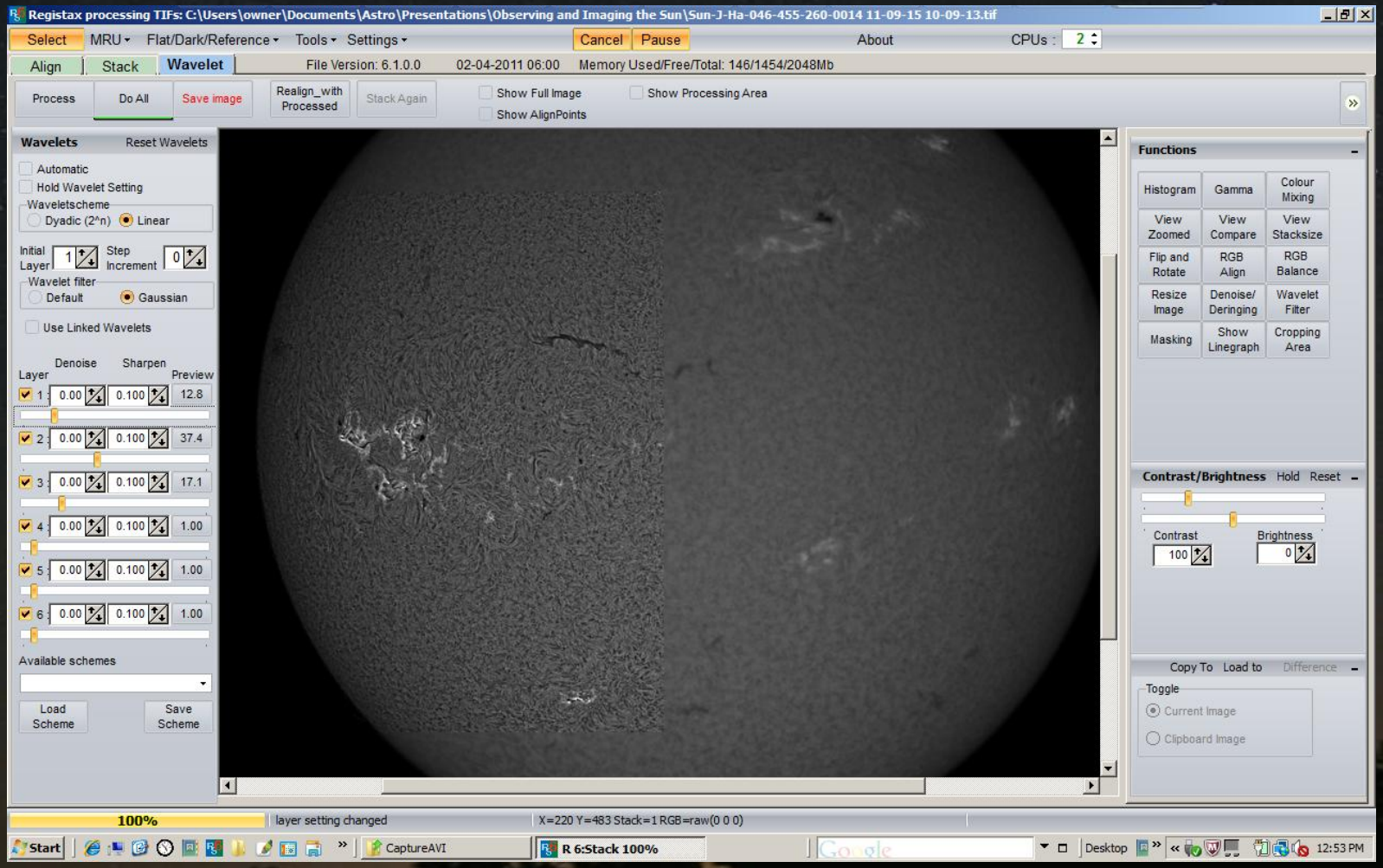
Click Wavelet button and adjust wavelettes according to your taste



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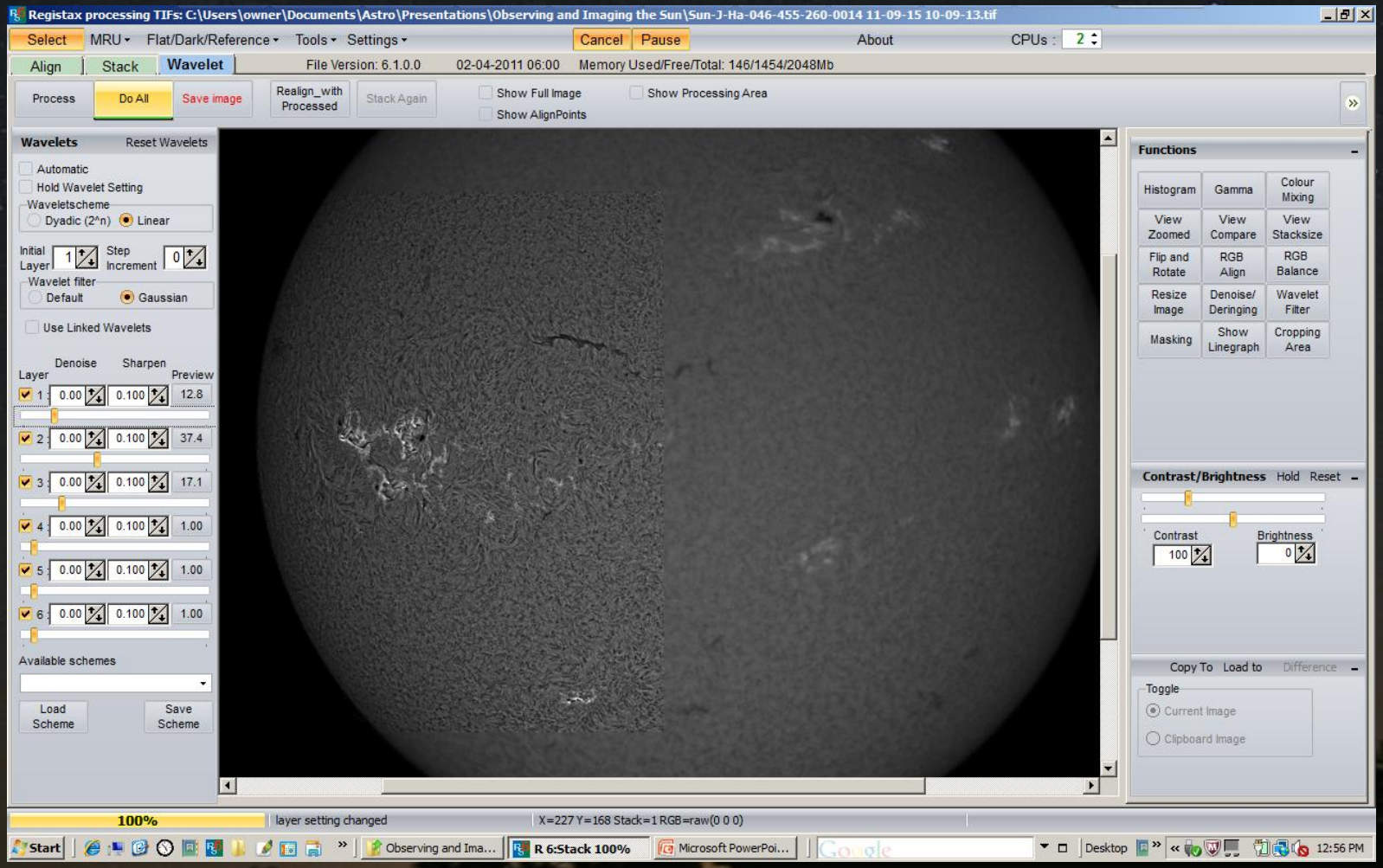
Click Do All and Save the image as a .jpg or .png once completed



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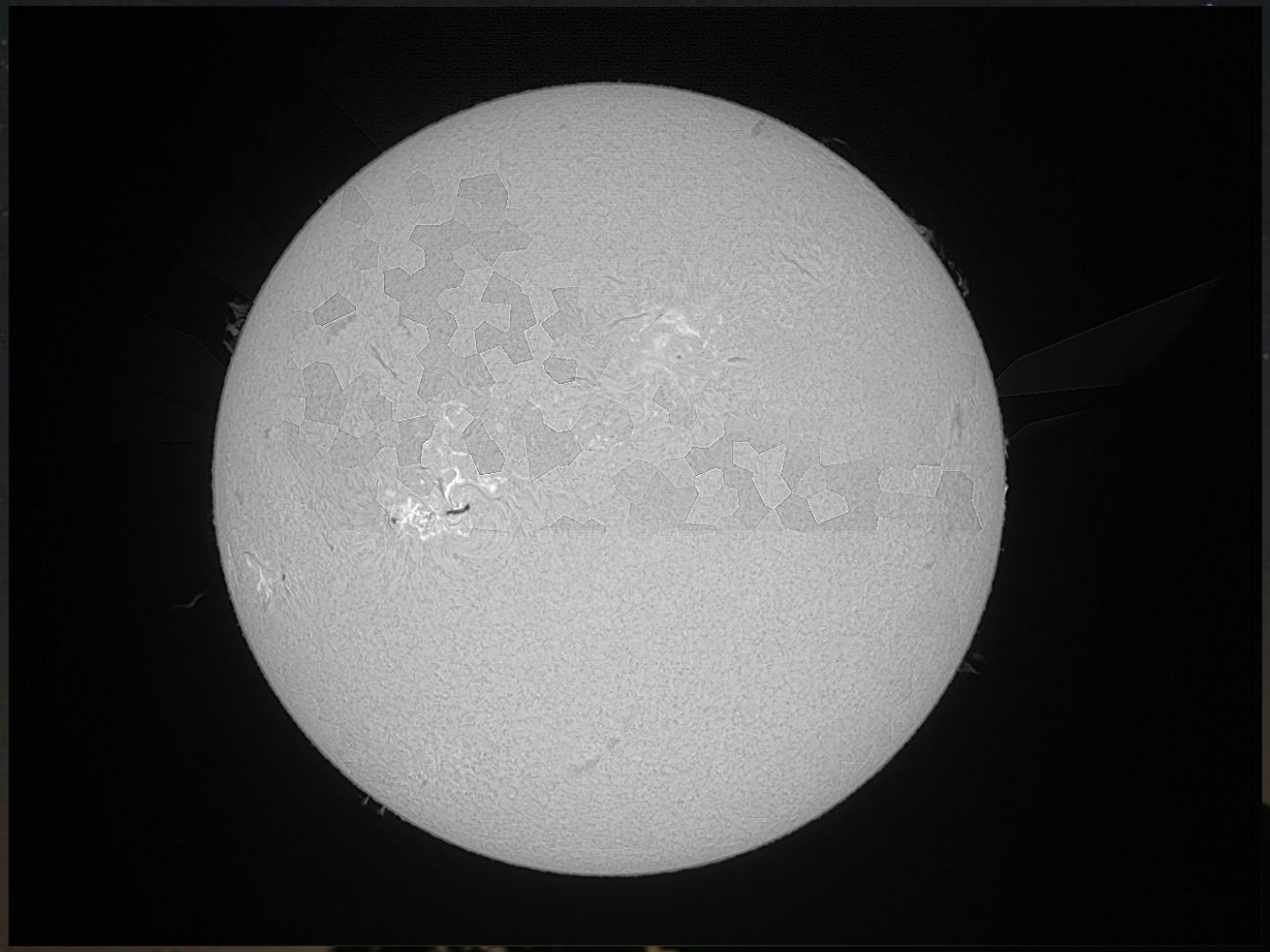
When clouds passed through the image Registax 6 does not work right



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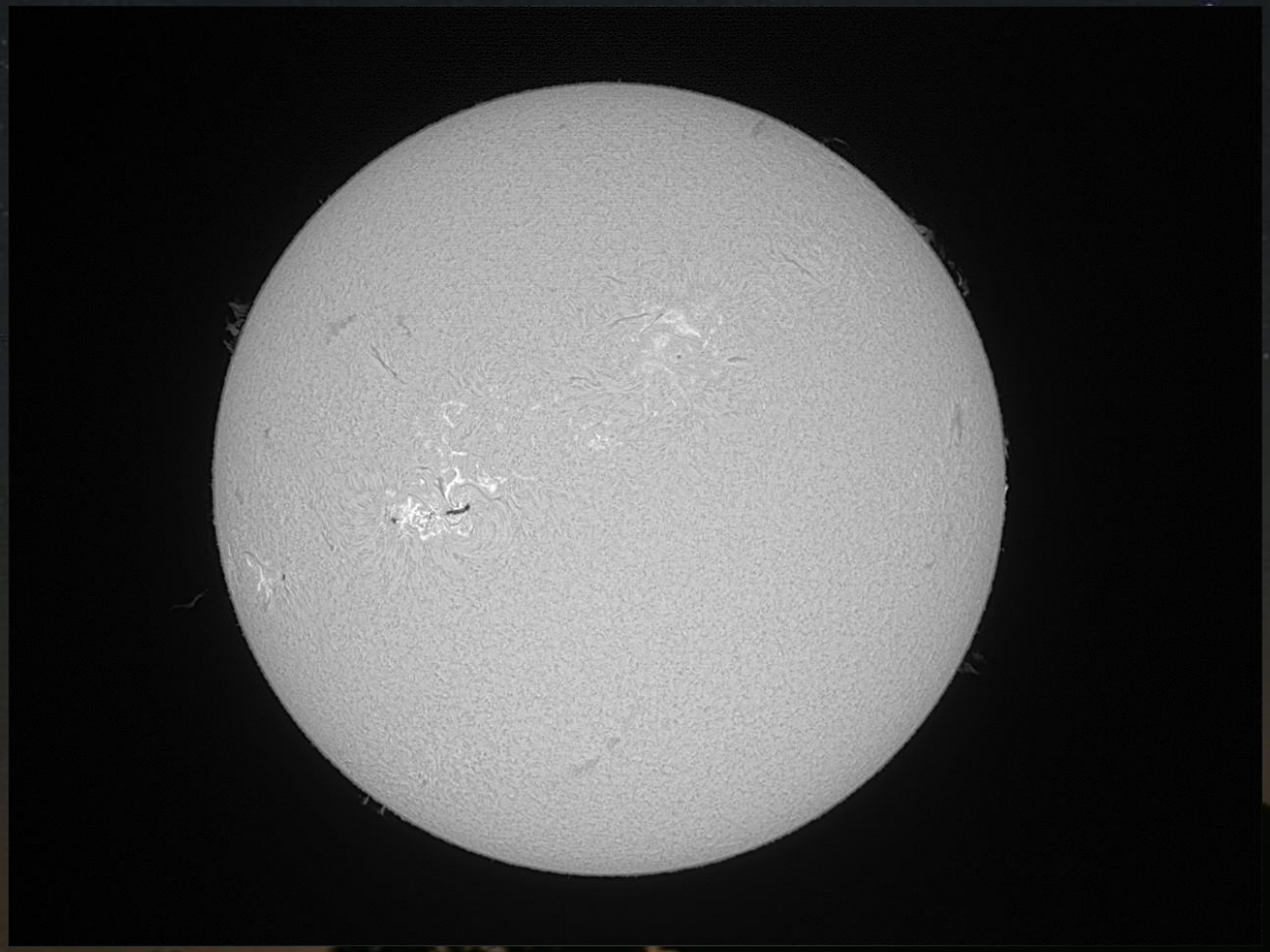
Use Registax Version 5 instead



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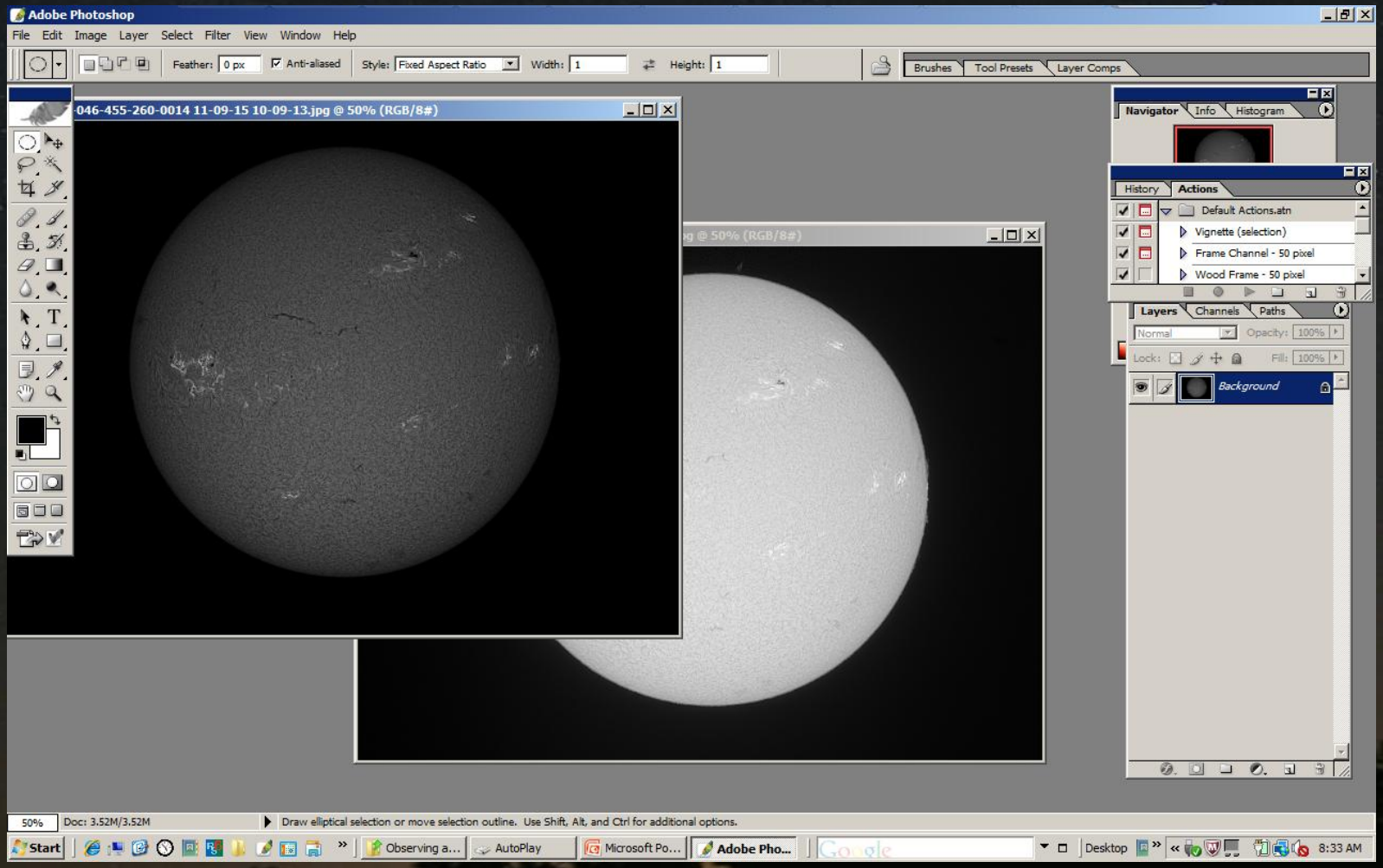
In Photoshop load the solar disk as well as the image showing the limb details



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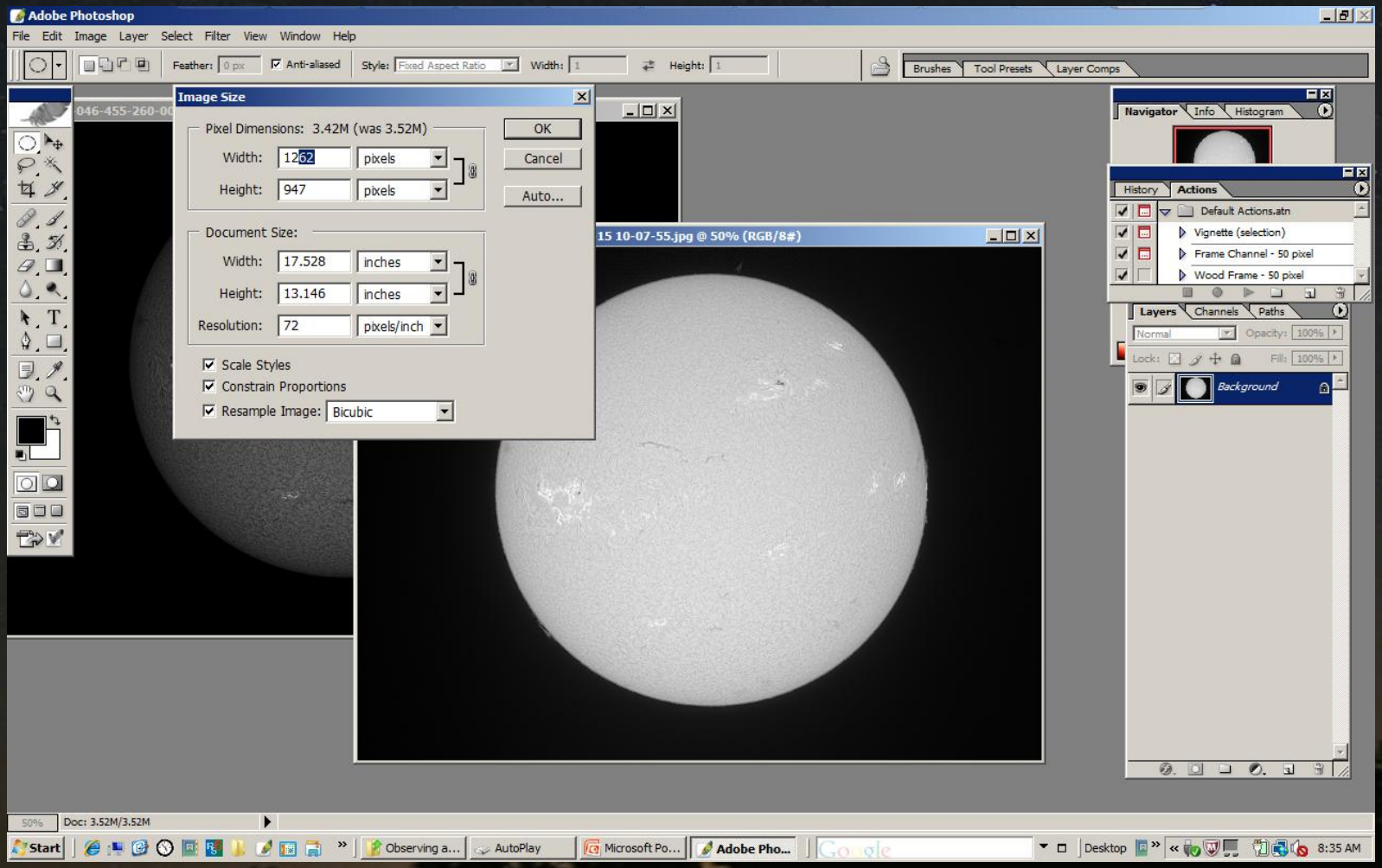
Because the capture program "Bloats" the overexposed image, reduce its size



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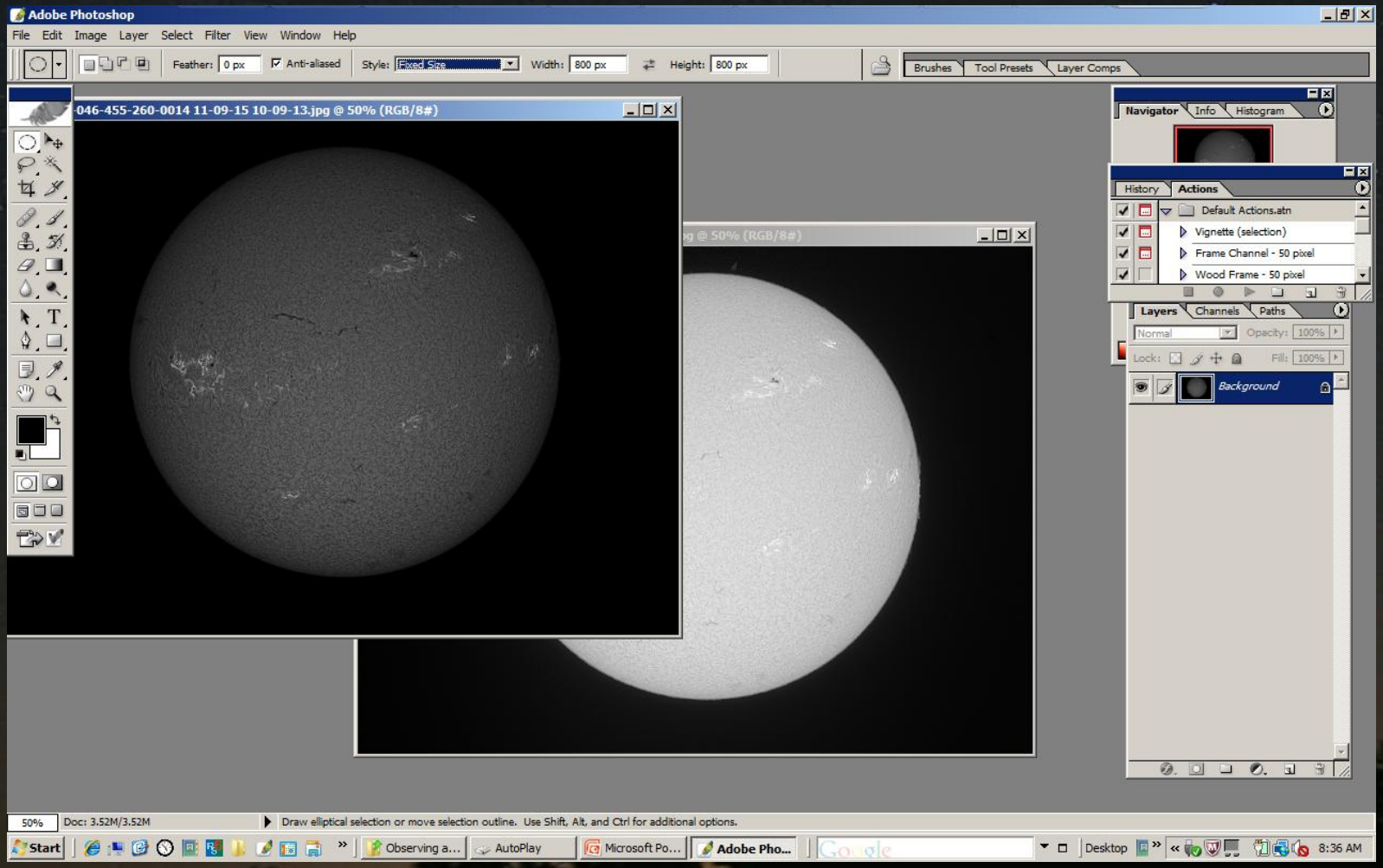
Select the fixed size circle tool and outline exactly the solar disk



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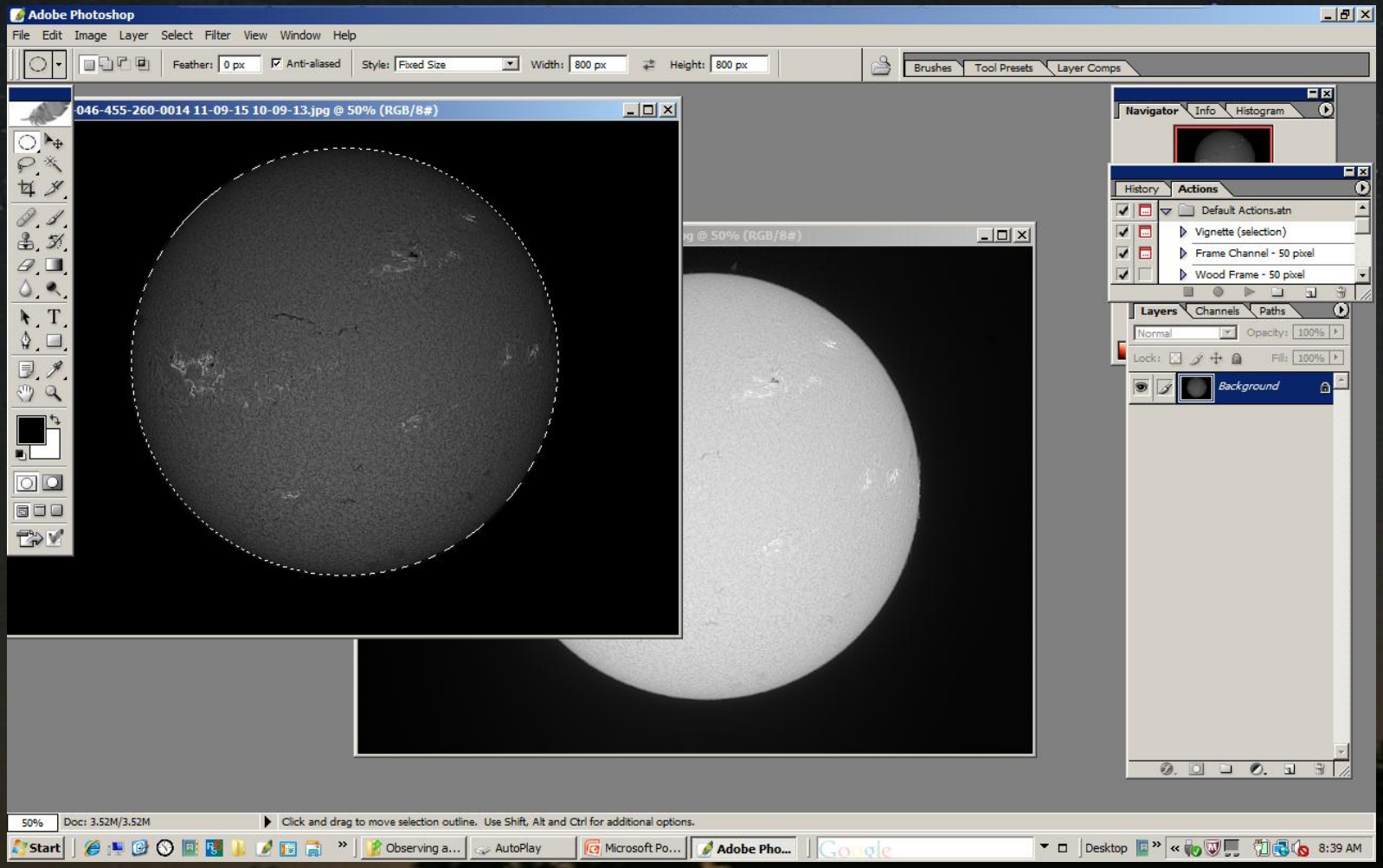
Select the fixed size circle tool and outline exactly the solar disk



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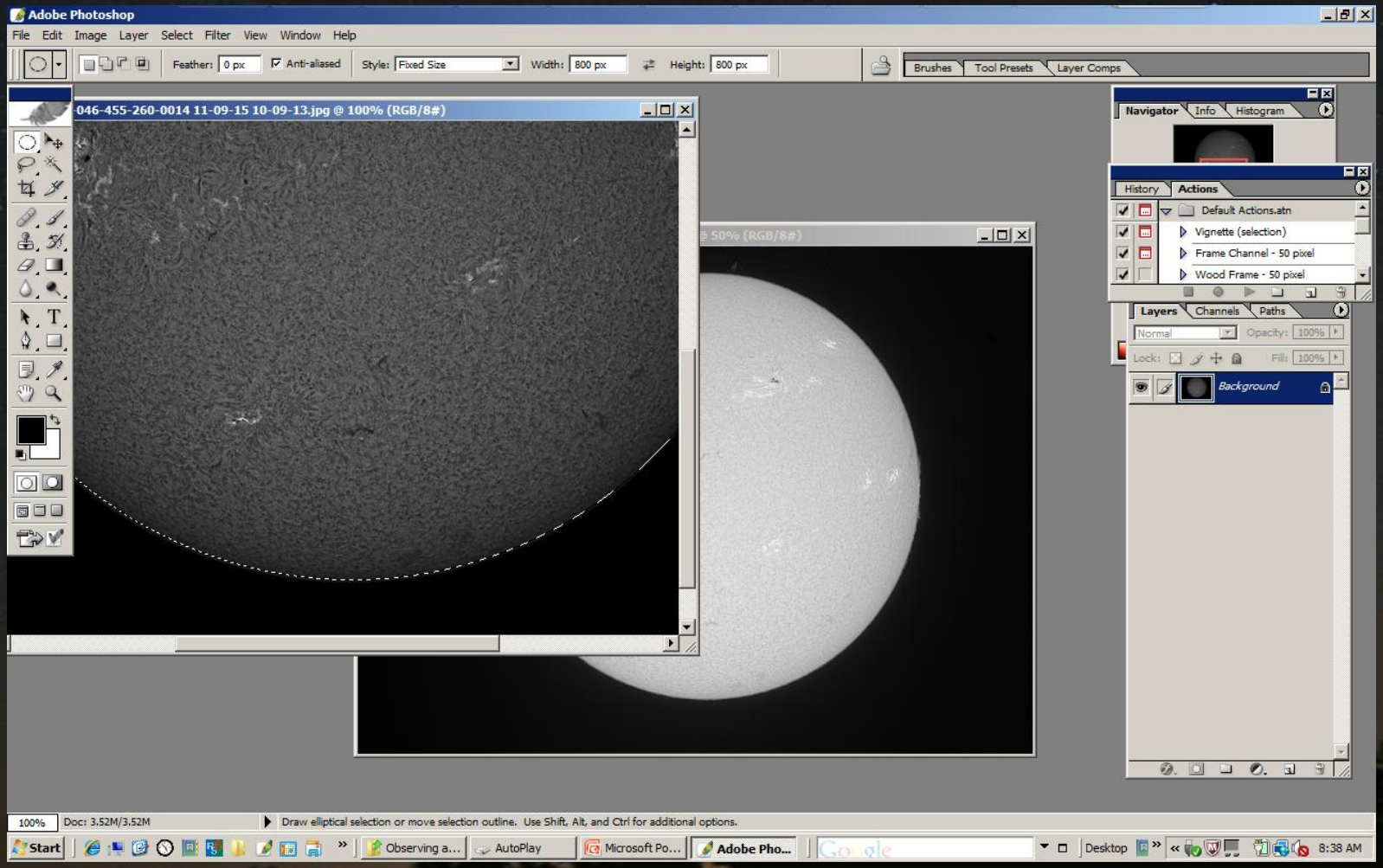
Double check the exact alignment by going to full sized image



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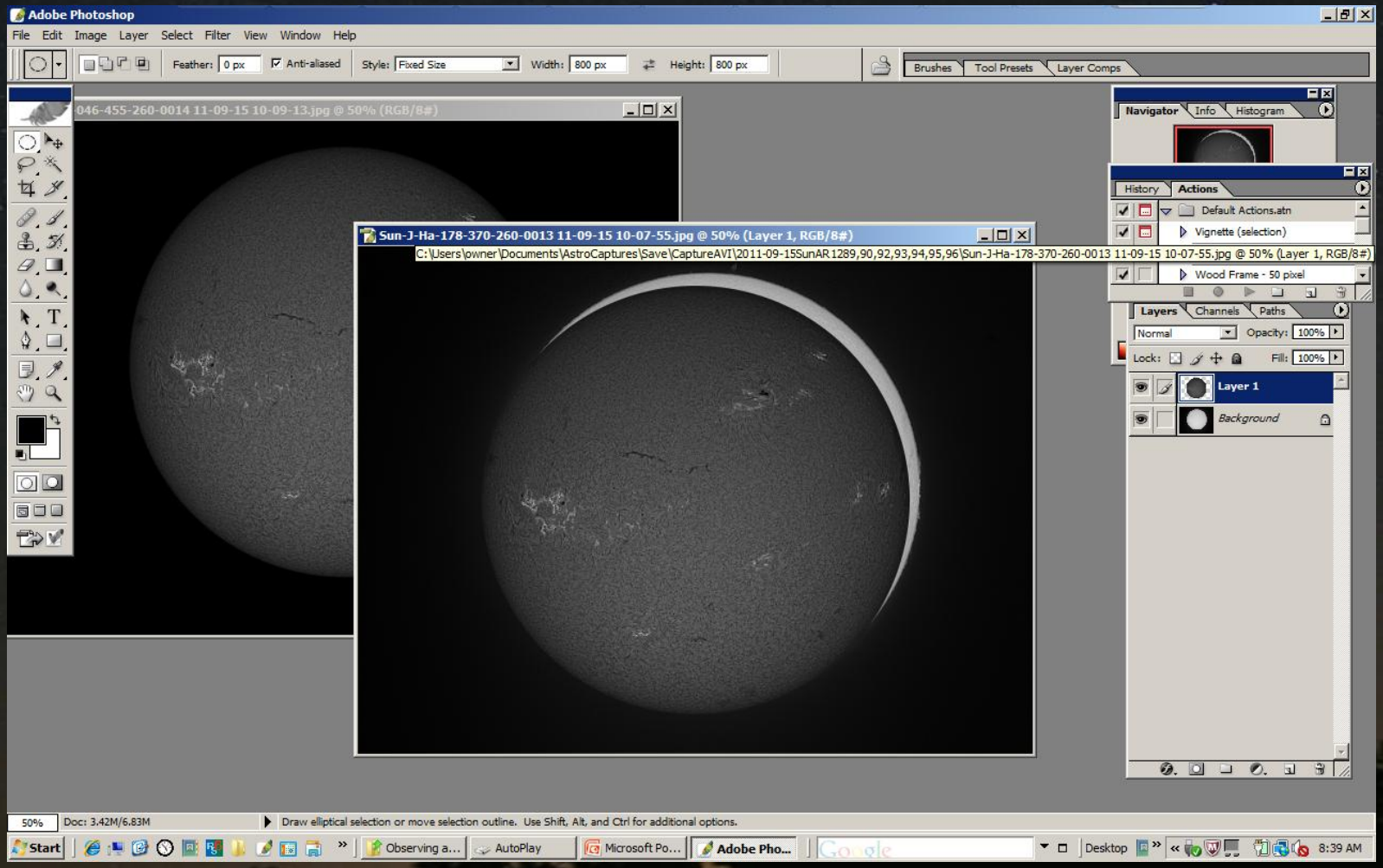
When location of the circle is OK, copy image and paste it in the “Limb” image



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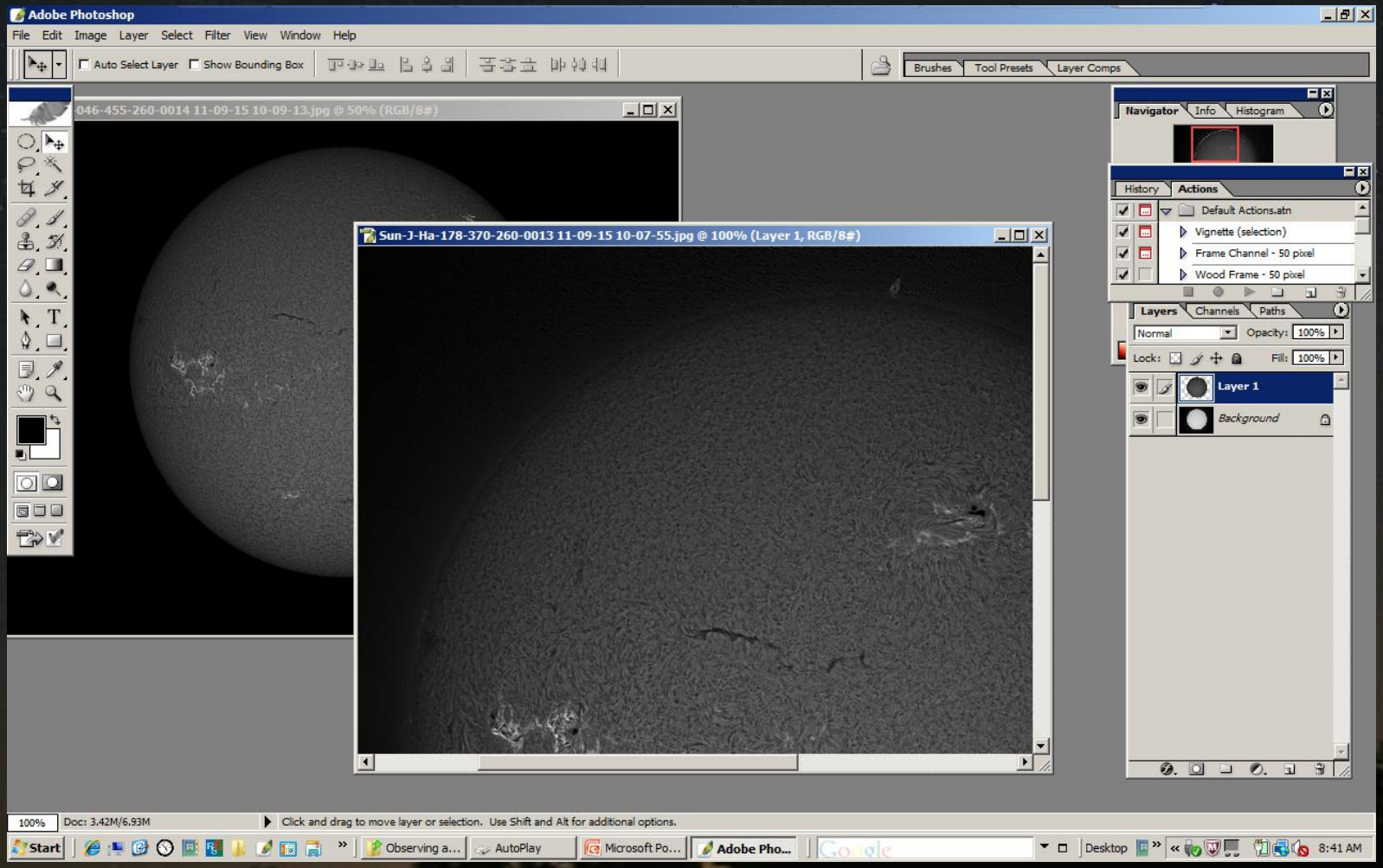
Make sure again that the image fits exactly (Check full size)



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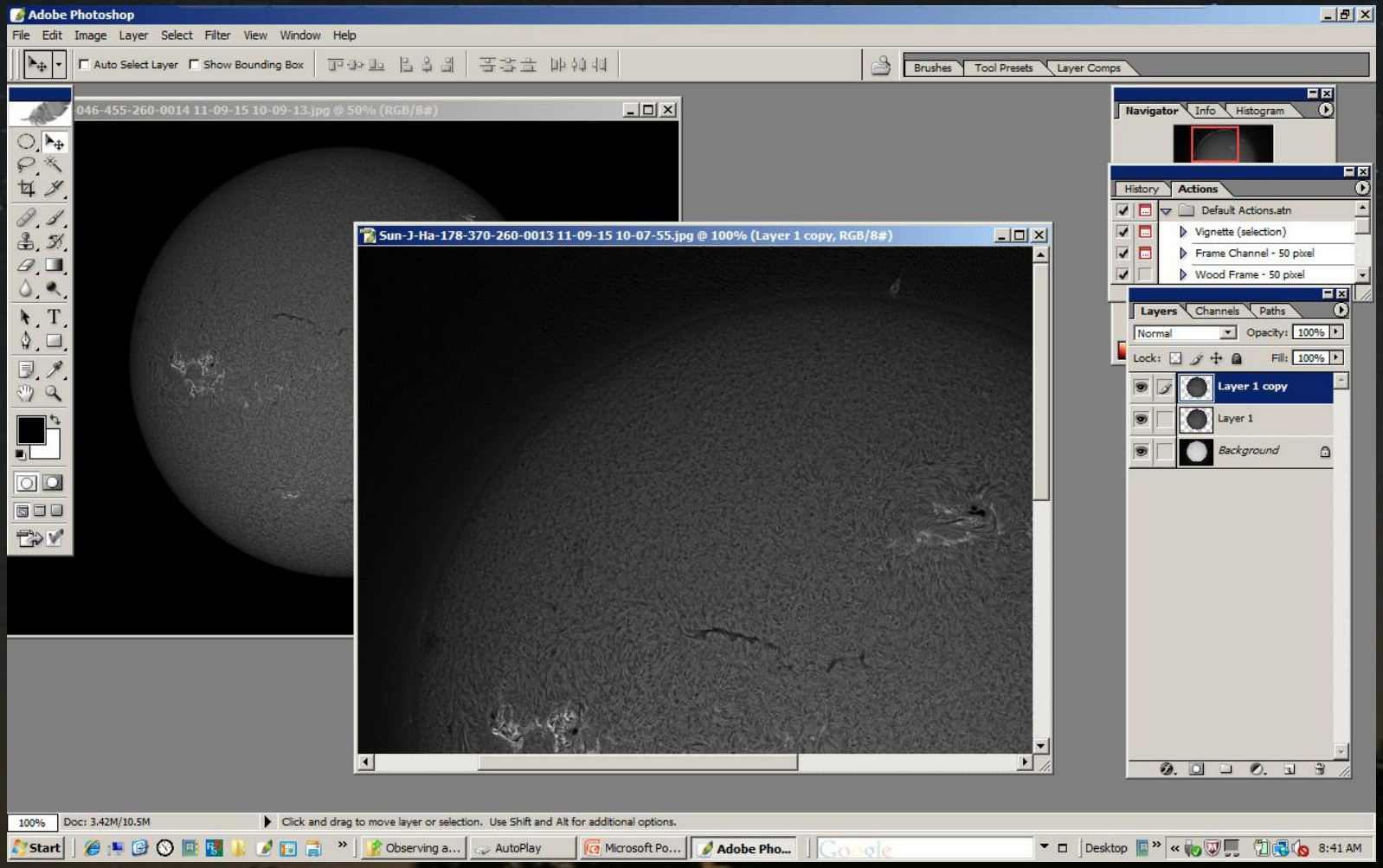
Now make a copy of the disk you just copied on the “Limb” image



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Now I generate a Levels and Color Balance clipping layer
For each of the three images.
Adjust the Levels and Color Balance settings according
To your preference.

I use the following color settings:

Medium: Red: 61% Blue: -61%
High: Red: 20-25%
Dark: Red: 15-25%

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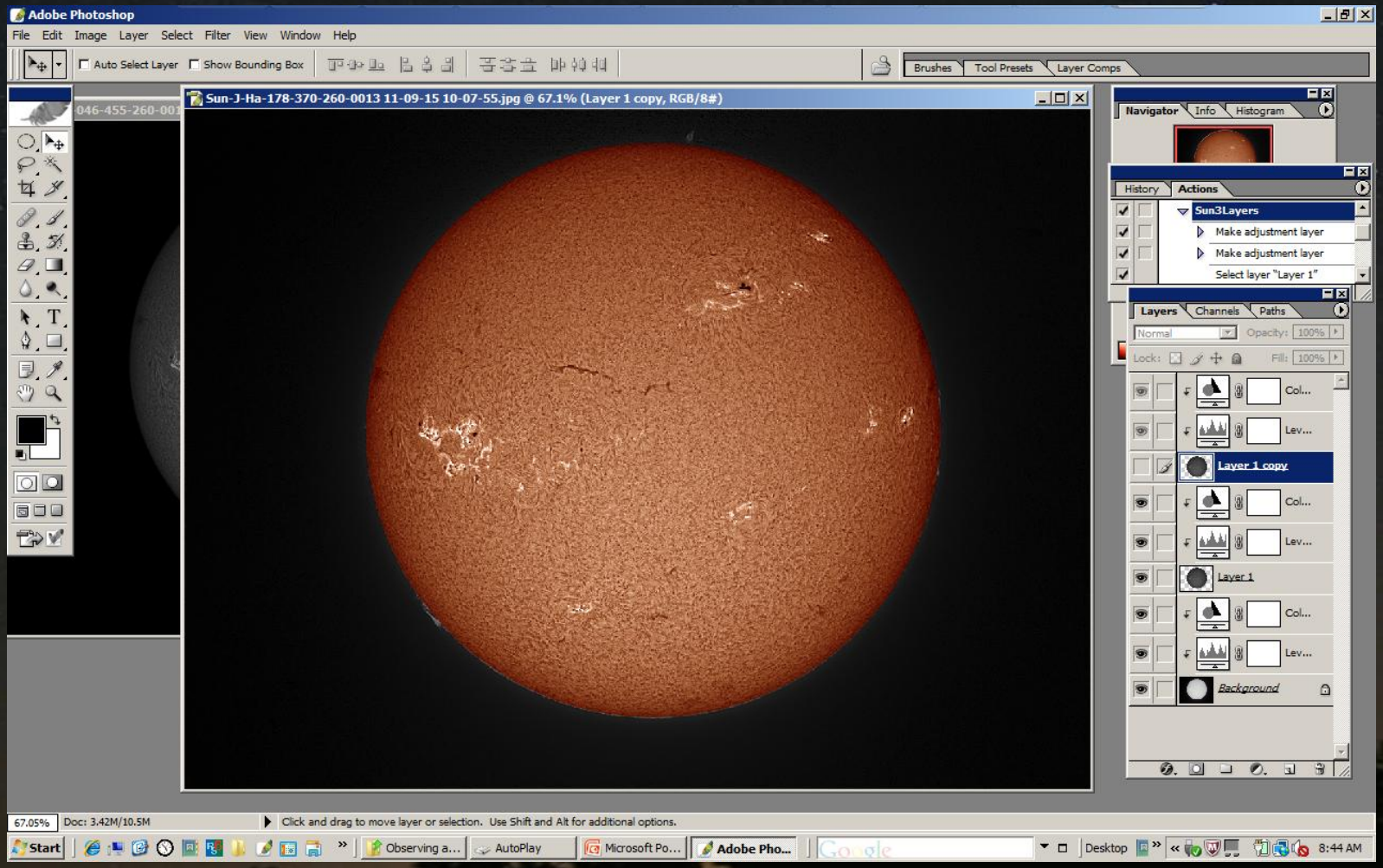
I activate a set of actions to generate the control layers for all three images



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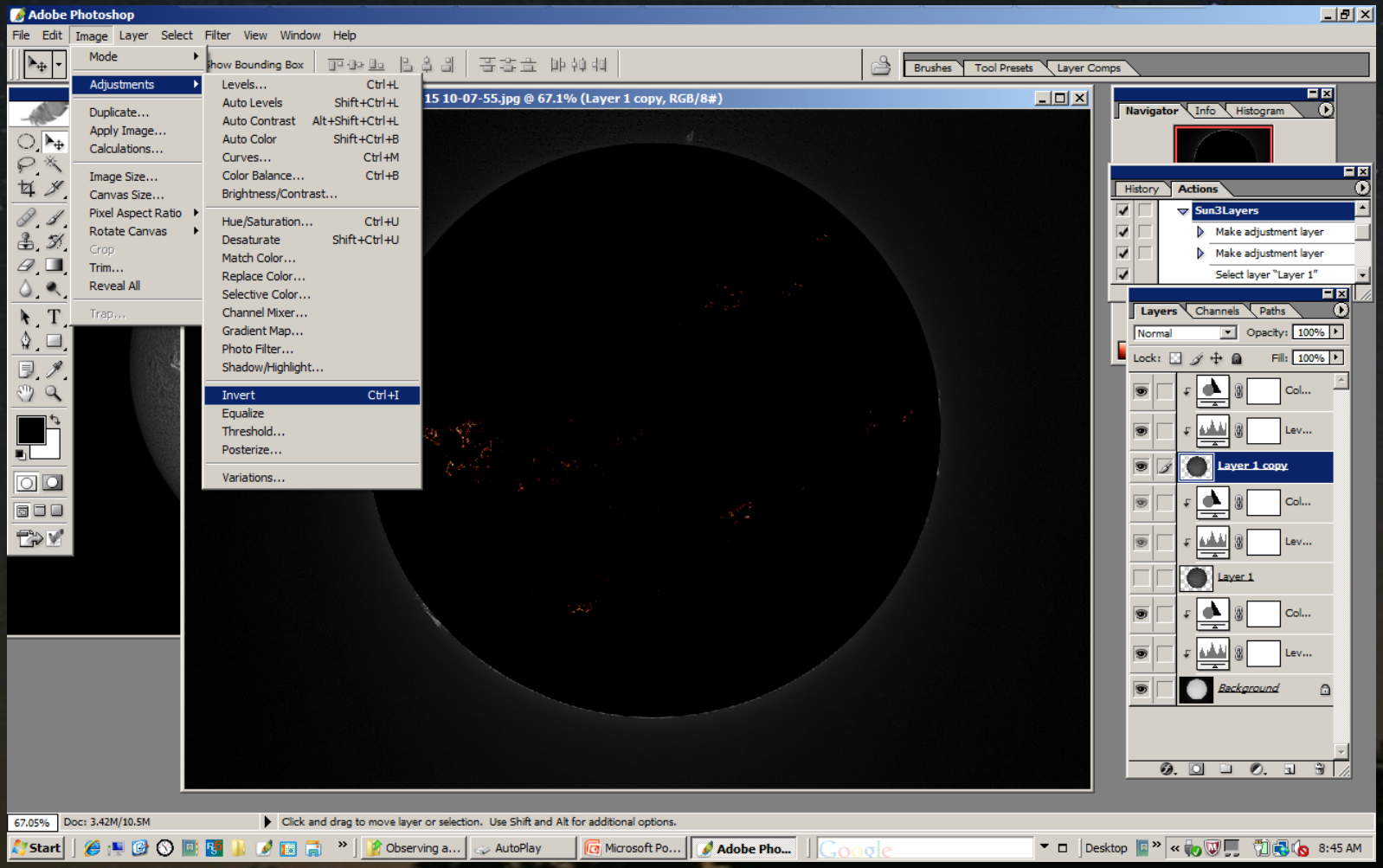
To include an inverted disk image, select the top image in the stack and invert



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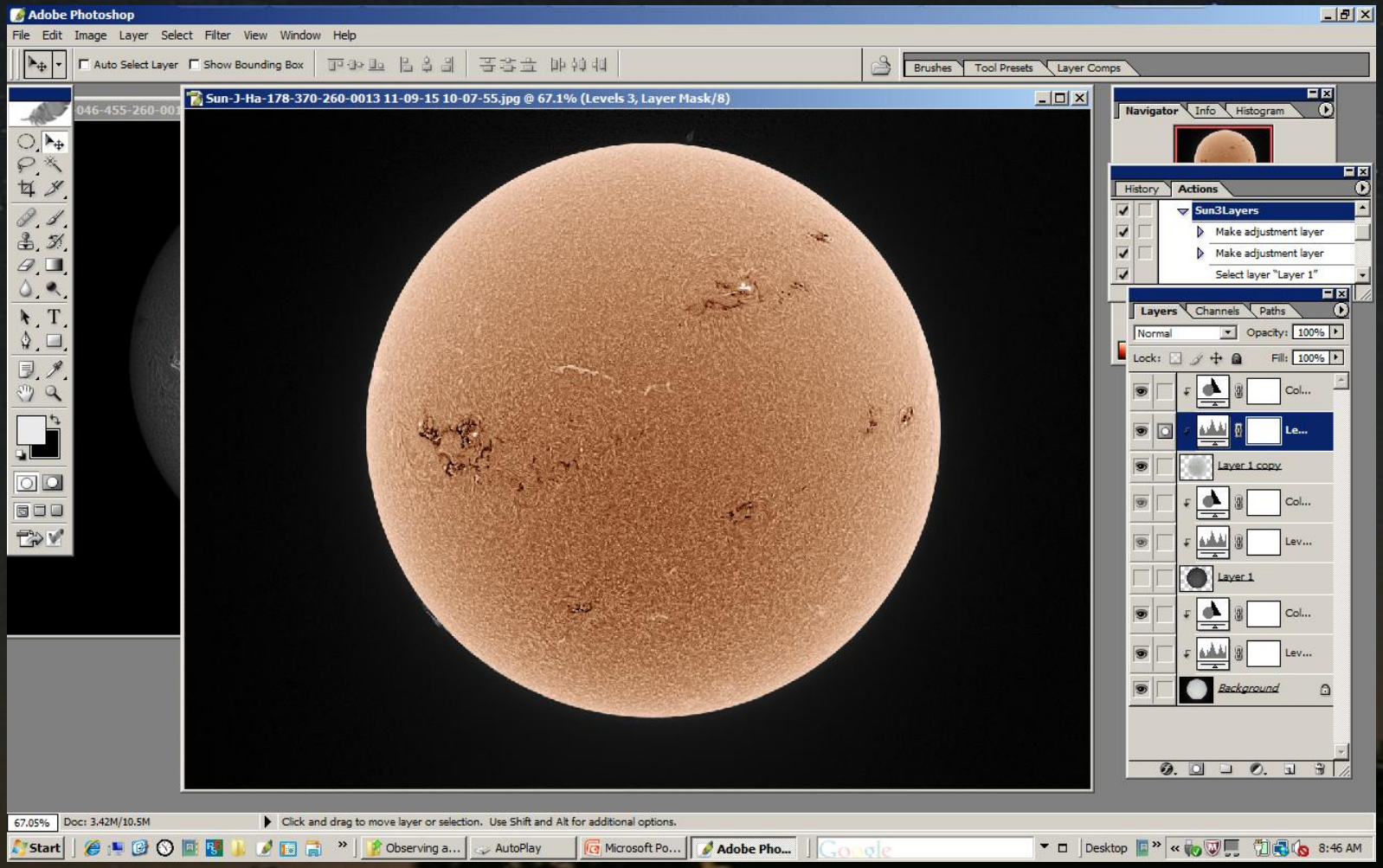
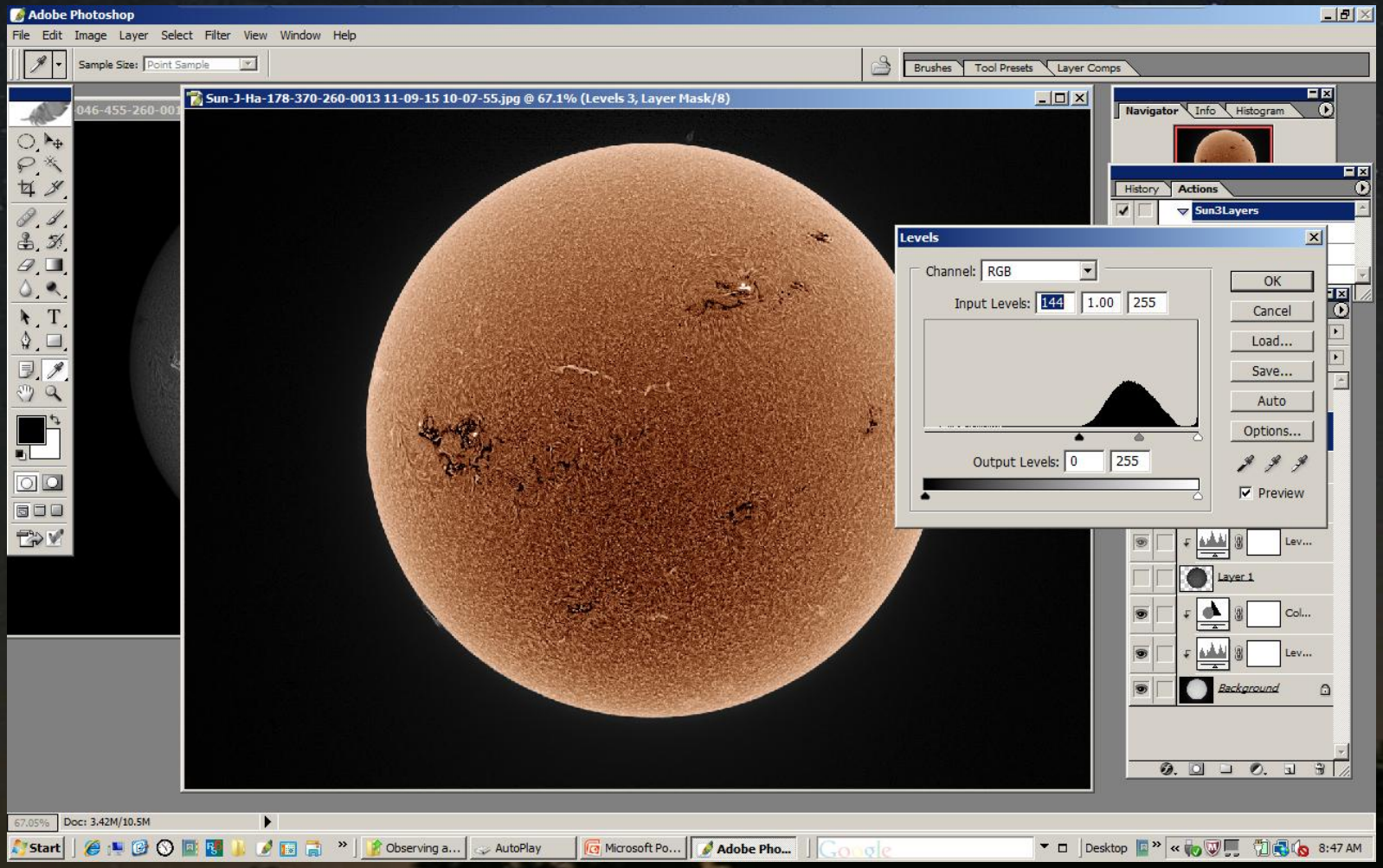
This is my defaulted result



Than fine tune the Levels and Color Balance to the desired result



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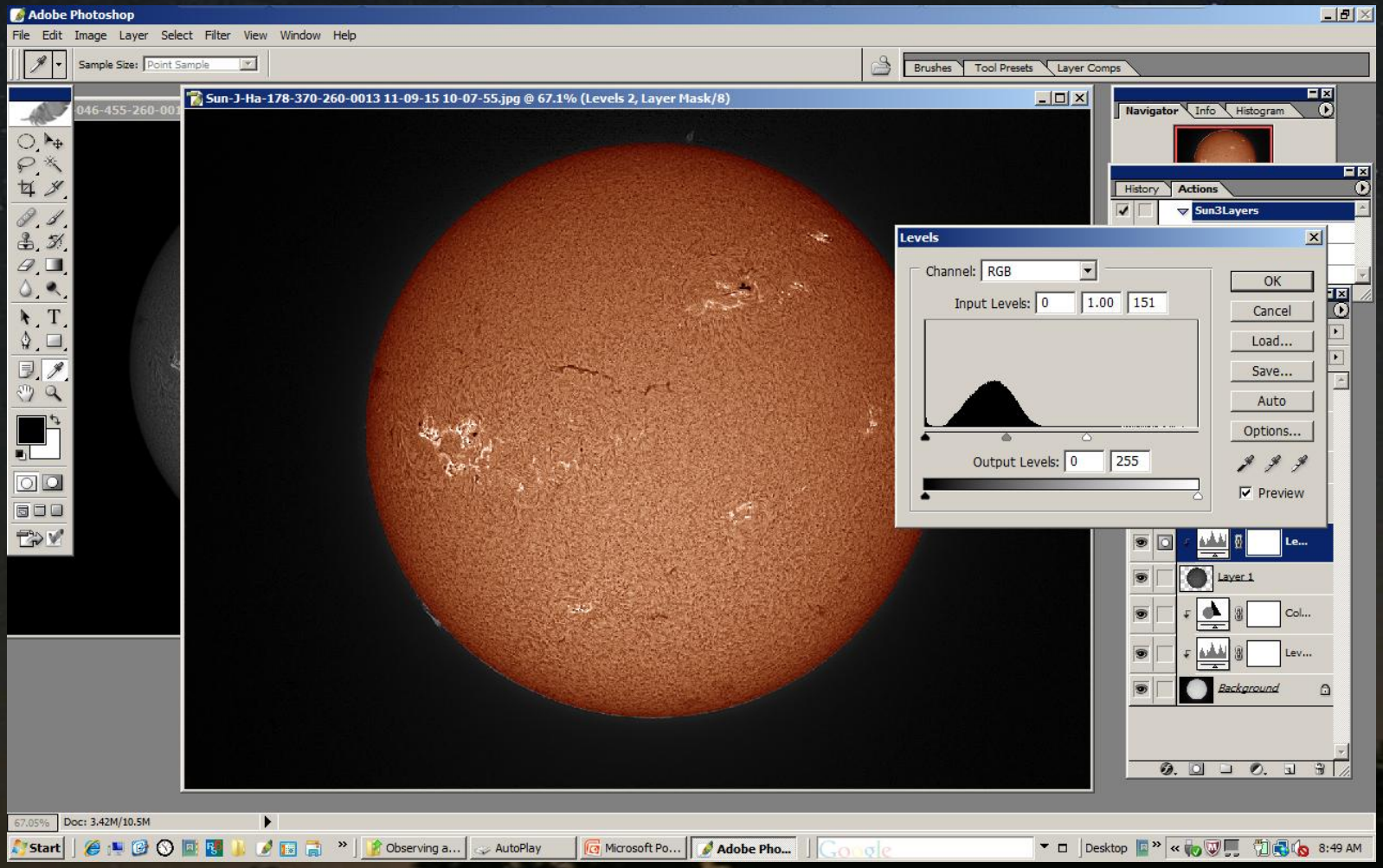
Do the same for the normal image



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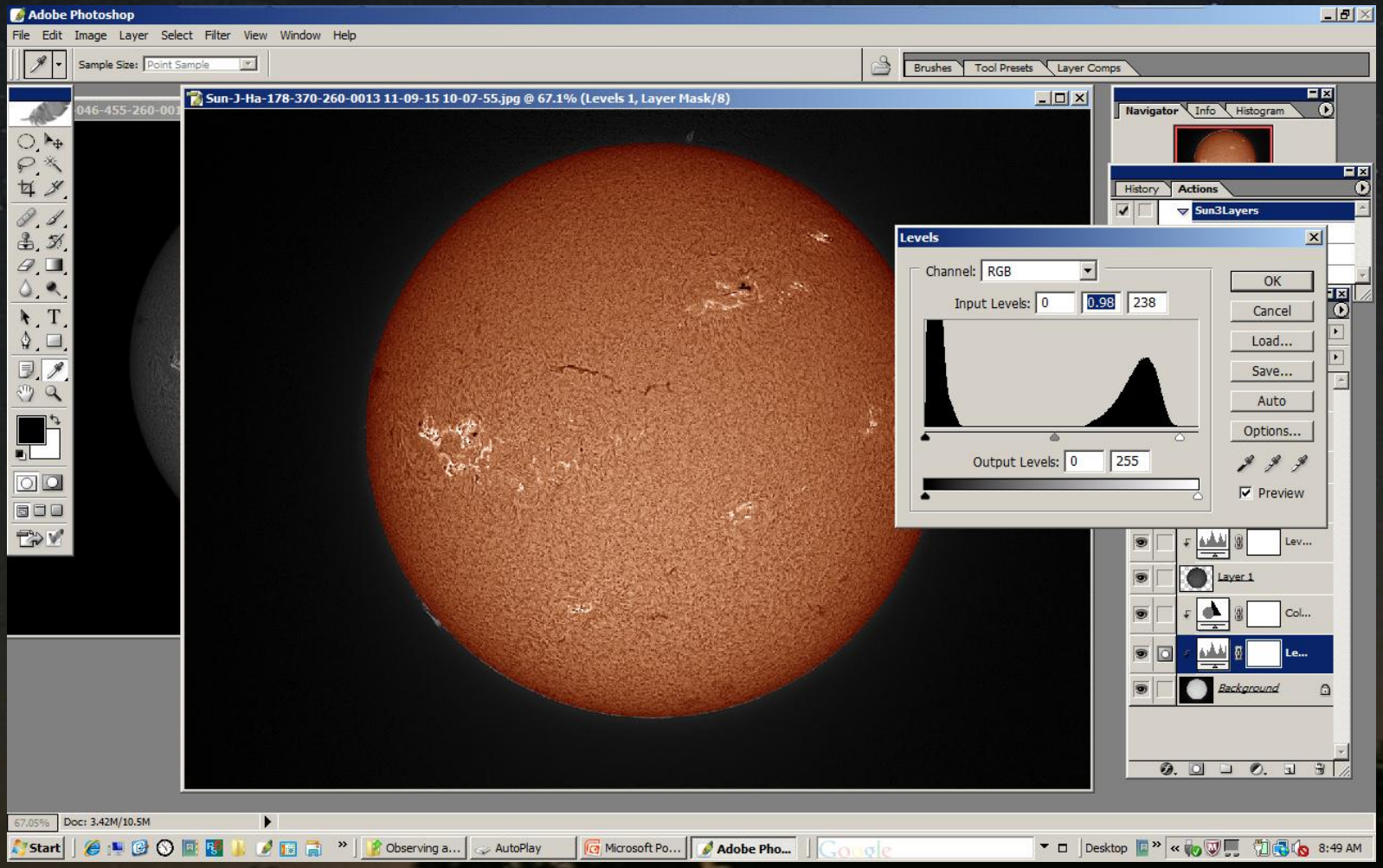
And the image with the details on the limb.



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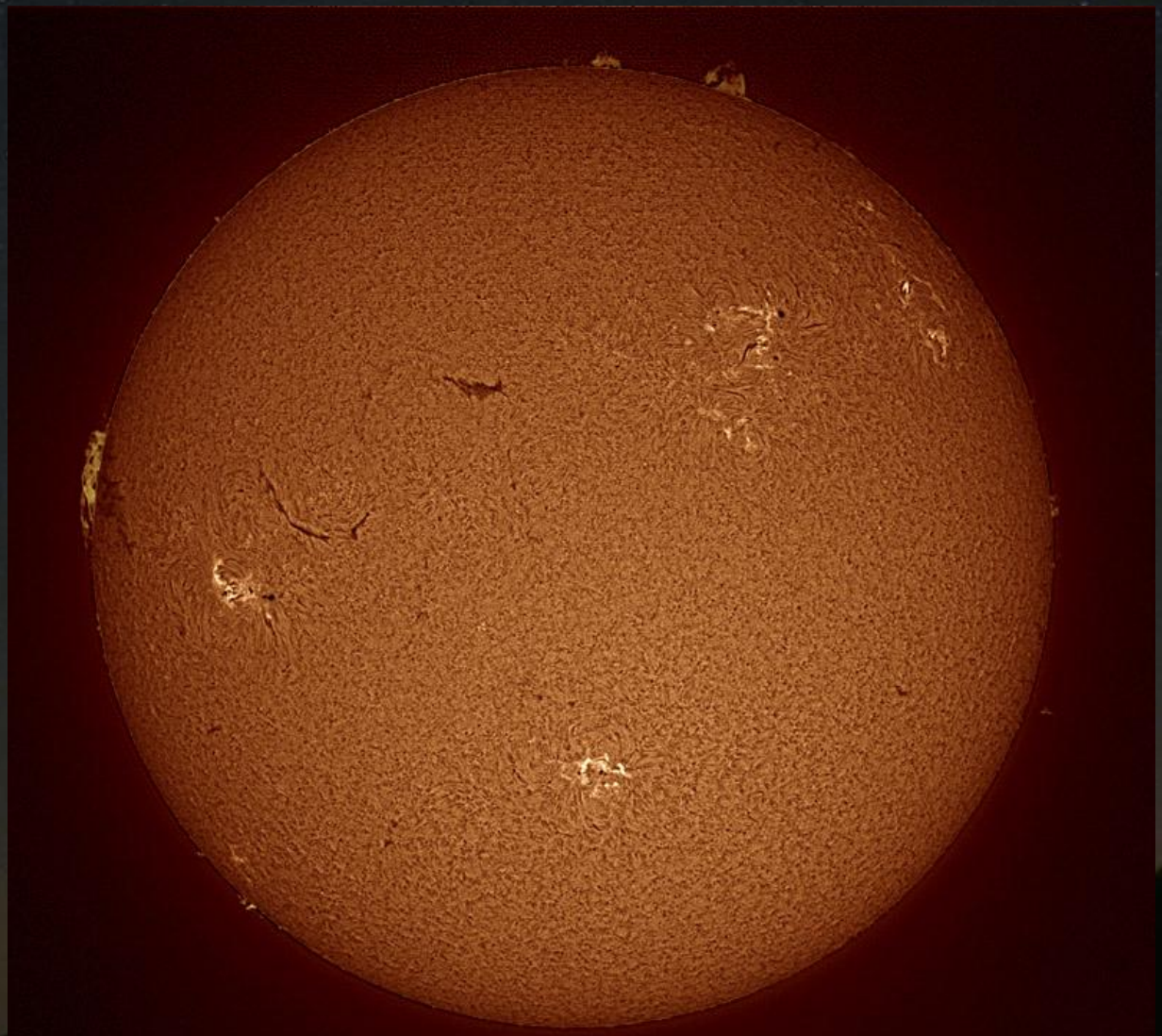

Sun AR1277,79,80,81,82,83 2011-09-02 14:26 UT CR2114 SM40 DMK41AU02.AS Theo Ramakers Social Circle

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Sun AR1277,79,80,81,82,83 2011-09-02 14:26 UT CR2114 SM40 DMK41AU02.AS Theo Ramakers Social Circle

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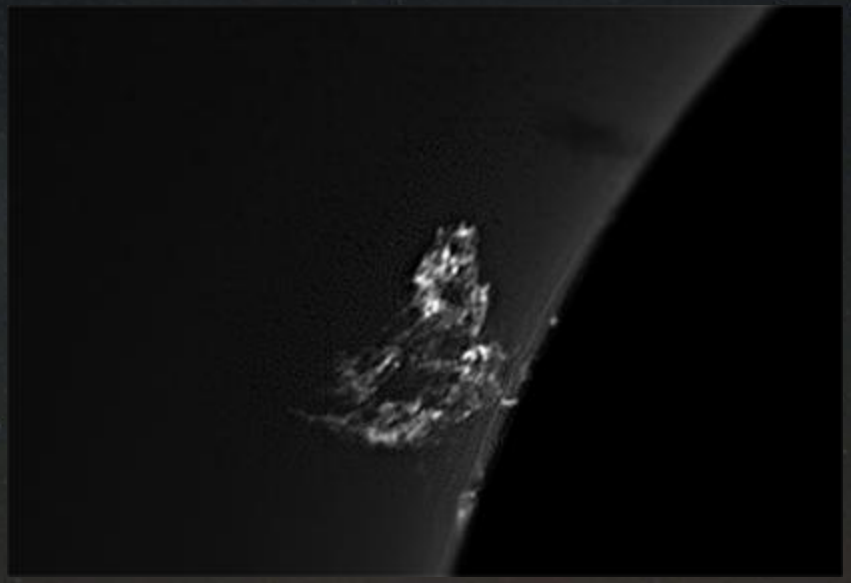
A few images and Animations:



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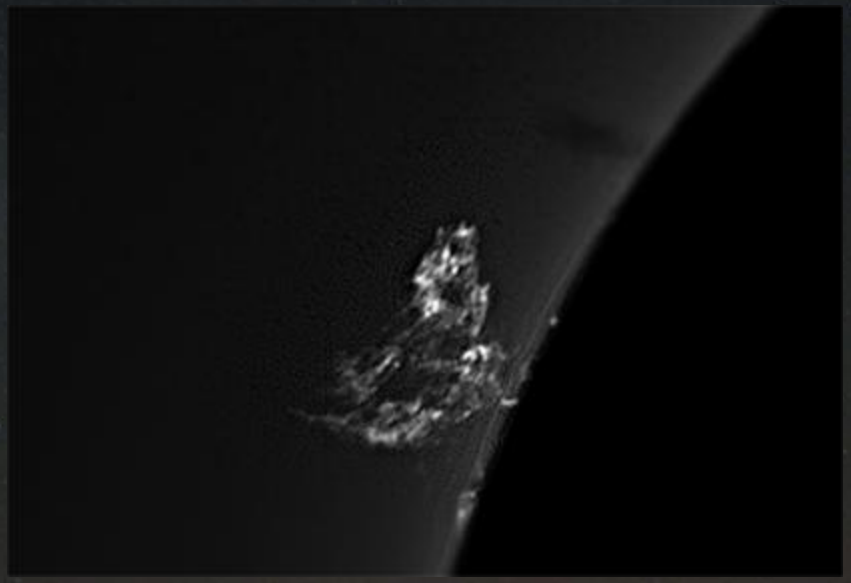
A few images and Animations:



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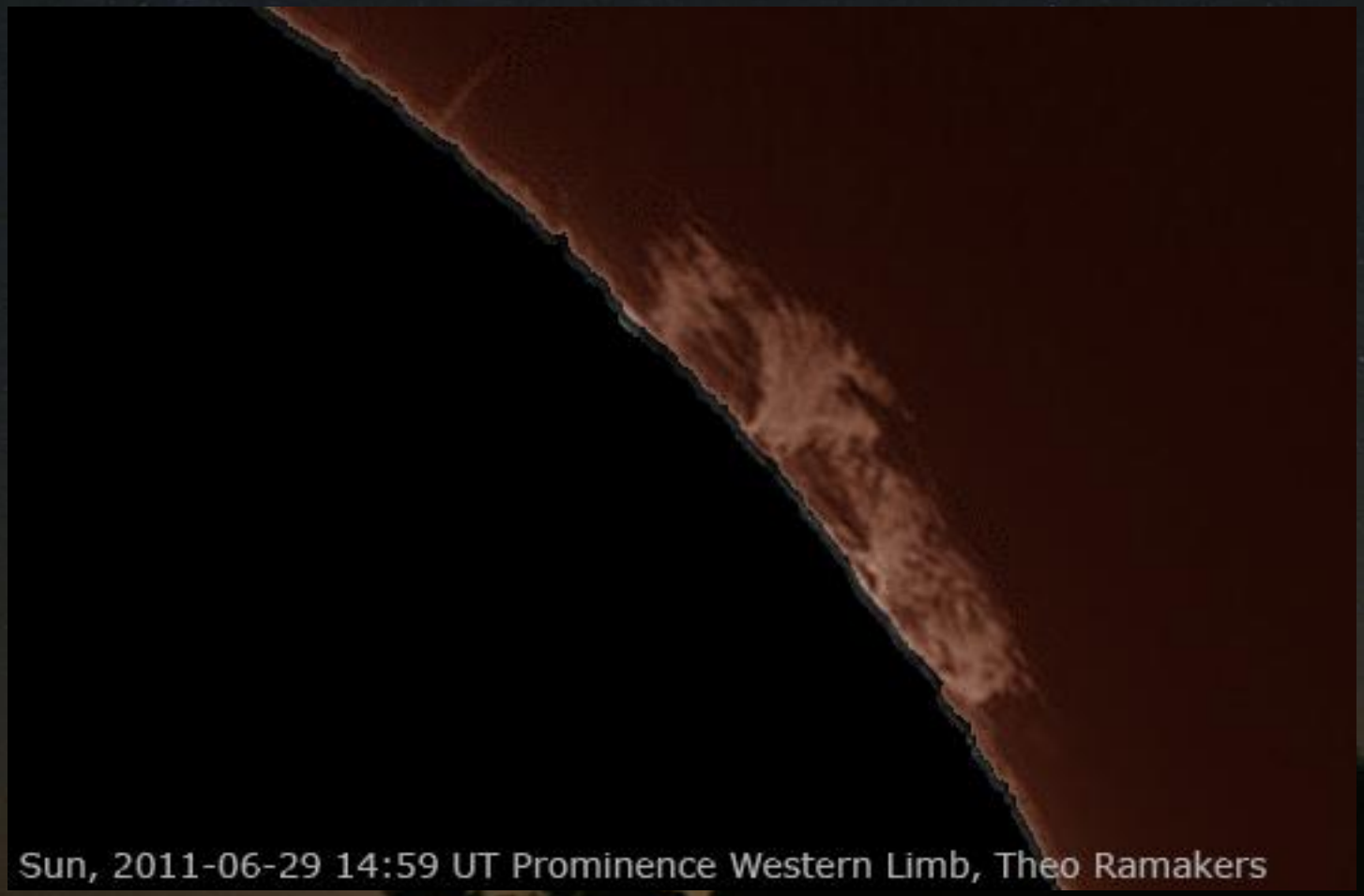

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Sun, AR1242,43 2011-06-29 14:43 UT CR2111 SolarMax40 DMK41AU02.AS Theo Ramakers Social Circle

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Thanks for your attention and….

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