

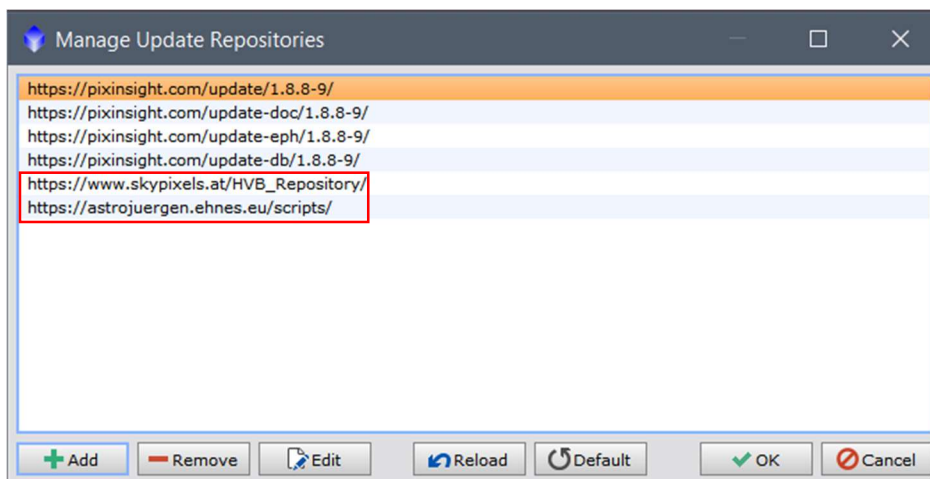
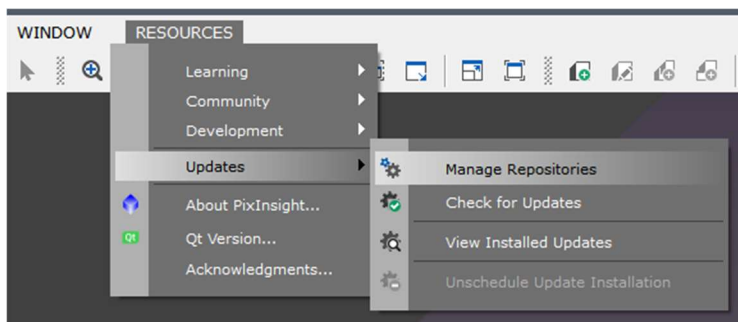
Editing RGB images (capturing without filters) with PixInsight (version 1.8)

For the image processing of a pure RGB image, a sequence is suggested below, which is one of many possible ones.

For some steps in this sequence additional scripts are needed, but they are not decisive for the final image.

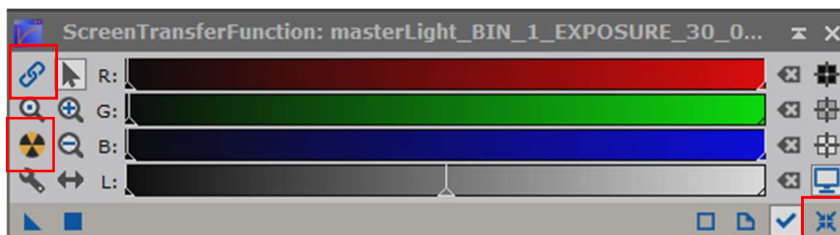
Procedure:

Via 'Resources' - 'Updates Manage Repository' take over the last two entries shown in the picture.



Then click on 'Updates' - 'Check for Updates' and restart Pixinsight. The new scripts will be installed automatically.

After opening the stacked RGB image, the 'ScreenTransferFunction' from the 'Process' menu item should be opened. Deactivate the chain symbol at the top left, otherwise the image will have "distorted" colors, and then click on the atom sign. This gives the images an automatic stretching.



The reset sign at the very bottom right restores the original state of the stacked image.

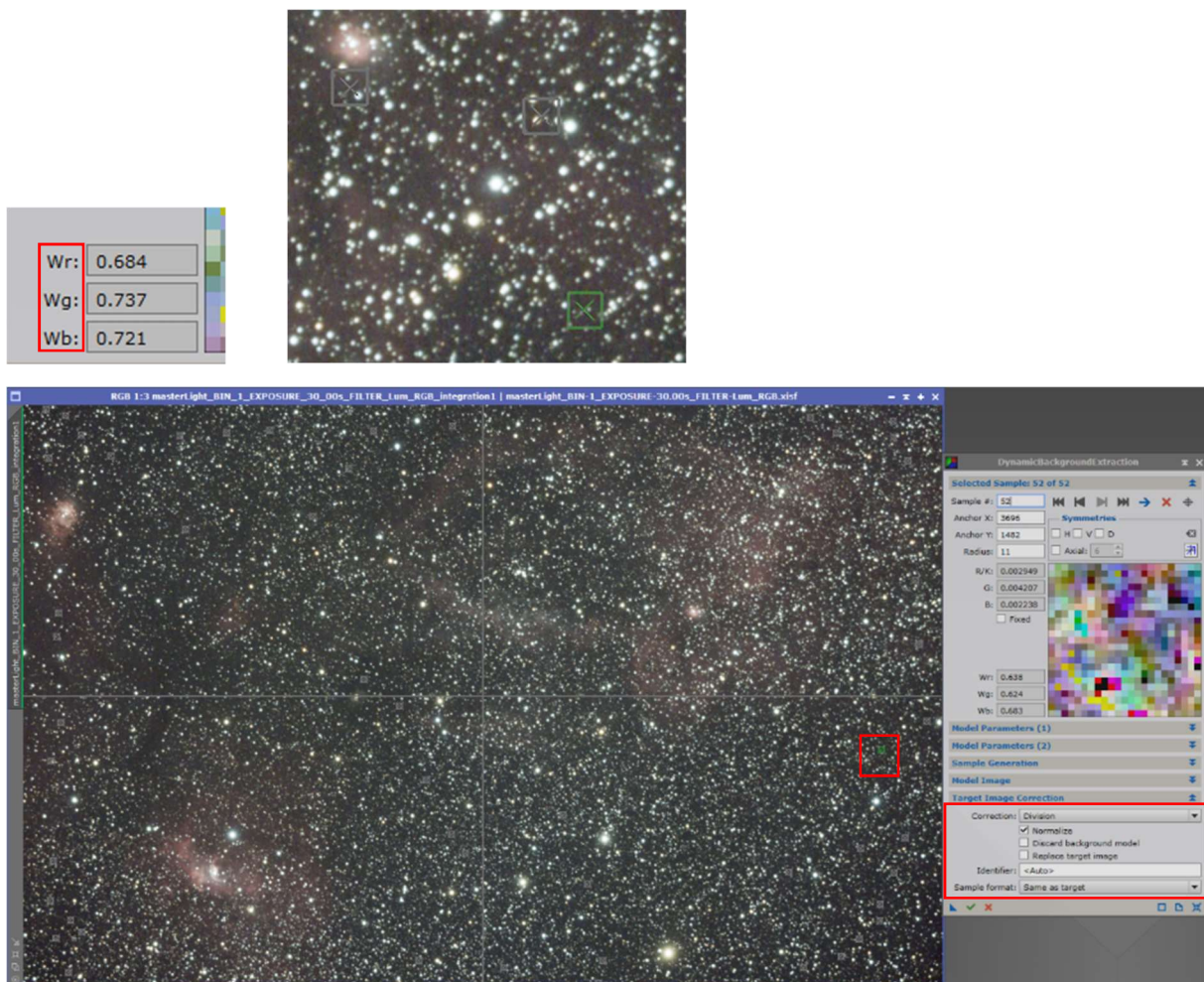
After running 'DynamicCrop', the 'DynamicBackgroundExtraction' is continued. (All other processes listed here can be found under the menu item 'Process' - 'All Processes').

With this process, gradients (differences in brightness due to different causes during the exposure series) are brought back into line with each other. The background is thus made neutral.

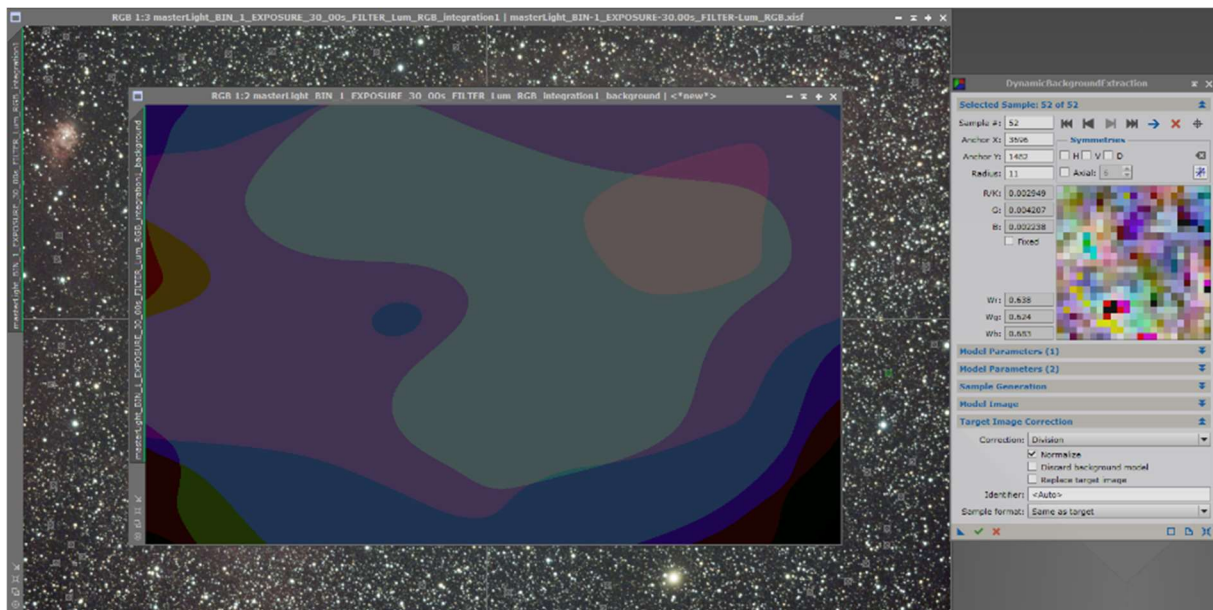
More information can be found e.g. in the Astrophotocast of Frank Sackenheim at <https://www.youtube.com/watch?v=lgXgDCS63QM>).

For this process, click on individual areas of the background with as few stars as possible, or let the program automatically set points in the Sample Generation tab (and test which gives the better result).

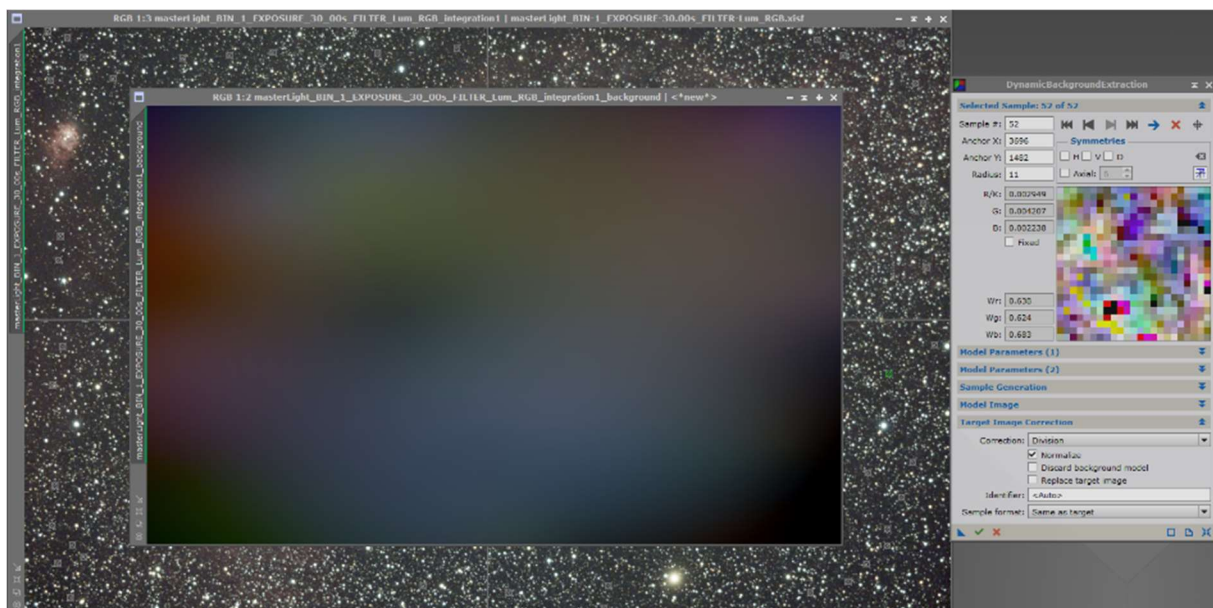
The points (samples) should not be placed exactly in the corners, if possible, and they should reach a high weighting (Wr, Wg, Wb) (max. value is 1).



Under 'Correction' select the line 'Division' (you can also try 'Substraction') and check 'Normalize'.



An image with the gradient progression is generated, which can be displayed in a finer gradation using the following button in the menu bar at the top right.



The gradient should roughly correspond to the gradient that was already visible in the image (the bottom corners are very dark, the middle corners have a greenish cast).

Here it is necessary to play a little with the values and always make a before and after comparison. Depending on how much nebula is visible in the image, or if there is only a small object with a lot of background, the settings will differ somewhat. No nebula parts should be affected in the process.

Before:



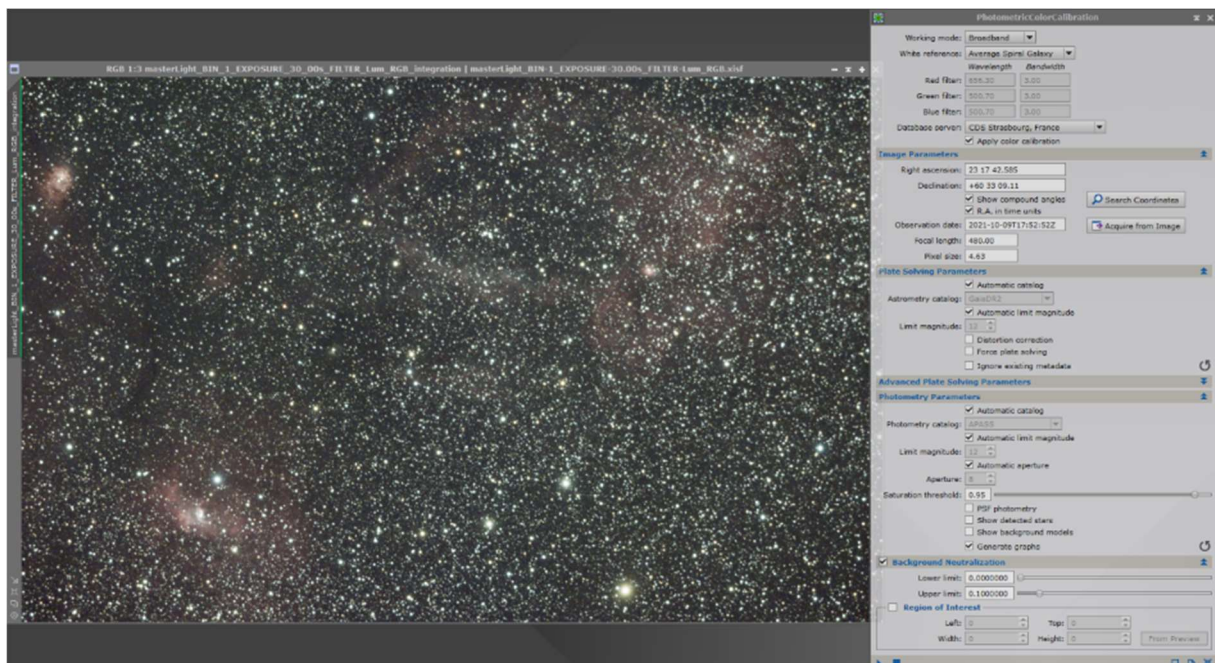
After:



The next step is a 'PhotometricColorCalibration'.

By dragging the blue triangle onto the image, a white balance (based on photometric measurements of stars) is performed. More detailed information can be found in this link:

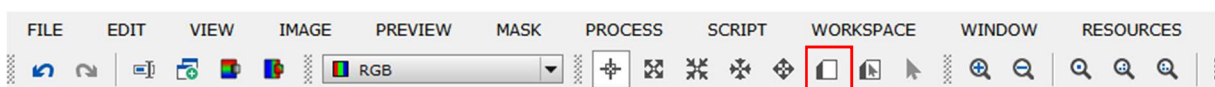
<https://pixinsight.com/tutorials/PCC/>.

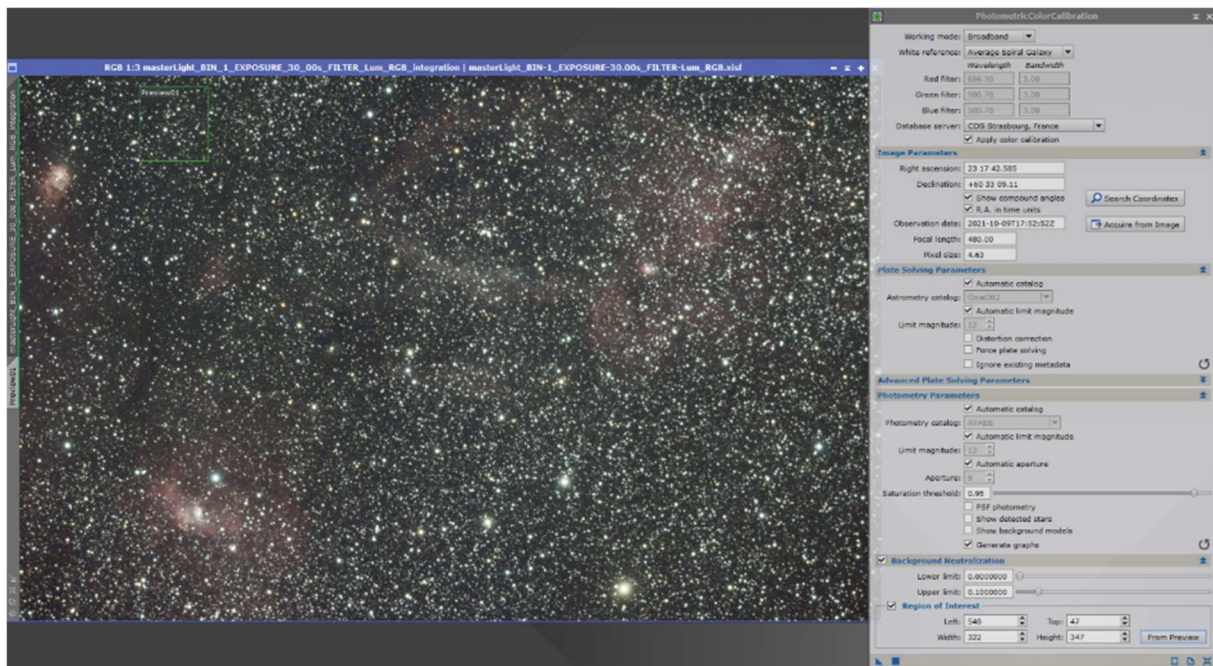


Note: After each operation, click the atomic sign in the ScreenTransferFunction to "recalibrate" the image for viewing by stretching it automatically.

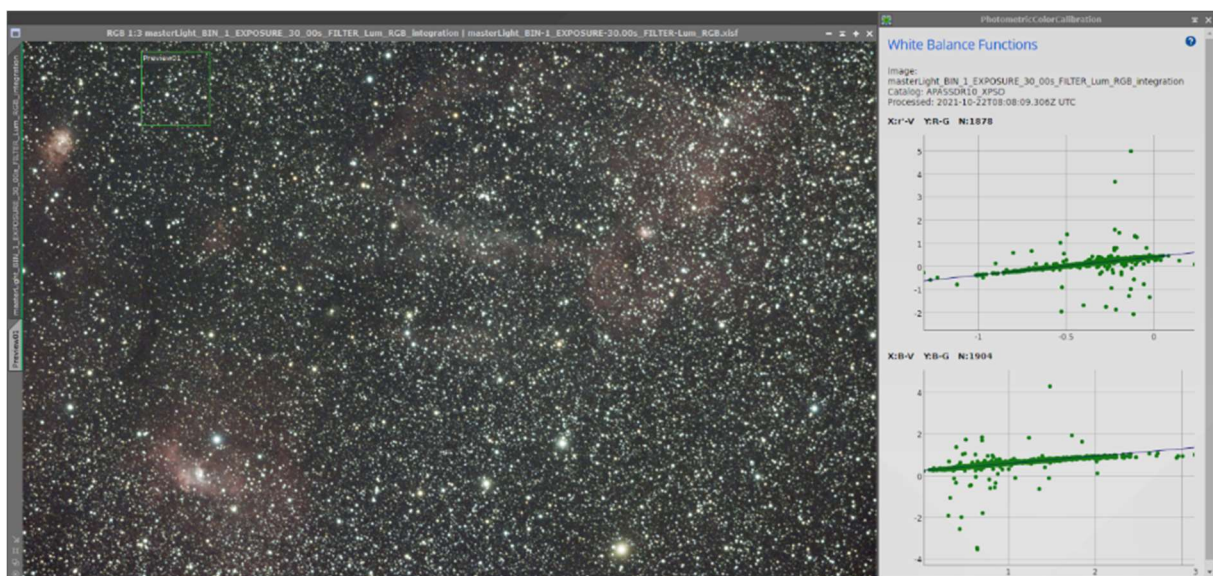
It can also be tried to select a background via a preview in order to influence the 'Background Neutralization' somewhat. Here it has to be tested what gives the better result.

To select a preview window, click on this icon at the top of the menu bar and select a background area.





Result:



The next step deals with the denoising of the image. During denoising, the image is 'softened' somewhat. However, since this should only be done for the background and not for the stars, the stars must be excluded from this process via a mask.

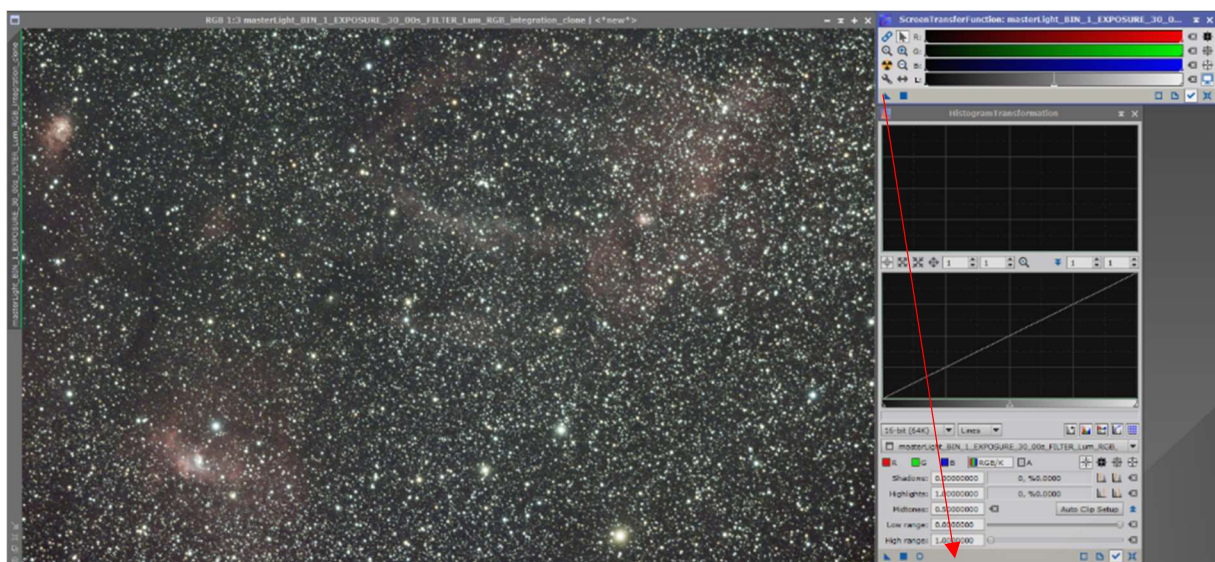
To create a star mask, the image is cloned by dragging the image tab with the label onto the workspace.



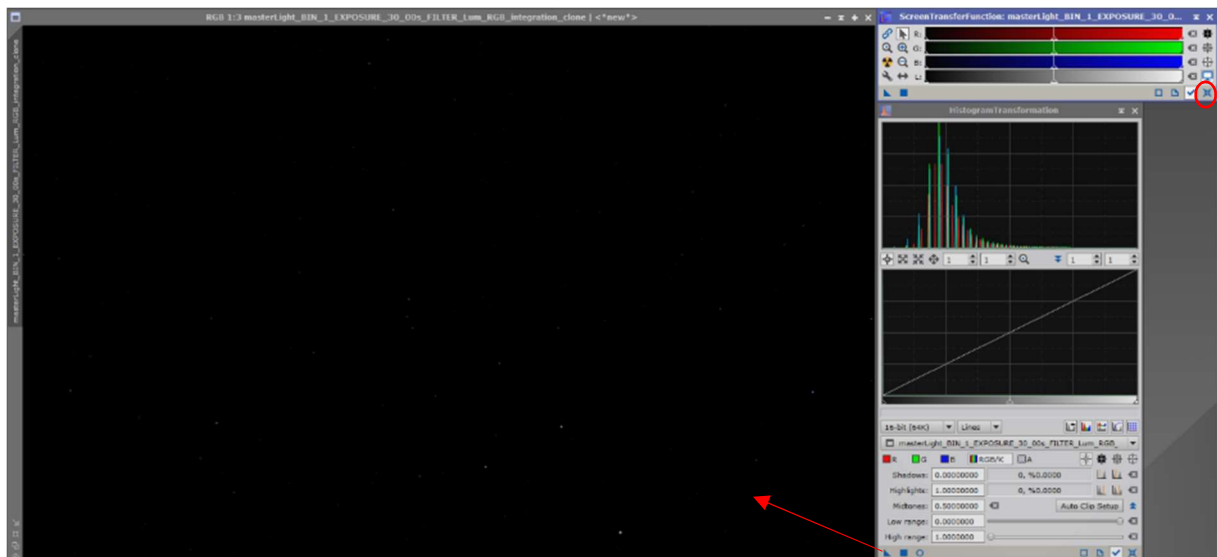
(Make sure that the cloned image is automatically stretched again via the Atom icon).

Masks are only effective if they are stretched. Stretching in preparation for creating the mask of this image can be simplified by transferring the information used for automatic brightening in the 'ScreenTransferFunction' to the histogram curve.

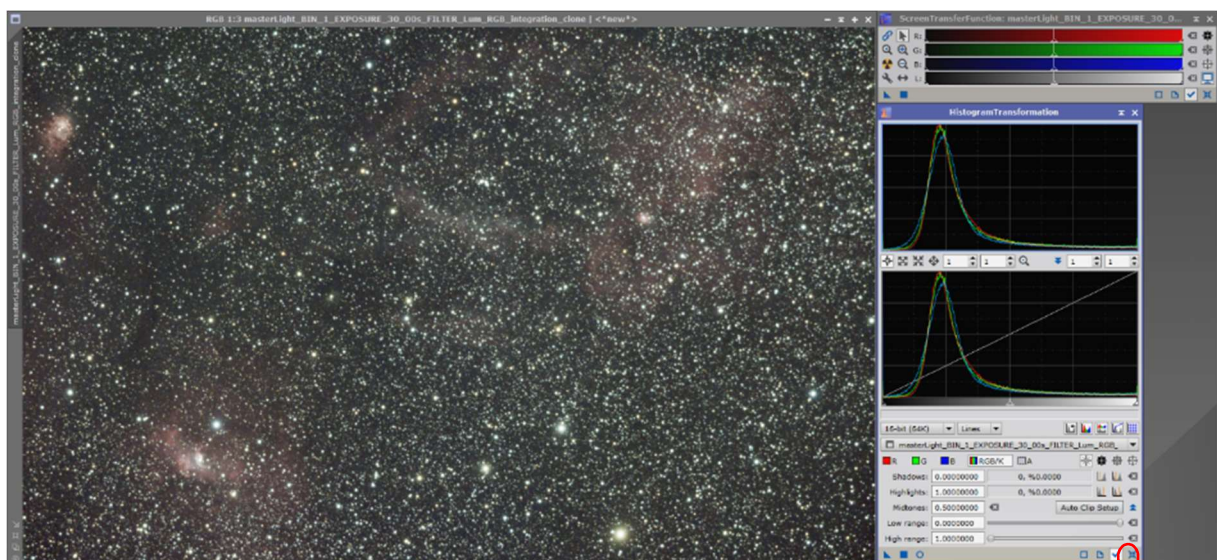
To do this, open 'HistogramTransformation' and select the cloned image in the tab or click on the bottom right after selecting the hook. The blue triangle of the 'ScreenTransferFuntion' is now dragged to the bottom bar of the histogram window.



Now the 'ScreenTransferFuntion' is reset via the small button in the lower right corner of the window to make the view linear again. Then the blue arrow of the histogram is dragged onto the image.



If the histogram image is now reset once again, the typical histogram curve of a stretched image can be seen.



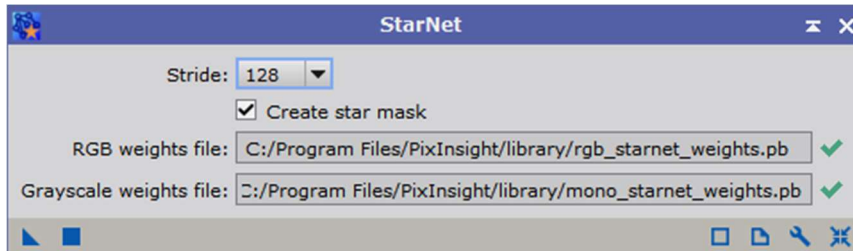
The cloned image is now stretched.

There are two variants for the star mask. which can be selected depending on the sensation and quality of the nebula.

- Variant 1: only the stars in the mask are used
- Variant 2: the stars and the brightest nebulae are used in the mask.

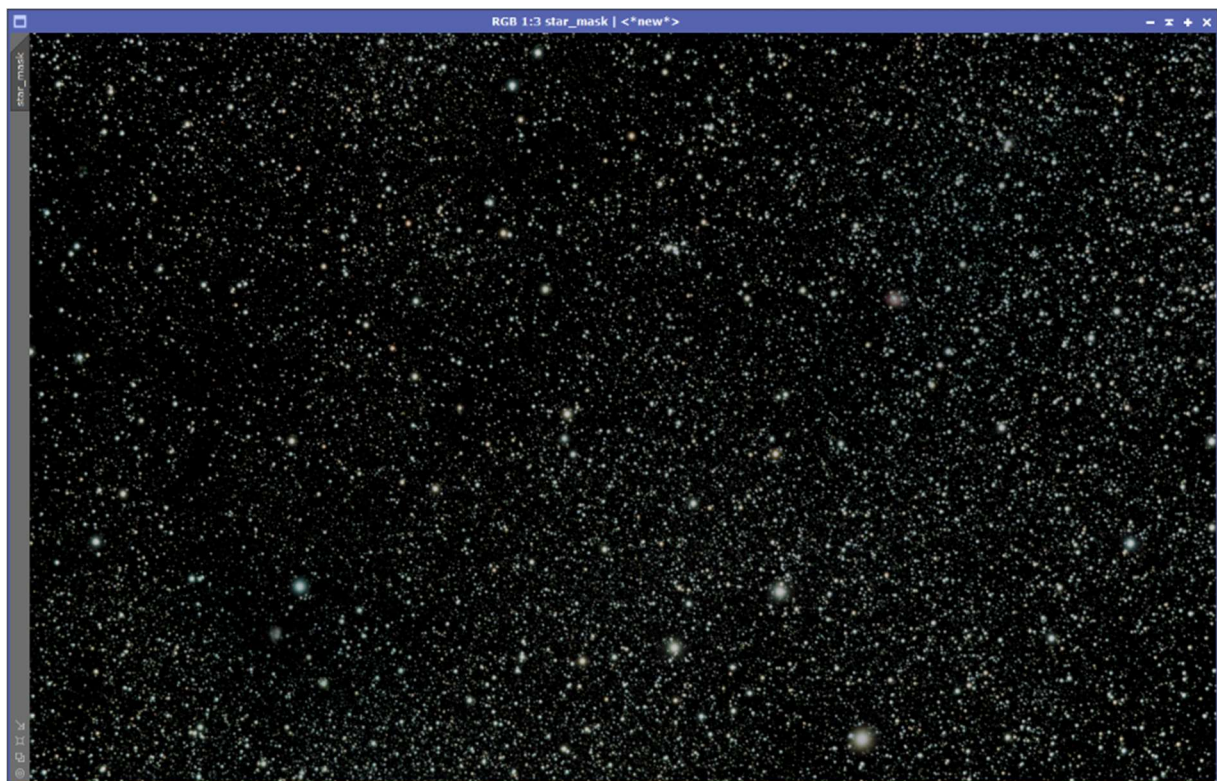
Variant 1 (stars only)

Only the stars are extracted by the 'Process' 'StarNet':



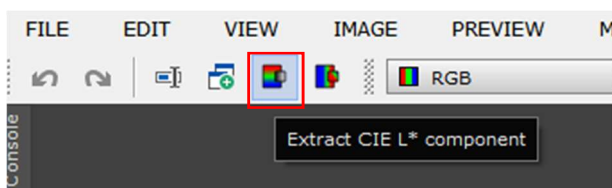
Select the shown files from the folder via Settings (second icon at the bottom right) and **check 'Create star mask'!**

The following constellation is created:

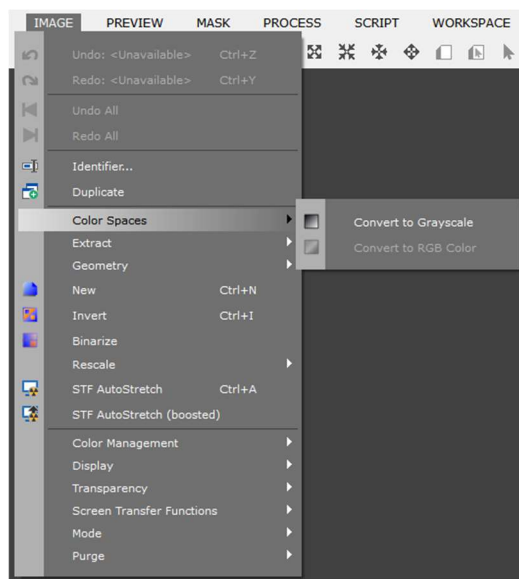


Then the brightness information is extracted from the image, since no color information is needed to create the star mask. It is only interesting where the stars are located.

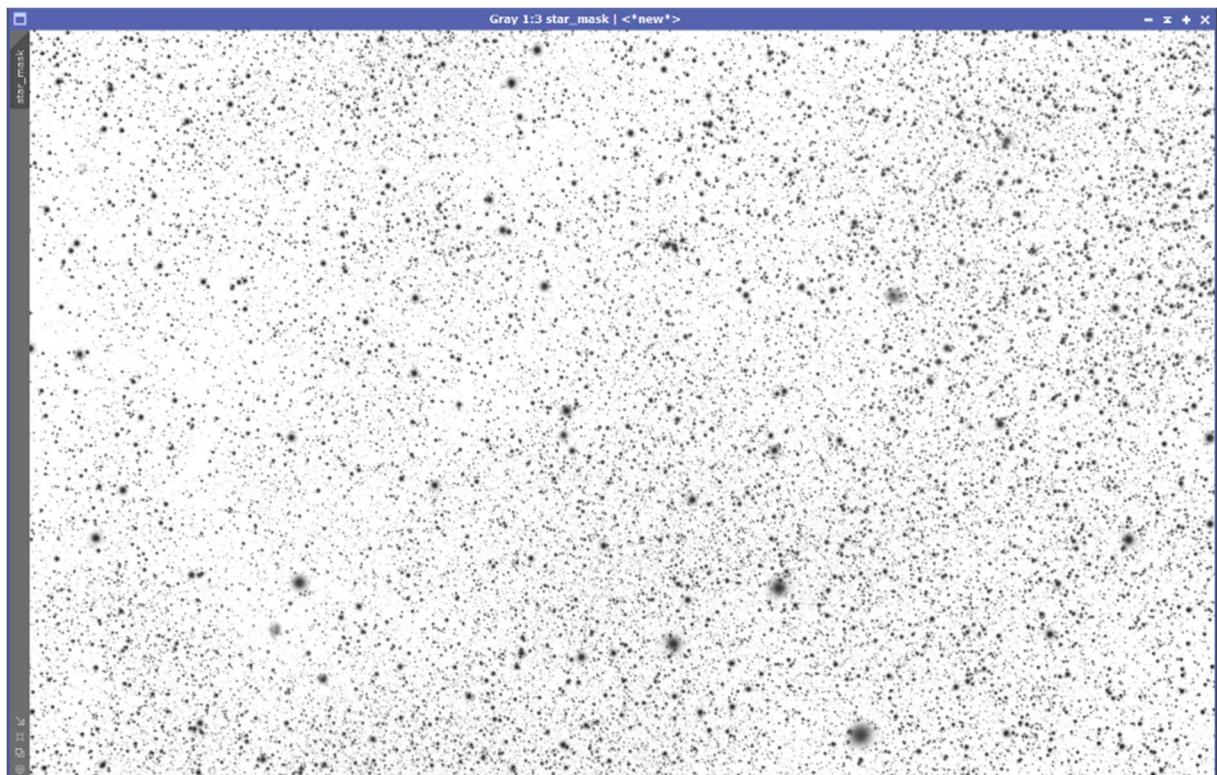
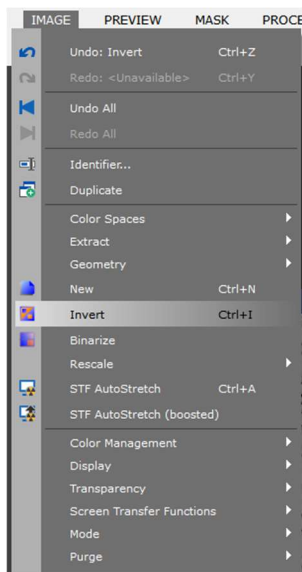
Click on this icon to do so:



Or use 'Image' 'Color Spaces' to convert the image to a gray image.

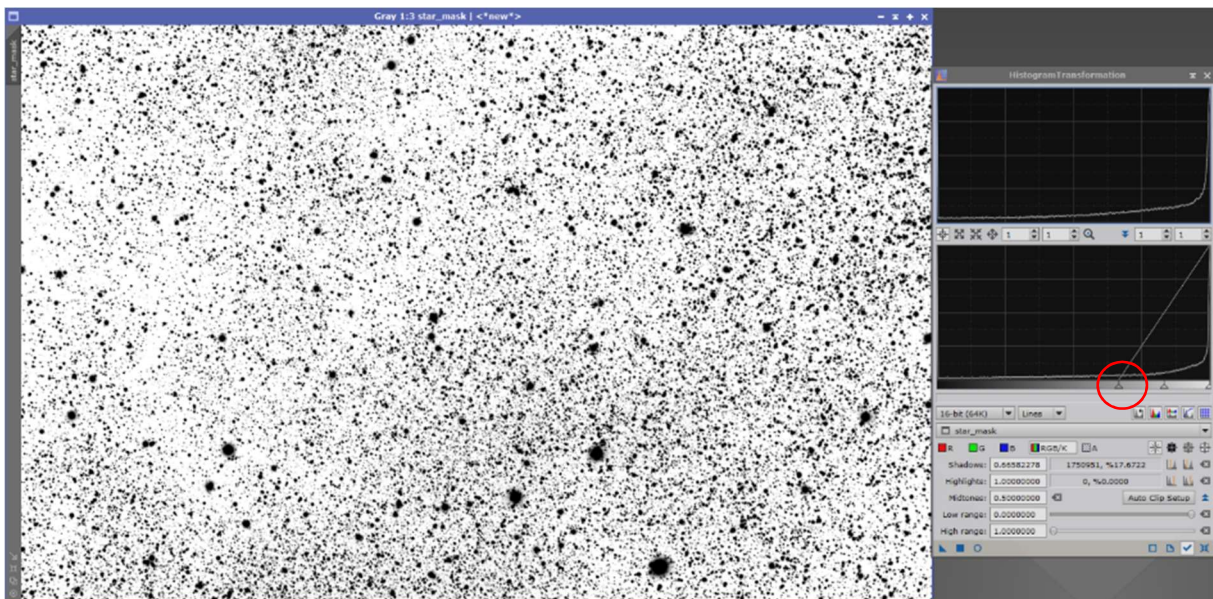


Then the image is inverted via 'Image' - 'Invert'.

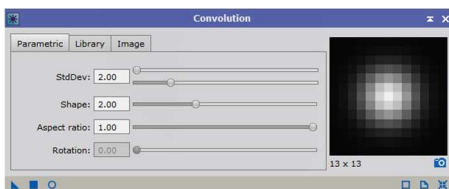


Everything that is white allows editing in the mask, everything that is black blocks editing. To better define black and white, the grays are also blackened.

For this, the left histogram slider is moved to the right and the stars get more black values.



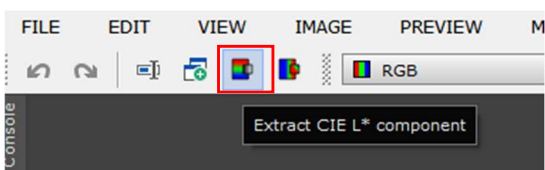
Process 'Convolution' can be used to soften the transitions of the stars to the background.



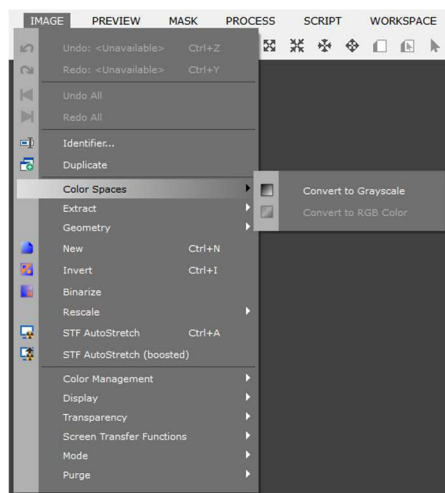
Variant 2 (stars and brightest nebula parts)

The complete stretched image is converted to a black and white image for this purpose.

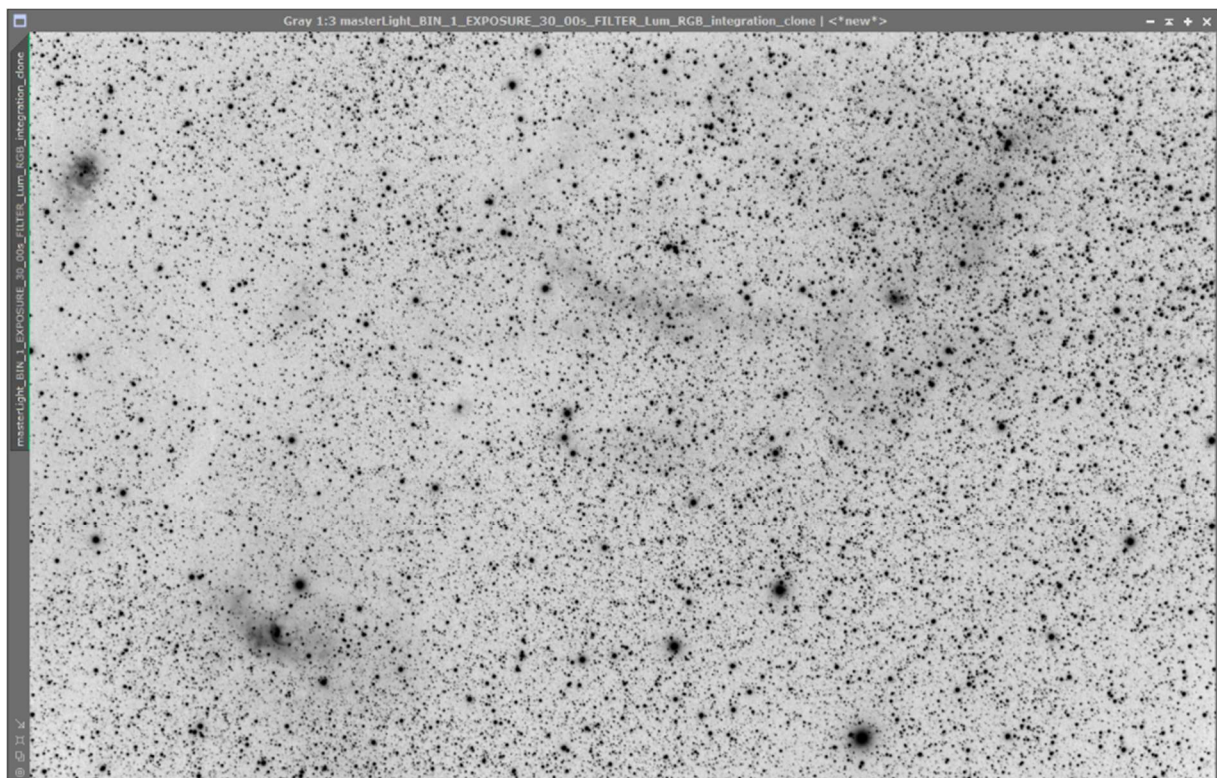
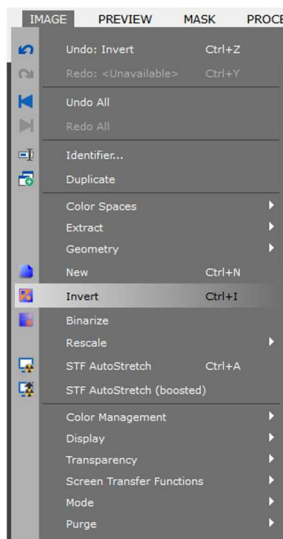
This icon is used again for this purpose:



or use 'Image' - 'Color Spaces' to transform the image into a gray image.

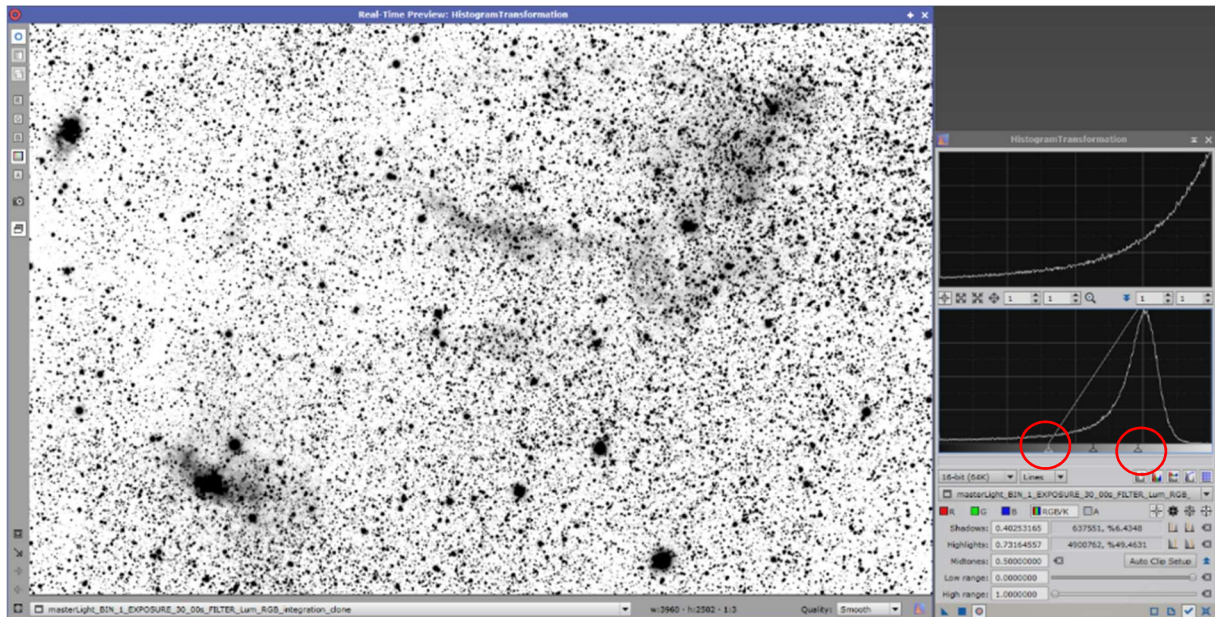


Then the image is inverted via 'Image' - 'Invert'.



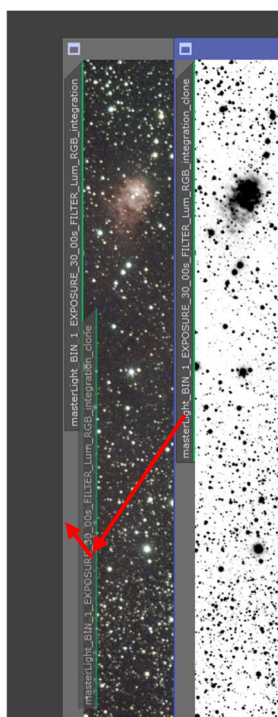
Again, everything that is white allows editing with the mask, everything that is black blocks editing. To better define black and white, the grays are extracted from the image.

This time the right histogram slider is also moved (the left one towards the center, the right one to the left until behind the maximum).



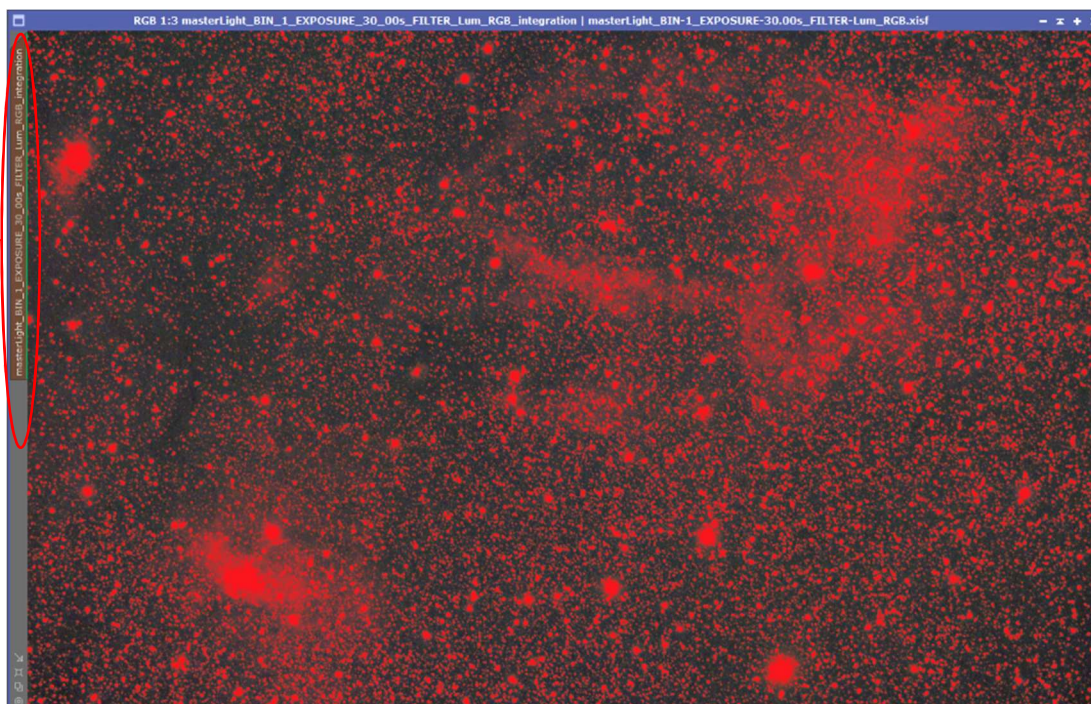
After deciding on an editing variant, the star masks can be applied.

To make the mask effective, move the name tab of the mask under the tab of the image.

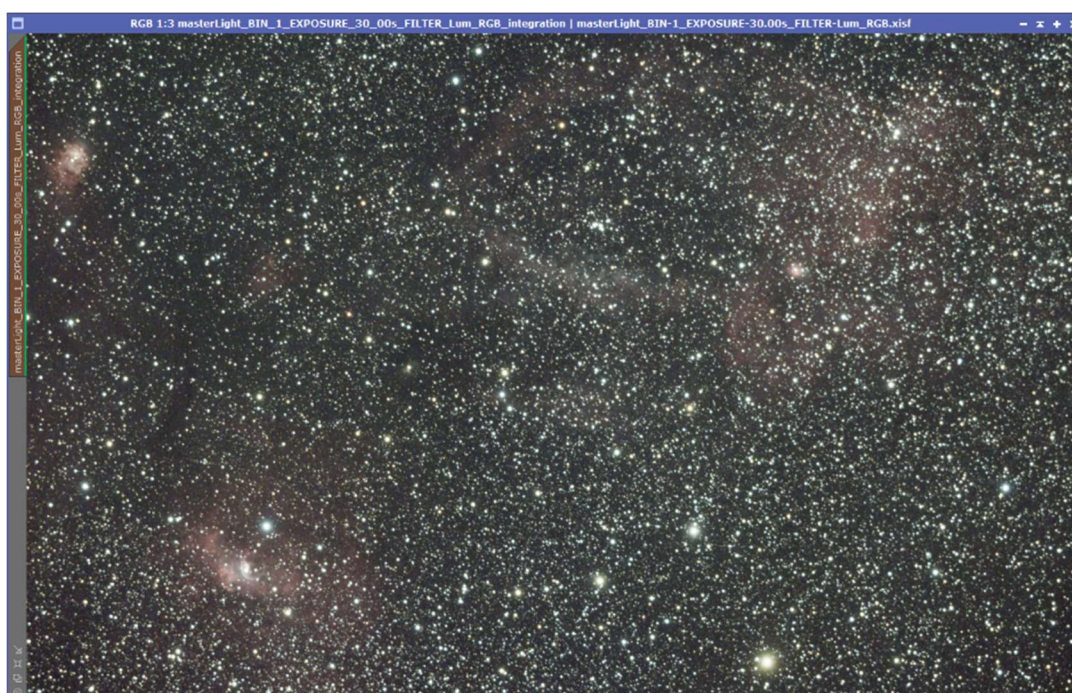
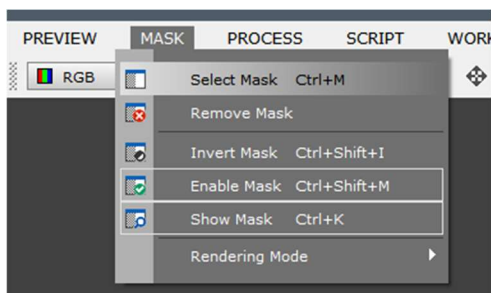


The mask is then reduced (do not close).

The successful masking of the image is evident from the brown name tab.

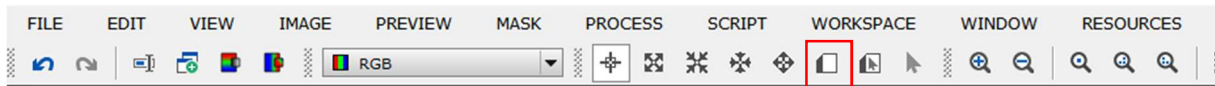


To allow the image to be viewed without a mask, 'Show Mask' is deactivated in the 'Mask' menu point (the mask is then still active, but is hidden).

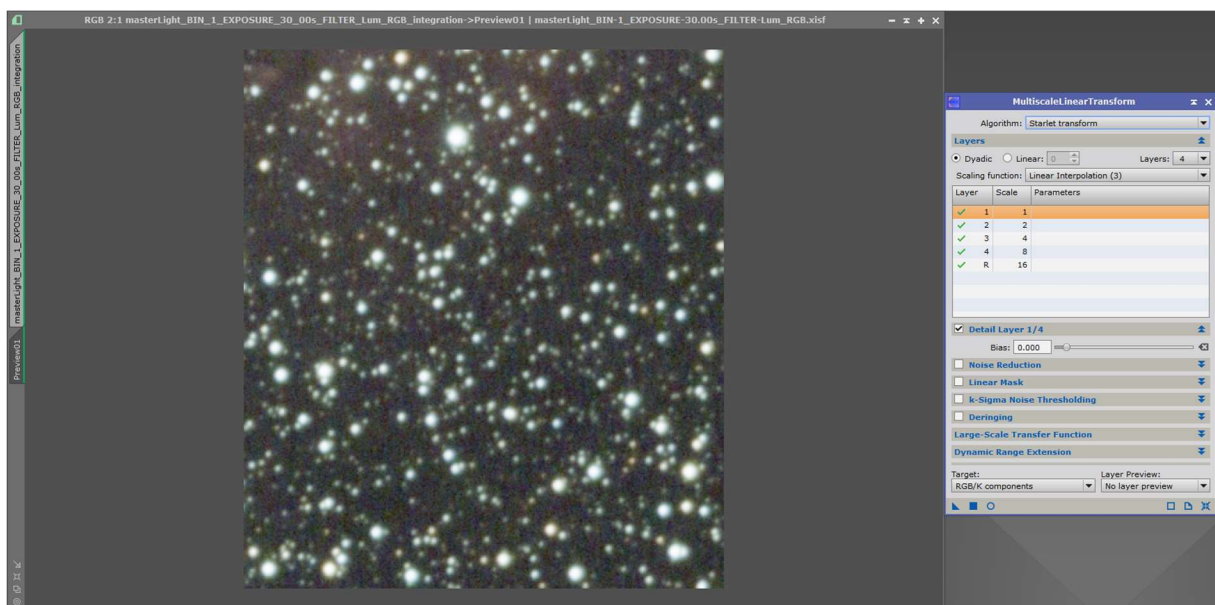


Now that the stars can no longer be influenced, the denoising can begin. For this process the 'Process' 'MultiscaleLinearTransformation' and a small preview of a background section are needed. With the preview the results can be viewed faster, because the calculation is computationally intensive. So the values can also be modified quickly.

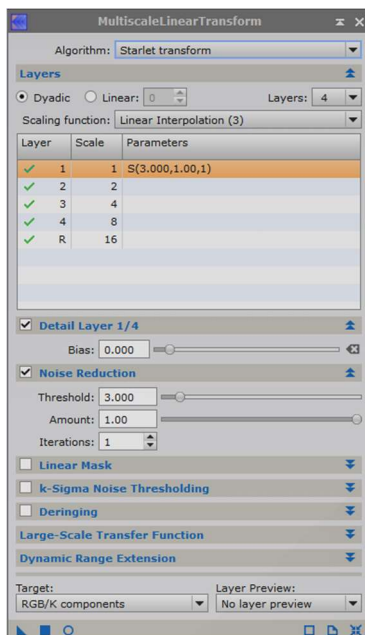
To do this, click this icon at the top of the menu bar and select a background area



Now open the 'MultiscaleLinearTransformation' via 'Process'.

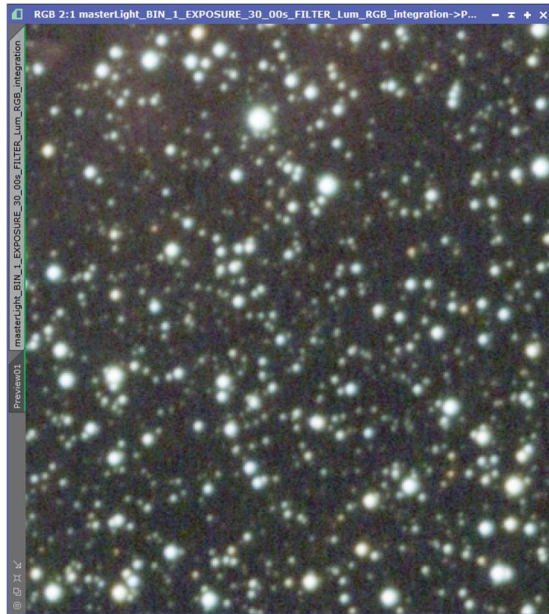


In the 'MultiscaleLinearTransformation' window, check 'Noise reduction' and define a value to test the effects.

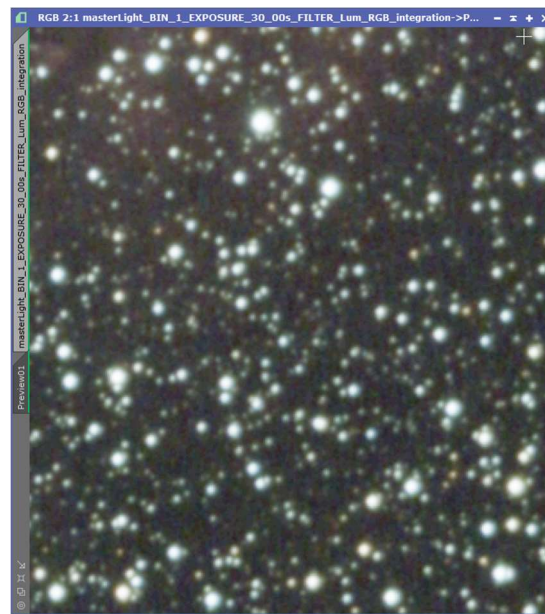


By dragging the blue triangle to the preview, the effect for the first layer can be viewed.

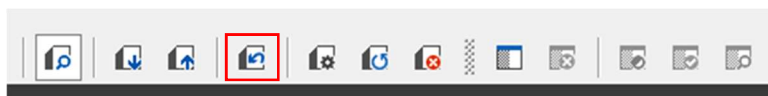
Before:



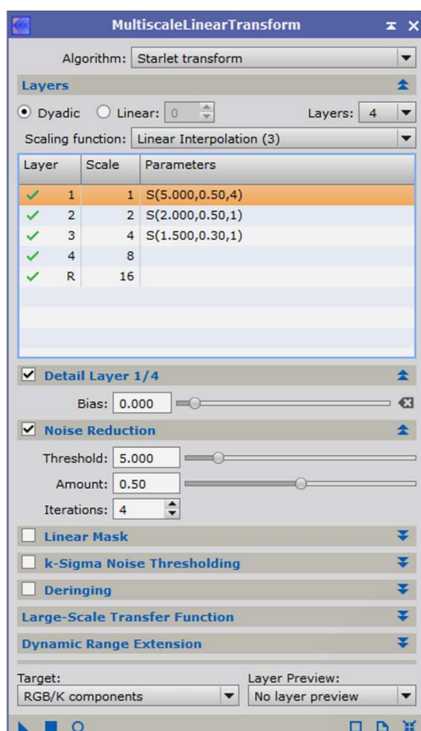
After:



The 'Back arrow' in the menu bar can be used to undo the result in the preview and reactivate it to quickly compare the result.



Mostly only the first three to four layers in the astro images are affected by noise. The higher the layer number, the stronger the influence of the entered parameters. In this example, the first three layers receive the following parameters, with which satisfactory results were obtained:



Before:



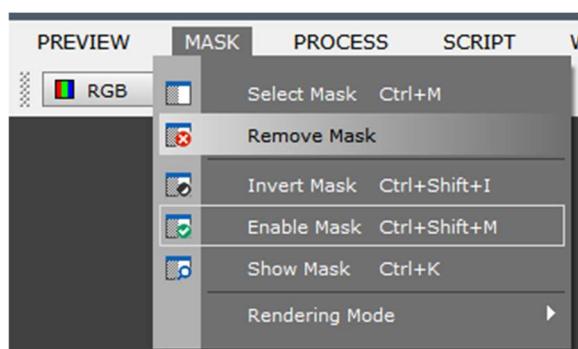
After:



The values can now be applied to the main image and the preview removed.



The mask is then deleted again.



The next step involves stretching.

Color information is lost during stretching. Therefore, before stretching begins, the color saturation is raised.

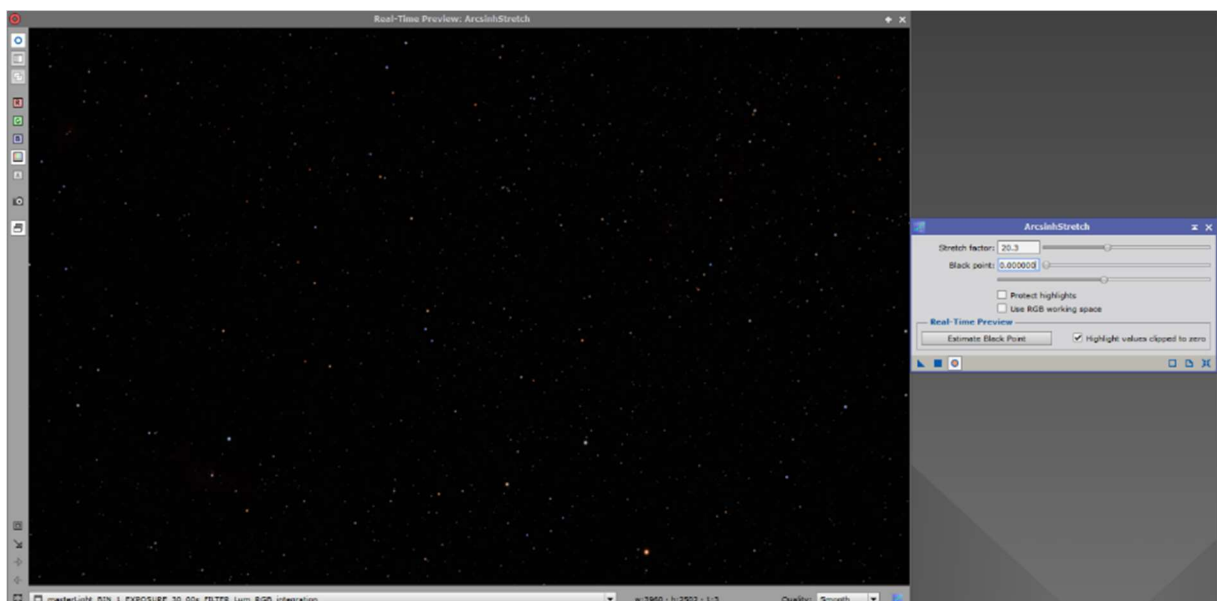
Open 'ColorSaturation', grab the line on the left side with the mouse and move it upwards. The result can be previewed using the preview circle.



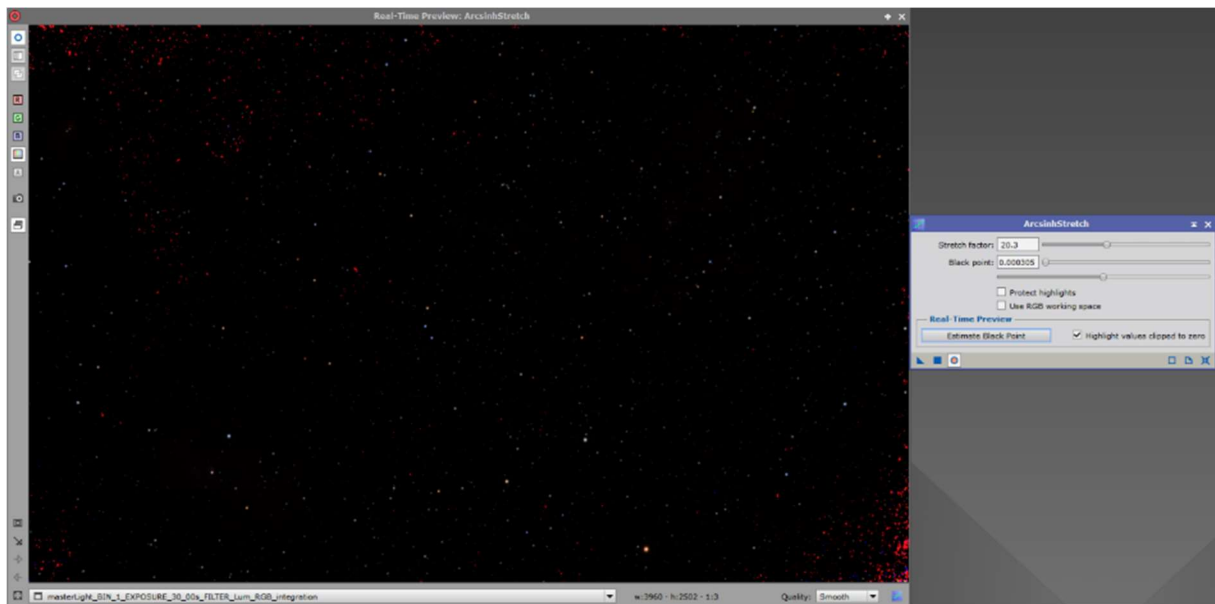
Before the image is stretched as usual via the histogram curves, the 'ArcSinStretch' can also be used for the first part of the stretching. This has the advantage that the star colors are retained almost unaffected for the first slight stretching.

For the 'ArcSinStretch' activate the preview via the circle at the bottom and reset the 'ScreenTransferFuntion' so that an unstretched image is visible.

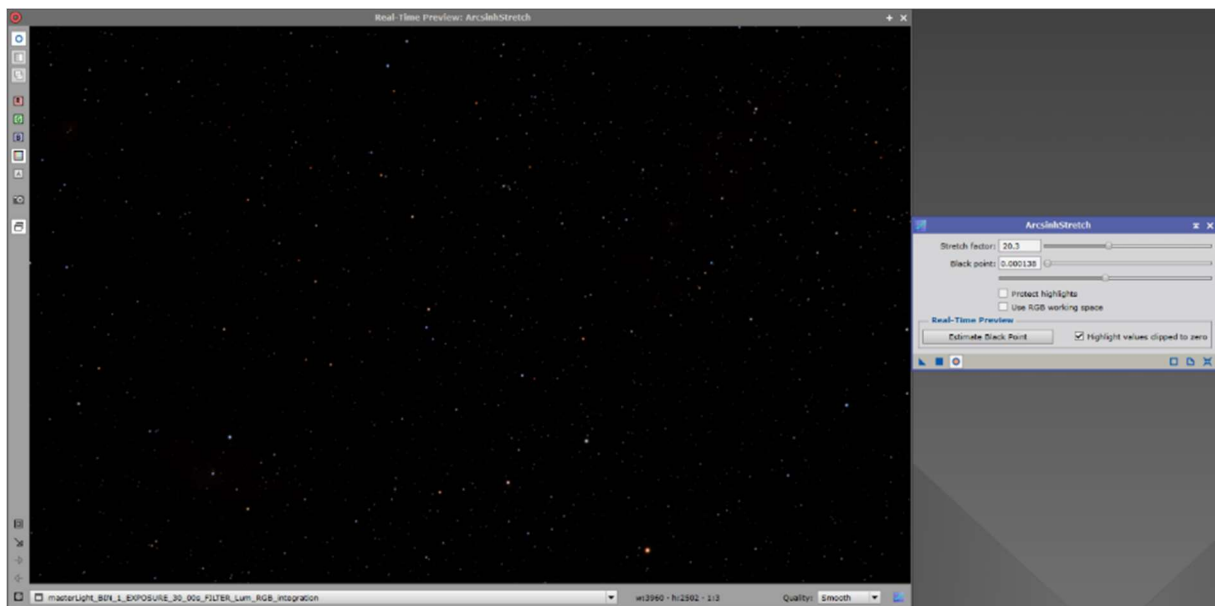
Move the slider so that just the first deepsky objects are detected. Do not move the slider too far, otherwise the star colors will get an unnatural coloring.



Clicking on 'Estimate BlackPoint' still shows the black points that would have an absolute value of 0.

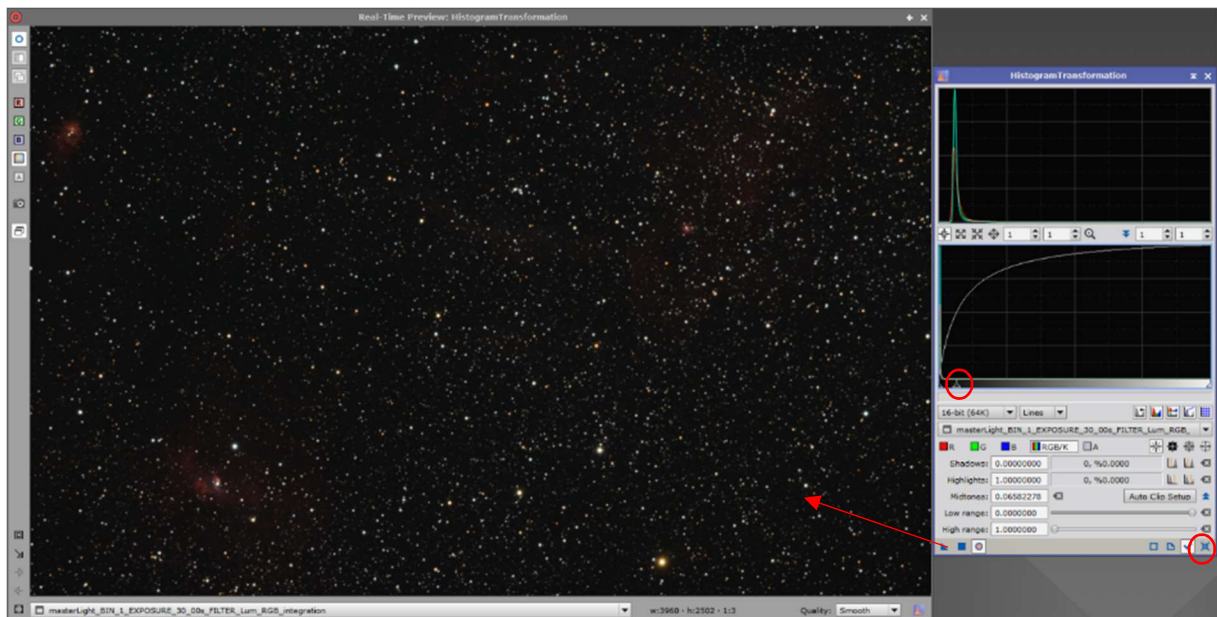


By moving the lowest slider to the left, these black levels can still be corrected.

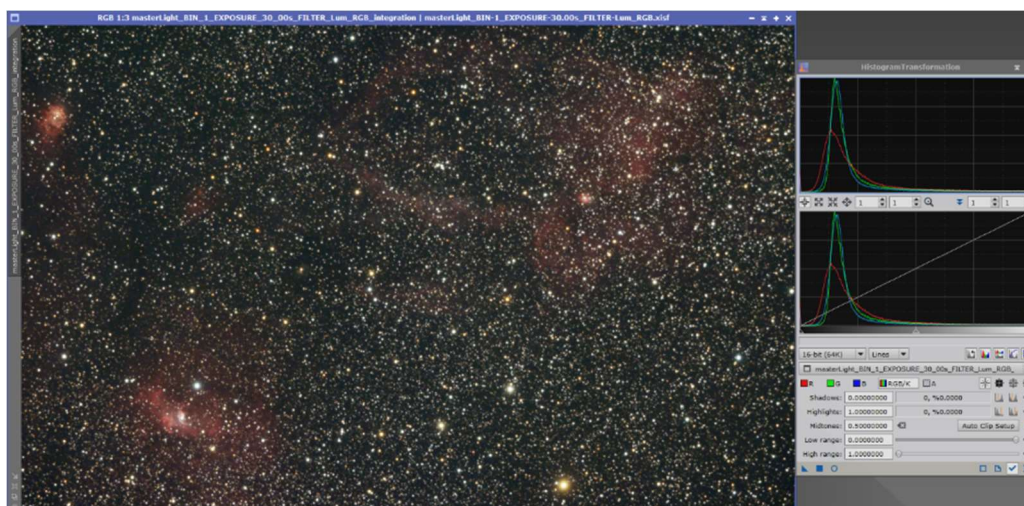


Now apply the 'ArcSinStretch' to the main image by dragging the blue triangle and perform the rest of the stretching process via the histogram.

To do this, keep moving the center slider and later the left slider, and apply the histogram to the image in between via the blue triangle. After each pass, the histogram curve must be reset with the button at the bottom right so that the sliders can be moved again from the starting point.

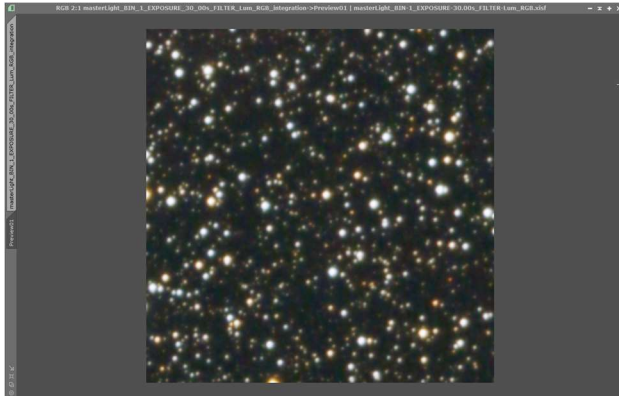


Stretched image:

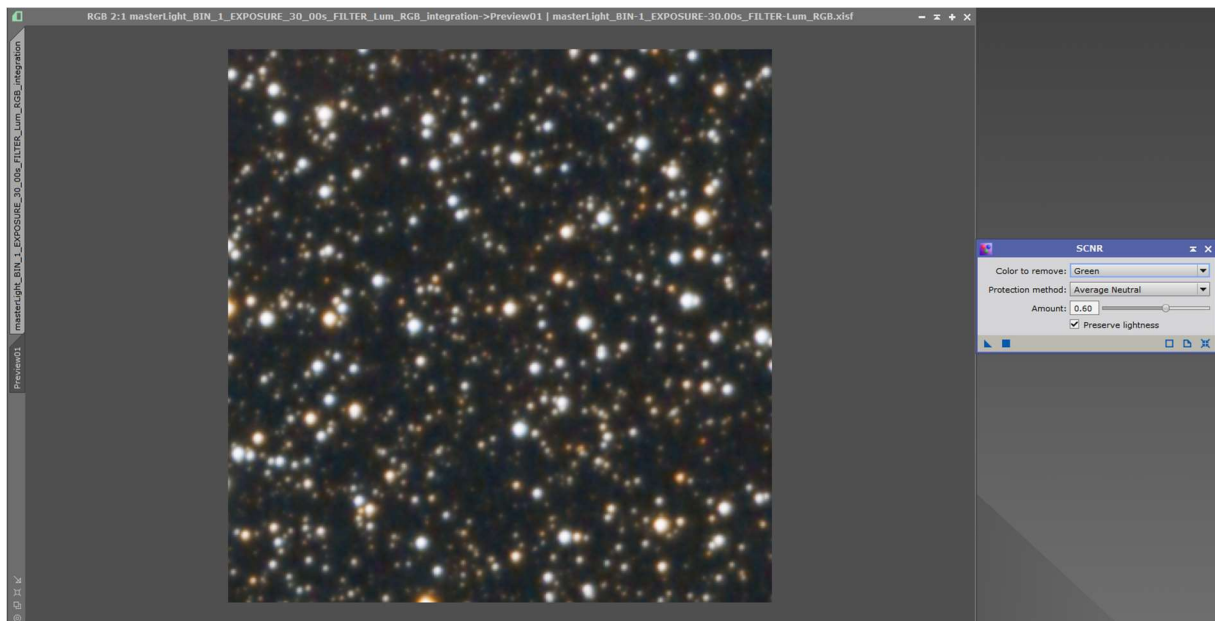


A slight green cast can still be detected with the help of a preview. If this is very intense, the subsequent process can also be applied in one operation before stretching and then again after stretching.

Slight green cast in the image:



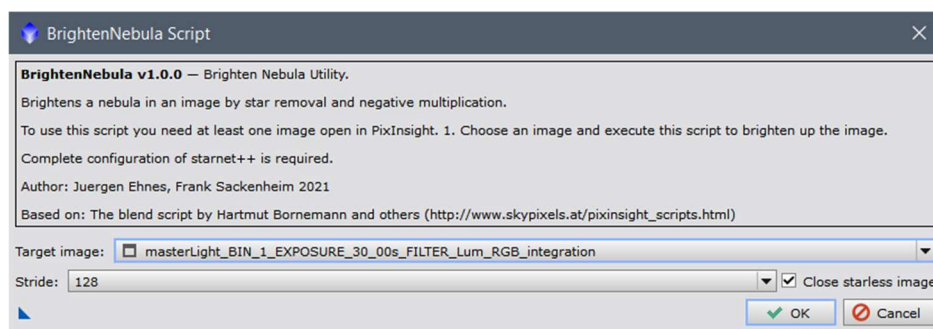
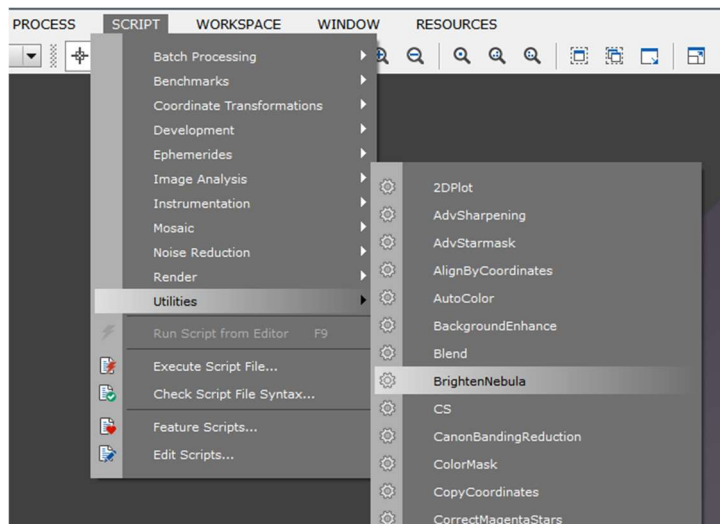
The green cast can be adjusted via the 'Process' 'SCNR'.



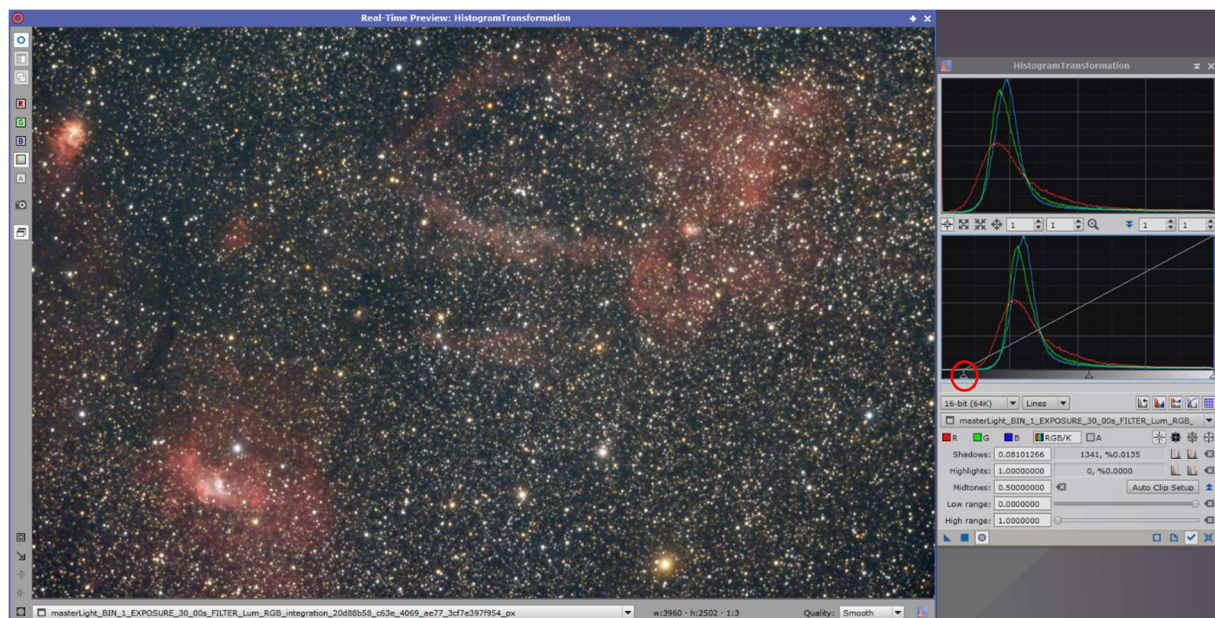
The finished stretched image can now be saved separately for further use in the other instructions.

The next steps deal with the processing of the RGB image for a collection.

To lighten the nebula a bit, select the script 'BrightenNebula' from the scripts and run it through with 'OK'.



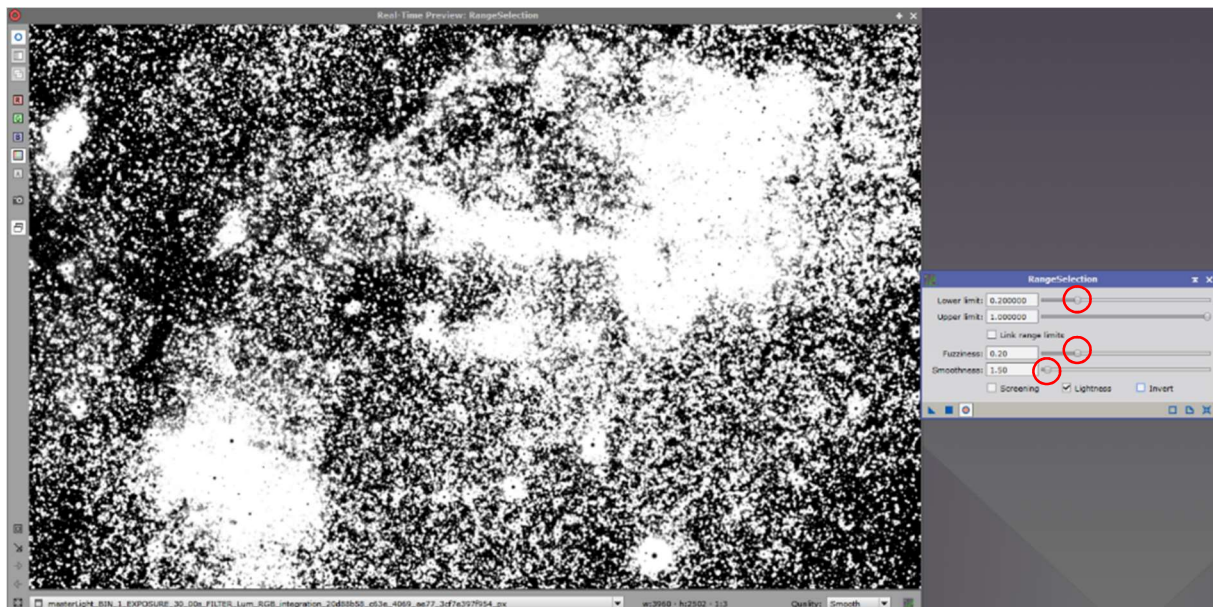
Since the image has become brighter, the black point in the histogram must be redefined.



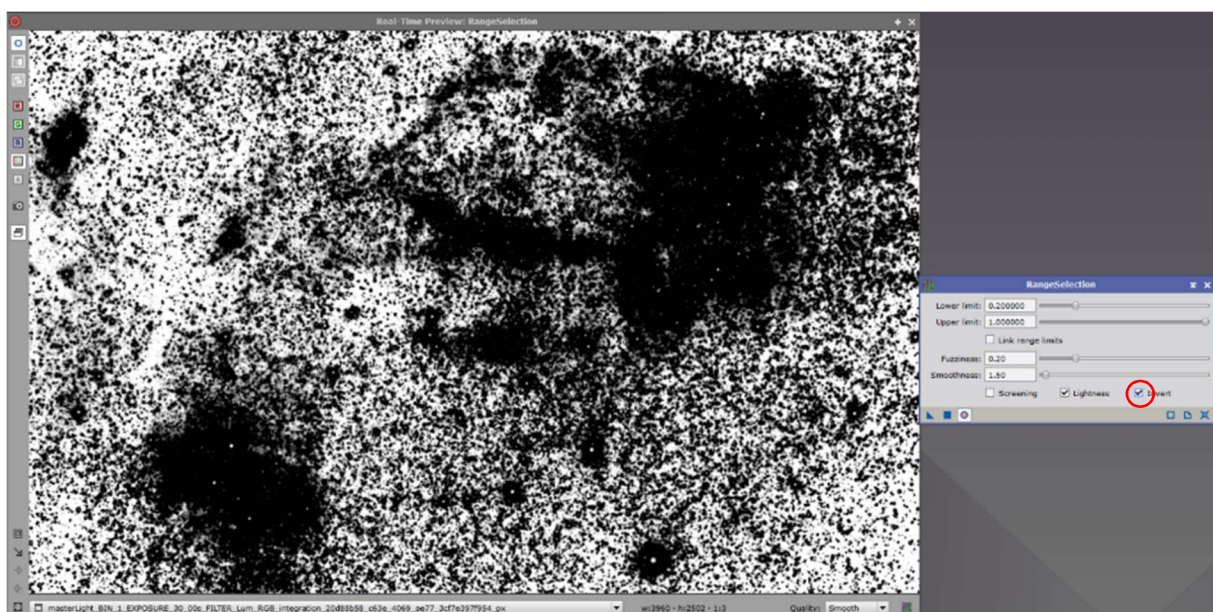
If the color channels still differ too much from each other, the 'Process' 'Background Neutralization' can be used at this point. In this case, however, it is not needed.

The background and the nebula should now be processed separately from each other. The goal is that the background loses a little of its blue cast and the nebula appear a little more intense.

Since this is a stretched image, a 'RangeSelection' must now be performed. Here you can use the sliders to separate the background from the object and create a mask. By inverting the mask several times, either the background or the objects can be edited.



Again, everything that is white allows further processing, everything that is black blocks processing. In this case, the nebula area and the stars can be processed. If the mask is inverted, the background can be edited.



The 'RangeSelection' is now applied to the image. If the mask is to be adjusted a bit more, the 'Process' 'Binarize' helps. The mask consists only of black or white and can be changed via this process, which only knows binary values (0 or 1).



Now apply the mask to the image again by dragging it under the side name tab and coloring the tab brown. Use the menu point 'Mask' to hide the mask, if it is activated.



Since the mask last had a white background and black nebulae and stars, the background is processed first.

Select 'Process' 'CurvesTransformation' for this. With this process the colors and the saturation can be controlled by curves. For this purpose, the image can now be adjusted in the preview (red circle below) by dragging the corresponding curves until a satisfactory result can be seen. This process produces different results depending on the color desired.



Selection of the color curves
or saturation to be processed

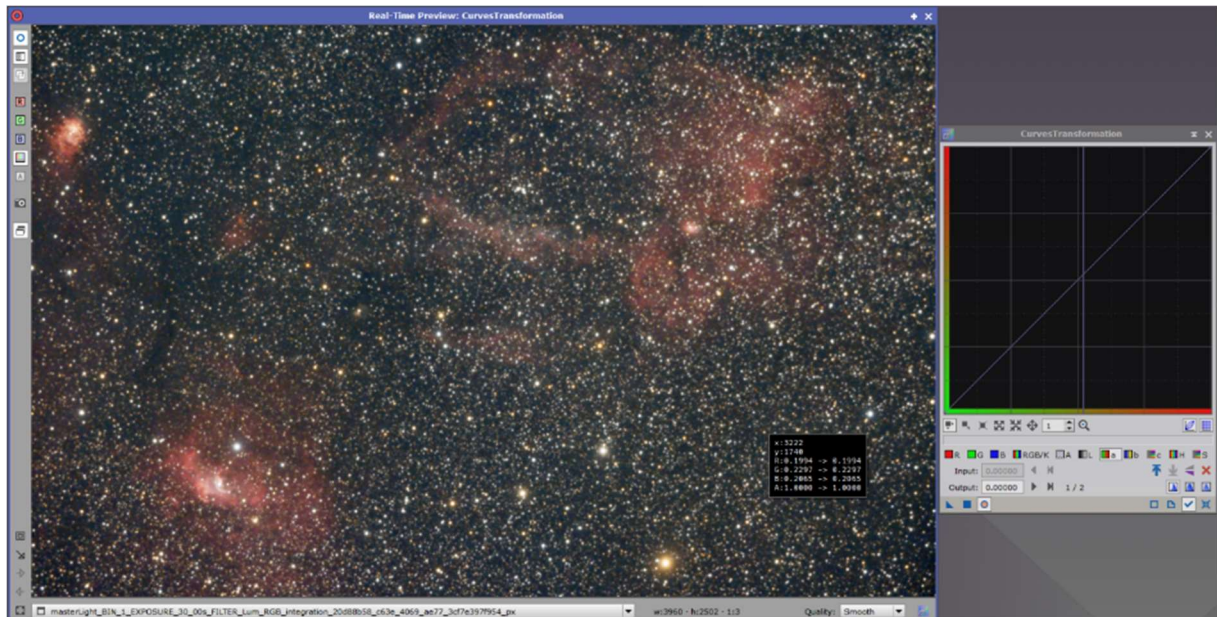
Resetting the current curve

Resetting all curves

One or more points can be set as anchor points. Attached is an exaggerated picture:



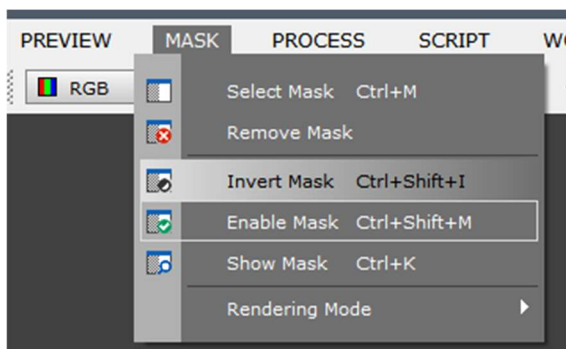
With a long mouse click of the left button on the preview image (or the original image), the current color values can be displayed at the location of the mouse pointer.



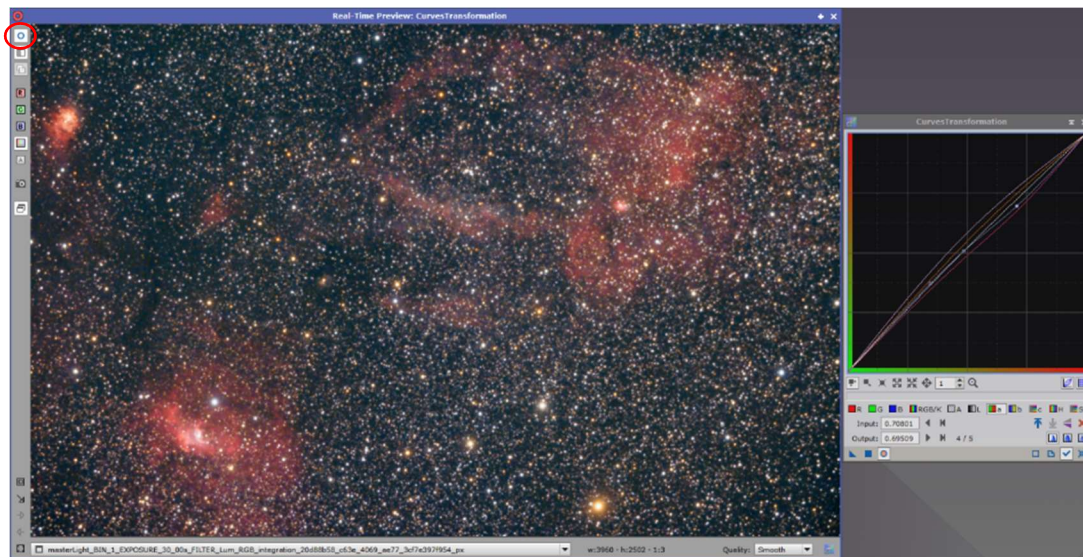
For the background in this case, the green channel and the red-green area were slightly adjusted.



Now the mask can be inverted to activate the nebulae and stars (and no longer the background) for processing.



First, the saturation is raised slightly, and the various color channels are adjusted.



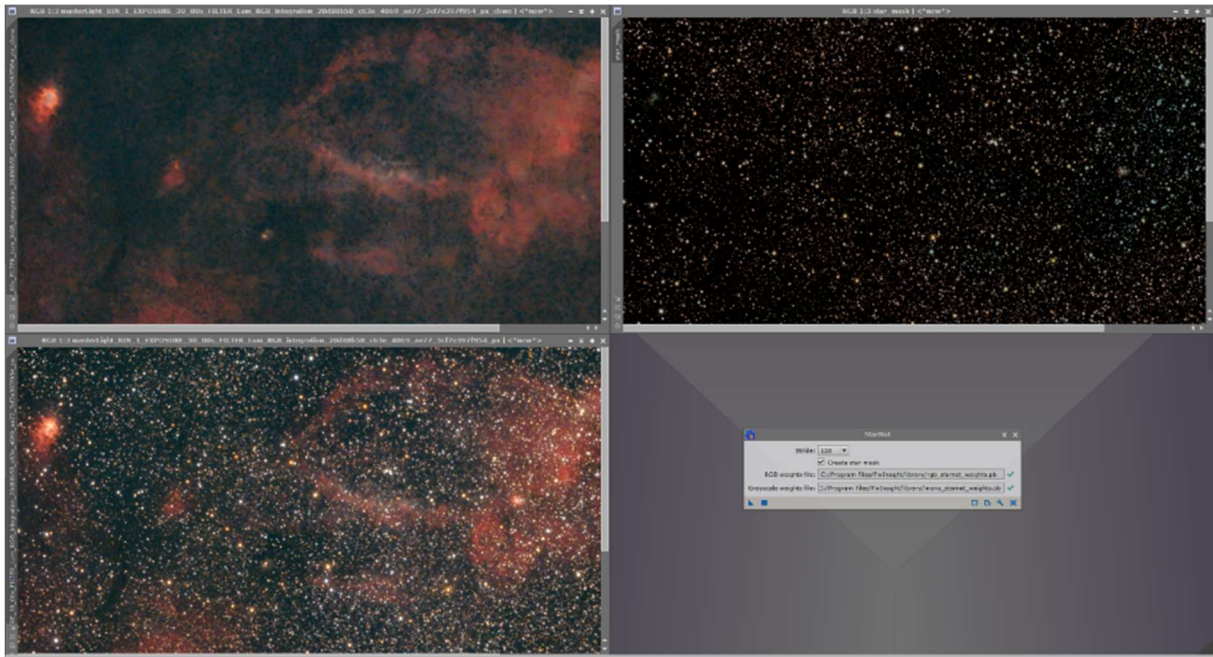
Use the circle in the upper left corner of the preview to switch between the before and after result.

Then adjust the blue and red tones a bit and deactivate the mask.



In the next step, the stars can be made a little smaller so that they look a little more discreet on the image.

To do this, **clone the image** and then, as above, run the 'StarNet' process and create a star mask:



The pure nebula image can be closed. The constellation is converted back into a gray image.

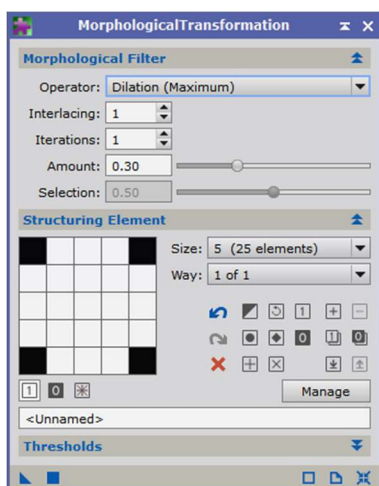


In order to be able to process the stars in the image really well later, the stars in the mask should be a little larger than in the original image.

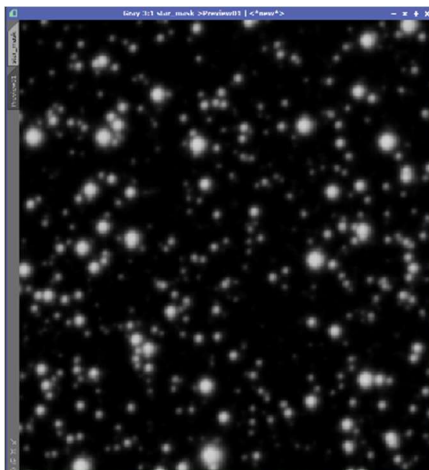
To do this, open the 'Process' 'MorphologicalTransformation' and select the operator 'Dilation (Maximum)'.



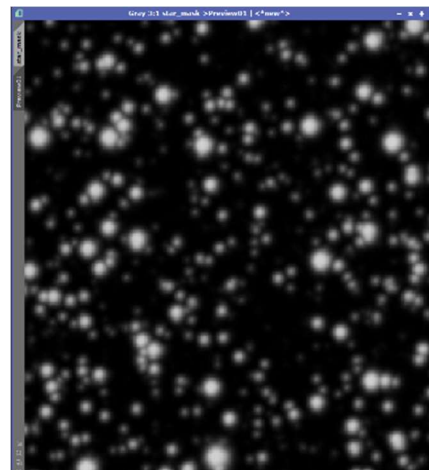
Now adjust the lower values via a preview so that the stars are very slightly magnified. For the small focal length and relatively large pixels of the camera, the following settings give quite decent results:



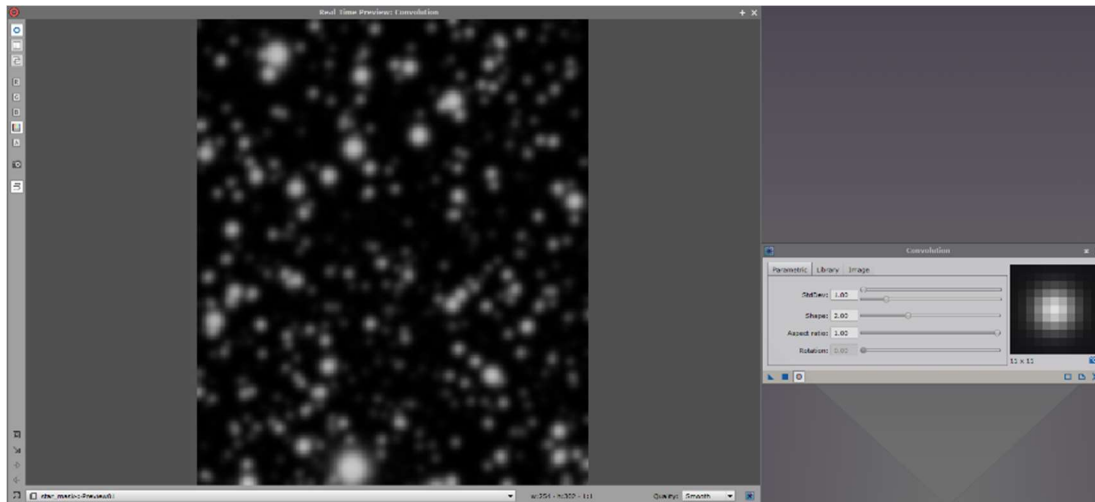
Before:



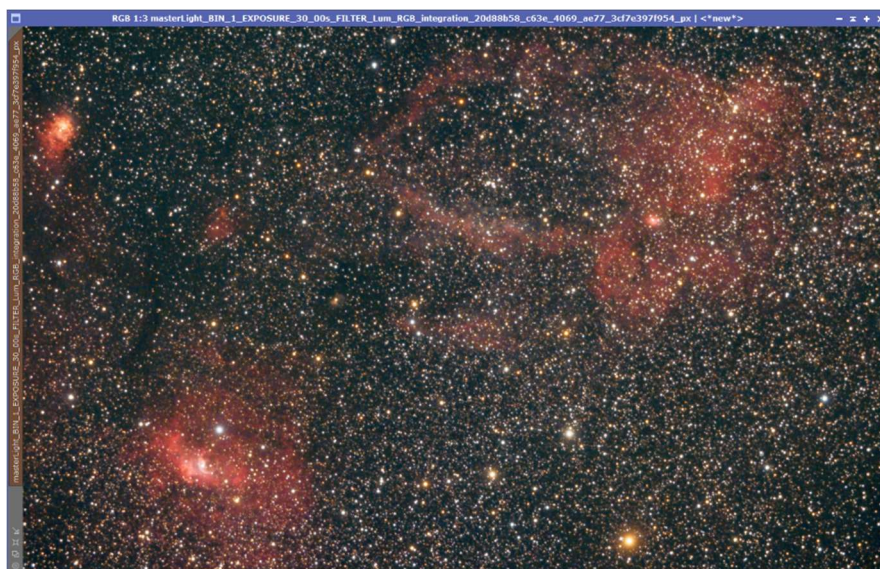
After:



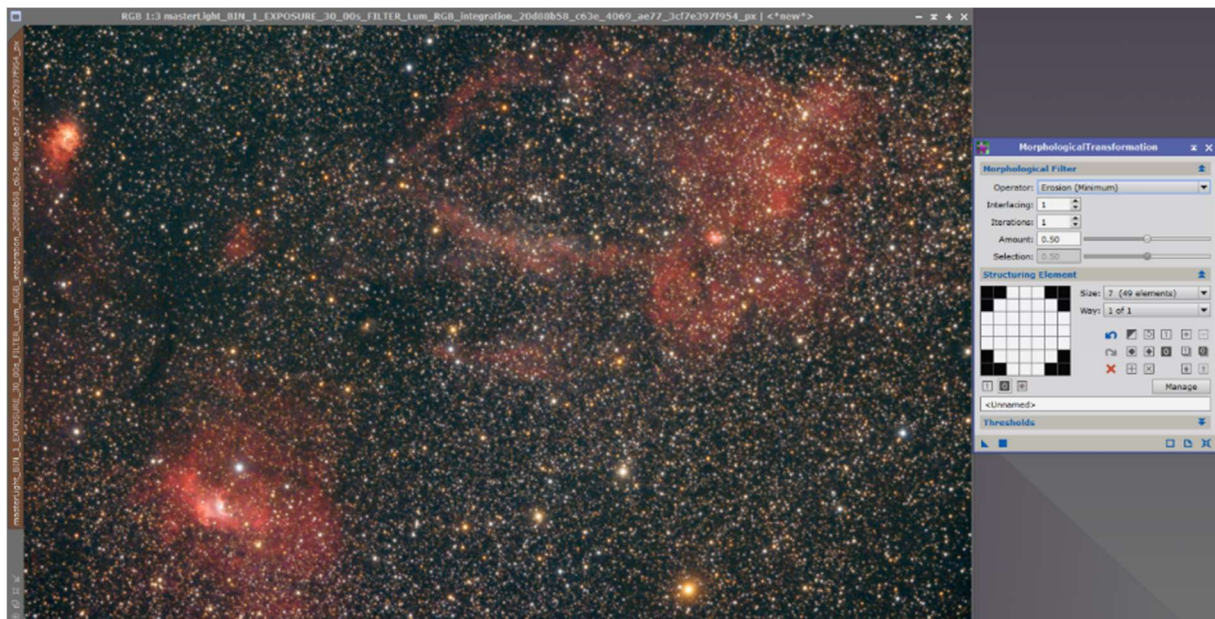
With the 'Process' 'Convolution' the transitions of the stars to the black background can be softened a bit.



Now the star mask can be applied to the image.



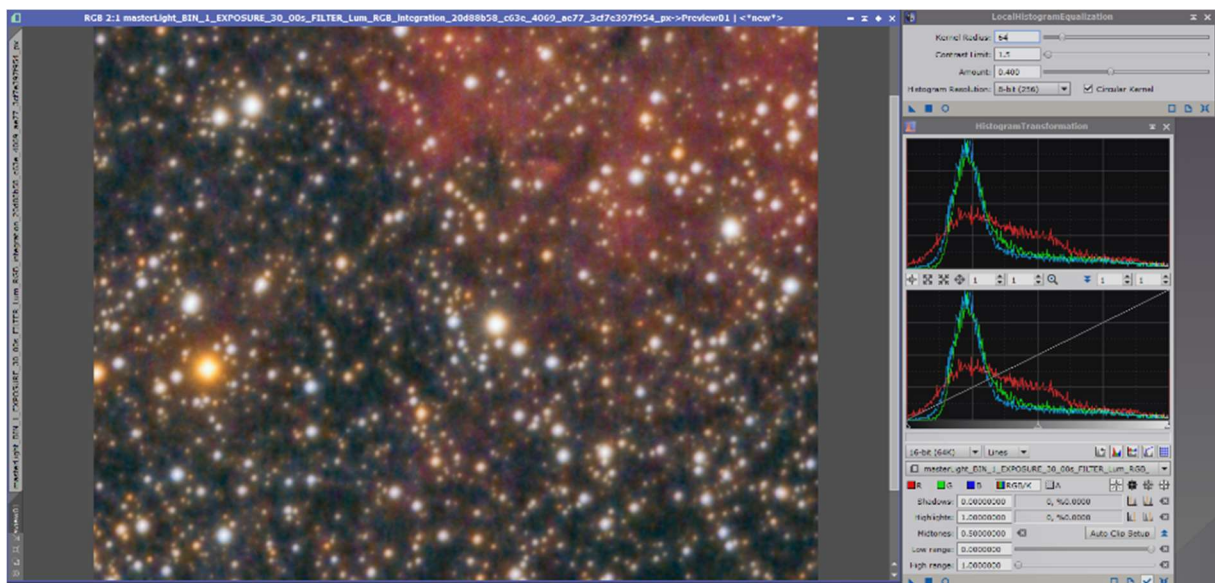
Then the 'Process' 'MorphologicalTransformation' is called again, but this time with the operator 'Erosion (Minimum)'. The values should now be applied so that the stars look a little more discreet.



The star mask is deactivated again, but not yet deleted from the workspace, in case it is needed again.

Next, the histogram curves can be adjusted with the 'Process' 'LocalHistogramEqualization' to increase the contrast. This is again tested on a preview and then applied to the image.

The following are the values appropriate for this image.



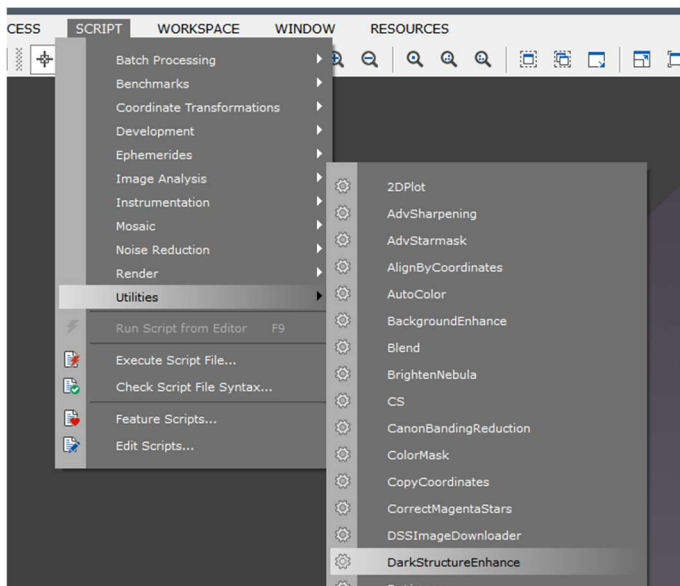
Before the 'Process' 'LocalHistogramEqualization':

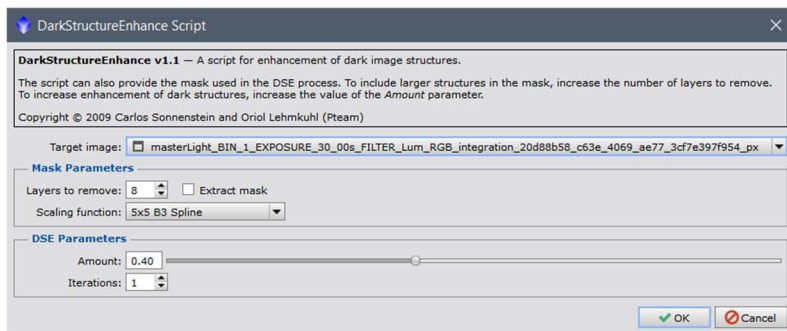


After the 'Process' 'LocalHistogramEqualization':



To make small dark areas appear a bit stronger, the script 'DarkStructureEnhance' is executed.





Before:

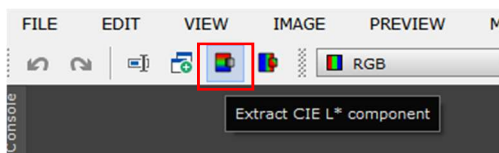


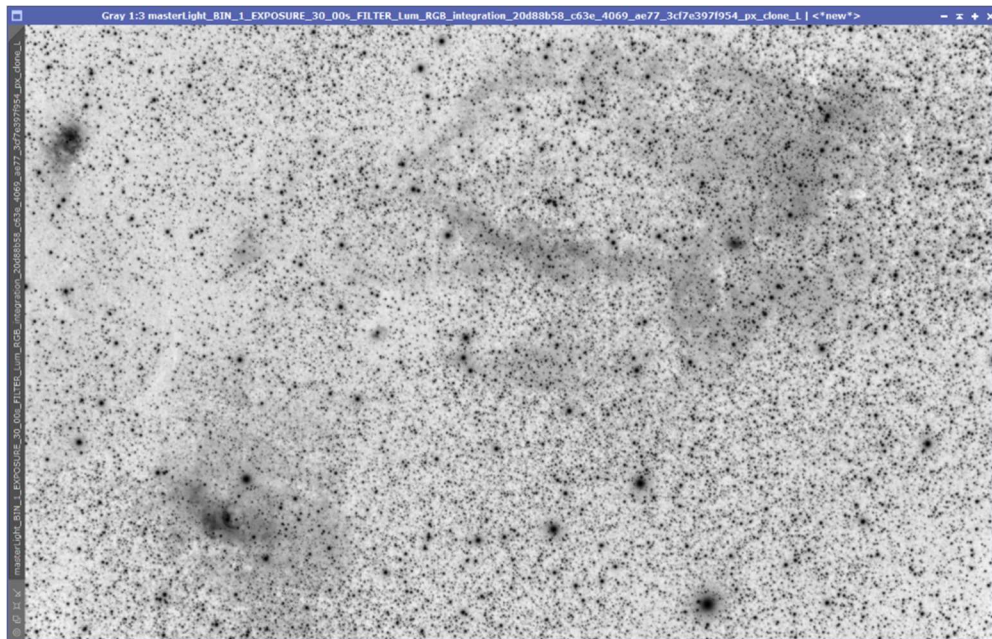
After:



The processing steps have again created artifacts and noise in the image. To soften these somewhat, the 'Process' 'TGVDenoise' is used for non-linear image processing (non-linear, because the image is already stretched). For denoising, a mask (in this case a luminance mask) is always used, which must be created beforehand as follows.

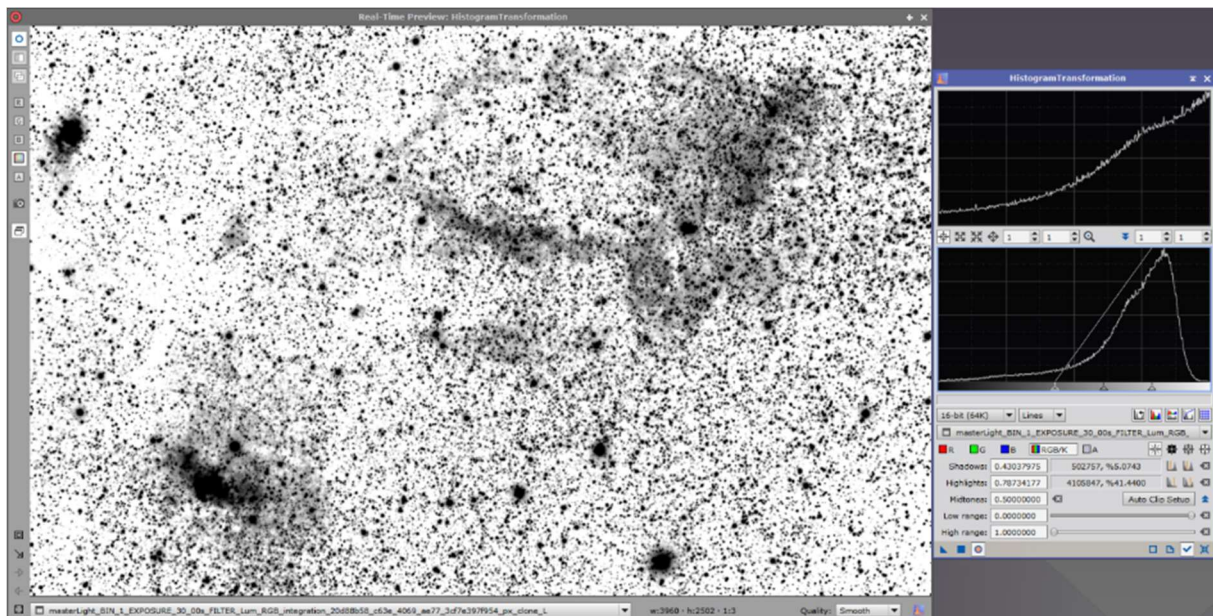
For this it is important to make a clone of the image again and extract the luminance via this icon and then invert it:



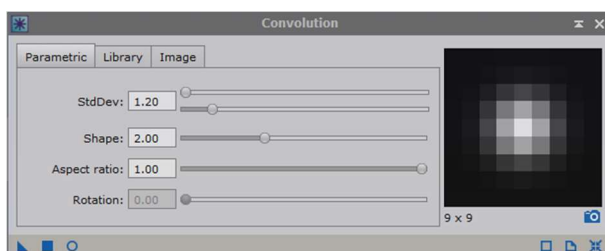


And again: everything that is white allows editing, everything that is black blocks it.

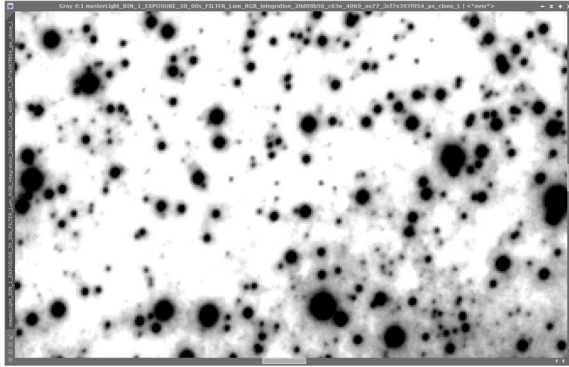
After that, the gray part of the background has to be transformed via the 'HistogramTransformation' so that there is almost only white. To do this, move the left slider to the right and the right slider to the left beyond the maximum mountain.



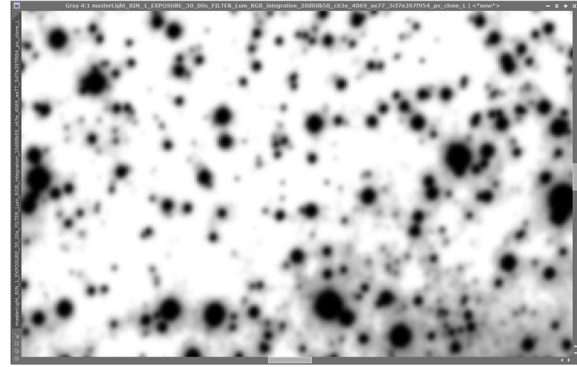
To remove the slight noise from the mask, the 'Process' 'Convolution' is applied.



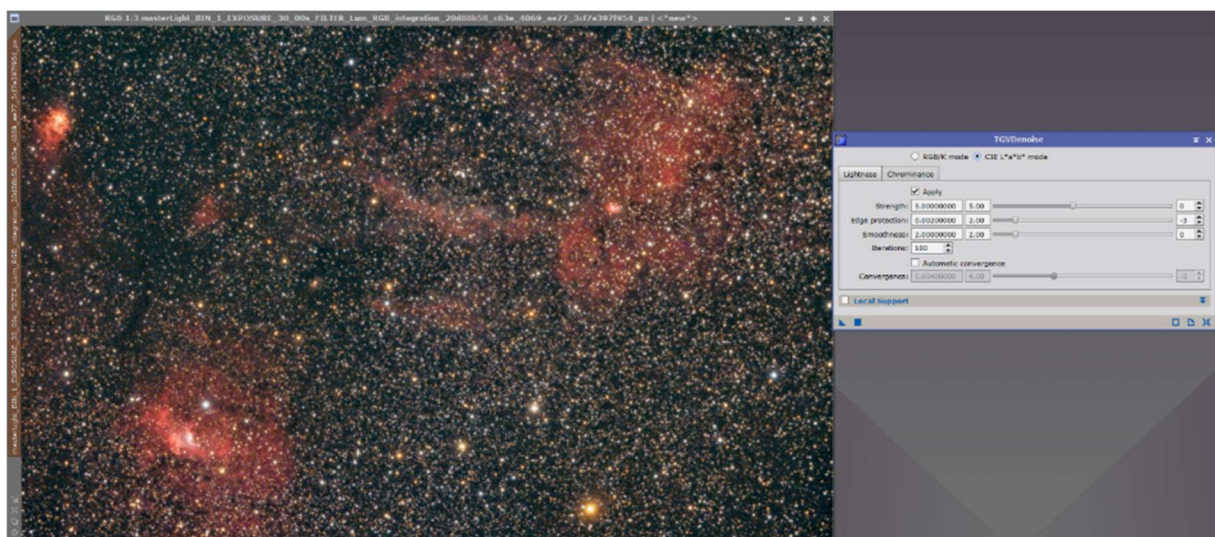
Before:



After:



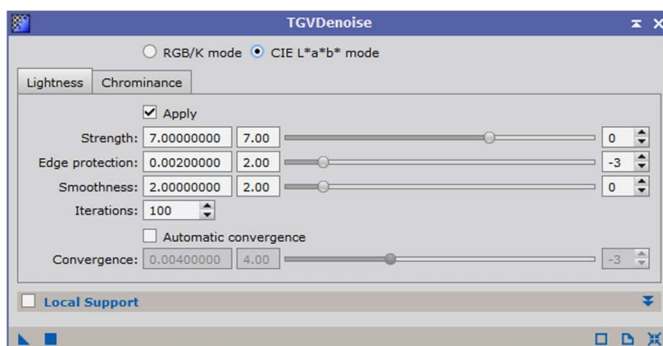
Now apply the mask to the image, start the 'Process' 'TGVDenoise' and change the mode at the top to Luminance and Color to process color and luminance noise.



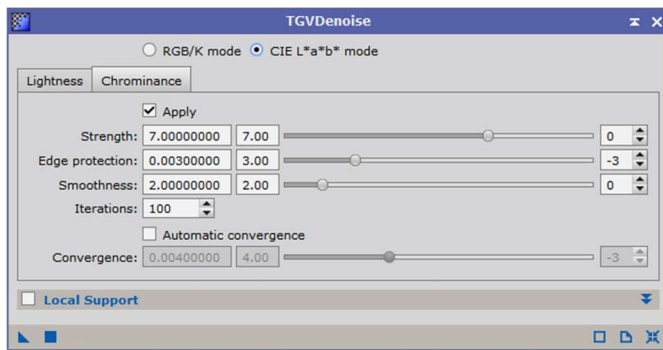
Using a preview, the values are now be adjusted so that the noise disappears but the image does not yet look too artificial.

With these values the result for this image looks satisfactory:

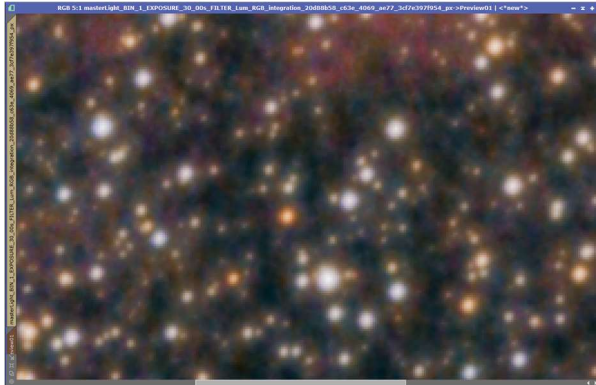
For Lightness:



For Chrominance:



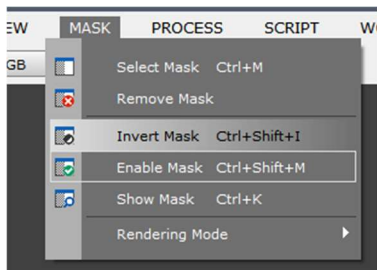
Before:



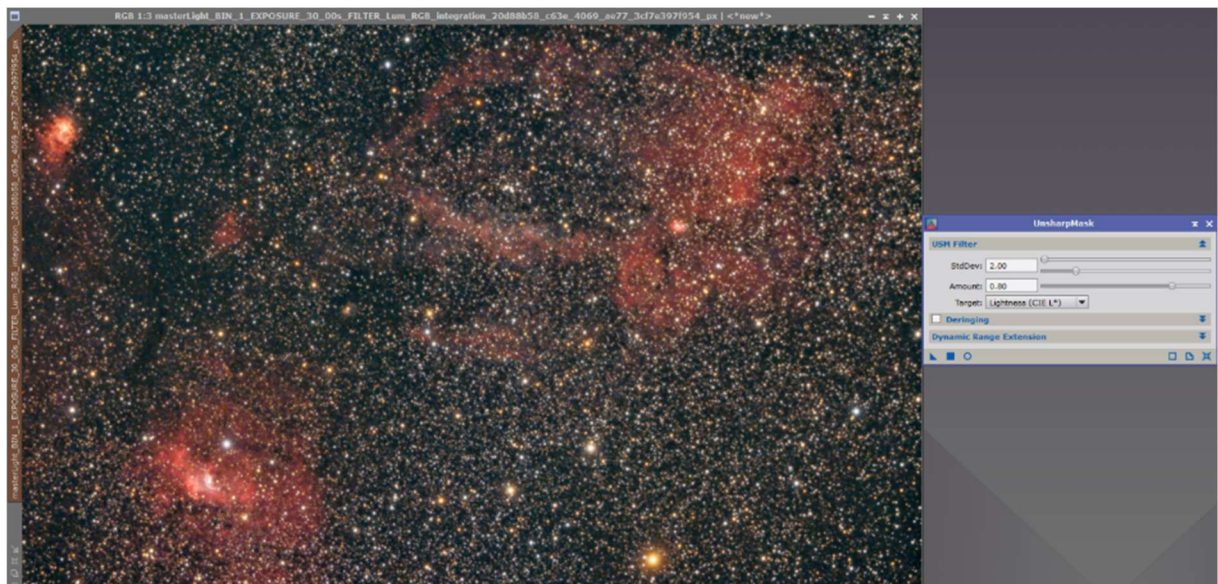
After:



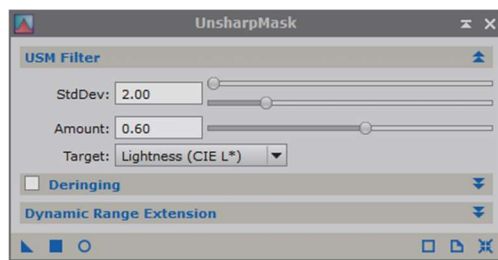
The last step is to sharpen the stars. To do this, invert the active mask:



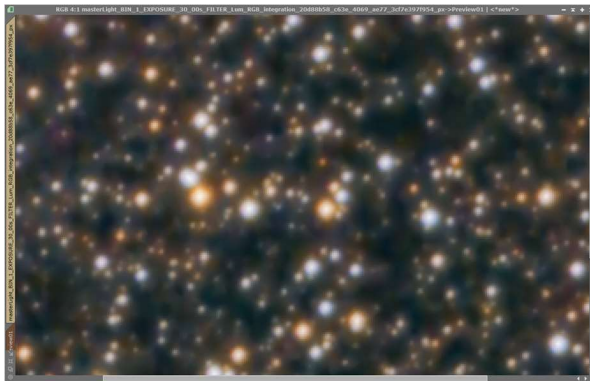
Now open the 'Process' 'UnsharpMask':



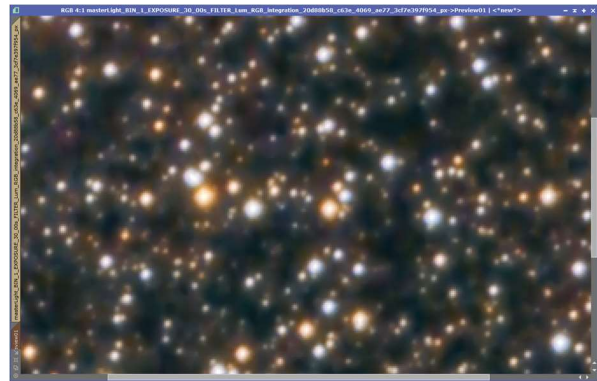
Subsequent setting values do not exaggerate the effect too much:



Before:



After:



The image can now be saved as a 16 bit TIF file.