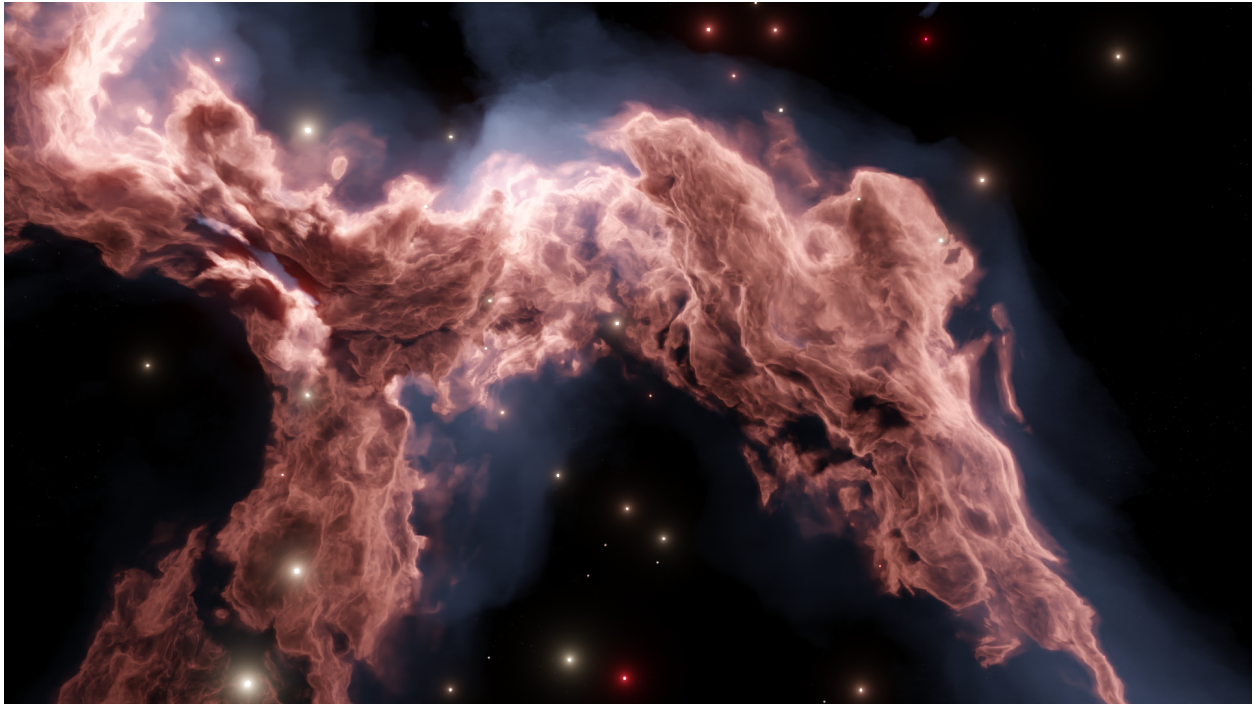

Nebula Generator

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Aug 01, 2022

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WHAT IS THE NEBULA GENERATOR?

The is for digital artists to create configurable space nebula effects in 2D or 3D using . Great for concept art, game backgrounds, and animations.

FEATURES

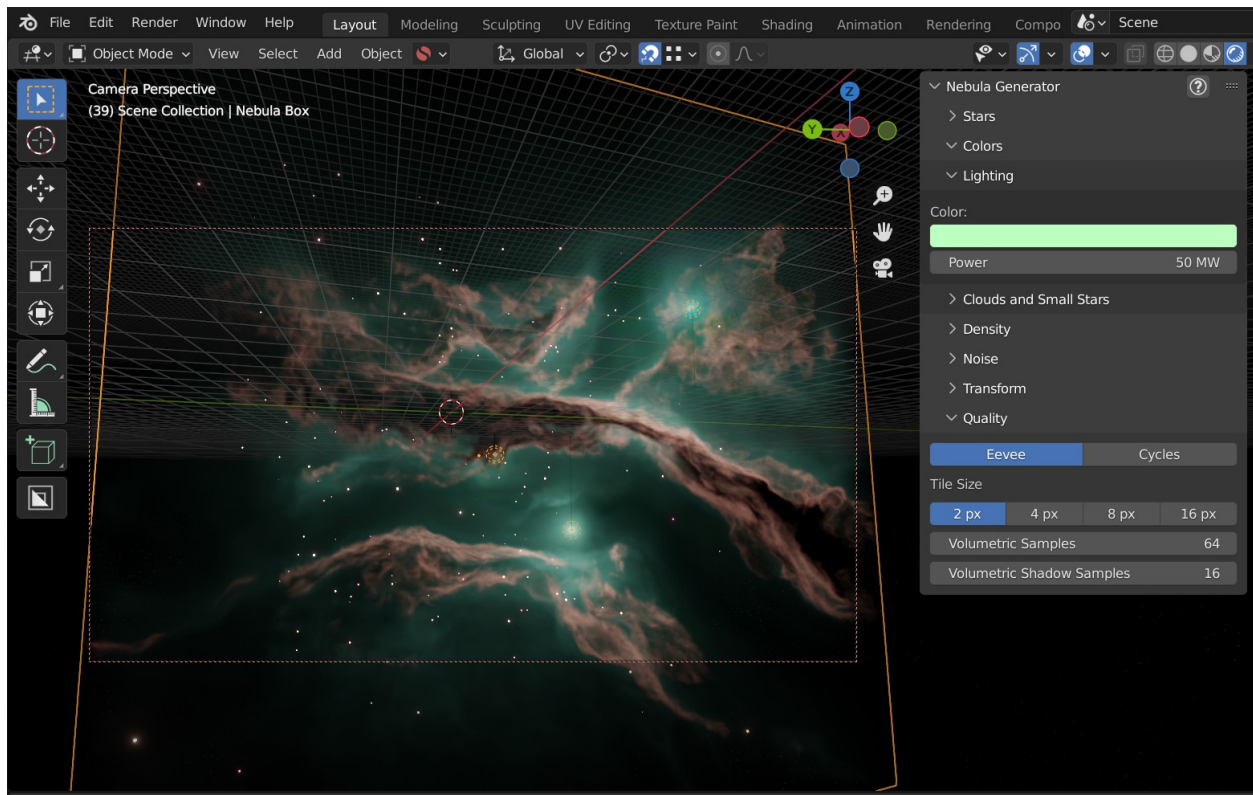
- A ready made file setup with additional sample files.
- A *Control Panel* for the 3D version to manage all the parameters in one interface.
- Change the colour and shape of the nebula through a range of options.
- Control the number, position and color of stars and light sources.
- Pan and Zoom around the 3D Nebula set up.
- Animate parameters to make the clouds and stars appear as if they are moving.
- Use in both *Cycles and Eevee* Blender render engines.

2.1 Files

2.1.1 Files: 3D Version

The 3D version has two parts:

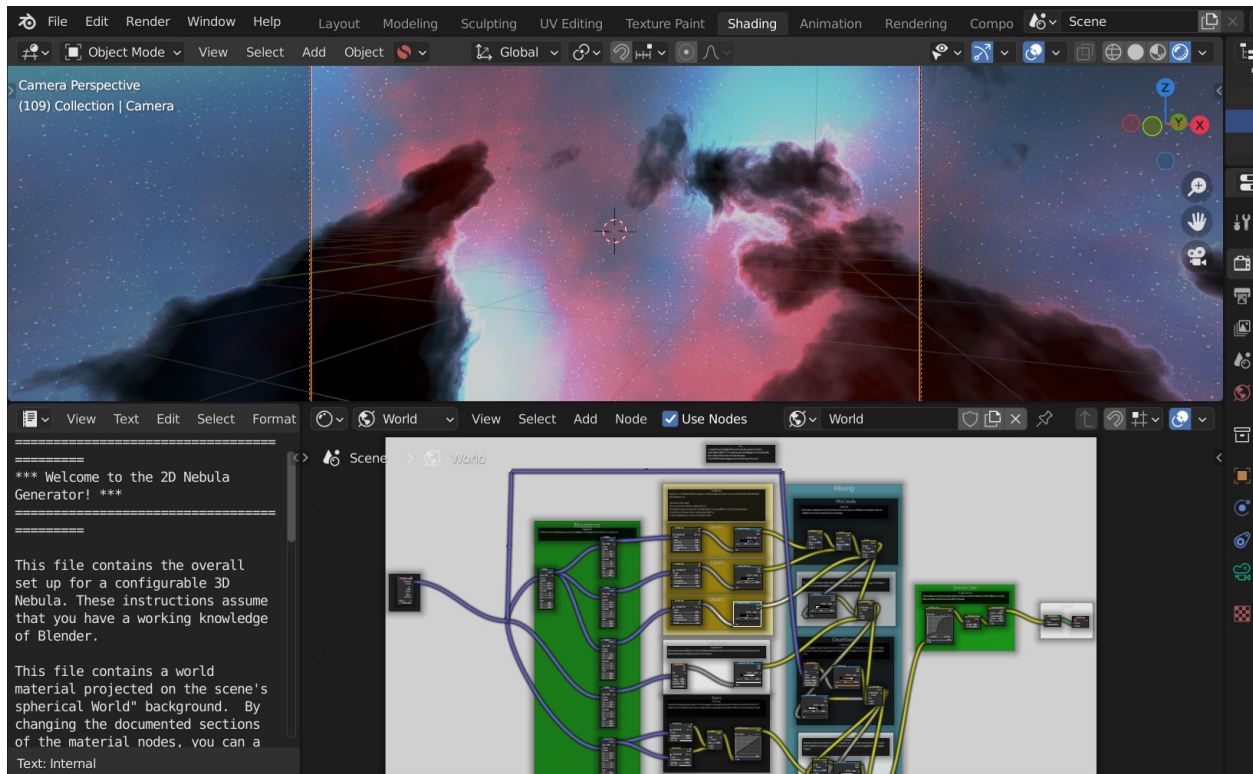
- **nebula_3d_vX.X.blend** - the latest version of the 3D Nebula Generator set up.
- **nebula_generator_control_panel.vX.X.install.me.zip** - the optional *Control Panel* for the 3D Nebula Generator.



2.1.2 Files: 2D Version

The 2D version is all contained in one .blend file:

- **nebula_2d_vX.X.blend** - the latest version of the 2D node group for background effects.



2.1.3 Sample Files

- [samples.unzip.me.zip](#) - a collection of sample files using the 2D and 3D set ups.

2.2 3D Version

The 3D Version of the Nebula Generator is a volumetric cloud setup in Blender available for both *Eevee* and *Cycles*.

2.2.1 Getting Started

Open the **nebula_generator_3d**.blend file.

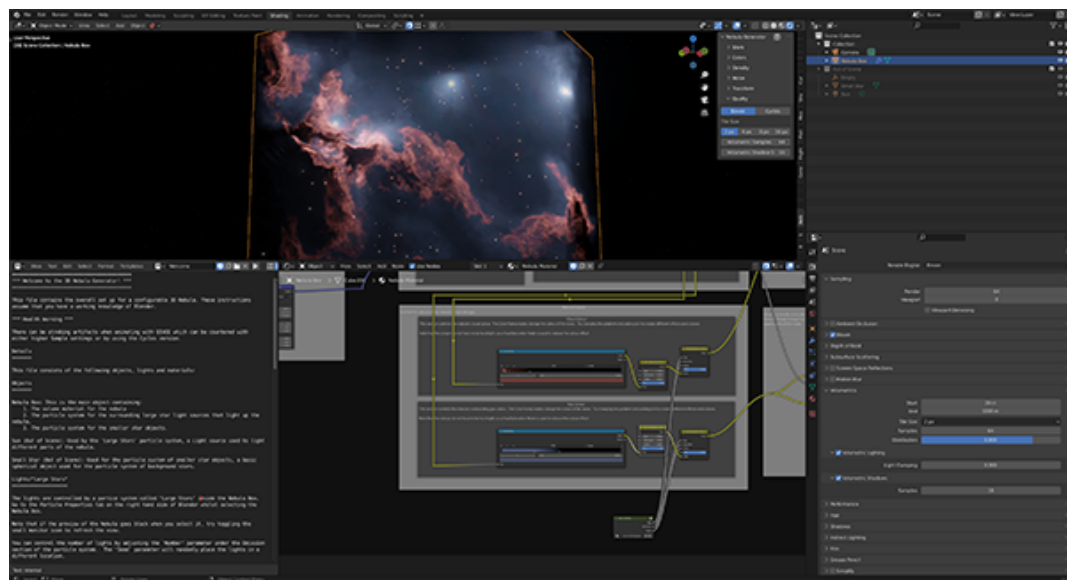
You have two options for controlling the 3D nebula set-up:

1. **Control Panel:** Use the *Control Panel* that manages all the nodes and particle systems.
 - *Install the control panel.*
 - *Access the control panel.*
 - *Use the control panel parameters.*



2. **Direct Use:** Alternatively, use the nodes directly in the *shader* section to control the shape of the nebula, and manipulate the Nebula Box Object's particles settings to control the stars and lighting.

The .blend file includes instructions on how the file is set up and how to use it. It assumes that you have a beginner/intermediate working knowledge of Blender.



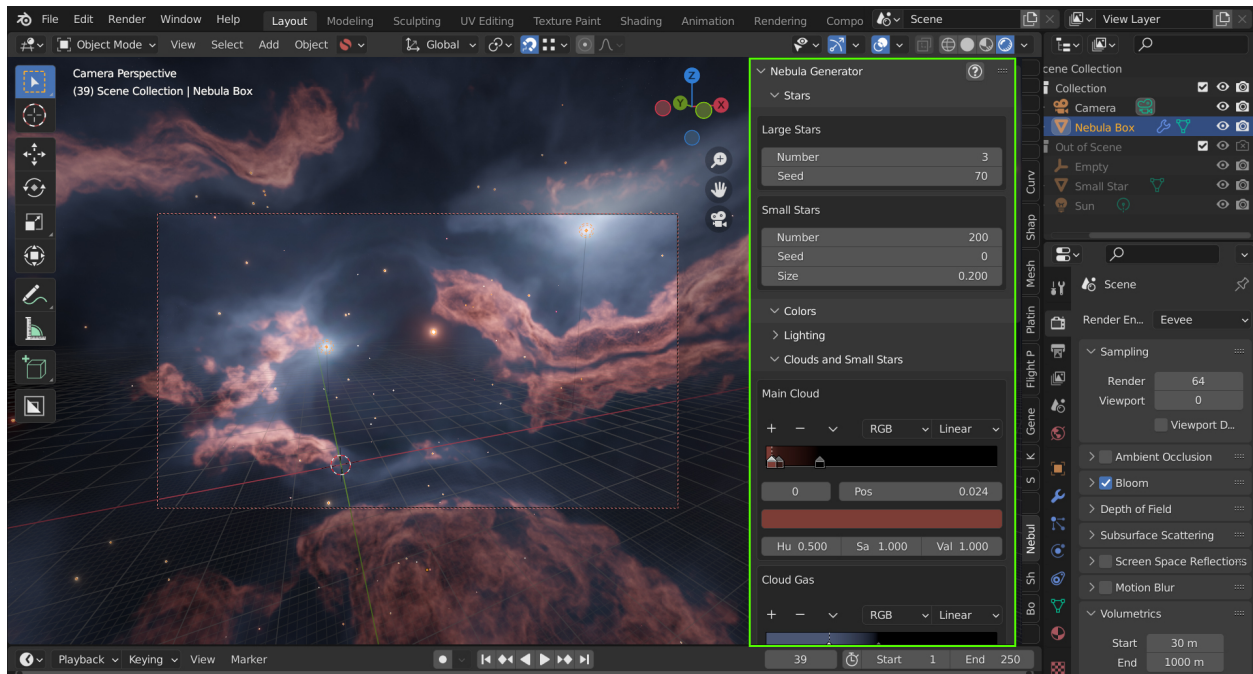
2.2.2 Control Panel

The Nebula Generator comes with a control panel that can manage all aspects of the nebula .blend file.

The panel works for both *Eevee* and *Cycles* versions.

It needs to be *installed* separately.

Warning: The control panel can only be seen if one of the Nebula Generator .blend files are open.



2.2.2.1 Installing the Panel

1. Go to *Edit -> Preferences*.
2. Select the *Add-ons* tab on the left if it is not already.
3. Select the *Install...* button along the top.
4. This will open a file dialog where you should navigate to where you have downloaded the **neb-ula_generator.x.x.x.zip** file (where x.x.x is the version number). This file should not be unzipped.
5. Then, click the *Install add-on from file* button.
6. Search for the add-on by typing *Nebula Generator* in the search box if it does not already appear.
7. Make sure the checkbox next to the Add-on (*Add Mesh: Nebula Generator*) is ticked:

If you have any issues do not hesitate to get in touch via info@configurate.net.

2.2.2.2 Using the Control Panel

1. Open one of the Nebula Generator's .blend files. You will not be able to see or use the panel otherwise.
2. If you cannot see any tabs on the left hand side of the viewport, press the 'N' key.
3. Navigate to the tab named "Nebula Generator".

Tip: Using the shift key whilst dragging the mouse over the parameters will provide a higher degree of control.

Warning: The control panel works on the nodes and particle systems of the .blend file. Adding or Deleting the nodes or particles will stop the panel from working.

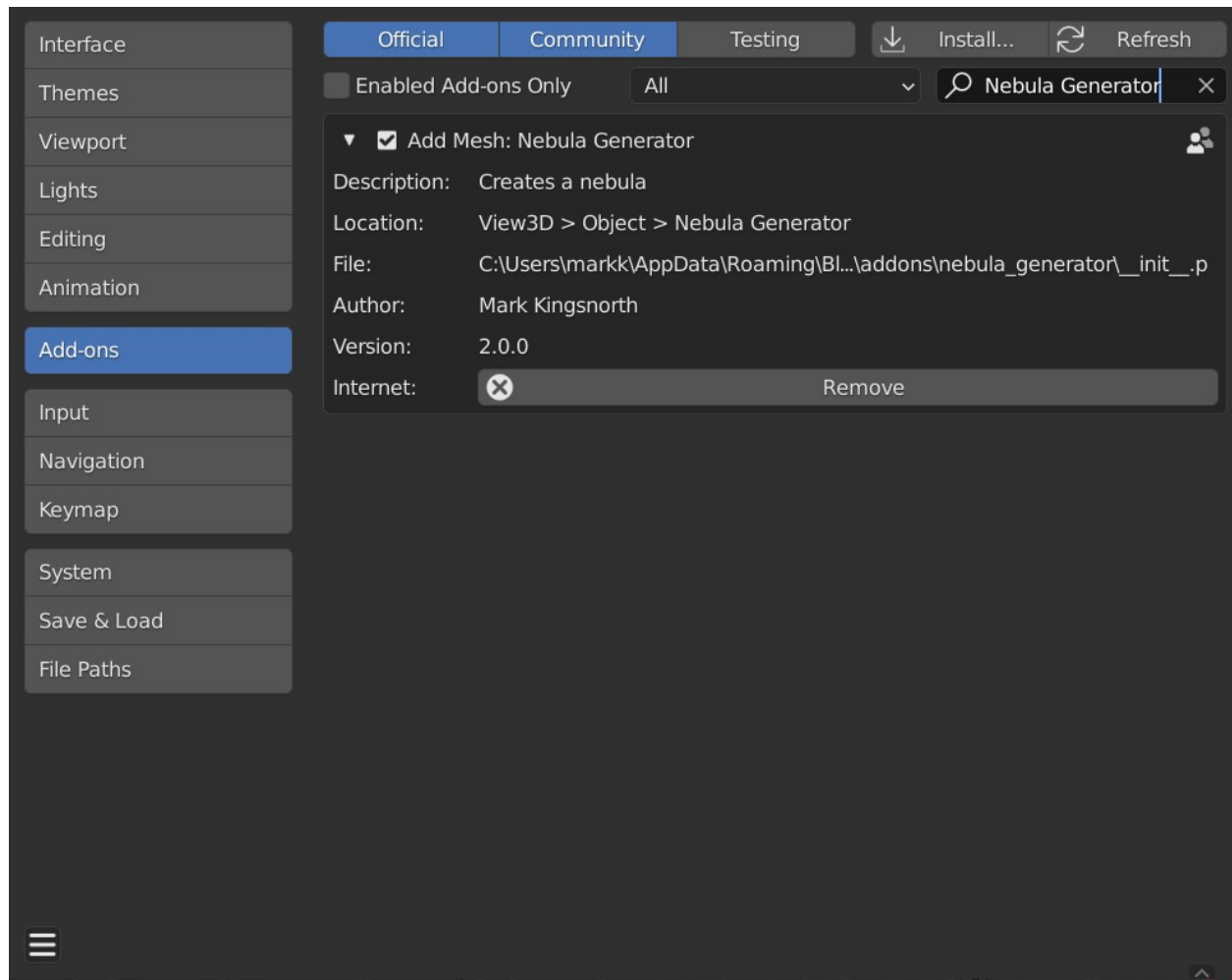


Fig. 1: Nebula Generator Panel Installed

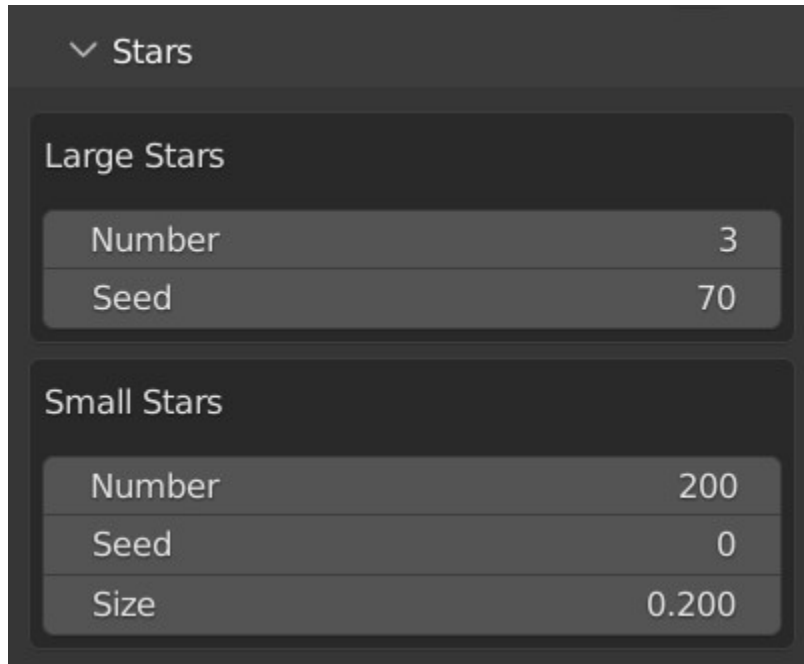
Fig. 2: Accessing the control panel.

See the [FAQ](#) section if you are having issues and don't hesitate to [get in touch](#)

2.2.2.3 Control Panel Parameters

Each section controls a different aspect of the nebula:

Stars



Stars	
Large Stars	
Number	3
Seed	70
Small Stars	
Number	200
Seed	0
Size	0.200

This controls the number and random placement of the stars.

Large stars

The Large Stars are actually point like sources that light the nebula.

- **Number:** The number of large stars in the nebula. Their number is set relatively low as too many and the lights will become overwhelming.
- **Seed:** This is a seed value to control the random placement of the stars. Changing this number will randomly place the stars in different positions.



Small stars

The smaller stars do not actually emit light and are exist to proved background and depth.

- **Number:** The number of small stars in the nebula.
- **Seed:** This is a seed value to control the random placement of the stars. Changing this number will randomly place the stars in different positions.
- **Size:** The size of the small stars.

Colors

Change the colors of the lighting, clouds and small stars separately:

Lighting

This controls the light emitted from the *Large stars*.

- **Color:** The color of the lights.
- **Power:** How powerful these lights/stars are.



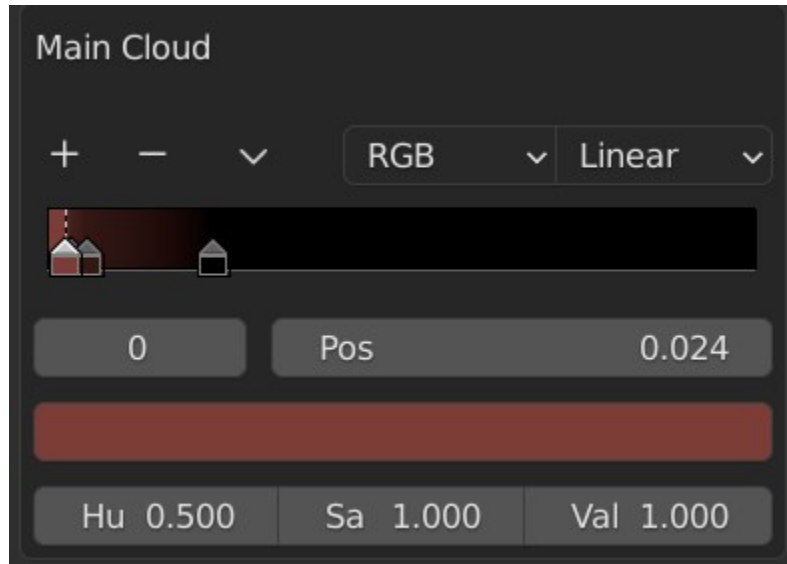
▼ Lighting

Color:

Power 50 MW

Clouds and Small Stars

Main Cloud



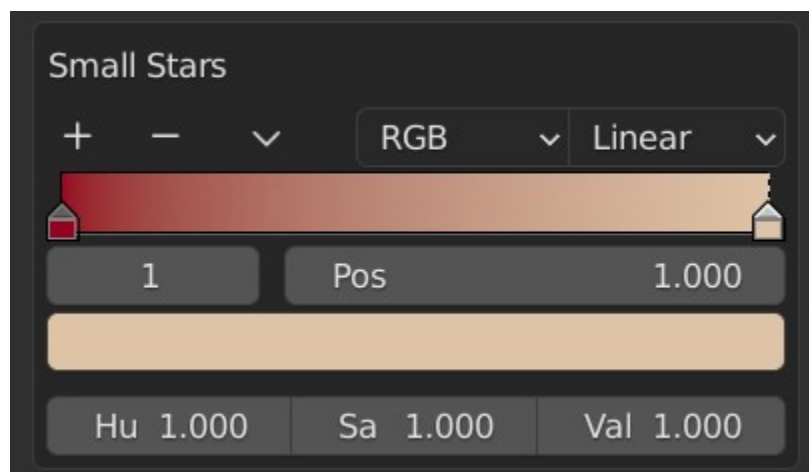
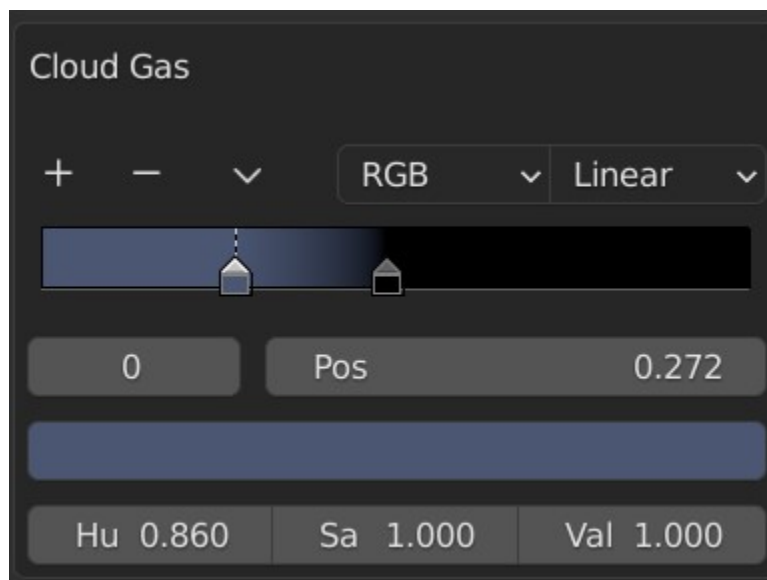
- **Color Ramp:** This is a control to change the color of the thickest clouds. Values on the left hand side of the ramp controls the colors of the least dense part of those clouds, where values on the right control the most dense parts.
- **Hue/Sat/Val:** This alters the hue, saturation and value of the ramp color. Colors changes will be shown in the viewport, but not on the ramp controls.

Cloud Gas

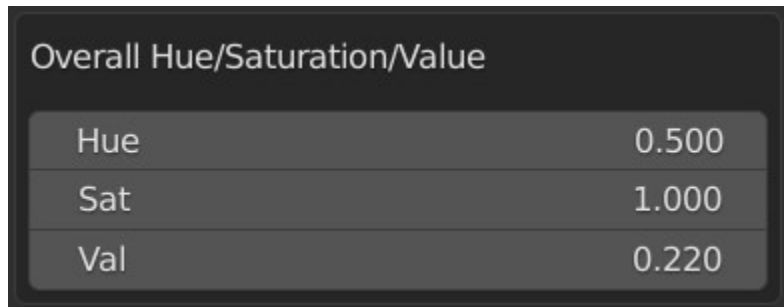
- **Color Ramp:** This is a control to change the color of the lighter clouds that surround the denser clouds. Values on the left hand side of the ramp controls the colors of the least dense part of those clouds, where values on the right control the most dense parts.
- **Hue/Sat/Val:** This alters the hue, saturation and value of the ramp color. Colors changes will be shown in the viewport, but not on the ramp controls.

Small Stars Colors

- **Color Ramp:** This is a control to change the different colors of the small background stars. The range of colors along the ramp are randomly assigned to each star.
- **Hue/Sat/Val:** This alters the hue, saturation and value of the colors. Colors changes will be shown in the viewport, but not on the ramp controls.



Overall Hue/Saturation/Value



This controls the overall Hue, Saturation and Value of the clouds and small stars. This is useful if you are happy with the overall values that are set. Note the lighting is altered separately.

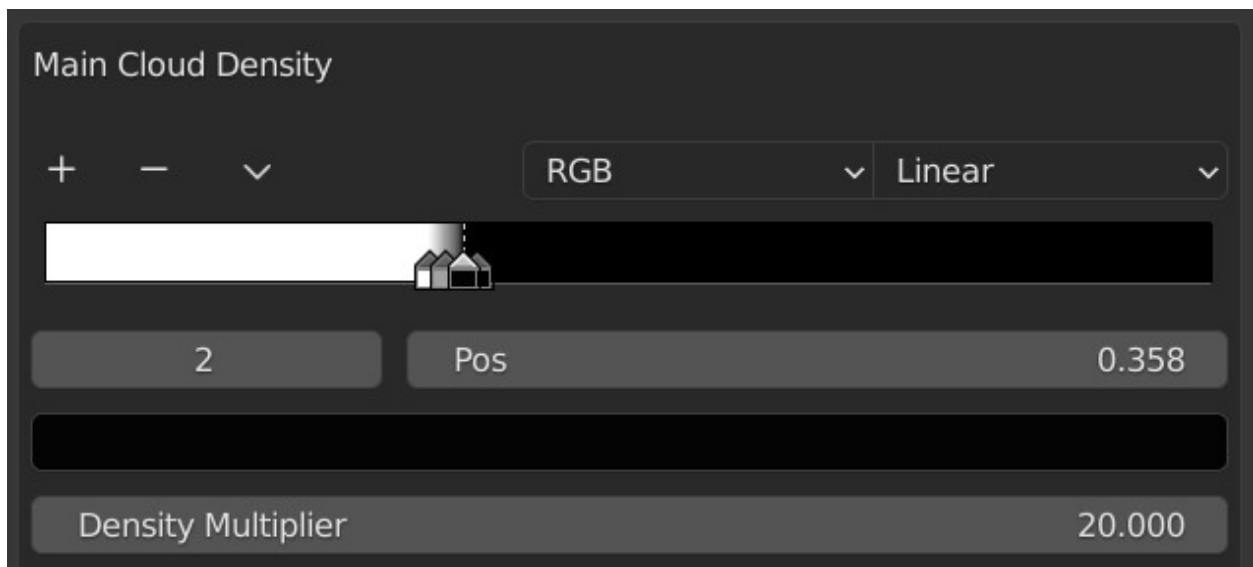
Tip:

You can expand the width of the panel so you have more room to control the color ramps.

Density

Control the different densities and sizes of the nebula's cloud and gas.

Main Cloud Density

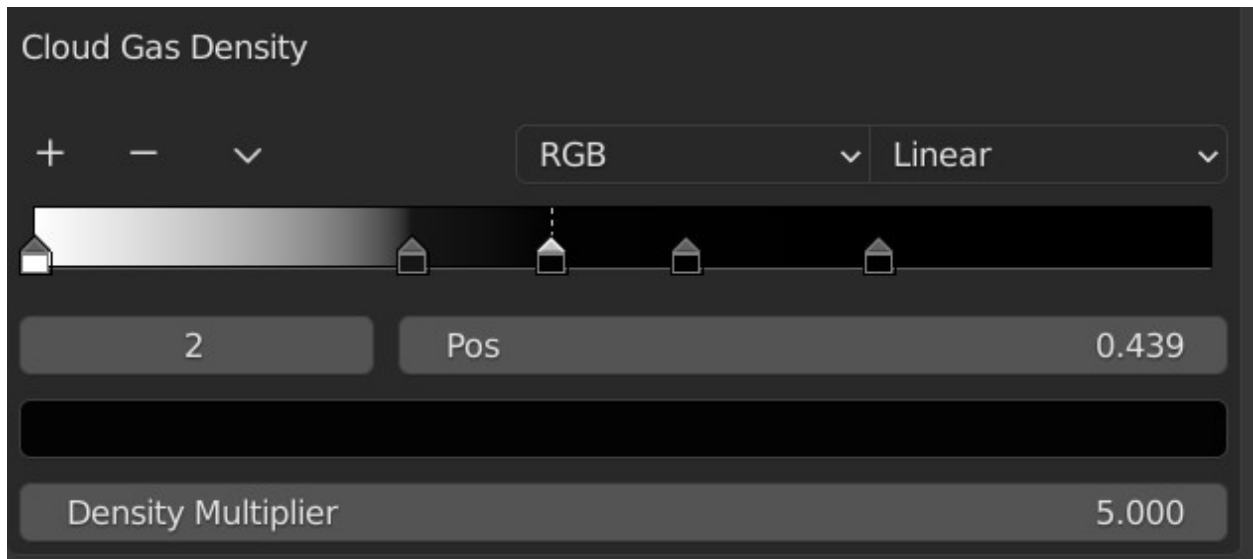


This controls the density of the main clouds.

The controls where the cloud starts and ends. The white part of the gradient ramp will be the thickest part of the cloud and the black parts will have no cloud at all. Try dragging different parts of the gradient to get different effects, or by adding or removing different control points on the gradient.

The **Density Multiplier** increases the thickness of the clouds even further.

Cloud Gas Density



This controls the density of the gas surrounding the clouds. The controls where the cloud starts and ends. The white parts of the gradient ramp will be the thickest part of the gas and the black parts will have no clouds at all.

The **Density Multiplier** increases the thickness of the clouds even further.

Noise

The cloud shapes are generated using a set of overlaid on top of each other. See for how noise functions are used in computer graphics.

To get a variety of effects, changing the parameters here will change the different inputs to those .

Tip: If you wish to have even greater control, try changing the noise node set-up in the “Shape” section of the shader tab. However, this section of the control panel will no longer work properly as it is tied to the existing node setup.

Overall Noise

This controls the overall noise being applied.

- **Detail:** Number of noise octaves or waves, creating more variation in the clouds. Higher number of octaves corresponds to a higher render time.
- **Roughness:** Number of 'peaks' in the noise, where higher values will provide rougher surface effects.

Noise Scale Variation

The 'Size', or 'Scale', of the overall noise effect is manipulated even further by another noise function to give a more dynamic effect.

- **Scale:** The size of the noise effect that is used to manipulate the overall scale.
- **Detail:** Number of noise octaves or waves, creating more variation in the scale of the clouds.
- **Roughness:** Number of 'peaks' in the noise used to affect the overall scale of the clouds.
- **Distortion:** The amount of bending or distortion being applied to the overall noise scale.

Noise Distortion Variation

The 'distortion' of the overall noise is also manipulated by another noise function.

Although not always apparent in preview mode, this adds a greater level of smaller surface detail to the clouds. Be careful increasing the parameters such as 'scale' too high or the clouds may appear too noisy at render time:



- **Scale:** The size of the noise effect that is used to manipulate the overall distortion.
- **Detail:** Number of noise octaves or waves, creating more variation in the distortion of the clouds.
- **Roughness:** Number of 'peaks' in the noise used to affect the overall distortion of the clouds.
- **Distortion:** The amount of bending or distortion being applied to the overall noise distortion.

Transform

Control the position of the nebula's location, rotation and scale inside the object:

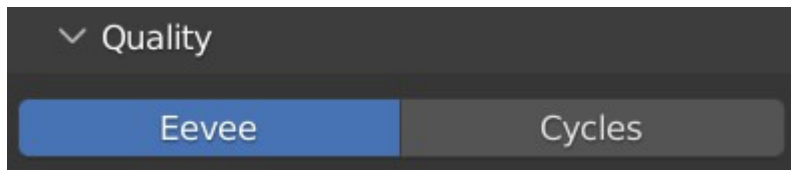
- **Location:** Location of the nebula.
- **Rotation:** Rotation of the nebula's clouds.
- **Scale:** Overall size of the nebula..

Quality

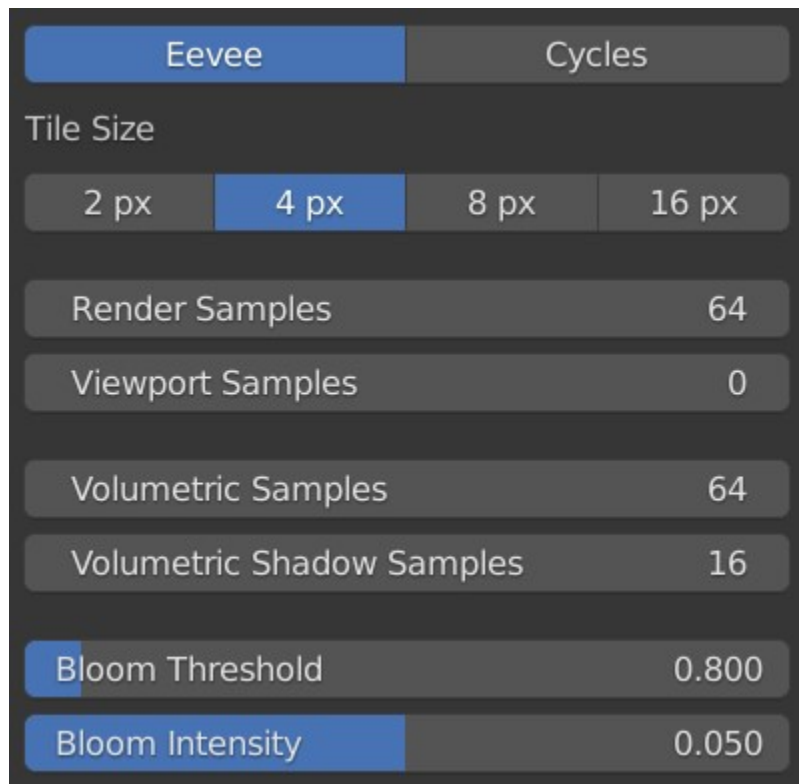
Depending on whether you are rendering in Eevee or Cycles, the following parameters expose the most frequently used settings when controlling the quality of the nebula image.

Tip: These settings and more can be found on the standard Render Properties tab as well, and are provided here for convenience.

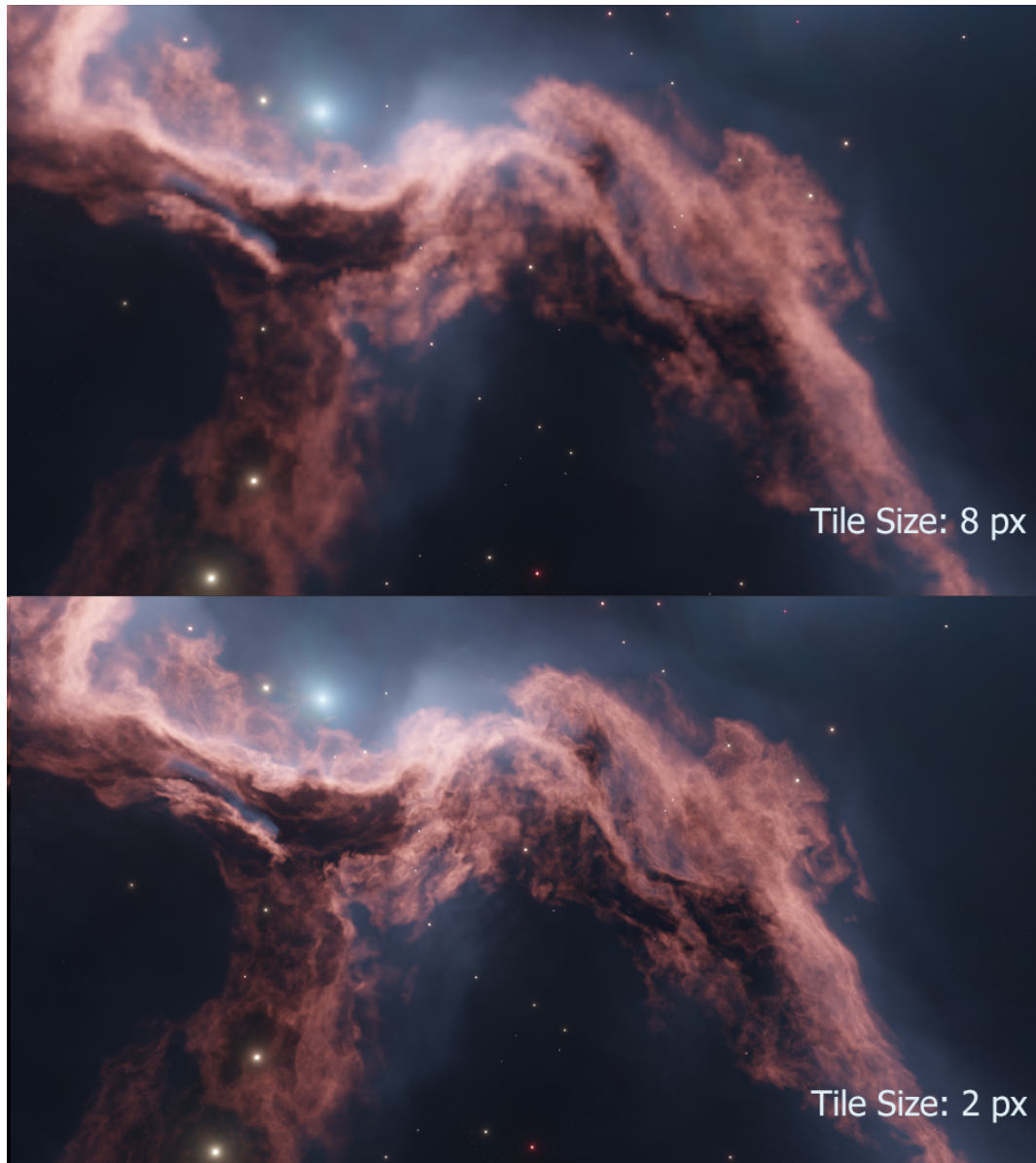
- **Render Engine:** Choose between Eevee and Cycles modes. Not sure which? See the [FAQ](#) section.



Eevee Quality Settings



- **Tile Size:** Arguably one of the most important settings in Eevee volumetric rendering, this controls the level of detail for the render. The smaller the tile size, the greater level of detail at the expense of memory usage and render times which will also slow down your GPU in Eevee. Whilst altering the nebula parameters, it is best to keep the setting at either 4px or 8px and then change to 2px for the final render.



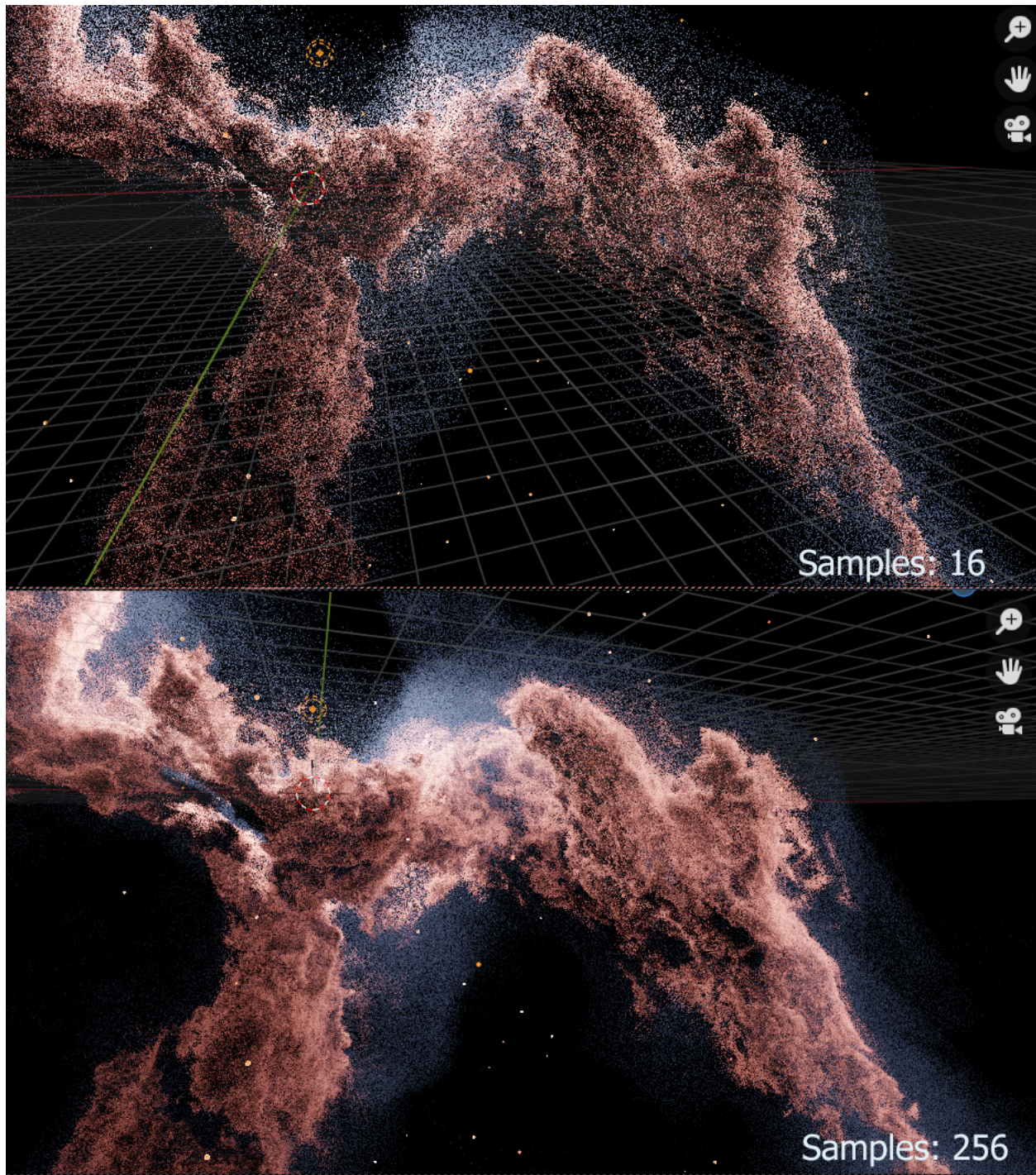
- **Render Samples:** Number of render time samples per pixel. Increasing this value will increase the detail of the clouds and can reduce speckles in the noise.
- **Viewport Samples:** Number of viewport render samples per pixel.
- **Volumetric Samples:** This controls the number of times that Eevee calculates a render pass for the volume in the nebula.
- **Volumetric Shadow Samples:** This controls the number of times that Eevee calculates the quality of the shadows when doing a render pass.
- **Bloom Threshold:** This affects the glow of the stars. Reducing this value increases the number of stars affected and the overall brightness of the nebula.
- **Bloom Intensity:** How blended with the image the bloom effect is. Lower values will reduce the overall effect.

Cycles Quality Settings

Eevee		Cycles
Viewport Samples		256
Render Samples		512
<input checked="" type="checkbox"/> Noise Threshold	0.0100	
<input checked="" type="checkbox"/> Denoiser	OptiX ▾	
Viewport Step Rate		0.10
Render Step Rate		0.10
Glare Threshold		1.000
Glare Mix		0.000

Samples

The number of times Cycles will calculate a render pass. Higher levels will increase details, but will also increase time to render and system usage.

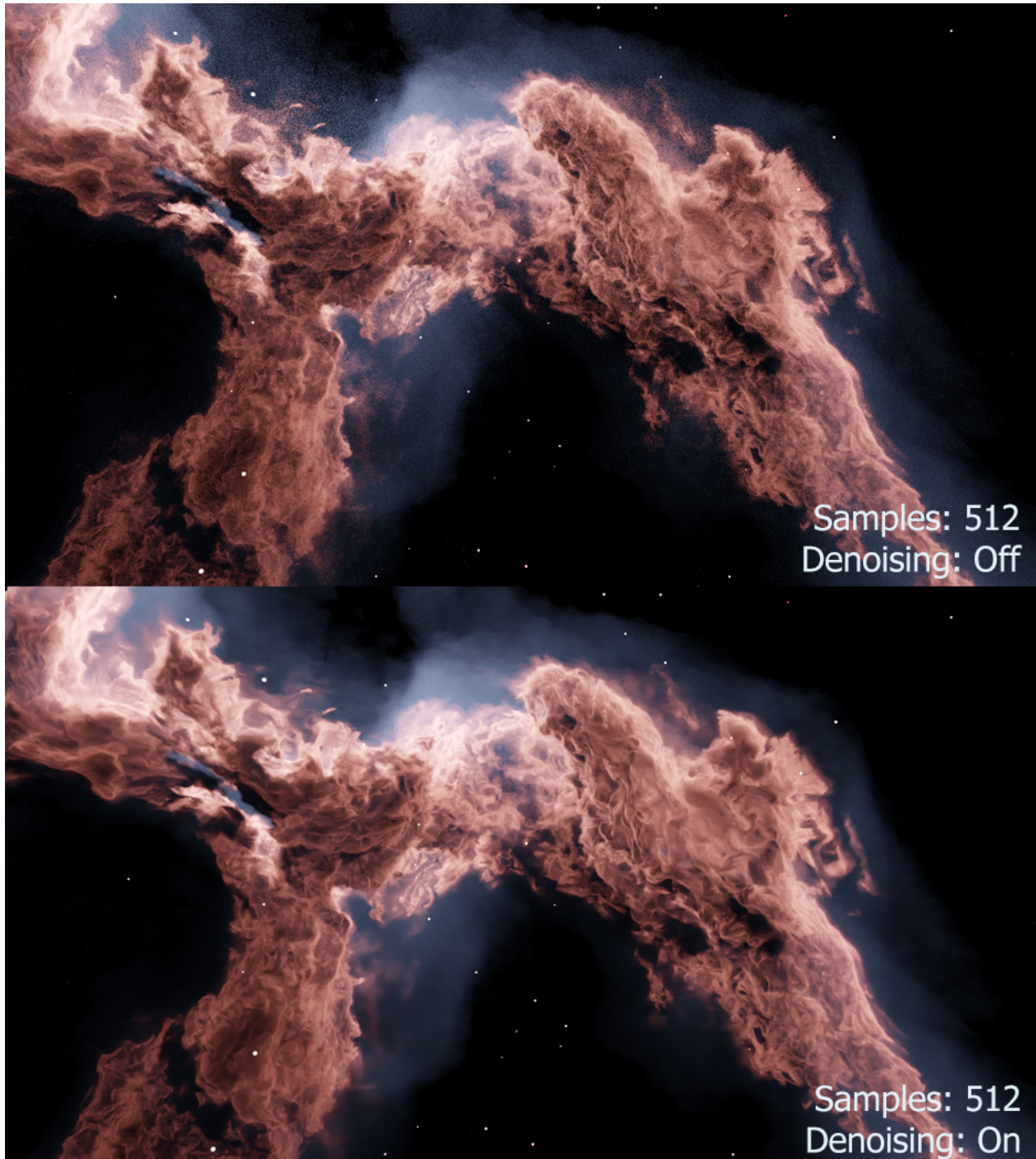


- **Viewport Samples:** The number of times Cycles will calculate a render pass in the viewport.
- **Render Samples:** The number of times Cycles will calculate a render pass at render time.

Denoising

is automatically switched on whilst rendering to remove , or speckles, in the nebula effect. Sometimes, this may produce a slightly *liquid* effect at lower sample settings. You may wish to turn the denoiser off and increase the sample settings in this case.

- **Denoiser:** Which denoising function to use. Using this combined with the *samples* settings should produce a smoother result.



Step Rate

This essentially controls the ‘thickness’ of the nebula volume in the viewport, or in other words the distance between points in the volume. Lower values increase the thickness.



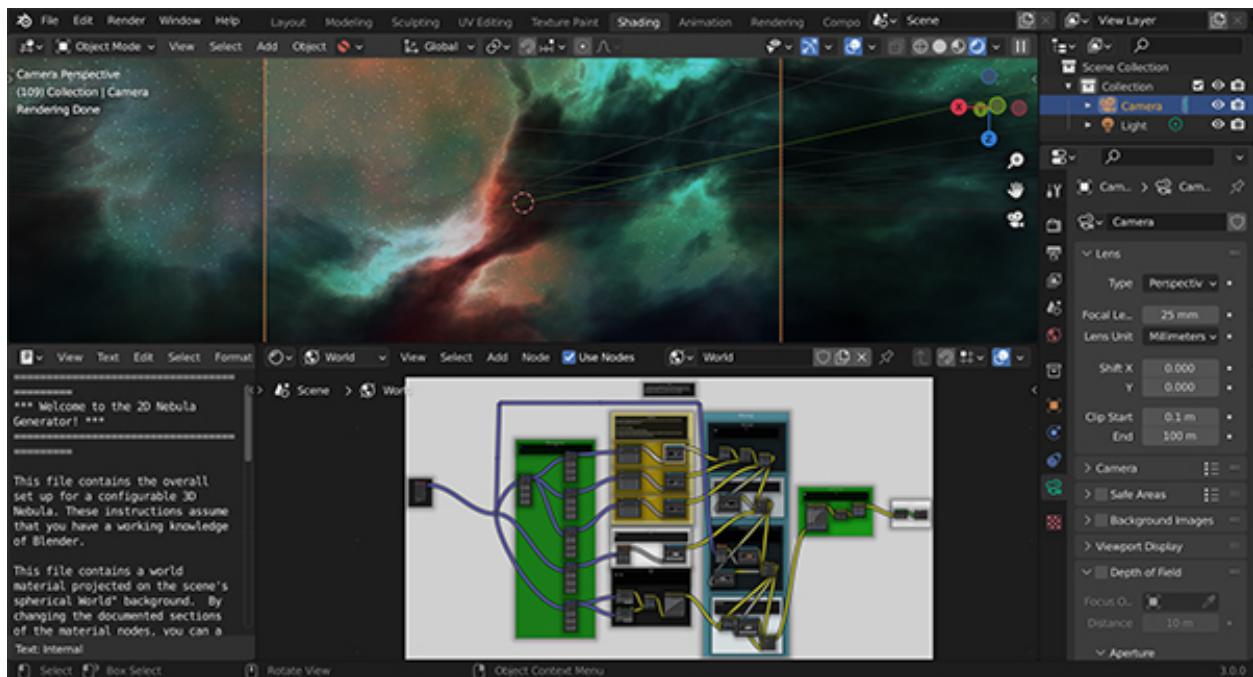
- **Viewport Step Rate:** The ‘thickness’ of the nebula volume in the viewport.
- **Render Step Rate:** The ‘thickness’ of the nebula volume in the viewport at render time.

Glare Threshold and Mix

This controls the amount of post-processing *Glare* is added to the render, which affects star glow.

- **Threshold:** Increasing this parameter will make the stars and image glow less.
- **Mix:** This controls how much the glare effect is mixed with the final image: 0.0 represents 50% Glare, -1 will remove the Glare and +1 will overwrite the image with the Glare effect.

2.3 2D Version



The original 2D version of the is still supplied, and still works on the latest versions of Blender.

The 2D .blend file includes instructions on how the file is set up and how to use it. It assumes that you have a beginner/intermediate working knowledge of Blender.

The node works by overlaying a series of different to produce the clouds and the stars.

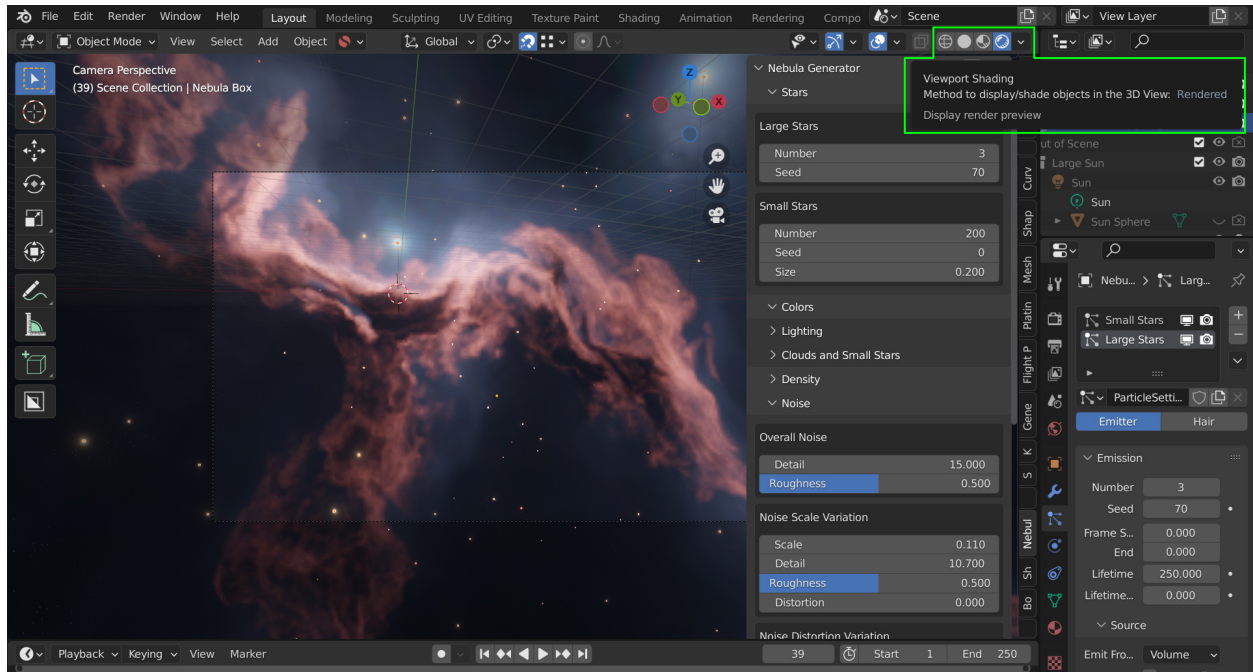
The principles behind the node group is described in this video:

2.4 FAQ

2.4.1 General Questions

2.4.1.1 When I load the .blend file the viewport is blank. What's happened?

You have to change the *viewport shading* mode to “Rendered” by clicking the *viewport shading* button in the top right of the viewport, Blender does not load the *Rendered* viewport shading by default.



2.4.1.2 How can I control the parameters more slowly when I move the mouse?

A neat trick in Blender is the *shift* key - whilst clicking and moving the mouse over a parameter, hold shift. The values will change more slowly. Especially for this node group, you can more subtly change the effects.

2.4.1.3 How best can I control the parameters? I've managed to change something so that I'm not getting a good effect. What do you suggest I do?

You can click and slide the mouse over multiple parameters and change them all at once - this is useful when you want to change a property on all 3 cloud settings.

Also, by hovering over the parameter box and hitting the *delete* key, the parameter will return to its default value.

There are a set of sample .blend files I have supplied in a .blend file to give you a head start in configuring different effects. I'm sure you can find more.

2.4.1.4 I have a Mac with an AMD Radeon GPU Pro, and when I load the 3D Nebula Generator I can only see the stars. What's happened?

There seems to be an outstanding issue with Blender's EEVEE volumetrics engine and the Mac OS AMD Radeon Pro, described here: <https://developer.blender.org/T65873>

2.4.1.5 I cannot see the Control Panel in Blender.

Make sure you have done the following:

- Make sure the *panel is installed*.
- The panel will only open with one of the Nebula Generator files with the ‘Nebula Box’ object in it.
- If you cannot see any of the side panels on the right, pressed the ‘N’ which should make them appear.

2.4.1.6 Any general tips?

- Activate the built in Node Wrangler add-on and hold SHIFT-CTRL and click on a node to see the individual effect of each node. This will help understand how the different parts of the effect is made up.
- By adding node groups like noise and musgrave to the inputs of the main node group, you can get lots of additional interest effects. I’d encourage you to experiment and let me know if you get anything interesting.
- **2D Version**
 - I have added a curves node to the outputs of the stars and nebula node groups - playing with those settings will help intensify the colours of the nebula further.
 - Try swapping out the stars input for your own starfields and you should get more interesting effects.
- **3D Version**
 - When changing parameters that have a significant effect or preparing for a render, switch the viewport to Wireframe mode.
 - Start with a high Tile Size and low Samples value, change parameters, and then increase them gradually to get the desired effect.
 - When animating, you will experience strobing effects on the clouds unfortunately in EEVEE. This can be countered with a higher Samples setting but may not be resolved entirely. It is hoped that EEVEE can be improved to counter this.
 - Although the default renderer is EEVEE, the file can be adapted for CYCLES by changing the rendering format and changing the parameters of the materials. Even though there will be a significant performance, this removed the strobing artefacts mentioned earlier.

2.4.2 Should I use Eevee or Cycles?

You can switch between the Eevee and Cycles render engines at any time in the *Quality* section of the control panel or in Blender’s Render Properties. Here are some advantages and disadvantages of each render engine to help you choose.

A possible workflow is to work in Eevee to set up the overall effect, and then switch to Cycles to tailor it further, if needed.

2.4.2.1 Eevee

Advantages of Eevee

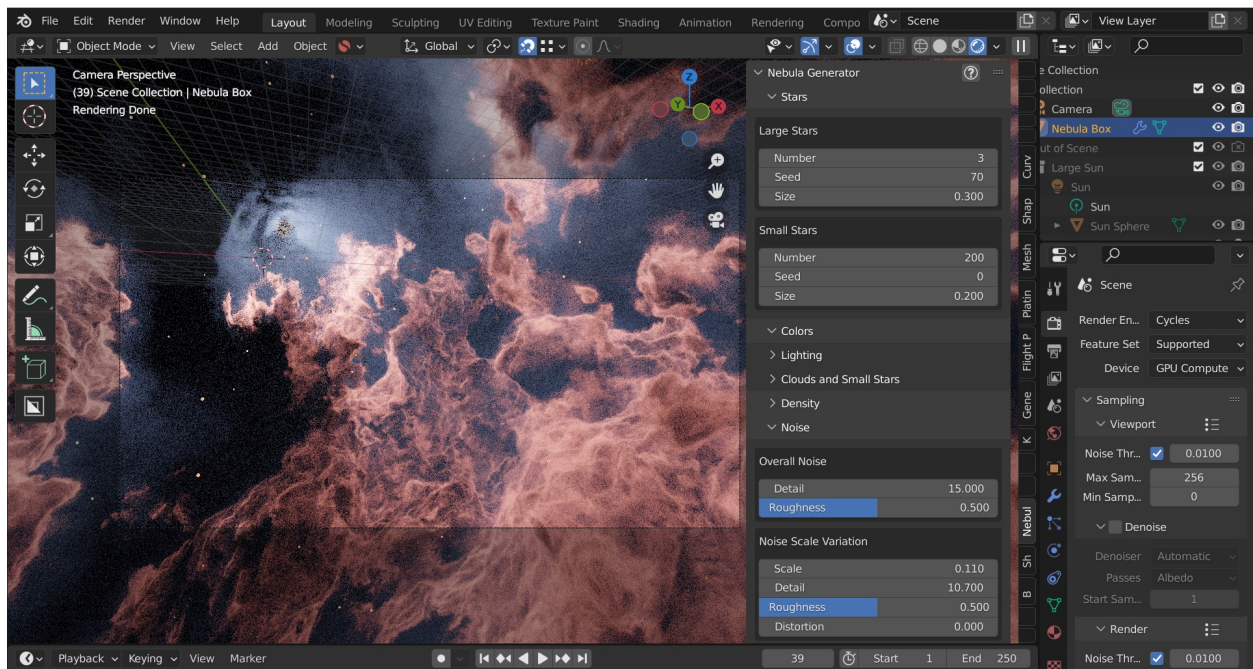
- Quickly visualise the effect in the viewport.
- Faster than Cycles.
- Good for medium resolution still shots and backgrounds.

Disadvantages of Eevee

- When animating, a strobing effect can occur. This is because Eevee converts the nebula to flat 2D cards when rendering. The Cycles rendering engine does not have this issue.
- Edges of the clouds can appear blurred, which can be sharpened if you either *decrease the tile size* or *change Blender's code slightly* to set an even smaller tile size than the default. However there is a limit to how sharp the render will be at high resolutions.
- Intended as a fast preview renderer, Eevee will encounter performance issues at higher >4K resolutions.
- Whilst rendering, Eevee will use your display adapter which will cause general slowdown on your computer.

2.4.2.2 Cycles

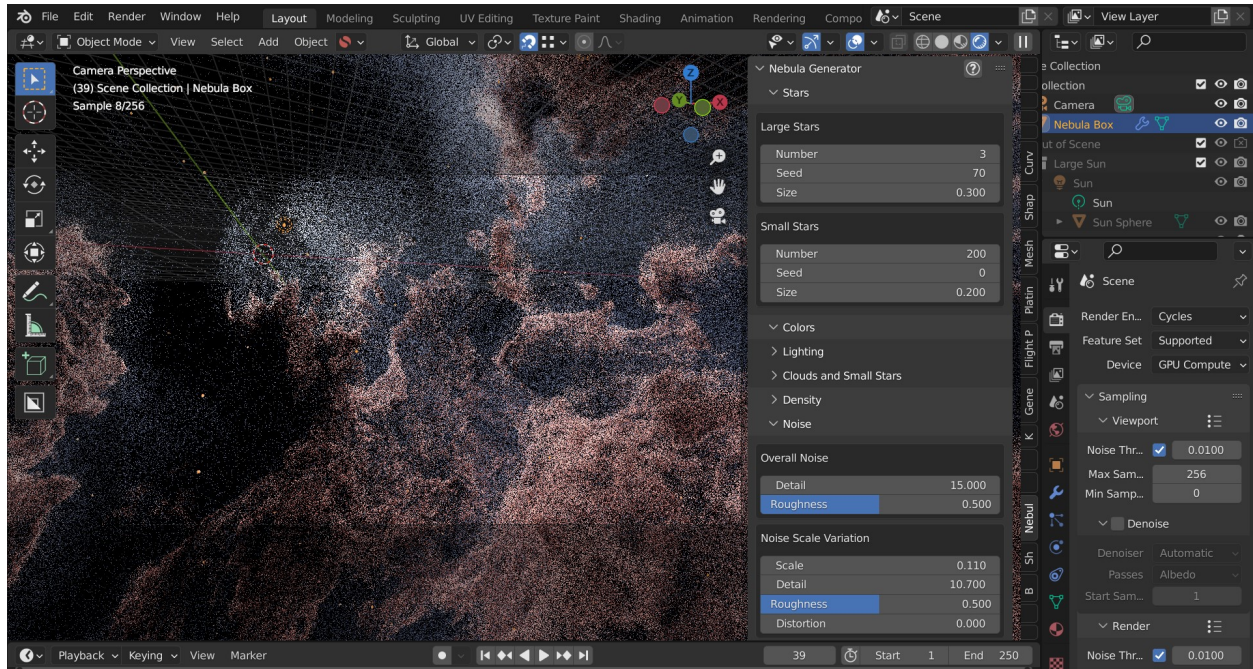
Advantages of Cycles



- Better for animations as it eliminates Eevee's *strobing effect*.

- At higher sample settings it will show enhanced detail (at the expense of performance).
- Good for Higher resolution stills and animation.

Disadvantages of Cycles



- Slower render times.
- Viewport Preview is slower than Eevee.
- Effect will be slightly different to the Eevee version.
- More settings to consider.
- , or speckled pixels, will occur which need to be resolved with the . See the [Denoising](#) section.

2.4.3 How can I improve the Eevee render?

Tip: There are further hints and tips about which Eevee settings to change in the [Eevee Quality Settings](#) section.

2.4.3.1 Decreasing Tile Size

If you decrease Eevee's volumetric setting to increase the detail seen in the nebula. This setting is the size of the pixels in a volume:

This setting can be found on Blender's Render Properties tab or on the Nebula Generator's [Control Panel](#):



Fig. 3: Tile Size 16px



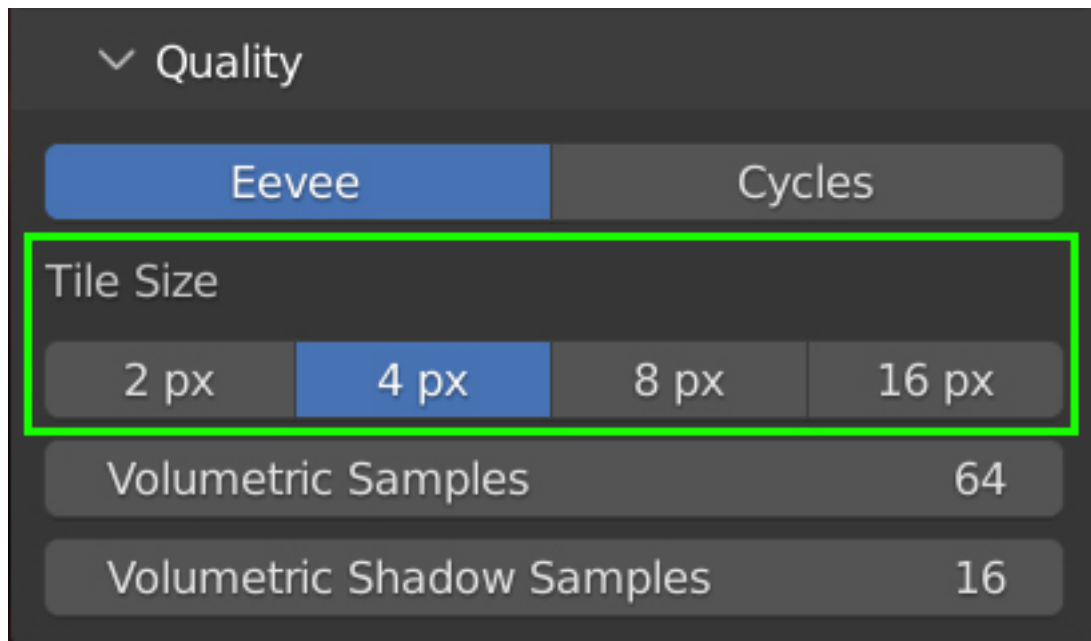
Fig. 4: Tile Size 8px



Fig. 5: Tile Size 4px



Fig. 6: Tile Size 2px



2.4.3.2 Increasing samples

You can also increase the render samples, volumetric samples and volumetric shadow samples settings if you wish to have greater thickness and contrast at the expense of performance. Increasing the render samples will decrease any speckles in the clouds, especially around light sources.

2.4.3.3 Changing Blender codebase for a 1px tile size and higher sample limits

Warning: Advanced users only! This will require some knowledge of building Blender, altering small amounts of code, and may cause Blender to crash in some computer setups.



Fig. 7: 64 Volumetric Samples, 16 Shadow Samples (click to enlarge)

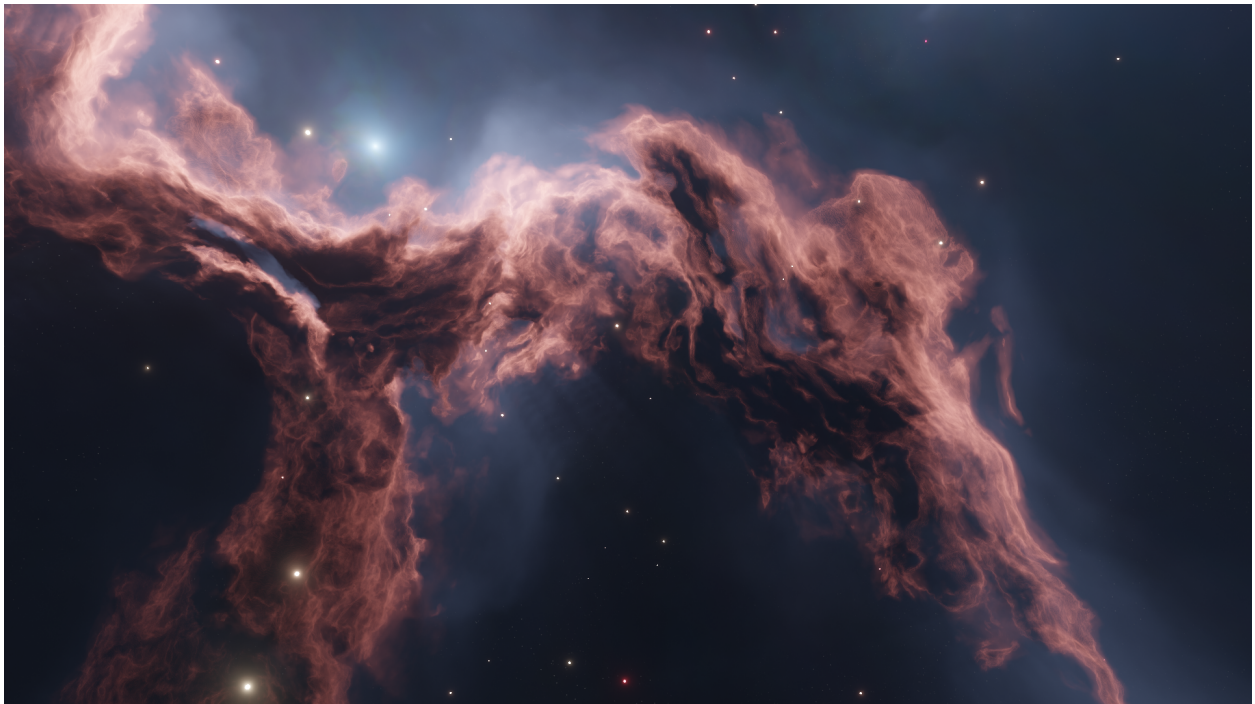


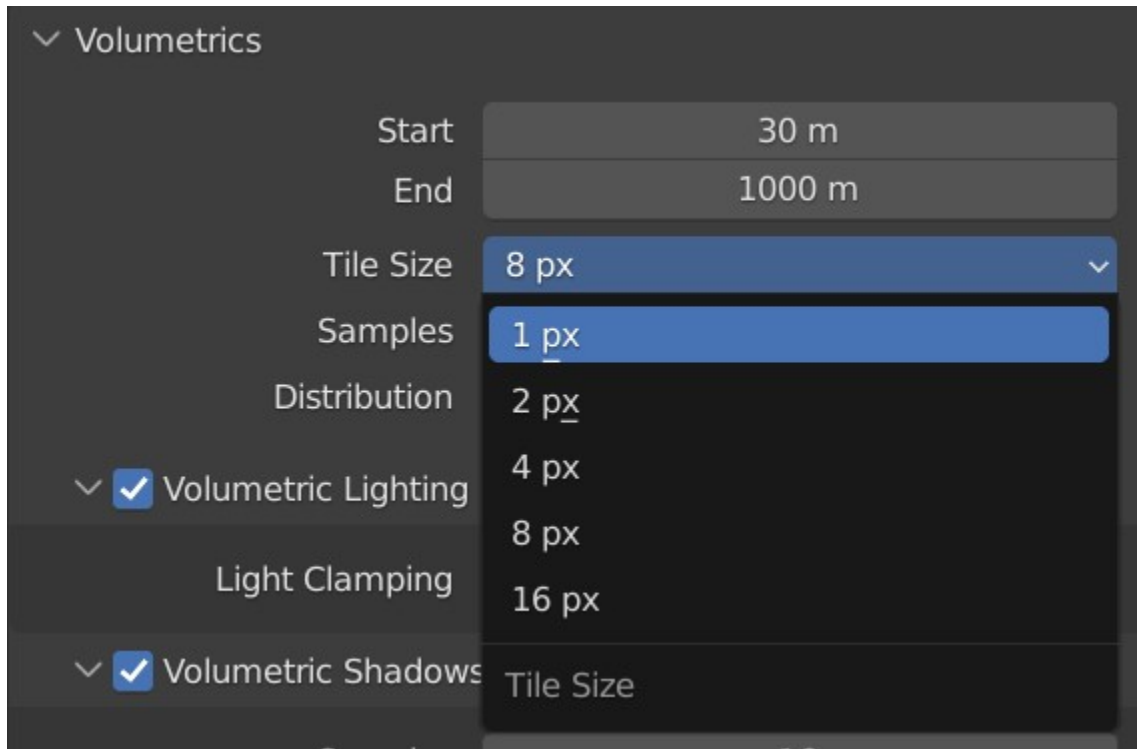
Fig. 8: 128 Volumetric Samples, 32 Shadow Samples (click to enlarge)



Fig. 9: Image at 2px Tile Size (click to enlarge)



Fig. 10: Slightly sharper image at 1px Tile Size (click to enlarge)



At the moment you can decrease Blender's *tile size* setting to 2px only in the official Blender version. You can in fact alter Blender's core code to provide you with a 1px option, and make a custom version of Blender from it. This will give a slightly sharper image than the default 2px, at the expense of memory usage and performance.

To change Blender's code to do this:

1. Follow the instructions to set up from the official website. Choose the instructions according to your operating system.

You don't necessarily need to install development tools, as we will be only altering small amounts of code which can be done in a text editor of your choice.

Essentially, get to the point where you can build your own Blender with the `make update` and `make` commands.

2. You will now have a copy of Blender's source code in your local directory where you have set up the build. Find the following file:

```
<blender code directory>\source\blender\makesrna\intern\rna_scene.c
```

3. Locate the following block of code:

```
static const EnumPropertyItem eevee_volumetric_tile_size_items[] = {
    {2, "2", 0, "2 px", ""},
    {4, "4", 0, "4 px", ""},
    {8, "8", 0, "8 px", ""},
    {16, "16", 0, "16 px", ""},
    {0, NULL, 0, NULL, NULL},
};
```

4. Add the line `{1, "1", 0, "1 px", ""}`, to the start of the variable declaration. The code block should now look like this:

```
static const EnumPropertyItem eevee_volumetric_tile_size_items[] = {
    {1, "1", 0, "1 px", ""},
    {2, "2", 0, "2 px", ""},
    {4, "4", 0, "4 px", ""},
    {8, "8", 0, "8 px", ""},
    {16, "16", 0, "16 px", ""},
    {0, NULL, 0, NULL, NULL},
};
```

5. **Optional Step:** You can increase the limit on the volumetric samples and volumetric shadow samples settings in the same file.

Warning: Higher settings here will dramatically increase render time.

Change the following lines of code:

```
RNA_def_property_range(prop, 1, 256);
.
.
.
RNA_def_property_range(prop, 1, 128);
```

To this:

```
RNA_def_property_range(prop, 1, 2048);
.
.
.
RNA_def_property_range(prop, 1, 512);
```

6. Once the changes are made, go to the command prompt and build blender:

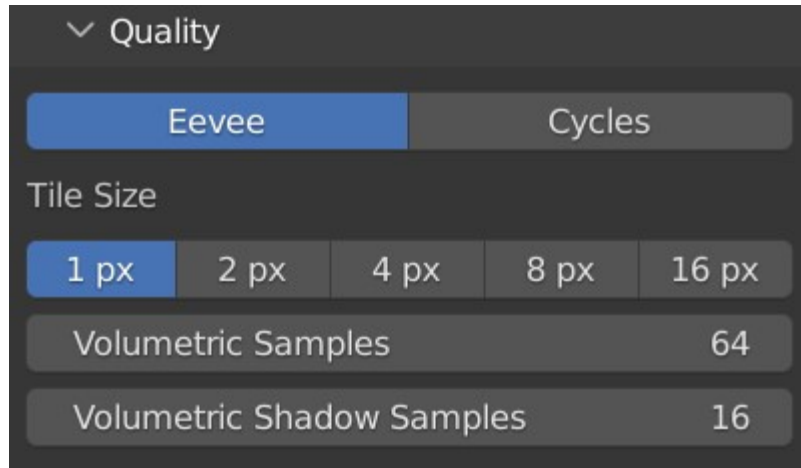
```
make
```

Note: If you re-build Blender, especially after a period of time, use the `make clean` and `make update` commands. See `make help` for further options.

7. When built, navigate to the blender executable to launch Blender. In Windows, for instance, this will be:

```
build_windows_x64_vc16_Release\bin\Release\blender.exe
```

8. You should see the 1px tile size option in the drop down options and in the Nebula Generator *Control Panel*:



2.4.4 How can I improve the Cycles render?

Tip: There are further hints and tips about which Cycles settings to change in the [Cycles Quality Settings](#) section.

2.4.4.1 Recommended settings

Key recommended settings in the are as follows:

- **Noise Threshold** is checked (turns on) and set to **0.01000**.
- **Max Samples** *Viewport:* 256 *Render:* 512
- **Denoise** is enabled at render time to remove /speckled in the final render. Use the **Optix** denoiser if you have an NVidia GPU.
- **Volume Step Rate** is set between 0.1 and 1.0 (lower settings improve thickness and quality).

Render Engine	Cycles
Feature Set	Supported
Device	GPU Compute

Sampling

Viewport

Noise Threshold ☒ 0.0100

Max Samples 256

Min Samples 0

☐ Denoise

Denoiser Automatic

Passes Albedo

Start Sample 1

Render

Noise Threshold ☒ 0.0100

Max Samples 512

Min Samples 0

Time Limit 0 sec

☒ Denoise

Denoiser OptiX

Passes Albedo and Normal

> Advanced

> Light Paths

Volumes

Step Rate Render 0.10

Viewport 0.10

Max Steps 1024

2.4.4.2 Which values to change

- The main parameter will be the **Samples** setting under the *Samples* tab of the section in Blender. This increases the number of times Cycles calculates a render pass. Increasing this setting improves the quality and detail, and it is recommended to increase this in multiples of 32 to optimise the computer's memory address size allocation (e.g. 32, 64, 128, 256, 512, 1024). Higher values will slow render times, however, which can be countered by the use of other settings such as .
- Change the threshold value tells Cycles to estimate the amount of noise/ in an image, and to stop rendering an image tile when it is of a good enough threshold. Reducing the threshold value makes Cycles more particular at identifying noise/ in an image tile.
- Enabling the **Denoiser** will attempt to remove unwanted from the image, but still needs to be used in tandem with higher *samples* settings. Note that the open source denoiser has occasionally caused crashes.

2.4.5 How can I create a panoramic skybox?

Warning: This works for Cycles only. Eevee does not have panoramic camera settings at the moment.

You are able to render a panoramic view of the nebula in mode which is useful for creating and background environments for games:

1. Make you are in rendering mode.
2. Move the camera to the center of your scene (location 0,0,0).
3. Select the camera and go to the 'Object Data Properties' tab on the right hand panel.
4. In the Lens section change the following:
 - **Type:** Panoramic
 - **Panorama Type:** Equirectangular

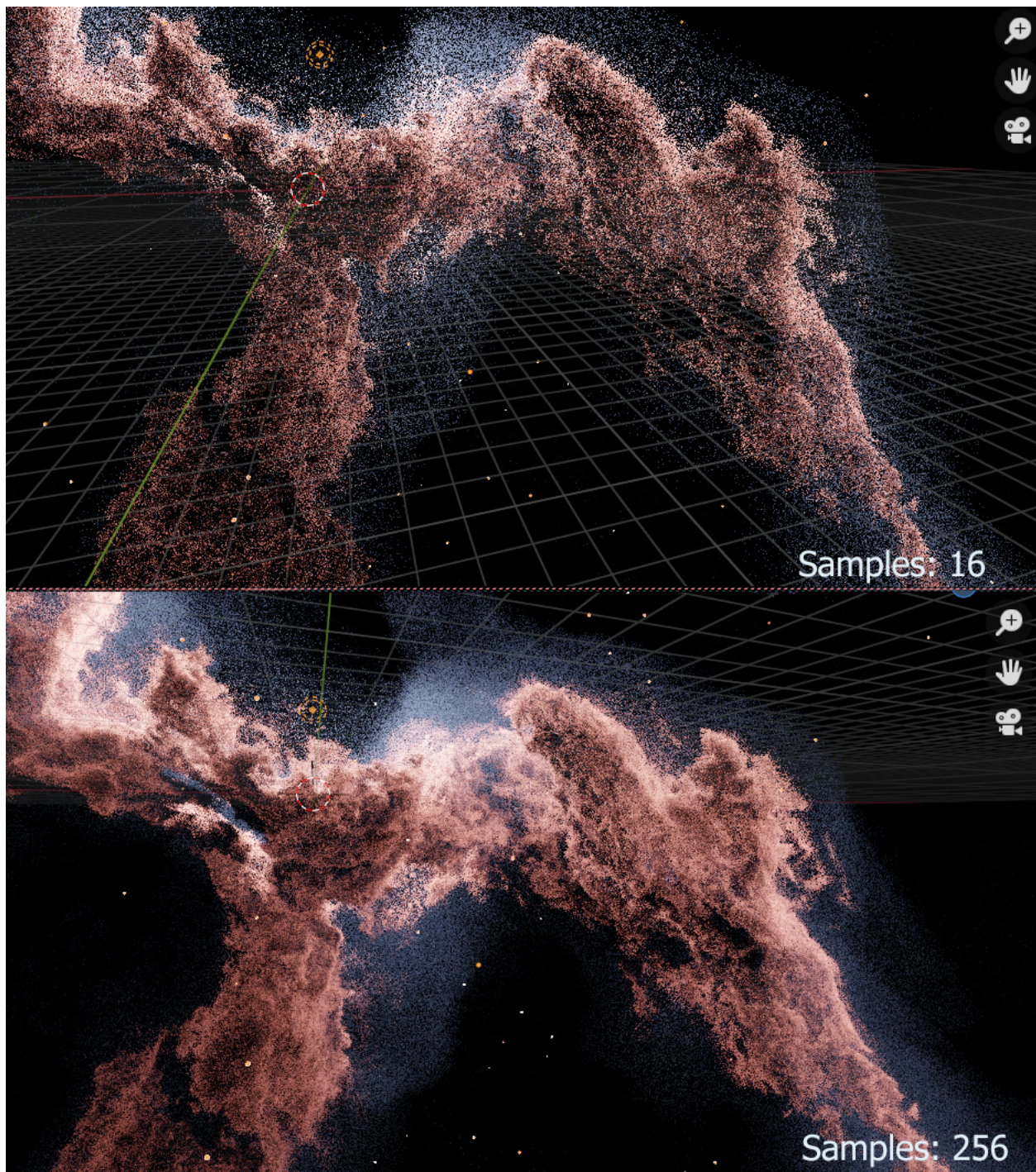


Fig. 11: Go to the the *Cycles Quality Settings* section for further hints and tips.

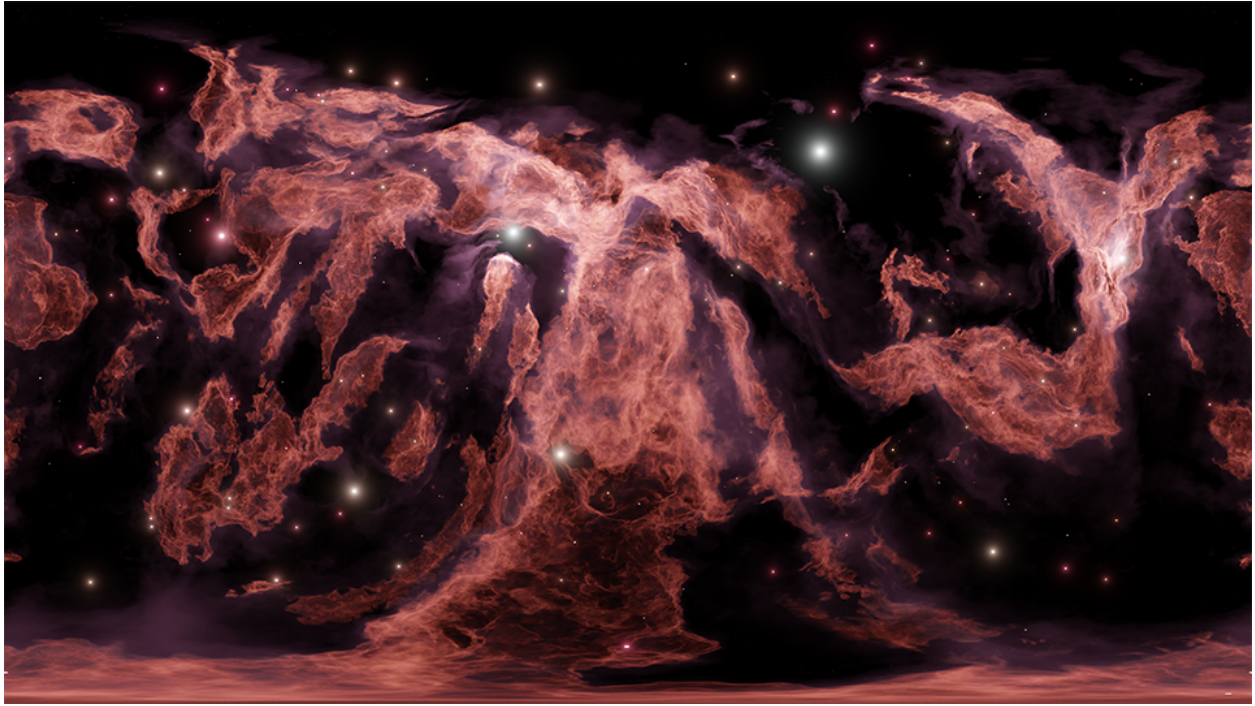
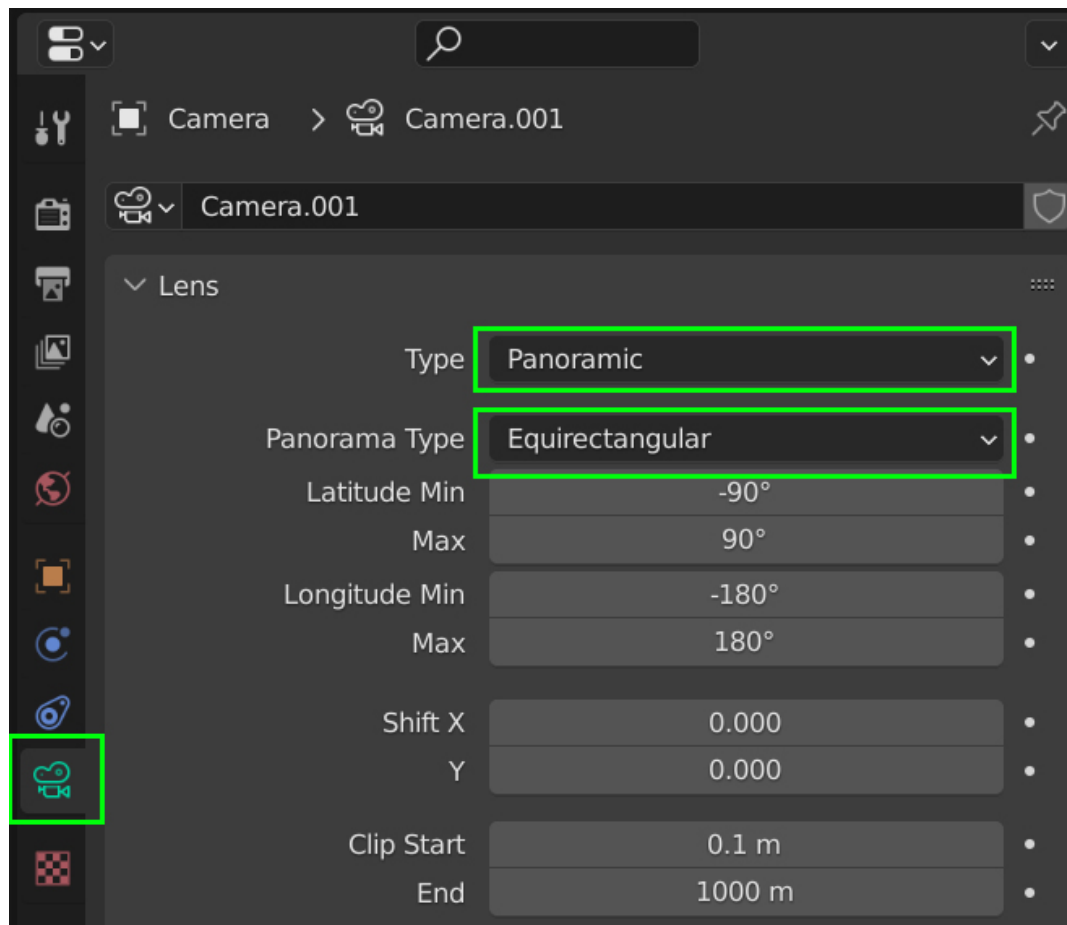
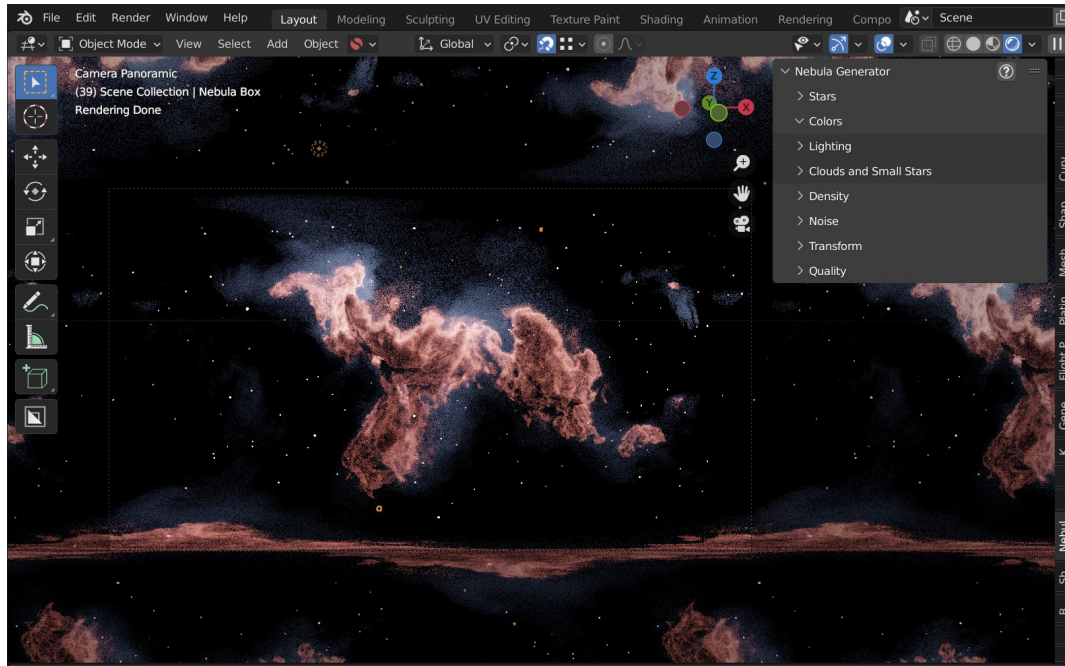


Fig. 12: Panoramic Skybox Example (Cycles Only)



5. You should now be able to view and render a panoramic view in the viewport.



Note:

As star glow is added to the image afterwards you may notice cut-off glows when the image wraps around a spherical background. You can address this by either reducing the *glare effect* or by correcting the result in an image editor.

2.5 Contact

If you have a question, issue, or new feature do not hesitate to get in touch via info@configurate.net.