

8K Earth, Moon and Mars Shaders Asset V0.3

Documentation

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1. Introduction

This asset aims to provide a simple and fast way to add quite realistic looking planets Earth, Moon and Mars in your project.

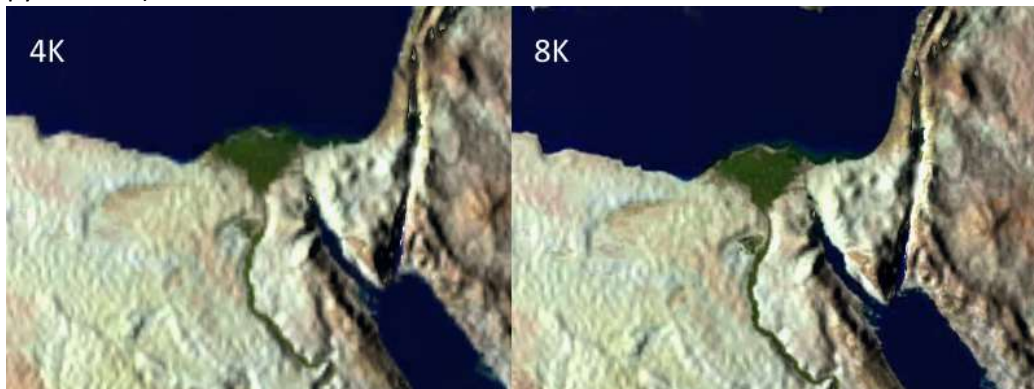
The asset contains:

- A demo scene to show how to use it.
- Shaders for the Earth surface (3 different shaders), clouds and the atmospheric outer scattering effect, Moon Surface and Mars surface.
- A high polygon sphere.
- A set of textures.
- A sunlight example.
- Scripts, mainly for the demo scene.

The 3 different shaders for the earth surface are the following:

- *earthGround* : SM3.0 shader, 4k texture, normal mapping, nightlights, inner atmospheric scattering effect.
- *earthGound8k* : SM3.0 shader, same as *earthGround* but uses 4 textures and wrap them to result in an 8k textured planet. Normal, specular and nightlight effects keep using a single texture.

Here's an example of the difference you can get on the Nile (still not enough to see the pyramids☹):



- *earthGroundSM2.0* : compared to “*earthGround*”, it loses the specular effect but is SM2.0 compatible.

2. How to Use

1. Set the scene

1. Set the scene with prefabs

First, copy all assets into your project.

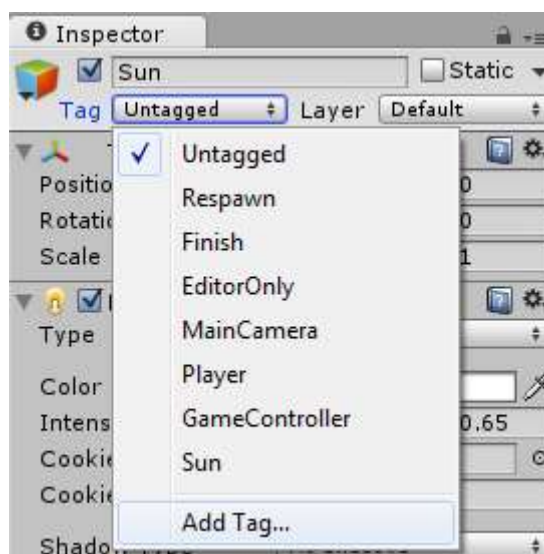
Then, if your scene doesn't contain any sun object yet (or any object that emit a light), create it.

Add a light to the Sun object (Add component > Rendering > Light), make it directional, then add a lens flare to it (one is included in "Lens Flares/" folder).

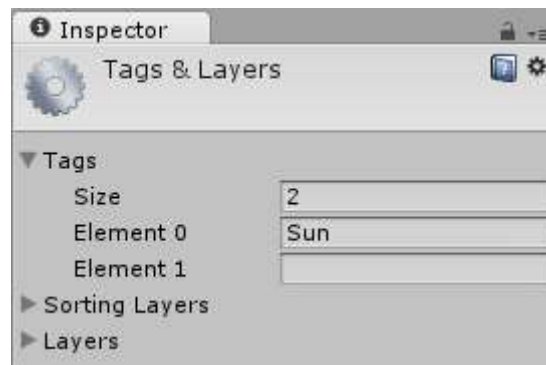


Finally, add a tag "Sun" to the sun object (or the one that emit the light). To can do it this way:

Select « Add Tag... »



Add a tag named "Sun"



And select it in the drop down list

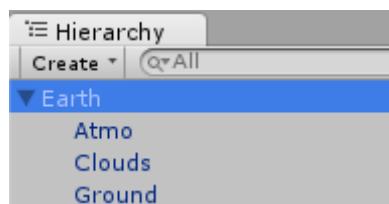


The tag have to be "Sun", this allows the planets prefabs to works without any setting, so that way you can dynamically instantiate them by code.

Now you just have to drag any of the planet prefabs to your scene. Those prefabs are contained in these folders:

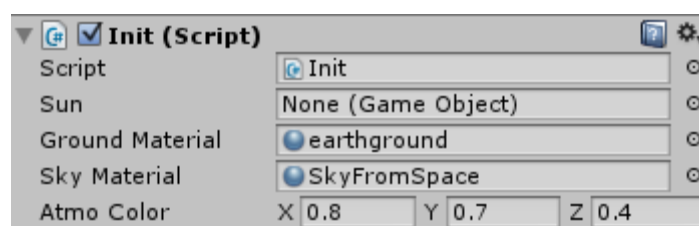
Planet/Earth/Earth.prefab
Planet/Moon/Moon.prefab
Planet/Mars/Mars.prefab

Newly added prefabs should looks like this in the hierarchy view:



Prefabs can be dragged anywhere in the hierarchy, whether on the root or inside another object.

If for some reason your Sun object can't have a tag named "Sun" on it, you can still manually assign your Sun object to the planet object by filling the **Sun** field in the Init component in the Inspector (just drag the Sun object from the hierarchy view):



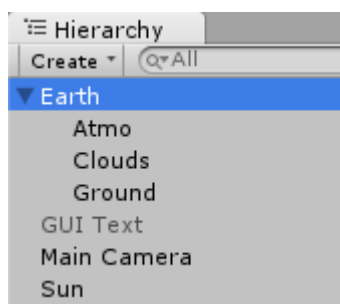
And that's it! If you want you can jump to the chapter [Outer atmospheric scattering effect](#)

2. Set the scene manually (Earth example)

If you want to set the scene manually (you may want to use spheres with less polygon for example), here's is how you can make this works:

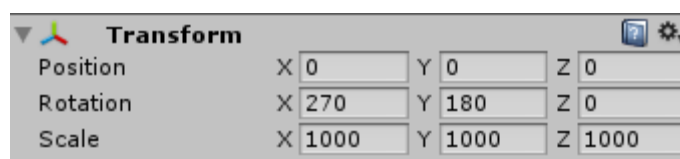
First, copy all assets into your project.

Then, to make the earth, create an empty object, and add 3 child empty object into it. Then add a sun empty object. Let's name them this way:



The GUI object is for a demo purpose, it's unnecessary here.

For floating precision sake, I would recommend you to set the "Earth" object scale to a bigger scale:



Now in inspector, add a mesh filter (Add Component > Mesh > Mesh Filter) on the 3 child objects, and select the mesh "sphere01". Then add them a mesh renderer (Add Component > Mesh > Mesh Renderer).

In mesh renderer part, add the following materials:

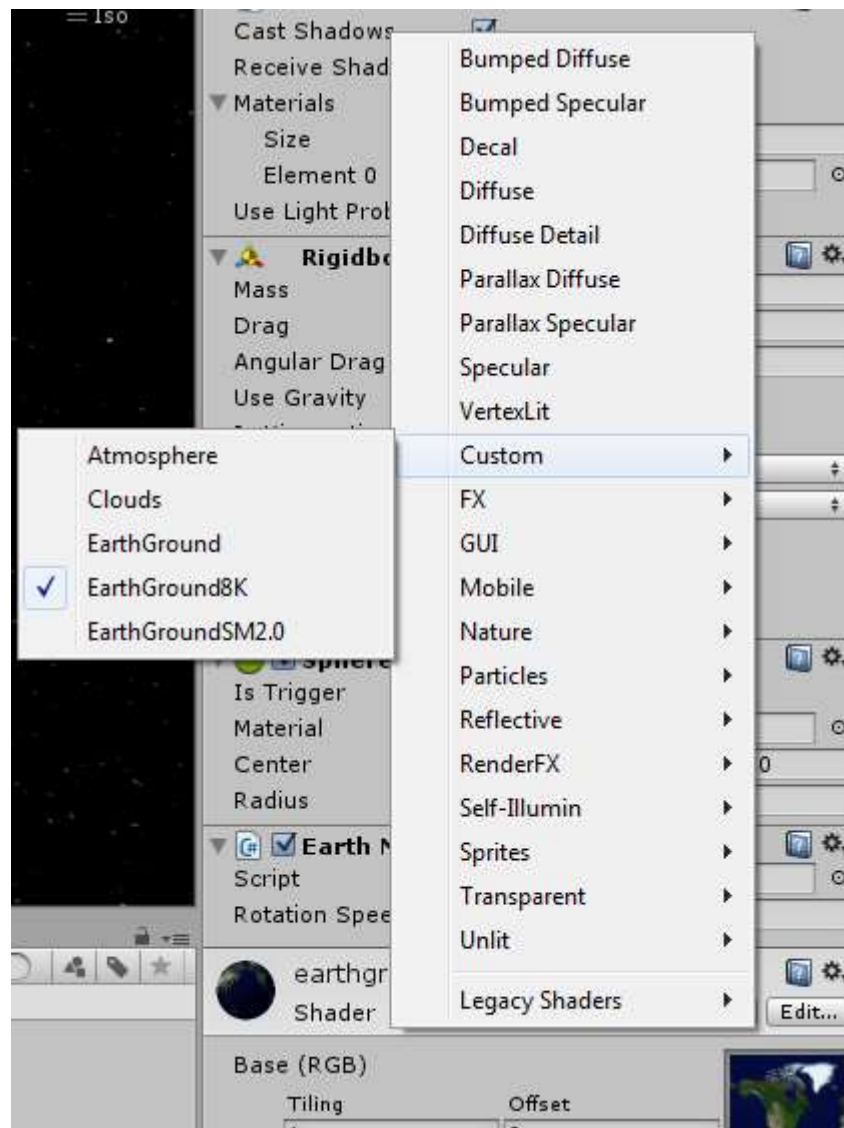
- Atmo: SkyFromSpace.mat
- Clouds: Clouds.mat
- Ground: earthground.mat

Inspector should looks like this (respectively Ground, Clouds, Atmo):

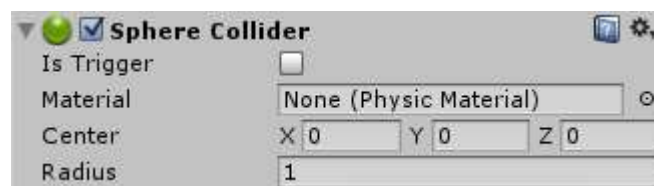


As you can notice, the "Atmo" object scale is at 1.025, it's important for the atmospheric effect, the sphere has to be 2.5% bigger, so you have to change these values to exactly 1.025 too.

Materials should already be linked to the right shaders, but if they don't (that happens), you'll find them there:



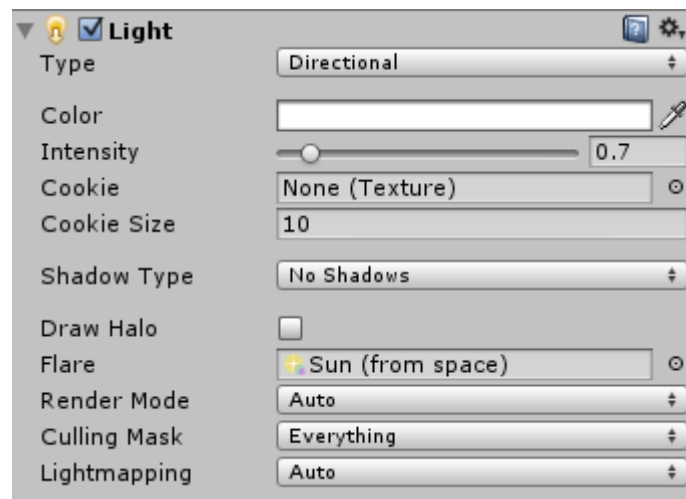
Now, select the “Ground” object and add a sphere collider to it (Add Component > Physics > sphere collider). The default values should be good:



The purpose of this is, in addition to do add a collider, to hide the lens flare of the light when it is behind the planet.

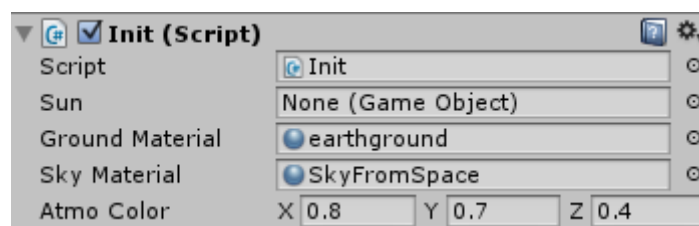
You may also ask why not use the mesh collider using the previous high polygon sphere, it'll work but it would be a waste of resources, the default sphere seems sufficient for the most of purpose.

Finally, add a light to the Sun object (Add component > Rendering > Light), make it directional, then add a lens flare to it (one is included in “Lens Flares/” folder).



2. Outer atmospheric scattering effect

Attach the script named “Init.cs” (located in “Scripts/” folder) to the “Earth” object (Drag and drop it to the inspector, or in the inspector do Add Component > Scripts > Init. Then, fill the empty fields as follow:



Sun: the sun object where the light is attached

Ground Material: the material that is used for your “Ground” object.

Sky Material: the material used for your “Atmo” object.

The “*Atmo Color*” parameters allow you to play with the color and aspect of the atmosphere.

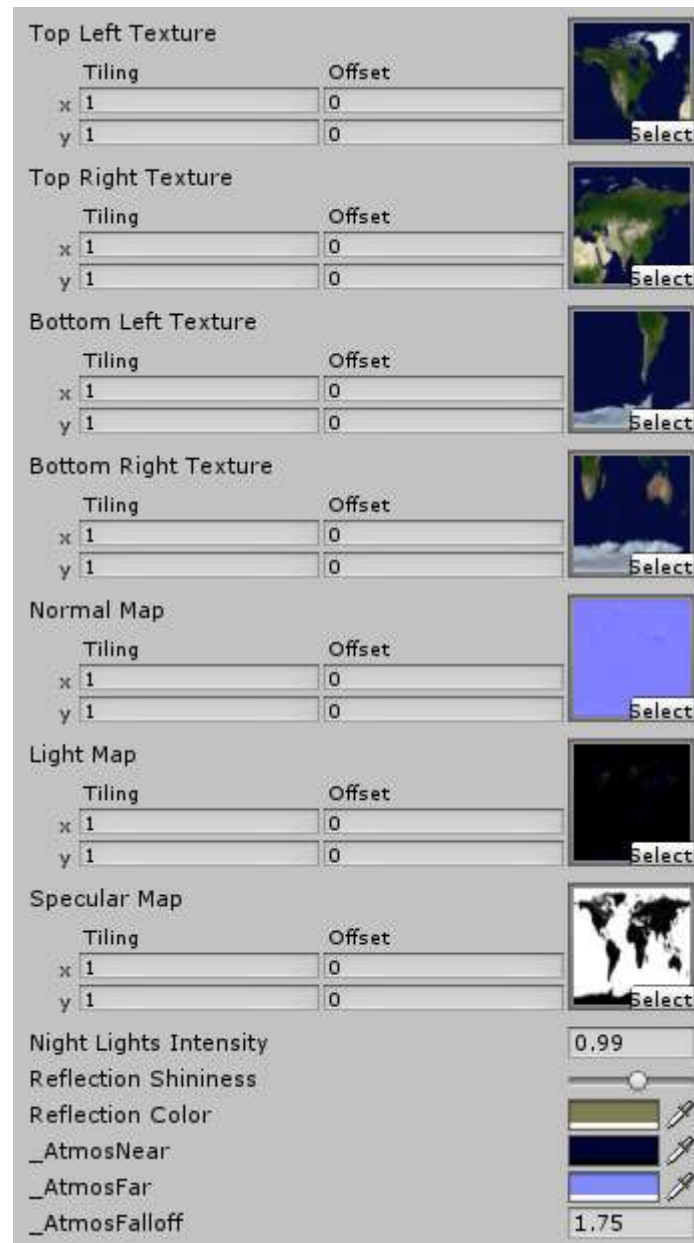
Be warned, the atmospheric effect doesn’t appear in the editor view (or barely appears but looks like crap), you have to run the scene to see it. So you should play with the value while the scene is running to see effects. Examples:



3. Surface materials shaders

1. earthGround8K

This 8K shader looks like this in inspector:



As you can see, the main texture is divided in 4 parts. In this way we can have like an 8K texture on the sphere. Downward, you must attach your 4 texture parts like this:

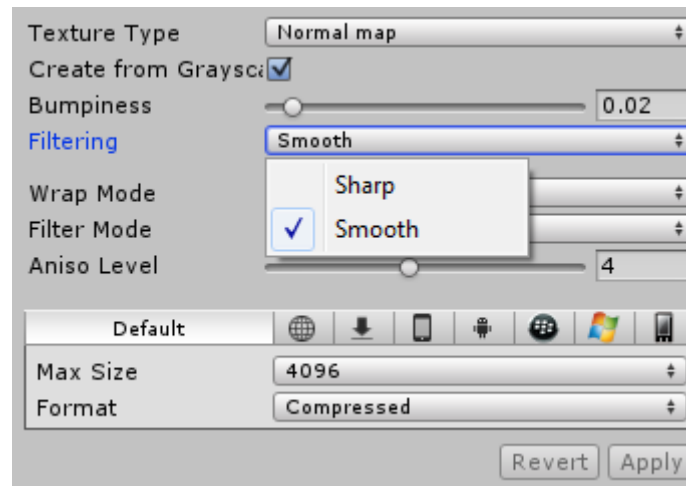
Top Left Texture: put here the upper left part of your 8K texture

Top Right Texture: put here the upper right part of your 8K texture

Bottom Left Texture: put here the lower left part of your 8K texture

Bottom Right Texture: put here the lower right part of your 8K texture

Normal Map: the normal map texture to add a relief (bump mapping) effect. I would suggest you to use a grayscale texture (the gray ones) rather than an already “normal mapped” texture (the pink ones). So that when you select the texture, in the inspector you can play with sharpness and bumpiness of the effect:



Light Map: the illuminating texture that allow the city light to be shown on the dark side of the earth.

Specular Map: the specular map texture to set the sun reflection area (water here)

Night Light Intensity: set here the intensity of the night lights.

Reflection Shininess: set here the diffusion of the sun reflection on the water. Higher = less diffusion.

Reflection Color: set here the color of the reflection. By playing with the darkness of the color, you can play with the intensity of the reflection.



The next 3 parameters affect the atmospheric scattering gradient effect on the surface of the earth.

_AtmosNear: inner gradient color tint.

_AtmosFar: outer gradient color tint.

_AtmosFalloff: set here the thickness of the gradient. Lower value means a thinner atmospherer gradient ring.

If you want to use your own 8K texture, please note that you have to set their “wrap mode” on “clamp” (default is “repeat”)

2. earthGround

It's the same as earthGround8K, but using a single main texture. You may want to use it if the 8K Shader is too demanding.

3. earthGroundSM2.0

This shader is here to ensure a shader model 2.0 compatibility for directX9.0 GPU, as the 2 previous shaders are compatible with DirectX 9.0c GPU only.

It's globally the same as earthGround, but without specular map (arbitrary choice, I think the specular mapping is less important as other effects).

4. 8k_normal_scattering

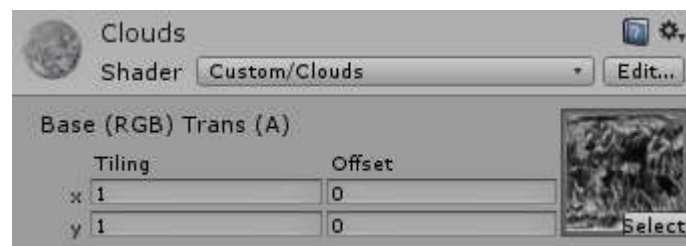
This shader used for the Mars surface, is basically a simplified version the “earthGround8K” shader, since it doesn't have nightlight and specular effects.

5. 8k_normal

This shader, used for the Moon surface is even simpler as it doesn't have atmospheric scattering effect.

4. Cloud material shader

This shader looks like this in inspector:



Well, just choose your cloud texture here.

Just be sure that the texture have “alpha from grayscale” checked.

5. Demo Scripts

Except the atmospheric script `Init.cs`, all other script are here for a demo purpose, they aren't necessary in your project. But still, here is a short summary of them:

- `CameraZoom.cs`: Allow to zoom-in and zoom-out using the scroll wheel. Attach it to the camera.
- `EarthMovement.cs`: Allow any rigidbody to automatically rotate. You can attach it on either "Ground" or "Clouds" objects, but be sure they do have a rigidbody attached.
- `RotateEarth.cs`: Allow users to rotate a planet with the right mouse button or the arrow keys. Attach it to any planet object.
- `RotateSun.cs`: Allow users to rotate the sun light with the left mouse button or the Q-D keys. Attach it to the "Sun" object.
- `GUI.cs`: This script allow to browse the different planets using buttons in the demo scene. You can see in it how to dynamically instantiate the planets.

3. Credits

Cloud and ground shaders are based on the work of Fragile Earth Studios:

<http://fragileearthstudios.com/2012/07/03/code-snippets-realistic-earth-and-clouds-shader/>

The atmospheric scatter shader is a part of “scrawk” work that you can find here:

<http://scrawkblog.com/2013/04/13/gpu-gems-to-unity-atmospheric-scattering/>

Earth textures came from NASA, have been modified to render better within the scene, but you’ll find originals here:

Earth surface : <http://visibleearth.nasa.gov/view.php?id=57752>

Night lights : <http://visibleearth.nasa.gov/view.php?id=55167>

Clouds : <http://visibleearth.nasa.gov/view.php?id=57747>

Normal map : <http://visibleearth.nasa.gov/view.php?id=73934>

Specular map : <http://www.shadedrelief.com/natural3/pages/extra.html>

Moon and Mars texture can be found on the Celestia Motherlode website:

Mars textures: <http://www.celestiamotherlode.net/catalog/mars.php>

Moon textures: <http://www.celestiamotherlode.net/catalog/moon.php>

Skymap textures uses a photograph from the European Southern Observatory (ESO) / S. Brunier :

[http://commons.wikimedia.org/wiki/File:ESO - The Milky Way panorama \(by\).jpg](http://commons.wikimedia.org/wiki/File:ESO_-_The_Milky_Way_panorama_(by).jpg)