EVRTH Getting Started

About:

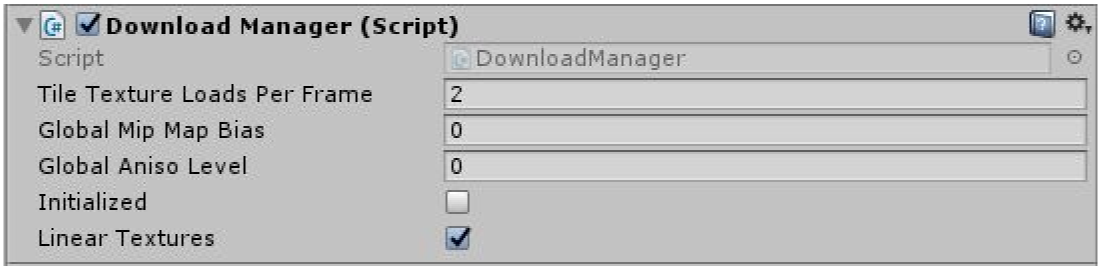
Using several orbiting instrument datasets, EVRTH allows users to engage with scientific data layers across different intervals in VR. This README covers a quickstart, core components and development demos to getting started with EVRTH in Unity.

Quickstart:

1) Import the EVRTH package into a new project.
2) Open the Story scene in Assets->EVRTH->Scenes
3) Make sure that VR is enabled, or move the Camera so that you have a good view.
4) Play to view an example of one of the many ways that EVRTH can be used.

Core Components:

Core components are located on the Globe prefab, and should be preconfigured for the most part. There will be a brief overview of these components but they functioning is beyond the scope of a getting started document.

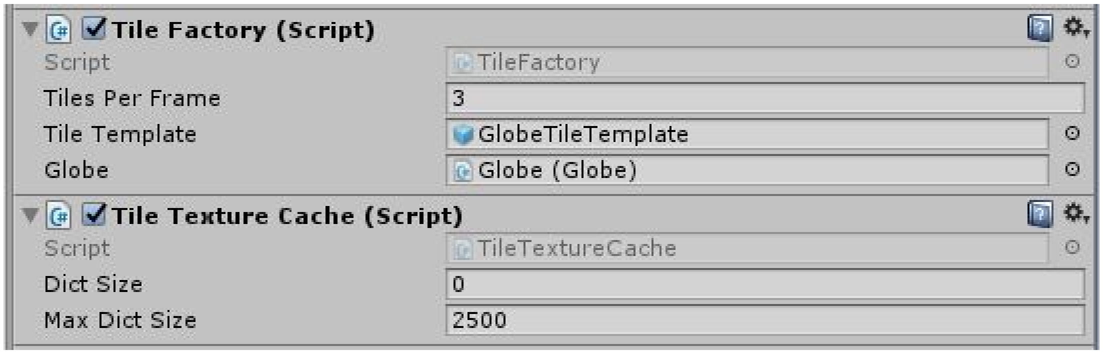


Download Manager (Script)

Script	DownloadManager
Tile Texture Loads Per Frame	2
Global Mip Map Bias	0
Global Aniso Level	0
Initialized	□
Linear Textures	☑

Download Manager:

This handles all of the downloading and loading of tile images in the background. It also spawns a Swarm Download Manager. Settings are fairly self-explanatory and you can play with the loads per frame depending on the speed of your machine.



Tile Factory (Script)

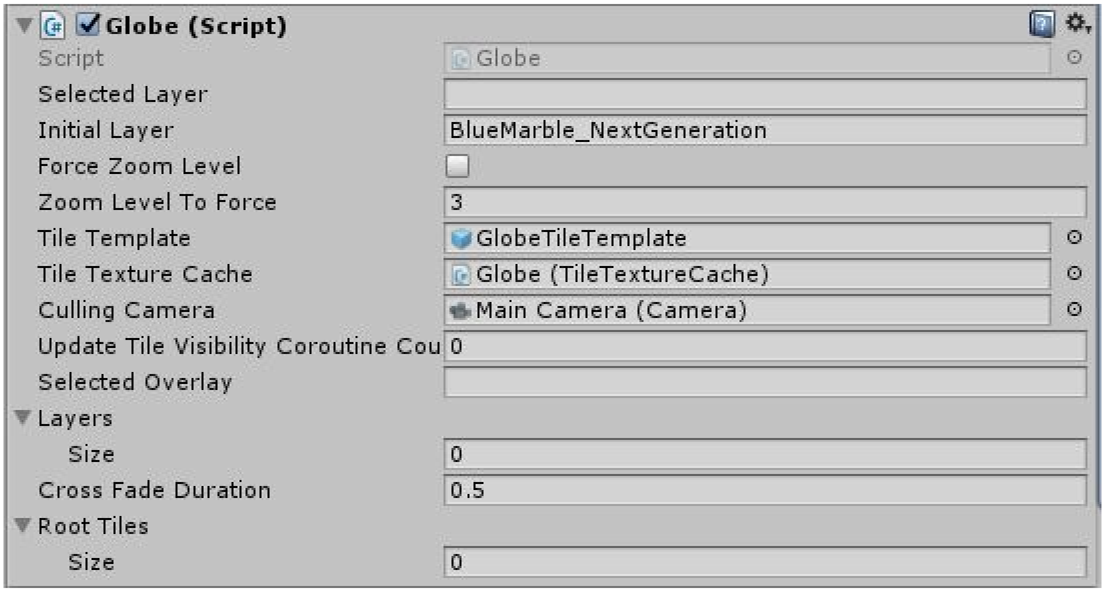
Script	TileFactory
Tiles Per Frame	3
Tile Template	GlobeTileTemplate
Globe	Globe (Globe)

Tile Texture Cache (Script)

Script	TileTextureCache
Dict Size	0
Max Dict Size	2500

Tile Factory and Tile Cache:

The Tile Factory and Tile Cache work in tandem to hold all of the tile textures loaded in the background. The tiles are stored and sorted so that they can be quickly retrieved when animating between layers, or between dates on the same layer. They also support the dynamic LOD system.The tiles per frame is again something you can play with depending on the speed of your machine.

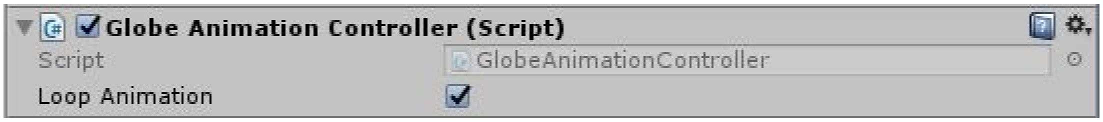


☑ **Globe (Script)**

Script	Globe
Selected Layer	
Initial Layer	BlueMarble_NextGeneration
Force Zoom Level	□
Zoom Level To Force	3
Tile Template	GlobeTileTemplate
Tile Texture Cache	Globe (TileTextureCache)
Culling Camera	Main Camera (Camera)
Update Tile Visibility Coroutine Cou	0
Selected Overlay	
Layers	
Size	0
Cross Fade Duration	0.5
Root Tiles	
Size	0

Globe:

The globe component creates and manages the globe visualization as well as dynamic LOD.

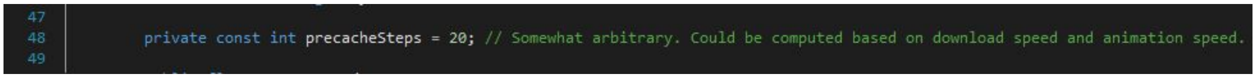


☑ **Globe Animation Controller (Script)**

Script	GlobeAnimationController
Loop Animation	☑

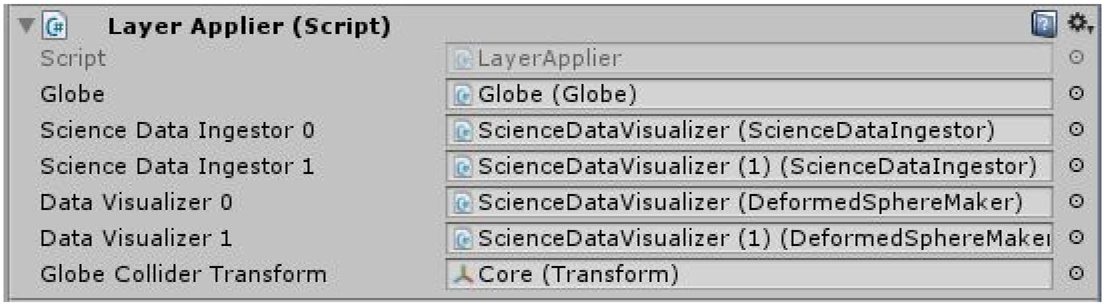
Globe Animation Controller:

The globe animation controller has no public configuration other than if you want the animations to loop. In the code there is one important configuration :



```
        private const int precacheSteps = 20; // Somewhat arbitrary. Could be computed based on download speed and animation speed.
```

This const should always be lower than the number of days that your animation runs for, or it will never run. It should also be around 2/3rds of the total length of the animation otherwise you will most likely get hung up buffering during playback.

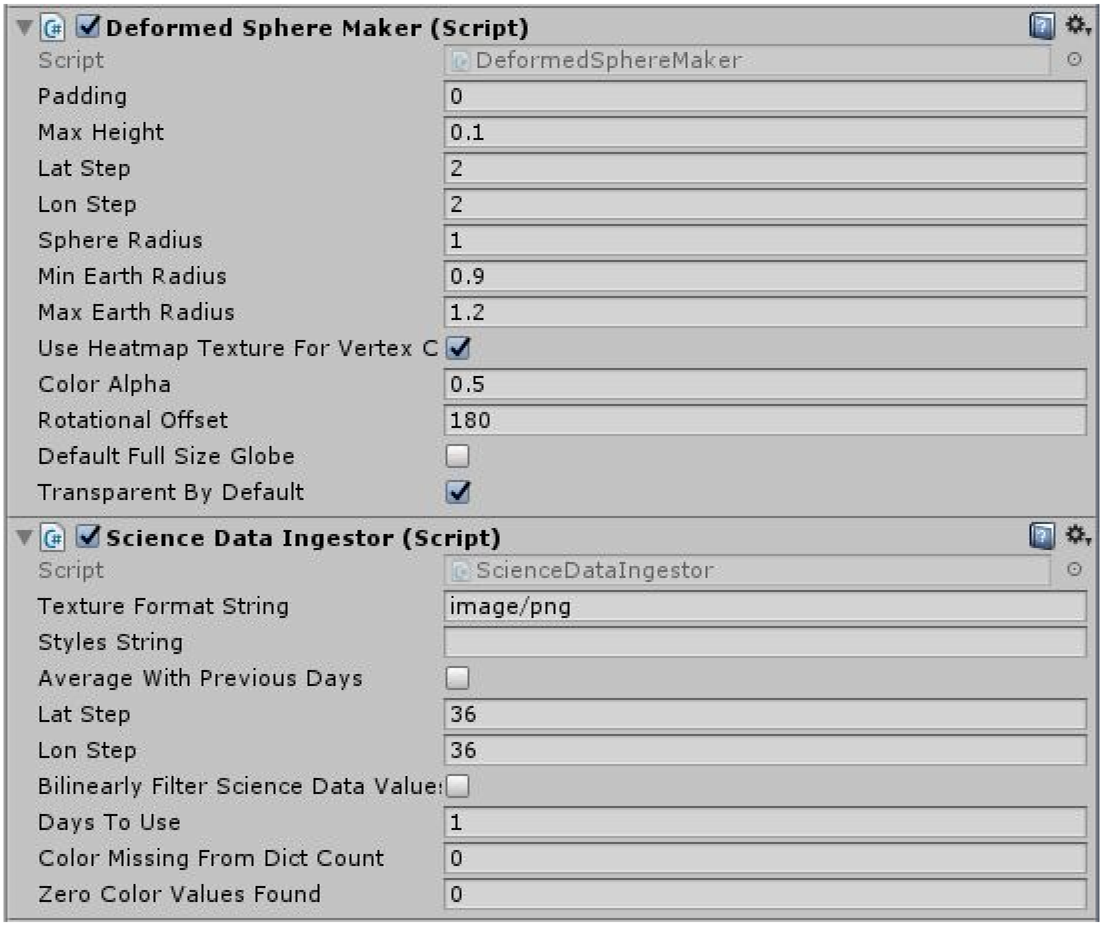


Layer Applier (Script)

Script	LayerApplier
Globe	Globe (Globe)
Science Data Ingestor 0	ScienceDataVisualizer (ScienceDataIngestor)
Science Data Ingestor 1	ScienceDataVisualizer (1) (ScienceDataIngestor)
Data Visualizer 0	ScienceDataVisualizer (DeformedSphereMaker)
Data Visualizer 1	ScienceDataVisualizer (1) (DeformedSphereMaker
Globe Collider Transform	Core (Transform)

Layer Applier:

The layer applier links the various data sources and controls to the globe. It handles applying GIBS data layers to the globe in either flat or volumetric visualizations. It must be linked to the globe as well as the volumetric visualizers with their ingestors.



☑ **Deformed Sphere Maker (Script)**

Script	DeformedSphereMaker
Padding	0
Max Height	0.1
Lat Step	2
Lon Step	2
Sphere Radius	1
Min Earth Radius	0.9
Max Earth Radius	1.2
Use Heatmap Texture For Vertex C	☑
Color Alpha	0.5
Rotational Offset	180
Default Full Size Globe	□
Transparent By Default	☑

☑ **Science Data Ingestor (Script)**

Script	ScienceDataIngestor
Texture Format String	image/png
Styles String	
Average With Previous Days	□
Lat Step	36
Lon Step	36
Bilinearly Filter Science Data Value:	□
Days To Use	1
Color Missing From Dict Count	0
Zero Color Values Found	0

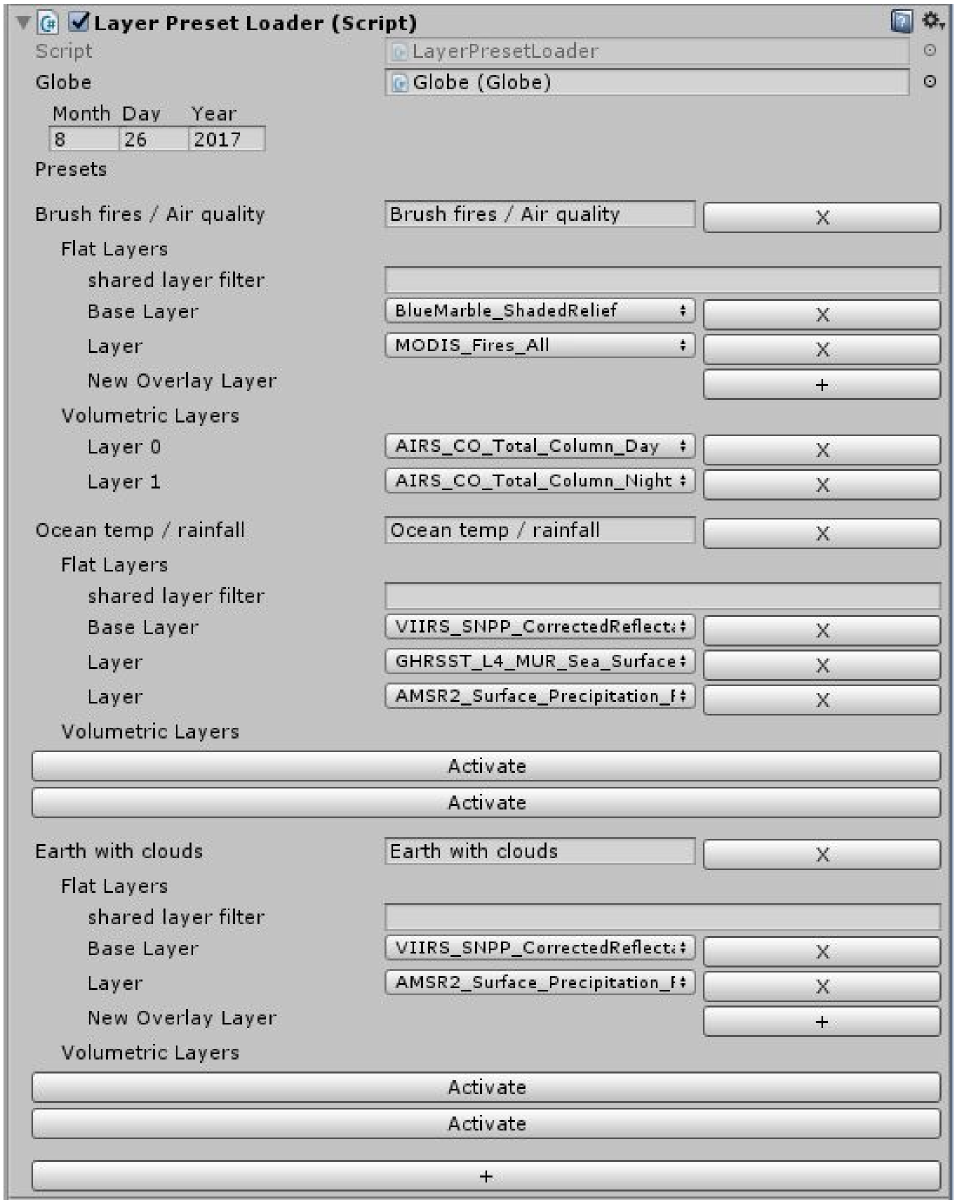
Deformed Sphere Maker and Science Data Ingestor:

These two components work together to create the volumetric visualization. The science data ingestor takes in a png of GIBS data and then turns that into offsets that the deformed sphere maker uses to move vertices on a sphere. They were left as separate classes so that new types of visualizations can be made. In order to make new visualizations one should examine the structure of the deformed sphere maker as well as its base class.

Dev Demos:

LoadingLayers_Presets

This demo introduces the “Layer Preset Loader” which is a key component in the more high level portion of the EVRTH sdk.

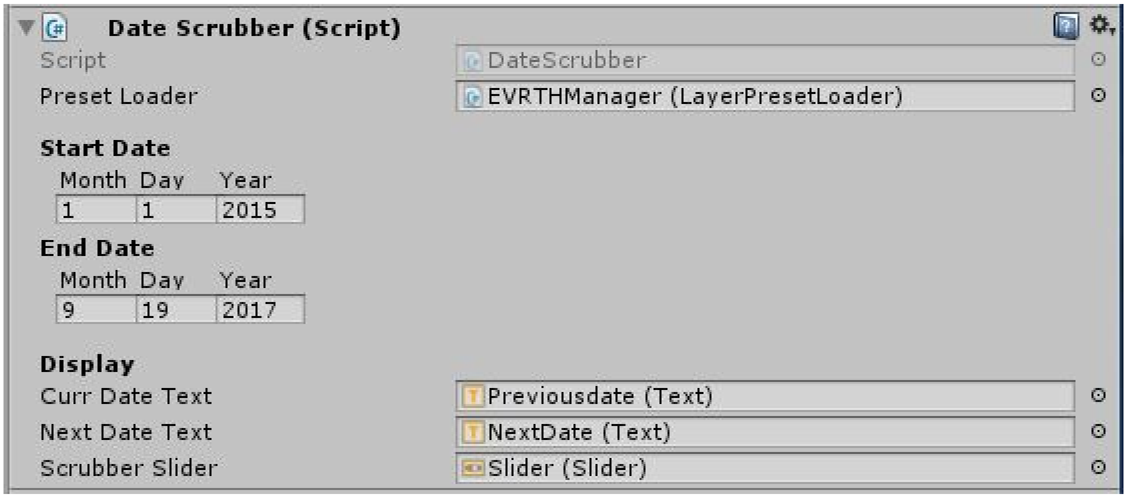


```
Layer Preset Loader (Script)
Script                        LayerPresetLoader
Globe                         Globe (Globe)
  Month  Day   Year
  8      26    2017
Presets

Brush fires / Air quality     Brush fires / Air quality
  Flat Layers
    shared layer filter
    Base Layer                BlueMarble_ShadedRelief
    Layer                     MODIS_Fires_All
    New Overlay Layer
  Volumetric Layers
    Layer 0                   AIRS_CO_Total_Column_Day
    Layer 1                   AIRS_CO_Total_Column_Night

Ocean temp / rainfall         Ocean temp / rainfall
  Flat Layers
    shared layer filter
    Base Layer                VIIRS_SNPP_CorrectedReflect:
    Layer                     GHRSST_L4_MUR_Sea_Surface
    Layer                     AMSR2_Surface_Precipitation_I
  Volumetric Layers

Earth with clouds             Earth with clouds
  Flat Layers
    shared layer filter
    Base Layer                VIIRS_SNPP_CorrectedReflect:
    Layer                     AMSR2_Surface_Precipitation_I
    New Overlay Layer
  Volumetric Layers
```

Most of the high-level demos are built utilizing the Layer Preset Loader. It lets you create a number of presets addressing all of the available layers on the default globe. It also allows you to filter the large list of available data. To preview the data layers without taking the time in Unity, or for a more curated experience, check out https://worldview.earthdata.nasa.gov/ (which is a web representation of much of the same GIBS data). There is some data present on the web version that is not available in EVRTH, so take that into consideration when using the web representation to pick out collections of layers. The web version is also a good way to check if specific dates are available. Once there are presets built in the preset loader they can be loaded by calling ApplyPreset(int) and passing the number of the preset you would like to load. Examining the preset loader would be a good jumping off point for the creation of custom ways to interact with the more low level EVRTH API.

Loading Dates

This scene introduces the Date Scrubber component which provides simple functionality to "scrub" through dates and then apply the layer preset you have defined in the preset loader to the globe at the date specified by the Date Scrubber.



Date Scrubber (Script)

Script: DateScrubber

Preset Loader: EVRTHManager (LayerPresetLoader)

Start Date

Month	Day	Year
1	1	2015

End Date

Month	Day	Year
9	19	2017

Display

Curr Date Text: Previousdate (Text)

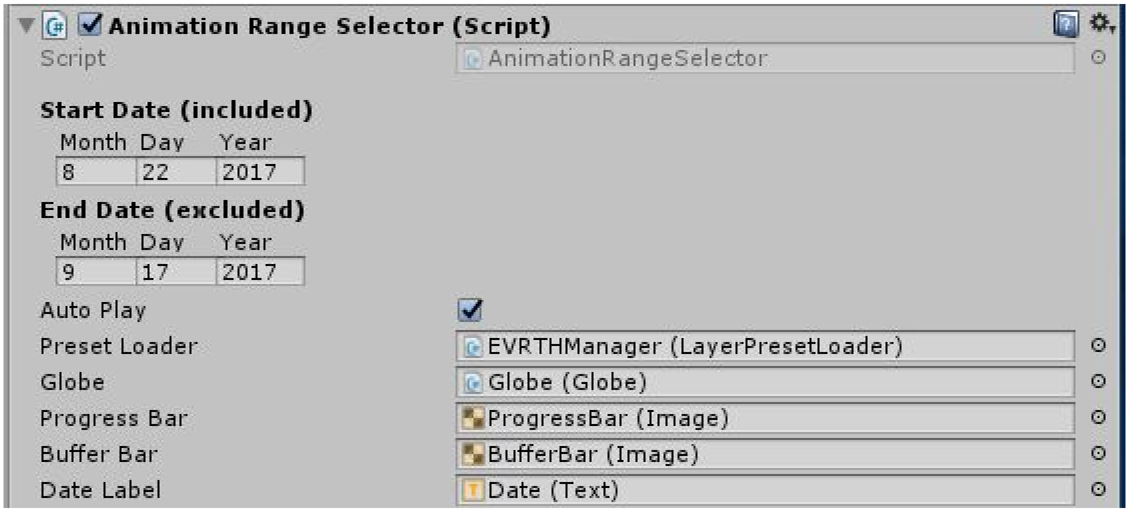
Next Date Text: NextDate (Text)

Scrubber Slider: Slider (Slider)

This is similar to the time bar at the bottom of the worldview web page and functionality like the button adjustable date could also easily be achieved with this component. The date fields will try to not let you pick unavailable dates, but they do not currently handle leap years and simply count Feburary as having 29 days. It is also possible to pick dates in the future, as only the year is limited to prevent this.

Animating Layers

This scene introduces the Animation Range Selector which simply wraps the Globe Animation Controller providing an easy to use inspector, linking to the preset loader, and some buffer/progress bar functionality. It also makes it easy to animate an entire preset of flat layers. One could follow the flat layer pattern to extend this to animating volumetric layers as well.



☑ **Animation Range Selector (Script)**

Script: AnimationRangeSelector

Start Date (included)

Month	Day	Year
8	22	2017

End Date (excluded)

Month	Day	Year
9	17	2017

Auto Play ☑

Preset Loader: EVRTHManager (LayerPresetLoader)

Globe: Globe (Globe)

Progress Bar: ProgressBar (Image)

Buffer Bar: BufferBar (Image)

Date Label: Date (Text)

The only oddity to note is that the end date is excluded from the animation, so in the example the last day that will be in the animation is 9/16/17. The start date is included in the animation.

The animation range selector also handles things like setting the number of steps in the animation as well as giving you the option to autoplay an animation. The autoplay will take 10 seconds before attempting to start, but the number of buffered steps will also have to meet the pre-cache requirements from the Globe Animation Controller before it will actually play. The buffer will start filling after 1 second. If the animation is looping then it should be noted that the animation will continue to refine to higher resolution while the animation plays.