Recording Meteor Showers

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Abstract

Meteor Showers are referred as a cosmic light show caused by debris from comets or asteroids. They are also known as shooting stars or fireballs and definitely one of the best event to see in the night sky. They happen really fast, looking at the right place in the sky is important to be able to see them. For this project I used some basic equipment that allow to attempt capturing meteor showers from different places. To capture meteors there is no need for sophisticated tools, with a camera and tripod is enough. Clear skies are crucial and if the moon is new or waxing crescent is even better because there is less interference to have good views. Recording meteor showers is a learning process to create new attempts to capture them as it was my case that I explain in detail through the paper.

1 Introduction

1.1 Meteor Showers

Meteor Showers are a special celestial event that has been witnessed by humans since a long time ago, in which several meteors, fireballs or shooting stars as many people relates to, radiate at high velocity from one point in the night sky. They are caused by streams of cosmic debris called meteoroids. Important reminder: when a meteor survives through the Earth's atmosphere and hits the surface is called meteorite. Normally the meteors coming from the meteor shower do not survive and they just become visible for certain seconds in the night sky. This event occurs when the Earth passes through a region having a greater than usual concentration of intern planetary debris. When comets come around the Sun, the dust they emit gradually spends into a dusty trail around their orbits. Every year the Earth passes through these debris trails, which allows the bits to collide with out atmosphere where they disintegrate to create fiery and colorful streaks in the sky (REFERENCE). Most meteors are smaller than a grain of sand, so almost all of them disintegrate and never hit the Earth's surface. Some meteors can appear very bright. If they are brighter than Venus (about magnitude -5), they are called fireballs [7]. Meteor storms which is an event bigger than the meteor showers, may produce greater than 1,000 meteors per hour. For this paper, there is going to be some interesting Facts about the meteor showers happening during the Fall season, and then how I tried to capture these event and what was the equipment.

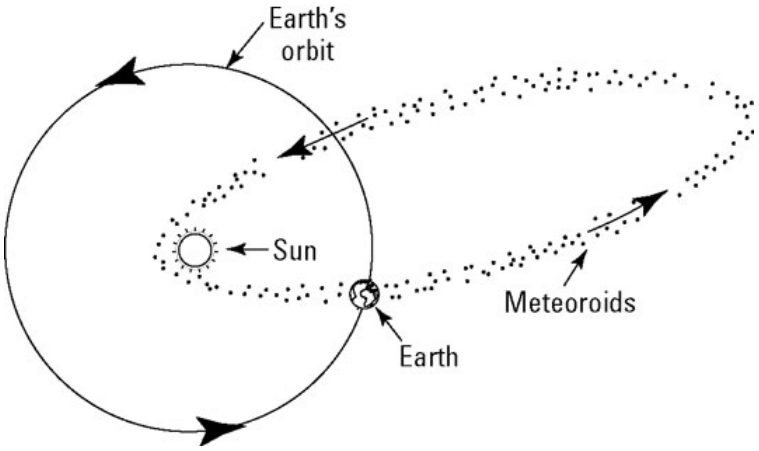

Figure 1: Earth's path crossing a belt of meteoroids creates a shower of meteors.

Figure 1 represents how the meteors are orbiting around and when the Earth passes through that belt is when meteor showers happen. The direction in space or place on the sky where a meteor shower seems to come from is called the radiant.

2 Fall Season

2.1 Perseids

The most popular meteor shower is the Perseids, which , at its peak, produces as many as 80 meteors per hour. The perseids get their name because they are mainly coming from the constellation Perseus, the Hero. They are active every year from mid July to late August. Instead of being in fall they are more towards the end of summer, but I still including it because August is when the Fall semester starts. Every year around August 12, the Earth passes through the core of a dust cloud originating from comet 109P/Swift-Tuttle, a Halley-type comet discovered in 1862 [4].The Perseid meteor shower has been persistently active with a similar annual rate and only minor yearly variations [4]. The stability of the cometary orbit is indicated by the fact that, over the last 2700 years, parameters such as the eccentricity, the argument of perihelion, the longitude of the ascending node and the inclination have only varied randomly by 0.28, 0.47, 0.51, and 0.57 per cent respectively [2].

Figure 2: This figure shows the radiant point where the perseids most likely come from.

2.2 Draconids

They are named after the constellation Draco, the Dragon. The draconids are best viewed after sunset in an area with a clear dark sky. It produced large meteors storms in 1933 and 1946 and strong outbursts in a number of other years [1]. This event occurs during October 6^{th} to October 10^{th} or it can vary depending on the year, but is usually a short term shower.

Figure 3: This diagram shows the Draco constellation, highlighting the radiant point where the draconids are visible.

2.3 Orionids

The Orionid meteor shower is one of the two meteor showers associated with comet 1/P Halley. The Orionid shower typically produce faint meteors while the fraction of fireballs is small as compared with other meteor showers [6]. They are active every year from September 26^{th} to November 22^{nd}, and its peak occurs around October 20-21. The best time to watch

the orionids is after midnight until early in the morning , when Orion is up high in the sky, and of course, have a nice clear sky.

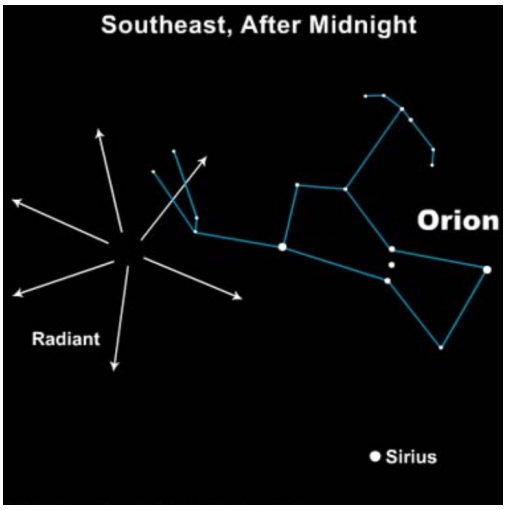

Figure 4: This diagram shows the Orion constellation pointing where the radiant is, close to Betelgeuse.

2.4 Leonids

The Leonid meteor shower is the last one to be happening during Fall season, the next one would be the Geminids which is going more towards December. The activity of the Leonid meteor shower strongly depends on its parent comet [3]. The comet 55P/Tempel Tuttle passed thorugh the perihelion in 1998 annd subsequently strong meteor storms ocurred in 1998 to 2002 [5]. They are active between November 3^{rd} and December 2^{nd}. Its peak occurs around November 17-18, producing 15 meteors per hour. It is considered one of the fastest meteors, going at 44 miles per second.

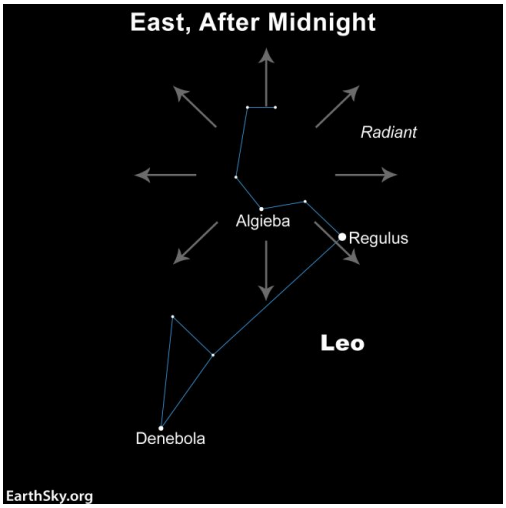

Figure 5: This figure shows the Leo constellation, close to the star Algieba there is the radian point for the Leonids.

3 Methods

3.1 Equipment

For this project which was focused on capturing meteor shower I used a basic equipment: my personal phone, IPhone 13 pro, a regular tripod, and then I use two important apps that make this project possible. I used Nightcap Camera to capture meteors, and I used the Photo Pills app to predict when the meteor shower were going to happen and what was the rate of meteors per hours. The tripod is essential for this types of experiments because stability is one of the main keys to succeed. Having an unstable image or if camera is moving during taking the image, then the results are not going to be as accurate as possible. The tripod gives stability and also allow me to let my phone stand recording outside without the need of me being there.

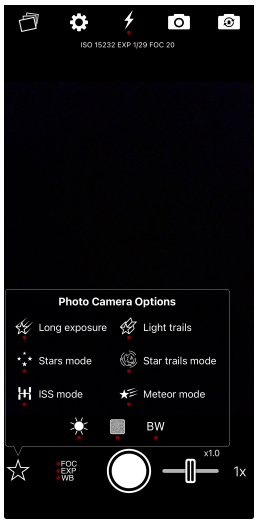

Figure 6: This picture shows the different options the Nightcap app provides.

By the menu of camera options from figure 6, I could click on the meteor showers mode and let my phone do the rest. The camera would take a picture every 10 seconds but that could be changed by going into the settings tab.

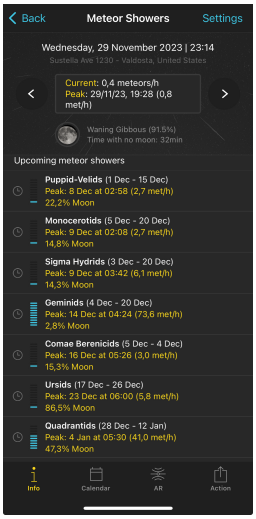

Figure 7: This screenshot shows inside of meteor shower mode from the Photo Pills app.

The meteor shower menu showed in figure 7 explains with detail the rate of meteors per hour every meteor shower will have. One interesting thing I noticed was the many diverse names od meteor showers. I did not know many of them until I started using the app.

4 Successful Attempt

I tried to record the Draconids, Orionids, and Leonids but my only really successful attempt was for the Draconids. On October 8^{th} I went to Stephen C. Foster Park because there is no light pollution at all and is also being recommended but many people that has been there and the views at night are just amazing.

Figure 8: Draconid captured in October 8^{th}, 2023 at Stephen C. Foster Park, Georgia.

An interesting thing about the meteor captured from figure 8, is that the meteor did not come specifically from the Draco constellation. The meteor was coming more from the South side rather than the east part where the Draco constellation was raising. It also make me think that sometimes is just looking at the right place at the right moment to be able to capture the meteors. For the Orionids I could not capture any but I did see some of them but unfortunately my camera was no pointing at the right place. I did make nice observations about the Orion constellation that day. Then for the Leonids, which its peak was happening between November 17-18, I woke up early in the morning around 4:30 am to watch them but I was unlucky and the sky was covered by clouds. I did not give up that day and I found a streaming from Asahi Astro Live channel in Youtube. I watched for around 45 minutes and I was able to capture 4 meteors and make clips about them. They can be visible in my power point presentation for this project.

5 Conclusions

Watching meteor showers sometimes is just being lucky and looking at the right place in the perfect time. Studying that they are coming from debris and most of them coming from asteroids like the Halley comet is interesting to know, knowing that the Halley's comet is so far away from us that the Orionids we received could have been coming from a lot of years ago is in a way crazy to think. Weather conditions are important for this celestial event to happen, a nice clear night sky with no moon is the best. It has been an amazing learning project even tho I did not get the chance to capture as many as I wanted but it was definitely a learning process that makes me wanting to still trying capture more in the future.

References

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