

## Meteor Activity Outlook for December 21-27, 2019

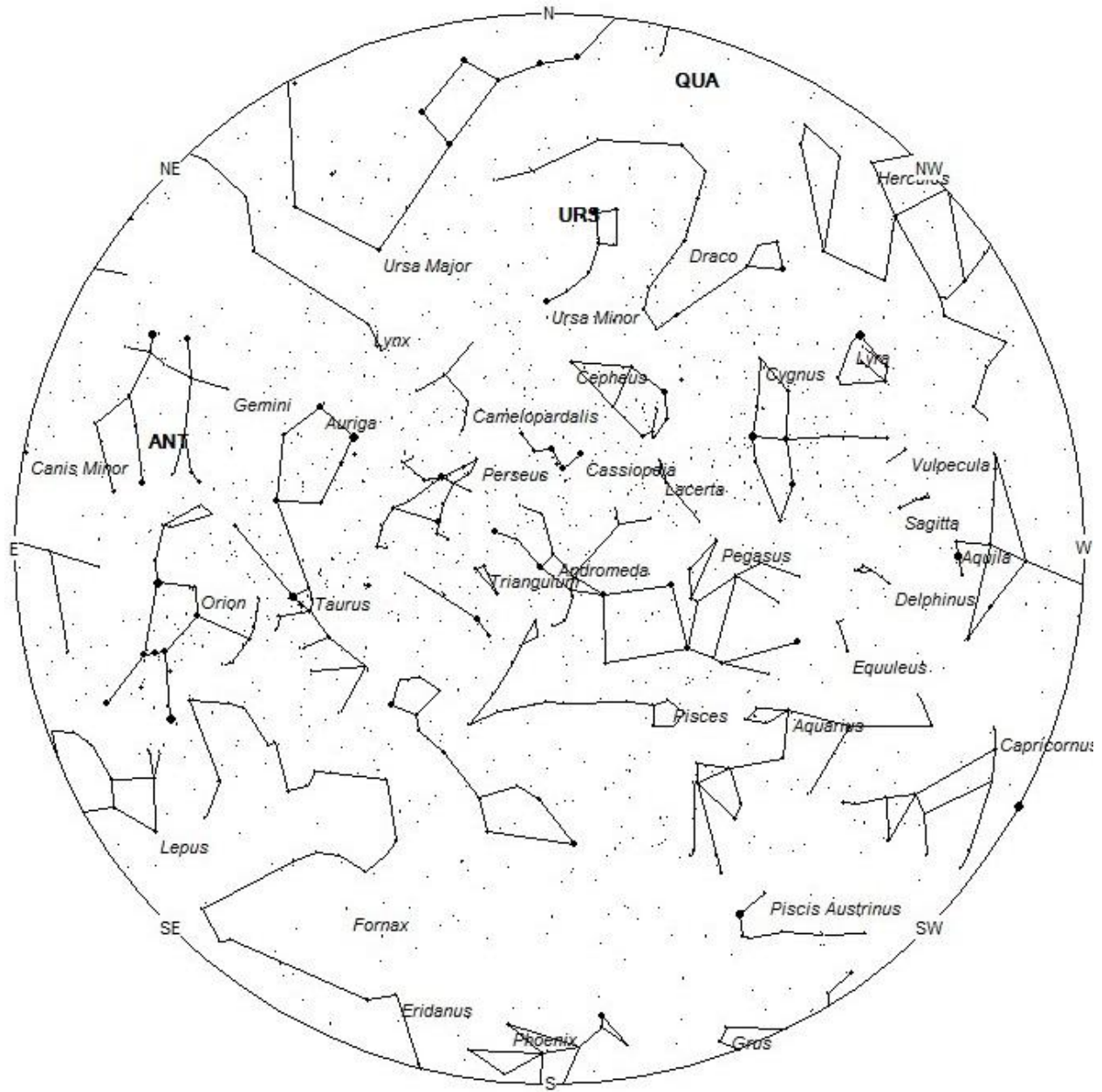


Abigail Keenan captured this Geminid fireball on December 14, 2019 at 9:30pm EST from Belton, South Carolina. Notice the change of color from ruddy to white (left to right). There are also numerous flares near the end of the meteor which show up well. ©Abigail Keenan

During this period the moon reaches its new phase on Thursday December 26th. At this time the moon will be located near the sun and will be invisible at night. This weekend the waning crescent moon will rise during the early morning hours but will not interfere with meteor observing as long as you keep it out of your field of view. The estimated total hourly meteor rates for evening observers this week is near 3 for those viewing from the southern hemisphere and 4 for those located north of the equator. For morning observers the estimated total hourly rates should be near 9 as seen from tropical southern locations (25S) and 20 as seen from mid-northern latitudes (45N). The actual rates will also depend on factors such as personal light and motion perception, local weather conditions, alertness and experience in watching meteor activity. Morning rates are slightly reduced due to moonlight. Note that the hourly rates listed below are estimates as viewed from dark sky sites away from urban light sources. Observers viewing from urban areas will see less activity as only the brightest meteors will be visible from such locations.

The radiant (the area of the sky where meteors appear to shoot from) positions and rates listed below are exact for Saturday night/Sunday morning December 21/22. These

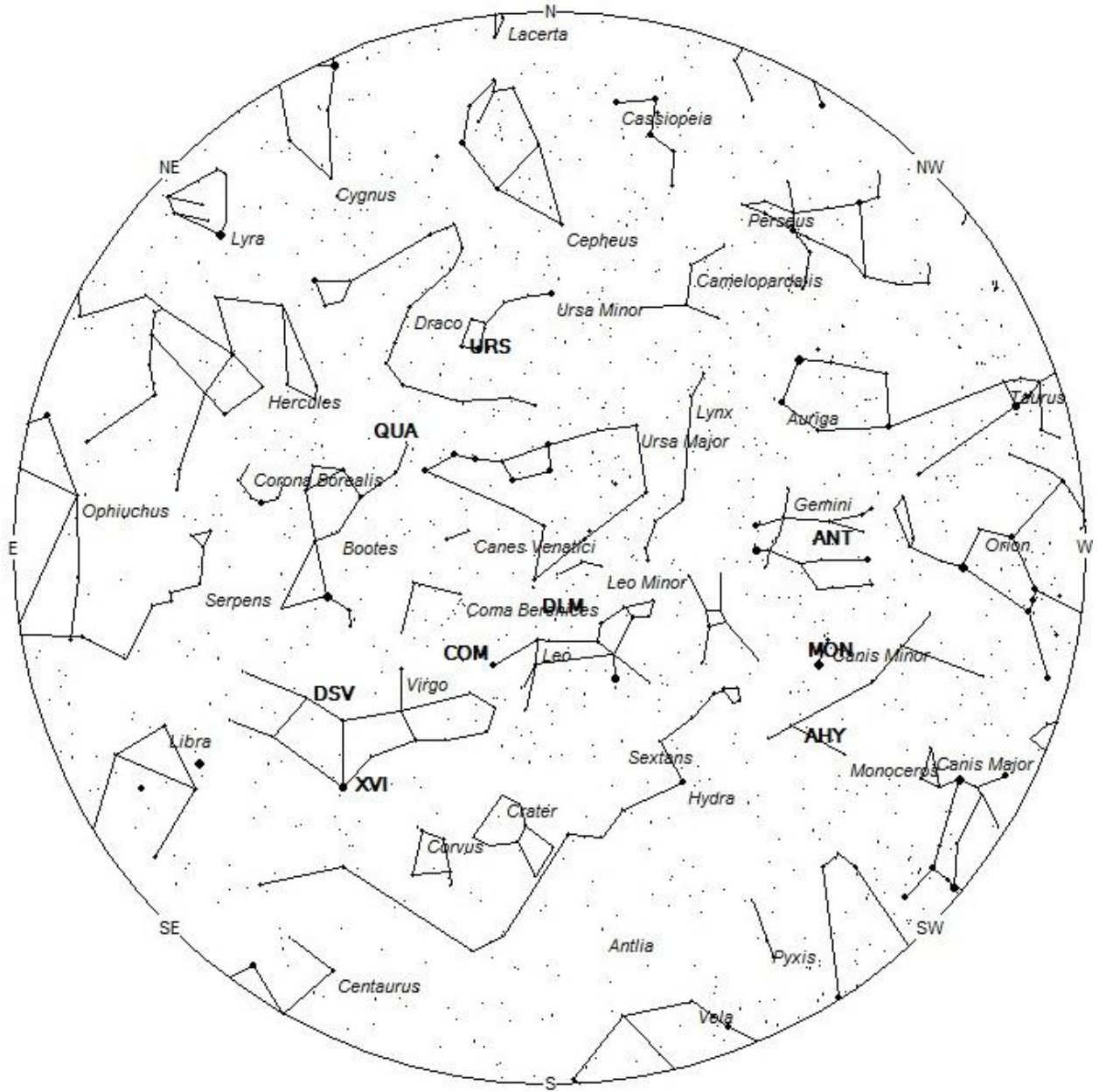
positions do not change greatly day to day so the listed coordinates may be used during this entire period. Most star atlases (available at science stores and planetariums) will provide maps with grid lines of the celestial coordinates so that you may find out exactly where these positions are located in the sky. A planisphere or computer planetarium program is also useful in showing the sky at any time of night on any date of the year. Activity from each radiant is best seen when it is positioned highest in the sky, either due north or south along the meridian, depending on your latitude. It must be remembered that meteor activity is rarely seen at the radiant position. Rather they shoot outwards from the radiant so it is best to center your field of view so that the radiant lies at the edge and not the center. Viewing there will allow you to easily trace the path of each meteor back to the radiant (if it is a shower member) or in another direction if it is a sporadic. Meteor activity is not seen from radiants that are located below the horizon. The positions below are listed in a west to east manner in order of right ascension (celestial longitude). The positions listed first are located further west therefore are accessible earlier in the night while those listed further down the list rise later in the night.



Radiant Positions at 7pm local standard time



Radiant Positions at Midnight local standard time



Radiant Positions at 5:00am local standard time

## **These sources of meteoric activity are expected to be active this week.**

Now that the activity from particles produced by comet 2P/Encke have ceased encountering the Earth, the Taurid showers for 2019 are over and we resume reporting activity from the **Anthelion (ANT)** radiant. This is not a true radiant but rather activity caused by the Earth's motion through space. As the Earth revolves around the sun it encounters particles orbiting in a pro-grade motion that are approaching their perihelion point. They all appear to be radiating from an area near the opposition point of the sun, hence the name Anthelion. These were once recorded as separate showers throughout the year but it is now suggested to bin them into their category separate from true showers and sporadics. There are several lists that have the Chi Orionids currently active, but we include them with the Anthelions as the celestial positions overlap. This radiant is a very large oval some thirty degrees wide by fifteen degrees high. Activity from this radiant can appear from more than one constellation. The position listed here is for the center of the radiant which is currently located at 06:53 (103) +23. This position lies in central Gemini, 3 degrees southeast of the 3rd magnitude star known as Mebsuda (epsilon Geminorum). Since the radiant is so large, Anthelion activity may also appear from southeastern Auriga and northeastern Orion as well as Gemini. This radiant is best placed near 01:00 local standard time (LST) when it lies on the meridian and is highest in the sky. Rates at this time should be near 2 per hour as seen from the northern hemisphere and 1 per hour as seen from south of the equator. With an entry velocity of 30 km/sec., the average Anthelion meteor would be of slow velocity.

The **Monocerotids (MON)** are active from November 28th through December 27th with the peak activity occurring on December 13th. The radiant is currently located at 07:28 (112) +07. This position lies in central Canis Minor, just 1 degree south of the 3rd magnitude star known as Gomeisa (beta Canis Minoris). Current rates should be less than 1 per hour no matter your location. Monocerotids are best seen near 0200 LST when the radiant lies highest above the horizon. At 41 km/sec. the Monocerotids produce mostly meteors of medium velocity.

The **alpha Hydrids (AHY)** were discovered by Dr. Peter Brown and are mentioned in his article "A meteoroid stream survey using the Canadian Meteor Orbit Radar". This shower is active from December 17 through January 17 with maximum activity occurring on January 3rd. The radiant is currently located at 07:46 (117) -06. This position lies in eastern Monoceros, 11 degrees southeast of the brilliant zero magnitude star known as Procyon (alpha Canis Minoris). These meteors are best seen near 0200 LST when the radiant lies highest above the horizon. At 43 km/sec. the alpha Hydrids produce meteors of medium velocity. Expected rates this week are less than 1 per hour no matter your location.

The **C Velids (CVE)** is a continuation of the Puppis/Velid activity this time of year. Unlike the two week activity during the first half of December, the C Velids are only active on 6 nights centered on December 29th. This segment of the Puppis/Velids is not as strong as the previous one and rates are low, even at maximum activity. At maximum, the radiant is located at 09:20 (140) -54. This area of the sky lies in southern Vela, 2 degrees north of the 2nd magnitude star known as Markeb (kappa Velorum). These meteors are best seen near 0300 LST when the radiant lies highest above the horizon. At 39 km/sec. the C Velids produce meteors of medium velocity. Like all sources of the Puppis/Velid complex, these meteors are not well seen from the

northern hemisphere. They are best seen from the deep southern hemisphere where the sources are found high in the sky during the southern summer mornings. Activity from this complex is weak in January with barely discernible radiants in Carina and Crux. Activity increases in February with several radiants spread across Centaurus. This complex weakens again in March with the last traces appearing in the Lupus/Norma region of the sky.

The **December Leonis Minorids (DLM)** are a shower of long duration active from December 6th through January 18th. Maximum occurs near December 21st when rates may reach 3 an hour. The radiant is currently located at 10:44 (161) +29. This position lies in southeastern Leo Minor, 4 degrees northwest of the faint star known as 54 Leo Minoris. These meteors are best seen near 0400 LST when the radiant lies highest above the horizon. At 63 km/sec. the December Leonis Minorids produce mostly swift meteors.

The last of the **Coma Berenicids (COM)** expected this weekend from a position of 12:11 (183) +14. This position in southwestern Coma Berenices, 5 degrees east of the 2nd magnitude star known as Denebola (Beta Leonis). Current hourly rates should be less than 1 shower member per hour no matter your location. These meteors are best seen near 0500 LST when the radiant lies highest above the horizon. At 69 km/sec. The Coma Berenicids would produce mostly swift meteors.

The last of the **December chi Virginids (XVI)** are visible this weekend. The radiant is currently located at 13:04 (196) -13. This position lies in southern Virgo, 3 degrees west of the bright 1<sup>st</sup> magnitude star known as Spica (alpha Virginis). Current hourly rates would be near 1 no matter your location. These meteors are best seen during the last dark hour before dawn, when the radiant lies highest above the horizon in a dark sky. At 68 km/sec. the December Sigma Virginids would produce mostly swift meteors.

The **December Sigma Virginids (DSV)** was discovered by John Greaves using the data of SonotaCo. IMO video cameras confirmed that this source is active during the month of December. Peak rates occur near December 14th. The current radiant location is at 13:52 (208) +03 which places it in northern Virgo, 2 degrees northwest of the 4th magnitude star known as tau Virginis. Current hourly rates would be less than 1 shower members no matter your location. These meteors are best seen during the last dark hour before dawn, when the radiant lies highest above the horizon in a dark sky. At 68 km/sec. the December Sigma Virginids would produce mostly swift meteors.

The **Ursids (URS)** peak on the morning of December 23<sup>nd</sup> from a radiant located at 14:30 (218) +75. This area of the sky is located in southern Ursa Minor, near the spot occupied by the faint star known as 5 Ursae Minoris. The bright 2<sup>nd</sup> magnitude star Kochab (beta Ursae Minoris) also lies 3 degrees to the southeast of this radiant. Rates at maximum are variable usually ranging from 5-15 as seen during the morning hours of December 22<sup>nd</sup>. At 33 km/sec. this source would produce mostly medium-slow meteors.

The **Quadrantids (QUA)** are active from December 22nd through January 17th. Maximum occurs on January 4 when rates may reach 100 an hour from dark sky sites over the Atlantic area and eastern North America. The radiant is currently located at 14:54 (224) +53. This position lies

in northern Bootes , 4 degrees northeast of the 4<sup>th</sup> magnitude star known as Asellus Primus (theta Bootis). These meteors are best seen during the last hour before dawn when the radiant lies highest above the horizon in a dark sky. At 41 km/sec. the Quadrantids produce meteors of moderate velocity. These meteors are visible from the southern tropics but not seen from the deep southern hemisphere.

As seen from the mid-northern hemisphere (45N) one would expect to see approximately 10 **sporadic** meteors per hour during the last hour before dawn as seen from rural observing sites. Evening rates would be near 3 per hour. As seen from the tropical southern latitudes (25S), morning rates would be near 6 per hour as seen from rural observing sites and 2 per hour during the evening hours. Locations between these two extremes would see activity between the listed figures. Evening rates are reduced by moonlight during this period.

The list below offers the information from above in tabular form. Rates and positions are exact for Saturday night/Sunday morning except where noted in the shower descriptions.

SHOWER	DATE OF MAXIMUM ACTIVITY	CELESTIAL POSITION	ENTRY VELOCITY	CULMINATION	HOURLY RATE	CLASS
					Local Standard Time	
		RA (RA in Deg.) DEC	Km/Sec			
Anthelion (ANT)	-	06:53 (103) +23	30	01:00	2 - 1	II
Monocerotids (MON)	Dec 13	07:28 (112) +07	41	02:00	<1 - <1	II
alpha Hydrids (AHY)	Jan 03	07:46 (117) -06	43	02:00	<1 - <1	IV
C Velids (CVE)	Dec 29	09:20 (140) -54	39	03:00	<1 - <1	IV
December Leonis Minorids (DLM)	Dec 21	10:19 (155) +32	63	04:00	2- 1	II
Comae Berenicids (COM)	Dec 16	12:11 (183) +14	65	05:00	1 - <1	II
December chi Virginids (XVI)	Dec 19	13:04 (196) -13	69	06:00	1 - 1	IV
December Sigma Virginids	Dec 14	13:52 (208) +03	68	07:00	<1 - <1	IV



(DSV)						
Ursids (URS)	Dec 23	14:30 (218) +75	33	08:00	5 - <1	I
Quadrantids (QUA)	Jan 04	14:54 (224) +53	41	08:00	<1 - <1	I