

Meteor Activity Outlook for November 30-December 6, 2024



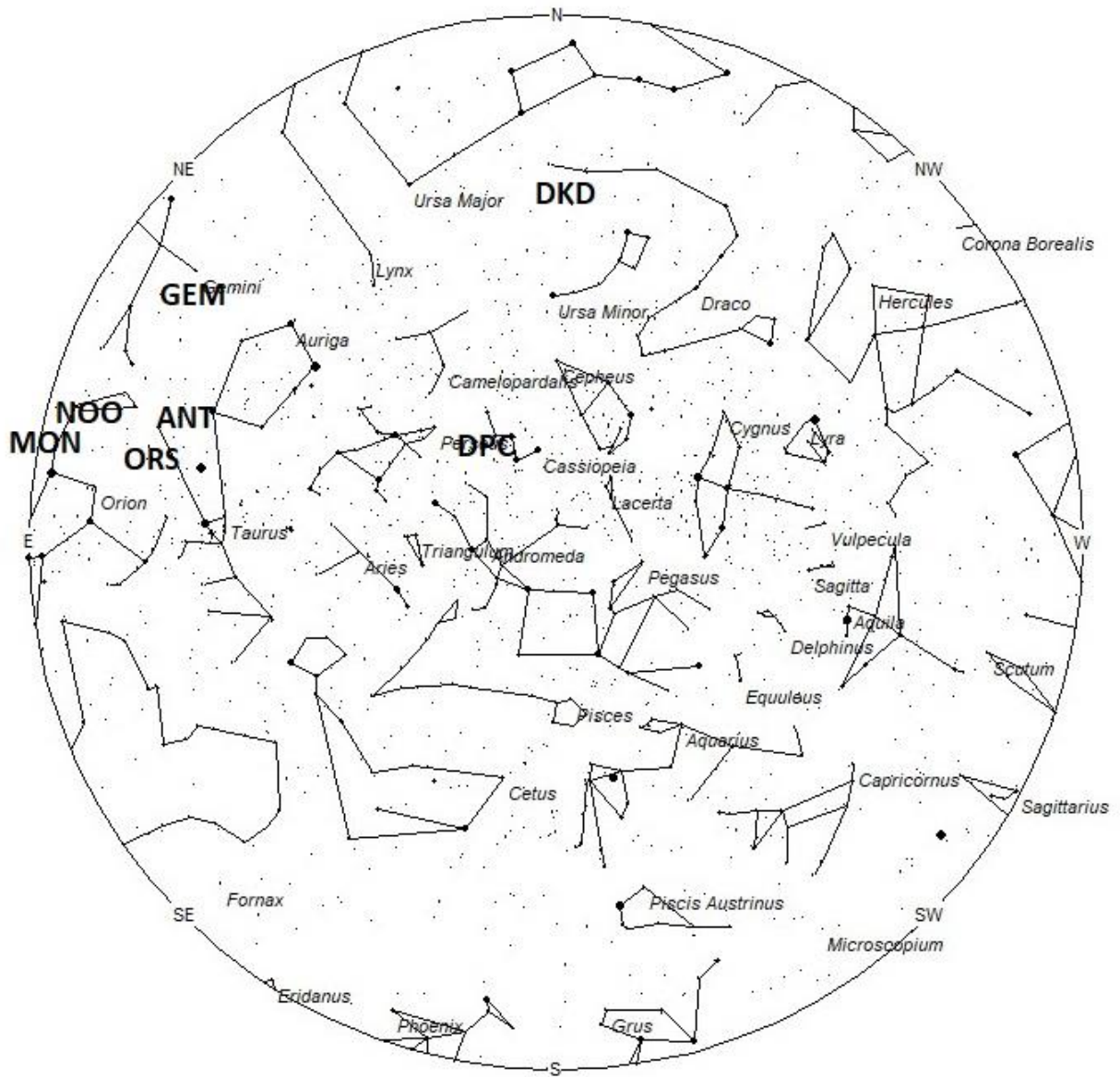
Jordan Ragsdale captured this brilliant fireball using his [AllSky Camera System](#) on July 11, 2024, at 1:46 MDT (7:46 UT) from Eagle, Idaho, USA. ©Jordan Ragsdale

No matter where you live, the first half of December provides some of the best meteor activity of the year. In the Northern Hemisphere the sporadic rates are still strong plus you can also count on strong activity from the Geminids, which peak on December 14th. There are also several minor sources that add a few meteors each hour. All these centers of activity are located high in the sky during the early morning hours this time of year. Much of the activity mentioned above can also be seen from the Southern Hemisphere. While the sporadic rates are not as strong as those seen from the north, they are stronger than the previous months and heading for a maximum in February. The warm, but short summer nights south of the equator make for some great viewing as long as the moon does not interfere.

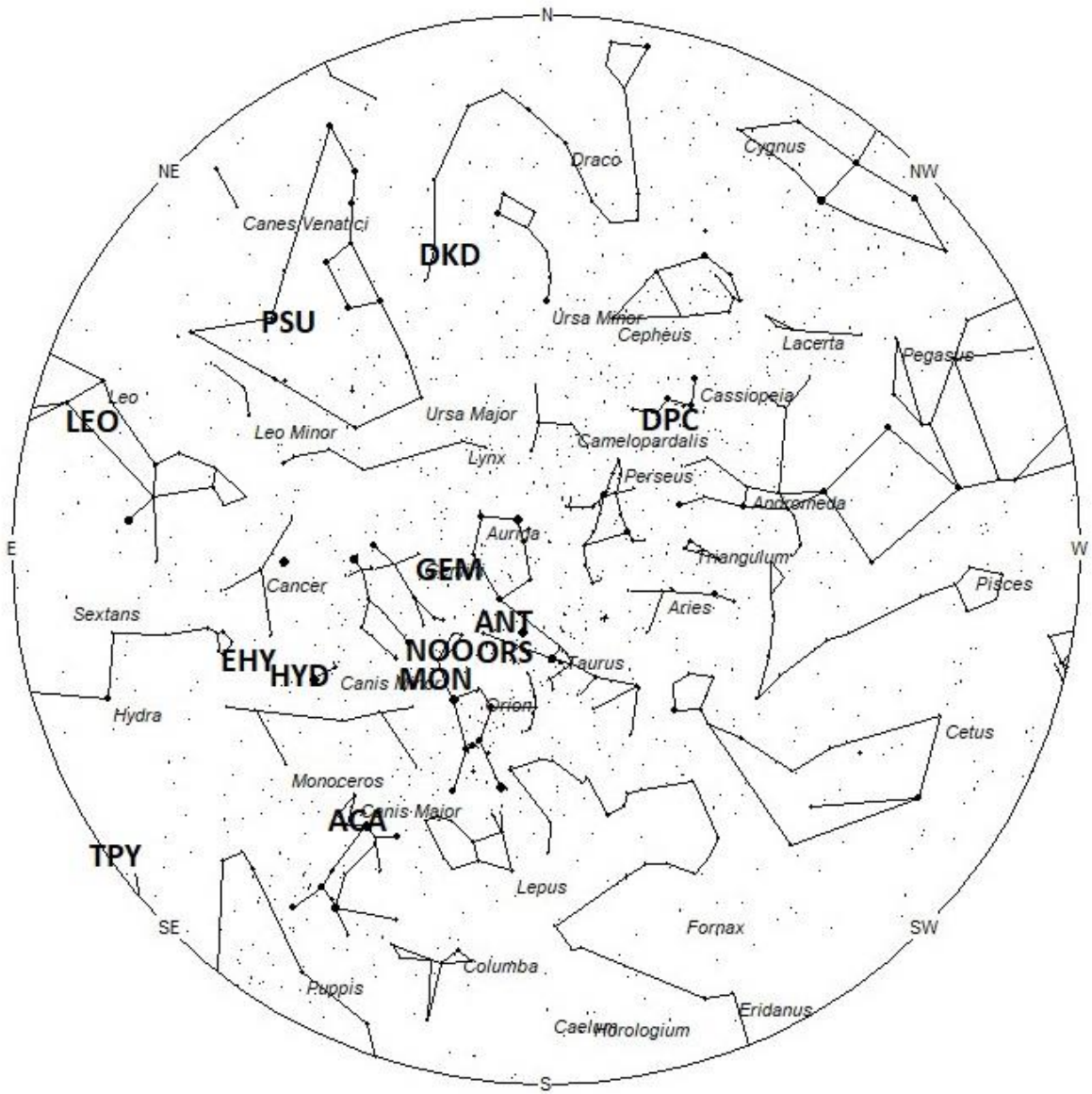
During this period, the moon reaches its last quarter phase on Saturday November 23rd. At that time the half-illuminated moon will rise near 23:00 Local Standard Time (on the previous evening) and will remain above the horizon the remainder of the night. Successful meteor observations are possible this weekend if you keep the moon out of your field of view. Viewing conditions improve with each passing night as the moon wanes and rises closer to dawn. The estimated total hourly rates for evening observers this weekend should be near 4 as seen from mid-northern latitudes (45N) and 3 as seen from tropical southern locations (25S). For morning observers, the estimated total hourly rates should be near 16 as seen from mid-northern latitudes (45N) and 10 as seen from tropical southern locations (25S). Morning rates are reduced during this period due to moonlight. The actual rates seen will also depend on factors such as personal light and motion perception, local weather conditions, alertness, and experience in watching meteor activity. 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 brighter meteors will be visible from such locations.

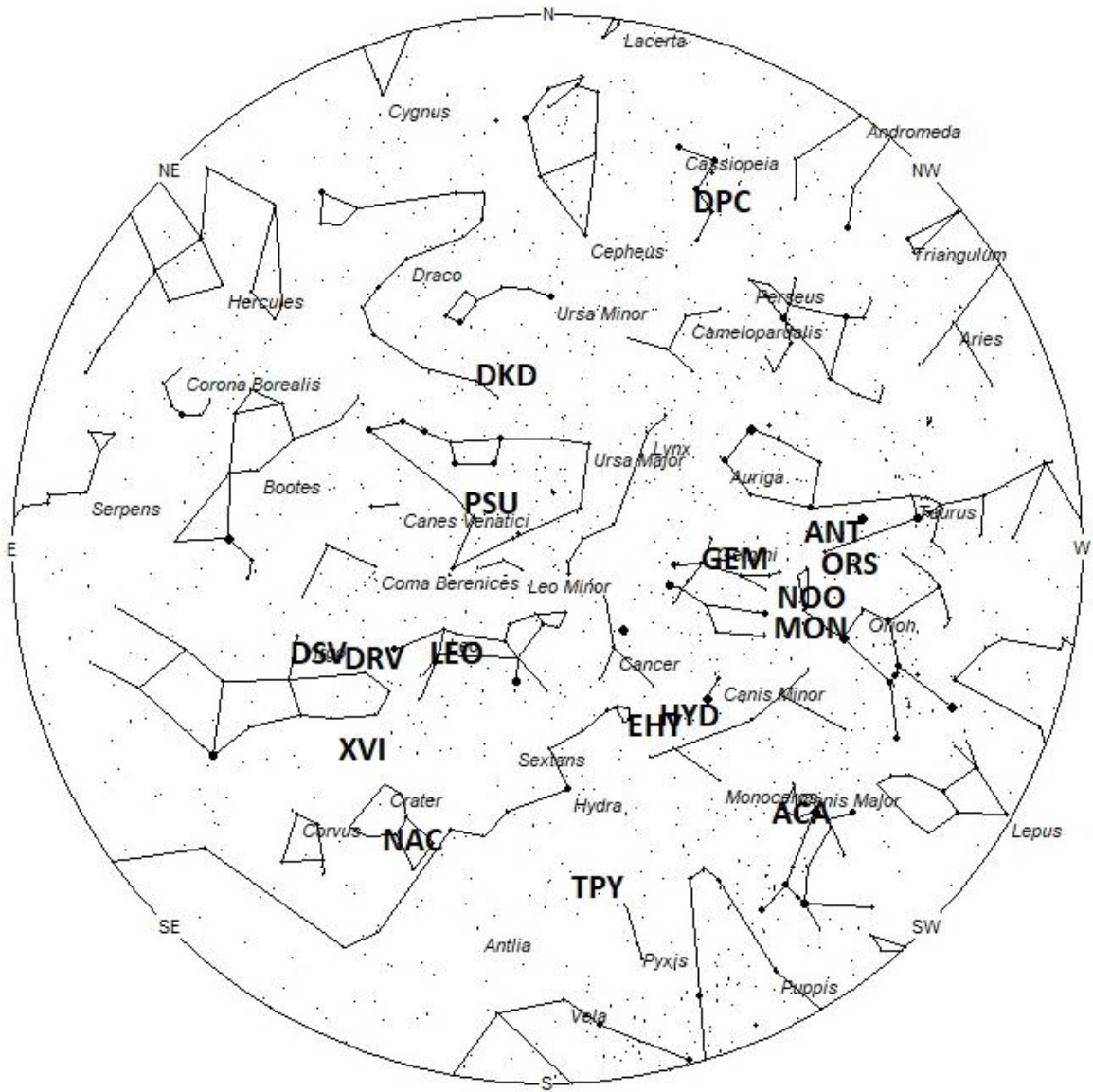
The radiant (the area of the sky where meteors appear to shoot from) positions and rates listed below are exact for Saturday night/Sunday morning November 23/24. These positions do not change greatly day to day so the listed coordinates may be used during this entire period. Most star atlases (available online and at bookstores 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. I have also included charts of the sky that display the radiant positions for evening, midnight, and morning. The center of each chart is the sky directly overhead at the appropriate hour. These charts are oriented for facing south but can be used for any direction by rotating the charts to the desired direction. 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. Radiants that rise after midnight will not reach their highest point in the sky until daylight. For these radiants, it is best to view them during the last few hours before dawn. It must be remembered that meteor activity is rarely seen at its radiant position. Rather they shoot outwards from the radiant, so it is best to center your field of view so that the radiant lies toward 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 sporadic. Meteor activity is not seen from radiants that are located far 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 19:00 Local Standard Time



Radiant Positions at Midnight Local Standard Time



Radiant Positions at 05:00 Local Standard Time

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

The **December Phoenicids (PHO)** are a periodic shower that rarely produces noticeable activity. The only impressive display produced so far by this shower occurred in 1956 when ZHR's were near 100. The normal range for these meteors is from November 28 through December 9 with a peak on December 2nd. The radiant at maximum is located at 01:12 (018) -53. This position lies in southern Phoenix, 5 degrees south of the 3rd magnitude star known as beta Phoenicis. For those viewing from the northern tropics southward, this position also lies 7 degrees northwest of the bright 1st magnitude star known as Achernar (alpha Eridani). This area of the sky is best placed in the southern sky as soon as evening twilight ends. These meteors are best seen from the southern hemisphere where the radiant lies much higher in the sky. For those viewing from the northern hemisphere, only those in the northern tropics have any real chance of seeing activity from this source. At only 18 km/sec. the Phoenicids produce extremely slow meteors.

The **December phi Cassiopeiids (DPC)** are the classical return of the Andromedids and the radiant that was active prior to the breakup of comet 3D/Biela in the 1840's. This source is active from November 28 through December 10th. Maximum activity is expected to occur on December 4th when the radiant is located at 01:18 (020) +58. This area of the sky is located southern Cassiopeia, 1 degree west of the faint star known as phi Cassiopeiae. These meteors are best seen near 2000 (8pm) LST by looking toward the northern sky. Meteors from the December phi Cassiopeiids strike the atmosphere at 17km/sec., which would produce meteors of very slow velocity. No unusual activity is expected from this source in 2024, but this shower should be monitored during its entire activity for possible outbursts.

The **Southern chi Orionids (ORS)** are active from November 14 through December 16, with maximum activity occurring on November 28th. The radiant is currently located at 05:14 (19) +18, which lies in southeastern Taurus, 4 degrees southwest of the 3rd magnitude star known as Tianguan (zeta Tauri A). This radiant is best placed in the southern sky near 01:00 LST, when it lies on the meridian and is located highest in the northern sky. Rates at this time should be near 1 per hour as seen from the northern hemisphere and less than 1 as seen south of the equator. With an entry velocity of 27 km/sec., the average ORS meteor would be of medium-slow velocity. Don't confuse these meteors with the similar, but more numerous Anthelion meteors, which lie only 5 degrees to the north.

Now that the activity from particles produced by comet 2P/Encke have ceased encountering the Earth, the Taurid showers for 2024 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 a category separate from true showers and sporadics. 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 05:20 (080) +23. This position lies in eastern Taurus, 5 degrees south of the 2nd magnitude star known as El Nath (beta Tauri). This radiant is best placed near 01:00 local standard time (LST) when it lies on the meridian and is

highest in the southern sky. Rates at this time should be near 3 per hour as seen from the northern hemisphere and 2 per hour as seen from south of the equator. With an entry velocity of 30 km/sec., the average Anthelion meteor would be of medium-slow velocity.

The **November Orionids (NOO)** are active from November 13 through December 12, with maximum activity occurring on November 28th. The radiant is currently located at 06:10 (093) +15. This area of the sky lies in the northeastern Orion, 1 degree north of the 4th magnitude star known as nu Orionis. This radiant is best placed in the southern sky near 0200 LST, when it lies highest above the horizon. Hourly rates should be near 3 per hour as seen from the northern hemisphere and 2 per hour as seen from south of the equator. With an entry velocity of 42 km/sec., most activity from this radiant would be of medium speed.

The **Monocerotids (MON)** become active this week from a radiant located at 06:18 (095) +09. This area of the sky is located in northeastern Orion, 4 degrees northeast of the 1st magnitude orange star known as Betelgeuse (alpha Orionis). This position is less than 10 degrees away from the NOO radiant so care must be taken to differentiate between these two showers. This radiant best placed near 0200 LST, when it lies highest in the southern sky. Hourly rates should be near 1 per hour no matter your location. With an entry velocity of 43 km/sec., most activity from this radiant would be of medium speed. This shower is active from November 23rd through December 24th, with maximum activity occurring on December 10th.

The **Geminids (GEM)** are active from December 1-21, peaking on December 13th. The Geminid radiant is currently located at 06:42 (101) +33. This area of the sky lies in northwestern Gemini, 2 degrees southwest of the 4th magnitude star known as theta Geminorum. These meteors are best seen near 02:00 LST, when the radiant lies highest in the southern sky. Rates are expected to be less than 1 per hour no matter your location. With an entry velocity of 33km/sec, most of these meteors would appear to possess a medium velocity.

The **alpha Canis Majorids (ACA)** were also discovered by Dr. Peter Brown during his 7-year survey using the Canadian Meteor Orbit Radar (CMOR2). This source is active from November 2 through December 11 with a maximum occurring near November 21st. The radiant is currently located at 06:52 (103) -17 which places it in northern Canis Major, 1 degree east of the -1 magnitude star known as Sirius (alpha Canis Majoris). These meteors are best seen near 0200 LST when it lies on the meridian and is located highest in the southern sky. Current rates should be less than 1 per hour no matter your location. With an entry velocity of 44 km/sec., the average ACA meteor would be of medium velocity.

The **sigma Hydrids (HYD)** are active from a radiant located at 07:59 (120) +04. This area of the sky is located in southeastern Canis Minor, 4 degrees southeast of the zero-magnitude star known as Procyon (alpha Canis Minoris). These meteors are active from November 22nd through December 31st, with maximum activity occurring on December 7th. These meteors are best placed above the southern horizon near 03:00 LST. Rates should be near 1 per hour no matter your location. With an entry velocity of 59km/sec, most of these meteors would appear swift.

The **eta Hydrids (EHY)** were recently discovered by members of the Croatian Meteor Network. This radiant is active from November 26 through January 1st with maximum activity occurring on

December 12th. The radiant is currently located at 08:28 (127) +04, which places it in extreme western Hydra, 1 degree southwest of the 4th magnitude star known as sigma Hydrae. This position is close to that of the sigma Hydrids so care must be taken to separate the two sources. These meteors are best seen near 0300 LST when the radiant lies highest above the southern horizon. Current rates should be less than 1 per hour no matter your location. With an entry velocity of 62 km/sec., most activity from this radiant would be of swift speed.

The **Puppis-Velid Complex (PUP)** are a vast complex of weak radiants located in the constellations of Puppis and Vela. Visual plots and photographic studies have revealed many radiants in this area during November and December. The combined strength of these radiants can produce a ZHR of 10. Actual hourly rates will be much less unless you happen to be observing from the deep southern hemisphere. Activity from this source begins around November 22nd. The center of this activity is currently located at 08:38 (130) -47. This position lies in western Vela, 4 degrees northeast of the 2nd magnitude star known as gamma Velorum. Peak rates occur near December 8th. These meteors are best seen near 0400 LST when the radiant lies highest in the southern sky. Observers located in the southern hemisphere have an advantage viewing this shower as the radiant will rise higher into their sky allowing more activity to be seen. Since the radiant lies low in the south for most northern hemisphere observers, meteors seen from north of the equator tend to be long in length and long-lasting. At 42 km/sec. the Puppis-Velids produce meteors of average velocity. Note: these are also listed as the “e Velids” from several sources.

The **theta Pyxidids (TPY)** consist of two weak showers that peak two weeks apart. The early version is active from November 27 through December 5 with maximum occurring on December 1st. The radiant is currently located at 09:15 (139) -26. This area of the sky is located in northeastern Pyxis, 1 degree east of the faint star known as kappa Pyxidis. These meteors are best seen during the last couple of hours prior to dawn when the radiant lies highest in the southern sky. At 60 km/sec. the theta Pyxidids would produce mostly swift meteors.

The **Leonids (LEO)** are active from October 27 to December 7 with maximum activity occurring on November 17th. The radiant is currently located at 10:49 (162) +16. This position lies in central Leo, 2 degrees south of the faint star known as 51 Leonis. The Leonid radiant is best placed in the eastern sky during the last hour before morning twilight when the radiant lies highest in a dark sky. Leonids may be seen from the southern hemisphere, but the viewing conditions are not quite as favorable as those north of the equator. Current rates are expected to be less than 1 per hour no matter your location. With an entry velocity of 71 km/sec., most activity from this radiant would be of swift speed with numerous persistent trains on the brighter meteors.

The **psi Ursa Majorids (PSU)** were discovered by observers in Japan using data from SonotaCo. This shower is active from November 29-December 11 with maximum activity occurring on December 4th. The radiant is currently located at 11:04 (166) +45. This position lies in southern Ursa Major, 1 degree west of the third magnitude star known as psi Ursae Majoris. This area of the sky is best placed during the last hour before dawn, when it lies highest above the northern horizon in a dark sky. Current hourly rates would most likely be near one per hour as seen from the northern hemisphere and less than 1 as seen from south of the equator. At 60km/sec., the average psi Ursa Majorid meteor would be swift.

The **November alpha Corvids (NAC)** are a recent discovery by Peter Jennisken's system of worldwide cameras. This weak shower is active from November 17th through December 6th with maximum activity occurring on November 28th. The current position is 11:11 (168) -18, which places the radiant in central Crater, 1 degree north of the faint star known as psi Crateris. This area of the sky is best placed for viewing during the last couple of hour prior to dawn when the radiant lie highest in a dark sky above the southeastern horizon. Hourly rates at this time are expected to be less than 1 no matter your location. With an entry velocity of 67 km/sec., most activity from this radiant would be of swift speed.

The **December rho Virginids (DRV)** are active from November 17 through December 26 with peak rates occurring near December 7th. The current radiant location is at 12:08 (182) +13, which places it in northwestern Virgo, 4 degrees southeast of the 2nd magnitude star known as Denebola (beta Leonis). Current hourly rates would be less than 1 no matter your location. These meteors are best seen during the last dark hour before dawn, when the radiant lies highest above the eastern horizon in a dark sky. At 68 km/sec. the December rho Virginids would produce mostly swift meteors.

The **December chi Virginids (XVI)** were discovered in Japan by observers using data from SonotaCo. This source is active from November 26 through December 30 with maximum occurring on December 14th. The radiant is currently located at 12:10 (183) -06, which places it in southwestern Virgo, 5 degrees southwest of the 4th magnitude star known as Zaniah (eta Virginis). Hourly rates should be less than 1 no matter your location. These meteors are best seen during the last dark hour before dawn, when the radiant lies highest above the eastern horizon in a dark sky. At 68 km/sec. the December chi Virginids would produce mostly swift meteors.

The **December kappa Draconids (DKD)** were discovered by SonotaCo during studies of new radiants in 2008-09. This shower is active from November 28 through December 7 with maximum activity occurring on December 2nd. The radiant is currently located at 12:13 (183) +72. This position lies in extreme western Draco, 2 degrees northwest of the 4th magnitude star known as kappa Draconis. While the radiant lies above the horizon all night for most of the northern hemisphere, it is best placed during the last hour before dawn, when it lies highest above the northern horizon in a dark sky. Rates could reach 1 per hour on the morning of the 2nd. Away from that morning I would expect hourly rates of less than 1. Due to the high northerly declination of the radiant these meteors are not visible from most of the southern hemisphere. At 43km/sec., the average December kappa Draconid meteor would be of medium velocity.

The **December sigma Virginids (DSV)** is a source of long duration discovered by John Greaves using the data from SonotaCo. This source is active from November 26 through January 24 with peak rates occur near December 23rd. The current radiant location is at 12:41 (190) +09, which places it in northern Virgo, 1 degree south of the faint star known as rho Virginis. Current hourly rates would be less than 1 no matter your location. These meteors are best seen during the last dark hour before dawn, when the radiant lies highest above the eastern horizon in a dark sky. At 66 km/sec. the December Sigma Virginids would produce mostly swift meteors.

Sporadic meteors are those meteors that cannot be associated with any known meteor shower. All meteor showers are evolving and disperse over time to the point where they are no longer

recognizable. Away from the peaks of the major annual showers, these sporadic meteors make up the bulk of the activity seen each night. As seen from the mid-northern hemisphere (45N) one would expect to see during this period approximately 12 sporadic meteors per hour during the last hour before dawn as seen from rural observing sites. Evening rates should be near 3 per hour. As seen from the tropical southern latitudes (25S), morning rates would be near 8 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 these listed figures.

The list below offers the information in tabular form of the showers that I feel are within reach of the visual observer to discern. Hourly rates are often less than one, so these sources are rarely listed as visual targets in most meteor shower lists. If you are like me and wish to associate as many meteors as possible with known sources, then you will appreciate these listings. Before listing meteors from these obscure sources, you should attempt to prove these meteors belong to them and are not chance alignments of sporadic meteors. You can note parameters such as duration, length, radiant distance and the elevation of each meteor to help compute the probability of shower association. It should be remembered that slow meteors can be seen from fast showers, but fast meteors cannot be produced from slow showers. Slower showers are those with velocities less than 35/km per second. Slow meteors can appear from fast showers when they appear close to the radiant or low in the sky. The table located on page 22 of the [IMO's 2024 Meteor Shower Calendar](#) is a big help in aiding in the identification of meteors. If you record the length and duration of each meteor, you can use this chart to check the probability of the meteor belonging to a shower of known velocity. If the angular velocity is similar to the figure in the table, then your meteor probably belongs to that shower. Rates and positions are exact for Saturday night/Sunday morning.

SHOWER	DATE OF MAXIMUM ACTIVITY	CELESTIAL POSITION	ENTRY VELOCITY	CULMINATION	HOURLY RATE	CLASS
		RA (RA in Deg.) DEC	Km/Sec	Local Standard Time	North-South	
December Phoenicids (PHO)	Dec 02	01:12 (018) -53	18	20:00	<1 - <1	III
December phi Cassiopeiids (DPC)	Dec 04	01:18 (020) +58	17	20:00	<1 - <1	IV
Southern chi Orionids (ORS)	Nov 28	05:14 (019) +18	27	01:00	1 - <1	IV
Anthelion (ANT)	Nov 08	05:20 (080) +23	30	01:00	3 - 2	II
November Orionids (NOO)	Nov 28	06:10 (093) +15	42	02:00	2 - 1	II

Monocerotids (MON)	Dec 10	06:18 (095) +09	42	02:00	1 - 1	II
Geminids (GEM)	Dec 13	06:42 (101) +33	33	02:00	1 - 1	II
alpha Canis Majorids (ACA)	Nov 21	06:52 (103) -17	44	02:00	<1 - <1	II
sigma Hydrids (HYD)	Dec 07	07:59 (120) +04	59	03:00	1 - 1	IV
eta Hydrids (EHY)	Dec 12	08:28 (127) +04	62	03:00	<1 - <1	IV
Puppis-Velid Complex (PUV)	Dec 08	08:38 (130) -47	42	03:00	<1 - 1	II
theta Pyxidids (TPY)	Dec 01	09:15 (139) -26	60	04:00	<1 - <1	IV
Leonids (LEO)	Nov 17	10:49 (162) +16	71	06:00	<1 - <1	I
psi Ursa Majorids (PSU)	Dec 04	11:04 (166) +45	60	06:00	1 - <1	IV
November alpha Corvids (NAC)	Nov 28	11:11 (168) -18	67	06:00	<1 - <1	IV
December rho Virginids (DRV)	Dec 07	12:08 (182) +13	68	07:00	<1 - <1	IV
December chi Virginids (XVI)	Dec 14	12:10 (183) -06	68	07:00	<1 - <1	IV
December kappa Draconids (DKD)	Dec 02	12:13 (183) +72	43	07:00	<1 - <1	IV
December sigma Virginids (DSV)	Dec 23	12:41 (190) +09	66	08:00	<1 - <1	IV

You can keep track of the activity of these meteor showers as well as those beyond the limits of visual observing by visiting the [NASA Meteor Shower Portal](#). You can move the sky globe to see different areas of the sky. Colored dots indicate shower meteors while white dots indicate sporadic (random) activity. The large orange disk indicates the position of the sun so little activity will be seen in that area of the sky.

Class Explanation: A scale to group meteor showers by their intensity:

- **Class I:** the strongest annual showers with Zenith Hourly Rates normally ten or better.
- **Class II:** reliable minor showers with ZHR's normally two to ten.
- **Class III:** showers that do not provide annual activity. These showers are rarely active yet have the potential to produce a major display on occasion.
- **Class IV:** weak minor showers with ZHR's rarely exceeding two. The study of these showers is best left to experienced observers who use plotting and angular velocity estimates to determine shower association. These weak showers are also good targets for video and photographic work. Observers with less experience are urged to limit their shower associations to showers with a rating of I to III.