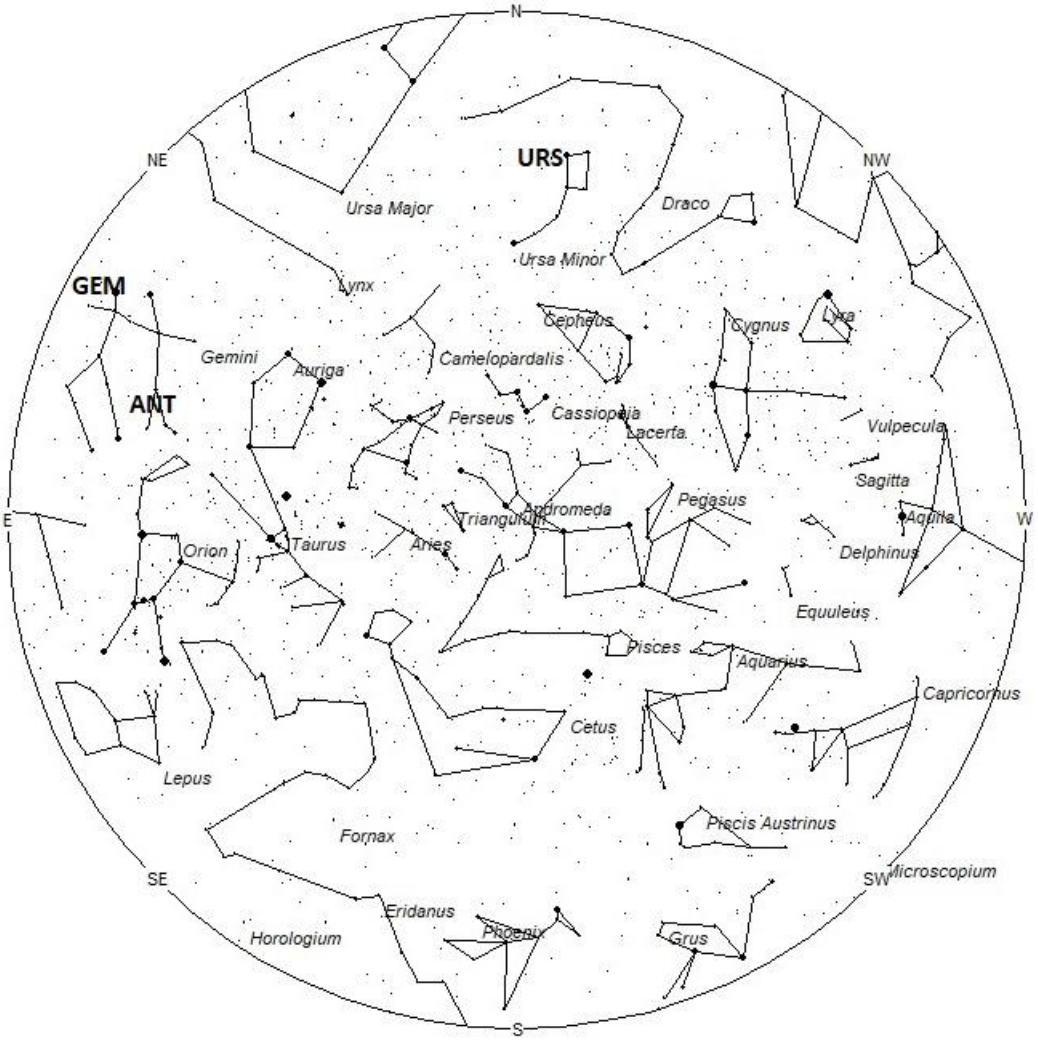
Meteor Activity Outlook for December 17-23, 2022

Nicolas Rossetto captured this colorful fireball at 00:20 UT on July 31, 2022 (2:20 CEST), from Saint-Thiébaud, Bourgogne-Franche-Comté, France. ©Nicolas Rossetto

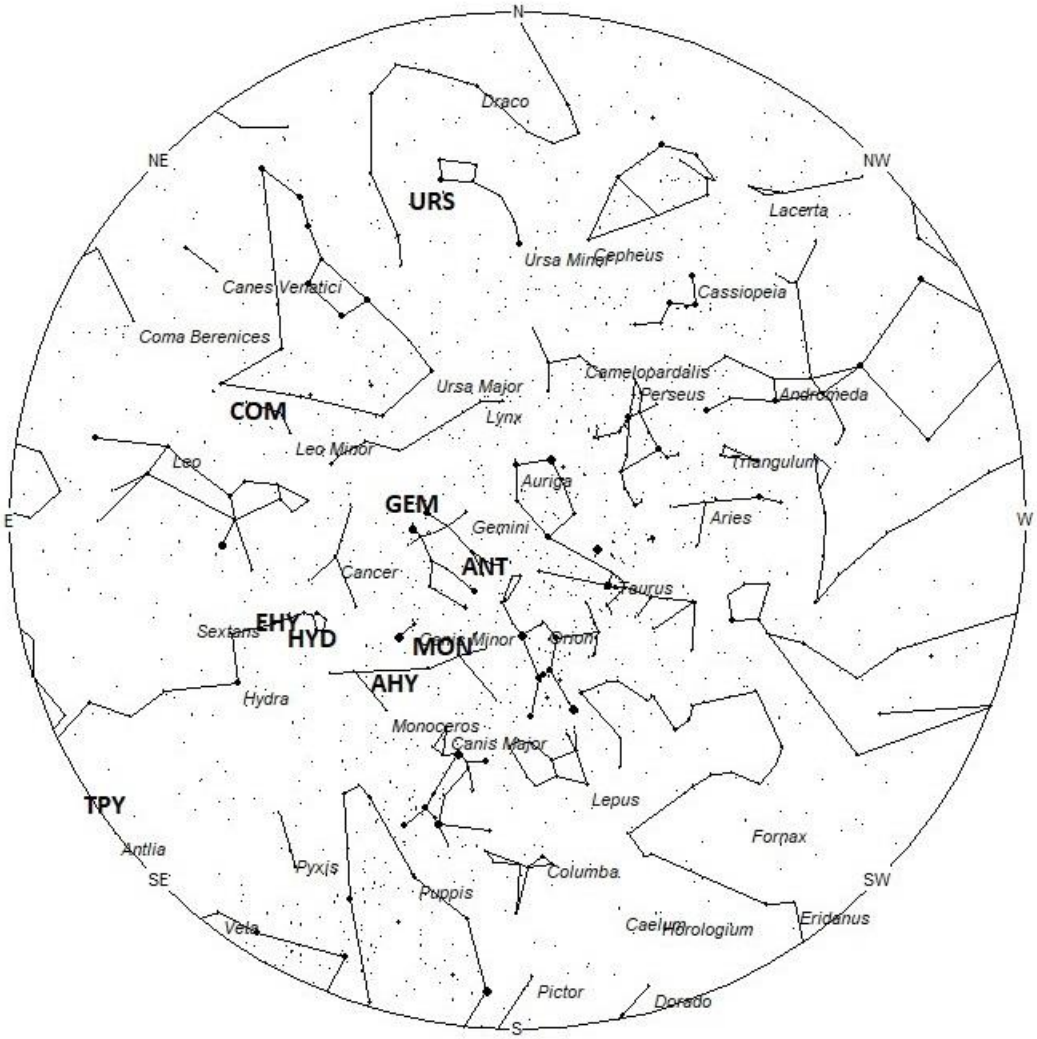
During this period, the moon reaches its new phase on Friday December 23rd. At that time the moon will lie near the sun and will be invisible at night. This weekend the waning crescent moon will rise during the early morning hours but should not interfere with meteor observing as long as you keep it out of your field of view. The estimated total hourly rates for evening observers this week 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 20 as seen from mid-northern latitudes (45N) and 13 as seen from tropical southern locations (25S). 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 during this period. 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 December 17/18. 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. I have also included charts of the sky that display the radiant positions for evening, midnight, and morning. The

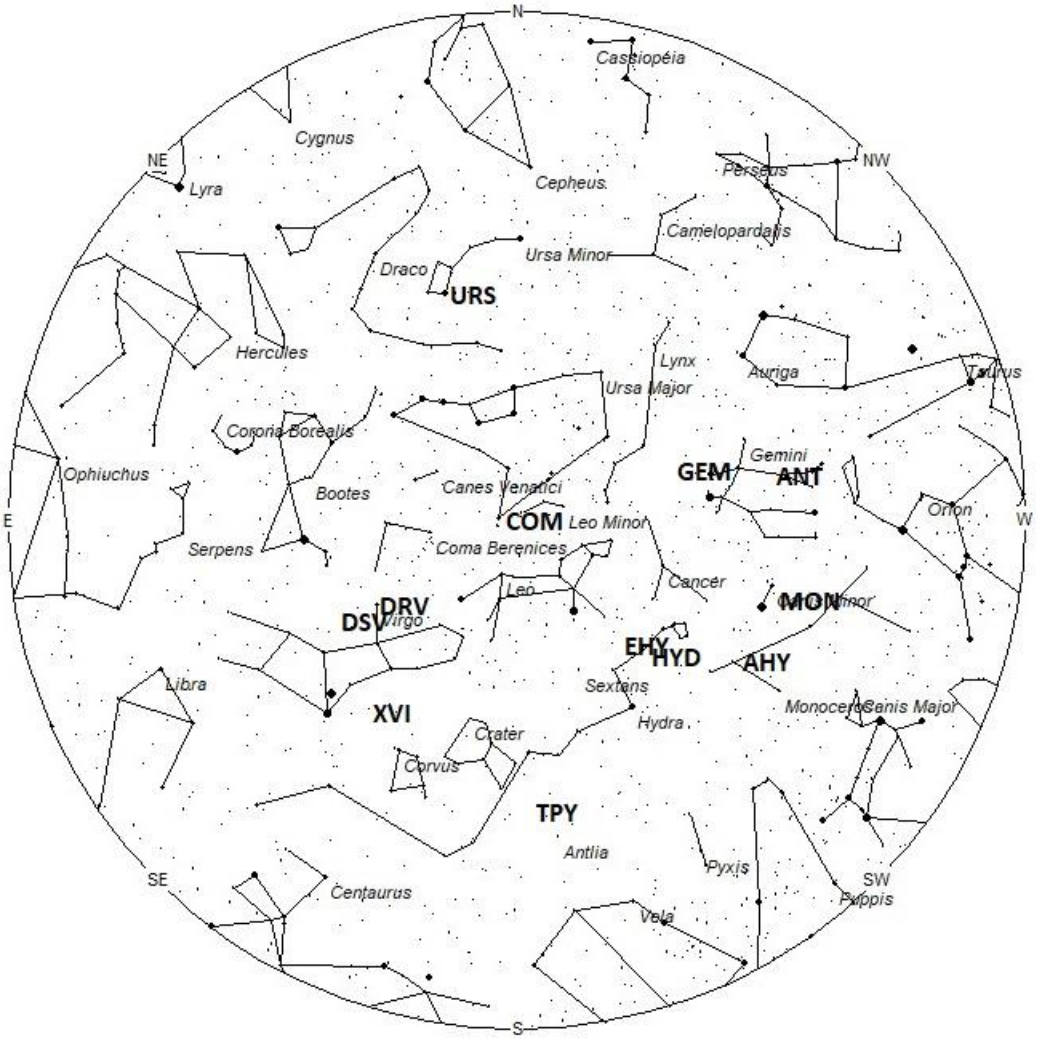
center of each chart is the sky directly overhead at the appropriate hour. These charts are oriented for facing south but can be used for any direction by rotating the charts to the desired direction. A planisphere or computer planetarium program is also useful in showing the sky at any time of night 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. 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 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 7pm Local Standard Time



Radiant Positions at Midnight Local Standard Time



Radiant Positions at 5am 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 2022 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 06:36 (099) +23. This position lies in central Gemini, 2 degrees southwest of the 3rd magnitude star known as Mebsuta (epsilon Geminorum). 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 slow velocity.

The **Monocerotids (MON)** become active this week from a radiant located at 07:02 (106) +07. This area of the sky is located in northern Monoceros, 5 degrees southwest of the 3rd magnitude star known as Gomeisa (beta Canis Minoris). This radiant best placed near 0100 LST, when it lies highest in the southern sky. Rates should be near 1 per hour no matter your location. With an entry velocity of 40 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 11th.

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 15 through January 22 with maximum activity occurring on January 5th. The radiant is currently located at 07:42 (116) -05. This position lies in eastern Monoceros, 5 degrees north of the 4th magnitude star known as alpha Monocerotis. These meteors are best seen near 0200 LST when the radiant lies highest above the southern horizon. At 46 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 **Geminids (GEM)** are active from November 19th through December 24th, peaking on December 14th. The radiant currently lies at 07:50 (118) +32. This area of the sky lies in northwestern Gemini, 3 degrees east of the 2nd magnitude star known as Castor (alpha Geminorum). These meteors are best seen near 02:00 LST, when the radiant lies highest in the southern sky. Rates are expected to be near 4 per hour as seen from the Northern Hemisphere and 2 as seen from south of the equator. With an entry velocity of 34km/sec, most of these meteors would appear to possess a medium velocity.

The **sigma Hydrids (HYD)** are active from a radiant located at 08:53 (133) +00. This area of the sky is located in western Hydra, 4 degrees southeast of the 4th magnitude star known as eta Hydrae. These meteors are active from November 24 through January 7th, with maximum activity occurring

on December 7th. These meteors are best seen near 03:00 LST, when the radiant lies highest in the southern sky. Rates should be less than 1 per hour no matter your location. With an entry velocity of 58km/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 09:21 (140) +01, which places it in extreme western Hydra, 2 degrees southeast of the 4th magnitude star known as theta 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 0400 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 **theta Pyxidids (TPY)** consist of two weak showers that peak two weeks apart. The late version is active from December 8 through January 8, with maximum occurring on December 18th. The radiant is currently located at 10:15 (154) -24. This area of the sky is located in western Hydra, 6 degrees southwest of the 4th magnitude star known as mu Hydrae. These meteors are best seen near 0400 LST when the radiant lies highest in the southern sky. At 62 km/sec. the theta Pyxids would produce mostly swift meteors.

The **Comae Berenicids (COM)** are a long duration shower active from December 5th through February 4th. Maximum activity occurs on December 16th. The radiant is currently located at 10:38 (160) +32, which places it in Leo Minor, 4 degrees southwest of the faint star known as 46 Leonis Minoris. These meteors would be best seen near 04:00 LST, when the radiant lies highest in the eastern sky. Current rates would be near 2 per hour as seen from the Northern Hemisphere and 1 as seen from south of the equator. At 63km/sec., these meteors would produce mostly swift meteors. These meteors are also known as the December Leonis Minorids.

The **December chi Virginids (XVI)** are another shower discovered in Japan by observers using data from SonotaCo**.** This source is active from November 26 through December 30 with maximum occurring on December 12th. The radiant is currently located at 12:54 (193) -12, which places it in southern Virgo, 7 degrees southwest of the 1st magnitude star known as Spica (alpha 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 rho Virginids (DRV) are** active from November 29 through December 22 with peak rates occur near December 5th. The current radiant location is at 13:08 (197) +12, which places it in northern Virgo, 1 degree northeast of the 3rd magnitude star known as Vindemiatrix (epsilon 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 68 km/sec. the December rho Virginids would produce mostly swift meteors.

The **December sigma Virginids (DSV)** is a source of long duration discovered by John Greaves using the data of SonotaCo. This source is active from November 26 through January 24 with peak

rates occur near December 21st. The current radiant location is at 13:36 (204) +06, which places it in northern Virgo, 6 degrees north of the 3rd magnitude star known as Heze (zeta Virginis A). 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.

The **Ursids (URS)** are active from December 13-24 and peak on the morning of December 22nd. The radiant is currently located at 13:51 (208) +76. This area of the sky is located in southwestern Ursa minor, 3 degrees west of the 4th magnitude star 5 Ursae Minoris. This area of the sky is best seen during the last hour before dawn when it lies highest in the northern sky. Current rates are expected to be less than 1 no matter your location. This will increase to 5-10 meteors per hour on the morning of December 22nd for observers in the Northern Hemisphere. These meteors are not visible from the Southern Hemisphere. At 35 km/sec. this source would produce mostly medium speed 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 9 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 7 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. Evening rates are reduced during this period due to moonlight.

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 available at: https://meteorshowers.seti.org/ 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.

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 1 but noting parameters such as the radiant distance and the elevation of each meteor, one can compute the probability of shower association. Most showers discovered by video means have rates less than 1 per **night** away from maximum, so the showers listed in these outlooks are not as weak as they seem. 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
		RA (RA in Deg.) DEC	Km/Sec	Local Standard Time	North-South	
Anthelions (ANT)	-	06:36 (099) +23	30	00:00	3 - 2	II
Monocerotids (MON)	Dec 11	07:02 (106) +07	40	01:00	1 - 1	II
alpha Hydrids (AHY)	Jan 05	07:42 (116) -05	46	02:00	<1 - <1	IV
Geminids (GEM)	Dec 14	07:50 (118) +32	34	02:00	4 - 2	I
sigma Hydrids (HYD)	Dec 07	08:53 (133) +00	58	03:00	<1 - <1	II
eta Hydrids (EHY)	Dec 12	09:21 (140) +01	62	04:00	<1 - <1	IV
theta Pyxidids (TPY)	Dec 18	10:15 (154) -24	62	04:00	<1 - <1	IV
Comae Berenicids (COM)	Dec 16	10:38 (160) +32	63	05:00	2 - 1	II
December chi Virginids (XVI)	Dec 12	12:54 (193) -12	68	07:00	<1 - <1	IV
December rho Virginids (DRV)	Dec 05	13:08 (197) +12	68	07:00	<1 - <1	IV
December sigma Virginids (DSV)	Dec 21	13:36 (204) +06	66	08:00	<1 - <1	IV
Ursids (URS)	Dec 22	13:51 (208) +76	35	07:00	<1 - <1	I

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.