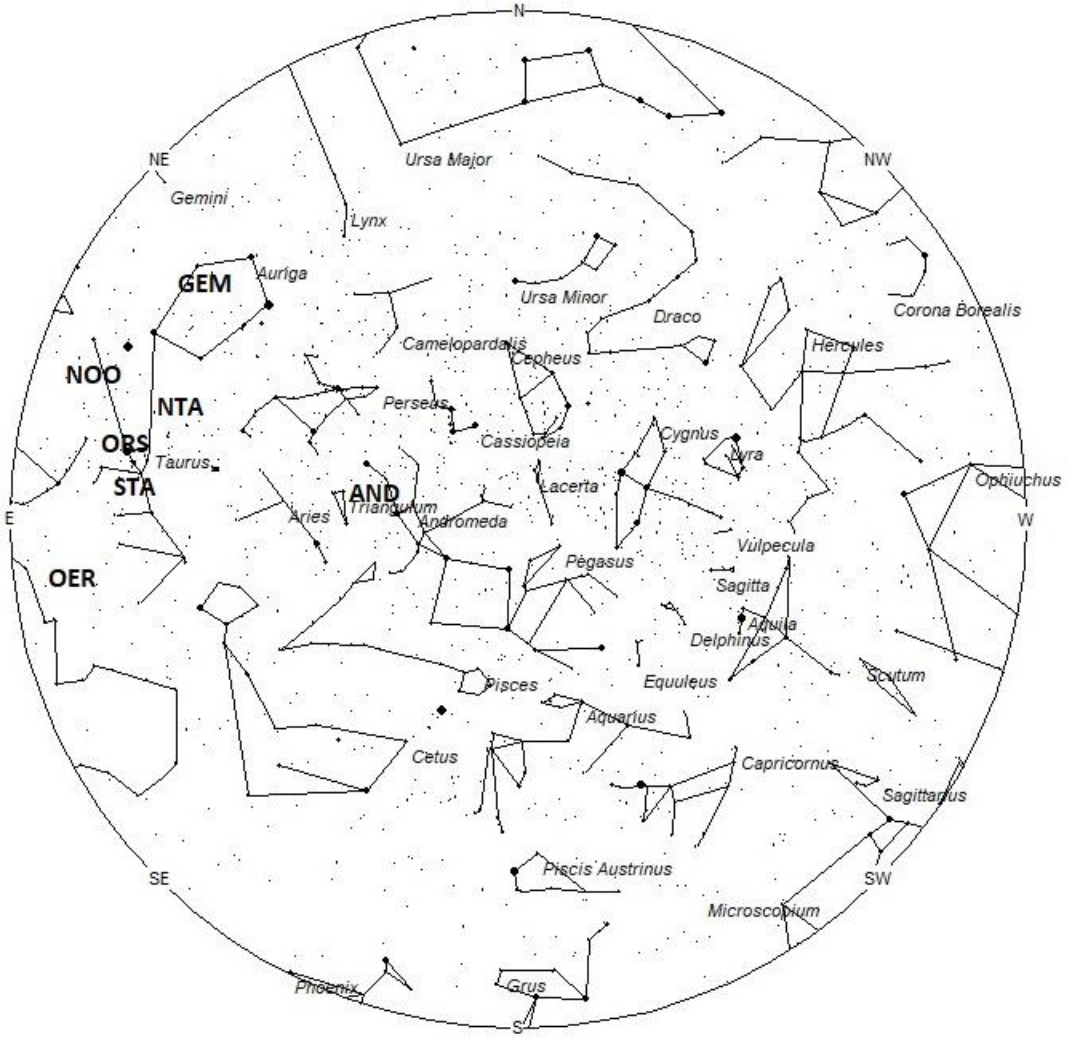
Meteor Activity Outlook for November 19-25, 2022

Just over a year ago on November 4, 2021, Justin Anderson was photographing an intense aurora display from Minnedosa. Manitoba, Canada, when a fireball shot through the field of view, adding to the splendor of the scene. Of course, the odds of this occurring are astronomical! © Justin Anderson

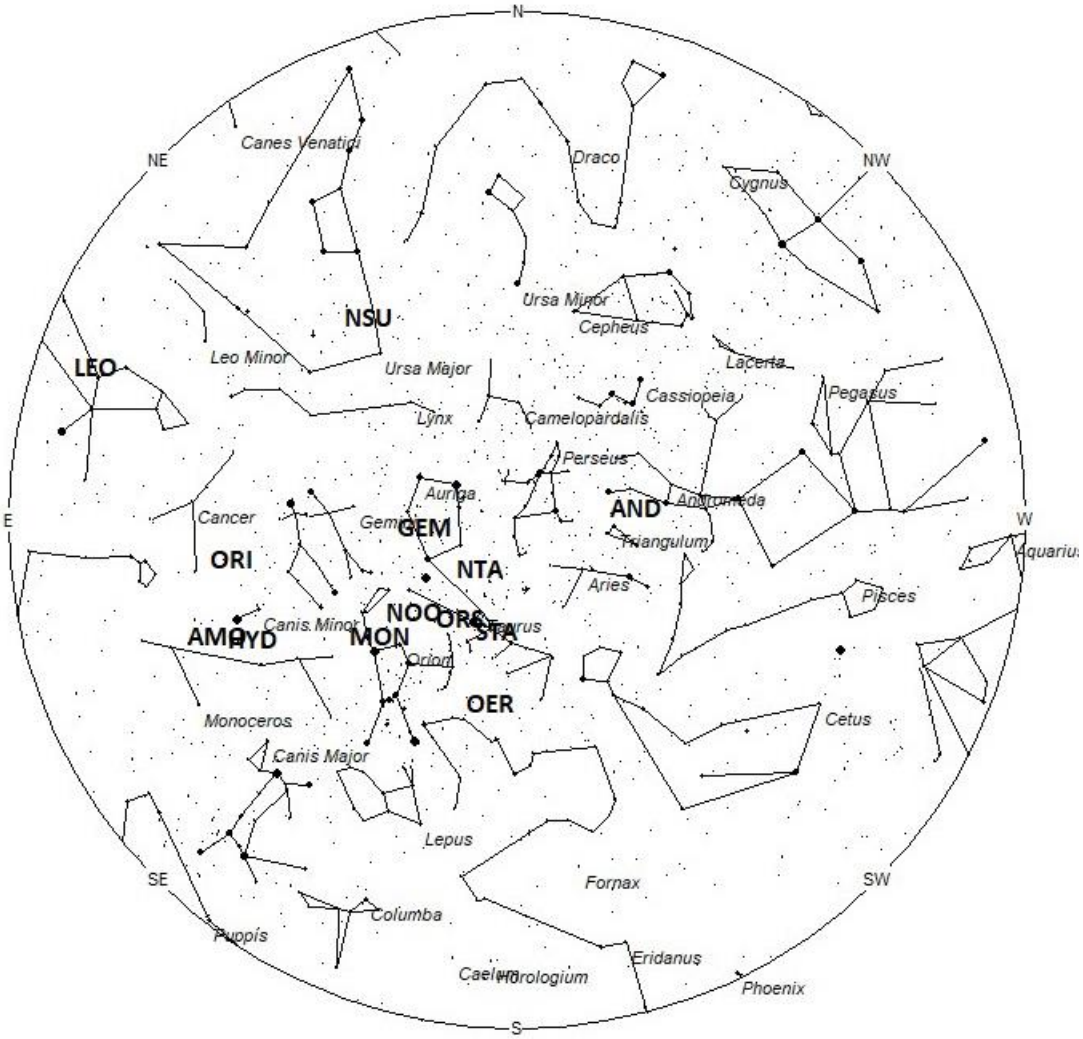
During this period, the moon reaches its new phase on Wednesday November 23rd. At that time the moon will lie near the sun and will be invisible at night. This weekend the waning crescent moon will rise during the late morning hours and can be easily avoided by keeping it out of your field of view. The 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 15 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. 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.

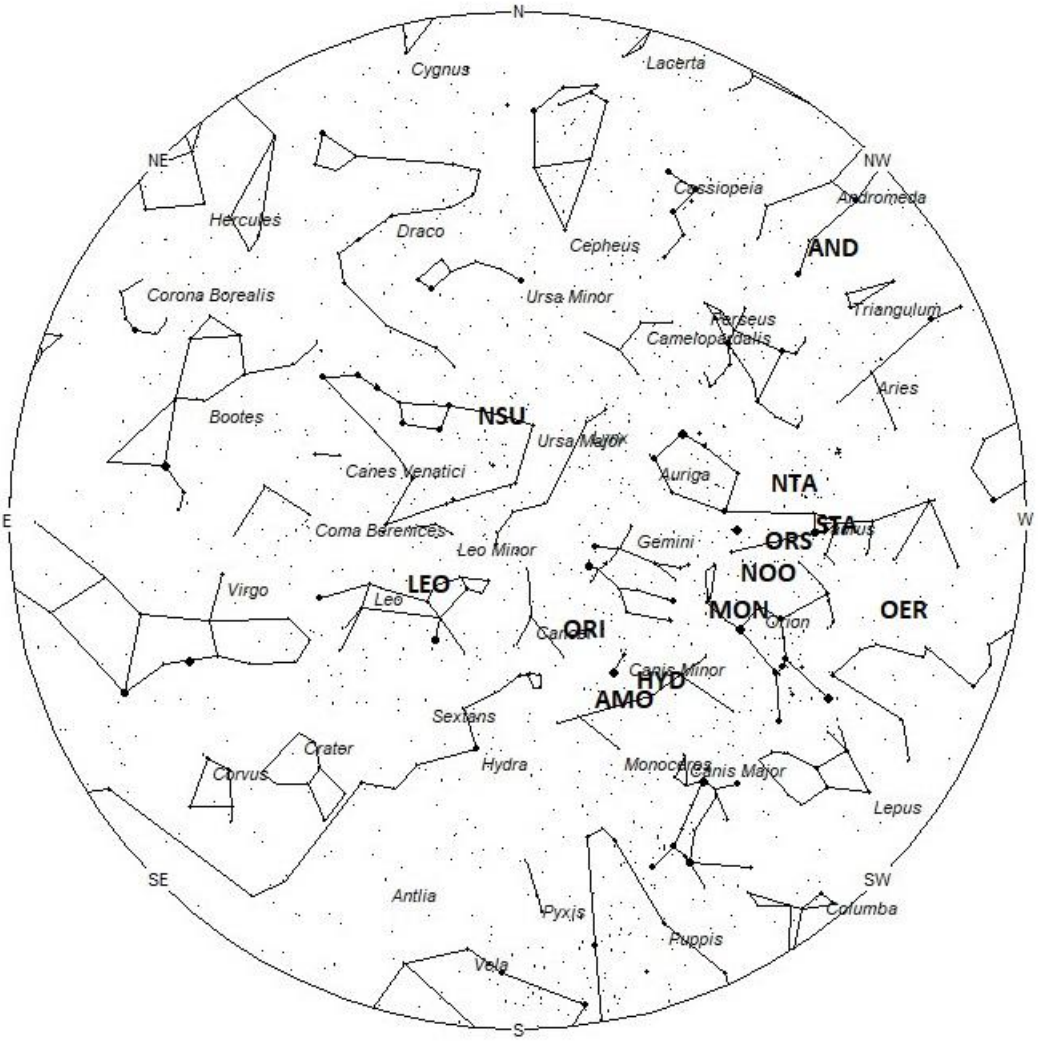
The radiant (the area of the sky where meteors appear to shoot from) positions and rates listed below are exact for Saturday night/Sunday morning November 19/20. These positions do not change greatly day to day so the listed coordinates may be used during this entire period. Most star atlases (available 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.

The **Andromedids (AND)** are the annual debris encountered from the remains of comet 3D/Biela. These meteors should not be mistaken for the great meteor storms of the 19th century as those meteors are in a slightly different orbit and irregularly encountered in early December. They are known as the December phi Cassiopeiids (DPC). The AND radiant currently is located near 01:36 (024) +37. This position lies in southeastern Andromeda, 4 degrees southwest of the 2nd magnitude double star known as Almach (gamma Andromedae A). This part of the sky is best placed near 2300 local standard time (LST), when the radiant lies highest above the horizon. Face toward the south at this time to best see these meteors. Current rates would most likely be less than 1 per hour no matter your location. With an entry velocity of 15 km/sec., the average Andromedid meteor would be of very slow velocity.

The **Southern Taurids (STA)** are still active and producing fireballs from a radiant located at 04:08 (62) +15. This position lies in western Taurus, 2 degrees west of the 4th magnitude star known as Prima Hyadum (gamma Tauri A). To best see these meteors, one should face southward near 01:00. Rates at this time should be near 2 per hour no matter your location. With an entry velocity of 24 km/sec., the average STA meteor would be of medium-slow velocity.

The **omicron Eridanids (OER)** was discovered by the Japanese video meteor network SonotaCo from video data obtained during 2007-2008. These meteors are active from October 23 through December 2nd. Maximum activity is ill-defined and may occur anytime from November 3-27. The date listed in the table represents the midpoint of the activity curve and not the actual date of maximum activity. The radiant is currently located at 04:13 (63) -02, which is located in northeastern Eridanus, 5 degrees north of the 4th magnitude star known as Beid (Omicron[1] Eridani). This radiant is best placed near 0100 LST, when it lies on the meridian and is located highest in the sky. Face toward the south at this time to best see these meteors. Rates at this time should be less than 1 per hour no matter your location. With an entry velocity of 27 km/sec., the average OER meteor would be of medium-slow velocity.

The **Northern Taurids (NTA)** are active from a radiant located at 04:20 (65) +24. This area of the sky is located in northern Taurus, 1 degree northwest of the 4th magnitude star known as upsilon Tauri. Like the STA's, to best see these meteors, one should face southward near 01:00 LST. Maximum activity was on November 12th so rates at this time should be near 3 per hour as seen from the Northern Hemisphere and 2 as seen from south of the equator. With an entry velocity of 26 km/sec., the average NTA meteor would be of medium-slow velocity.

The **Southern chi Orionids (ORS)** are usually included in the totals of the Southern Taurids, as the two radiants are separated by only 5 degrees. Careful study of this area of the sky can separate these two showers. These meteors are active from November 14 through December 16, with maximum activity occurring on December 2nd. The radiant is currently located at 04:37 (69) +17, which lies in central Taurus, only 1 degree east of the 1st magnitude star known as Aldebaran (alpha Tauri). This radiant is best placed in the southern sky near 0100 LST, when it lies on the meridian and is located highest in the sky. Rates at this time should be less than 1 per hour no matter your location. With an entry velocity of 28 km/sec., the average ORS 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 30th. The radiant is currently located at 05:24 (081) +16. This area of the sky lies on the Taurus/Orion border, 10 degrees north of the 2nd magnitude star known as Bellatrix (gamma Orionis). This radiant is best placed in the southern sky near 0300 LST, when it lies highest above the horizon. Rates should be near 1 per hour no matter your location. With an entry velocity of 44 km/sec., most activity from this radiant would be of medium speed.

The **Monocerotids (MON)** become active this week from a radiant located at 05:47 (087) +11. This area of the sky is located in northern Orion, 3 degrees northwest 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 0300 LST, when it lies highest in the southern sky. Rates should be less than 1 per hour no matter your location. With an entry velocity of 45 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.

It's mid-November, yet the **Geminids (GEM)** are making their first appearance this week. These November Geminids were first called the theta Aurigids, but it soon became clear that they and the Geminids were one and the same. The Geminids are active from November 19th through December 24th, peaking on December 14th. The radiant currently lies at 05:53 (088) +35. This area of the sky lies in south-central Auriga, 2 degrees southwest of the 2nd magnitude star known as Mahasim (theta Aurigae A). These meteors are best seen near 03:00 LST, when the radiant lies highest in the southern sky. Rate are expected to be less than 1 per hour, no matter your location. With an entry velocity of 35km/sec, most of these meteors would appear to possess a medium velocity.

The **sigma Hydrids (HYD)** become active this week from a radiant located at 07:20 (110) +06. This area of the sky is located in central Canis Minor, 3 degrees west of the zero-magnitude star known as Procyon (alpha Canis Minoris). These meteors are active from November 24 through January 7th, with maximum activity occurring on December 7th. The activity profile is not smooth as there are several minor peaks of activity throughout the activity period. We will highlight these as they occur. To best see these meteors, face toward the south during the last couple of hours prior to dawn. With an entry velocity of 60km/sec, most of these meteors would appear swift.

The **alpha Monocerotids (AMO)** are best known for their occasional outbursts, the last which occurred in 2019. These meteors are active from 13-27 November with maximum occurring on the 22nd. Rates away from the night of maximum are very low, far less than 1 per hour no matter your location. The radiant is currently located at 07:46 (116) +01. This area of the sky is located in southern Canis Minor, 4 degrees southeast of the zero-magnitude star known as Procyon (alpha Canis Minoris A). To best see these meteors, face toward the south during the last hours prior to dawn. With an entry velocity of 62km/sec, most of these meteors would appear swift.

The last of the **Orionids (ORI)** will appear this week from a radiant located at 07:52 (118) +16, which places it in southeastern Gemini, 11 degrees northeast of the zero magnitude star known as Procyon (alpha Canis Minoris). To best see these meteors, face toward the south during the last

hours prior to dawn. Current rates are expected to be less than near 1 per hour, no matter your location. With an entry velocity of 64 km/sec., the average ORI meteor would be of swift velocity.

The **Nov. sigma Ursae Majorids (NSU)** are a weak shower active from November 17-December 2. Maximum activity occurs on November 24th. The radiant is currently located at 09:35 (144) +61. This area of the sky lies in western Ursa Major, 3 degrees northwest of the 4th magnitude star known as upsilon Ursae Majoris. To best see these meteors, face toward the north during the last hours prior to dawn. Current rates are expected to be less than near 1 per hour, no matter your location. With an entry velocity of 52 km/sec., the average NSU meteor would be of medium-swift velocity.

The **Leonids (LEO)** are active from November 03-December 02 with maximum activity occurring on November 18th. The radiant is currently located at 10:22 (155) +21. This position lies in western Leo, 1 degree northeast of the 2nd magnitude double star known as Algieba (gamma Leonis A). 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 near 5 per hour as seen from the Northern Hemisphere and 3 as seen from south of the equator. With an entry velocity of 70 km/sec., most activity from this radiant would be of swift speed with numerous persistent trains on the brighter meteors. To read about a possible outburst from the Leonids this year, check out: https://www.amsmeteors.org/2022/11/viewing-the-leonid-meteor-shower-in-2022/

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 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 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. Morning 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	
Andromedids (AND)	Nov 06	01:36 (024) +37	15	23:00	<1 - <1	IV
Southern Taurids (STA)	Nov 05	04:08 (62) +15	24	01:00	2 - 2	II
omicron Eridanids (OER)	Nov 13	04:13 (63) - 02	27	01:00	<1 - <1	IV
Northern Taurids (NTA)	Nov 12	04:20 (65) +24	26	01:00	3 - 2	II
Southern chi Orionids (ORS)	Dec 02	04:37 (69) +17	28	01:00	<1 - <1	IV
Nov. Orionids (NOO)	Nov 30	05:24 (081) +16	44	03:00	1 - 1	II
Monocerotids (MON)	Dec 11	05:47 (087) +11	45	03:00	<1 - <1	II
Geminids (GEM)	Dec 14	05:53 (088) +35	35	03:00	<1 - <1	I
sigma Hydrids (HYD)	Dec 07	07:20 (110) +06	60	05:00	<1 - <1	II
alpha Monocerotids (AMO)	Nov 22	07:46 (116) +01	62	05:00	<1 - <1	III
Orionids (ORI)	Oct 21	07:52 (118) +16	64	05:00	<1 - <1	I
Nov. sigma Ursae	Nov 24	09:35 (144) +61	52	07:00	<1 - <1	IV

Majorids (NSU)						
Leonids (LEO)	Nov 18	10:22 (155) +21	70	07:00	5 - 3	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.