

Meteor Activity Outlook for December 5-11, 2020

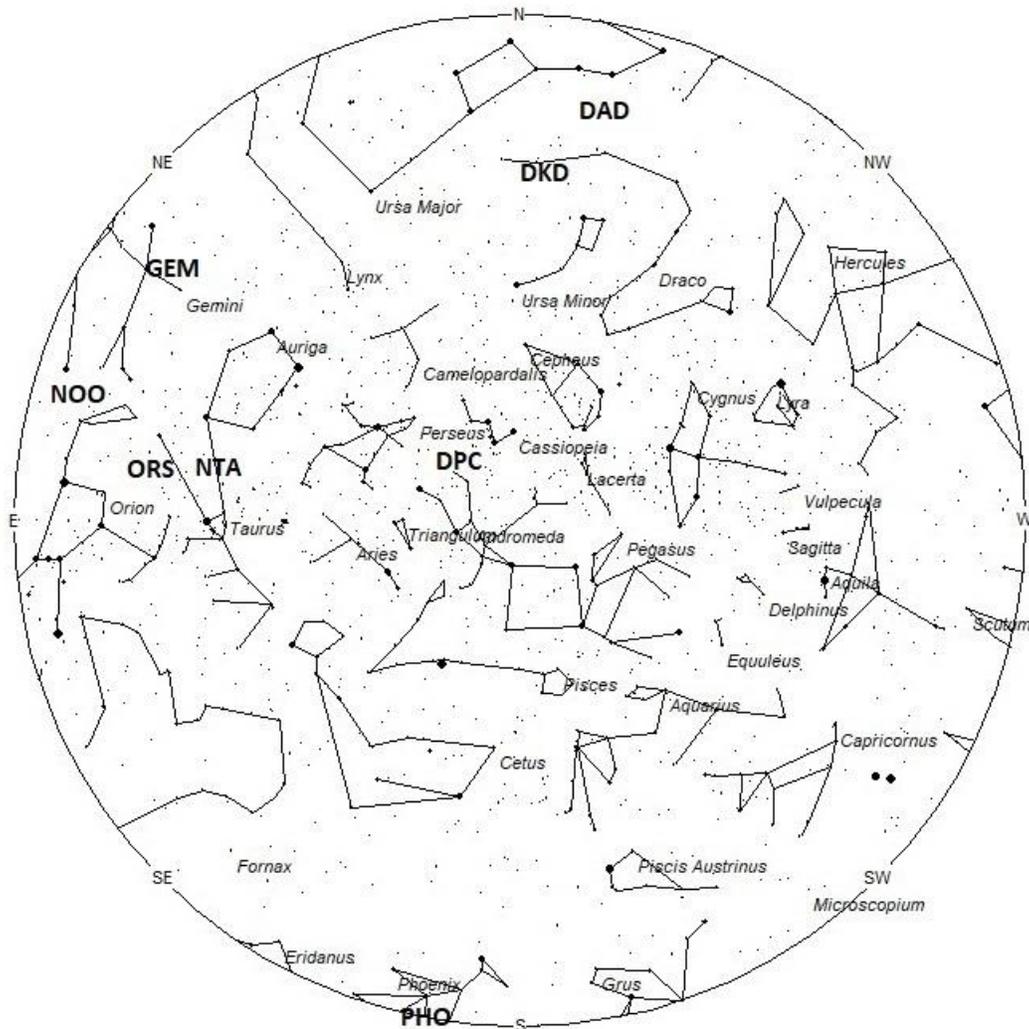


Samer Hobeika was photographing this nighttime scene when this bright fireball occurred just above the horizon. It occurred at 04:34 UT (12:34am EST) on 22 August 2020 from Dalkeith, Ontario, Canada. For more details on this particular event visit: https://fireball.amsmeteors.org/members/imo_view/event/2020/4701. Credit Samer Hobeika

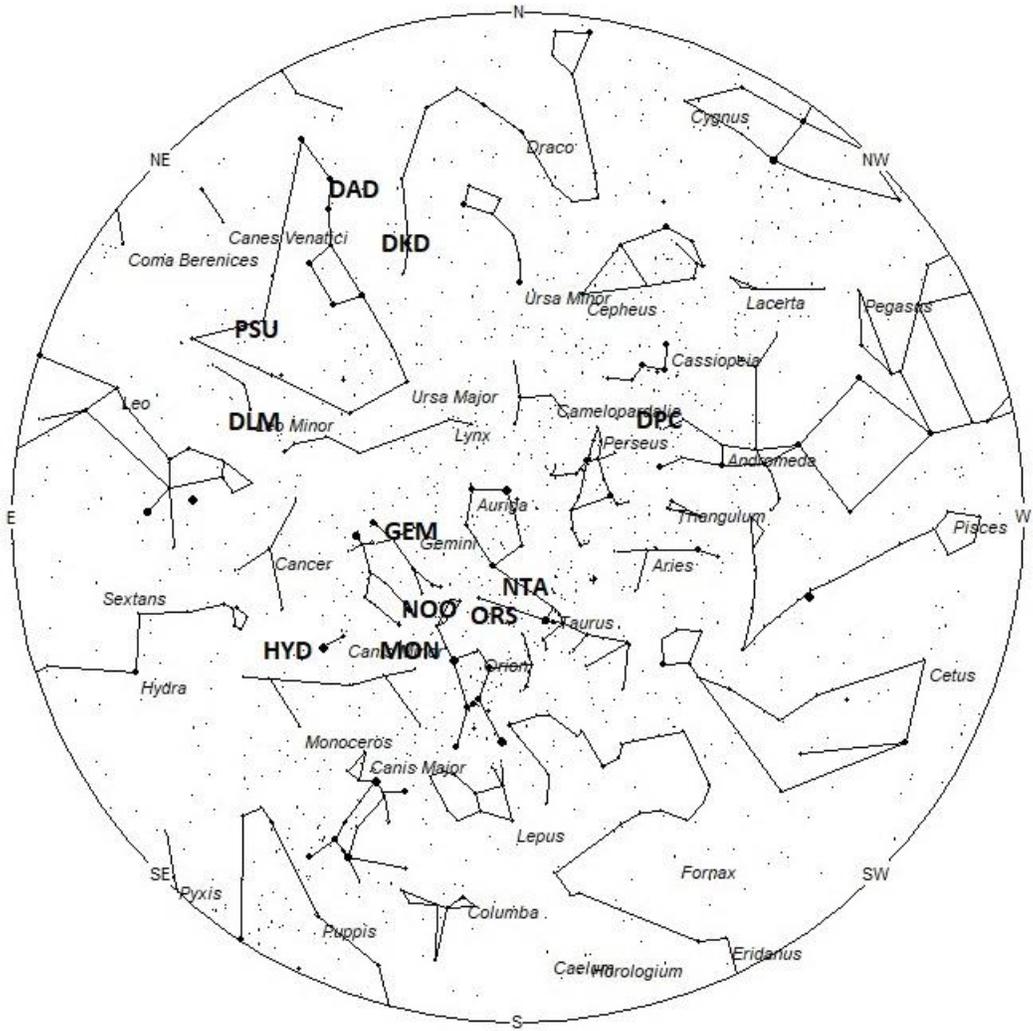
During this period, the moon reaches its last quarter phase on Tuesday December 8th. At this time, the moon is located 90 degrees west of the sun and rises near midnight local standard time (LST). The evening hours will be free of interfering moonlight and the morning hours can also be used for observing as long as you keep the moon out of your field of view. The estimated total hourly meteor rates for evening observers this week is near 4 as seen from mid-northern latitudes and 3 as seen from tropical southern locations (25S). For morning observers, the estimated total hourly rates should be near 12 as seen from mid-northern latitudes (45N) and 8 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. Rates are reduced during the morning hours due to interfering 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 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 5/6. These positions do not change greatly day to day so the listed

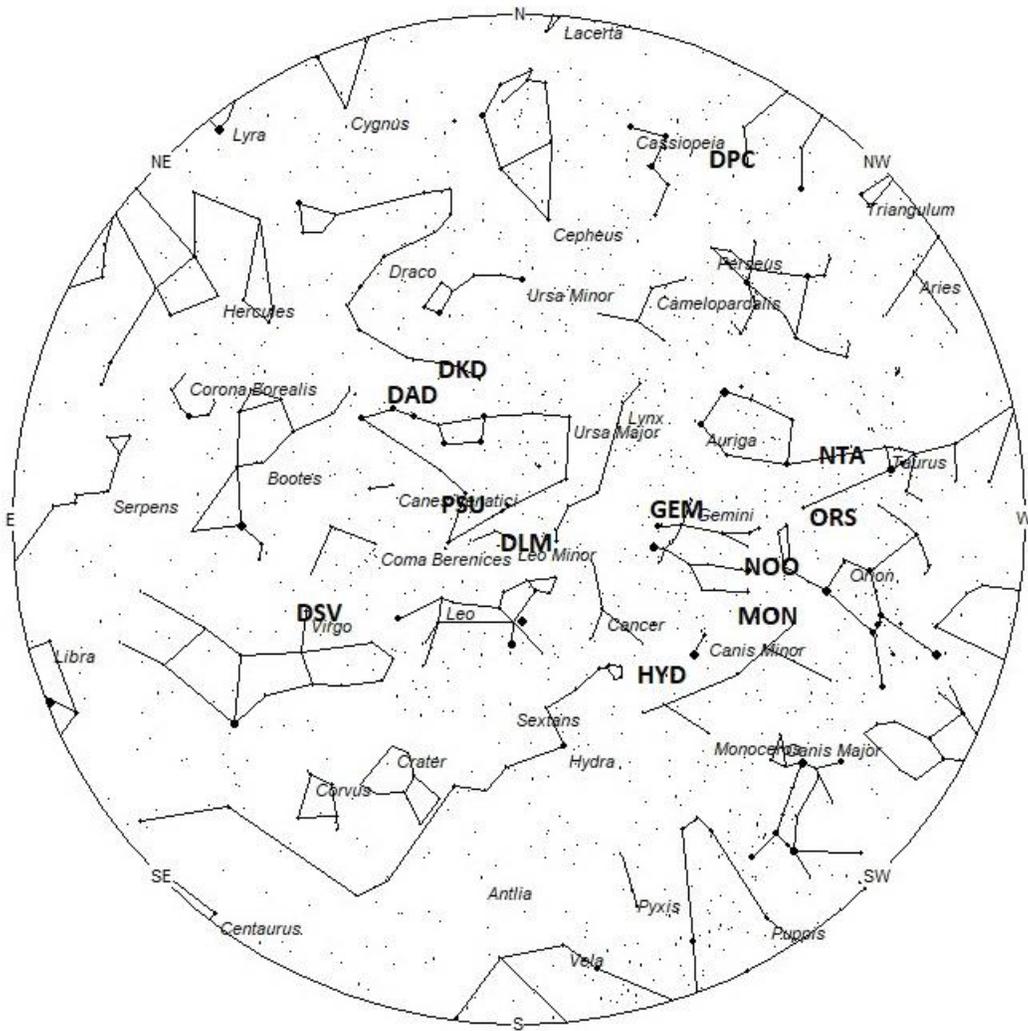
coordinates may be used during this entire period. Most star atlases (available at science stores and planetariums) will provide maps with grid lines of the celestial coordinates so that you may find out exactly where these positions are located in the sky. A planisphere or computer planetarium program 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 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 12am Local Standard Time



Radiant Positions at 5am 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 5. 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 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 12 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 6th when the radiant is located at 01:36 (024) +50. This area of the sky is located just northwest of the 4th magnitude star known as Nembus (51 Andromedae). This position is also very close to the border with Cassiopeia and in some years the radiant lies in Cassiopeia, hence the name of phi Cassiopeiids. These meteors are best seen near 2100 (9pm) Local Standard Time (LST). Meteors from the December Phi Cassiopeiids strike the atmosphere at 17km/sec., which would produce meteors of very slow velocity. Expected rates are less than 1 per hour no matter your location.

The **Northern Taurids (NTA)** are still active from a large radiant located at 04:58 (074) +26. This area of the sky is located in northern Taurus, 5 degrees southwest of the 2nd magnitude star known as El Nath (beta Tauri). This position is close to the **Southern chi Orionids** so care must be taken in separating these meteors. You should have the two radiants near the center of your field of view to properly differentiate these sources. Current rates should be less than 1 per hour no matter your location. These meteors may be seen all night long but the radiant is best placed near midnight LST when it lies on the meridian and is located highest in the sky. With an entry velocity of 27 km/sec., the average Northern Taurid meteor would be of slow velocity.

The **Southern chi Orionids (ORS)** have been known for about 150 years and are somewhat of a controversial listing. Many believe this is just a continuation of the Taurids into December and others feel it's just the Anthelion source. Recent studies by Masahiro Koseki indicate that this is a separate source and should be listed separately from the Taurids/Anthelion sources. Activity is listed from November 13 through December 21, with a weak maximum on December 2nd. These meteors are known more for their fireballs than hourly rates, which seldom exceed 1 per hour. The radiant is currently located at 05:29 (082) +18. This area of the sky is located 10 degrees south of the 2nd magnitude star known as El Nath (beta Tauri). Current rates should be less than 1 per hour no matter your location. These meteors may be seen all night long but the radiant is best placed near midnight LST when it lies on the meridian and is located highest in the sky. With an entry velocity of 26 km/sec., the average meteor from this source would be of slow velocity.

The last of the **November Orionids (NOO)** may be seen from a radiant located at 06:23 (096) +15. This area of the sky lies on the Gemini/Orion border, 4 degree southwest of the 2nd magnitude star known as Alhena (gamma Geminorum). This radiant is best placed in the sky near 0100 LST, when it lies highest above the horizon. This stream is active from November 7 through December 17, with maximum activity occurring on November 29. Rates should be near less than 1 per hour no matter you location. With an entry velocity of 43 km/sec., most activity from this radiant would be of medium speed.

The **December Monocerotids (MON)** are active from December 5-20 with the peak activity occurring on December 11th. The radiant is currently located at 06:36 (099) +09. This position lies in northern Monoceros, 8 degrees south of the 2nd magnitude star known as Alhena (gamma Geminorum). This position is only 7 degrees south of the radiant of the November Orionids so care must be taken to distinguish between the two. Current rates should be near 1 per hour no matter your location. Rates at maximum may reach 2 per hour. The Monocerotids are best seen near 0100 LST when the radiant lies highest above the horizon. At 41 km/sec. the Monocerotids produce mostly meteors of medium velocity.

The **Geminids (GEM)** are active from December 1-22, with peak activity occurring on December 14th. This weekend the radiant is located near 07:01 (105) +34. This position lies in northern Gemini, 2 degrees southeast of the 4th magnitude star known as a theta Geminorum. Rates this weekend should be near 3 per hour as seen from the northern hemisphere and 2 as seen from south of the equator. This radiant is best placed in the sky near 0200 LST, when it lies highest above the horizon. At 34 km/sec. the Geminids produce mostly meteors of medium velocity.

The **Puppis-Velids (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 December 1st. The center of this activity is currently located at 08:10 (122) -45. This position lies in western Vela, 2 degrees northeast of the 2nd magnitude star known as gamma Velorum. Peak rates occur near December 7. These meteors are best seen near 0300 LST when the radiant lies highest above the horizon in a dark 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 40 km/sec. the Puppis-Velids produce meteors of average velocity. Note: these are also listed as the “e Velids” from several sources.

The **sigma Hydrids (HYD)** are active from a radiant located at 08:14 (123) +03. This area of the sky is located in western Hydra, 5 degrees west of the faint star known as sigma Hydrae in the head of the serpent. With maximum activity occurring on December 7th, current rates should be near 1 per hour no matter your location. These meteors are best seen near 0300 LST, when it lies highest above the horizon in a dark sky. With an entry velocity of 59 km/sec., the average sigma Hydrid meteor would be of swift velocity.

The **December Leonis Minorids (DLM)** are a shower of long duration active from December 6th through January 18th. Maximum occurs near December 17th when rates may reach 3 an hour. During this period, I would expect an hourly rates less than 1 from a radiant located at 09:54 (148) +36. This position lies in western Leo Minor, 2 degrees southwest of the faint star known as 21 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 **Psi Ursa Majorids (PSU)** were discovered by observers in Japan using data from SonotaCo. This shower is active from November 27-December 12 with maximum activity occurring on December 4th. At maximum the radiant is located at 11:16 (169) +44. This position lies in central Ursa Major, 1 degree southeast 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 horizon in a dark sky. Current rates would most likely be less than one per hour no matter your location At 61km/sec., the average Psi Ursa Majorid meteor would be swift.

The **December Kappa Draconids (DKD)** are another shower discovered in Japan by observers using data from SonotaCo. This short-lived shower is only active from December 2-7 with maximum activity occurring on December 4th. On the night of maximum the radiant will be located at 12:29 (187) +70. This position lies in extreme western Draco, close to the faint star 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 horizon in a dark sky. Rates could reach 2 per hour on the morning of the 3rd. 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 41km/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 of SonotaCo. IMO video cameras confirmed that this source is active from November 22 through January 25. Peak rates occur near December 21st. The current radiant location is at 12:58 (194) +08 which places it in northern Virgo, 2 degrees southeast of the 3rd magnitude star known as Vindemiatrix (epsilon 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 66 km/sec. the December Sigma Virginids would produce mostly swift meteors.

The **December Alpha Draconids (DAD)** were discovered by the Japanese observers using data from SonotaCo. This source is active from November 30-December 15, with maximum activity occurring on December 8th. The radiant is currently located at 13:29 (202) +59. This position actually lies in northeastern Ursa Major, 5 degrees north of the second magnitude star known as Mizar (zeta Ursae Majoris). These meteors are best seen during the last dark hour before dawn, when the radiant lies highest above the horizon in a dark sky. This shower is not well seen from the southern hemisphere. Current rates would most likely be less than 1 per hour no matter your location. At 44 km/sec. meteors from this source would produce mostly medium velocity meteors.

As seen from the mid-northern hemisphere (45N) one would expect to see approximately 7 **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 5 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. Morning 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
		RA (RA in Deg.) DEC	Km/Sec	Local Standard Time	North- South	
December Phoenicids (PHO)	Dec 05	01:12 (018) - 53	12	20:00	<1 – <1	III
December phi Cassiopeiids (DPC)	Dec 06	01:36 (024) +50	17	21:00	<1 – <1	III
Northern Taurids (NTA)	Nov 16	04:58 (074) +26	27	00:00	<1 – <1	II
Southern chi Orionids (ORS)	Dec 02	05:29 (082) +18	26	00:00	<1 – <1	IV
November Orionids (NOO)	Nov 29	06:23 (096) +15	43	01:00	<1 – <1	II
December Monocerotid s (MON)	Dec 11	06:36 (099) +09	41	01:00	1 – 1	II
Geminids (GEM)	Dec 14	07:01 (105) +34	34	02:00	3 – 2	I
Puppilid- Velids (PUP)	Dec 07	08:10 (122) - 45	40	03:00	<1 – 1	II
sigma Hydrids (HYD)	Dec 07	08:14 (123) +03	59	03:00	1 – 1	II

December Leonis Minorids (DLM)	Dec 17	09:54 (148) +36	63	04:00	<1 – <1	II
Psi Ursa Majorids (PSU)	Dec 04	11:16 (169) +44	61	05:00	<1 – <1	IV
December Kappa Draconids (DKD)	Dec 04	12:29 (187) +70	41	06:00	<1 – <1	IV
December Sigma Virginids (DSV)	Dec 21	12:58 (194) +08	66	07:00	<1 – <1	IV
December Alpha Draconids (DAD)	Dec 08	13:29 (202) +59	44	08:00	<1 – <1	IV