Meteor Activity Outlook for October 29-November 4, 2022

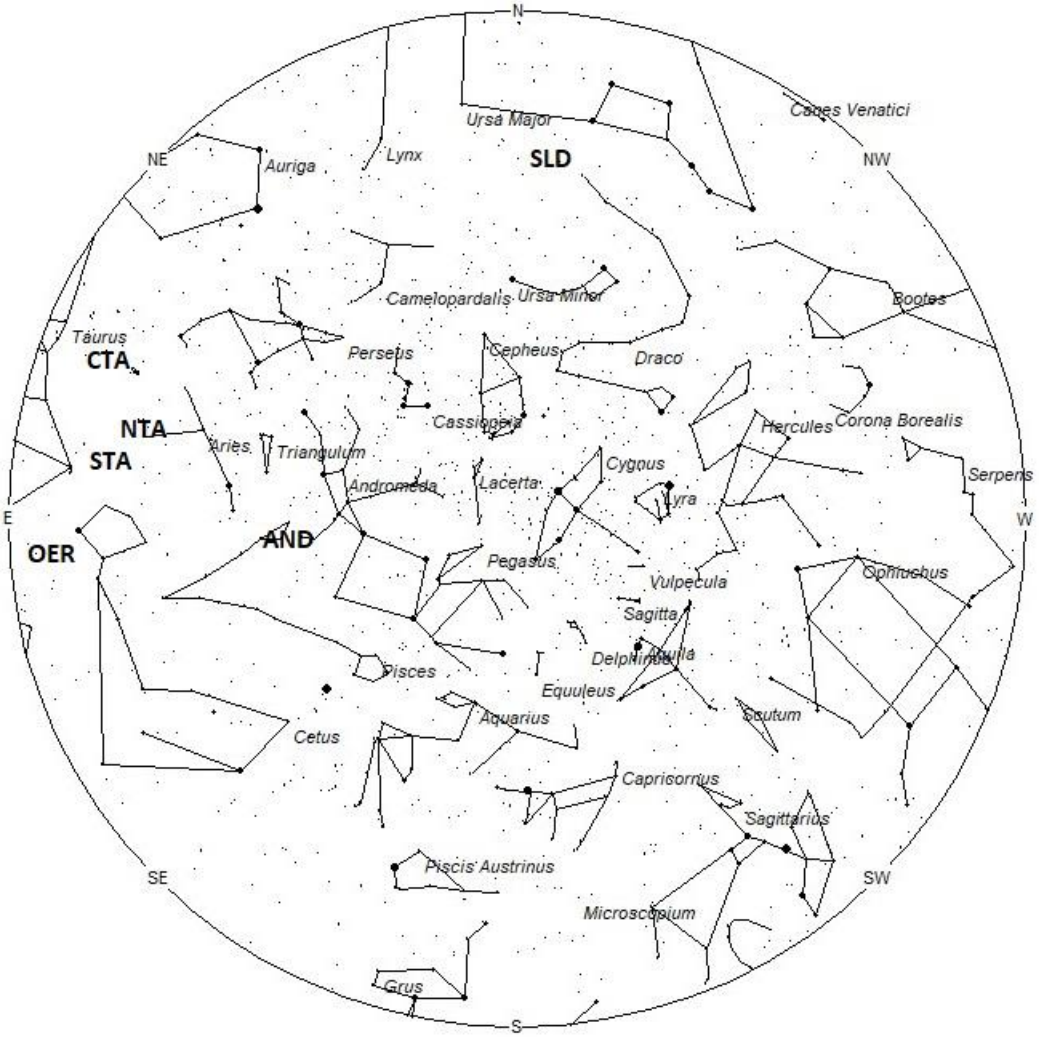
On July 21, 2022, Greg Price was photographing the night sky from Richmond, South Island, New Zealand, hoping to capture aurora. Instead he captured this impressive fireball at 20:06 NZST (8:06 UT) For more on this fireball, visit: https://fireball.amsmeteors.org/members/imo_view/event/2022/4171 ©Greg Price

As seen from the Northern Hemisphere, meteor rates continue to be strong in November. While no major activity is expected this month, the two Taurid radiants plus the Leonids keep the skies active. The addition of strong sporadic rates makes November one of the better months to view meteor activity from north of the equator. Skies are fairly quiet as seen from the Southern Hemisphere this month. Activity from the three showers mentioned above may be seen from south of the equator, but the sporadic rates are much lower than those seen north of the equator. Both hemispheres can see an increase in fireballs from the Southern Taurids, which is expected to last though the first half of the month.

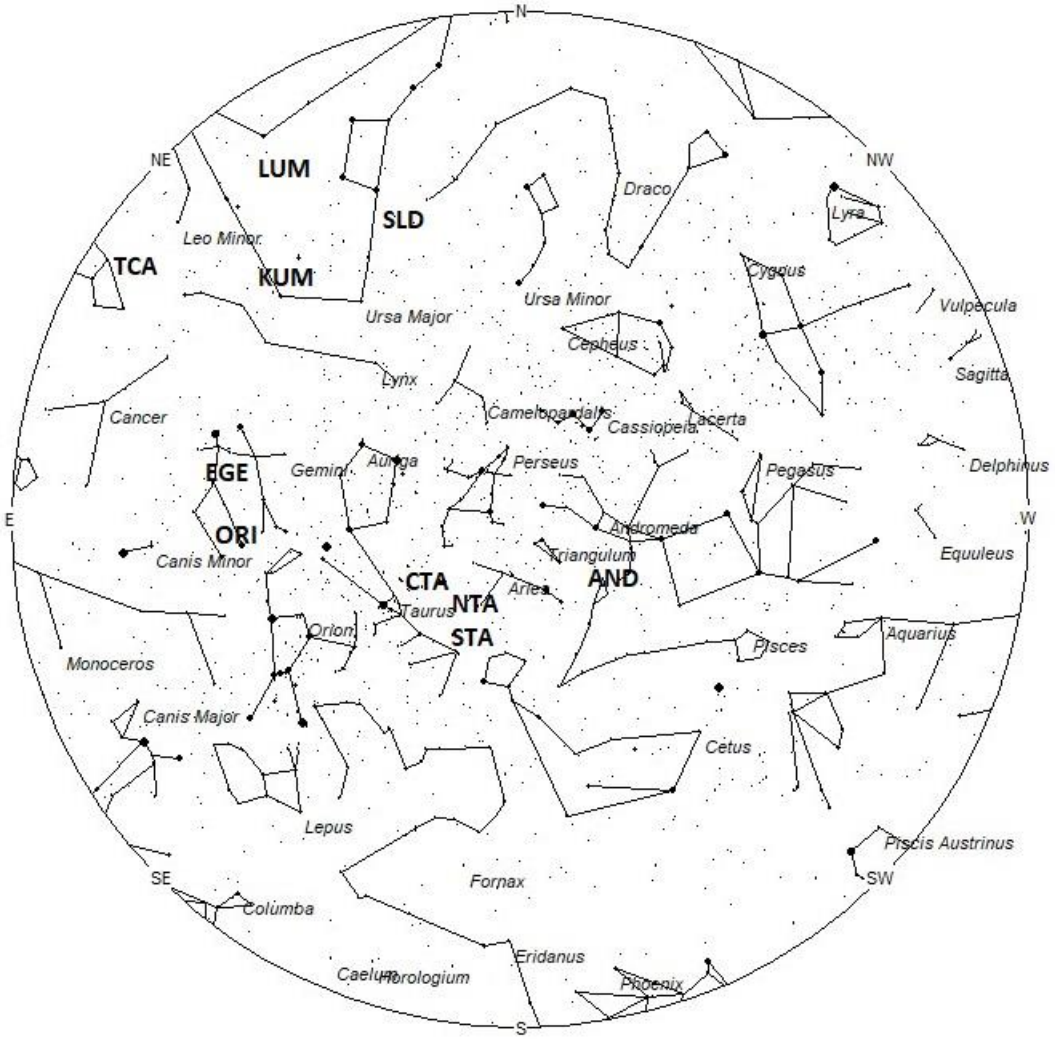
During this period, the moon reaches its first quarter phase on Tuesday November 1st. At that time the moon will lie 90 degrees east of the sun and will set near 22:00 local standard time (LST) on October 31st. As the week progresses the waxing gibbous moon will shrink the window of dark sky between moon set and dawn to about two hours by the end of the period. This weekend the moon will during the evening hours and will not interfere with meteor observing. 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). Evening rates are reduced by moonlight during this period. 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.

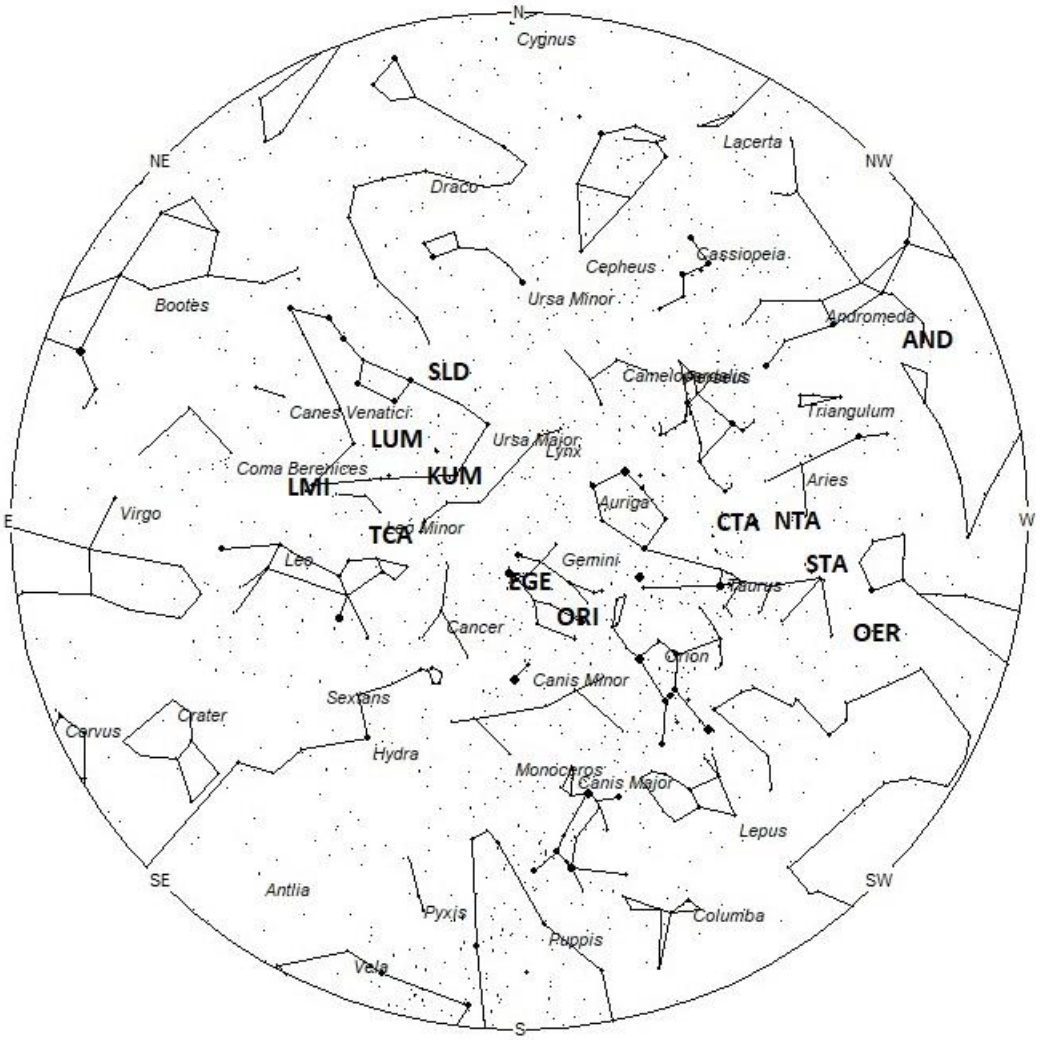
The radiant (the area of the sky where meteors appear to shoot from) positions and rates listed below are exact for Saturday night/Sunday morning October 29/30. These positions do not change greatly day to day so the listed coordinates may be used during this entire period. Most star atlases (available 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 8pm Local Daylight Saving Time



Radiant Positions at 1am Local Daylight Saving Time



Radiant Positions at 6am Local Daylight Saving 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 radiant currently is located near 01:15 (019) +23. This position lies in northeastern Pisces, 3 degrees east of the 4th magnitude star known as eta Andromedae. This part of the sky is best placed near 2200 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 20 km/sec., the average Andromedid meteor would be of very 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 03:15 (49) +00, which is located in northeastern Cetus, 5 degrees southeast of the 3rd magnitude star known as Menkar (alpha Ceti). 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 30 km/sec., the average OER meteor would be of medium-slow velocity.

The **Northern Taurids (NTA)** are active from a radiant located at 03:15 (49) +20. This area of the sky is located in central Aries, 1 degree east of the 4th magnitude star known as Botein (delta Arietis). To best see these meteors, one should face southward near 01:00. Maximum activity is not until November 12th so rates at this time should be near 2 per hour as seen from the Northern Hemisphere and 1 as seen from south of the equator. With an entry velocity of 30 km/sec., the average NTA meteor would be of medium-slow velocity.

The **Southern Taurids (STA)** are very complex and recent investigations have revealed two distinct components of this meteor shower. The first component represents the early and regular annual activity of Southern Taurids, and the latter component represents the main source of activity and is periodic. The early STA's are active from September 28 through November 7 and peaks on October 17th. The main component of the STA's is active from October 13 through December 2 and peaks on November 5th*. These two components lie only 5 degrees apart and would be difficult to distinguish by visual means. Therefore, we will list the mean position of these two sources which happens to be 03:16 (49) +13. This position lies in southeastern Aries, 5 degrees west of the 4th magnitude star known as 5 Tauri. Like the NTA's, to best see these meteors one should face southward near 01:00. Rates at this time should be near 7 per hour as seen from the Northern Hemisphere and 5 per hour as seen from south of the equator. With an entry velocity of 28 km/sec., the average STA meteor would be of medium-slow velocity. Also see: https://www.amsmeteors.org/2022/10/will-there-be-a-swarm-of-taurid-meteors-this-year/

*The activity of meteor showers recorded by SonotaCo Net video observations 2007–2018, Masahiro Koseki, 2021, https://www.meteornews.net/2021/02/09/february-2021-special-issue-of-emeteornews-online/ Page 170

The **chi Taurids (CTA)** were discovered by Dr. Peter Brown during his 7-year survey using the Canadian Meteor Orbit Radar (CMOR). This source is active from October 24 through November 13 with a maximum occurring near November 4th. The radiant is currently located at 03:56 (059) +26, which places it in western Taurus, 3 degrees east of the naked eye open cluster known as the Pleiades. These meteors may be seen all night long but the 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. Current rates should be less than 1 per hour no matter your location. With an entry velocity of 41 km/sec., the average chi Taurid meteor would be of medium velocity.

The **Orionids (ORI)** are active from September 26 through November 22, with maximum activity occurring on October 21st. The radiant is currently located at 06:48 (102) +16, which places it in western Gemini, 2 degrees east of the 2nd magnitude star known as Alhena (gamma Geminorum). To best see these meteors, face toward the south during the last hours prior to dawn. Current rates are expected to be near 3 per hour, no matter your location. With an entry velocity of 65 km/sec., the average ORI meteor would be of swift velocity.

The **epsilon Geminids (EGE)** are active from a radiant located at 07:24 (111) +26. This area of the sky lies in central Gemini, 5 degrees southwest of the 1st magnitude star known as Pollux (beta Geminorum). To best see these meteors, face toward the east during the last dark hour prior to dawn. These meteors are active from September 27 through November 8, with maximum activity occurring on October 19. Hourly rates at this time should be less than 1 no matter your location. With an entry velocity of 68 km/sec., the average EGE meteor would be of swift velocity.

The **kappa Ursae Majorids (KUM)** were discovered by cameras of the SonotaCo network in Japan during an outburst of activity on November 5, 2009. This radiant is active from October 28-November 17, with maximum activity occurring on the 5th. The radiant is currently located at 09:10 (138) +47. This position lies in southwestern Ursa Majoris, 2 degrees east of the 4th magnitude star known as Alkafzah (kappa Ursae Majoris A). Rates are expected to be less than 1 regardless of your location. Rates may reach 2 per hour on the morning of maximum activity as seen from the Northern Hemisphere. These meteors are best seen during the last hour before dawn when the radiant lies highest above the northern horizon in a dark sky. With an entry velocity of 66 km/sec., the average Kappa Ursae Majorid meteor would be of swift velocity.

The **tau Cancrids (TCA)** are a weak shower with a long activity period of seven weeks. They are active from September 23 through November 12 with maximum activity occurring on October 20th. The radiant currently lies at 09:46 (146) +29, which places it in northwestern Leo, 5 degrees north of the 3rd magnitude star known as Algenubi (epsilon Leonis). To best see these meteors, face eastward during the last two hours of the morning prior to dawn. Expected hourly rates are less than 1 per hour no matter your location. With an entry velocity of 67 km/sec., the average TCA meteor would be of swift velocity.

The **Southern lambda Draconids (SLD)** were discovered by Željko Andreić and the Croatian Meteor Network team based on studying SonotaCo and CMN observations (SonotaCo 2007-2011, CMN 2007-2010). These meteors are active from October 29-November 8 with maximum activity occurring on November 4th. The radiant is currently located at: 10:14 (154) +71. This area of the sky is currently located in a remote area of northwestern Ursa Major. See the charts for the exact location. This area of the sky is best placed in the sky during the last hour before dawn, when it lies highest above the northern horizon in a dark sky. Current rates should be less than 1 per hour no matter your location, but may reach 1 per hour on the morning of maximum activity. With an entry velocity of 49km/sec., most activity from this radiant would be of medium-swift speed.

The **lambda Ursa Majorids (LUM)** were discovered by Željko Andreić and the Croatian Meteor Network team based on studying SonotaCo and CMN observations (SonotaCo 2007-2011, CMN 2007-2010). These meteors are active from October 18 through November 7, with maximum activity occurring on October 28th. The current location of the LUM radiant lies near 10:42 (160) +49. This area of the sky lies in southern Ursa Major, 5 degrees northwest of the 3rd magnitude star known as psi Ursae Majoris. This area of the sky is best placed in the sky during the last hour before dawn, when it lies highest above the horizon in a dark sky. Current rates should be less than 1 per hour no matter your location. Due to the high northern location of this radiant, these meteors are difficult to see from the Southern Hemisphere. With an entry velocity of 61km/sec., most activity from this radiant would be of swift speed.

The last of the **Leonis Minorids (LMI)** will be seen this week from a radiant located at 11:19 (169) +34, which places it in southern Ursa Major, near the spot occupied by the 4th magnitude star known as Alula Borealis (nu Ursae Majoris). These meteors are best seen by facing toward the northeast during the last couple of hours prior to dawn. This shower is better for observers situated in the Northern Hemisphere where the radiant rises far higher into the sky before the start of morning twilight. Current hourly rates would be less than 1 no matter your location. At 61km/sec., the average Leonis Minorid is swift. From my personal experience this minor shower produces a high proportion of bright 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 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. Evening rates are reduced during this period.

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 Daylight Saving Time	North-South	
Andromedids (AND)	Nov 06	01:15 (019) +23	20	23:00	<1 - <1	IV
Omicron Eridanids (OER)	Nov 13	03:15 (049) +00	30	01:00	<1 - <1	IV
Northern Taurids (NTA)	Nov 12	03:15 (049) +20	30	01:00	2 - 1	II
Southern Taurids (STA)	Nov 05	03:16 (049) +13	28	01:00	7 - 5	II
chi Taurids (CTA)	Nov 04	03:56 (059) +26	41	02:00	<1 - <1	IV
Orionids (ORI)	Oct 21	06:48 (102) +16	65	04:00	3 - 3	I
epsilon Geminids (EGE)	Oct 19	07:24 (111) +26	68	05:00	<1 - <1	II
kappa Ursae Majorids (KUM)	Nov 05	09:10 (138) +47	66	06:00	<1 - <1	II
tau Cancrids (TCA)	Oct 20	09:46 (146) +29	67	07:00	<1 - <1	IV
Southern lambda	Nov 04	10:14 (154) +71	49	08:00	<1 - <1	IV

Draconids (SLD)						
lambda Ursa Majorids (LUM)	Oct 28	10:42 (160) +49	61	08:00	<1 - <1	IV
Leonis Minorids (LMI)	Oct 21	11:19 (169) +34	61	09:00	<1 - <1	II

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.