DOST PAGASA
The Weather and Climate Authority

PRESS RELEASE DECEMBER 2023

# ASTRONOMICAL DIARY

PREPARED BY ASTRONOMICAL PUBLICATION AND PLANETARIUM UNIT, SPACE SCIENCE AND ASTRONOMY SECTION

## ASTRONOMICAL EVENTS, DECEMBER 2023

| DATE | EVENT | TIME |
|---|---|---|
| 04 | Mercury at greatest elongation east | 10:28 p.m. |
| 05 | Moon at Apogee (Distance = 404,273.056 km) | 02:42 a.m. |
| 09 | Close approach of Venus and waning crescent Moon | - |
| 10 | Conjunction of Venus and waning crescent Moon | 12:53 a.m. |
| 15 | Geminid Meteor Shower (ZHR=150) | 03:00 a.m. |
| 17 | Moon at Perigee (Distance = 367,949.255 km) | 02:53 a.m. |
| 18 | Conjunction of Saturn and waxing crescent Moon | 06:01 a.m. |
| 22 | Conjunction of Jupiter and waxing gibbous Moon | 10:24 p.m. |
| 22 | December Solstice | 11:27 a.m. |
| 23 | Ursid Meteor Shower (ZHR=10) | 05:00 a.m. |

## PHASES OF THE MOON

**Last Quarter**
Dec 05 01:49 p.m.

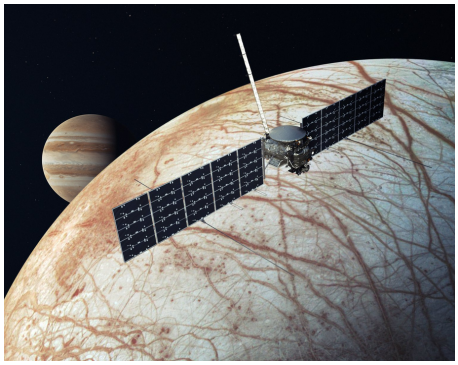
**New Moon**
Dec 13 07:32 a.m.

**First Quarter**
Dec 20 02:39 a.m.

**Full Moon**
Dec 27 08:33 a.m.

## RISE AND SET TIMES OF PLANETS

| DATE | MERCURY | | VENUS | | MARS | | JUPITER | | SATURN | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Rise | Set | Rise | Set | Rise | Set | Rise | Set | Rise | Set |
| Dec 01 | 07:41 am | 06:49 pm | 03:01 am | 02:50 pm | 05:49 am | 05:07 pm | 03:21 pm | 03:55 am* | 11:43 am | 11:19 pm |
| Dec 11 | 07:38 am | 06:48 pm | 03:11 am | 02:51 pm | 05:42 am | 04:57 pm | 02:39 pm | 03:12 am* | 11:06 am | 10:42 pm |
| Dec 21 | 06:34 am | 05:47 pm | 03:23 am | 02:55 pm | 05:35 am | 04:48 pm | 01:58 pm | 02:31 am* | 10:29 am | 10:06 pm |
| Dec 31 | 05:08 am | 04:26 pm | 03:36 am | 03:01 pm | 05:29 am | 04:40 pm | 01:18 pm | 01:51 am* | 09:52 am | 09:30 pm |



## SEND YOUR NAME TO JUPITER'S MOON EUROPA

### ASTRONOMY PICTURE OF THE MONTH

Jupiter's moon Europa shows strong evidence for an ocean of liquid water beneath its icy crust. Beyond Earth, Europa is considered one of the most promising currently habitable environments in our solar system.

NASA's Europa Clipper spacecraft will perform approximately 50 close flybys of the moon, gathering detailed measurements to investigate whether the moon could have conditions suitable for life. Europa Clipper is not a life detection mission – its main science goal is to determine whether there are places below Europa's surface that could support life.

Join the mission and have your name engraved on NASA's Europa Clipper spacecraft as it travels 1.8 billion miles to explore Europa, an ocean world that may support life. Sign up to send your name on NASA's Europa Clipper spacecraft here: europa.nasa.gov/message-in-a-bottle/sign-on/

Credit: NASA/JPL-Caltech

*Notes:*
*[1] All times displayed are in Philippine Standard Time (PhST)*
*[2] *following day*

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# Stars and Constellations

The prominent constellations best observed in **December** are Perseus, Triangulum, and Aries in the northern sky, while Eridanus, Fornax, and Horologium are located in the southern sky. Figure 1 shows the view of the sky on 15 December at around 09:00 p.m. when the December constellations are situated overhead [1].

Figure 1: The view of the night sky featuring the prominent December constellations at 09:00 p.m. on 15 December 2023, using the Stellarium software

The renowned variable star Algol (Beta Persei) is located in the constellation Perseus, the Hero. This constellation is home to several well-known deep-sky objects, including Messier 34, a bright open cluster, the Double Cluster (NGC 869 and NGC 884), the California Nebula (NGC 1499), and Messier 76, a planetary nebula known as the Little Dumbbell Nebula (Figure 2) [2,3].

Triangulum is famous for its unusual triangular asterism. The brightest star in this constellation is the Beta Trianguli, with an apparent magnitude of 3.00. The Triangulum Galaxy, commonly known as Messier 33, is one of the heavenly gems inside Triangulum's borders. In the Local Group, it is regarded as the third-largest galaxy (Figure 2b) [2,4].

One of the zodiac constellations, Aries, the Ram has six officially named stars: Bharani, Botein, Hamal, Lilii Borea, Mesarthim, and Sheratan. Hamal is the brightest star in this constellation and has an apparent brightness of 2.00. It plays a special significance in the field of celestial navigation and is likewise considered one of the 58 navigational stars. Along with the stars Hamal, Sheratan, and Mesarthim, Aries stars create the distinctive "Flat Triangle" asterism. There are several noteworthy deep sky objects that can be found in Aries, including the unbarred spiral galaxy NGC 772 and its satellite galaxy, NGC 770, and the dwarf galaxy NGC 1156 (Figure 2c) [2,5].

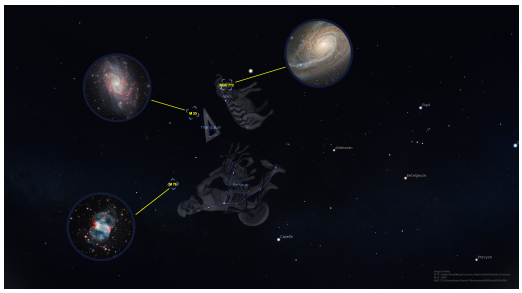

Figure 2: The prominent constellations of the northern hemisphere in December 2023, along with specific significant deep-sky objects as indicated

Eridanus, known as the celestial river, features Achernar (Alpha Eridani), with a brightness almost 3,000 times that of the Sun, this prominent white B-class star is the 9th brightest in the night sky. Achernar is near the southernmost point of the constellation, as its name is from the Arabic word that means "the end of the river." Eridanus is also home to Epsilon Eridani, which has an apparent magnitude of 3.73, making it the third-closest individual star visible to the naked eye. Notable deep-sky objects in Eridanus include the Witch Head Nebula (IC 2118), the Cleopatra's Eye Nebula (NGC 1535), the ring galaxy NGC 1291, the Eridanus Cloud (Eridanus Group), which contains over 200 galaxies [2,6].

Fornax, known as the Furnace, is a constellation surrounded by Eridanus. It hosts the Fornax Galaxy Cluster, the second-richest galaxy cluster within 100 million light years. Some notable members include the Great Barred Spiral Galaxy NGC 1365 and the barred spiral galaxy NGC 1398. This celestial region also features other remarkable objects, such as the planetary nebula NGC 1360 (Robin's Egg Nebula) and the Seyfert barred spiral galaxy NGC 1097 [2,7].

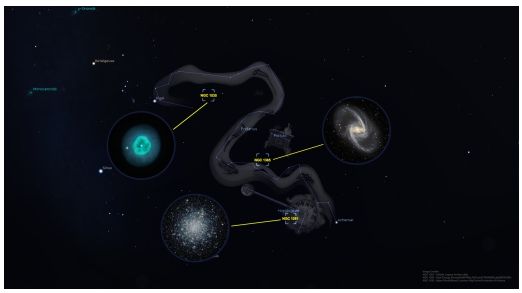

Figure 3: The prominent constellations of the southern hemisphere in December 2023, along with specific significant deep-sky objects as indicated

Underneath Eridanus is the constellation Horologium, the Clock. Though a relatively faint constellation, it is the location of the Horologium Supercluster, a large supercluster measuring about 550 million light-years wide and containing roughly 5,000 galaxy groupings. These include Abell 3266, one of the largest clusters of galaxies in the southern celestial hemisphere, globular cluster NGC 1261, and the barred spiral galaxy NGC 1512 [2,8].

Fornax and the constellation Horologium belong to the La Caille Family of constellations along with Antlia, Caelum, Circinus, Mensa, Microscopium, Norma, Octans, Pictor, Reticulum, Sculptor, and Telescopium [2].

## Planetary Location

**Mercury**, hanging low on the southwestern horizon will be seen after sunset during the first half of the month. On 04 December at 10:28 p.m., Mercury will be at its greatest elongation east and its maximum distance from the Sun will be at 21.3°. The exact time of the event is not visible, because it happened below the horizon. On 06-07 December, the planet will also be at its highest point in the evening sky. Mercury can be seen 10° above the western horizon at 06:00 p.m., among the background stars of Sagittarius, and shines brightly at a magnitude of -0.3, which is the ideal time to watch this event (Figure 4) [9,10,11].

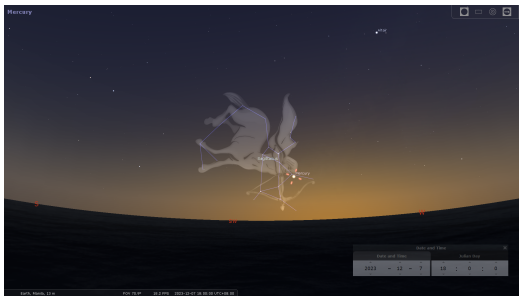


Figure 4: The view of the west-southwestern sky on 07 December 2023 at 06:00 p.m. showing the best time to observe the highest altitude of Mercury in the evening sky using Stellarium software

**Venus** will be visible rising on the east-southeast horizon early in the morning before disappearing from view before sunrise. On 09 December at 09:43 p.m, Venus and the waning Crescent Moon will make a close approach, passing within 3°18' of each other. Then, the pair will be in conjunction the following day on 10 December at 00:53 a.m., with the Crescent Moon and Venus being separated 3°38' from each other, lying at the same coordinate (right ascension). The view of this close pairing placed among the background stars of the constellation Virgo can be observed on the eastern horizon as soon as it is already high in the sky at around 05:30 a.m. on 10 December (Figure 5) [9,12,13].

**Mars** will not be readily available due to its close proximity to the Sun.

Figure 5: The view of the east-southeastern sky on 10 December 2023 at 05:30 a.m. showing the best time to observe the close approach of the Moon and Venus using Stellarium software.

**Jupiter** and **Saturn** are readily visible after sunset, high above the eastern horizon and south-western horizon, respectively. On 18 December at 06:01 a.m., the Waxing Crescent Moon and Saturn will be in conjunction, where Saturn and the Moon will be separated by 2°29'. Subsequently, at 07:44 a.m., they will make a close approach, passing within 2°15' of one another. The actual occurrence of the event cannot be observed because it will occur during the day. It will, however, be best seen at around 07:00 p.m. in the southwestern sky among the background stars of the constellation Aquarius (Figure 6) [9,14,15].

Figure 6: The view of the southwestern sky on 18 December 2023 at 07:00 p.m. showing the best time to observe the close approach of the Moon and Saturn using Stellarium software

Additionally, the Waxing Gibbous Moon and Jupiter will pass within 2°22' of one another on 22 December at 08:31 p.m. The pair will also be in conjunction at 10:24 p.m. when the two objects will be 3°36' apart from one another. After sunset, turn your gaze to the east-northeast horizon to catch a glimpse of this conjunction against the background stars of constellation Aries (Figure 7) [9,16,17].

Figure 7: The view of the western sky on 22 December 2023 at 10:24 p.m. showing the conjunction of the Moon and Jupiter using Stellarium software

The abovementioned conjunction and close approach events will be too widely separated to fit within the field of view of a telescope but will be visible to the naked eye or through a pair of binoculars.

## Meteor Shower

The **Geminid meteor shower**, produced by asteroid 3200 Phaethon, is active from 04 December to 17 December, with peak activity occurring on 15 December (Figure 8). At its peak, Geminids is estimated to produce a nominal rate of about 150 meteors per hour. It becomes visible when the constellation Gemini, the Twins, rises above the eastern horizon at around 07:13 p.m. and is most likely to put on spectacular displays at around 02:00 a.m. when its radiant point is highest in the sky. It is expected to reach peak activity on 15 December at 03:00 a.m.. The meteor shower will reach its peak near the time of the new moon, presenting minimal interference from moonlight [18].

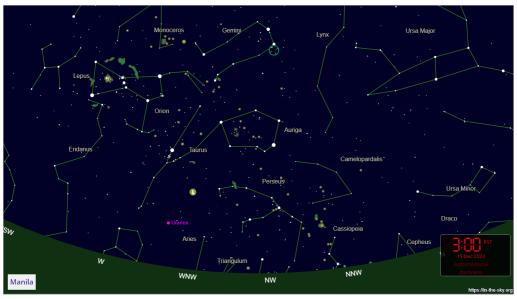


Figure 8: The view of the northwestern sky during the peak of Geminids on 15 December at 03:00 a.m. when the shower radiant is already up in the sky and represented by the green solid circle

The **Ursid meteor shower**, produced by comet 8P/Tuttle, is active from 17 December to 26 December, with peak activity occurring on 23 December. The meteor shower is expected to produce a nominal rate of around 10 meteors per hour. It will be active from when the shower's radiant point in Ursa Minor rises in the northern sky at midnight until before sunrise on 23 December. The shower will be active all through the night since the radiant point is circumpolar, which means it is constantly above the horizon. The number of visible meteors increases as the radiant ascends to its highest point in the sky and is likely to produce its best display at 05:00 a.m. At the shower's peak, the Moon in the constellation Aries will be only three days away from full phase, causing substantial interference throughout the night (Figure 9) [18].

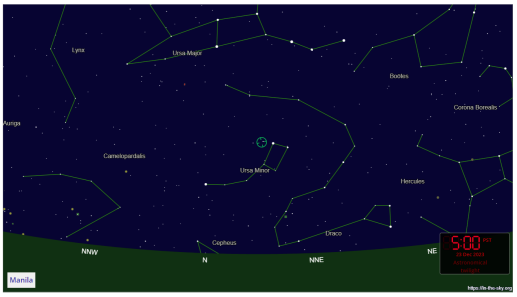


Figure 9: The view of the northern sky after the peak of Ursid on 23 December at 05:00 a.m. when the shower's radiant is already up in the sky and represented by the green solid circle.

## December Solstice

The **December Solstice**, also known as the Winter Solstice will be on 22 December at 11:27 a.m.. By then, the Sun located in Sagittarius will reach its most southerly point in the sky at a declination of 23.5° S. It also marks the shortest day and longest night of the year in terms of daylight hours in the Northern Hemisphere. Furthermore, the North Pole is tilted away from the Sun, causing the Sun to take its lowest and shortest path across the sky. This results in the least amount of daylight for the day in the Northern Hemisphere. In contrast, it is known as the Summer Solstice in the Southern Hemisphere. The South Pole is tilted towards the Sun, allowing the Sun to travel in its highest and longest journey across the sky, resulting in its longest day and shortest night [19].

# Calendar of Astronomical Events for December 2023

Table 1 shows a summary of the astronomical events for December 2023. All times displayed are in Philippines Standard Time (PhST).

Table 1: The summary of astronomical events for December 2023

| Date | Event | Time |
|---|---|---|
| 04 | Mercury at greatest elongation east | 10:28 p.m. |
| 05 | Moon at Apogee (Distance = 404,273.056 km) | 02:42 a.m. |
| 09 | Close approach of Venus and waning crescent Moon | |
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**Approved by:**

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23 November 2023

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