NAMIBIA Scientific Society
Wissenschaftliche Gesellschaft

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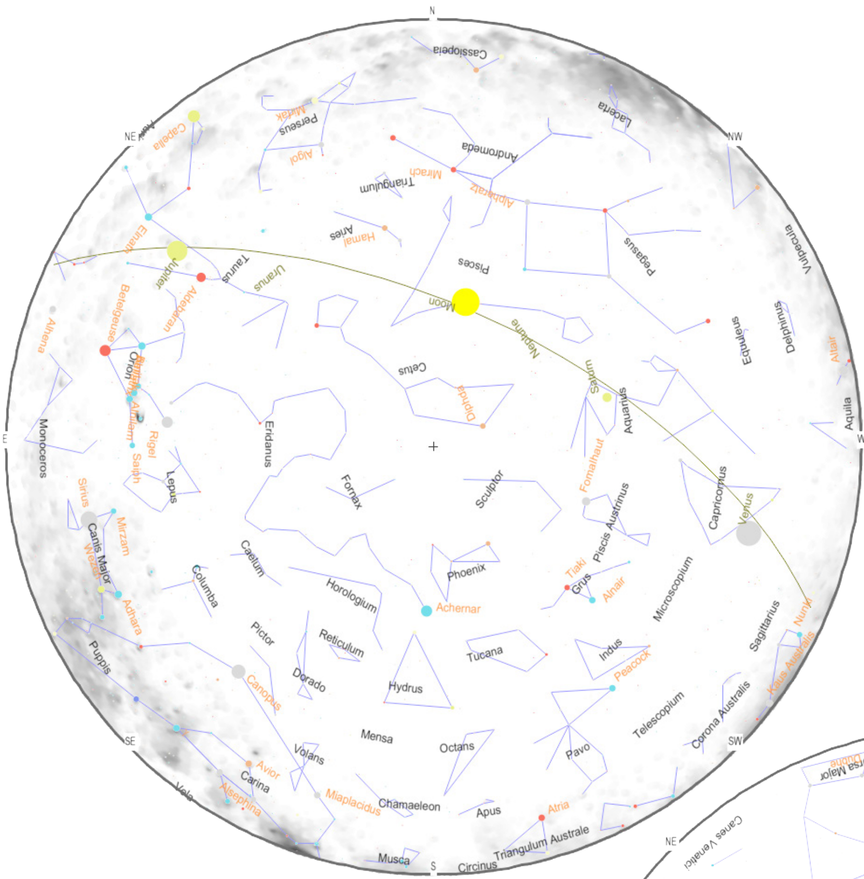
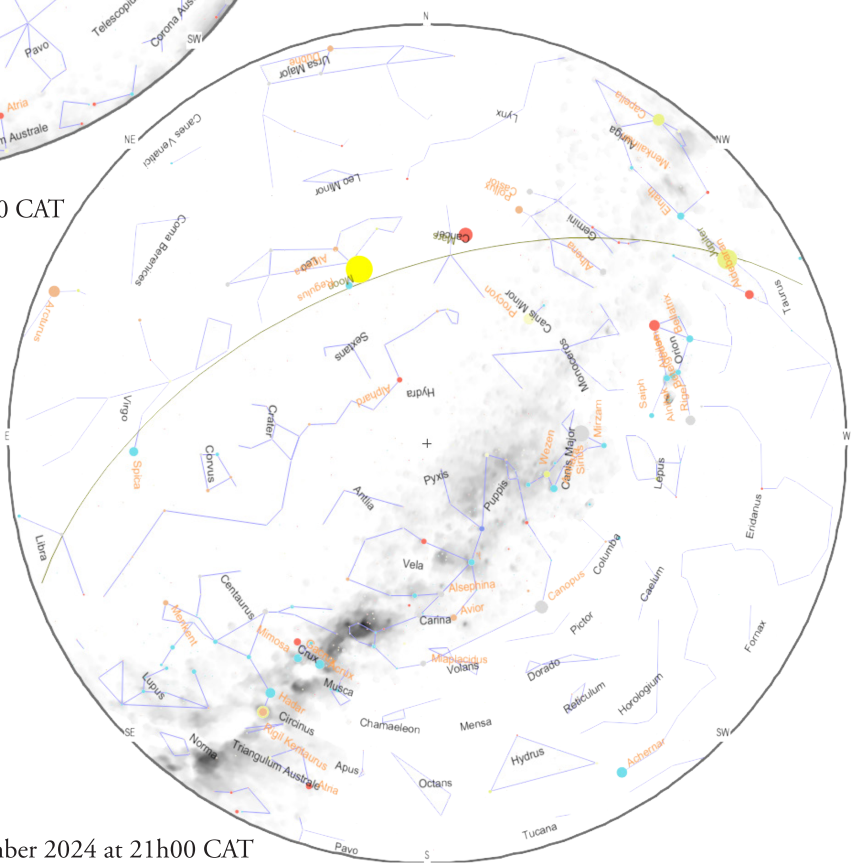
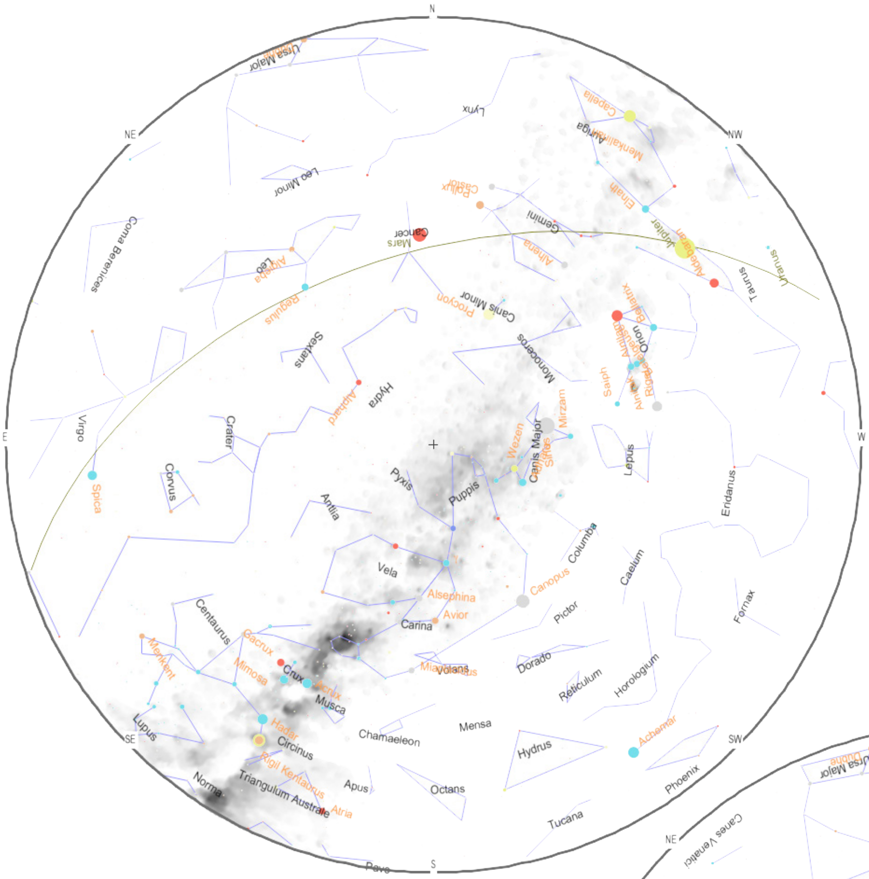
Astronews December 2024



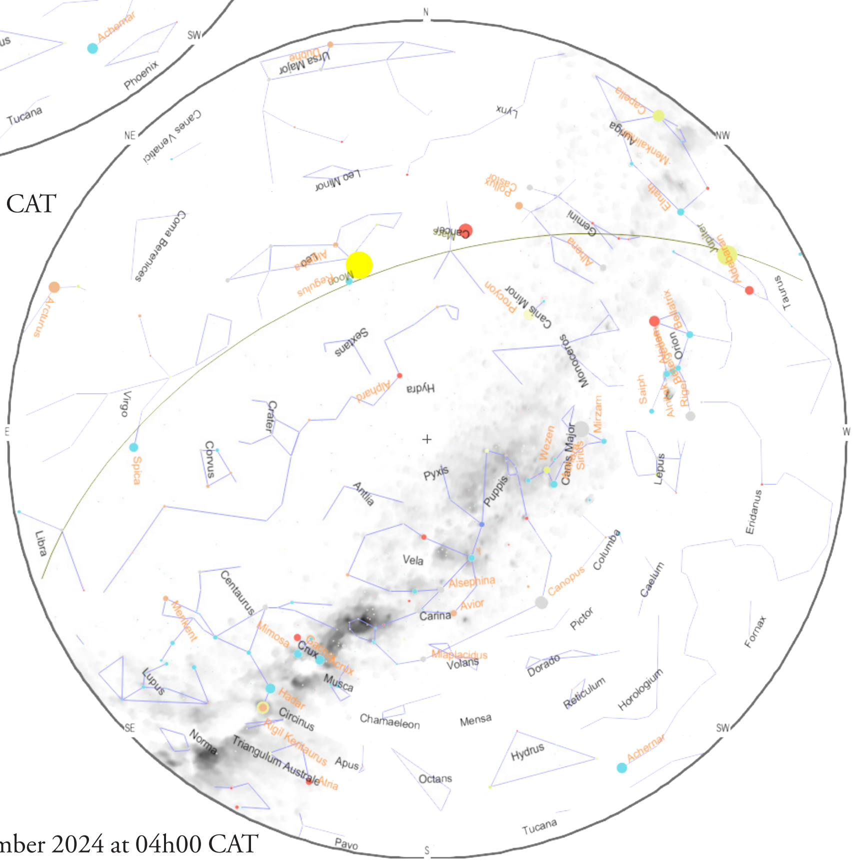
Skychart at Windhoek on 10 December 2024 at 21h00 CAT



Skychart at Windhoek on 20 December 2024 at 21h00 CAT



Skychart at Windhoek on 10 December 2024 at 04h00 CAT



Skychart at Windhoek on 20 December 2024 at 04h00 CAT

Moon Phases

01 Dec 2024	New Moon
08 Dec 2024	First Quarter
15 Dec 2024	Full Moon
23 Dec 2024	Last Quarter

Solar System

Planet Visibility	Rise	Culm.	Set
15 Dec 2024			
Mercury	04:57	11:32	18:07
Venus	09:20	15:58	22:36
Mars	22:25	03:48	05:34
Jupiter	18:46	00:10	05:34
Saturn	11:56	18:13	00:29

Mercury will pass very close to the Sun on 6 December as its orbit carries it between the Sun and Earth. This occurs once every 116 days, the synodic cycle of the planet, and marks the end of Mercury's sight in the evening sky and its transition to become a morning object over the next few weeks. Mercury will also pass perigee, the time when it is closest to the Earth, at around the same time, since it will lie on the same side of the Sun as the Earth.

Venus: On Thursday 05 December there will be a close approach of the Moon and Venus. From Namibia, the pair will become visible at around 19:40, 37° above the western horizon. They will be visible to the naked eye or through a pair of binoculars.
As seen from Namibia, Venus will reach its highest point in the sky in its 2024–2025 evening apparition on 5 December. It will be shining brightly at mag -4.4.

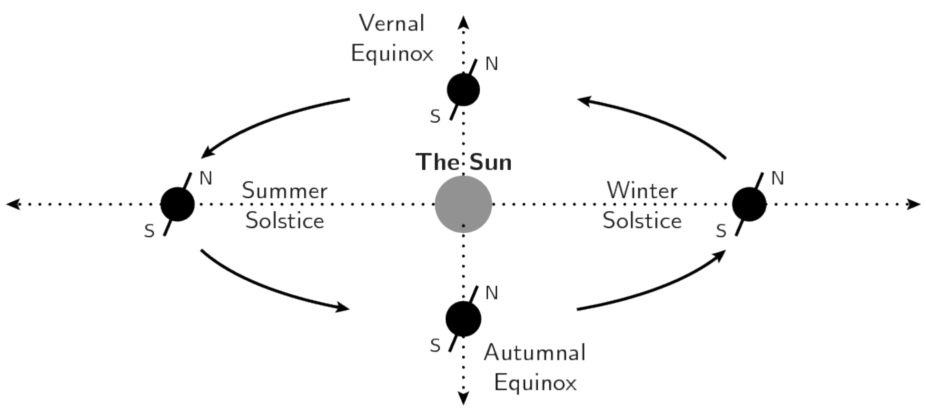
Mars will enter retrograde motion on 7 December, halting its usual eastward movement through the constellations, and turning to move westwards instead. This reversal of direction is a phenomenon that all the solar system's outer planets periodically undergo, a few months before they reach opposition. See the short description of retrograde motion below.

Jupiter is currently approaching opposition and becoming accessible around 23:00. It will reach its highest point in the sky at 03:30, 45° above your northern horizon.
Jupiter will reach opposition, when it lies opposite to the Sun in the sky on 7 December. It will lie at a distance of 4 Astronomical Units or 600 million kilometres from Earth.
See Planet of the Month by Simon van der Lingen below.

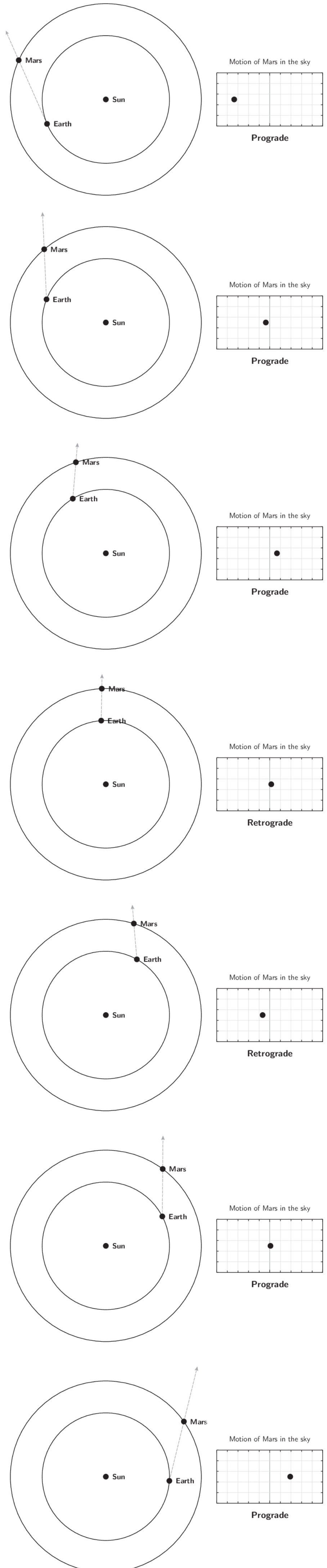
Saturn is currently an early evening object. It will then reach its highest point in the sky at 20:30, 76° above your northern horizon. It will continue to be observable until around 01:30 when it sinks below the western horizon.

Other Occurrences

December Solstice – 21 December will be the longest day of 2024 in the southern hemisphere, a midsummer day. The solstice occurs exactly on 21 December at 11:20 CAT when the Sun's annual journey through the constellations of the zodiac reaches its most southerly point in the sky, in the constellation of Capricornus at a declination of 23.5°S. This day is counted by astronomers to be the first day of summer in the southern hemisphere.



The retrograde motion is caused by the Earth's own motion around the Sun. As the Earth circles the Sun, our perspective changes and this causes the apparent positions of objects to move from side to side in the sky with a one-year period. This nodding motion is superimposed on the planet's long-term eastward motion through the constellations.
The diagram below illustrates this. The grey dashed arrow shows the Earth's sight-line to the planet, and the diagram on the right shows the planet's apparent movement across the sky as seen from the Earth:

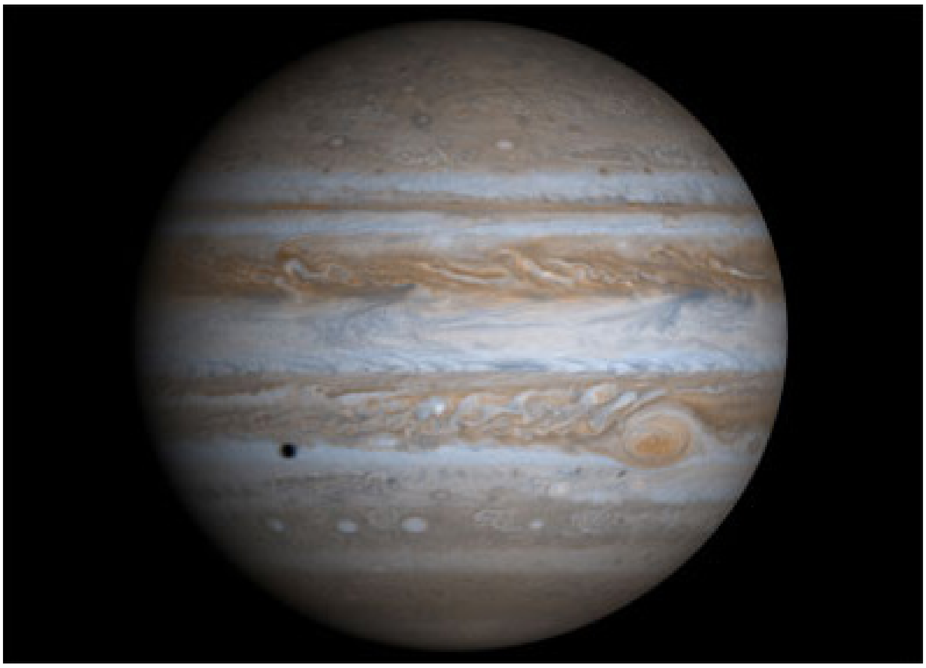


Jupiter

Planet of the Month

by Simon van der Lingen

Jupiter will reach opposition during the evening of December 7th this year, meaning that (if the weather cooperates), this will be a great evening to watch the Gas Giant through a telescope. Planetary oppositions occur when the Sun, Earth and the planet in question all line up. Ignoring time zones and deviation from the plane of the Solar System, at midnight on the 7th, the Sun will be directly beneath us and Jupiter directly overhead and the side facing us fully illuminated. It also means that the Earth and Jupiter are at their closest in their respective orbits. Not all oppositions are equal, however. All orbits are elliptical (see Kepler's Second Law), so that from time to time the Earth's apogee (the furthest point in its orbit from the Sun), and Jupiter's perigee (the closest point) will match, and the distance between the two will be minimised. This is called a Great Opposition and is relatively rare. Jupiter's next Great Opposition will be in 2033, when Jupiter will be about 3.4% closer than this December's event.



If you do get the opportunity to watch Jupiter through a telescope on December 7th, take a moment to consider what you are seeing. Jupiter, at Opposition, will still be 611 million kilometres away. You will be looking at a planet almost twice as massive as all the other planets combined; heavy enough that the centre of mass around which Jupiter and the Sun orbit lies outside the Sun's perimeter. Jupiter, like the Sun, is overwhelmingly composed of hydrogen, and we traditionally classify it as a Gas Giant but only between 1–5% of Jupiter's mass exists as hydrogen gas. Beneath the gas, gravity compresses the increasingly hot hydrogen into a liquid making up 30–40% of the planet's mass. Below this is a thin layer of liquid helium, then a layer of liquid, metallic hydrogen making up maybe 65% of the total mass. If hydrogen is compressed above 1.4 million bar pressure, electrons are able to move freely between nuclei, and the hydrogen becomes electrically conductive. Like Earth's molten iron core, Jupiter's metallic hydrogen core generates magnetic fields. Unsurprisingly, Jupiter's is about 20 times stronger than ours and extends almost all the way to Saturn.

Through the telescope, Jupiter's cloud bands should be clear. The clouds are made of water and ice crystals, becoming ammonium hydrosulphide crystals and then the ammonia ice crystal layer which we can observe. The dark belts we see are ridges or upwellings of warmer hydrogen circulating from below, stained with organic materials formed as a result of solar ultraviolet radiation.

Built into one of the Southern Hemisphere layers is the famous Great Red Spot, (GRS), a giant storm 40,000 kilometres across and two or three times bigger than the Earth. Discovery of the GRS is often attributed to Robert Hooke (more famous for having first used the word "cell" to describe the basic unit of most terrestrial life) in May 1664, but should probably more correctly be credited to Italian Astronomer Giovanni Cassini, who much more accurately described the phenomenon a year later. Hooke's description placed the GRS in a belt in the Northern Hemisphere of the planet and he was most likely looking at the shadow cast by one of Jupiter's moons.

Visible as bright dots in an angle line across Jupiter's diameter, Jupiter's innermost four moons are themselves fascinating. From innermost moving outwards, Io, Europa, Ganymede and Callisto are all named for Jupiter's most gorgeous lovers and it seems somehow right that the space probe sent by NASA in 2011 to investigate them is named for his wife, Juno. Although discovered by Galileo Galilei in 1610, the moons were only named in 1614 by German astronomer Simon Marius. By now the best studied of Jupiter's 95 official moons, the Galilean moons are full of interest. The innermost 3 moons have long settled into an orbital resonance whereby Europa orbits exactly twice for a single one of Ganymede's revolutions, and Io, twice for every one of Europa's. The resulting rhythmic gravitational pull on Io flexes the rocky moon so that its equatorial surface rises and falls by about 100m every orbit. This constant flexing of the solid rock that constitutes the moon heats it enough so that at any one moment Io has upward of 400 active volcanoes on its surface, leading the competition for the most volcanic body in the solar system. As many volcanoes do, Io's spew sulphur, colouring the surface of the moon a virulent yellow and creating a sulphur dioxide atmosphere that collapses as a type of snow every time the moon slips into Jupiter's shadow, only to sublimate into vapour as it emerges into the sunlight.

Europa is a complicated icy moon with a rocky core, a salty ocean perhaps 100km deep sealed by a 20km thick ice cap which prevents it from boiling off into space. Europa's core is subject to a scaled-down version of Io's gravitational flexing, generating enough heat to keep the ocean liquid and quite possibly producing underwater fumaroles (volcanic vents in the ocean floor). Given that terrestrial biologists theorise that life on Earth likely started around deep-sea vents that provided warmth and nutrients in an aquatic medium, Europa is most astrobiologists' favourite candidate for extra-terrestrial life. Vivid red lines on

Europa's surface testify to the presence of at least some complex organic chemistry on the moon.

Ganymede and Callisto are further away from Jupiter's gravitational tug but are also regarded as Icy Moons, with higher ice-to-water proportions. The first question astrobiologists ask about any potential habitat is whether it has liquid water. All three of Jupiter's Icy Moons have considerably more water than Earth – little Europa by a factor of two or three, bigger Ganymede and Callisto perhaps twenty times as much each.

Io has another claim to fame. Danish astronomer, Ole Roemer, precisely calculated Io's orbit around Jupiter, and over years of careful observation noted that Io seemed to be behind schedule when the distance between Earth and Jupiter was maximal, and slightly ahead of schedule when the two were closest (remember opposition?). This was enough to convince him that the speed of light was not infinite, as proposed by the mathematical genius and philosopher René Descartes. The Dutch scientist, Christiaan Huygens (who later discovered Saturn's rings and invented the pendulum clock) used Roemer's data to calculate the speed of light in 1678, arriving at the figure of about 211 000km/sec. He understated today's figure by about 30%, mainly because of errors in Roemer's timekeeping and the use of an incorrect value for Earth's orbital diameter.

Credits
SkyChart: Cartes du Ciel / Wikipedia
Data: https://in-the-sky.org / ASSA Sky Guide 2024
Pictures: Wikipedia