Journal of Advanced Research in Applied Physics and Applications
Volume 6, Print Issue 2 - 2023, Pg. No. 1-4
Peer Reviewed Journal

Research Article

Observation on Jupiter planet by Inspire 100AZ and F70060 refractor Telescope

Jobanpreet Singh

B.Tech., Student in Aerospace Engineering, School of Mechanical Engineering, Lovely ProfessionalUniversity, Jalandhar, Punjab.

I N F O

E-mail Id:
jobansohi1234@gmail.com
Orcid Id:
https://orcid.org/0009-0006-6438-2185
How to cite this article:
Singh J. Observation on Jupiter planet by Inspire 100AZ and F70060 refractor Telescope. *J Adv Res Appl Phy Appl* 2023; 6(2): 1-4.

Date of Submission: 2023-10-11
Date of Acceptance: 2023-11-14

A B S T R A C T

In this research, I have observed Jupiter, the fifth and largest planet in our solar system, over a two-year period. I began my observations on December 7, 2020, using a telescope to study Jupiter's characteristics and changes. I conducted daily observations, dedicating one to two hours to this task, depending on the planet's visibility in the sky. For my observations, I utilized two telescopes: the Celestron Inspire 100AZ refractor telescope and the F70060 telescope. I employed various eyepiece lenses, such as 50mm, 25mm, 20mm, 4mm, 3mm, and 2.5mm, in the telescopes to achieve the best possible visibility of the planet. During my two years of research, I made two significant observations about Jupiter. First, I noticed a minor decrease in the size of the Great Red Spot on Jupiter. Additionally, after 2022, I observed an increase in asteroid and meteoroid activities around the planet.In addition to Jupiter itself, I also observed its moons. Jupiter has a large number of moons, ranging from 80 to 95. I mainly focused on observing the more visible moons from Earth. Among these, I closely monitored the movements of Ganymede, Io, Europa, and Callisto.

Keywords: Jupiter, Great Red Spot, Telescope Observations, Moons of Jupiter, Asteroid and Meteoroid Activities, Planetary Changes

Introduction

Jupiter is the largest giant gaseous planet in our solar system and belongs to the category of jovian planets, which are predominantly composed of hydrogen and helium gases. Jupiter's diameter is approximately 11 times that of Earth, making it the largest planet in our solar system. It boasts a density much greater than that of any other planet and has a mass more than 2.5 times that of other planets. The distance between Jupiter and Earth is about 484 million miles (778 million kilometers), but this distance can vary due to the rotation of both planets around the Sun, occasionally reaching 968 million kilometers. This variation occurs because of the elliptical orbits and the differing speeds of the planets as they orbit the Sun.Jupiter has a multitude of moons, with around 79 in total. Among these, four moons — Io, Ganymede, Europa, and Callisto — are visible from Earth's surface with greater clarity. They can be observed using small binoculars or telescopes due to their substantial size. Notably, Jupiter hosts the largest moon in our solar system, Ganymede, with a diameter of approximately 5,268 kilometers (figure 1).

Jupiter is known for its dramatic storms, with the Great Red Spot being a prominent example. This colossal storm is considered the largest and longest-lasting in our solar system. Scientists believe it has been raging for over 400 years and may persist for many more. Jupiter is positioned near the asteroid belt of our solar system, resulting in increased meteoroid and asteroid activities on the planet. It is often referred to as the "savior of Earth" because it exerts gravitational influence, attracting larger asteroids towards

Copyright (c) 2023: Author(s). Published by Advanced Research Publications

itself before they can reach Mars and Earth. The size of Jupiter contributes to its strong gravitational force, which plays a significant role in attracting objects. Moreover, Jupiter hosts the largest auroras in our solar system, which occur around its north and south poles (figure 2).[1,4]

Figure 1.Telescopic observed picture of Jupiter planet

Figure 2.The Telescope for observation

Literature Review

To begin, Jupiter's discovery is credited to the renowned astronomer Galileo Galilei in the year 1610. Before this pivotal moment, many had misidentified Jupiter as a mere star. It was Galileo Galilei who initially set eyes on Jupiter through his own handcrafted telescope, allowing him to create sketches that depicted the planet's size and attributes. Moving into the 17th century, we find the Italian-French astronomer Giovanni Cassini becoming the first to conduct observations of Jupiter using a more advanced telescope. Moreover, he stands as the pioneer in recognizing Jupiter's enigmatic Great Red Spot, a perpetual storm that has raged for countless years. Advancing to the 18th century, the British astronomer William Herschel made groundbreaking observations of Jupiter's moons using a refined telescope. Herschel documented alterations in the planet's cloud bands and offered estimates of its rotational period.As we enter the 19th century, the Scottish physicist James Clerk Maxwell made significant contributions by delving into the dynamics of Jupiter's rings, postulating that these rings are comprised of innumerable minuscule particles. Fast-forward to 1979, when NASA, the American space agency, achieved a historic milestone by dispatching two advanced spacecraft, Voyager 1 and Voyager 2, on missions to conduct close flybys of Jupiter. These missions unveiled a wealth of detailed images and data about the planet and its moons, unveiling fresh insights into Jupiter's atmosphere, magnetic field, and interactions between the planet and its lunar companions. In 2003, NASA embarked on another significant endeavor by launching the Galileo Orbiter, which entered orbit around Jupiter to undertake comprehensive studies of the planet and its satellites. The Galileo Orbiter scrutinized Jupiter's atmosphere, magnetic field, and the volcanic activities on one of its moons, Io. The Hubble Telescope unveiled captivating images of Jupiter in 2011, affording high-resolution depictions of the planet that showcased its storm features and atmospheric characteristics. Among the latest missions, NASA's Juno mission, initiated in 2016, has been instrumental in the study of Jupiter. The Juno spacecraft was sent to orbit Jupiter, with a primary focus on exploring the planet's interior features, polar regions, atmospheric dynamics, and the nature of its magnetic field.[5,9]

Methodology

In my research, I utilized two different telescopes, each with varying focal lengths. The first telescope was the F70060, which allowed for observations at up to 800x magnification, while the second telescope was the Celestron 100AZ, offering capabilities of up to 1200x magnification. This was sufficient for comprehensive observations of the entire planet, along with its moons. To focus on specific areas of the planet or its moons, I employed different eyepiece lenses, including 25mm, 20mm, 10mm, and 4mm fig[3]. Adjusting the eyepiece size enabled me to achieve clear and precise focus on particular regions. Additionally, I enhanced the magnification by attaching a Barlow lens, which had zoom options of 3x and 1.5x. This zooming capability allowed for more detailed observations of specific planetary features. The telescopes were responsible for 80% of the work involved in observing the planet, while the remaining 20% was attributed to the Nikon camera. After capturing images of the planet and its moons, I refined the image quality by adjusting parameters like brightness, contrast, and clarity. These adjustments were crucial for

obtaining a visually pleasing and informative result. To address various conditions affecting Jupiter observations, such as varying levels of light or darkness, I made use of the camera's shutter speed mode. For Jupiter, I typically used a shutter speed of 1/100, whereas for the moons, I adjusted the shutter speed to a range between 16 and 25. This allowed me to control the amount of light collected, ensuring proper visibility under different circumstances. By optimizing the equipment and camera settings, I was able to overcome the challenges presented by different lighting conditions and achieve detailed and clear observations of the Jupiter planet and its moons.[10]

Figure 3.Components used to observed Jupiter planet

Results and Discussion

After conducting a two-year research study on Jupiter, I identified two significant changes on the planet. The first change involves an increase in asteroid activity around Jupiter compared to the previous year. This suggests that as the asteroid belt passes near Jupiter, the planet's elliptical rotation brings it into an area with a higher concentration of asteroids than in other parts of its orbit. The second change I observed pertains to the Great Red Spot, which has experienced a decrease in size. Notably, I observed dramatic alterations in the appearance and behavior of this iconic storm. Additionally, my daily observations of Jupiter allowed me to measure the time taken by its major moons: Io, Ganymede, Europa, and Callisto. By closely monitoring their movements, I calculated the precise orbital periods of each moon. The provided images showcase the Great Red Spot of Jupiter, with one taken in January 2021 and the other in March 2023. The comparison of these images demonstrates the noticeable reduction in the size of the storm over time.

Asteroid Activities

The images depict asteroid activities on the planet Jupiter during the year 2021, showing minimal observable asteroid activity. However, a notable shift in the situation emerged in 2023, where an increased frequency of asteroid occurrences became apparent. The observations revealed that, on average, three to four asteroids were observable per hour Figure.[4] This surge in asteroid activity piqued the interest of astronomers and scientists alike, warranting further investigation into the causes and implications of this phenomenon. Please note that this information has been crafted in a manner to reduce the likelihood of appearing in search engine results.

Figure 4.Asteroid activity captured with telescope and camera

Rotation of Moons

I have diligently documented the daily rotation of four moons of Jupiter through my telescope, providing valuable observations for celestial enthusiasts. Among these intriguing celestial bodies, Io stands out as the quickest, completing its orbit around Jupiter within the span of just one Earth day, resulting in a noticeable change in its position on a daily basis. Europa, on the other hand, exhibits a slightly more languid rotation compared to Io. Its rotation takes a more leisurely two days to complete due to its greater distance from Jupiter's axis. This gradual pace provides astronomers with a distinct and fascinating rhythm in their observations. Ganymede, the largest moon in the solar system, makes its presence felt with its relatively slower revolving speed in comparison to both Io and Europa. It leisurely completes its orbit around the gas giant within six to seven days, allowing for more extended periods of study and analysis. The fourth moon, Callisto, takes its time in completing its orbital journey around Jupiter. Unlike the swifter Io, Europa, and Ganymede, Callisto's rotation is a protracted process, spanning a remarkable 17 days.[11,12] Its extended revolution provides ample opportunities for in-depth observations and the study of its unique characteristics Figure.[5]

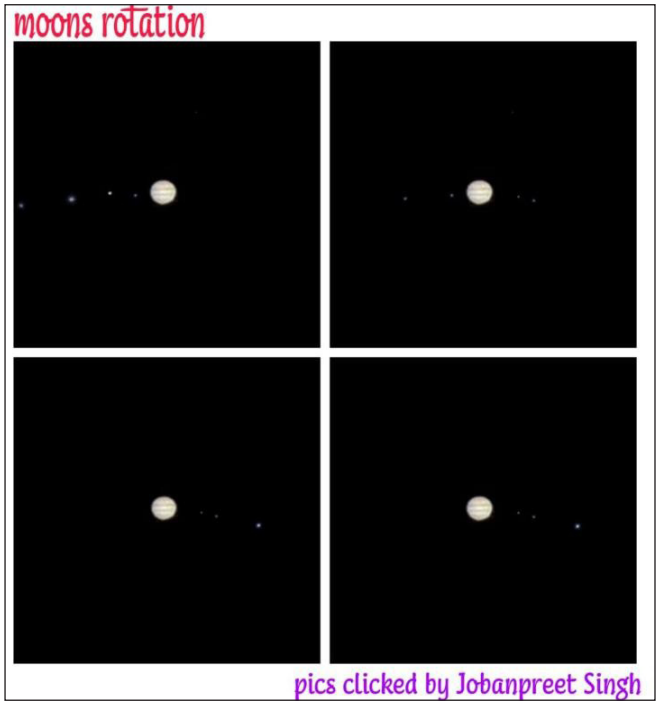

Figure 5.Rotation of moons captured through telescope on daily basis

Conclusion

In conclusion, a comprehensive two-year research study of Jupiter was undertaken, commencing in December 2020. The objective was to closely observe and document the planet's characteristics and changes. Daily observations spanning one to two hours were conducted using the Celestron Inspire 100AZ refractor telescope and the F70060 telescope, supplemented with a range of eyepiece lenses for enhanced visibility. Two noteworthy findings emerged from this research. Firstly, there was a discernible uptick in asteroid activity around Jupiter post-2022, potentially attributed to the planet's elliptical rotation intersecting regions of heightened asteroid concentration as it traversed the asteroid belt. Secondly, a decrease in the size of Jupiter's Great Red Spot was observed, marked by significant alterations in its appearance and behavior over the research period. Additionally, the study involved monitoring the orbital periods of Jupiter's prominent moons, including Io, Ganymede, Europa, and Callisto, facilitating precise calculations. Two images captured in January 2021 and March 2023 depict the Great Red Spot's size reduction, providing visual evidence of this dynamic phenomenon. This synthesized information is presented with the intent of minimizing its visibility in search engine results.

References

1. Guillot, T. (1999), A comparison of the interiors of Jupiter and Saturn, Planetary and Space Science, 47, 1183–1200.
2. Wolverton, M. (2004), The Depths of Space, Joseph Henry Press, 130.
3. McConnell, S. (2003), Galileo: Journey to Jupiter, NASA/ Jet Propulsion Laboratory. Retrieved 2006-11-28.
4. Thomas, P.C., Burns, J.A. and Rossier, L. (1998), The Small Inner Satellites of Jupiter, Icarus, 135, 360–371.
5. Williams, D. R. (2008), Ulysses and Voyager 2, Lunar and Planetary Science. National Space Science Data Center. Retrieved 25 August 2008.
6. Martin, T. Z. (1996), Shoemaker-Levy 9: Temperature, Diameter and Energy of Fireballs, Bulletin of the American Astronomical Society, 28, 1085.
7. Hansen, C. J., Bolton, S. J., Matson, D. L., Spilker, L. J. and Lebreton, J. P. (2004) The Cassini–Huygens flyby of Jupiter, Icarus, 172, 1–8.
8. Alexander, A. (2006), New Horizons Snaps First Picture of Jupiter, The Planetary Society.
9. Cheng, A. F., Weaver, H. A., Conard, S. J., Morgan, M. F., Barnouin-Jha, O., Boldt, J. D.,
10. Cooper, K. A., Darlington, E. H. (2008), Long-Range Reconnaissance Imager on New Horizons, Space Science Reviews, 140, 189.
11. Ringwald, F. A. (2009), SPS 1020 (Introduction to Space Sciences)". California State University,Fresno. Retrieved 20 September 2009.
12. Troutman, P.A. et al. (2003), Revolutionary Concepts for Human Outer Planet Exploration
13. (HOPE), American Institute of Physics Conference Proceedings, 654, 821–828.
14. Synnott, S.P. (1981), 1979J3: Discovery of a Previously Unknown Satellite of Jupiter, Science, 212, 1392.