OBSERVACIONES HISTÓRICAS Y RECIENTES DE COMETAS EN CUBA

HISTORICAL AND RECENT OBSERVATIONS OF COMETS IN CUBA

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Cuba tiene una larga tradición en la observación de cometas, que se remonta al siglo XIX, cuando figuras como José Joaquín de Ferrer registraron movimientos de cometas, incluido el cometa de 1807. Estos esfuerzos continuaron en el siglo XX, con eventos notables como la observación telescópica del cometa Halley en 1910 por el sacerdote jesuita Mariano Gutiérrez-Lanza. Sus observaciones contribuyeron a la ciencia cometaria y calmaron los temores públicos de una colisión entre el cometa y la Tierra. Hoy en día, astrónomos aficionados cubanos, utilizando herramientas digitales y redes sociales, continúan con este legado. Observaciones recientes de cometas reflejan la duradera pasión de Cuba por la astronomía y destacan su creciente interés en el tema.

Cuba has a long-standing tradition in comet observation, dating back to the 19th century when figures like José Joaquín de Ferrer recorded comet movements, including the 1807 comet. These efforts continued into the 20th century, with notable events such as the telescopic observation of Halley's Comet in 1910 by Jesuit priest Mariano Gutiérrez-Lanza. His observations contributed to cometary science and alleviated public fears of a collision between the comet and Earth. Today, Cuban amateur astronomers, using digital tools and social media, continue this legacy. Recent observations of comets reflect Cuba's enduring passion for astronomy and highlight its growing interest in this topic.

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Comets are ancient remnants from the early Solar System, formed over 4.6 billion years ago [1]. These ice-rich, kilometer-sized bodies, preserved at low temperatures, offer critical insights into the volatile materials present in the proto-solar disk and may have been key contributors to delivering water and organic compounds to early Earth [1,2]. As they approach the Sun, their volatile ices sublimate, releasing gases and dust into the surrounding coma, making comets not only fascinating subjects for scientific investigation but also essential to our understanding of planetary formation and evolution [2].

The observation of comets has long intrigued astronomers and skywatchers around the world, and Cuba holds a significant place in this history [3–10]. The island's geographical location made it an attractive point for astronomical observations, including those of comets, dating back to the 19th century [7]. Notable figures such as José Joaquín de Ferrer made important contributions with detailed recordings of cometary movements, such as the one seen in September 1807 [4, 5]. Ferrer's meticulous observations were highly regarded for their precision, contributing to both local and international understandings of cometary behavior. His work, carried out from Havana and other locations across the island, exemplifies the precision and dedication of early Cuban astronomers [3–10].

In 1825, a comet sighted from the island sparked a heated debate among some of the country's leading intellectuals, including Ramón de la Sagra, José Antonio Saco, and José de la Luz y Caballero. The controversy, which blended scientific inquiry with philosophical debate, was later documented by Mesa Rodríguez in 1945 [11]. Throughout the 19th century, Cuba continued to play a role in comet observation, gaining international recognition for the quality of its records [8–10]. These historical observations not only contributed to our understanding of comet orbits but also connected Cuba to the wider astronomical community of the time [10].

In particular, one of the most notable events in the early 20th century was the telescopic observation of Halley's Comet on January 13, 1910. This marked the first time Halley's Comet was observed telescopically in Cuba, a feat accomplished by personnel at the Observatorio del Colegio de Belén [12,13]. Interestingly, there are also reports [14] of a telescopic observation of a comet from Santa Clara starting on January 20, 1910, which was no longer visible from Cuba by February 1. However, it is noted that this was not Halley's Comet [14].

The first person to observe Halley's Comet from Cuba was Jesuit priest Mariano Gutiérrez-Lanza. Using the telescope located at the ancient convent of Belén in Havana, Gutiérrez-Lanza identified the comet on January 13, 1910, from the coordinates: 1h. 40m. right ascension and +9° 53′ declination, while it was still beyond Mars' orbit. His meticulous studies, presented to the Academy of Medical, Physical and Natural Sciences of Havana and published in their Annals [12], included a detailed description of the

comet's physical properties, its orbit, and a defense against public fears that Earth would be destroyed by a collision with Halley's comet or its tail gases. These early observations would serve as the foundation for a growing interest in studying the Halley's comet from Cuba in the following decades [15–17].

Two notable observation records from this period include the first perihelion observation of Comet Bester by amateur astronomer Roberto Ortiz in 1948, and the observation of Comet Ikeya-Seki in October 1965.

Recently, more concerted efforts have been made by Cuban institutions using more sophisticated equipment to observe comets, including a newly commissioned 20 cm wide-field robotic telescope [18–20]. This instrument serves as a multi-task tool for both astrometric and photometric research, with applications ranging from near-Earth and solar space tasks, such as monitoring space debris and small bodies in the Solar System, to deep-space astrophysical observations [18–20]. Although detailed public reports from these efforts are still limited, the deployment of this advanced technology highlights Cuba's growing commitment to continuing its legacy of comet observation, building on the foundational work of early astronomers like Ferrer and Gutiérrez-Lanza. These advancements signal a renewed investment in astronomical research, positioning Cuba as an active participant in tracking significant cometary and asteroid events.

One of the most remarkable aspects of modern comet observation in Cuba is the growing role of amateur astronomers. With the rise of social media platforms and affordable digital photography, enthusiasts have been able to make independent observations and share their findings with the broader public. Many have even built homemade telescopic equipment using accessible parts, combining these tools with open-source software to track and photograph comets. This inventive spirit has allowed amateur astronomers to contribute more to comet observation, while also enhancing public understanding of astronomy. This note examines both the historical records and contemporary comet observations, demonstrating how Cuba's astronomical legacy continues into the present. By exploring these efforts, we uncover Cuba's pivotal role in the broader context of cometary science, bridging the gap between past and present. Additionally, we hope the provided review serves as a foundation for future research endeavors.

In recent years, Cuban scientists and amateur astronomers have turned their attention to other notable cometary appearances. For example, in 2013, the comet PanSTARRS (C/2011 L4) passed close to the Moon and sparked interest among Cuban astronomers. These observations continued with the sighting of Comet C/2022 E3 (ZTF), Comet C/2023 P1 Nishimura, Comet 12P/Pons-Brooks, Comet NEOWISE (C/2020 F3) and the more recent appearance of Comet C/2023 A3 (Tsuchinshan-ATLAS), reflecting the enduring fascination with comets among astronomy enthusiasts in Cuba, leading to several organized observation efforts, primarily coordinated through local independent skywatchers.

The observations of Comet NEOWISE were particularly significant, as the comet's visibility in the Northern Hemisphere coincided with favorable weather conditions in Cuba. Amateur astronomers and photography enthusiasts, equipped with simpler observation tools, captured impressive images, and tracked the comet's trajectory across the night sky. This data, shared via social media (Fig. 1), contributed to a collaborative effort in documenting the comet's appearance from various regions across the island.

Similarly, preparations for the observation of Comet C/2023 A3 involved a small group of enthusiasts who closely monitored the event and shared their collected data, boosting public engagement in cometary science through social media. This convergence gained significant media attention, with scientific outreach platforms such as Juventud Técnica magazine featuring a photograph taken by amateur astronomer Jorge Félix Morales, as well as coverage by the Observatorio Científico. These efforts not only highlighted the growing role of amateur astronomers in Cuba but also underscored the island's increasing enthusiasm for astronomical events.

Although these recent initiatives may lack the advanced instruments of professional observatories, they offer valuable grassroots data that complements global comet studies and scientific outreach. The use of accessible digital tools for imaging and data sharing has enabled Cuban observers to engage in a worldwide dialogue on cometary science through publications in Facebook groups or personal profiles, thus preserving and continuing the island's long tradition of comet observation. The appearance of Comet NEOWISE (C/2020 F3), discovered by NASA's NEOWISE spacecraft on March 27, 2020, captivated observers globally due to its brightness and prominent tail [1,2]. Considered the brightest comet visible in the Northern Hemisphere since Hale-Bopp in 1997, it became a prominent naked-eye target during the summer of 2020, earning the nickname "The Great Comet of 2020" [2]. Its close passage near the Sun on July 3, 2020, caused its icy core to release dust and gas, forming spectacular tails visible to the naked eye under dark skies. Cuban amateur astronomers took full advantage of this celestial display, documenting it from various locations across the island, with reports of vivid views from cities like Havana and Matanzas, and rural areas with less light pollution.

C/2023 A3, also known as Tsuchinshan-ATLAS, is a retrograde long-period comet first discovered on January 9, 2023, by two independent survey teams: the Tsuchinshan Observatory in China and the ATLAS observatory based in Hawaii [21]. The comet reached perihelion on September 24, 2024, at a heliocentric distance of 0.391 AU, ahead of its closest approach to Earth on October 13, 2024 [21]. Expected to be one of the brightest comets visible in recent years, early reports from Cuba and other regions reflect growing anticipation for its close encounter in late 2024. Cuban astronomers, both amateur and professional, have already begun tracking its movement, contributing valuable observations as part of a larger international effort.

In recent observations from Gibara, one of the authors noted the increasing prominence of Comet C/2023 A3. On September

30, 2023, during its third day of visibility, the comet was captured with an apparent magnitude of 2.4, with reports of growing brightness from other Cuban locations (Fig. 2). It is projected to reach a magnitude of 0.7 by October 12, 2023, making it an exciting celestial event for skywatchers (Fig. 3-4).

To effectively observe comets, Cuban enthusiasts often seek out dark, rural locations that are free from city lights, minimizing light pollution; beaches and elevated spots provide excellent vantage points. While many comets, such as NEOWISE and C/2023 A3, can be viewed with the naked eye under ideal conditions, using binoculars or a telescope enhances the experience significantly. Photographers are advised to set their cameras to higher ISO settings and long exposure times, stabilizing them with a tripod to prevent blurring. For precise tracking, apps like SkySafari or Stellarium are useful tools. Additionally, observers should allow their eyes time to adjust to the darkness, steering clear of bright lights to enhance their night vision.

The vibrant enthusiasm among Cuban observers, exemplified by the recent sightings of NEOWISE and C/2023 A3, showcases the island's contribution to global cometary science. With the upcoming maximum approach of C/2023 A3, Cuban astronomers are expected to continue this legacy, capturing the event and contributing valuable data. The synergy of historical insights and modern observations ensures that the fascination with comets remains a cornerstone of Cuba's astronomical community, inspiring future generations to look to the stars.

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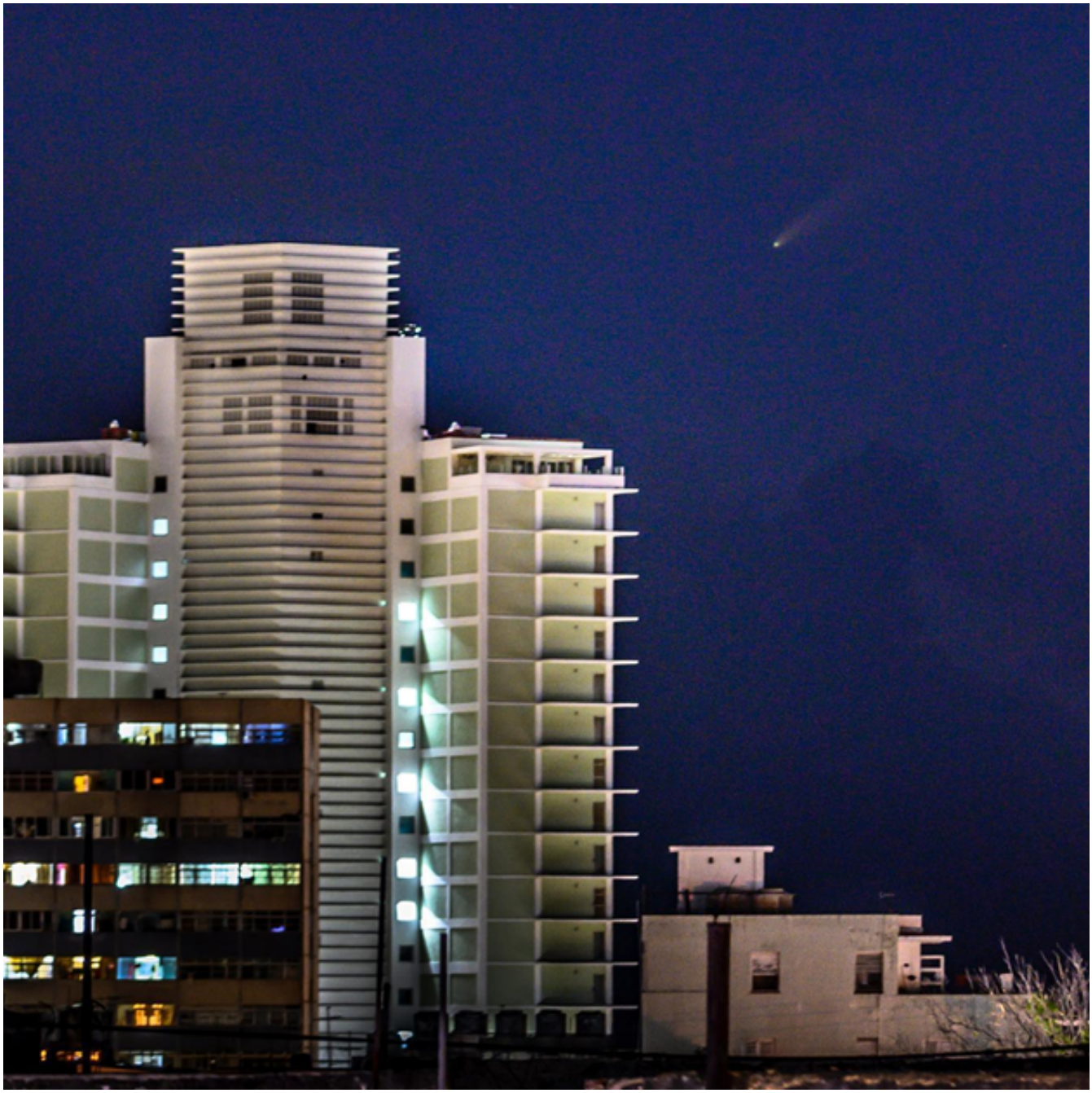

Figure 1. Comet NEOWISE in the Havana sky, seen from a rooftop on July 21, 2020 (Photo credit: Hector Garrido).

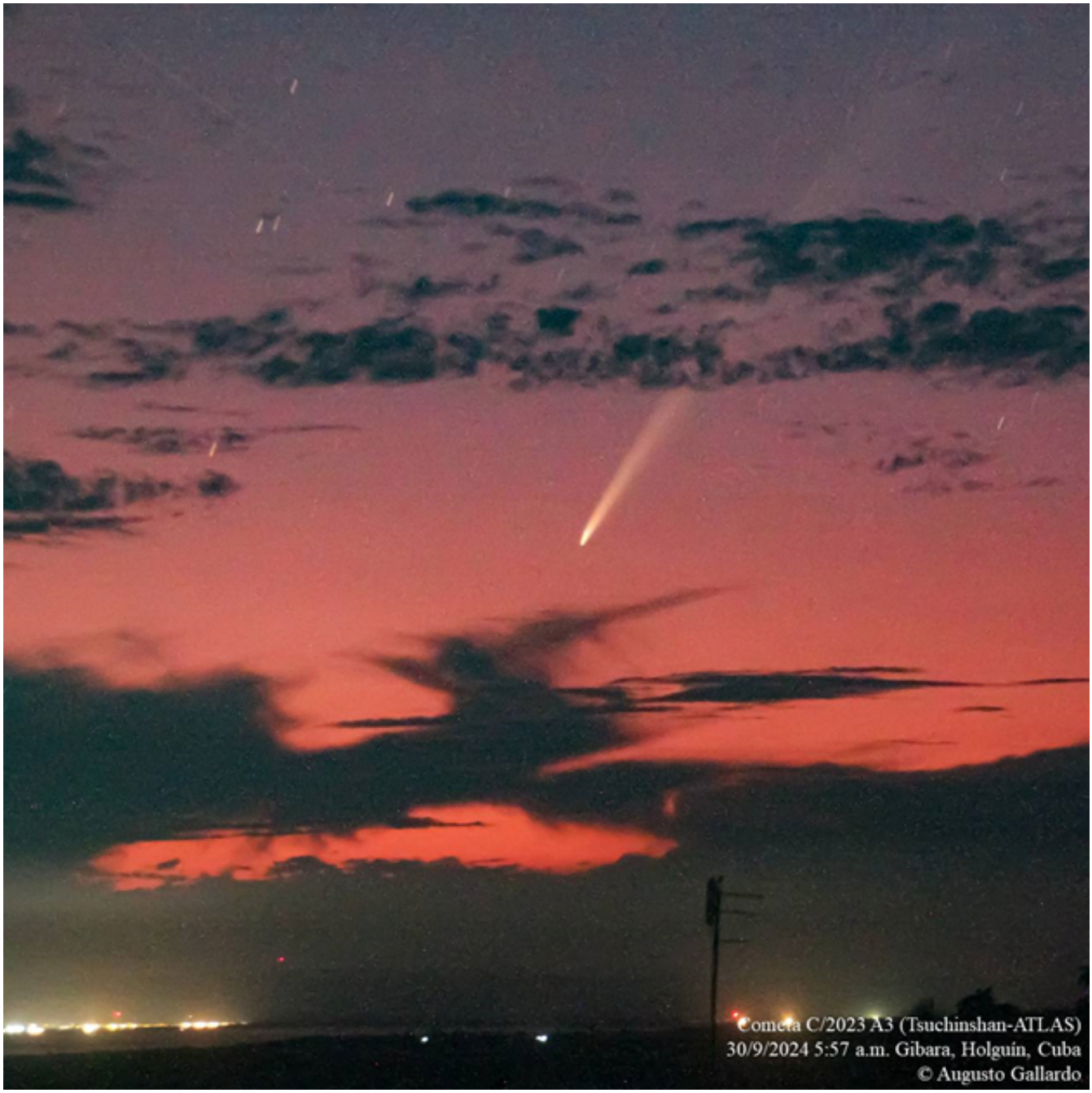

Figure 2. The comet C/2023 A3 (Tsuchinshan-ATLAS) at dawn on September 30, 2024, observed from Gibara, Cuba, with a magnitude of 2.4 at the time.

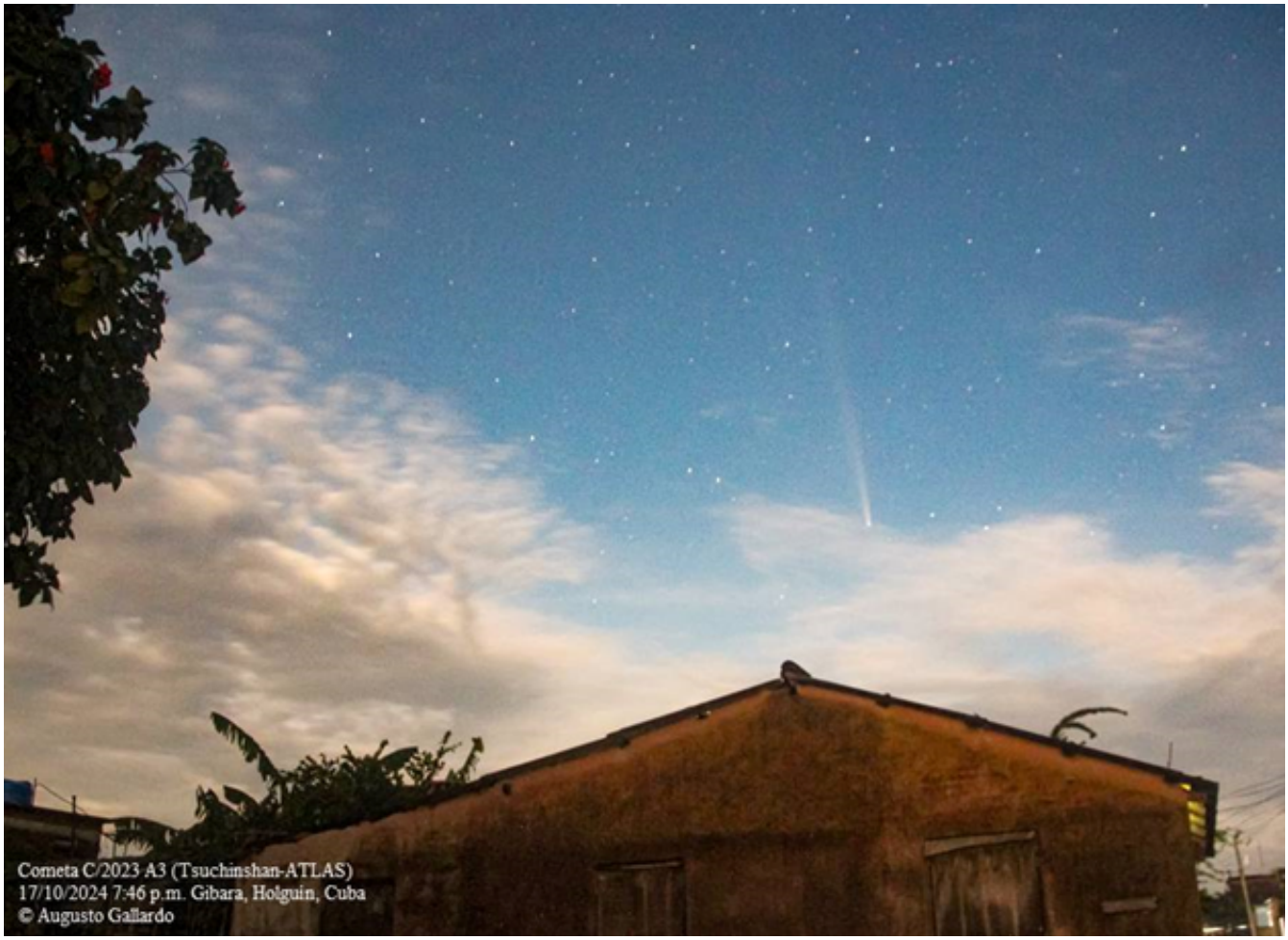

Figure 3. Comet C/2023 A3 (Tsuchinshan-ATLAS), observed from Gibara, Cuba, at sunset facing west. It was clearly visible to the naked eye, including its tail, in a light-pollution-free setting once eyes adjusted to the darkness.

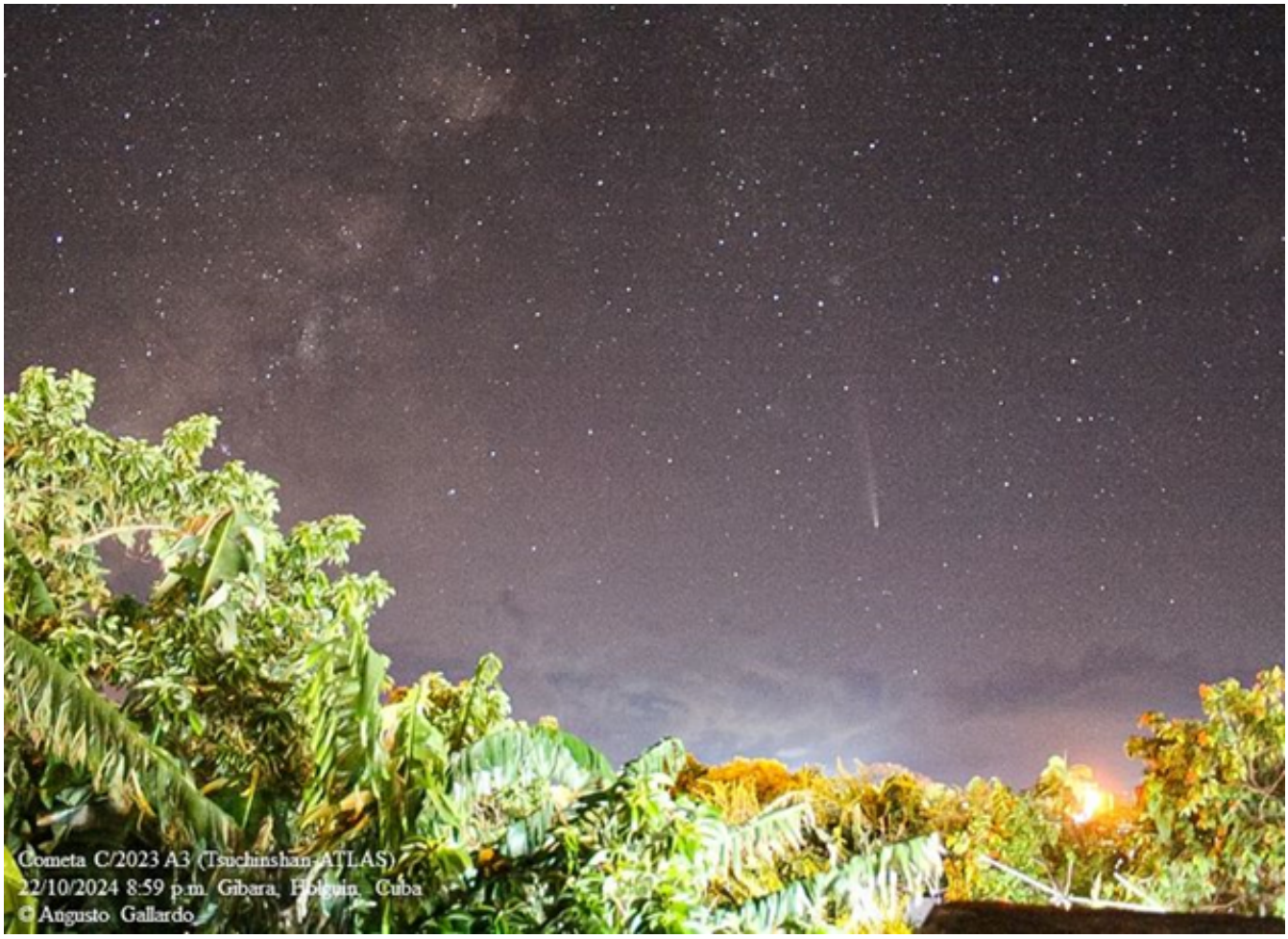

Figure 4. Comet C/2023 A3 (Tsuchinshan-ATLAS), which continues to move away and gradually loses brightness. October 22, 2024. Details: ISO 6400, 20 s, f/3.5, 18 mm, Canon EOS Rebel T3i.