

A WAY FORWARD FOR ISLAMIC ASTRONOMY IN MALAYSIA

Mohd Saiful Anwar Mohd Nawawi¹, Muhamad Syazwan Faid^{2*} and Esmā Dagtekin³

¹Department of Fiqh–Usul and Applied Science, Academy of Islamic Studies, Universiti Malaya, Kuala Lumpur, Malaysia

²Department of Islamic Studies, Centre of General Studies and Co-curricular, Universiti Tun Hussein Onn Malaysia, Johor, Malaysia

³Presidency of Religious Affairs of Türkiye, Çankaya, Ankara, Türkiye

*Corresponding author: mdsyazwan@uthm.edu.my

Published online: 30 April 2026

To cite this article: Mohd Saiful Anwar Mohd Nawawi, Muhamad Syazwan Faid and Esmā Dagtekin. 2026. A way forward for Islamic astronomy in Malaysia. *Kajian Malaysia* 44(1): 113–134. <https://doi.org/10.21315/km2026.44.1.6>

To link to this article: <https://doi.org/10.21315/km2026.44.1.6>

ABSTRACT

Islamic astronomy in Malaysia has developed into a well-organised discipline, supported by an ecosystem of universities, governmental institutions, observatories, and community organisations. However, Malaysia's potential to become a better player in Islamic astronomy on the global stage could be improved. This study examines the contemporary state of Islamic astronomy in Malaysia through literature review, site visits, and a strengths, weaknesses, opportunities and threats (SWOT) analysis to assess its potential and challenges. The results indicate that Malaysia possesses numerous institutional strengths, notably contributions from universities, the federal government's coordinating function, and the initiative-taking involvement of state mufti offices with their respective observatories. They have numerous significant achievements, including the nationwide implementation of Subh prayer and the establishment of the national crescent-sighting database and standard operating procedure (SOP). This demonstrates the nation's capacity to convert research into practical application that usable for general public. Nevertheless, there remains room for improvement, especially in fostering stronger collaboration among academic institutions, maximising the utilisation of research facilities, and expanding international engagement and visibility. Due to this issue, this study proposes a systematic national approach that integrates universities, religious authorities, and non-governmental organisations (NGOs), drawing on insights from Türkiye and Indonesia. This article examines how Malaysia could excel in domains such as big data applications, software development, and artificial intelligence. To establish itself as a global authority in this domain, Malaysia must enhance open data practices, rejuvenate local journals, and strengthen international-local research collaborations. This study provides a framework for enhancing Islamic astronomy in Malaysia, both domestically and globally.

Keywords: Islamic astronomy, big data integration, policy framework development, institutional synergy, international authority

INTRODUCTION

The issue of the Hijri calendar has been a staple social issue in the Muslim community since the prophetic time (Muhamad Syazwan et al. 2025). In the cases of the Hijri calendar, there remains persistent variation in the dates of Ramadan, Shawwal, and Dhu al-Hijjah across different countries and communities. For example, divergent new Hijri month determinations in Pakistan in 2021 and Nigeria in 2020 led to differences in the start and end of Ramadan. More recently, in 1446H (2025 CE), the commencement of Ramadan and Eid al-Fitr differed between Saudi Arabia and several Southeast Asian countries, with Saudi Arabia observing them a day earlier than others. Similarly, Indonesia experienced potential intra-country variation in the timing of the start of Ramadan 1446 AH, reflecting differing interpretations and local observations of the hilal. In North America, community-based sighting reports and mosque announcements sometimes result in different eid dates within the same country or region (IAC 2025). Beyond technical and jurisprudential considerations, the issue of Islamic astronomy, particularly the determination of the Hijri calendar, also carries significant social, psychological, and civilisational implications, as public confidence, communal cohesion, and spiritual preparedness are closely tied to the certainty of religious timekeeping (Rusdiono 2025).

The determination of Subh and Isha' prayer times is still a hotly debated issue, especially in Indonesia, where Nadhatul Ulama and Muhammadiyah, two major Indonesian Islamic groups, disagree on the solar depression angle for Subh prayer time (Cahyani 2021). Reducing the problem in Islamic astronomy to a binary viewpoint ignores the several legal, scientific, and social realities that mould the Hijri calendar scene nowadays (Mohd Saiful Anwar et al. 2024). This indicates that the issue of Islamic astronomy is still prevalent and requires an authoritative figure to serve as a guideline, providing perspective that could light the way to a solution for the convoluted issue of Islamic astronomy worldwide.

One of the authoritative figures could be Malaysia. The Malay world has a long history of astronomy, as evidenced by the Borobudur and Prambanan temples (Khairunnisa et al. 2021) and the Terengganu Inscribed Stone (Wan Ahmad Fauzi, Wan Rohaida and Hanif 2021). Malaysia Islamic astronomy also has structural ecosystem to support the development of Islamic astronomy, with Department of Islamic Development Malaysia (Jabatan Kemajuan Islam Malaysia, JAKIM) to as function as coordinator for all Islamic astronomy-related matters in Malaysia, and 13 states of state mufti offices to navigate the issue

of Islamic astronomy locally. Universities such Universiti Sultan Zainal Abidin (UNISZA), Universiti Kebangsaan Malaysia (UKM), Universiti Malaya (UM), Universiti Sains Malaysia (USM), Universiti Teknologi Malaysia (UTM), Universiti Sains Islam Malaysia (USIM), and Universiti Teknologi MARA (UiTM) also play their role as research talent in bringing the dimension of Islamic astronomy forward, a similar role played by Universiti Putra Malaysia (UPM), Universiti Islam Antarabangsa (UIA) and UiTM in advancing Malaysia halal industry (Aizan, Khadijah and Mohammaddin 2015). Malaysia also found influence in Islamic astronomy matters during the Informal Meeting of the Religion Ministers of Brunei, Indonesia, Malaysia, and Singapore (MABIMS) (Maskufa et al. 2022). Malaysia Islamic astronomy development is closely watched and followed by its neighbours, including Hong Kong, South Korea, and Japan. Due to Malaysia Islamic astronomy's influence over various countries, especially in Asia, this provides a potential for Malaysia to be one of the authoritative figures in Islamic astronomy on the global stage.

Indonesia has developed an honourable profile on the international scene. Research-wise, Indonesia has a wide, multidisciplinary reach, covering sociological studies, historical manuscript analysis, religious discourse, software development, and astronomical computing. This, in turn, increases the number of materials produced in books, peer-reviewed journals, and conference proceedings. From an educational standpoint, Islamic astronomy education starts early at Islamic boarding schools (*pesantren*) and continues through undergraduate and graduate degrees (Muhammad and Nur Fajriani 2022). Formal courses and research projects in Islamic astronomy are offered by several universities, such as Universitas Islam Negeri (UIN) Walisongo, UIN Sunan Ampel, UIN Sunan Kalijaga, Institut Teknologi Bandung (ITB), UIN Alauddin Makassar, UIN Siber Syekh Nurjati Cirebon, UIN Mataram, and Universitas Muhammadiyah Sumatera Utara. With groups like Rukyatul Hilal Indonesia and HISAB-Rukyat Network active in community outreach and public education, the number of non-governmental organisations (NGOs) and civil society groups committed to expand Islamic astronomy knowledge commendable (Ma'u 2019). Badan Hisab dan Rukyat, a national-level coordinating body comprised of religious experts, astronomers, and government officials, to unify Hijri calendar decisions, further strengthens Indonesia's methodical approach. Indonesia's influence is significant in the MABIMS meetings, alongside Malaysia, Brunei, and Indonesia. This demonstrates Indonesia's strength in the field of global Islamic astronomy.

Türkiye is also a figure of importance in the worldwide Islamic community in the field of Islamic astronomy. Due to its past as the centre of the Ottoman Empire, Türkiye's influence on religion has been maintained worldwide through Diyanet İşleri Başkanlığı (Presidency of Religious Affairs) (Gökalp and Baş 2024). Türkiye uses a worldwide Hijri calendar based on exact astronomical calculations and

global visibility of the lunar crescent rather than local sightings. This calendar guarantees consistency and predictability across the diaspora Turkish Muslim population. Diyanet created a calendar observed not only in Türkiye but also by a sizable worldwide network of Muslim communities. The largest Islamic umbrella group in Germany, the Turkish-Islamic Union for Religious Affairs, bases its calendar on the Diyanet. Where Turkish-affiliated mosques preserve Diyanet's calendar, similar adherence is observed in Germany, Australia, and Japan, demonstrating Türkiye worldwide recognition in Islamic astronomy. Moreover, the Turkish government has created and maintains Islamic calendar and prayer time software that combines international astronomical data, making it a worldwide software reference for Islamic astronomy (Arafat et al. 2025) with recurrent divergences over the start of Ramadan, Shawwal, and Dhu al-Hijjah. This article interprets the 2016 International Hijri Calendar Unity Congress in Istanbul not merely as a technical-astronomical gathering but as a strategic exercise in religious diplomacy orchestrated by Türkiye's Presidency of Religious Affairs (Diyanet). These factors make Türkiye as one of the most powerful and authoritative figures in Islamic astronomy worldwide.

Historically, Malaysian scholarship has received strong international recognition, particularly during the era of Mohammad Ilyas, whose works on the Islamic calendar and lunar visibility were widely cited and discussed at the global level (Ilyas 1992; 1994). However, despite this strong scholarly presence, most of the contributions during and after this period remained largely at the level of academic discourse, with limited translation into national policy or institutional implementation. To date, none of the major calendar-related frameworks proposed by Ilyas have been formally adopted as official policy in Malaysia and other countries.

In recent decades, the majority of Malaysian Islamic astronomy literature has shifted to focus on microscopic and problem-specific issues, offering technically robust yet narrowly scoped solutions, such as lunar crescent visibility criterion (Nazhatulshima et al. 2020; Muhamad Syazwan et al., 2026), authentication for lunar crescent observation (Muhamad Syazwan, Mohd Saiful Anwar and Mohd Hafiz (2023), International Lunar Dateline (Muhammad Ridzuan, Mohd Saiful Anwar and Sa'adan 2024), issue of prayer time zoning (Nurul Kausar et al. 2022) and qibla direction device and software (Roslan et al. 2025). Other literature discussed the current state of Islamic astronomy in Malaysia, but did not highlight its strengths and weaknesses.

There are still some internal challenges of Islamic astronomy that need to be addressed. One area that warrants further improvement is the communication interface between religious authorities and the public. The *raya mengejut* scenario in 2022, involving the announcement of 1st Shawwal 1443H, attracted significant public attention due to differences between the final decision and earlier calendar

projections (Jusran Kasim et al. 2024). This incident illustrates that, alongside technical and jurisprudential considerations, effective science-to-public communication is a critical component of contemporary Islamic astronomy.

Another area of concern is the determination of the qibla direction. There have been cases in which the old mosque qibla lines or public digital qibla apps were found to be misaligned with the actual direction of the Kaaba when used for qibla determination (Nurulhuda and Damia Batrisya 2025). For prayer time, there has been some uproar on social media lately, with people pointing out differences in prayer times across various apps, websites, and printed schedules compared to their actual observations (Amree 2022). Locally, Malaysia needs to address this communication problem to reduce public disagreement and confusion.

Although Malaysia has contributed significantly to regional discourse on the Hijri calendar, consensus within MABIMS has yet to be fully achieved. Divergent views persist regarding the appropriate frame of reference, including geocentric or topocentric interpretations, shariah frameworks, visibility criteria, and geographical reference points. This situation underscores the need for further analytical and integrative efforts to enhance regional alignment (Mohd Saiful Anwar et al. 2024). A similar situation is observed in the standardisation of Subh prayer time, while Malaysia adopted a new degree of solar depression for Subh prayer time based on research (JAKIM 2015), Indonesia, Brunei and Singapore continue to apply their own parameters based on earlier twilight data, reflecting ongoing methodological differences at the regional level.

Malaysia's potential to be recognised as a regional reference authority in Islamic astronomy continues to develop. While neighbouring countries such as Indonesia, Brunei, and Singapore maintain their own established approaches, alignment with Malaysia's research-based frameworks has not yet been fully realised. Strengthening internal coherence and consistency in managing domestic issues may enhance public confidence, expand Malaysia's regional presence, and further reinforce its standing as an international contributor to Islamic astronomy. Notably, countries such as Japan, Australia, Hong Kong, regularly observe Malaysia's official announcements for the commencement of Hijri months, particularly Ramadan, Shawwal, and Dhu al-Hijjah, while Australia have conducted site visits to Malaysia to learn from its practices in Hijri month determination, qibla orientation, and prayer time calculation.

This article intends to explore the potential of Islamic astronomy in Malaysia to be one global powerhouse, while addressing its flaws and room for improvement. The article endeavour to provide a macroscopic view on how Malaysia could put forward an Islamic astronomy product as a worldwide authoritative figure.

METHODOLOGY

Methodologies conducted to reach the aim of this article are a literature study, site visit, and SWOT analysis. A review was undertaken using the PRISMA review method (Rethlefsen et al. 2021), using sources from Google Scholar, Scopus, Mendeley, and Web of Science databases on 27 January 2024, using the search terms Malaysia, Islamic astronomy, lunar crescent visibility, prayer times, and qibla determination (n = 221). Duplicate records were removed, and the study was limited to journal articles to retain robust peer-reviewed references. Then, articles that do not discuss the Malaysian scene of Islamic astronomy are excluded. Only 13 articles pass the selection criterion, and they only provide a limited view on the status of Islamic astronomy in Malaysia.

Therefore, the site visit methodology is employed in this study. The first step of this methodology is to identify key stakeholders of Islamic astronomy in Malaysia. Stakeholders may include governmental bodies such as JAKIM and the Department of Survey and Mapping Malaysia (Jabatan Ukur dan Pemetaan Malaysia, JUPEM), academic institutions, state observatories, State Mufti Offices, religious scholars, and community organisations. Once key stakeholders are identified, the next step involves establishing contact to arrange site visits. Observations are made during the site visits to document the physical infrastructure, facilities, and activities related to Islamic astronomy at each institution. Relevant documents, reports, publications, and other materials related to Islamic astronomy produced by the visited institutions are collected and analysed. This is vital as most of the article that discuss the status of Islamic astronomy in Malaysia is presented in a closed-door meeting and not available publicly.

Using a thematic analysis technique, this study systematically investigated the qualitative data obtained during the site visits. Documentary materials, field observations, and qualitative data taken from a variety of institutional sources, all of which fit this approach, were selected. Key phrases, concepts, patterns, and innovative ideas were straight taken from the data using an inductive coding technique free of pre-defined categories. Every data point was coded using a structured spreadsheet, breaking down into logical units to guarantee no detail was missed. These codes were then polished and arranged into more general topics depending on recurrent trends seen in many sources and institutions.

SWOT analysis is then used to provide valuable insights into the internal and external factors influencing the advancement and stagnation of this field of Malaysia Islamic astronomy. The internal factors that contribute positively to the advancement of Islamic astronomy in Malaysia is evaluated. The internal factors that pose challenges or limitations to the development of Islamic astronomy is assessed. External factors that present opportunities for the

growth and expansion of Islamic astronomy in Malaysia is evaluated. External factors that pose risks or challenges to the advancement of Islamic astronomy to anticipate potential obstacles that may hinder progress in the field of Islamic astronomy in Malaysia.

RESULTS

Strength of Islamic Astronomy in Malaysia

Status of Islamic astronomy research in Malaysia

There are numerous Islamic astronomy research projects that have been conducted at universities in Malaysia. In UM, the primary research project is on Islamic Jurisprudence in Islamic astronomy, integrating science and technology with Islamic Studies. This includes the determination of prayer time zoning using multiple point system (Nurul Kausar, Khairussaadah and Mohd Saiful 2024), standard operating procedure during observation of new Hijri month particularly using charged couple device (CCD), telescope, and analysis software (Wahid 2021), Subh prayer time determination using digital single light reflex (DSLR) and sky quality meter (SQM) (Mohammaddin et al. 2019), degree of qibla deviation among mobile devices (Ahmad Zaki and Hidayatullah 2025), and authentication and analysis of lunar crescent records and criterion using Python (Muhamad Syazwan, Mohd Saiful Anwar, Raihana et al. 2023; Muhamad Syazwan, Mohd Saiful Anwar and Mohd Hafiz 2023; 2024; Faid et al. 2024).

UNISZA focus on lunar crescent visibility, observatory light pollution monitoring and remains the sole university software solution provider for Islamic astronomy (Ahmad Hariz et al. 2025; Nasir et al. 2025). In UKM, the focus of Islamic astronomy is on the human side of the study. This includes historical analysis, economic potential, and human resource study of observatories in Malaysia (Mohd Hafiz et al. 2024), feasibility of Astrolabe for Malaysian education (Mohd Hafiz et al. 2023), fasting and prayer time concession for working unique conditions (All-Mu'izz et al. 2022; Al-Shiha et al. 2023), and Astro tourism potential in Malaysia (Mohd Hafiz et al. 2020). Other universities' research areas are not as focused or expansive as UKM and UM, with UiTM Shah Alam primarily focused on Subh prayer time determination (Affendi et al. 2021), and UPM and USIM primarily focused on Islamic jurisprudence (Sahid et al. 2024).

The strength of UM is its ability to institutionalise its research findings in government and society. Subh prayer time determination is one of the research projects from UM that are currently institutionalised into the federal government and followed by state mufti offices. This is the output from a

collaboration between UiTM, UNISZA, and JAKIM; they concluded that 18 degrees of solar depression is a more appropriate representation of Subh prayer time. Therefore, on 20 to 21 November 2019, the 116th Muzakarah Committee Meeting of the National Council for Islamic Affairs convened and agreed to set the start of the morning prayer time in Malaysia to the sun's altitude at 18° below the horizon (JAKIM 2015).

Another notable example is the institutionalisation of research-based guidelines for lunar crescent observation in determining new Hijri months, integrating shariah and astronomical analysis. These guidelines and enactments, which recognise observations by female observers and provide detailed procedures for image processing, demonstrate how rigorous academic research in Islamic astronomy can be effectively translated into governmental enactments and official policies (Jabatan Mufti Negeri Selangor 2024).

Building on its longstanding reputation in Islamic astronomy, UM is proposed as the national coordinator for Islamic astronomy research. UM will act as the central hub for charting national research roadmaps, standardising data across observatories, and ensuring public and policymaker access to research findings.

In the East Coast area, UNISZA, with its proven background in image processing, light pollution monitoring, and software development, will focus on digital innovation, developing an expert workforce in light pollution monitoring and crescent image processing.

In the northern region, USM will lead technological advancement, particularly in optical systems, atmospheric modelling, and CCD imaging. The State Mufti Office of Kedah previously published a traditional calendar for agricultural and fisheries planning, the Piama calendar (Rahimah 2015), which could be one of the main thrusts of research in this region. UKM will address the policy and societal dimensions of Islamic astronomy. Through research on public perceptions, science communication, and religious engagement, UKM will help bridge scientific advancements with religious authority and community trust.

Down south, UTM will apply its strengths in engineering and geospatial science to projects like mosque alignment, mobile qibla direction apps, and prayer time zoning using geographical information system (GIS). To ensure that all scientific advancements remain within Islamic legal boundaries, USIM will focus on shariah compliance, particularly in matters related to Islamic astronomy.

Supporting roles will be filled by Universiti Malaysia Sabah (UMS) and Universiti Tun Hussein Onn Malaysia (UTHM), focusing on technical training and outreach in East Malaysia and the peninsula. Finally, effective collaboration with state mufti offices and NGOs will be crucial for grassroots adoption and

public engagement. This integrated, thematic strategy will position Malaysia as a leading global model for Islamic astronomy governance, where science, technology, and faith work hand in hand. This is also deeply rooted in Malaysian governance culture, where Islamic values are integrated into public service, whether in state mufti offices, universities, or the federal government (Ilhaamie and Junaidah 2022).

Universities, NGO and government partnership

The success of institutionalisation relies on the partnership and collaboration between universities and governmental bodies. Research conducted with governmental bodies has a higher chance of being converted into institutionalised research utilised by society. In Malaysia, the primary governmental bodies involved in Islamic astronomy are JAKIM and the state mufti offices.

Such an example is the Malaysia Rukyah Hilal Kebangsaan database (MyRHK). In 2021, JAKIM, in cooperation with UM, JUPEM, and Falak Online, developed a free-access database of lunar crescent sightings for Malaysian observers. Lunar crescent data collection predating the MyRHK is fragmented and irregular. Recognising this problem, JAKIM has developed the MyRHK database, in which each state mufti office is required to update data on lunar crescent sightings monthly. MyRHK serves as a model of government-led lunar crescent observation that could be emulated worldwide.

Non-governmental bodies also play a role in conducting research, organising events, and engaging in activities related to Islamic astronomy in Malaysia. Persatuan Falak Syar'i Malaysia (PFSM) has worked with JAKIM and Malaysia Airlines to develop In-Flight Prayer Times application for Muslim travellers. They are also responsible for researching the determination of Muslim astronaut's prayer times during an outer space mission, conducted alongside the Malaysia Space Agency. PFSM has also contributed to Malaysia's international visibility by organising major scholarly platforms, such as International Experts Summit on Islamic Astronomy 2025. These events brought leading scholars and experts in Islamic astronomy to Malaysia, facilitating intellectual exchange and reinforcing Malaysia's role as a regional hub for discussion in this field. Another NGO, Persatuan Jurufalak Syarie (JUFAS), has also been actively involved in regional and international capacity-building initiatives in Islamic astronomy. These efforts include organising a Southeast Asia Islamic Astronomy Seminar in collaboration with state mufti offices and JUPEM.

At the international level, the association coordinated a three-day intellectual discourse programme in Tokyo, Japan, bringing together scholars and practitioners to engage in structured discussions on contemporary issues in Islamic astronomy.

This was followed by an intensive 14-day seminar and workshop series in Türkiye, conducted in collaboration with JAKIM and state mufti offices, focusing on advanced scholarly exchange, methodological refinement, and professional capacity-building. Collectively, these programmes have strengthened cross-border knowledge exchange and enhanced regional expertise in Islamic astronomy.

Islamic astronomy in Malaysia saw active partnerships among governmental, non-governmental, and university bodies. JAKIM plays its role in promoting research in universities that are beneficial to society. Without JAKIM, research in universities only cater theoretical problem, and does not ground to the actual issue among the Muslim society in Malaysia. While JAKIM's research area in Malaysia is macro in scope, state mufti offices provide micro-level research solutions that address their state's issues and problems. Therefore, research on Islamic astronomy in Malaysia, through partnerships with governmental and non-governmental bodies, does not limit itself to theoretical work; it is also finding footing in social applications regarding macro and micro issues of Islamic astronomy in Malaysia.

Weaknesses and Threat of the Islamic Astronomy in Malaysia

This weakness and threat to Islamic astronomy in Malaysia could be portrayed in three main themes: internal and external collaboration, database collection, and research synergy. These are vital for the development of Malaysia at the local and regional levels (Shah Rul Anuar 2022).

Internal and external collaboration

Malaysia is relatively well positioned in terms of astronomical infrastructure, with nine observatories under the administration of State Mufti Offices, universities, and federal agencies. These facilities are furnished with contemporary telescopes suitable for research-oriented observations, supported by dedicated funding and professional personnel. By contrast, in many parts of the Muslim world, Islamic institutions lack permanent observatory infrastructure, and existing facilities are commonly limited to the operational role of determining Hijri month commencements.

However, despite the facilities provided to the state observatory, no significant research output can be extracted from each state observatory. Most state observatories serve only to observe sites for new Hijri month sightings, staff training, public programmes, school activities, and museums, with the exception of the Negeri Sembilan Observatory and the Langkawi National Observatory. Balai Cerap Negeri Sembilan is operated by Majlis Agama Islam Negeri Sembilan (MAINS), where it serves as a research breeding ground for JAKIM and UM

to conduct their studies and meetings. Balai Cerap Negeri Sembilan provides housing options, meeting rooms, event halls, and proper observation sites to ensure that researchers can conduct their research activities comfortably. This unique collaboration should be emulated by other universities and observatories.

The weight should not be burdened on the state observatory alone. Universities should play their role as researcher and initiate research collaboration between neighbouring state observatories. These universities have their own Islamic astronomy clubs, students, research ideas, and funding that can be allocated to initiate collaborations with state observatories. Collaboration between universities and the state government enables the research output of these universities to reach wider beneficiaries and not only serve the university key performance indicators.

Another important institutional actor that can play a catalytic role in strengthening research activities at state observatories is the State Mufti Offices. Several state mufti offices in Malaysia have demonstrated proactive engagement in advancing Islamic astronomy through funding, research collaborations, and public programmes. For instance, MAINS, State Mufti Office of Selangor, the Majlis Agama Islam Selangor (MAIS), and the State Mufti Office of Sarawak have been particularly active in supporting Islamic astronomy initiatives by providing dedicated funding and research grants for activities conducted within their respective states.

Similarly, several state mufti offices in Malaysia have emerged as key contributors to the advancement of Islamic astronomy. The State Mufti Office of Perak has been particularly prominent, most recently through the provision of research funding and collaborative support. Comparable initiatives have also been undertaken by the state mufti offices of Kedah, Melaka, Pahang, and Terengganu, which have supported research, technical collaborations, and scholarly engagements related to Islamic astronomy and its contemporary applications. Collectively, these state-level contributions reflect a growing institutional commitment to strengthening research capacity and inter-agency collaboration in the field. Collectively, these initiatives illustrate the growing strategic role of state mufti offices in bridging religious authority, scientific research, and public engagement within Malaysia's Islamic astronomy ecosystem.

Malaysia can also benefit much from Indonesia's experience in creating cooperative and creative environments in Islamic astronomy. One important example is the curriculum development at UIN Walisongo, which integrates religious studies with contemporary scientific fields like astronomy. This

prepares graduates to function successfully at the junction of empirical science, technology, and theology. Adopting such models will help Malaysia's graduates to be both spiritually grounded and scientifically capable (Royyani et al. 2023).

Beyond curriculum reform, Indonesia has demonstrated how infrastructure investment can strengthen public engagement and long-term sustainability in Islamic astronomy. At UIN Walisongo Semarang, the development of a planetarium and observatory, supported through funding from the Islamic Development Bank (IsDB), has successfully transformed academic facilities into public-facing centres for astronomy education and outreach. These facilities have attracted strong public interest, school engagement programmes, and community participation, positioning Islamic astronomy not only as an academic discipline but also as a tool for science communication and cultural engagement. A similar model can also be observed at Universitas Muhammadiyah Sumatera Utara, where the establishment of the Observatorium Ilmu Falak has strengthened institutional capacity in Islamic astronomy while simultaneously serving as a hub for research, student training, and public outreach.

Initiatives such as the Program Beasiswa Santri Berprestasi have enabled promising young scholars from religious backgrounds to pursue specialised training in Islamic astronomy through structured pathways that integrate higher education, research development, and future employment (Rusydziana et al. 2023). Indonesia's relative success in Islamic astronomy is not solely attributable to institutional diversity, but also to the deep societal embedding of Islamic astronomy as a lived religious and cultural practice, where astronomical knowledge is widely recognised as part of collective religious life rather than a specialised technical domain (Rusdiono 2025).

Drawing inspiration from this model, Malaysian institutions, such as the State Islamic Religious Councils, the Ministry of Higher Education, and state mufti offices, could collaborate more closely with nearby universities to establish dedicated scholarship and fellowship schemes specifically targeted at local and international students, and early-career researchers in Islamic astronomy. By opening these opportunities to the global community, Malaysia can effectively export its expertise and cement its status as a premier hub for Islamic astronomy, mirroring the successful internationalisation strategy employed by Türkiye. Malaysia could not only strengthen its human capital and research sustainability, but also attract international funding and investment from similar sources, including multilateral development banks and regional partners. Such strategies would enable Malaysia to reposition Islamic astronomy from isolated academic outputs towards institutionalised, publicly engaged, and internationally visible centres of excellence, comparable to leading models in Indonesia.

Indonesia faces more multifaceted challenges due to contrasting Islamic astronomical views among Muhammadiyah, Nahdlatul Ulama, and other Islamic groups. Additionally, Islamic astronomy scholars in Indonesia often hold differing views and approaches, which can lead to internal debate (Arifianto 2021). Malaysia, on the other hand, provides a more united front, either from top-down or bottom-up, under the umbrella of the Asy-Syafie School of Islamic thought. Therefore, Malaysia possesses a strategic edge to move forward more decisively in Islamic astronomy development without being constrained by internal social or sectarian issues.

Database collection

A continuous free-access database collection fosters the growth of research and promotes collaboration. Such an example is the Islamic Crescent Observation Project (ICOP), which collects data on lunar crescent sightings from all over the world and makes all the data publicly available on its website. As in 2026, ICOP received data from more than 20 countries and lunar crescent observers, amassing more than 5,000 data points. The open-access nature of ICOP lunar crescent-sighting data, and its comprehensive reporting, attract a large number of submissions and are used for various research projects (Loucif et al. 2024). In addition, ICOP is curated by a team of astronomy experts, ensuring the validity of the reported lunar crescent data, and managed by non-governmental bodies, including the International Astronomical Centre (IAC), which enable the ICOP data to be continuously updated without the restrictions of government bureaucracy. ICOP serves as a model for developing a successful database project in the field of Islamic astronomy worldwide. The availability of openly accessible databases related to Islamic astronomy in Malaysia remains an area with considerable potential for further development. At present, data produced by many state observatories are primarily managed for internal or operational purposes and are not consistently disseminated through open-access platforms. Similarly, JAKIM's MyRHK system, which has been in operation since 2021, represents an important national initiative; however, continued improvements in user interface design, accessibility, and public engagement mechanisms could further enhance its reach and usability among researchers worldwide.

Beyond observational data, the accessibility of scholarly literature, such as academic journals and conference proceedings, is crucial to advancing any scientific discipline, including Islamic astronomy. In this regard, Indonesia provides a useful comparative example through its systematic development of online Islamic astronomy literature platforms. Several peer-reviewed journals dedicated specifically to Islamic astronomy are managed by local universities, including *ELFALAKY: Jurnal Ilmu Falak*, *Jurnal Al-Marshad: Jurnal Astronomi Islam dan Ilmu-Ilmu Berkaitan*, *AL-AFAQ: Jurnal Ilmu Falak dan Astronomi*, *HISABUNA: Jurnal Ilmu Falak*, and *Al-Hilal: Journal of Islamic Astronomy*. These

journals are published on a regular basis and contribute to the continuous dissemination of current research findings, methodological developments, and contemporary discussions in Islamic astronomy within Indonesia.

Malaysia, on the other hand, only has a handful of journals on Islamic astronomy, namely *Jurnal Falak*, managed by JAKIM, and *Journal of Fatwa and Falak Selangor (JUFFAS)*, managed by the State Mufti Office of Selangor. At present, only the 2015 volume of *Jurnal Falak* is available on the JAKIM website, which may pose challenges for researchers seeking a comprehensive reference on the development of Islamic astronomy in Malaysia. *JUFFAS* was introduced in 2024 and has maintained a steady publication frequency since. *JUFFAS* covers a wider issue: Islamic jurisprudence, which functions as an umbrella term for various fields such as Islamic family law, Islamic jurisprudence of transactions, Islamic dietary law, and Islamic criminal law. This enables *JUFFAS* to collect a higher volume of manuscript submissions, which, in turn, enables stable and frequent publication. Universities in Malaysia have their own Islamic astronomy workforce, the capacity to publish research output yearly, and could divert some of that output to publication in *Jurnal Falak* dan *JUFFAS*. This is a gap that an Islamic astronomy-themed journal in Malaysia should fill. If these journals are updated consistently, then the current issue and ideas on Islamic astronomy in Malaysia can be circulated online and analysed by researcher worldwide.

Research synergy

Research conducted as a collective effort across multiple universities has a higher chance of creating a worldwide impact compared to stand-alone research within a single university. Research involving multiple universities and collaborations is becoming the norm in the physics and astronomy field, with examples such as the Higgs Boson particle research by G. Aad et al., which was conducted within the ATLAS and CMS Collaborations and authored by more than 5,000 authors. These groups collaborate together, sharing their research idea, methodologies, and technique to offer a study that could impact and change the perspectives of their own research field.

A similar collaboration could be emulated in Malaysia. There are instances of synergies that have been conducted at the national level; the primary example is the Pusat Rujukan Haji (RAJIH), or the Research Centre of Hajj. The research centre is launched in collaboration with corporate and academic entities, namely Tabung Haji, Universiti Utara Malaysia (UUM), UKM, and USIM. This is a huge undertaking and would strengthen Malaysia's foothold in hajj research worldwide. Constructive collaboration between Universities in Malaysia on Islamic astronomy is critical. There is numerous issue that could be addressed and has potential to cause confusion among research governmental bodies. The Isha' prayer times, visibility criteria for the lunar crescent, unification of the

calendar, and the issue of state zoning are still not resolved due to indifference among Islamic astronomy scholars on these issues. The recently adopted MABIMS lunar crescent visibility criterion in 2021 has received dissent and criticism from a number of researchers. This demonstrates that there are a number of issues that could be studied collaboratively among universities, the federal government, and the state mufti office to increase research impact and social visibility.

Malaysia could observe Türkiye as one illustration of successful Islamic astronomy development. Islamic astronomy has been structured comprehensively under the presidency of the Religious Affairs of Türkiye (Diyanet). Under one roof, the Time Calculation Branch, which comprises five officers, combines astronomers, religious academics, and timekeepers, enabling Türkiye to monitor prayer timings, Hijri calendar management, and qibla orientation from a religious and scientific perspective (Gökalp and Baş 2024).

Türkiye actively supports world conversations on calendar unification. One important example is its organisation of the International Hijri Calendar Union Congress in Istanbul in 1978 and 2016, when religious leaders and experts discussed a worldwide benchmark for the visibility parameter of the lunar crescent. In addition, Türkiye offers precise prayer times software for over 8,600 cities in 206 countries, available on platforms such as <https://vakithesaplama.diyamet.gov.tr/> and <http://namazvakitleri.diyamet.gov.tr/>. Türkiye's leadership in global harmonisation demonstrates an important lesson; the importance of bridging the discussion of Islamic astronomy research on a global platform, in contrast to Malaysia's approach, which stresses a locally and regionally focused research network.

Nevertheless, Malaysia holds a unique strength of its own. The country has established an Islamic Astronomy Panel of Experts comprising professors, lecturers, government officials, and industrial practitioners specialised in Islamic astronomy. Furthermore, every state mufti office is equipped with its own Islamic astronomy officer, giving focused attention to the development and implementation of Islamic astronomy initiatives at the state level. This gives Malaysia a clear advantage in localised expertise, grassroots outreach, and state-level innovation, elements that collectively create a robust ecosystem for the development of Islamic astronomy.

Prospectus of Islamic Astronomy in Malaysia

The potential for data collection in Islamic astronomy is commendable. Data such as lunar crescent sighting, Subh prayer time determination, qibla direction accuracy, and observation site assessment involve a wide variety of data types: numeric data from SQM readings, textual data from lunar crescent sighting

reports, GIS data for mosque locations, prayer time reference points, and observation sites, as well as image data from DSLR or CCD captures of the lunar crescent. These portrayed the variety and volume of data that could be amassed under the framework of Islamic astronomy.

MyRHK, if well-organised, holds potential as a big data platform in Islamic astronomy. It already possesses the capability to store and manage comma-separated values from SQM readings, structured textual reports from sighting observations, and high-resolution images of the lunar crescent. This integrated data environment can support advanced research in lunar crescent visibility. To unlock this potential, a structured implementation strategy is essential. This includes the development of a centralised, scalable data infrastructure capable of integrating data in real time. Standardisation of data formats, such as CSV for numeric data, JSON/XML for textual data, and FITS or JPEG for imagery, will ensure consistency, accessibility, and interoperability across platforms.

However, while the development of big data infrastructures is critical, it is equally important to communicate the impact of big data in ways that resonate with policy makers and the general public. Big data applications should not only aim for scientific production, grant acquisition, or academic publications, but also be translated into tools and services that provide tangible societal value. A socialisation approach is needed to ensure that the broader community, including decision-makers to recognise its significance and utility. In this way, big data becomes not just a scientific ambition, but a community-serving innovation.

Creating a worldwide impact requires international collaboration. This is because each country has its own unique situation in Islamic astronomy and offers unique insights in research. International collaboration not only provides a fresh perspective on research in Islamic astronomy, but can also attract international funding and strengthen academic bonds between collaborating countries.

Although this study emphasises cooperation as a major asset in the field of Islamic astronomy in Malaysia, it is crucial to underline that cooperation alone does not always lead to worldwide recognition. Instead of seeing it as a goal in and of itself, it is suggested that the basis for advancing it be organised around long-term alliances between universities, the state mufti office, federal government bodies, and NGOs. Experiences from Türkiye, and Indonesia, show that real progress in Islamic astronomy results from a confluence of coordinated collaboration, open data sharing, continuous scholarly production, and worldwide outreach. These countries demonstrate that organisation, alignment, and sustained throughout time arrangement of resources define more than just their availability.

CONCLUSION

Islamic astronomy in Malaysia exhibits a robust ecosystem comprising academic research, institutional partnerships, and NGOs, contributing to both national development and global scholarly endeavours. In this regard, Malaysia's advancement in Islamic astronomy should be framed not merely as a pursuit of technical leadership, but as a civilisational responsibility to harmonise scientific rigour, religious legitimacy, and social unity within a coherent, forward-looking governance framework. Universities in Malaysia, particularly UM and UKM are actively involved in diverse Islamic astronomy research projects, ranging from prayer time determination to Astro tourism potential. The institutionalisation of research findings into government and society, facilitated by bodies like the National Council for Islamic Religious Affairs Malaysia and state fatwa committees, underscores the practical impact of this research. The success of institutionalisation is attributed to effective collaboration between universities and government bodies, primarily JAKIM and state mufti office. Noteworthy examples include MyRHK database, developed in collaboration with JAKIM, which has the potential to support extensive data collection. NGOs like PFSM and JUFAS play pivotal roles in extending Islamic astronomy outreach beyond academia. Initiatives such as the In-Flight Prayer Times project highlight the tangible impact of NGO-government collaboration. The prospect of big data analysis in Islamic astronomy, particularly through MyRHK, presents an opportunity for worldwide impact. International collaboration remains a key factor for a more comprehensive understanding, and the need for groundbreaking software with lasting impact is evident. Encouraging diverse collaborations among universities can enrich research perspectives in Islamic astronomy. Strengthening international cooperation will not only enhance research quality but also attract funding and strengthen academic bonds. Malaysia's Islamic astronomy community, if strategically positioned, has the potential to influence global understanding and advancements in the field. A focus on big data analysis, innovative software development, and tangible product creation can propel Islamic astronomy into a new era of academic and practical influence. In summary, Islamic astronomy in Malaysia is at a juncture where its strengths in research, government-university collaboration, and NGO coordination can be harnessed for both national and international prominence. The potential for big data analysis and innovative software development positions Malaysia to be a key player in shaping the future of Islamic astronomy on a global scale.

ACKNOWLEDGEMENTS

Thanks to Universiti Malaya for funding this project through Project RMF0068-2021 Research Maintenance Fee. The authors acknowledge support from the Universiti Malaya Research Excellence Grant (UMREG005-2025). This research is also supported by Universiti Tun Hussein Onn Malaysia (UTHM) through the Tier 1 Grant (Vot Q989).

REFERENCES

- Aad, G., B. Abbott, J. Abdallah, O. Abidinov, R. Aben, M. Abolins, O.S. AbouZeid, H. Abramowicz, H. Abreu et al. (ATLAS Collaboration & CMS Collaboration). (2015). Combined measurement of the Higgs boson mass in pp collisions at $\sqrt{s} = 7$ and 8 TeV with the ATLAS and CMS experiments. *Physical Review Letters*, 114(19), 191803. <https://doi.org/10.1103/PhysRevLett.114.191803>
- All-Mu'izz Abas, Mohd Hafiz Safiai, Salmah Abu Hasan, Ahmad Ibrahim Azam and Razalie Hussaini. 2022. Determining the times for prayer and fasting on skyscraper building. *BITARA International Journal of Civilizational Studies and Human Sciences* 6(1): 53–59.
- Affendi, T.N.T., N.N.M. Shariff, Z.S. Hamidi and N.F. Ngadiman. 2021. Measurement of Subh and Isha at Besut, Kuala Terengganu by using sky quality meter. *AIP Conference Proceedings* 2368: 040002. <https://doi.org/10.1063/5.0058253>
- Aizan Ali@Mat Zin, Khadijah Ismail and Mohammaddin Abdul Niri. 2015. Sejarah dan faktor perkembangan astronomi Islam di Malaysia: Satu penelitian. *Journal of Al-Tamaddun* 10(1): 1–18. <https://doi.org/10.22452/JAT.vol10no1.1>
- Ahmad Hariz Bely, Roslan Umar, Nor Hazmin Sabri, Ahmad Lutfi Afifi Mohd Nasir, Razalie Hussaini et al. 2025. The limitation of optical equipment in new crescent moon visibility: Insight from 27 years of observation data in Sarawak, Malaysia. *Sains Malaysiana* 54(9): 2263–2276. <https://doi.org/10.17576/jsm-2025-5409-13>
- Al-Shiha, A.A.R.A.A., Mohd Izhar Ariff Mohd Kashim, Badli Shah Alauddin, Abdul Muhaimin Mahmood and Mohd Hafiz Safiai. 2023. Provisions for fasting hard professions and expatriates: A comparative jurisprudence study. *BITARA International Journal of Civilizational Studies and Human Sciences* 6(4): 127–147.
- Amree Ahmad. 2022. Waktu solat salah sebab bumi putar perlahan belum disahkan. *Kosmo!* 24 February. <https://www.kosmo.com.my/2022/02/24/waktu-solat-salah-sebab-bumi-putar-perlahan-belum-disahkan/> (accessed 12 April 2024).
- Arafat, M., S. Azhari, A. Budiwati and Y. Nurilham. 2025. Turkish religious diplomacy an analysis of efforts to achieve socio-political consensus through the 2016 Global Islamic Calendar Congress. *Pena Justisia: Media Komunikasi Dan Kajian Hukum* 24(2): 8027–8040. <https://doi.org/10.31941/pj.v24i2.7047>
- Arifianto, A.R. 2021. From ideological to political sectarianism: Nahdlatul Ulama, Muhammadiyah, and the state in Indonesia. *Religion, State and Society* 49(2): 126–141. <https://doi.org/10.1080/09637494.2021.1902247>

- Cahyani, R. 2021. Putusan Munas Muhammadiyah mengenai koreksi ketinggian matahari subuh dalam fikih dan astronomi. *Al-Syakhsiyyah Journal of Law & Family Studies* 3(2): 83–103. <https://doi.org/10.21154/syakhsiyyah.v3i2.3443>
- Gökalp, H. and D. Baş. 2024. Islam and the perennial significance of time: Exploring its role in human existence and cultural perspectives. *İSTEM* 43: 357–380. <https://doi.org/10.31591/istem.1464271>
- Ilhaamie Abdul Ghani Azmi and Junaidah Hashim. 2022. Islamic innovation in Malaysian public service. *Kajian Malaysia* 40(2): 21–44. <https://doi.org/10.21315/km2022.40.2.2>
- Ilyas, M. 1992. Islamic schematic calendars: A note on some useful compendia. Islamic Research Institute. *International Islamic University Islamabad* 31(4): 487–493.
- _____. 1994. Lunar crescent visibility criterion and Islamic calendar. *Quarterly Journal of Royal Astronomical Society* 35: 425–461.
- International Astronomical Center. 2025. Visibility of Ramadan crescent 1446H. <https://astronomycenter.net/icop/ram46.html> (accessed 5 March 2025)
- JAKIM (Jabatan Kemajuan Islam Malaysia). 2015. Kompilasi pandangan hukum Jawatankuasa Muzakarah Majlis Kebangsaan bagi Hal Ehwal Ugama Islam Malaysia Jabatan Kemajuan Islam Malaysia (JAKIM).
- Jabatan Mufti Negeri Selangor. 2024. Enakmen Pentadbiran Agama Islam (Negeri Selangor) 2003. Fatwa di bawah Seksyen 52. <https://www.muftiselangor.gov.my/wp-content/uploads/2024/06/FATWA-HUKUM-PENGISBATAN-ANAK-BULAN.pdf> (accessed 15 August 2022).
- Jusran Kasim, A., Ahmad Abbas, Nurul Adhha and Iin Mutmainnah. 2024. Determination of Hijri calendar in Islamic history and its criteria in Southeast Asia. *Journal of Al-Tamaddun* 19(1): 247–259. <https://doi.org/10.22452/JAT.vol19no1.18>
- Khairunnisa, S.A., T. Hidayat, W. Orchiston and N. Nikeu. 2021. Astronomical aspects of the Prambanan Temple in Central Java, Indonesia. In *Exploring the history of Southeast Asian astronomy*, eds. W. Orchiston and M.N. Vahia, 487–502. Cham: Springer.
- Khairussaadah Wahid. 2021. Garis panduan pengisbatan cerapan anak bulan menurut perspektif syariah dan astronomi. PhD diss., Universiti Malaya.
- Loucif, S., M. Al-Rajab, R. Abu Zitar and M. Rezk. 2024. Toward a globally lunar calendar: A machine learning-driven approach for crescent moon visibility prediction. *Journal of Big Data* 11(1): 114. <https://doi.org/10.1186/s40537-024-00979-6>
- Maskufa, M., S. Sopa, S. Hidayati and A. Damanhuri. 2022. Implementation of the new MABIMS crescent visibility criteria: Efforts to unite the Hijriyah Calendar in the Southeast Asian Region. *AHKAM Jurnal Ilmu Syariah* 22(1). <https://doi.org/10.15408/ajis.v22i1.22275>
- Ma'u, D.H. 2019. The history and development of Islamic astronomy in Indonesia. *Malaysian Journal of Syariah and Law* 7(2): 91–100. <https://doi.org/10.33102/mjssl.v7i2.102>
- Mohammaddin Abdul Niri, Raihana Abdul Wahab, Mohd Saiful Anwar Mohd Nawawi and Abdul Razak Nayan. 2019. The knowledge integration perspective on the issue of determining the time for the beginning of Fajr prayer. *Jurnal Fiqh* 16(2): 253–288.

- Mohd Hafiz Safiai, Muhamad Firdaus Ab Rahman, Mohamad Zulfazdlee Abul Hassan Ashari, Ezad Azraai Jamsari and Nurul Ilyana Muhd Adnan. 2020. The feasibility of Islamic astrotourism in Malaysia. *International Journal of Advanced Research* 8(11): 162–166. <https://doi.org/10.21474/IJAR01/11988>
- Mohd Hafiz Safiai, Md. Yazid Ahmad, Abdul Basir Mohamad, Mohd Nasran Mohamad, Che Maryam Ahmad and Zuliza Mohd Kusrin. 2023. Observing sun's altitude during transit using Astrolabe as a teaching aid in Astrofiqh. *International Journal of Academic Research in Business and Social Sciences* 13(2): 1165–1174. <https://doi.org/10.6007/IJARBSS/v13-i2/16400>
- Mohd Hafiz Safiai, Salmah Abu Hasan, Mohd Saifullah Dimiyati, Ahmad Ibrahim Azam, Ezad Azraai Jamsari and W.D Graaf. 2024. The influence and adaptation of observatories in Islamic civilisation: A case of Malaysia. *Journal of Al-Tamaddun* 19(1): 75–91. <https://doi.org/10.22452/JAT.vol19no1.6>
- Mohd Saiful Anwar Mohd Nawawi, Muhamad Syazwan Faid, Mohd Hafiz Mohd Saadon, Raihana Abdul Wahab and Nazhatulshima Ahmad. 2024. Hijri month determination in Southeast Asia: An illustration between religion, science, and cultural background. *Heliyon* 10(20): e38668. <https://doi.org/10.1016/j.heliyon.2024.e38668>
- Muhamad Syazwan Faid, Mohd Saiful Anwar Mohd Nawawi and Mohd Hafiz Mohd Saadon. 2023. Analysis tool for lunar crescent visibility criterion based on integrated lunar crescent database. *Astronomy and Computing* 45: 100752. <https://doi.org/10.1016/j.ascom.2023.100752>
- Muhamad Syazwan Faid, Mohd Saiful Anwar Mohd Nawawi, Raihana Abdul Wahab and Nazhatulshima Ahmad. 2023. HilalPy: Software to analyse lunar sighting criteria. *Software Impacts* 18: 100593. <https://doi.org/10.1016/j.simpa.2023.100593>
- Muhamad Syazwan Faid, Mohd Saiful Anwar Mohd Nawawi, Mohd Hafiz Mohd Saadon, Muhammad Syaoqi Nahwandi, Nur Nafhatun Md Shariff, Zety Sharizat Hamidi, Raihana Abdul Wahab, Mohd Paidi Norman and Nazhatulshima Ahmad. 2023. Confirmation methodology for a lunar crescent sighting report. *New Astronomy* 103: 102063. <https://doi.org/10.1016/j.newast.2023.102063>
- Muhamad Syazwan Faid, Mohd Saiful Anwar Mohd Nawawi and Mohd Hafiz Mohd Saadon. 2024. *Design, development and analysis of lunar crescent visibility criterion with Python*. Oxon: CRC Press.
- Muhamad Syazwan Faid, Mohd Saiful Anwar Mohd Nawawi, Mohd Hafiz Mohd Saadon, Raihana Abdul Wahab, Nazhatulshima Ahmad, Muhamad Syauqi Nahwandi, Ikramullah Ahmed, Ibrahim Mohamed. 2024. Assessment and review of modern lunar crescent visibility criterion. *Icarus* 412: 115970. <https://doi.org/10.1016/j.icarus.2024.115970>
- Muhamad Syazwan Faid, Mohd Saiful Anwar Mohd Nawawi, Mohd Hafiz Mohd Saadon, Khairussaadah Wahid and Paidi Norman. 2025. Methods in determining new Hijri month: A thematic review from Islamic jurisprudence perspective. *Malaysian Journal of Syariah and Law* 13(1): 75–99. <https://doi.org/10.33102/mjsl.vol13no1.687>

- Muhamad Syazwan Faid, Muhammad Syaofi Nahwandi, Shahrin Ahmad, Mohd Saiful Anwar Mohd Nawawi. 2026. *Python for Islamic astronomy: Modern computational approaches to Hijri calendar, qibla, and prayer times*. 1st ed. Oxon: CRC Press.
- Muhammad Awaludin and Nur Fajriani Zar'ah. 2022. The contribution of digitalisation in the development of astronomy in Indonesia. *Al-Hilal: Journal of Islamic Astronomy* 4(1): 61–74. <https://doi.org/10.21580/al-hilal.2022.4.1.11191>
- Muhammad Ridzuan Hashim, Mohd Saiful Anwar Mohd Nawawi and Sa'adan Man. 2024. The practice of Matla' al-Hilal according to astronomical scholars in determining the Hijri calendar. *Al-Basirah Journal* 14(2): 90–105. <https://doi.org/10.22452/basirah.vol14no2.6>
- Nasir, A.L.A.M., R. Umar, W.N.J.W. Yussof, N. Ahmad, A.N. Zulkeflee, N.H. Sabri, W.M.Y.W. Chik, N.A. Mahiddin, A.H. Bely and A.I.S. Izdihar. 2025. New crescent moon detection using Circular Hough Transform (CHT). *Astronomy and Computing* 51: 100902. <https://doi.org/10.1016/j.ascom.2024.100902>
- Nazhatulshima Ahmad, Mohd Saiful Anwar Mohd Nawawi, Mohd Zambri Zainuddin, Zuhaili Mohd Nasir, Rossita Mohamad Yunus and Ibrahim Mohamed. 2020. A new crescent moon visibility criteria using circular regression model: A case study of Teluk Kemang, Malaysia. *Sains Malaysiana* 49(4): 859–870. <https://doi.org/10.17576/jsm-2020-4904-15>
- Nurulhuda Ahmad Zaki and Damia Batrisya Hidayatullah. 2025. Analisis ketepatan aplikasi kiblat dalam Play Store dan Apple App Store. *Jurnal Fiqh* 22(1): 1–35. <https://doi.org/10.22452/fiqh.vol22no1.1>
- Nurul Kausar Nizam, Muhammad Syazwan Faid, Mohd Saiful Anwar Mohd Nawawi and Mohd Paidi Norman. 2022. The concept of zoning system for the determination of prayer time in Malaysia from contemporary Islamic jurisprudence perspectives. *Al-Qanatir International Journal of Islamic Studies* 28(2): 168–177.
- Nurul Kausar Nizam, Khairussaadah Wahid and Mohd Saiful Anwar Mohd Nawawi. 2024. Pemakaian hadis yang menjadi sandaran konsep zon dua minit: Analisis menurut pandangan panel pakar falak di Malaysia. *Al-Qanatir International Journal of Islamic Studies* 33(3): 130–139.
- Rahimah Abdul Hamid. 2015. Farmers' almanac and traditional wisdom: Rice cultivation in the northern region of peninsular Malaysia. *Kajian Malaysia* 33(1): 175–190.
- Rethlefsen, M.L., S. Kirtley, S. Waffenschmidt, A.P. Ayala, D. Moher, M.J. Page, J.B. Koffel and PRISMA-S Group. 2021. PRISMA-S: An extension to the PRISMA Statement for Reporting Literature Searches in Systematic Reviews. *Systematic Reviews* 10(1): 39. <https://doi.org/10.1186/s13643-020-01542-z>
- Roslan Umar, Wardatul Jannah Awan, Nurulhuda Ahmad Zaki, Ahmad Idris Syahmi Izdihar and Jazeel H. Azeez. 2025. Accuracy of qibla direction: Evaluating smartphone apps with the Istiwa' Adzam method. *Islamiyyat* 47(1): 3–14. <https://doi.org/10.17576/islamiyyat-2025-4701-01>
- Royyani, M.A., M. Kibtyah, A. Adeni, A.A. Rofiuddin, M. Machzumy and N. Kholis. 2023. Religious dialogue and astronomy from the perspective of Indonesian Muslim scholars. *Samarah: Jurnal Hukum Keluarga Dan Hukum Islam* 7(1): 261–280. <https://doi.org/10.22373/sjhk.v7i1.12406>

- Rusdiono Mukri. 2025. Masyarakat Indonesia ingin awali-akhiri Ramadhan bersama. *Majalah Gontor*. <https://gontornews.com/masyarakat-indonesia-ingin-awali-akhiri-ramadhan-bersama/> (accessed 15 January 2026).
- Rusydiana, A.S., Nadia Nurul Izza, M. Sari, A.K. Ocktavia, Siti Maysyaroh and Siti Salmah. 2023. Assessing social and economic impact: A case study of the hafidzpreneur scholarship program. *The Economic Review of Pesantren* 2(1). <https://doi.org/10.58968/erp.v2i1.240>
- Shah Rul Anuar Nordin. 2022. Differentiating state administrative thinking in the Book of Salatin. *Global Journal al Thaqafah* 12(2): 119–134.
- Sahid, M.M., Habibullah, A.R. Cemda and M. Kasduri. 2024. Lunar crescent visibility criteria in determining the new Islamic month in Malaysia. *Al-Hisab: Journal of Islamic Astronomy* 1(4): 197–209.
- Wan Ahmad Fauzi Wan Husain, Wan Rohaida Wan Husain and Hanif Md Lateh. 2021. The role of the religious scholars of Faqih Ali Dato' Maharaja's descent in upholding Sharia implementation in Terengganu. *Malaysian Journal of Syariah and Law* 12(1): 216–227. <https://doi.org/10.33102/mjssl.vol12no1.674>