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Scientific perspective on rukyatul hilal: A case study of assalam kartasura sukoharjo observatory

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ABSTRACT

In essence, rukyat is looking deeply to see whether the moon has undergone changes to indicate the change of the moon or not. With the advancement of the times, observations no longer only use manual binoculars but are supported by various adequate equipment, making it very easy to carry out observations. . Therefore, it is important for humanity to understand what an observatory is and its uses. This research uses qualitative methods supported by documentation and direct field research at the Assalam observatory in Sukoharjo, Central Java. The results of this research are the contribution of the Assalam Observatory in the implementation of rukyatul hilal in Indonesia. The Assalam Observatory is also the Secretary General of JOPI (Indonesian Planetarium Observatory Network) so its involvement in rukyatul hilal is beyond doubt. So far, the results of observations at the Assalam observatory are at 7-8 degrees every month.

Introduction

The obligatory worship for Muslims throughout the world has a stipulated time and procedure for carrying it out which involves observing celestial bodies in different positions. These principles, which originate from astromechanical studies regarding the movement and position of celestial bodies, form guidelines regarding the beginning of prayer times, the direction of the Qibla, determining the beginning of the month of Qamariah, and eclipse events. This guide is important for Muslims in carrying out religious obligations such as prayer, fasting and celebrating holidays.

Based on the previous description, it can be concluded that in determining the time of worship, astronomy plays an important role. This science specifically focuses on research regarding the position of celestial bodies, including derivatives such as reckoning and rukyat, which are more focused on determining the beginning of the month of Qamariah. The main aim of studying astronomy is to understand the actual movements of celestial bodies, so that it can become a basis and guide for Muslims in carrying out their worship. The study of astronomy provides competency in basic knowledge about the universe, earth and sky, as well as basic

concepts of trigonometry. The science of astronomy also provides skills in calculating the beginning of prayer times, determining the direction of the Qibla, the beginning of the qamariah month, and other aspects that are relevant in the context of Muslim worship. (Adi Suyudi, 2018)

Moreover, this subdiscipline of science focuses on the exploration of celestial bodies and the existence of the universe by developing research based on observation results. Astronomical calculations in this context are based on the natural laws that govern the movement of the moon and sun, with ongoing tests based on astronomical observations. (Qulub, 2018) In the context of calculating the visibility of the new moon, the term "imkan rukyat" is used, which indicates the possibility that the new moon can be seen. seen. Determining the start of the new month in the Hijriyah calendar plays a crucial role in Islam, especially as a determinant of the beginning and end of the Ramadan fast, which in turn also influences the implementation of the Eid al-Fitr prayer on Shawwal 1. However, in reality, we are often faced with two choices or differences in determining the date of Eid al-Fitr in one city, because determining the Hijri month involves several complex aspects. For example, the determination of 1 Shawwal involves fiqh, socio-political and scientific aspects. Differences of opinion in this matter reflect the complexity and variety of interpretations regarding these aspects.

Basically, rukyatul hilal is looking, which in its context is looking at the moon to determine whether the next day the moon has changed or is still the same month. When determining the month of rukyat, it will usually be held on the 29th of each month. The Indonesian Ministry of Religion in 1998 initiated the Imkan Rukyat MABIMS "criteria" as a result of an agreement between the ministers of religion in Malaysia, Brunei Darussalam, Indonesia and Singapore with parameters for a minimum height of the crescent moon of 3 degrees and a minimum elongation angle of 6.4 degrees. (Arkanuddin & Ma, 2009) When reviewed from its normative basis, rukyat in the Al-Qur'an and Sunnah, which in its development, apart from being done with the naked eye, can also be done with binoculars. Apart from that, to support the success of rukyah, it is necessary to calculate the height of the new moon and the position of the new moon relative to the sun based on modern astronomical data. So based on this, the accuracy of the rukyah results can be scientifically justified. (Sakirman, 2017) In accordance with the word of Allah SWT in Surah Al-Baqarah verse 189 (Qur'an Ministry of Religion, n.d.-a)

يَسْـَٔلُوْنَكَ عَنِ الْاَهِلَّةِۗ قُلْ هِيَ مَوَاقِيْتُ لِلنَّاسِ وَالْحَجِّۗ وَلَيْسَ الْبِرُّ بِاَنْ تَأْتُوا الْبُيُوْتَ مِنْ ظُهُوْرِهَا وَلٰكِنَّ الْبِرَّ مَنِ اتَّقٰىۚ وَأْتُوا الْبُيُوْتَ مِنْ اَبْوَابِهَاۚ وَاتَّقُوا اللّٰهَ لَعَلَّكُمْ تُفْلِحُوْنَ

Meaning: They asked you (Prophet Muhammad) about the crescent moon. Say, "it is (indicator of) the time for humans and (the Hajj). "It is not virtuous to enter a house from behind it, but it is virtuous (virtue) of those who are pious. Enter houses from their doors, and fear Allah so that you may succeed.

It is also supported by Sahih Muslim sharia which states that there are some Muslims who see the new moon. Therefore, it is not enough just to have the testimony of a fair person. However, concrete evidence is needed, namely the results of observations of the rukyatul hilal. (Zaman, 2015) Based on Hadith History of Bukhari no. 1774 as follows:

حَدَّثَنَا عَبْدُ اللَّهِ بْنُ مَسْلَمَةَ حَدَّثَنَا مَالِكٌ عَنْ عَبْدِ اللَّهِ بْنِ دِينَارٍ عَنْ عَبْدِ اللَّهِ بْنِ عُمَرَ رَضِيَ اللَّهُ عَنْهُمَا أَنَّ رَسُولَ اللَّهِ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ قَالَ الشَّهْرُ تِسْعٌ وَعِشْرُونَ لَيْلَةً فَلَا تَصُومُوا حَتَّى تَرَوْهُ فَإِنْ غُمَّ عَلَيْكُمْ فَأَكْمِلُوا الْعِدَّةَ ثَلَاثِينَ

Meaning: Has told us 'Abdullah bin Maslamah has told us Malik from 'Abdullah bin Dinar from 'Abdullah bin 'Umar radliallahu 'anhu that the Messenger of Allah sallallaahu 'alaihi wasallam said: "There are twenty-nine nights (days) in one month. Do not fast until you see it. If clouds hinder you, then make the number thirty." (Hadith.id, n.d.)

The implementation of rukyatul hilal in Indonesia is carried out in various locations, usually in places with minimal obstructions such as buildings or hills, and is often carried out in coastal areas because they have an unobstructed western horizon. These areas are considered free from obstacles that could hinder the observation of the crescent moon. This activity is officially regulated by the government and coordinated directly by the Ministry of Religion. Apart from that, several institutions and organizations in Indonesia are also involved in rukyatul hilal activities. Some of them are Nahdlatul Ulama, Rukyatul Hilal Indonesia (RHI), Meteorology, Climatology and Geophysics Agency (BMKG), as well as several Islamic universities. Apart from formal institutions, several astronomical communities in Indonesia also participated in carrying out this activity. All of these parties contribute to ensuring that new moon observations are carried out accurately in accordance with Islamic religious guidelines.

Referring to the above, the implementation of rukyatul hilal requires a place or supporting facilities, namely an Observatory which according to the Big Indonesian Dictionary, Observatory means "a building equipped with equipment (telescopes, star binoculars, etc.) for the purposes of observation and scientific research on stars. and so on" (KBBI VI Online) It is undeniable that the existence of observatories in Indonesia can have many implications because observatories are a forum for astronomical research and will later be able to produce data that will be very useful for the survival of the Muslim community because the data This will later become a guide for arranging prayer times, and certain times which are important dates for Muslims. (Bramastartya, 2017)

The focus of this research will discuss the important role of observatories as a product of science and technology which will make it easier for Muslims to determine times of worship. The aim of this research is to provide education about the importance of studying astronomy not just by observing but also by taking part. to be developed.

Method

This research is a critical analysis research with a qualitative approach. Data collection techniques in this research used observation, interviews and documentation. It is hoped that these three methods will be able to complement each other so as to obtain the expected information. Furthermore, in the data analysis process, researchers used a method consisting of three steps, namely data condensation, data presentation, and drawing conclusions. Data condensation involves reducing information from observations at the Assalam Observatory, where less relevant data will be filtered and selected based on the problem formulation or research objectives that have been determined. Data presentation is carried out through various forms such as description, narrative and argumentation. After these two stages have

been carried out, we formulate the conclusion of Rukyatul Hilal Based on a Science-Technology Perspective in the Case Study of the Assalam Kartasura Observatory, Sukoharjo.

Result and Discussion

1. Rukyatul Hilal in Astronomy

Astronomy is a branch of science based on observation or magic. Observations occupy the most important part in astronomy, but what is no less important is the knowledge used in these observations. Based on observations, you can predict phenomena that will occur, so it is important to carry out or design the observation process itself. In essence, the implementation of rukyatul hilal not only requires healthy eyes to be able to see no matter how thin the moon appears, but more knowledge is needed to be able to see both how thin and thick the visible moon is.

Based on facts in the field, it is inevitable that visual observations have many factors that complicate things and automatically become a source of error in observations. Such as weather conditions, conditions of the earth's atmosphere, the quality of the observer's eyes, the quality of the tools for observation, time and costs. These factors are clear and do not require further explanation because if the conditions are cloudy due to clouds, smoke, fog, the visibility of the new moon will certainly be disturbed and will result in visual observation of the new moon being impossible. (Tono, 2007)

Astronomy, as a science rooted in observation, requires not only the ability to see celestial objects like the moon but also the knowledge to interpret these observations accurately. While the process of rukyatul hilal (observing the new moon) relies on keen eyesight, it also demands a deep understanding of astronomical principles to accurately predict and interpret the visibility of the moon. However, visual observations are prone to errors due to various factors such as weather conditions, atmospheric disturbances, the observer's eyesight, and the quality of observation tools. These factors can significantly hinder the visibility of the moon and complicate the observation process.

In addition to these challenges, the precision of astronomical predictions and observations is heavily influenced by the design and execution of the observation process itself. Proper planning, the use of advanced tools, and a deep understanding of celestial mechanics are essential to mitigate the errors caused by environmental and physiological factors. The success of rukyatul hilal, therefore, hinges not just on favorable conditions but also on the observer's expertise and the technology employed. This underscores the importance of integrating both observational skills and scientific knowledge to achieve accurate and reliable results in astronomy.

If you look at the conditions in the field, it is supported by findings by Shofiyullah (Mukhlas, 2009) who explains that the position of the new moon on the 29th day has three possibilities, namely still below the horizon, above the horizon but not yet possible to be rukyat and above and already possible to be rukyat. Based on these three conditions, the weather that afternoon could be sunny or cloudy. Meanwhile, reports of several conditions obtained can be used as a conclusion as to whether the crescent moon has been successful in rukyat or has not been successful in rukyat. Through these details the number of possibilities that occur reaches 12 forms in the table as follows:

Table 1.
Month Criteria

No.	Calculation Results	Weather	Rukyat Results	Law
1	Below The Horizon	Bright	Succeeded in rukyat	1) Questioned
			Not yet succeeded in rukyat	2) Accepted
		Overcast	Succeeded in rukyat	3) Not accepted
			Not yet succeeded in rukyat	4) Accepted
2	Above the horizon but it is not yet possible to rukyat	Bright	Succeeded in rukyat	1) Sorted
			Not yet succeeded in rukyat	2) Accepted
		Overcast	Succeeded in rukyat	3) Not accepted
			Not yet succeeded in rukyat	4) Accepted
3	Above the horizon and it is possible to be rukyat	Bright	Succeeded in rukyat	1) Accepted
			Not yet succeeded in rukyat	2) Ikhtilaf
		Overcast	Succeeded in rukyat	3) Not accepted
			Not yet succeeded in rukyat	4) Accepted

In the details above, the theory of reckoning is made possible by the results of rukyat. The details regarding this law can be stated below:

a. The position of the crescent moon is below the horizon

If the new moon is below the horizon, the weather is clear but the new moon is successfully rukyat then this kind of testimony must be questioned. Because testimony in such conditions may be false. Or there is also the possibility that what is rukyat is not actually a hilal. Even using the most sophisticated tools, we are unable to position the crescent moon from below the horizon to above the horizon. Of course, the results of such rukyat cannot be used, especially on a public scale. If it is forced to be used, it is maximum only for perpetrators who claim to be merukyat hilal.

If the new moon is below the horizon, the weather is clear and the new moon has not been successfully rukyat, the result is the same as the result of the reckoning formula. The perpetrator's testimony was acceptable and the following night was not considered a new moon. If the new moon is below the horizon, the weather is cloudy and the new moon is successfully rukyat, the results of this kind of rukyat can be immediately rejected. Because neither of the two theories for determining the beginning of the month is confirmed. If the new moon is below the horizon, the sky is cloudy and the new moon has not been successfully rukyat, testimony like this can be accepted immediately and the next day is still considered the same or in the same month.

b. The position of the crescent moon is above the horizon and it is not possible to rukyat it

If the new moon is above the horizon and it is not yet possible to rukyat it, the sky is clear and the new moon is successfully rukyated, some scholars say the testimony of people like this is immediately rejected, and some say it is accepted. (Mukhlas, 2009) However, it would be better if it was accepted with several conditions. If the crescent moon is above the horizon and it is not possible to rukyat it, the sky is clear and the

crescent moon has not been successfully rukyated, then the report is received and the new moon has certainly not arrived.

If the new moon is above the horizon and it is not yet possible to rukyat it, the sky is cloudy but the new moon has been successfully rukyated, then the testimony of a person like this cannot be accepted. Because, the new moon is above the horizon but it is not yet possible to see it. Then, if the new moon is above the horizon and it is not yet possible to perform rukyat because the sky is cloudy and the results of the new moon cannot be seen yet, then the testimony of a person like this can be accepted and the new moon will certainly not have arrived.

c. The position of the crescent moon is above the horizon and it is possible to do rukyat

If it is possible to conjure the hilal, the sky is clear and then the crescent moon appears, then in such conditions there is no reason to deny the results of the rukyat. If it is possible to rukyat the hilal, the sky is clear and the hilal is not yet visible, the following things need to be taken into account: if the person cannot calculate, then he must believe that the night has not yet entered the new moon, whereas for people who understand calculations, he is allowed to use knowledge. The fact is, even though the new moon is not yet visible and the sky is clear. However, for people who are unable to calculate, but trust the results of calculating the calculation, that person may follow it. Likewise, those who do not believe in the results of the reckoning are not permitted to follow it.

If there is a case where the crescent moon is possible to be rukyated, the sky is cloudy and the crescent moon has been successfully rukyated. Testimony like the one above cannot be accepted but the status of the new moon can be determined in the following way: cloudy afternoons are sometimes the first, second or even third occurrence. This means firstly, the previous month was 29 days old and during the rukyat there were no clouds. The second meaning is that when the rukyat was performed the previous month it was already cloudy so that the month was 30 days old. And the third meaning, 2 months previously the moon was already 30 days old because of the weather caused by clouds.

2. Assalam Observatory

There are two celestial bodies that influence the division of time on Earth, namely the Sun and the Moon. The sun is a source of light that rises on the eastern horizon and when it rises it immediately looks huge, because basically the sun is hundreds of times bigger than the earth, so the time of its rising is never disputed. The sun rises in the east, so the hemisphere that is geographically located in the east will get light first, like Indonesia which is 4 hours ahead of Saudi Arabia.

In contrast to the moon which only reflects sunlight, it only rises in the west, when its position is parallel to the earth from the direction of the sun, it is called ijtima', then the reflection of the moon is not visible, but if it shifts a little then the crescent moon starts to rise very little, then the date of the month must be based on the science of arithmetic or astronomy which is then proven with rukyat. (Ardliansyah, 2022) This is what then encourages scientists to find methods that make the process of rukyatul hilal easier. Like the Assalam Observatory which has experienced a long journey in the process of forming an organization and an observatory as a forum for carrying out various research and achieving many achievements through this observatory.

Initially in 2005 the government, through the religious department, assisted schools, especially madrasas, with various educational support tools. Through this opportunity,

Assalam received assistance in the form of laboratory equipment ranging from microscopes, telescopes, and so on. Because most of the assistance was in the form of astronomical equipment, Assalam students became interested in building a club or organization that specifically studied astronomy. Seeing the enthusiasm of the students in learning astronomical matters, the Assalam Santri Astronomy Club (CASA) was created, whose members were students at the high school level in Assalam. As time went by in 2007 the Assalam Observatory officially and actively collaborated with NASA (National Aeronautics and Space Administration) as well as part of the IAC or International Astronomical Center which is based in Jordan and MSW in America. These two places are websites where hilal rukyat results are reported from various observatories around the world.

Starting with the construction of the observatory building in 2010 at the Assalam Islamic Modern Islamic Boarding School (PPMI), this opened many roads on the journey of the Assalam observatory as one of the rukyatul hilal places in Indonesia. Apart from being active in conducting rukyatul hilal, the Assalam observatory has another achievement, namely being officially selected by the Jakarta Planetarium to live report the total lunar eclipse phenomenon that occurred at midnight in 2011. In 2012, Assalam again had the opportunity to contribute to observing the eclipse of the planet Venus. In the end, the Assalam Islamic Modern Islamic Boarding School (PPMI) in Kartasura, Sukoharjo, Central Java, was named the first Islamic boarding school in Indonesia to have an observatory. The observatory was inaugurated directly by the Minister of Religion at that time, Lukman Hakim Saifuddin, in July 2015.

In terms of location, the Assalam observatory is not in an ideal location or not on the 0 horizon, but since it was established until now the success rate of rukyatul hilal at the Assalam observatory is at 7-8 degrees. The Assalam Observatory itself actively carries out and reports the results of rukyatul hilal every month. There are two types of tools or telescopes used in rukyatul hilal, namely manual and automatic, the manual one is the Sky-Watcher Evostar 102 telescope while the automatic one is the ZWO Seestar S50 telescope and the William Optics + Cube iOptron Mount. Apart from actively carrying out observations and reporting related to the rukyatul hilal, the Assalam observatory is actively involved in the field of education regarding astronomy using a mobile observatory called CASAMO (Assalam Santri Astronomy Club Mobile Observatory) using a Mitsubishi F71 which was designed and manufactured in New Armada Magelang. This car has the facilities of two manual telescopes and two digital telescopes imported from China and America, namely the Crux 200HD Series. (Interview with Ustadzah Ratna, 2023)

The Assalam Observatory itself is part of JOPI (Indonesian Observatory and Planetarium Network) which was later entrusted as Secretary General of JOPI. Assalam once succeeded in carrying out the rukyatul hilal during the 1st of Shawwal because according to Ustadz AR Sugeng Riadi the rukyatul hilal during Ramadhan, Shawwal and Dzulhijah had various obstacles so that the Assalam observatory itself often failed to carry out the rukyatul hilal in those months. (Interview with Ustadz AR Sugeng Riadi, S.Pd., 2023) The various data presented above show that the Assalam observatory has undoubted flying hours, however there are still several problems that often occur. This obstacle is divided into 2 factors, namely:

a. Natural factors

Indonesia has two seasons, both of which greatly influence the implementation of the rukyatul hilal, in the dry season it will be easier and more flexible to observe, however in the rainy season the implementation of the rukyatul hilal will certainly have more obstacles, be it cloudy or rainy. The crescent moon which is still very low is also an obstacle in observation. Negative hilal is when the hilal has set before the sun, which if this happens, the hilal cannot be observed

b. Non-natural factors: Perukyat who are not ready or do not understand what it is like to observe the new moon, of course the main obstacle is non-natural factors. Apart from perukyat, obstacles can come from equipment which is of course a determining factor as well, where sometimes the process of setting up the equipment takes quite a long time so that you don't have time to observe the new moon.

In implementing rukyatul hilal of course we must have supporting data related to weather conditions on the day of implementation and so on, in this case the Assalam observatory collaborates with the BMKG (Meteorology, Climatology and Geophysics Agency) apart from collaboration related to weather information, the Assalam observatory was also chosen. as the launch location for the Hilal Field School, which is a new BMKG program and will be officially launched next December.

3. Interconnection-Integration Analysis

This research explains the role of the observatory as a means of rukyatul hilal (case study of the Assalam observatory) through scientific, technological and normative approaches. Rukyatul hilal is something that is familiar to Muslims in the world, especially in Indonesia, with the existence of rukyatul hilal, humans are able to have a calendar for their daily needs. Apart from that, with rukyatul hilal we are able to know prayer times, determining the start of the new month and even determining the start of Ramadan and the arrival of 1 Shaawal.

هُوَ الَّذِيْ جَعَلَ الشَّمْسَ ضِيَآءً وَّالْقَمَرَ نُوْرًا وَّقَدَّرَهٗ مَنَازِلَ لِتَعْلَمُوْا عَدَدَ السِّنِيْنَ وَالْحِسَابَ ۗ مَا خَلَقَ اللّٰهُ ذٰلِكَ اِلَّا بِالْحَقِّ ۗ يُفَصِّلُ الْاٰيٰتِ لِقَوْمٍ يَّعْلَمُوْنَ

Meaning: He is the one who makes the sun shine and the moon shine. He is also the one who determined the orbital locations so that you know the number of years and calculations (time). Allah does not create like that, except correctly. He explains the signs (of His greatness) to a people who know. (Ministry of Religion, n.d.)

In terms of science and technology, this rukyatul hilal is a form of response to technological studies regarding scientific developments. With the rukyatul hilal, physical evidence can be obtained which is able to convince the public of the truth of the changes in the moon or the change of the moon itself, so that there is no doubt in it. Apart from that, sometimes unpredictable changes in the moon are visible and sometimes do not require the help of a telescope that is able to aim at the target according to the settings that have been made. Apart from the rukyat aspect, the observatory is seen as a legacy of civilization which is capable of being a place to observe various things, one of which is observing the hilal. In the observatory there are tools that can support the implementation of rukyatul hilal. In general, observatories have domes that can be opened and become a place for rukyat observations.

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This verse not only explains that the sun and moon move according to definite laws, but also allows us to calculate and predict their movements. As well as providing incentives to do so because it has many benefits, including knowing the number of years and managing time better. Based on the normative study above, it indirectly requires the crescent moon in determining the beginning of the month. Because, it cannot be denied that we live in modern times where everything not only needs to be textual but also has to have concrete evidence that can provide understanding to society.

يٰمَعْشَرَ الْجِنِّ وَالْاِنْسِ اِنِ اسْتَطَعْتُمْ اَنْ تَنْفُذُوْا مِنْ اَقْطَارِ السَّمٰوٰتِ وَالْاَرْضِ فَانْفُذُوْاۗ لَا تَنْفُذُوْنَ اِلَّا بِسُلْطٰنٍ

Meaning: "O class of jinn and humans! If you are able to penetrate (across) the corners of heaven and earth, then penetrate! You cannot cross it except with strength (from Allah)." (Qur'an Kemenag)

The verse above emphasizes that humans and jinn, although given permission to explore space and the earth, will not be able to do so without the power and permission of Allah. This reflects the concept of human dependence on God's power and will in living life, exploring, and using science and technology. Even though humans are given the authority and freedom to explore the universe, they are still reminded of their limitations and dependence on divine power. They are limited and that power comes from Allah SWT. And as we understand, the power of Allah SWT is much greater than the power that humans have.

The science and technology approach, in this rukyatul hilal requires the knowledge of astronomy because it relates to things that we do not or perhaps rarely see and know about, things related to objects in outer space are of course no longer within the reach of humans but require the help of technology. Although there are differences in approach between rukyat and hisab, it is important to remember that both can contribute to a better understanding of the universe. Contradicting the two can hinder the development of astronomy, and conversely, integration between observations and calculations can improve our understanding of celestial phenomena. This understanding can then be applied in religious contexts, such as determining the beginning of the Hijriah month or other requirements in Islamic worship. (Adi Suyudi, 2018)

Seeing the limitations of the human eye in viewing long distances, this rukyatul hilal requires technological assistance in the form of a telescope, with a telescope it will make it easier to verify the research object or the hilal itself. Apart from making verification easier with physical evidence, it seems that the hilal from the telescope is able to provide rukyat knowledge in terms of astronomy to various elements of society. All of this is done in order to avoid mistakes and errors in determining major holidays or the implementation of worship that will be carried out by Muslims, especially in Indonesia. In this case, the

observatory is part of technological progress in response to science or knowledge because the synergy between science and technology is able to make it easier to determine important things, especially regarding worship.

Given the limitations of the human eye in observing distant objects, rukyatul hilal, or the observation of the new moon, increasingly relies on technological aids like telescopes. The use of telescopes not only facilitates the verification of the hilal with greater precision and physical evidence but also enriches the understanding of astronomy within various segments of society. This technological integration is crucial to avoid errors in determining important Islamic dates, such as major holidays or the timing of religious practices, which are especially significant for Muslims in Indonesia. The role of observatories thus becomes a testament to the progress of science and technology, highlighting how their synergy can simplify and ensure accuracy in matters of religious observance. By embracing these advancements, the process of rukyatul hilal not only becomes more reliable but also serves as an educational tool, promoting scientific literacy and awareness in the broader community.

Conclusion

In terms of science and technology, this rukyatul hilal is a form of response to technological studies regarding scientific developments. With the rukyatul hilal, physical evidence can be obtained which can convince the public of the truth of the changes in the moon or the turn of the moon itself, so that there is no doubt in it. Apart from that, sometimes unpredictable changes in the moon are visible and sometimes do not require the help of a telescope that is able to aim at the target according to the settings that have been made. Apart from the rukyat aspect, the observatory is seen as a legacy of civilization which is capable of being a place to observe various things, one of which is observing the hilal. In the observatory there are tools that can support the implementation of rukyatul hilal. In general, observatories have domes that can be opened and become a place for rukyat observations.

Bibliography

Adi Suyudi. (2018). Bandung in the Development of Hisab and Rukyat in Indonesia.

Ardliansyah, M. F. (2022). Volume 01 No 01 , 2022 HISAB AND RUKYAT PERSPECTIVE OF HADITH AND ASTRONOMY (Study of the Rukyatul Hilal Concept in Determining the Beginning of the Qomariyah Month). 01(01).

Arkanuddin, M., & Ma, M. (2009). RUKYATUL HILAL INDONESIA (RHI) HILAL VISIBILITY CRITERIA (CONCEPT, CRITERIA AND IMPLEMENTATION) Mutoha Arkanuddin & Muh. Ma'rufin Sudibyo. 34–44.

BRAMASTARTYA, J. (2017). Observatory Overview.

Hadits.id. (n.d.). Bukhari Hadith No. 1774. https://www.hadits.id/hadits/bukhari/1774

Ministry of Religion, Q. (n.d.). QS.Yunus Verse 5. https://quran.kemenag.go.id/quran/per-ayat/surah/10?from=5&to=5

Mukhlas, S. (1829). HISAB FALAK AND RUKYAT HILAL: BETWEEN THE SCIENTIFIC MISSION AND THE CALL 7 $ · $ %% 8 '. 17.

Qulub, S. T. (2018). Integration of Astronomy in Astronomy at PTAI and Islamic Boarding Schools Introduction Astronomy is part of the treasure trove of knowledge in Islam. During the heyday, he succeeded in translating monumental works from the decline of the Islamic sultanate. Journal of Islamic Legal Thought and Reform, 21(2), 288–309.

Ministry of Religion Qur'an. (n.d.-a). Al-Baqarah Verse 189. https://quran.kemenag.go.id/quran/per-ayat/surah/2?from=189&to=286

Ministry of Religion Qur'an. (n.d.-b). Qs. Ar-Rahman verse 33. https://quran.kemenag.go.id/quran/per-ayat/surah/55?from=33&to=78

RI, K. (n.d.). KBBI Online "Observatorium" accessed on November 28 2023 at 20.09. https://kbbi.kemdikbud.go.id/entri/observatorium

Sakirman. (2017). The Controversy of Hisab and Rukyat in Determining the Beginning of the Hijri Month in Indonesia. ELFALAKY: Journal of Astrology, 1(1), 1–14.

Tono, S. (2007). Compromising Rukyat & Reckoning. Amythas Publicita.

Interview with Ustadz AR Sugeng Riadi, S.Pd., M. U. (2023). Interview with Ustadz AR Sugeng Riadi, S.Pd., M.Ud. on November 25, 2023.

Interview with Ustadzah Ratna on November 25, 2023. (2023).

Zaman, Q. (2015). Understanding the Meaning of Hilal According to Tafsir of the Qur'an and Science. Universum, 9(1), 103–115. https://doi.org/10.30762/universum.v9i1.78