SCIENCE PREDICTION ON THE HADITH ABOUT THE SUN RISING FROM THE WEST

Muhammad Fajri Kholili Zain,*[1] Ahmad Mufarih Hasan Fadly[2]
[1]Al-Masthuriyah Islamic Boarding House, Semarang-Indonesia, [2]University of New South Wales-Australia
*corresponding author: fajrikholili082@gmail.com

Abstract

There are a lot of holy texts in Islam, like Al-Qur'an and Hadith, discussing the Sun that will rise in the West. However, a study has yet to be conducted to explain this phenomenon from a scientific point of view. It creates several issues, such as the explanation of the Sun rising from the West from the point of view of religion and scientific terms, nor the way to prove and predict the time of this phenomenon. This research was compiled using a qualitative analysis method with a case study approach. This approach limits its analysis tools to one specific case. This study used an analysis of the Sun's azimuth shift at the time of the Equinox to prove the possibility of sunrise from the West. With this method, it is discovered that in a religious view, the rising Sun from the West is seen as a real event and will occur physically. Meanwhile, science is to explain how possible scenarios can cause this phenomenon to occur. In addition, an analysis of the shift in the Sun's rising point concerning the azimuth of the Sun at the time of Equinox cannot prove and cannot predict when the Sun will rise from the West, which is a sign of doomsday.

Keywords*: Science Prediction; Doomsday; Sunrise; Azimuth*

Abstrak

Banyak teks suci dalam agama Islam, baik Al-Qur'an maupun hadis yang membahas fenomena terbitnya matahari dari barat. Namun, hingga saat ini, belum ada suatu penelitian resmi yang membahas fenomena tersebut dalam pandangan sains. Hal tersebut kemudian merumuskan beberapa masalah umum seperti penjelasan teks-teks suci tersebut jika dilihat dari sudut pandang agama dan sains ataupun pembuktian serta prediksi terkait waktu terjadinya fenomena tersebut. Penelitian ini disusun menggunakan metode analisis kualitatif dengan pendekatan studi kasus. Pendekatan tersebut membatasi alat untuk analisis kasus pada suatu kejadian yang khusus. Analisis yang digunakan dalam penelitian ini adalah pergeseran azimuth matahari pada saat ekuinoks. Dengan metode tersebut, ditemukan bahwa dalam pandangan agama fenomena matahari terbit dari barat dilihat sebagai sebagai suatu kejadian yang nyata dan akan berlaku secara fisik. Sedangkan sains kemudian menjelaskan bagaimana skenario yang memungkinkan untuk bisa menyebabkan fenomena tersebut terjadi. Selain itu, analisis pergeseran titik terbit matahari dengan mengacu pada azimuth terbit matahari pada saat Ekuinoks tidak dapat membuktikan serta tidak dapat memperkirakan kapan waktu matahari akan terbit dari arah barat yang menjadi tanda dari terjadinya kiamat.

Kata Kunci*: Prediksi Sains, Kiamat;, Matahari Terbit; Azimuth*

A. Introduction

Many Islamic holy texts discuss the Apocalypse and its signs. For example, several hadiths describe in detail the signs, both in the form of natural and psychological-social events. Several hadiths explicitly state that one of the signs of the Apocalypse is the rising of the Sun from the West. One is hadith number 4872, found in the book of Sahih Muslim. In the Hadith, a clause means, "Whoever repents before the sun rises from the west (doomsday), then Allah will still accept his repentance." However, it is miserable that until now, no one has discussed the events in these divine texts from a detailed and specific scientific perspective. The absence of such discussion has caused many social phenomena that significantly impact society.

The absence of scientific discussion that becomes rational legitimacy for events beyond reason results in various free societal interpretations that create chaos. Almost every year, rumors appear in society that report that the phenomenon of the Sun rising from the West will occur shortly or has even happened in the short video uploaded by a resident of Jeneponto, South Sulawesi, which contains the commotion of the people in Jeneponto because the Sun does not rise exactly in the East but instead leans slightly to the North.[1] In 2022, a similar discussion reappeared, but this discussion started from a Facebook post by someone using the username NASA, which said that the Sun would rise from the West in the next few decades. This post then received a response from NASA. And there were still many similar incidents in previous years.[2]

According to the opinion of several scholars, the signs of the Apocalypse mentioned in several hadith texts above are physical events that occur naturally. Imam al-Qurṭubi's opinion said that of several signs of the Apocalypse, some have

[1] Hendra Cipto and Dony Aprian, "Video Viral Matahari Terbit dari Utara di Jeneponto, Ini Penjelasan BMKG," *Kompas.Com*, June 18, 2021, https://regional.kompas.com/read/2021/06/18/083907578/video-viral-matahari-terbit-dari-utara-di-jeneponto-ini-penjelasan-bmkg.

[2] Syifa Hanifah, "Cek Fakta: Viral NASA Prediksi Matahari Terbit dari Barat, Simak Faktanya," *Merdeka.Com*, 2022, https://www.merdeka.com/cek-fakta/cek-fakta-viral-nasa-prediksi-matahari-terbit-dari-barat-simak-faktanya.html; Tim Redaksi, "Matahari Menuju Terbit dari Barat Tanda Kiamat, NASA Buka Suara," *CNBC Indonesia*, 2024, https://www.cnbcindonesia.com/tech/20240928073630-37-575310/matahari-menuju-terbit-dari-barat-tanda-kiamat-nasa-buka-suara.

already occurred and some will occur in the future.[3] Al-Qurṭubī gave this explanation when describing the Hadith, which discusses 10 signs of the Apocalypse, where the phenomenon of the Sun rising from the West is included in one of these signs. In short, al-Qurṭubī argues that events related to nature as signs of the Apocalypse are understood as physical events that will happen. In the sense that it has happened in the past, will happen in the future, and there is even the possibility that some signs are happening in the present.[4] Based on the opinion above, there is a possibility that the phenomenon of the Sun rising from the West has occurred at present, with a gradual shifting process.

From the perspective of science, the shift could happen in various scenarios. One of them the author uses as an analytical knife in this study is looking at the change in the Sun's azimuth at the time of the Equinox. The position of the rising Sun at the time of the Equinox, which is said to be right above the equator and right at the eastern point, is influenced by the tilt of the Earth's ecliptic (*Obliquity of the Ecliptic*).[5] Ahmad Syarif Hidayatullah then conveyed an exciting fact based on previous astronomical research: it is known that the value of the actual ecliptic tilt constantly changes every century. Likewise, the Sun's ecliptic longitude can change every second on the arc minute scale. This change can then cause the position of the Sun to change in its apparent path when viewed from Earth.[6] So, there is no harm in trying to dig deeper and guess whether we can observe that every time it rises, the Sun shifts, even though the value of the shift is so small that we never notice it.

From the author's observations on past research on the Apocalypse, many researchers have discussed the event. However, there are still few or even none who

[3] ʻAbd al-Raḥmān al-ʻAẓīm Abadī, *ʻAwn al-Maʼbūd Sharḥ ʻalā Sunan Abī Dāwud* (Beirūt: Dār Ibn Ḥazm, 2005), vol. xi.

[4] Imam Al-Qurthubi, *Rahasia Kematian, Alam Akhirat, dan Kiamat Terjemah al-Tadhkirah fī Aḥwāl al-Mawtā wa Umūr al-Akhīrah*, ed. Abdur Rosyad Shiddiq (Jakarta: Akbar Media, 2009).

[5] Philip Scherrer and Deborah Scherrer, "Solstice and Equinox ('Suntrack') Season Model" (Stanford, n.d.), https://solar-center.stanford.edu/AO/Sun-Track-Model.pdf.

[6] Ahmad Syarif Hidayatullah, "Komparasi Algoritme Dekinasi Matahari dan Equation of Time dalam Buku Mekanika Benda Langit dengan Buku Anfa'ul Wasilah serta Pengaruhnya terhadap Awal Waktu Sholat" (Universitas Islam Negeri Walisongo Semarang, 2017), https://eprints.walisongo.ac.id/id/eprint/7995/1/132611047.pdf.

discuss it from a scientific perspective.[7] Hidayatullah researched the Qur'an and Hadith and explained in detail about the universe, from its creation, formation, and development to how this world will be destroyed on the last day. However, the research did not reach the realm of analysis of scientific reinforcement specifically and only explained the events in terms of the text alone.[8] Had and Rukmanasari have also discussed the events of the Apocalypse in the texts but only limited to religious interpretation, not to scientific analytics. In short, in this literature, no one discusses explicitly the proof of the signs of the Apocalypse, such as the rising of the Sun from the West, precisely and in detail.

B. Method

This research is compiled using a qualitative method with a case study approach. This method is taken because this research is only based on natural conditions with the intention, not an experimental result. This condition requires researchers to come and examine the data source directly without any changes. In this study, there are two methods of data collection: data is taken from the mathematical calculation process and previous literature reviews related to the research theme. The data obtained is used as a critical instrument in this study.[9] The author uses two sources of data in this study. The primary Source that the author uses comes from calculation data using the Sun's azimuth formula, which astronomy experts have established. For the Source of Hadith, the phenomenon of the Sun rising from the West, the author takes it from the books of Hadith of the salaf scholars known as Kutubut Tis'ah - the nine main books of Hadith -. The author uses supporting data; the main data is taken from the books of interpretation of hadith

[7] Heru Juabdin Sabda, "Alam Semesta dalam Perspektif Al-Qur'an dan Hadis," *Al-Tadzkiriyah: Jurnal Pendidikan Islam* 7, no. 2 (2017), https://ejournal.radenintan.ac.id/index.php/tadzkiyyah/article/view/1507.

[8] Soleh Bin Che' Had, "Penafsiran Ayat tentang Hari Kiamat Menurut Umar Sulaiman 'Abdullah Al-Asyqar" (Universitas Islam Negeri Ar-Raniri, 2018), https://repository.ar-raniry.ac.id/id/eprint/2752/1/Soleh Bin Cha%60 Had.pdf; Rukmanasari, "Hari Kiamat Dalam Perspektif Al-Qur'an: Studi Terhadap Q.S. Al-Qari'ah/101" (Universitas Islam Negeri Alauddin Makassar, 2013), https://repositori.uin-alauddin.ac.id/3929/1/RUKMANASARI_opt.pdf.

[9] Sugiyono, *Metode Penelitian Kualitatif untuk Penelitian yang Bersifat: Eksploratif, Enterpretatif, Interaktif, dan Konstruktif*, ed. Sofia Yustiyani Suryandari, 3rd ed. (Bandung: Alfabeta, 2021).

interpreters and several quotes from modern astronomy/Falak experts regarding the possibility of the phenomenon of the Sun rising from the West.

In this study, two methods are used to collect data: First, mathematical calculations using ephemeris data to obtain the azimuth coordinate data of the Sun at sunrise. This calculation is done using the time reference when the Equinox occurs, which is when the Sun orbits precisely on the equator. The mathematical calculation is then used as an Excel-based calculation program based on the astronomical algorithm, a calculation algorithm compiled by Jean Meeus.[10] Second, a literature review is used to search for hadiths about the phenomenon of the Sun rising from the West and its interpretation. After obtaining the required data, the author will draw the relationships between one data and another. First, the existing Hadith will be analyzed in terms of meaning and content according to the interpreter. Furthermore, the data generated from the observations will begin to explore whether the Sun experiences a shift.

C. Result and Discussion

1. Hadits on Doomsday

Table 1.
Hadiths on Doomsday

No.	Sources	Text
1.	*Shahīh* Muslim Hadis No. 158	" ثَلاَثٌ إِذَا خَرَجْنَ لاَ يَنْفَعُ نَفْسًا إِيمَانُهَا لَمْ تَكُنْ آمَنَتْ مِنْ قَبْلُ أَوْ كَسَبَتْ فِي إِيمَانِهَا خَيْرًا طُلُوعُ الشَّمْسِ مِنْ مَغْرِبِهَا وَالدَّجَّالُ وَدَابَّةُ الأَرْضِ "
2.	*Shahīh* Muslim Hadis No. 2901	قَالَ اطَّلَعَ النَّبِيُّ صلى الله عليه وسلم عَلَيْنَا وَنَحْنُ نَتَذَاكَرُ فَقَالَ " مَا تَذَاكَرُونَ " . قَالُوا نَذْكُرُ السَّاعَةَ . قَالَ " إِنَّهَا لَنْ تَقُومَ حَتَّى تَرَوْنَ قَبْلَهَا عَشْرَ آيَاتٍ " . فَذَكَرَ الدُّخَانَ وَالدَّجَّالَ وَالدَّابَّةَ وَطُلُوعَ الشَّمْسِ مِنْ مَغْرِبِهَا وَنُزُولَ عِيسَى ابْنِ مَرْيَمَ صلى الله عليه وسلم وَيَأْجُوجَ وَمَأْجُوجَ وَثَلاَثَةَ خُسُوفٍ خَسْفٌ بِالْمَشْرِقِ وَخَسْفٌ بِالْمَغْرِبِ وَخَسْفٌ بِجَزِيرَةِ الْعَرَبِ وَآخِرُ ذَلِكَ نَارٌ تَخْرُجُ مِنَ الْيَمَنِ تَطْرُدُ النَّاسَ إِلَى مَحْشَرِهِمْ .
3.	Sunan Ibnu Majah Hadis No. 4068	لَا تَقُومُ السَّاعَةُ حَتَّى تَطْلُعَ الشَّمْسُ مِنْ مَغْرِبِهَا فَإِذَا طَلَعَتْ وَرَآهَا النَّاسُ آمَنَ مَنْ عَلَيْهَا فَذَلِكَ حِينَ لَا يَنْفَعُ نَفْسًا إِيمَانُهَا لَمْ تَكُنْ آمَنَتْ مِنْ قَبْلُ

[10] Jean Meeus, *Astronomical Algorithms* (Richmond: Willmann-Bell, Inc., 1991).

The hadiths above all explain the signs of the Apocalypse that will occur later. Each Hadith explains the signs with different quantities. However, in terms of events, several continuous signs exist between one Hadith and another. The first Hadith mentions three signs of the Apocalypse: the sunrise from where it sets (the West), the Dajjal, and the Earth's beast (*dābbatu al-ard*). Unlike the first Hadith, the second Hadith mentions ten signs related to the Apocalypse, as the companions ask. The Prophet Muhammad SAW also mentioned the sunrise from the West as the fourth sign among the ten signs. Likewise, with the third Hadith, the Hadith explains explicitly the sunrise from the West as a sign of the Apocalypse.

2. Shift of Sun's Rising Azimuth at Equinox

Based on the hadiths in the previous data variables, there is no definite mention of when the phenomenon of the Sun rising from the West occurred, nor is there a process of the phenomenon taking place. One way to see whether the Sun rising from the West has been going on for a long time or will happen in the future is to see whether there is a shift in the sunrise point towards the West that is running constantly. To see it, we need a definite reference to provide a clear and detailed picture of the existing shift. Therefore, this study uses a reference value obtained from observations of the Sun's azimuth value at the time of the Equinox so that accurate and detailed data will be produced and can explain the shift in the coordinates of the sunrise in the last 101 years, namely from 1923 to 2023.

a. The Equinox Occurs in 101 Years

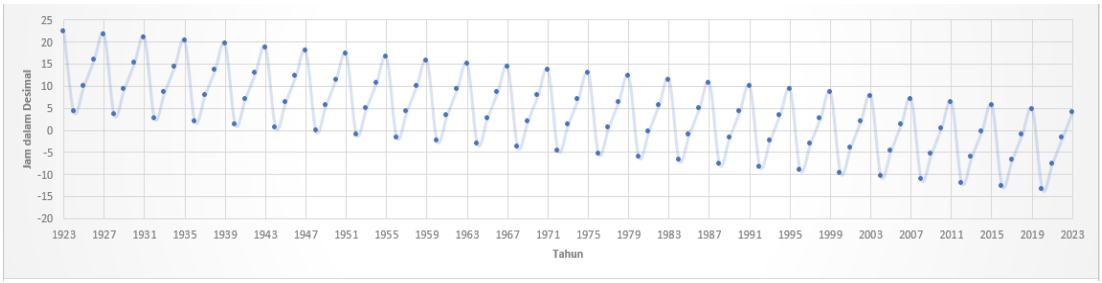

Figure 1

The pattern of the recurrence of the Vernal Equinox every 100 years, Source: personal documentation

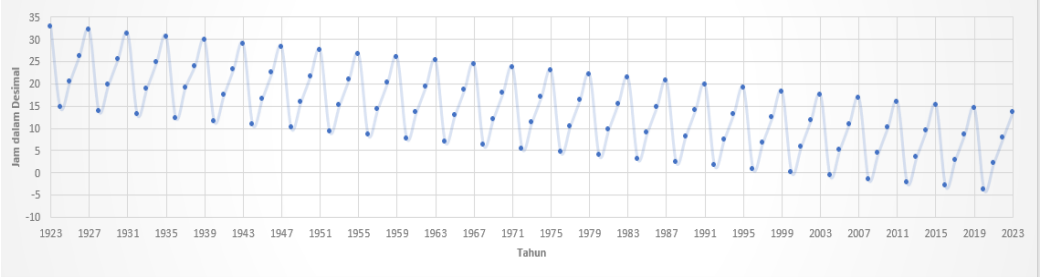

Figure 2
The pattern of the recurrence of the Autumnal Equinox every 100 years,
Source: personal documentation

From the data collected, at first glance, there is no apparent regularity in the time of the Equinox each year. For example, in 2001, the vernal Equinox occurred on March 20 at 20:05, while in the following year, the vernal Equinox occurred on March 21 at 01:56, a difference of about five hours 51 minutes. This time difference is apparently irregular for subsequent events; in 2003, the vernal Equinox occurred on March 21 at 07:45. There was an interval of 6 hours and 11 minutes between the two. This irregularity also occurs during the autumnal Equinox. The autumnal Equinox in 2001 occurred on September 23 at around 05:52, having a time difference of 6 hours 10 minutes with the autumnal Equinox in 2002, which occurred on September 23 at 11:41. The autumnal Equinox in 2002 also has a different time difference to the autumnal Equinox in 2003, in those 2 years there was a time difference of 6 hours 12 minutes. However, after forming a chart as in Figure 1 and Figure 2, there is a time pattern that repeats itself over a period of 4 years; every 4 years, the equinox time will have almost the same value, only having a time difference of about 44 minutes with an upward pattern for the vernal Equinox and a downward pattern for the Autumnal Equinox.

b. The Sun Rises at the Equinox

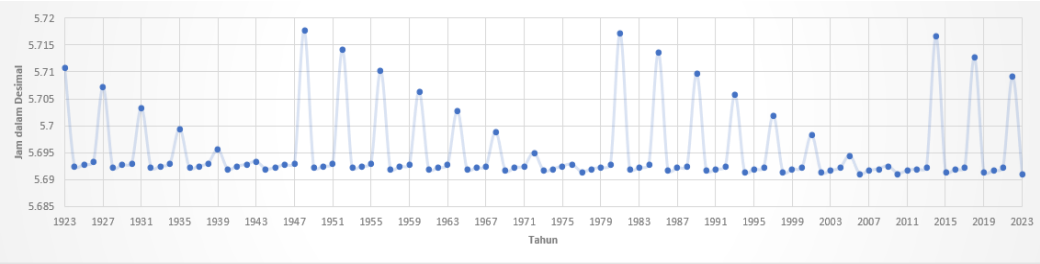

Figure 3
The pattern of differences in sunrise times at the vernal Equinox

It should be noted in advance in this study that the location used as a reference for determining the sunrise time at the Equinox is the UIN Walisongo

Observatory, which has a Longitude (λ) and Latitude (φ) value of 110° 20' 53.33" longitude and -6° 59' 29.53" latitude, respectively. The UIN Walisongo Observatory also has an altitude of 86.258 meters above sea level. The sunrise times are obtained using these data, as listed in the graph above.

Slightly different from the pattern formed by the time of the Equinox each year, in the equinox time data, the pattern formed between the time of the vernal Equinox and the autumnal Equinox is uniform in creating a 4-year cycle. In contrast to this, the collected rising times have a different pattern, not uniform. For the Cycle in the vernal Equinox, several rising times differ above the average and change regularly in each Period. The changing value will show a vast difference compared to the average difference, where the average difference in rising time is at +/- 26 seconds, while in exceptional years, the difference can reach 30 seconds to 3 minutes.

The different azimuth values are not always in the same year in the table. In every eight cycle changes, the position of the rising time points on the chart that has a high difference change in each Period; for example, in the first Period or from 1924-1947, the rising time that has a high difference is in the fourth year of one Cycle (1923) and multiples of 4 of the fourth year (1927, 1931, 1935, and 1939). Furthermore, in the second Period (1948-1979), the year that has a rising time with a difference above the average moves to the first year in the cycle sequence (1948) and multiples of 4 of the first year (1948, 1952, 1956, 1960, 1964, 1968, 1972, 1976). The author assumes that this pattern continues to repeat itself to form a regular cycle. After reaching the fourth year in the next Period, the publication time, which had a difference in value above the average, returned to the first year in one Cycle.

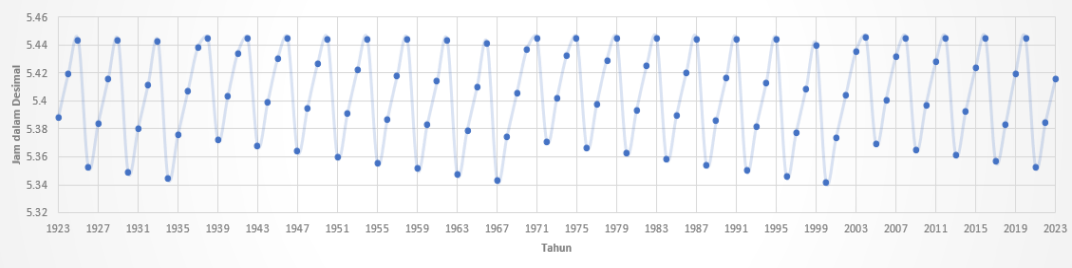

Figure 4

The pattern of differences in sunrise times at the Autumnal Equinox

Meanwhile, during the autumnal Equinox, the time difference ranges to minutes but repeats in a 4-year cycle, as illustrated in the chart in Figure 4. The difference in time intervals resulting from calculations related to the time of sunrise at the autumnal Equinox is in the range of only 1-2 minutes. There are also changes in the position of the peak and lowest points in each Cycle, where this position change occurs in 8 repetitions of the Cycle. This means that after eight repetitions of the Cycle, the position of the year that occupies the graph's peak on the chart will change regularly. The pattern is identical to that at the vernal Equinox, although with a different year order. For example, for the first Period, namely between 1923 and 1937, the peak position of the graph was occupied by the year 1930 and multiples of four of that year. This position then changed for the second Period or from 1938 to 1969, where in this Period, the peak position of the graph was occupied by the year 1963 and multiples of 4 of that year. A clearer picture can be seen in Figure 4.

c. Azimuth of the Sunrise at the Equinox

Azimuth has a maximum value of 360°; every time it meets another cardinal point, the value increases by 90o. The details are as follows: from the North (N) to the East (T) the azimuth value formed is 90°; from the East to the South (S) the value increases by 90° so that from the North to the South the azimuth formed is 180° (90° + 90° = 180°), from the South if continued to the West (B) the value will also increase by 90° and make the azimuth value from the North point to the West point total 270°, likewise if calculated to reach the North again as a complete circle perfection, and the overall maximum azimuth value that can be achieved is 360°.

Because the reference point of the calculation uses the actual wind direction, the azimuth can be used as a determinant of the direction of sunrise from the Sun. The equator, as a line that describes the annual path of the Sun, also intersects the horizon at times, and there is a possibility of exactly intersecting the east direction. This phenomenon only occurs at the time of the Equinox; it is also said that the Sun will rise precisely from the East, which applies to all areas in the world.[11] Of course, in determining the rising azimuth,

[11] Slamet Hambali, *Ilmu Falak 1 (Tentang Penentuan Awal Waktu Salat dan Penentuan Arah Kiblat di Seluruh Dunia)* (Semarang: Pascasarjana IAIN Walisongo, 2011).

the author uses reference data from the UIN Walisongo Observatory, which has a value of Longitude (λ) and Latitude (φ) of 110° 20' 53.33" Longitude and -6° 59' 29.53" Latitude, respectively. The following is the data that was successfully collected:

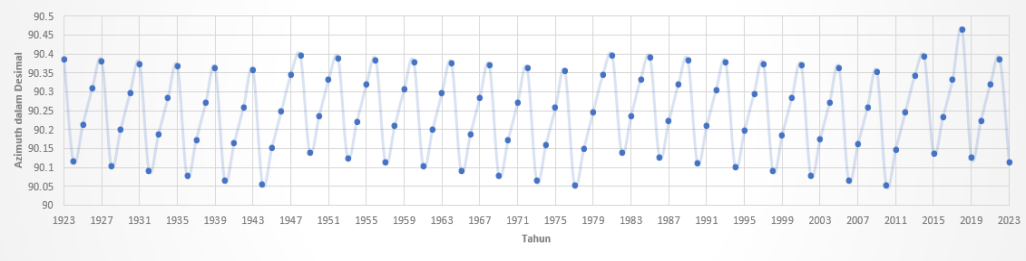

Figure 5
Sunrise Azimuth at Vernal Equinox

If we compare the data obtained with the previous data, we will form a unique pattern that is not very different from the earlier data. To provide a more comprehensive discussion related to the data from the existing solar azimuth, the following will explain the azimuth value pattern formed from each equinox time. At the time of the vernal Equinox, the solar azimuth at sunrise every year forms a repeating pattern every 4 years, and there is a change in the position of the peak and the lowest point in the chart graph, the same as the patterns on the chart of the rising time for the autumnal equinox period. In one Period, there is a year at the top and the bottom, and between the 2 positions, there are 2 years whose positions are in a row upwards, forming an upward graph. However, in 8 repetitions of the Period, a change in the year's position occupies the top and bottom points.

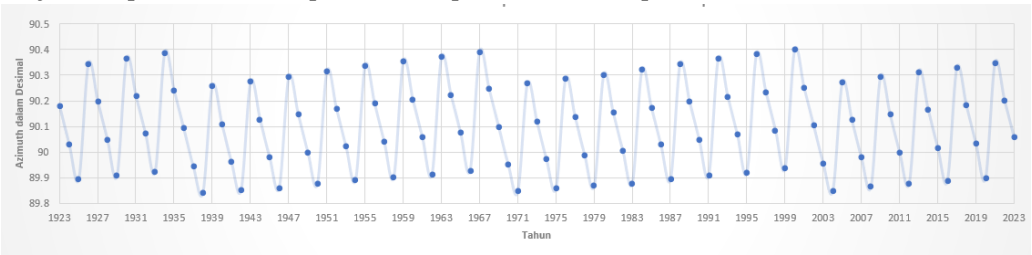

Figure 6
Azimuth of Sunrise at the Autumnal Equinox

Similar to the point sequence model in Vernal Equinox, in Autumnal Equinox, some years are at the top and bottom positions. The difference is that the graph formed by one Period in autumnal Equinox is a descending line.

Further explanations regarding the periods and changes in the years that occupy the top and bottom positions in the chart will be presented in the next sub-chapter, and the depiction of the graph can be seen in Figure 5 and Figure 6.

3. Shifting of the Sunrise Azimuth at the Equinox as an Indicator of the Shifting of the Sunrise Point from East to West

We can interpret azimuth shift as the movement of the azimuth point at a specific time interval. In the context of this research, the time interval used is between one Equinox to another. As previously explained, the equinox time in question is divided into two types, namely, the vernal Equinox and the autumnal Equinox. The Sun is said to have risen precisely at the eastern point worldwide these past two times. If, at that time, the Sun rises at a point that continues to shift away from the East towards the West constantly, this can be used as an indicator of the shift in the sunrise coordinates from East to West.

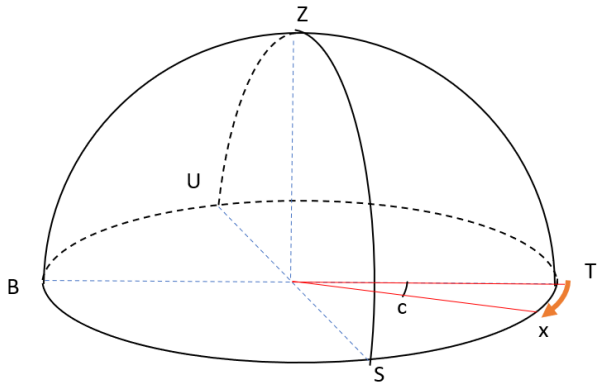

Figure 7
Shifting of the azimuth point from the East (T) to point x, which points west

Figure 7 illustrates the shift of a point from the east end (T) to point x, which is heading west, and angle c shows the magnitude of the shift in degrees. The change to the West can also occur in the opposite direction, namely from the East to the North, then to the West. This shift analysis will only be carried out for shifts at sunrise. However, azimuth coordinate analysis is needed at other times for comparative data.

In this sub-explanation, the term cycle is used to describe a grouping of similar azimuth patterns in a graph at a specific time interval. So, the Cycle in question may only be a group of data whose sequence is irregular and short. The term cycle is used

to refer to 1 data that has one graph pattern, namely up or down. In one Cycle, there are four consecutive years with sequential graph patterns. Because in this study the analysis applied is different between the vernal Equinox and autumnal Equinox, the division of the Cycle will also be separated into 2 discussions, namely the Cycle at the time of the vernal Equinox and the Cycle at the time of the autumnal Equinox.

In one Cycle, there are years at the top and bottom positions, and between the two positions, there are 2 years whose positions are in a row upwards, forming an upward graph. However, in 8 repetitions of the Cycle, there are changes in the position of the years that occupy the top and bottom points. For example, in the first Period, the years at the top are 1923 and 1927, and multiples of 4 of those years. After eight repetitions of the Cycle, the year that occupies the highest point of the graph changes, shifting to the year that in the table occupies the position of year 1. It can be seen in the graph that after the 8th repetition of the first Cycle, namely in 1947, the following year, namely 1948, which should have occupied the bottom point of the graph, changes position to the peak point in the graph. This pattern is followed by multiples of 4 from 1948. Likewise, after experiencing eight repetitions of the Cycle, the peak position on the chart is replaced by the 2nd year in the table sequence, and so on.

Please note that the following table division will be divided into specific periods. One Period contains eight cycles with the same pattern of years at the top and bottom positions; when this position changes, the Period in the graph changes to the next Period. The division of periods on the Vernal Equinox will be named with a period number followed by the description "ve," an abbreviation of vernal Equinox. For example, the first Period in the vernal Equinox will be labeled "Period 1.ve". The period description will be marked with the sign "ae" for the Autumnal Equinox.

To see the existing shift, we must compare data that has the same or similar characteristics. In this case, the author uses the reference point position on the chart graph as a determinant of which points will be compared. That way, we can see the constant and observable shift value. The similarity of the points in question is the position of the azimuth value according to the year that the author has previously divided into several cycles/periods. The comparison is made by comparing the azimuth with the same cycle position in different periods. The top point with the 1st

cycle sequence in the first Period (1.ve) will be compared with the top point with the 1st cycle sequence in the second Period (2.ve), and so on.

a. Comparison of Azimuths at the Vernal Equinox

Table 2
Comparison of the top points at the vernal Equinox with different periods

Cycle	1st Periode.ve	2nd Period.ve	3rd Period.ve	4th Period.ve
1.		90°23'49.672"	90°23'48.412"	90°23'40.822"
2.		90°23'23.222"	90°23'28.099"	90°23'28.294"
3.	90°23'09.208"	90°23'02.364"	90°23'03.596"	90°23'08.450"
4.	90°22'52.905"	90°22'48.805"	90°22'42.329"	
5.	90°22'30.840"	90°22'32.837"	90°22'28.503"	
6.	90°22'06.601"	90°22'11.171"	90°22'12.844"	
7.	90°21'49.023"	90°21'46.785"	90°21'51.594"	
8.	90°21'25.454"	90°21'17.694"	90°21'14.184"	

Table 3
Comparison of the lowest points at the vernal Equinox with different periods

Cycle	1st Periode.ve	2nd Period.ve	3rd Period.ve	4th Period.ve
1.		90°08'23.179"	90°08'22.282"	90°08'15.423"
2.		90°07'32.798"	90°07'37.675"	90°07'36.418"
3.	90°06'57.866"	90°06'50.119"	90°06'47.231"	90°06'52.260"
4.	90°06'17.581"	90°06'11.640"	90°06'04.103"	
5.	90°05'28.149"	90°05'29.941"	90°05'25.507"	
6.	90°04'39.273"	90°04'42.639"	90°04'44.221"	
7.	90°03'59.787"	90°03'53.473"	90°03'57.232"	
8.	90°03'21.191"	90°03'13.591"	90°03'07.805"	

If the azimuth value with the same position is compared in the same Period, the trend formed is negative, namely having a value that continues to decrease. Meanwhile, the resulting shift value is not constant if one point is compared with the same cycle position in a different period. At one time, the

value decreases, and at another time, the value can increase or decrease. This is shown in the comparison between the top points in the 3rd Period as follows.

Table 4
Comparison between the top points of the autumnal Equinox in the 3rd Cycle

1St Cycle.ve	2nd Cycle.ve	3rd Cycle, ve	4th Cycle.ve
90°23'09.208"	90°23'02.364"	90°23'03.596"	90°23'08.450"

The value shows a decrease between the first and second periods, as does the comparison between the second and third Periods. However, this trend changes when the comparison value between the azimuth value for the 3rd Period and the 4th Period, the resulting value shows an increase. This shift pattern changes for comparisons in the 1st, 2nd, and 4th cycles, and so on. This indicates that comparing azimuth values in the same Cycle in different periods has an inconsistent pattern, so the changes that will occur cannot be predicted.

b. Comparison of Azimuths at Autumnal Equinox

Table 5
Comparison of the highest points on the autumnal Equinox with different periods

No	1st Period. ae	2nd Period.ae	3rd Period.ae	4th Period.ae
1.		90°15'32.125"	90°16'04.847"	90°16'24.173"
2.		90°16'31.981"	90°17'12.503"	90°17'44.825"
3.		90°17'41.751"	90°18'10.499"	90°18'51.504"
4.		90°19'01.031"	90°19'19.482"	90°19'51.327"
5.		90°20'17.159"	90°20'40.333"	90°20'59.535"
6.	90°20'41.823"	90°21'19.810"	90°21'55.382"	
7.	90°21'55.563"	90°22'19.738"	90°22'58.650"	
8.	90°23'16.832"	90°23'34.574"	90°23'59.981"	

Table 6
Comparison of the lowest points at the autumnal Equinox with different periods

No	1st Period.ae	2nd Period.ae	3rd Period.ae	4th Period.ae
1.		89°50'33.432”	89°50'51.913”	89°50’59.805”
2.		89°51'08.081”	89°51'37.985”	89°51’56.028”
3.		89°51'47.008”	89°52'12.866”	89°52’42.947”
4.		89°52'40.978”	89°52'51.084”	89°53’18.119”
5.		89°53'34.636”	89°53'44.552”	89°53'55.658”
6.	89°53'45.465”	89°54'14.928”	89°54'38.742”	
7.	89°54'31.991”	89°54'49.700”	89°55'19.808”	
8.	89°55'31.740”	89°55'48.097”	90°20'59.535”	

The results of the first model comparison comparing the azimuth values with the same position in the chart in one Period show a positive trend. The positive trend here means that the value of each of the same points in one Period continues to increase yearly. This increase in value shows that the azimuth shift in this comparison indicates that the sunrise is getting further away from the east point towards the south point as time goes by.

The same trend is also produced from the second comparison model. The value of each cycle point continues to increase in subsequent periods. Just look at the example in the 4th and 5th cycles for the azimuth, which has the highest point position in the following table:

Table 7
Comparison of the highest points of the autumnal Equinox in the 4th and 5th cycles

No	1st Period.ae	2nd Period.ae	3rd Period.ae	4th Period.ae
4.		90°19'01.031”	90°19'19.482”	90°19’51.327”
5.		90°20'17.159”	90°20'40.333”	90°11’01.443”

The azimuth value of the 4th Cycle in the second Period increased in the next Period, as did the 5th Cycle. For the 4th Cycle from the second Period to the third Period, there was an increase of 0 ° 0'18.45", and in the fourth Period, there was an increase in value of 0 ° 0'31.84". In the 5th Cycle between the second Period and the third Period, there was an increase in value of 0 ° 0'23.17", and in the fourth Period, there was an increase in value of 0 ° 0'19.02".

From the existing data presentation, we know together that the pattern of the Sun's azimuth shift at sunrise that is formed is not constant away from the East. In the vernal equinox period, the shifting trend formed is negative; this negative trend shows that during this Period, the azimuth of the Sun's sunrise each year is getting closer to the East. In contrast to the vernal equinox period, the shift pattern formed in the autumnal equinox period shows a positive trend. This positive trend shows that during the autumnal Equinox, the azimuth of the Sun's sunrise moves further away from the East. Because the shift pattern formed from each Period shows no consistency in the shift of the sunrise point, with the intention that sometimes it moves away in one Period, but in the next Period, the sunrise point is closer to the East. The analysis of the shift of the sunrise point by referring to the azimuth of the Sun's sunrise cannot prove nor predict when the Sun will rise from the West.

4. Factors Affecting Proof of Sunrise from the West Using Azimuth Shift Analysis

From the data presentation in the results chapter, we have learned that the proof of the phenomenon of the Sun rising from the West using the analysis of the azimuth shift in 101 years is less effective. Two factors, namely cause the lack of effectiveness of this analysis method:

a. The shift in the sunrise azimuth value over 101 years shows a non-uniform pattern.

The shifts generated from the data in the results chapter show a non-uniform pattern. In the vernal equinox period, the azimuth shift produces a negative trend, indicating that at the same point in several cycles, the sunrise azimuth moves closer to the East. In the autumnal equinox period, the

resulting shift trend shows a positive trend, meaning that the shift at each point moves at a value that continues to increase. This indicates that the sunrise azimuth shifts away from the East towards the South in the autumnal equinox period. The author concludes that the existence of two types of shifts that show opposing trends indicates that the change of the sunrise point is still in a limited shift pattern that is still linked to the tilt of the Earth's rotation axis and is still intertwined with the declination value which in its calculations has been established. This declination value continues moving from the East towards the North or South with a maximum value of 23.5°.

b. Consistency of the shift in the sunrise azimuth with the tilt of the Earth's rotation axis

The apparent path of the Sun's movement is dynamic (continuously changing) because the Earth does not rotate perpendicular to its plane of rotation. The Earth's axis of rotation has a tilt, which in Astronomy terms is called "axial tilt (orbital tilt)." The value of the orbital tilt is called the inclination angle, where the inclination angle of the Earth is 23.5° and always points in the same direction.[12] The apparent annual movement of the Sun is depicted in a line called the ecliptic. Comparable to the value of the inclination of the Earth's orbit, the ecliptic intersects the equator (which is the reference for dividing latitude) at a maximum angle of 23.5°. This means that in one year, the Sun does not always follow the equator; sometimes, the Sun is north of the equator, and at one time, the Sun is in the southern region of the equator. The northern and southern areas are limited by latitude 23.5° N called the Tropic of Cancer or the Tropic of Capricorn. In the south region, it is limited by latitude 23.5° S, called the Tropic of Capricorn or the Tropic of Capricorn.[13] This condition is also the reason why the Sun does not always rise directly in the East; when the Sun is at the north solstice, the position of the Sun rising is also in the East, which is leaning towards the North with a value of 23.5° comparable to the tilt of the Earth's axis of rotation, and vice versa.

[12] NASA, "All about That Tilt Sun & Seasons," *Earthobservatory.Nasa.Gov*, 2019, https://earthobservatory.nasa.gov/blogs/eokids/wp-content/uploads/sites/6/2019/04/16_Sun Seasons-508.pdf.

[13] Abu Yazid Raisal et al., "Posisi Matahari pada Saat Ekuinoks, Summer Solstice, dan Winter Solstice di Observatorium Ilmu Falak Universitas Muhammadiyah Sumatera Utara," *Jurnal Riset dan Kajian Pendidikan Fisika* 7, no. 1 (April 30, 2020): 35, doi:10.12928/jrkpf.v7i1.15772.

To ensure whether the shift in the sunrise azimuth value corresponds to the change in the declination value at the Equinox, the author compared the data in the form of a table as follows:

Table 8
Comparison of the time of sunrise with the time of Equinox at the time of vernal Equinox

No	Date	Azimuth	Sunrise Time	Equinox Time
1.	March 20, 2001	90 º 22' 12.844"	05:41:54	20:05
2.	March 20, 2005	90 º 21' 51.594"	05:41:40	19:23
3.	March 20, 2009	90 º 21' 14.184"	05:41:33	18:39
4.	March 20, 2013	90 º 20' 31.732"	05:41:32	17:55
5.	March 20, 2017	90 º 19' 53.307"	05:41:32	17:11
6.	March 20, 2021	90 º 19' 11.420"	05:41:32	16:27

Table 9
Comparison of sunrise time with the time of Equinox at the Autumnal Equinox

No	Date	Azimuth	Sunrise time	Equinox Time
1.	September 23, 2001	90 º 15' 06.896"	05:22:25	05:52
2.	September 23, 2005	90 º 16' 24.173"	05:22:10	05:06
3.	September 23, 2009	90 º 17' 44.825"	05:21:55	04:20
4.	September 23, 2013	90 º 18' 51.504"	05:21:41	03:34
5.	September 23, 2017	90 º 19' 51.327"	05:21:26	02:48

The comparison of the sunrise time with the equinox time in the two tables above shows that the closer the time interval between the equinox and the sunrise, the smaller the resulting azimuth value. Let's take an example at the time of the vernal Equinox; in 2001, the Equinox occurred at 20.05, and at that time, the sunrise fell at 05:41:54; the time interval between the two was 14 hours 23 minutes 6 seconds. With that time interval, the resulting azimuth value was 90 º 22 '12.844". In the following year (2002), the Equinox occurred

at 19:23 while the sunrise at that time fell at 05:41:40 or had an interval of 13 hours 41 minutes 20 seconds; with that time interval, the resulting azimuth value was 90^{o} 21 '51.594".

Finally, for 2003, the interval between the rising time and the equinox time was 12 hours 57 minutes 27 seconds; with this time interval, the resulting azimuth value was 90^{o} 21' 14.184". Of the three azimuth values, there was a decrease each year of 21.25 seconds and 37.41 seconds, respectively. This decrease in value is in line with the reduction of the interval value between the rising time and the equinox time, and so on. This makes sense, considering that the further the interval between the rising time and the equinox time, the greater the declination value will be; this declination value then affects the resulting azimuth value.

5. Discussing Religious Texts with Scientific Facts Related to the Event of the Apocalypse

Science has no boundaries and is not contradictory to religion; all are integrated, as mentioned by Barbour in his study When Science Meets Religion: Enemies, Strangers, or Partners? In mapping the relationship between Science and Religion, he views that science and religion can establish a relationship that builds integration. The relationship between science and religion is called integration when the relationship between science and religion is based on the belief that the area of study, design of approach, and goals are the same.[14] In fact, in the development of Islamic cultural studies, the relationship between knowledge and faith is very closely tied. Scholars also argue that perfect faith is impossible to achieve without knowledge because the heart's attachment depends on knowledge. Meanwhile, extensive knowledge is only formed from learning from solid knowledge. In some hadiths, it is even said that knowledge is a partner of faith; faith without thought is impossible.[15] Although both have slightly different natures and principles of truth in their relationship, there are limitations on certain things that

[14] Mukhyar Fanani, Sholihan Sholihan, and Karnadi Karnadi, "Transformasi Paradigma dan Implikasinya pada Desain Kurikulum Sains: Studi Atas UIN Syarif Hidayatullah, UIN Sunan Kalijaga, dan UIN Maliki" (Semarang, 2014), https://eprints.walisongo.ac.id/id/eprint/3954/1/Muhyar_dkk-Universitas_Islam.pdf.

[15] Hasan Yusufian and Ahmad Husain Sharifi, *Akal dan Wahyu: Tentang Rasionalitas dalam Ilmu, Agama, dan Filsafat* (Jakarta: Sadra International Collage, 2011).

cannot be mixed into one. One of them is how science and religious texts interpret the truth itself.

The latest discoveries can refute truth in science, while in religious texts, the highest truth is found in the word of God and the teachings of His Prophet. Asri Widowati characterizes science as a body of knowledge that continues to grow, not static. She explains that truth in science is not absolute; others always check the truth in science, or its observations are repeated, and its number continues to increase along with the development of the times. Therefore, truth in science is different from the truth referred to in religion because, in religion, truth concerns the preservation of a truth that is absolute and cannot be changed and replaced by anything. However, the sacred texts of these religions are universal in nature, which in their interpretation still opens the door wide for mutual discussion and does not ignore the differences of each existing interpretation. Al-Shāfi'ī also prioritizes a sense of appreciation for the existing differences. He does not force everything to be one, noting that everything is within the corridor of monotheism and reasonable limits.[16]

The rising of the Sun from the West is mentioned in several hadiths, such as Hadith No. 158 in *Ṣaḥīḥ Muslim*, Hadith No. 2901 from *Ṣaḥīḥ Muslim*, and Hadith No. 4068 from *Sunan Ibn Mājah*. Hadith narrated by Muslim number 158 and Hadith narrated by Ibn Mājah number 4068 both discuss the sunrise from the West, which will be a sign of the coming of the end of the world, which is also accompanied by the statement that when that time occurs, the repentance of those who previously did not believe will be in vain. Meanwhile, in the Hadith narrated by Muslim number 2901, the sunrise from the West is explained, which is one of the ten other signs of the coming of the Apocalypse. Hadith no. 4068 in *Sunan Ibn Mājah*, which was narrated directly by Abū Bakr Ibn Abī Shaybah, is found in volume 3 of *Sunan Ibn Mājah* chapter 32, which explains the rising of the Sun from the West (طلوع الشمس من المغرب) has the quality of authentic narration as explained in *al-Rawḍah al-Naẓīr* no. 1112 and *Takhrīj Sharḥ al-'Aqīdah al-Ṭaḥāwiyyah* page 566.[17]

All Hadith narrated by Muslims listed in *Ṣaḥīḥ Muslim* has the quality of "*Ṣaḥīḥ*" according to the name of the book that lists them. Muslim is reported to have

[16] Edi AH Iyubenu, *Belajar Mudah Ushul Fiqh Ala Bucin* (Yogyakarta: Diva Press, 2020).
[17] Ibn Mājah, *Sunan Ibn Mājah*, vol. II (Dār Iḥyā' al-Kutub al-'Arabiyyah, n.d.).

collected as many as 300,000 hadith, where from the hundreds of thousands of Hadith he investigated which ones had the quality of *ṣaḥīḥ* and which did not meet the criteria of sahih. In his efforts, Muslim traveled to see the continuity of the *sanad* of the Hadith that he had collected. He had met and received three hundred Hadith from famous hadith experts. Muslim was also recognized as very intelligent, diligent, careful, and strong-minded. On that basis, the Hadith that had been considered valid, marble, divided into levels of quality by Muslims, were all accepted and used as a reference by the *salaf* scholars. One of the results of his formulation was a collection of Hadith with levels of quality of sahih narration that were collected into one in the book *Ṣaḥīḥ Muslim*.[18]

The Sun rising from the West is said to be one of the signs that will occur physically before the Apocalypse happens, although the sequence with other events is still disputed. Al-Qurṭubī argued that the beginning of the disaster and chaos that became a warning to humans of the coming of the Apocalypse had begun since the death of the Prophet Muhammad SAW, then the death of ‘Umar Ibn al-Khaṭṭāb. Where with the death of the Prophet, revelation and prophecy automatically stopped, and that was also the beginning of the emergence of evil because many Arabs apostatized and so on. With the death of ‘Umar Ibn al-Khaṭṭāb, the sword of slander began to be drawn and resulted in the Caliph ‘Uthmān Ibn ‘Affān being killed. Things like that are part of the provisions and destiny of Allah SWT. In some narrations, it is said that the rising of the Sun from the West is the first sign that will appear as the beginning of a series of other signs of the Apocalypse. However, in some other narrations, it is mentioned that the emergence of Dajjal is the first sign. This second opinion is more robust, based on the words of the Prophet: "*Indeed, Dajjal will emerge among you, and that is certain*."[19]

According to science, the only thing that can make the Sun rise from the direction it sets (from the West) is the reversal of the Earth's rotation direction, which is currently rotating on its axis in the opposite direction to the clockwise direction (rotating from West to East) towards the direction that rotates the same as the clockwise direction. NASA, through Associate Administrator for

[18] Abū Ḥusayn Muslim Ibn al-Ḥajjāj Al-Naysābūrī, *Ṣaḥīḥ Muslim* (Beirut: Dār al-Kutub al-’Ilmiyyah, 2008).

[19] Al-Qurthubi, *Rahasia Kematian, Alam Akhirat, dan Kiamat Terjemah al-Tadhkirah fī Aḥwāl al-Mawtā wa Umūr al-Akhīrah*.

Communication Bettina Inclán, when responding to the issue related to the possibility of the Sun rising from the West as quoted by AFP Fact Check, said that NASA and other scientific organizations until now have not predicted that the Sun will rise from the West. Click or tap here to enter text. However, this statement does not mean that the possibility of the phenomenon of the Sun rising from the West is gone.

In a scientific article published by the University of Lisbon, Portugal, it is stated that the Earth's rotation can change due to the influence of internal and external processes. The most influential external aspects include gravitational interactions with the Moon, Sun, and planets, variations in the axis of rotation, and the position of the solar system relative to the arms of the spiral galaxy. The internal processes in question include density retribution in the mantle due to the subduction of lithospheric plates and mantle convection, distribution of continents, and variations caused by glacial and interglacial periods. One of the influences humans can currently feel is the change in the length of day (LOD).[20] From the existing scientific facts, there is a planet in the Solar System whose rotational direction is opposite to most other planets. Venus is considered an eccentric planet (oddball) because its rotational direction rotates from East to West (when viewed from the perspective of the Earth) with a rotation period of about 243.16 days; this causes the sunrise on the planet to start from the west point.[21]

Astronomy and physics experts offer several theories most likely to explain the cause of Venus having a different rotation from other planets. There are at least three popular theories, and all three can happen to the Earth we inhabit. So, if one of the three theories occurs, the Earth is likely to reverse its rotation direction, causing the Sun to not rise from its proper place anymore. The three theories are:

a. The first theory states that in the early days of its formation, Venus rotated in an average direction until, one day, there was a collision between Venus and a planet-sized object. This collision caused changes in Venus's rotational motion axis, so it changed its rotational motion. This theory is also widely supported

[20] Igor G. Pacca, Everton Frigo, and Gelvam A. Hartmann, "Possible Relationship between the Earth's Rotation Variations and Geomagnetic Field Reversals Over the Past 510 Myr," *Frontiers in Earth Science* 3 (April 9, 2015), doi:10.3389/feart.2015.00014.

[21] V. V. Beletskii, E. M. Levin, and D. Yu Pogorelov, "On the Problem of the Resonance Rotation of Venus. II," *American Institute of Physics* 25, no. 1 (1981): 110.

by experts in Indonesia, one of whom is Thomas Djamaludin; he explained that the Sun will only rise from the West when the Earth's axis of rotation is reversed due to a significant collision. He added that the Earth and everything in it were also crushed when the crash occurred.[22]

b. The second possible cause of Venus's reverse rotation is the tidal effect of Venus's atmosphere rubbing against the movement of the planet's crust (core-mantle). Scientists believe the Sun's gravitational pull on the planet's dense atmosphere can cause solid atmospheric tides. Such tides, combined with friction between the mantle and the core of Venus, result in Venus' reverse rotation.[23]

c. Alexander Correira and Jacques Laskar offer the third theory of French astronomers. They argue that Venus is not rotating in reverse, but its current rotation direction is one of the processes that help it reach a steady rotation direction. Venus is slowing down its rotation to a stop and then reversing direction, which is why its rotation period is so long.[24]

In conclusion, the scholars who interpret this Hadith are limited in the context of the phenomenon of the Sun rising from the West as an actual event and will occur physically, not just as a figurative sign. Science then explains how the possible scenario can cause the phenomenon to occur. From each view between the Islamic religious text and several scientific theories, both agree that the possibility of the reversal of the Earth's rotation, which causes the shift in the sunrise point, occurs spontaneously and suddenly, not gradually and regularly. However, in the third theory, changing the direction of rotation can occur progressively, influenced by the Sun's gravity and the tidal effects of other planets. However, as the nature of science is temporary and can be refuted when new facts are found, there is nothing wrong with us trying to see if there is currently an unnatural shift in the direction of the sunrise so that it can be used as one of the factors that can be used to analyze and estimate the time of the phenomenon of the Sun rising from the West.

[22] Danang Suryo, "Tak Ada Hubungannya dengan Kiamat, Ini Penjelasan Lapan Terkait Heboh Matahari Terbit dari Utara," *Kompas TV*, 2021, https://www.kompas.tv/nasional/184966/tak-ada-hubungannya-dengan-kiamat-ini-penjelasan-lapan-terkait-heboh-matahari-terbit-dari-utara.

[23] Harald Franzen, "Why Venus Spins the Wrong Way," *SCIAM*, 2001, https://www.scientificamerican.com/article/why-venus-spins-the-wrong/.

[24] Ibid., 33.

Based on Barbour's thoughts in his book When Science Meets Religion: Enemies, Strangers, or Partners?[25] We can see that the relationship between science and religion formed from the study of verses and hadiths regarding the Apocalypse and its signs with existing established scientific theories produces a mutually integrated relationship, where this relationship describes science and religion that is based on the belief that basically the area of study, design of approach, and the goals of both are the same and one. The conclusion related to this relationship is drawn from the fact that in this study, science explains how a possible scenario can cause the phenomenon of the Sun rising from the West, which has been mentioned in several hadiths as a sign of the coming of the Day of Judgment. The explanation of science strengthens the opinion that science in this study is positioned as explanatory, which certainly shows the unity of science goals, enhances the study, and provides a detailed description of the sacred religious texts.

D. Conclusion

Based on the data that has been collected, processed, and interpreted in the previous chapters, we can conclude that:

1. The hadiths that explain the rising of the Sun from the West are all hadiths that are Sahīh. The scholars who interpret this Hadith are only limited to the context of the phenomenon of the Sun rising from the West as an actual event and will occur physically, not only as figurative signs. Meanwhile, science then explains what possible scenarios could cause this phenomenon to occur.
2. Analysis of the shift of the sunrise point by referring to the azimuth of the sunrise at the time of the Equinox cannot prove nor predict when the Sun will rise from the West, which is a sign of the occurrence of the Apocalypse. There are at least two things that cause the failure of the proof: first, the irregularity of the shift pattern of the sunrise azimuth at the time of the Equinox, so there is no definite pattern indicating that the sunrise point moves from East to West. This also shows that the shift of the sunrise point is still in a limited shift pattern that is still linked to the tilt of the Earth's rotation axis, no more. Second, the a need for more periods used for the analysis. This causes the shift

[25] Ian G. Barbour, *When Science Meets Religion* (New York: HarperCollins Publisher, 2000), 17.

cycle pattern to be cut off, and the change in the Obliquity of the Ecliptic value is ignored.

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