

Climate Change and its Reflection on the Frequency of Lightning

Asst. Prof. Maysoun Taha Mahmoud Al-Saady

*Al- Karkh University of Science, Faculty of Remote Sensing and Geophysics,
Department of Remote Sensing.
dr.maysoun2022@kus.edu.iq*

Abstract

The phenomenon of lightning is a frightening and bewildering event for scientists over many centuries, and the problem of the study answers that the phenomenon of lightning in Iraq varies in time and place and what is the duration of its frequency, and what is a direct effect of the phenomenon of lightning The manifestations of public life in Iraq, and climate changes play a role in the phenomenon of lightning in Iraq, which The frequency of the phenomenon of lightning and the analysis of the climatic characteristics of the state of Iraq affect time and place, as well as the detection of the factors affecting the phenomenon of lightning, whether they are natural or human factors, given the location of the study area within the arid regions; Therefore, relying on studying the recurrence of the phenomenon of lightning is mainly because it is considered an input to economic and social development, and Calypso is considered one of the satellites with a polar orbit, orbiting from the pole to the pole, and the developer of NASA, which is designed to give excellent information about the height of the clouds in the atmosphere, that the moon Calypso It contains the CALIOP sensor, which uses two wavelengths of 532 and 1064 nm to measure the properties of the scattered light from the suspended particles in particular using the LIDAR system, which is a very effective system in detecting lightning in the atmosphere, as well as ice crystals in it, and the work of the moon Calypso is focused on sending pulses from LIDAR laser light penetrates the atmosphere to reach the surface of the earth, where the moon collects information about the distribution of lightning and monitors the phenomenon of lightning in the atmosphere, and it is one of the important tools for monitoring and interpreting the effects of lightning on the climate system. Tracking the movement of the deep depression coming from the central Mediterranean towards the eastern Mediterranean and Iraq, the National Center for Environmental Forecasts This data is analyzed and compared with the moon images (CALIPSO, TRMM-LIS), and recent practical experiments to study thunderstorms have proven that there are two types of thunderstorms, one of them is strong. And weak ones, and that the differences in the effectiveness of lightning depend on these two types of storms, which also depend on the available convective potential energy, as both give heavy rains, but they differ in terms of the atmospheric instability in which these thunderstorms are formed. The world joined and touched with the world Renault 1998 in Finding the relationship between the change in the number of monthly lightning flashes (increase and decrease) with the change in the temperature of the higher wet thermometer, and by applying the equation to the selected stations, the frequency of N is observed in the Baghdad station by 22.2%, the Mosul station by 20.2%, the Rutba station by 16.3%, and the al-Nukhayeb station by 14.2%, and the lightning is formed. Usually inside a cumulonimbus stabilizer which is also called a thunderstorm cloud.

Keywords: Moon Calypso - Thunderstorms - Latent Pregnancy Energy - Air Transport - Airstrips - Dynamic Movement.

Introduction :

The phenomenon of lightning has been a frightening and puzzling event for scientists for

many centuries, every civilization that looked at a phenomenon from a angle commensurate with its beliefs and was trying to explain the event, lightning is defined as a natural phenomenon created by electrical discharges in the form of a spark when there is a surplus of negative or positive electrical charges within a certain area of the cloud enough to break air resistance to the passage of electricity, and lightning is usually associated with the slandering or thunder clouds, but it may also occur in clouds. Class, which is positioned in the form of large horizontal layers, in sandstorms and snowstorms, and in a few cases lightning may be associated with dust and gases emitted when volcanoes erupt (As Yasin al-Ameri, 2014, p. 91).

Electrical discharge occurs during lightning in the form of a lightning bolt that can travel at a speed of 45 km per second (100,000 miles per hour) and causes temperatures to rise to about 28,000 m5, which is high enough to turn sand into glass, and can A lightning bolt charged with a negative charge carries an average electrical current of 40 kAh, yet it is known that some lightning bolts can carry an electric current of up to 120 kA, and transmit an electrical charge of 5 coulombs and 500 Mega joules, or produce enough power to power a 100-watt light bulb for a little less than two months, and the voltage depends on the length of the thunderbolt, where the electric collapse of the air (the phenomenon of the transformation of a insulating material into a conductor) is 3 million volts per meter, which means the production of about 1 billion volts for a lightning bolt of 300 meters (1000 feet) (Saadi Razzaq Abdul Wahab, Karim Nur Mohsen, 2011, p. 82).

1- Study problem:

The problem of looking for the following questions answers, does climate change have an impact on the frequency of lightning within Iraq?

Do the frequency of lightning occur selected weather stations? How much is the impact of the change in the natural factors affecting the formation of the lightning phenomenon on its temporal and spatial occurrence? Does Iraq's astronomical site play a role in lightning ?

2- Study hypotheses :

Climate change plays a role in the recurrence of the phenomenon of lightning in Iraq, where many natural factors that lead to a recurrence of the phenomenon of lightning on Iraq, the astronomical site of Iraq plays a major role in the frequency of the occurrence of lightning, multiple types of lightning in Iraq and multiple effects.

3- The objectives of the study :

Analysis of the climatic characteristics of the State of Iraq temporally and spatially as well as the detection of the factors affecting the phenomenon of lightning, whether natural or human, and the knowledge of the geographical characteristics of the phenomenon of lightning, and the highlighting of the effects of the frequency of lightning.

4- The study area:

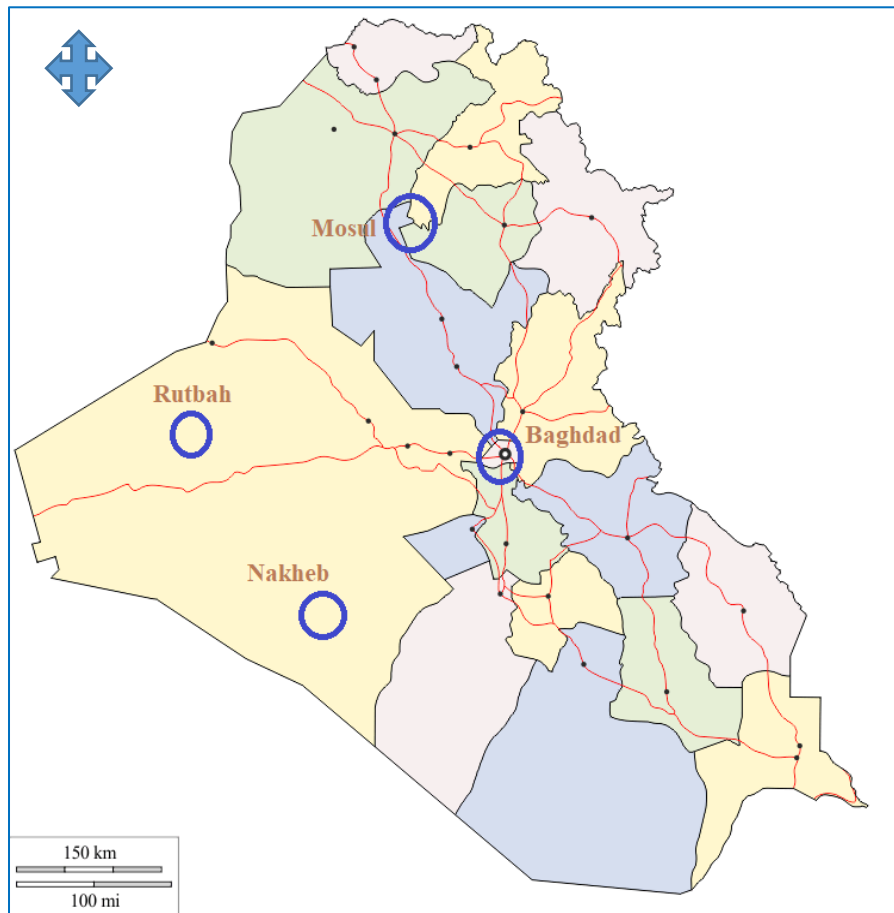
The study area is determined in Iraq, but for the international borders are bordered to the east by Iran, to the south by Kuwait and to the south of Saudi Arabia, while for the astronomical site it is located between two long lines ('38 42° - '48 45°) eastward, and between two viewing circles ('05 29' The geographical location is limited to the north by Turkey and to the west by The State of Syria, and from the southwest by the State of Saudi Arabia, note the map (1), while the time limits for the study were from 1975 to 2020.

Table (1) the location of climatic stations by latitude, longitude, nodding number and topographic station height.

Topographic station height (m)	Station No	Arc length	View circle	Station
223	608	-59 43.	-19 36.	Baghdad
31.7	650	-24 44.	-18 33.	Mosul
630	642	-18 40.	-02 33.	Rutbah
53	670	-19 44.	-57 31.	Nakheb

Source: Based on Data from the General Climate Department, Unpublished Data, Authority for Atmospheric And Seismic Survey, Baghdad, 2020.

Map (1) The astronomical location of the study area and climatic stations in 2020



Source: Based on thematic mapper tm satellite of the U.S. land landsat sat sat 8/4/2020 m for Iraq,

consisting of three panels 40 row 177 path for 2020 and consists of 7 bands with a spatial

resolution of 33 meters, and their source <http://glovis.usgs.gov>.

5- The importance of the study:

Given the fact that the study area is located within the dry regions, therefore, the reliance on the study of the frequency of the phenomenon of lightning is mainly because it is an input of economic and social development, and the frequency of the occurrence of lightning has negative effects on human beings as well as aviation movements because it is one of the most important pillars of Iraqi national security.

6- Research methodology and methods:

The study was based on a descriptive analysis approach based on the study of natural characteristics affecting the frequency of lightning and a comprehensive assessment of its impact on the areas of public life in Iraq, and the system methodology that helped to produce many results and create maps, as well as the use and application of mathematical equations and statistical analysis.

7- How to work:

The Calypso satellite is a polar-orbiting satellite orbiting from pole to pole and developed by NASA, which is designed to give excellent information about the height of clouds in the atmosphere that the Moon Calypso contains the CALIOP sensor that uses the 532 wavelengths. 1064 nm to measure the properties of light dispersed from particularly suspended minutes using LIDAR, a system very effective in detecting lightning in the atmosphere, as well as the ice crystals in it, the work of the moon Calypso is focused on sending pulses from Lidar laser light penetrates the atmosphere to the Earth's surface, where the moon collects information on the distribution of lightning and monitors the phenomenon of lightning in the atmosphere and is an important tool for monitoring and interpreting the effects of lightning in the climate system.

The U.S. GFS-GLOBAL-FORECAST SYSTEM data has been used to track the movement of deep air depression from the central Mediterranean towards the Eastern Mediterranean and Iraq, and the National Center for Environmental Predictions of nasa provides information on the amount of rainfall falling every six consecutive hours, where this data is analyzed and compared with moon images (CALIPSO, TRMM-LIS).

The study included three axes: first- the climatic characteristics of the study area, secondly, the causes and characteristics of lightning in Iraq, and thirdly, the effects of the frequency of lightning.

A- The climatic characteristics of the study area:

Recent practical experiments to study thunderstorms carried out by the world and touches 1992 that there are two types of thunderstorms, one strong and the other weak, and that differences in the effectiveness of lightning depend on these two types of storms (Saadi Abdul Razzaq Abdul Wahab, Karim Noor Mohsen, 2011, p. 87) which also depends on the underlying load energy available Convection Available Potential Energy as both give heavy rains but they are different in terms of the atmospheric instability that is formed by these thunderstorms and the world has shared and Williams with World Renault 1998 in finding the relationship between the change in the number of monthly lightning flashes (increase and decrease) with the change in the temperature of the higher wet engine as follows:

$$\text{Log (N)} = aT^p.w$$

Since N = the number of lightning times, a = the cut value (fixed value), T = the highest wet engine temperature, P = phase difference, a value based on longitude.

By applying the equation to the selected stations, the frequency of N is observed at Baghdad station by 22.2%, the Mosul station 20.2%, the humid station 16.3%, and the al-Nakhaib station 14.2%, and lightning is usually formed within the rammitos, which is also called the cloud of the

thunderstorm, It is noted that the most frequent type of lightning in Iraq is the lightning formed between the clouds and the earth (CG), despite the greater prevalence of lightning flashes within the clouds (IC) and between clouds (CC), but it is difficult to study due to the lack of physical points for observation and measurement at the cloud level, in addition to To the difficulty of predicting when and where lightning flashes occur in recent species, but in principle, observations and results obtained from lightning formed between the clouds and the earth can be generalized to other types of lightning (Saadi Abdul Razzaq Abdul Wahab, Karim Nur Mohsen, 2011, p. 102) .

The effectiveness of lightning N is known as the number of times lightning occurs frequently within a certain time period, the scientist Lawrence 2000 M conducted an experiment showing the relationship between rainfall and the effectiveness of lightning in the tropics by radar was heavily supported on the latitude, and as the study carried out by each of the geyser 2004 Klyushov calculates the effectiveness of lightning using the previous equation (Saadi Abdul Razzaq Abdul Wahab, Karim Nur Mohsen, 2011, p. 90), where the results showed that negative lightning flashes were attributed to 85.7% and flashes of telegram charged with charge. Positive 3.9%, and that 27.7% of lightning flashes sometimes come from sources other than telegram, so they corrected the value of lightning potency in the following equation:

$$0.86 \times K$$

$$N = \frac{0.86 \times K}{1 - 0.004} = 0.7K$$

$$1 - 0.004$$

Since N = the number of lightning times (lightning effectiveness), K = total observations, and by applying the equation to the selected stations in Iraq, the most frequent stations of lightning occurrence is Baghdad station, it has 21.2% and the mosul station 18.5% while the

station is 10.2%. 10. The United States has adopted a large budget to exploit this energy and in the United States because 30% of the world is lightning occurs. In Iraq, however, this issue is affected by the lack of thunderstorms and the lack of material and scientific support in this regard.

Most of the different weather conditions usually occur in the near-earth layer of the troposphere and these phenomena are monitored through stations scattered on the globe at specific times and at specific times, where geographical location has a key role in the distribution of different weather conditions as well as for the time periods of their occurrence. And its frequency, and from these weather conditions is the lightning phenomenon that is produced by thunderstorms, and that the effectiveness of this phenomenon varies due to atmospheric and other factors represented by geographical latitudes, as the latter plays an important role In the effectiveness of the phenomenon of lightning through the proximity and remoteness of the region from the equator, these factors are the temperature of the wet engine T_w , and the relative humidity $RH\%$ (Ruhi Lotfi Sharif, 1997, p. 85).

In this research, the focus was on the effectiveness of lightning in Iraq, its effectiveness and the impact of the above-mentioned weather factors on it, as well as the impact of the latitudes and four selected stations, including Mosul, Wet, Baghdad and Al-Nakhaib, and for the rain months of January, March, April, December, December 2020, the required data was obtained from the General Infrastructure and Seismic Monitoring Authority and through personal observations.

-The relationship between the number of times of monthly lightning (N) and the monthly rate of wet engine temperature (T_w).

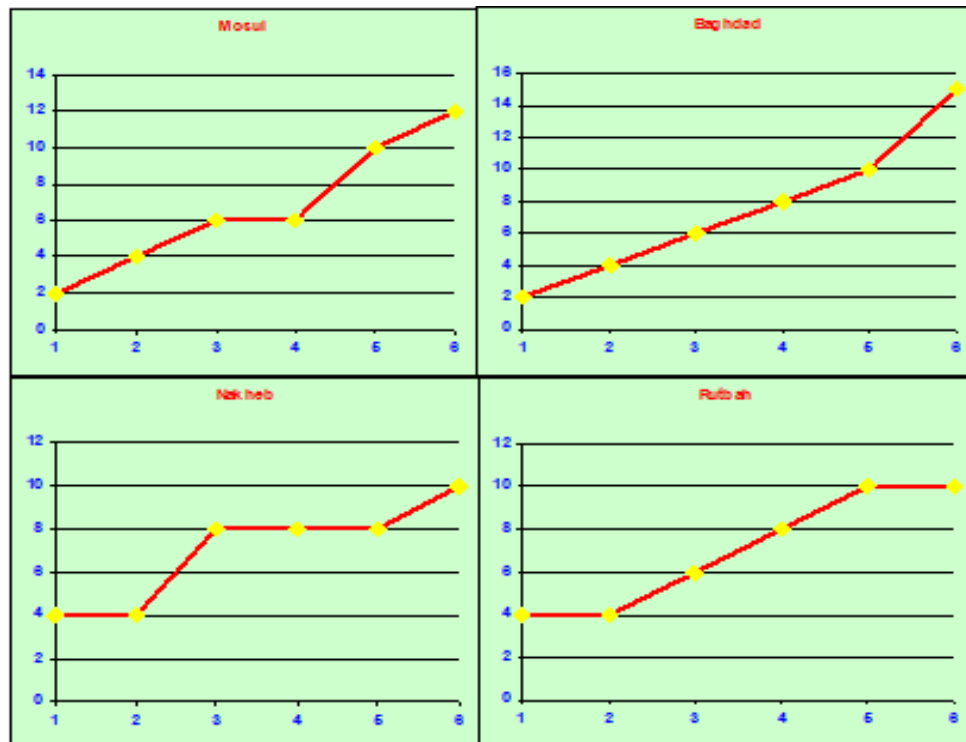
From tracking table data (2) and figure 1, the difference between the frequency of monthly lightning rates and temperatures can be identified as follows:

Table (2) monthly temperature and its relationship to the frequency of lightning in selected stations during the period 1975-2020.

General rate	Summer			Spring			Winter			Autumn			Station
	12	11	10	9	8	7	6	5	4	3	2	1	
23.2	33.9	34.2	32.7	29.0	17.6	17.2	13.0	7.5	11.9	17.9	25.1	30.4	Baghdad
25.0	37.3	37.5	36.1	31.3	18.5	16.5	13.8	9.9	12.5	18.4	26.2	33.0	Mosul
24.0	35.5	34.3	32.8	29.7	20.2	18.2	13.9	9.9	12.8	18.9	26.1	31.6	Rutbah
24.1	33.6	34.0	32.8	29.7	19.3	18.9	14.6	10.2	13.6	14.7	26.0	30.6	Nakheeb

Source: Based on: Iraqi General Authority for Air And Seismic Survey Data, Climate Department, Unpublished Data, Baghdad, 2020.

Fig (1) the relationship between the frequency of lightning times (N) and the monthly temperature rate (Tw).



Source: United Nations World Meteorological Organization (WMO), Global Climate Outlook, World Climate Report, Published Data, New York, 2020.

The results of the study showed the relationship between the number of times of the monthly lightning (N) and the monthly rate of temperature of the engine Wet (Tw and selected stations in Iraq for the days when lightning appeared, as shown in Figure 4) that All of these relationships take a reverse course, i.e. the value of (N) decreases by increasing the rate (Tw) and vice versa and the mother of the connector station shows the highest value of (N) estimated 19 times when the rate (Tw) was 9.9 m5 in January and that the lower value of (N) 4 times at the tw rate equal to 16.5 m5 in March, while at Baghdad station it was 14 times when the average (Tw) was 7.1 m5 in January, and the lowest value for (N) was in a month Nissan also reached 4 times when the average value of (Tw) was 17.6 m, and at al-Nakheeb station the value of (N) in

November 2 times when the average (Tw) was 14.7 m5 and the other rain months, the values (N) ranged from the values mentioned above to all selected stations in Iraq for the year 2020 (Nasrin Awad Abdal-Jassani, 2004, p. 3).

-The relationship between the number of times of monthly lightning (N and the monthly rate of relative humidity RH%):

The relationship between the number of times of the monthly lightning (N and the monthly rate of relative humidity (RH% and the selected stations in Iraq for the days in which the lightning appeared) was studied and clarified, showing from the forms (3-8) that all these relationships take a direct path, i.e. the value increases) (N increases by increasing the value) The rate (RH% and figure 4) shows the relationship in the mosul station we find that the highest value for (N) amounted to 19 times when the rate (RH% reached 77.2% in January and the lowest value for (N) was 4 times when the rate (RH% was 71.2% in April.

Table (3) monthly relative humidity rates and their relationship to the frequency of lightning at selected stations during 1975-2020.

General rate	Summer			Spring			Winter			Autumn			Station
	12	11	10	9	8	7	6	5	4	3	2	1	
44.1	26.9	25.8	26.4	33.9	65.1	51.6	59.4	76.2	70.4	58.9	35.5	32.9	Baghdad
52.7	26.9	26.6	28.8	44.5	71.2	68.6	75.5	77.2	79.6	65.7	47.8	32.8	Mosul
46.7	28.8	29.7	31.7	35.8	76.1	54.8	62.5	78.2	69.9	57.6	44.7	33.6	Rutbah
41.2	27.8	28.5	32.2	33.2	71.2	55.2	60.2	74.2	60.2	55.2	42.2	22.2	Nakheeb

Source: Based on: Iraqi General Authority for Air and Seismic Survey Data, Climate Department, Unpublished Data, Baghdad, 2020.

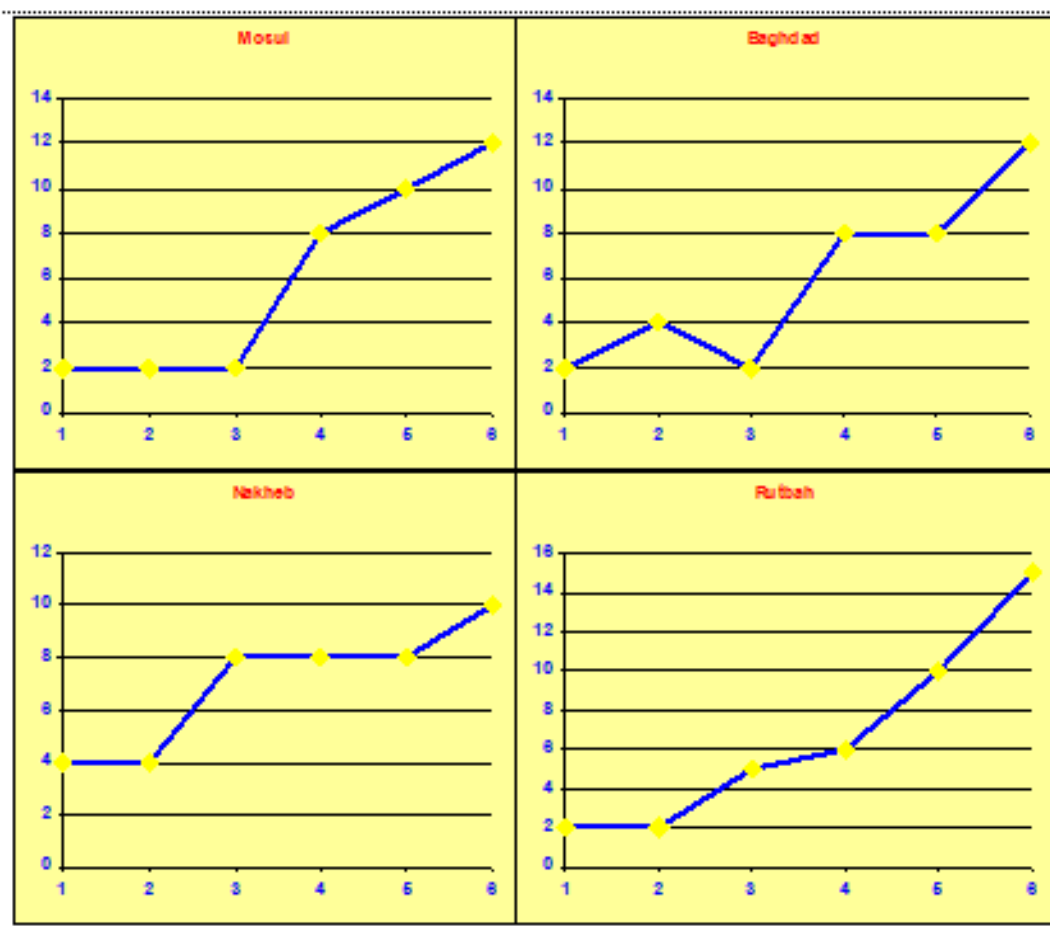
In The City of Rutbah, figure 2 shows the relationship, we find in January that the value of (N) was 15 times when the rate (RH% was 78.2% and its lowest value for (N) was 4 times when the rate (RH% was 76.1% in April) In Baghdad, figure 4 shows that the value of N was 14 times

higher when the RH% rate was 76.2% and its lowest value for (N) was 4 times when the RATE (RH% was 65.1%, and in the station of al-Nakheh that the value of (N reached 10 times when the rate (RH% was 74.2% and its lowest value for (N) was 2 times when the rate (RH% was 66.5%, the rain months the values (N) ranged between the above mentioned and all selected stations from Iraq in 2020 (Nasrin Awad Abdoun al-Jassani, 2004, p. 36).

The variation in the values of lightning effectiveness in the number of times of lightning (N) in Iraq is the result of the occurrence of the selected stations on different latitudes we find that the highest value of (N) in the city of Mosul was 18 times which is located at the latitude 30

31 5 The highest value for (N) was 10 times higher at the al-Nakheh station, which is located at a latitude of 37° 34', and this is due to the potential of the available load (CAPE plays a key role and is important for the effectiveness of Lightning is the driving force for the growth and development of the thunderstorm, which produces lightning, and that this energy increases in areas near the equator and decreases as we move away from it, in addition to the large number of water bodies in the southern regions, which is the highest in the central and northern regions, represented by marshes, rivers and the Arabian Gulf, which help to increase relative humidity.

Fig (2) the relationship between the frequency of lightning times (N) and the monthly rate of relative humidity (Tw).



Source: United Nations World Meteorological Organization (WMO), Global Climate Outlook, World Climate Report, Published Data, New York, 2020.

B- The causes and characteristics of lightning in Iraq:

1- Causes of lightning:

Lightning does not occur in any clouds, but there are specific clouds - scientists call it thunder clouds, which is the right environment for lightning, and there may be one or several clouds, which is mostly, and these clouds are usually filled with electric fields because of the wind that markets particles - water vapor and pushes it up, causing these particles to come into contact with each other, which generates these electric fields. At the same time, negative and positive charges are collected in the cloud, and positive charges often rise up and negative remains at the bottom of the cloud from the near-Earth side Jiao E Wang and feng Jun Jun, 2007, P. 200).

Studies have also shown that there is a difference in the voltage between the earth's surface and the ionosphere of 500,000 volts, and this difference is produced because of the global distribution of thunderstorms, which is necessary to maintain this difference. In water molecules, this bond is an important source of negative and positive charges that spread in cloud and air parts and in order to take a broader idea of the lightning that occurs on Earth, we reflect on some recent statistics on lightning flashes on the earth's surface.

Every second there are 100 flashes of lightning in the world, and every day there are 8.6 million flashes of lightning and in one year more than 20 million lightning flashes occur in the United States of America, each lightning flash generates electrical tension ranging from 100 million to 1,000 million volts per flash of lightning that produces an electric current of 10,000 to 200,000 amps if not limited to thunderstorms, but some lightning flashes have been seen in large hurricanes, blizzards and blizzards. The lightning spark can extend to more than ten kilometers horizontally, and accurate statistics indicate that

lightning killed 3,696 people in the United States of America between 1959 and 2003, i.e. in 45 years (Nasreen Awad Abdoun al-Jassani, 2004, p. 26).

2- Lightning stages:

-The hypothesis of electroconvany induction:

According to the electrocution induction hypothesis, shipping is carried out independently of a process that is not yet known. The process of separating the shipping seems to require a strong vertical pull that carries water droplets up, then there is a strong cooling of the droplets between -10-20 °C, these conflict with ice crystals, to be a fine ice-water mixture called soft cold, the collisions produce low-number positive charges that quickly transmit to ice crystals, and few negative charges are shipped to the cold, and then the process of taking the clouds of the lightest crystals up, making the cloud in the top the accumulation of gravity charges increasingly, causing, and then causing the cloud of gravity charges, causing increasingly positive charges, and then taking the cloud of the lightest crystals up, making the cloud in the top the accumulation of gravity charges increasingly, causing the Keep the heavier, negative-charged cold in the middle and middle of the cloud, increasing negative shipping of the cold. The process of electrical separation and accumulation continues until the electric latency phase is sufficient to start emptying lightning from the charges, which appears when the positive and negative charge distributions are strong enough to be an electrical field.

-Mechanical polarization hypothesis:

In any way that separates shipments, the mechanical hypothesis is still being researched. Another hypothesis is mechanical polarization, which has two components: falling droplets for rain and snow become polarized as they fall into the earth's natural field, and opposing snow particles become charged by electroconial induction.

When the linear guides reach the ground, the presence of the opposite charges on the ground of the electric field reinforces the stronger electric field on the ground connected to the material

above the base of the thunder cloud, such as trees and tall buildings, if the electric field is strong enough, the discharge is called (the positive mutated tape can develop from these points, and as the fields increase, the wave mutated tape can be extracted to become the hottest, the current top guides that eventually connect with the linear guide of the bearish cloud, and from the Many of the moving tapes are likely to evolve with the material at the same time, retaining only one with the guide to form the main discharge path, very clear photographs have been taken showing the unconnected straps and when a channel of ionized air between the earth and the cloud is created this channel becomes a path of less resistance and allows for much larger currents to spread from the ground to return again to the guide at the top at the cloud and this is the reverse thunderbolt which is the most illuminating and the most striking part of the lightning discharge .

-Discharge:

When the electronic field is strong enough, electrical discharge (for lightning bolt) occurs during clouds or between clouds and ground. During tasers, successive parts of the air become a conductible discharge channel when electrons and positive ions in the air particles are pulled from each other and forced to flow in the opposite direction, and electrical discharge increases the heat of the discharge channel increasingly, causing the air to expand rapidly and produce a shock wave you hear: thunder, twisting lightning and gradual dissipation of thunder due to delayed sound arrival from different places along the thunderbolt .

3- Types of lightning:

- Lightning cloud - land:

It is one of the most common and important species, lightning resulting from the confluence of two opposite charges between the cloud and the Earth, the cloud is often of a negative charge at the near-Earth, while the earth's surface is positively charged (Nasreen Awad Abdoun al-Jassani, 2004, p. 39).

- Lightning between a cloud - cloud:

It is what happens between a cloud and another cloud, and since the medium in which the clouds gather is filled with electric fields, the probability of contact with the opposite charges and their met is very high and therefore the lightning that occurs between the clouds represents three quarters of the flashes of lightning, which, as we said, is estimated at 100 flashes per second around the world.

-Lightning cloud -air:

The cloud is loaded with an electrical charge, and the surrounding air from one side carries an opposite charge and this type of lightning occurs when the amount of electrical charges in the cloud and in the air is sufficient to launch a lightning beam and is considered to be a low-impact species, although clear images of the lightning between the clouds and the surrounding air have recently been taken (Nasreen Awad Abdoun al-Jassani, 2004, p. 40) .

- Lightning cloud - upper atmospheres:

Another type is lightning between the clouds and the upper atmosphere, and this lightning occurs between the upper layers of the debris clouds and the ionosphere, which contains an electrical field permanently, and such lightning has been seen by satellite-mounted cameras, knowing that all types of lightning occur as a result of the confluence of opposing charges Jiao E Wang and Jun Jun Feng, 2007, P. 210).

There are many other types of mention, including what happens within the cloud itself, and if we know that any cloud carries a positive charge at one end, it must carry a negative charge at the opposite end, and so in the circumstances of thunderstorms contact occurs and achieves lightning that illuminates the Earth but does not reach it as well there is lightning occurs in the summer months and again in winter, and there is a lightning ball, lightning sheet and many others, as scientists have observed lightning on some like the planets Jupiter 100 times more than those strikes on the ground.

-Intermittent lightning :

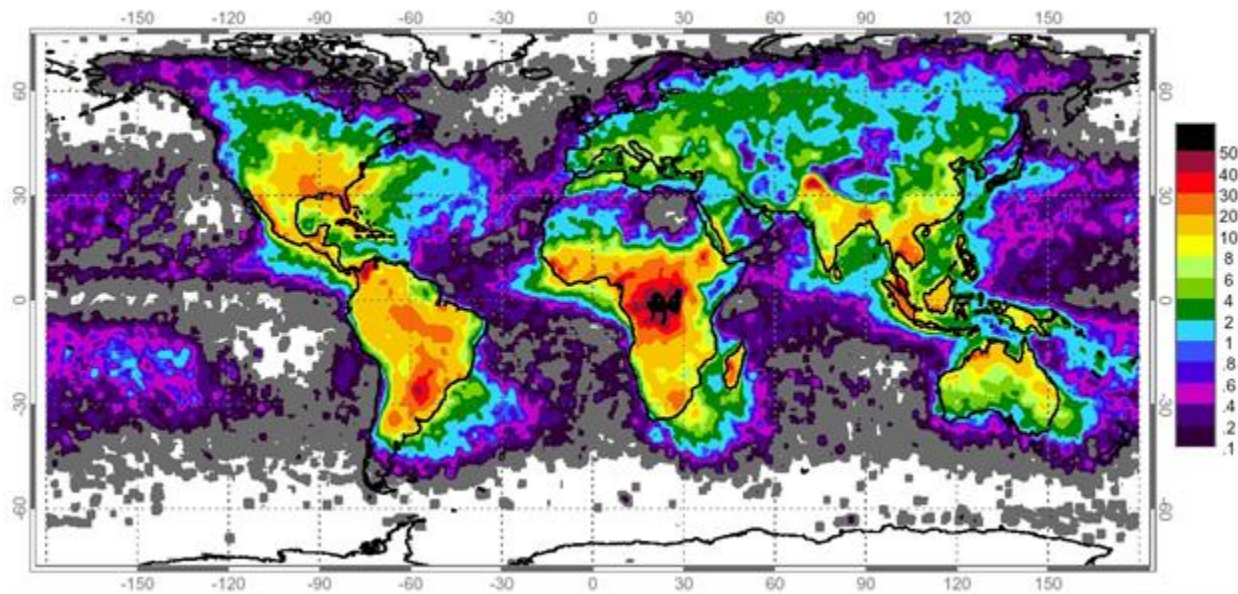
It is a lightning shock of a type (of the earth's clouds) that lasts for a short period of time, which

appears individually with a bright flash and often has branches.

- Branching lightning :

It is a name not for the official use of lightning type (of the earth's clouds) which show branches called "percussion lightning.

Map (2) Geographical distribution of the frequency of the phenomenon of lightning in the world.



Source: Thematic Mapper TM satellite data for The Land sat and its source <http://glovis.usgs.gov>.

-Paper lightning: is the unofficial name of lightning of the type of cloud cloud which depicts the spread of brightness of the cloud surface, which is created due to the concealment of the real discharge path .

- Thermal lightning: It occurs when it is very difficult to hear thunder happening because lightning generates a very distant sound and dissipates before the observer arrives.

-Dry lightning: This term is used in the United States for lightning, which occurs without sediment on the surface. This type is the first cause of forest fires, and the sedimentary clouds produce lightning for the same reason produced by black clouds, and this type occurs when the upper atmosphere layers of the atmosphere are colder and the surface is hotter to high degrees due to forest fires or volcanoes, thermal transport

will occur and then generate heat transfer lightning for this reason, the fire generates dry lightning through the developments of drier thunderstorms which in turn cause more (fires Of Jiao E Wang and Jun Jun , 2007, P. 2).

- Rocket lightning: a type of cloud discharge, generally horizontal and at the base of the cloud, with the emergence of a clear channel of evolution through the air, quickly and can be seen, often intermittently.

4- Lightning properties:

Time: The formation of lightning guide channels and secondary discharges require about 10 milliseconds (0.01 seconds); while the main discharge takes place in only 30 microseconds (0.00003 seconds). An average new discharge requires a interval of 30-50 microseconds (0.03 - 0.05 seconds) .

Speed: On average, the speed of lightning ranges from ten to one-third of the speed of light, with an average frequency of strike currents of about 100,000 km/s, as researchers at the University of

Florida found that the final velocities of one-dimensional lightning flashes of a total of 10 flashes range from 1.5×10^5 to 1.4×10^6 m/th at an average of 4.4×10^5 m/th, which the naked eye can follow to some extent at the stage of forming the lightning commander, at speeds of up to 300 kilometers per second, equivalent to one in a thousand light speeds (Ruhi Lotfi Sharif, 1997, p. 96).

Polarity: The lightning formed from the clouds to the Earth can be either negative or positive. In negative lightning, the negative electrical charge travels to the Earth in the form of electrons along the lightning channel; Upward from the surface of the earth along the lightning channel, leaving behind a positive charge on the surface of the earth, but most of the observed lightning is negatively charged, the positive-charge lightning is less common, representing less than 5% of all lightning strikes and lightning strikes, During positive prognosis, large amounts of ultra-low frequency radio waves (ELF) and ultra-low frequency (VLF) are formed during positive provoking.

Length: The length of lightning varies according to its type, the average length of negative lightning is 1-2 km in the tropics; The United States, with a horizontal length of 321 km (Ruhi Lotfi Al-Sharif, 1997, p. 93).

Power current strength: The average power current strength of a strike of 20-30 kAh 30,000 ATo for a typical lightning flash with a negative charge from the clouds to the ground, may be followed by large discharges of up to 40 times; lightning can then be considered a continuous current, a combination of continuous current and short-term rotation, and a lightning strike negatively affects an electrical current of about 30,000 amps, which may be significantly reduced by 30,000 amps. 2007, P. 202) Transporting about 15 coulombs of electrical charge; about 500 joules of energy, in the case of strong strikes of negative lightning, can reach 120,000 amps and 350 coulombs in return, the force of lightning positive On average, it is about twice the value of the supercurrent of a typical lysering flash, in which the maximum current intensity can reach about 400,000 amps and a charge of several hundred coulombs. From the intensity of

the current is usually followed by other relatively long-lasting currents, a phenomenon not seen in flashes of negative lightning.

Magnetism: It is physically known that electrical charging movement generates a magnetic field; 2007, P. 205) which provides tracks with less resistance than those on the surface. One theory is that the magnet stone was formed by this phenomenon.

C- Effects of the frequency of lightning:

Lightning or lightning causes a lot of damage to buildings and electrical equipment, so we find that buildings are usually equipped with lightning blockers, which are means of unloading the huge electrical charge resulting from lightning, and since lightning is a light it travels at the speed of light, i.e. the limits of three hundred thousand kilometers per second, and this great speed is suitable for the expression of the word (hijacks), which refers to surprise, surprise and speed.

Even the effects of flashing flashes reach astronauts, it has been shown that astronauts have problems with their vision and become blurry after a certain number of space flights, due to exposure to direct sunlight and cosmic radiation, most lightning injuries are caused by the effect of electric spark, heat or mechanical energy accompanying lightning strike, and the strikes mainly affect the nerve of the body and the lungs and there are effects on sight may lead to permanent blinding, and there are also disturbances Heart and Mental Disorders (Saadi Abdul Razzaq Abdul Wahab, Karim Nour Mohsen, 2011, p. 88).

It is recommended when lightning occurs to avoid standing at high altitudes and near metal towers or near a water source such as a swimming pool, lake or near a tree, because these will be easy targets in front of the spark of lightning, and lightning can be avoided by installing a metal rod at the top of the building connected to the ground (anti-lightning) where electricity leaks through it to the ground, as it is recommended to avoid using mobile phone or water or touching metal objects, because these objects are considered a good conductor of electricity and are therefore preferred when lightning is the preferred to empty its charge

Through it. Lightning or lightning causes a lot of damage to buildings and electrical equipment, so we find that buildings are usually equipped with lightning blockers, which are means of unloading the huge electrical charge resulting from lightning, and since lightning is a light it travels at the speed of light, i.e. the limits of three hundred thousand kilometers per second, and this great speed is suitable for the expression of the word (hijacks), which refers to surprise, surprise and speed.

- The occurrence of lightning: When lightning strikes a very large voltage difference and the flash then takes a spherical shape near the center of the cloud of the thunderstorm, and then when it approaches the ground becomes conical shape, the flash of the thunderbolt varies in terms of area and depth depending on the intensity of the electrical discharge, objects that are tapered are subjected to very high temperatures in addition to huge amounts of electrical forces, which may lead to their coalicness, when the thunderbolt on the heat tree is sufficient to vaporize the sap, leading to a sudden expansion of the channels due to The government's work on the "Women's And Women's Day" is a priority for the Government of The United States of The United States of The United States of The United States P. 215, and then the operation ends in short. When lightning strikes the sandy land, the sand surrounding the plasma channel can melt, forming a shape that resembles hollow prophets, called lightning (single lightning) or called lightning sticks, lightning plays an important role in the nitrogen cycle as it does not oxen bi-atom nitrogen molecules in the air into nitrogen oxides, which land with precipitation to the soil, to later turn into ammonia, which helps to oxify nitrogen molecules in the air to nitrogen oxides, which land with precipitation to the soil, to later turn into ammonia, which helps to oxiona am, which helps to oxidize the nitrogen molecules in the air to nitrogen oxides, which descend with precipitation to the soil, to later turn into ammonia, which helps to oxia um, which helps to oxiona bi-atom molecules in the air to nitrogen oxides, which descend with precipitation to the soil, to later turn to amona um, which helps to oxielize the nitrogen molecules in the air into

nitrogen oxides, which are descended into the soil, which later becomes the Soil fertilization is naturally called nitrogen stabilization process, which would change some flights or postpone some in case of any risk of lightning.

-The generation of electromagnetic pulses: Rapidly changing currents also form electromagnetic pulses that lead to external radiation from the ionchannel, a phenomenon observed in all types of electrical discharge, weakening the radioelectromagnetic pulse quickly when moving away from the center of its origin; Electrical protection against hypervoltage (hypervoltage) in preventing the impact of lightning, but it goes beyond the need to connect all electrically connected channels in the aircraft (e.g. electrical extensions and antennas in addition to gas, water and telephone extensions) jointly with the voltage equation device. Special devices, known as flow protectors, are also used to protect by connecting them in parallel with those wires, because flow protectors have the ability to change their physical properties when detecting irregular temporary currents caused by lightning flashes, so that those currents pass into a subject, protecting the devices from damage .

- The formation of thunder: Since the charge of electrical discharge of lightning flashes warms the air excessively to high temperatures along the plasma discharge channel in a short period; Long lightning, therefore, reaches the listener at slightly different times and complicates the perception of the acoustic properties of thunder with additional factors such as irregular branching and branching of the lightning channel, in addition to the echo from the adjacent terrain, as well as the possibility of repeated strikes (as Yasin al-Ameri, 2014, p. 111).

The speed of light is about 300,000 kilometers per second, while the sound speed is about 343 meters per second, so theoretically an observer can estimate the distance to the position of the thunderbolt by recording the time between the visible lightning flash and the sound of thunder coming from it. If the interval time is one second, the distance is about 343 meters; while if the interval time is 3 seconds, the distance is estimated at about one kilometer. At the point of the strike, recording the interval is difficult, so

that it realizes that the process occurs without a interval .

D- The impact of lightning on air traffic:

By studying spatial analysis of air traffic inside Iraq and by comparing the number of flights both domestic and external air traffic, the decrease in air traffic was observed during the months of frequency of lightning, especially during the winter months, where airlines reduce their flights in anticipation of any conditions that may occur in air traffic, where the percentage of operational capacity during the winter reached about 20.0% in the summer reached 30.0%, while it increased during the spring 35.0% and in the autumn 15.0% climate and geography scientists have concluded that aircraft are not affected by lightning and weather fluctuations; 98) However, some types of clouds have an impact but are not dangerous on the plane's trajectory, where the aircraft provide weather radars that detect clouds and weather phenomena surrounding the aircraft, and determine the strength of the cloud or the weather phenomenon and its impact on the aircraft with light indicators of the captain of the plane ranging from green, yellow and red to violet It has procedures known how to avoid the pilot clouds or weather phenomena, pointing out that the sky can be cloudy and has lightning and lightning but the plane's trajectory to the airport is clear and free of clouds does not affect and the plane can land or take off from the airport safely, in addition to the minimum limits at airports in take-off and landing is the range of horizontal visibility within the range of 800 meters and the height of the cloud base and its height from the ground within 200 feet.

E- The relationship of clouds to the frequency of the phenomenon of lightning:

The phenomenon of lightning is caused by electrical discharges in the form of a spark when there is a surplus of negative or positive electrical charges within a certain area of the cloud sufficient to break the air resistance to the passage of the electric current, usually associated with the sandoral or thunderstorm, but it may also occur in class clouds Positioned in the form of large horizontal layers, in sand storms and snowstorms, and in a few cases lightning may be

associated with dust and gases emitted when volcanoes erupt (Saadi Abdul Razzaq Abdul Wahab, Karim Nur Mohsen, 2011, p. 102).

Electrical charging within the clouds of thunderstorms is produced by the presence of small water particles or by the flow of ice crystals up and down the air and collide with each other depending on atmospheric humidity, resulting in the transfer of negatively charged electrons from one ice crystal to another and the separation of negative charges from the positive so that the upper part of the cloud is charged with a positive charge, while the cloud base becomes charged with a negative charge.

As the power of the electric field in the area of the presence of the thunderstorm cloud begins, the electric collapse of the air begins and a column of air loaded with charges, known as the gradual leader, begins to spread to the ground in successive steps of approximately 50 meters long, and as the movement and growth of the gradual leader continues to ionize the air and carries an electrical charge along its path, and as it approaches the ground an electrical voltage difference is formed between the end of the graduated commander and the ground, resulting in the release of electrical charges to the ground that intercept the path of the graduated commander before reaching the ground (turn Yasin Al-Ameri, 2014, p. 122).

Conclusions

1- I have studied the relationship between the number of times of the monthly lightning (N and the monthly rate of relative humidity) (RH% and the stations selected in Iraq for the days when lightning appeared that all these relationships take a direct route, i.e. the value of the (N) increases by increasing the value of The highest value for N is 19 times higher when rh% was 77.2% in January and the lowest value for N was 4 times higher when rh% was 71.2% in April.

2- The study showed the extent of variation in the values of lightning effectiveness the number of times of the (N) lightning in Iraq is the result of the fall of the selected stations on different latitudes we find that the highest value for (N) in

the city of Mosul was 18 times located at the latitude 30 31 5 while the highest value for (N) was 10 times higher at the al-Nakhaib station, which is located at a latitude of 57 34.°

3- Lightning does not occur in any clouds, but there are specific clouds - scientists call it thunder clouds, which is the right environment for lightning to occur, and there may be one or several clouds, which is most likely.

4- Every second there are 100 flashes of lightning in the world, and every day there are 8.6 million flashes of lightning and in one year more than 20 million flashes of lightning occur in the United States of America.

5- The speed of lightning ranged from 10 to one-third of the speed of light, with an average frequency of strike currents of about 100,000 km/s, with researchers at the University of Florida finding that the final velocities of single-dimensional lightning flashes of a total of 10 flashes ranged from 1.5×10^5 to 1.4×10^6 m/th with an average of 4.4×10^5 m/th.

6- Lightning formed from the clouds to the ground can be either negative or positive. In negative lightning, the negative electrical charge travels to the ground in the form of electrons along the lightning channel;

7- The length of lightning varies according to its type, with an average length of negative lightning of 1-2 km in the tropics; in the tropics, it is 2-3 km long, while the lightning positive is as long as 10 km.

8- The average power current intensity of the strike is 20-30 kAh 30,000 a.m. for a typical lightning flash with a negative charge from the clouds to the ground, some of which may be largely discharged, up to about 40 times;

9- With lightning, a very large voltage difference is formed and the flash then takes a spherical shape near the center of the thunderstorm cloud, and then when it approaches the ground it becomes conical, the flash of the thunderbolt varies in terms of area and depth depending on the intensity of the electrical discharge.

10- The electrical discharge charge for lightning flashes overheats the air to high temperatures

along the plasma discharge channel in a short period of time.

Recommendations

1- The necessity of encouraging scientific research programs to study such phenomena that have a major impact on a person's life and their recurrence that may have negative effects on his health and life.

2- Paying attention to establishing monitoring centers for lightning and all cosmic phenomena to benefit from them in encouraging scientific research fields.

3- Carry out the necessary periodic maintenance for electrical installations and water networks, as well as follow-up media channels that display such phenomena and benefit from them.

4- The necessity of establishing a specialized treaty to study such important phenomena that have a major role in human life and the surrounding environment.

5 - Pay attention to tracking areas where lightning occurs, which may set fires, so it is necessary to prepare appropriate extinguishing means and equipment.

Sources and References

- [1] The role of Yasin Al-Ameri, using remote sensing techniques to analyze the rain phenomenon of 25/12/2012 over Iraq and its relationship to lightning strikes, *The Journal of Al-Mustansiriyah Sciences*, Volume 25, Issue 3, 2014.
- [2] Jassim Mohammed al-Khalaf, lectures in Iraq's natural and economic geography, Institute of Arab Studies, Arab League, Dar al-Knowledge, Cairo, 2000.
- [3] Saadi Abdul Razzaq Abdul Wahab, Karim Nur Mohsen, The Impact of Weather Factors on the Effectiveness of Lightning in Iraq, *Iraqi Journal of Natural Sciences*, Faculty of Science, University of Al-Masriniya, Issue 22, 2011.

- [4] Saeed Ahmed Abdo, Development of Air Transport in the United Arab Emirates, Journal of the Faculty of Arts, Issue, Cairo, 1988.
- [5] Saladin Shami, Transport Geography Study, Publisher of Knowledge, I Bla, Alexandria, 1993.
- [6] Ruhi Lotfi Al-Sharif, Principles of Land, Air, Sea and Pipe Transport, National Library, Amman, 1997.
- [7] Mohammed Khamis Al-Zuka, Geography of Transport and Commerce, House of Knowledge University, Alexandria, 2008.
- [8] Nasreen Awad Abdoun Al-Jassani, Development of Religious Tourism in Najaf Al-Ashraf, Journal of Geographical Research, Girls College, Kufa University, Iraq, 2004.
- [9] Elanthan, Dan; Thomas W.Lin; S.Mark Young, 1996," Benchmarking and Management Accounting : A Framework of research.
- [10] Iraq Ministry of Planning, (Development Board), Dioxides associates consulting Engineers, (the future of najaf and kufa), .1958.
- [11] Jiao E Wang and feng Jun Jun , china's Air passenger transport : AN Analysis of Recent trends, Eurasian Geography and Economics, 48, no. 4, 2007.
- [12] ROBERT, H- FRANCISX, M. Planning and Design of Airports, Fouts, Fourth Edition, California, U.S.A, 1994.
- [13] Airports and their Environment, CLM/systems, for the U.s. Department of Transportation, September, 1982.
- [14] Al-Khanaifswy, A. N. (2020). A CRITICAL DISCOURSE ANALYSIS OF INTENTIONALITY STANDARD IN JOE BIDEN'S INAUGURAL SPEECH. International Journal of Development in Social Sciences and Humanities. Vol. 10, Jul-Dec.
- [15] Cooray, Vernon, 2003: The Lightning Flash, the Institution of Engineering and Technology Press, London, United Kingdom.
- [16] Renno N., and S. A. Rutledge, 1991: A radar and electrical study of tropical "Hot Towers", J. Atmos. Sci., 49.
- [17] Al Khanaifswy, A. N. (2022). A PRAGMATIC STUDY OF PRESUPPOSITION IN IMAM ALI'S SOME SELECTED TRANSLATED SAYINGS IN 'NAHJUL BALAGHA', Eastern Journal of Languages, Linguistics and Literatures (EJLLL). Vol.3, No.4.
- [18] Al Khanaifswy, A. N. (2017). A STYLISTIC STUDY OF EUPHEMISM IN JOHN DONNE'S SELECTED POEMS. The Islamic University College Journal, 35-38.
- [19] Al Khanaifswy, A. N. (2019). A SOCIO-PRAGMATIC STUDY OF OFFER STRATEGIES MANIPULATED BY IRAQI DIALECT SPEAKERS. The Islamic college university journal. Vol (8), No. (II).
- [20] Al-Khanaifswy, A. N. (2016). Investigating Iraqi EFL learners' use of the speech act of agreement. Adab Al-Kufa,1(27), 11-30.
- [21] Al-Khanaifswy, A. N. (2019). DISCOURSE ANALYSIS OF PRESIDENT GEORGE W. BUSH'S SPEECH AT THE ISLAM CENTRE IN WASHINGTON. International Journal of Research in Social Sciences and Humanities. Vol. No. 9, Issue No. III, Jul-Sep.
- [22] Al-Khanaifswy, A. N. (2021). [A Pragmatic-Dialectical Study of David Hare's 'Stuff Happens'](#). Zien Journal of Social Sciences and Humanities. Vol.2, 136-186.
- [23] Al-Khanaifswy, A. N. (2021). A Stylistic Study of Compliment Speech Act in Shakespeare's Julius Caesar. International Journal of Advancement in Social Science and Humanity. Vol.12.
- [24] Al-Khanaifswy, A. N. (2020). A CRITICAL DISCOURSE ANALYSIS OF INTENTIONALITY STANDARD IN JOE BIDEN'S INAUGURAL SPEECH. International Journal of Development in Social Sciences and Humanities. Vol. 10, Jul-Dec.