NEW INTERPRETATION OF THE EARTH'S MAGNETIC FIELD EFFECTS' ON LIFE

¹Basim Rushdi Hijab* and ²Moutaz A. Al- Dabbas

¹Department of Geology, College of Science, University of Baghdad, Baghdad, Iraq (Retired)

²Department of Geology, College of Science, University of Baghdad, Baghdad, Iraq

*E-mail brhijab@yahoo.com

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ABSTRACT

The relationships of the Earth's magnetic field intensity and time (the past 320 years) for many locations around the world are obtained, based on the IGRF-13 mathematical model. The results showed that each location on the earth surface has its magnetic intensity relation with time that reflects local variations. The sudden changes (magnetic anomalies) in the Earth's magnetic field with time are natural phenomena, which are different from place to another. These magnetic anomalies are investigated for possible relationship to the historical records of the influenza pandemic outbreaks. The results showed clear congruences between the Earth's magnetic anomalies and influenza outbreaks times. The congruences become clearer when comparing the highest magnetic anomaly intensity and the first outbreak location of the influenza pandemic. This is true for the recorded historical data since 1890 AD. It is not known how the changes in Earth's magnetic field affect the virus's outbreaks or evolution, but there is a clear relation that needs detailed studies.

Keywords: Earth's magnetic; Pandemic influenza; Life evolution; Outbreak

INTRODUCTION

Recently the relationship between the Earth's magnetic field, climate and life has become an interesting subject for many researchers. Positive relations were found for the Earth's magnetic field variations and the climate changes (Wollin et al., 1971; Dergachev et al., 2012 and Campuzno et al., 2018). A positive relation was also found for the biological life. Jiangmen and Wickramasinghe (2018) in their study found a good relation between Earth's magnetic field change and Zika virus outbreak. While, Channel and Vigliotti (2019) concluded that a clear relation is existed between changing of Earth's magnetic field and the Late Quaternary evolution of humans and large mammals.

On the earth surface, the distribution of the Earth's magnetic field is not entirely associated with the geographical latitude and longitude. It is continuously changing depending on the self-exciting dynamo of the magnetic field in the outer core of the Earth's interior (Dipole Field), and the secondary magnetic field that is generated at the Core-Mantle boundary (Non-Dipole Field). The Core-Mantle boundary conditions are changing with time for many reasons (Raymond and Thorne, 2005). These two generators cause the magnetic field to change from one place to another on the surface of the earth as well as change with time. The researchers, for several decades, have prepared a mathematical model that describes the geomagnetic field on the surface of the earth for five years. It is the International Geomagnetic Reference Field (IGRF). The aim of this paper is to investigate the geomagnetic intensity variations for the past 430 years for locations all over the world, and taking into consideration the historical human influenza outbreaks as time and place. The possible relationship of Corona COVID-19 virus outbreak to Earth's magnetic recent changes is considered in this study too.

MATERIALS AND METHODS

Recently, researchers are able to improve up the mathematical model that describes the terrestrial magnetic field for the 430 past years. It is the IGRF 13th generation (IGRF-13, 2020), which was endorsed by International Association of Geomagnetism and Aeronomy (IAGA) at the beginning of year 2020. The NOAA web site (National Center of Environmental Information) makes the IGRF-13 available and easy used calculator for the world researchers. According to this model (IGRF-13, 2020) the magnetic field with all its components can be obtained for any location on the surface of the earth and from 1590 AD to 2024 AD with very good accuracy for the past one hundred and twenty years and well accepted for previous periods depending on the availability of past marine navigation data and the historical records of the geomagnetic secular variation. The influenza pandemic history is well recorded in many references. The collected human influenza pandemic historical data (Cartwright and Biddiss 2014; History, 2020) are shown in Table 1. It seems that there are nine Influenza pandemic/epidemic outbreaks recorded in human past life, which started at 1730 AD.

RESULTS AND DISCUSSIONS

The Earth's Magnetic Field History Since 1590 AD

According to the mathematical model of the Earth's magnetic field (IGRF-13, 2020), the magnetic intensity can be calculated at any location of the earth's surface for the past 430 years. The curves of the magnetic field intensity changes for the period from 1590 to 2020 AD are established for chosen locations around the world (Fig. 1).

Table 1. Influenza Pandemic Historical data (Cartwright and Biddiss, (2014); History (2020); see also CDC org. and Wikipedia)

Date in years (AD)	Disease Type	Notes	Location
1729	Pandemic, Influenza	Influenza pandemic originates in Russia, spreading westwards in expanding waves to embrace all Europe within six months. High death rates are reported.	Russia
1780–1782	Epidemic, influenza	Influenza pandemic originates in Southeast Asia and spreads to Russia and eastward into Europe.	Southeast Asia
1830–1833	Pandemic, influenza	Influenza pandemic breaks out in the winter of 1830 in China, further spreading southwards by sea to reach the Philippines, India and Indonesia and across Russia into Europe and America. Attack rate is estimated at 20–25% of the population.	China
1889–1892	Pandemic, Influenza	1889-1890 flu pandemic. Dubbed the "Russian pandemic". Attack rates are reported in 408 geographic entities from 14 European countries and in the United States. Rapidly spreading, the pandemic would take only 4 months to circumnavigate the planet.	Russia
1917-1920	Pandemic Influenza	The Spanish flu (H1N1) pandemic is considered one of the deadliest natural disasters ever, infecting an estimated 500 million people across the globe and claiming between 50 and 100 million lives.	France
1957	Pandemic, Influenza	New, virulent influenza A virus subtype H2N2 breaks out in Guizhou (China)). It would turn into pandemic (category 2) and kill 1 to 4 million people. It is considered the second major influenza pandemic to occur in the 20th century, after the Spanish flu.	China
1968-1969	Pandemic flu	Hong Kong flu (H3N2) pandemic breaks out, caused by a virus that has been “updated” from the previously circulating virus by reassortment of avian genes.	Hong Kong
2003	Epidemic, SARS	First identified in 2003 after several months of cases, Severe Acute Respiratory Syndrome is believed to have possibly started with bats, spread to cats and then to humans in China, followed by 26 other countries, infecting 8,096 people, with 774 deaths	China
2013	Epidemic	Avian influenza A virus subtype H7N9 strain, a low pathogenic AI virus, breaks out in China. As of April 11, 2014, the outbreak's overall total would reach 419 people, including 7 in Hong Kong, with the unofficial death toll at 127.	China, Vietnam

It can be observed that there are groups of these curves, which are related to the regional geographic locations. The curves clearly show that the Earth's surface is subjected to a varying magnetic intensity from one location to another, and that any location on the Earth's surface is

subject to a change in the Earth's magnetic intensity with time. Accordingly, the Earth's magnetic environment is different from one place to another and it is also changing with time.

Fig. 1. The magnetic intensity curves for the time period from 1590 to 2020 for locations at Europe, America, and Asia where it is noted that the general curves shapes similarity is related to the region. Differences between the curves of the same region can be noticed too. (1 Gamma = 1 nano-Tesla)

The Earth's Magnetic Intensity Changes with Time and Place for the Past 320 Years

The most of the past influenza pandemics outbreaks were at Southeast Asia (Table 1). Therefore, the China-Beijing Earth's magnetic field will be investigated first. The total Earth's magnetic intensity of Beijing is plotted for the time period 1700 to 2020 AD (Fig. 2). Three clear positive changes and one negative change were detected for this curve, which are at 1780, 1917, 1957, and around 2000 AD. They are all related to the influenza pandemic outbreaks times (Table 1). The Hong Kong and Wuhan (China) magnetic curves (Figs.3 and 4) show three positive changes and two negative changes. At 1780 AD there is a weak negative change, while around 1790 AD a negative change so clear. The weak positive changes are noticed at 1917 AD and 2000 AD. At 1957-1960 AD the positive change is clear. The Seoul – Korea Earth's magnetic curve shows these pandemic time periods too (1780 AD, 1917 AD, 1957 AD, and 2000 AD).

Fig. 2. The Earth's magnetic intensity versus time (320 years) calculated for the location of Beijing, the capital of China. The blue and red are the time-periods for the influenza pandemics that is recorded in the history of Beijing. The Earth's magnetic changes and the influenzas outbreaks times show clear congruences

Fig. 3 The Earth's magnetic intensity versus time (320 years) calculated for the location of Wuhan, China. The blue and red lines indicating time-periods for the influenza pandemics that is recorded in the history. The Earth's magnetic changes and the influenzas outbreaks times show clear congruences

Fig. 4. The Earth's magnetic intensity versus time (320 years) calculated for the location of Hong Kong. The blue and red lines indicating time-periods for the influenza pandemics that is recorded in the history. The Earth's magnetic changes and the influenzas outbreaks times show clear congruence

Moving west to the Moscow, the magnetic curve shows clear negative changes at 1838-1843 AD and at 1918 AD. There is a very clear positive change at 1890 AD, and slight change at 1983 AD. The known Russian influenza pandemic outbreak was at 1890 AD. For the same time (1893 AD) magnetic changes is noticed for Istanbul magnetic curve as a slight positive change. No real abrupt changes are detected for Istanbul Earth's magnetic curve (Fig. 5). For Baghdad (Iraq) only one negative change is recorded at 1840. However, changes in the direction of the magnetic curve path can be noticed at 1730 AD, 1830 AD, and 1969/1970 AD, which are congruent to the influenza outbreaks times too. In west Europe, the Amsterdam (Holland) Earth's magnetic curve (Fig. 6) shows only two positive changes at 1780 AD and 1893 AD. This is quite resembling Berlin (Germany) magnetic curve. Madrid (Spain) magnetic curve also shows the positive change at 1778 AD and slight changes at 1893 AD and 1957 AD. It shows a clear negative change at 1930 AD. Paris (France) curve shows slight difference from Madrid curve particularly for the positive change at 1893 AD, which is detected clearly for Paris and Rome too. However, Rome shows clear negative change at 1920 AD. London (England) magnetic curve quite resemble to Paris curve with a negative change at 1930 AD. It seems that west Europe countries recorded magnetic changes at the pandemic outbreaks of 1780 AD and 1890 AD. In North America, New York, the Earth's Magnetic curve is different. Slight negative changes are recorded at 1750 AD, 1830 AD, 1955 AD, and strong positive one at 1860 AD (Fig. 7). At Seattle and San Francisco, the 1830 AD negative changes are detected, and slight

positive changes at 1860 AD are detected too. It is clear that most of these magnetic changes show matching to the recorded pandemic influenza time periods for the past 320 years (i.e. since 1700 AD) as positive, negative, high or low intensity changes.

Some of the Earth's magnetic anomalies are recorded almost all over the world, but with variable intensities. Such anomalies are mainly related to changes within the dipole field of the Earth's core. While there are other anomalies that only recorded within a region. These anomalies are related to the non-dipole field at the Mantle-Core boundary. The changes in the magnetics curves paths from place to another are also have their indications. However, only the magnetic intensity curve anomalies will be considered in this study. To identify the historical relationship between these anomalies and the pandemic outbreaks an intensity value criterion is suggested here. A scale of ten numbers (positive and negative) is shown in Table 2. It depends on the positive and negative magnetic intensity changes within 40 years, which will be look like as a convex or a concave anomaly within the Earth's magnetic curve (magnetic intensity versus time in years).

Fig.5. The Earth's magnetic intensity versus time (320 years) calculated for the location of Istanbul, Turkey. The blue is indicating the magnetic anomaly of 1890 AD that matching the influenza pandemics outbreak of 1890 AD. No other magnetic anomalies are recorded for Istanbul but only changes in the magnetic horizontal component from 1840 AD to 1920 AD

Fig. 6. The Earth's magnetic intensity versus time (320 years) calculated for the location of Amsterdam, Holland. The blue is indicating time-periods for the influenza pandemics that are recorded in the history of Europe. There are two clear magnetic anomalies (1780 AD and 1890 AD) for Amsterdam location and both of them are congruent to influenzas outbreaks times

Fig.7. The Earth's magnetic intensity versus time (320 years) calculated for the location of New York, USA. The blue and red are indicating the magnetic anomalies. Two of these (1830 AD and 1957 AD) are matching the recorded influenza outbreaks times. The other two anomalies (1750 AD and 1860 AD) may have other effects to the New York paleo-environment

Table 2. Magnetic anomaly intensity scale

Intensity Number	Magnetic Intensity value in nano-Tesla
1	More than or equal 50.0
2	Less than or equal 100.0
3	Less than or equal 150.0
4	Less than or equal 200.0
5	Less than or equal 250.0
6	Less than or equal 300.0
7	Less than or equal 350.0
8	Less than or equal 400.0
9	Less than or equal 450.0
10	More than or equal 450.0

The Earth's Magnetic Time and Place Relations to Influenza Pandemic Outbreaks

The Earth's magnetic intensity curves of thirty-one locations are investigated for the past 320 years (from 1700 AD to 2020 AD). The anomalies intensities classification from 1 to 10 is followed. Table 3 shows the names of the investigated locations, historical recorded influenza pandemic time-periods since 1700 AD, and the intensity degree of the recorded magnetic anomaly. The table results show the following:

1. Most of the detected magnetic anomalies are in congruence with the time periods of influenza outbreaks. This is very true for the Southeast Asia locations.
2. There are few magnetic anomalies of west Europe, North America, south America, and Africa that show no relationships to the known influenza outbreaks times. These are 1760 AD, 1840 AD, 1860AD, 1930 AD, and 1980 AD. Although they are not so much different from the known influenza outbreaks times (Table 1), but they could have other environmental indications. The 1980 AD anomaly, which are recorded in many locations all over the world, could be congruent to the AIDS outbreak time period.
3. The relationship of the magnetic intensity high values with the influenza outbreaks location is not clear particularly for the historical record of 1730- 1830 AD. For example, the recorded history of the first 1730 AD influenza outbreak was in Russia, which shows low anomaly degree of 1. While the maximum magnetic changes (9 +) at that time was recorded at Thailand. The outbreak of 1780 AD is recorded to be southeast Asia, which shows anomalies of 3 -5 degrees. However, at western Europe and Mexico, the magnetic anomalies at that time reached 10. For the 1830 AD outbreak, the historical data suggest it was at China, while the highest magnetic intensity was at Russia and Sydney (6 +). On the other hand, the 1890 AD outbreak is recorded to be at Russia. The

highest magnetic intensity was at Russia and north Europe too. The historical record also suggests that Spain flu (H1N1) outbreak was first in Spain or France. The magnetic curves of Europe do not show any anomaly more than 1 (50.0 nano-tesla). The highest magnetic intensity was recorded at Lobito, Angola (10 +) and 6+ at Russia and Mongolia. It worth mention that Angola was Portugal's colony at that time. During 1957 AD, the flu first outbreak was recorded to be in China. The highest magnetic intensity (10 +) are recorded at China and southeast Asia. No magnetic anomaly more than 1 is noticed for other locations except Sydney (5 +). This situation is repeated for the H3N2 virus with outbreak at Hong Kong. The highest magnetic intensity at Hong Kong (5+), and New Delhi (8 +). For SARS flu the highest recorded intensity was at Seoul, Korea. It is also restricted to the southeast Asia. Finally, the H7N9 outbreak on 2013/2014 at southeast Asia (Vietnam). A magnetic anomaly of the Earth's magnetic field is recorded at Bangkok, Thailand (7 +).

4. It seems that the highest positive magnetic intensities and the flu outbreaks region are matching well for the historical records from 1917 to 2015 AD. For years before 1917 AD there is no clear matching. This could be due to the recorded history of the flu pandemic, or the Earth's magnetic field prior to 1860 AD as described by the IGRF-13, 2020 model.
5. It is noticed, whenever there is a worldwide Earth's magnetic change incident there is a worldwide pandemic too. For H2N3, SARS, and H7N9 the pandemics are restricted to the southeast Asia locations where the Earth's magnetic clear anomalies are recorded.
6. Interesting facts were indicated by considering the relationship of recent Corona virus COVID-19 outbreak to Earth's magnetic changes. The increment and decrement in the magnetic intensity of 20 years (from 2000 AD to 2020 AD) are calculated for 49 locations around the world. High negative changes are recorded for Canada, N. America, and parts of S. America that could reach more than 2000.0 nano-tesla. On the other hand, positive changes of 300.0 to 550.0 nano-tesla are recorded for mid and east Asia. West Asia, India, middle east, east and west Europe recorded positive changes of 600.0 to 1100 nano-tesla (Fig. 8). Such high changes in the Earth's magnetic intensity have not recorded for the past 320 years. It is a worldwide phenomenon. It could be related to the changes within the earth's dipole magnetic field.

Though the virus outbreak was Wuhan – China but these regions did not show the highest changes in magnetic intensity. They showed gradual increase in the magnetic intensity for the

past 320 years (Fig. 1). The magnetic intensity curves of east and southeast Asia are different from the rest of the world.

Fig. 8. The Earth's magnetic intensity changes (of 20 years) versus relative locations of 49 countries. 1.0 degree equals 50.0 nano-Tesla. Asia, middle east and Europe show positive relatively high increments. Africa and S. America show moderate decrements, while Canada and N. America show strong magnetic intensity decrements

Table 3. Magnetic anomaly intensity of the Earth's Magnetic Field for the 320 years

City/ Country	1729 AD	1780- 1782 AD	1830- 1833 AD	1889- 1892 AD	1917- 1920 AD	1957 AD	1968- 1969 AD	2003 AD	2013 AD	Other Magnetic Anomalies
	Flu	Flu	Flu	Flu	H1N1	H2N2	H3N2	SARS	H7N9	
China/Beijing	--	??	1 +	--	2 +	10 +	??	4 +	--	1760-1780, 1960-1969, 1980 (-6)
China/Wuhan	--	4 -	--	--	2 +	10+	??	3 +	--	1760-1780, 1960-1969, 1980 (-6)
Mongolia	--	3 +	---	---	6+	10 +	---	3 +	--	1760 (+4), 1980 (+5)
Hong Kong	--	3 -	--	--	2 +	5 +	5 +	2+	--	1760-1780 & 1980 (-4)
Bangkok/ Thailand	9 +	--	1 -	--	--	4 +	--	--	7 +	1980 (-4)
Seoul/ Korea	--	3 -	1 +	--	3 +	10 +	--	6 +	--	1750 (+3), 1960-1969, 1980 (- 6)
New Delhi	2 +	3 -	--	--	--	--	8+	--	--	1750 (+3), 1990 (-8)
Colombo/ SirLanka	--	3 -	--	1 +	--	4 +	--	--	--	1980 (-6)
Baghdad/IRAQ	1 -	--	--	--	--	--	??	--	--	1840 (-3), 1969- 1990.

Tehran/Iran	2 -	--	3 -	2 -	--	--	3 +	--	--	1840 (-4), 1910(-2), 1980 (-1)
Johannesburg/ S. Africa	--	3 -	1 -	2 -	--	--	--	--	--	1760 (+4), 1880 (+2), 1900 (+3)
Kinshasa/Congo	--	4 -	--	3 -	1 +	--	--	1 -	--	1760(+3), 1870 (+3), 1980 (+4)
Lebito / Angola	--	5 -	--	4 -	10 +	--	--	--	--	1720 (-4), 1870 (+5)
Zambia/ Africa	--	--	1 -	??	--	--	--	--	--	1880-1890, 1900 (+10)
Moscow/Russia	1 -	--	5 -	6 +	6 -	--	--	--	--	1840(-6),1980 (+1)
Istanbul/Turkey	--	--	--	2+	2 -	--	--	--	--	NON
Amsterdam/ Holland	--	9 +	--	5 +	--	--	--	--	--	1930(-10)
London/Englan- d	--	10 +	--	6 +	--	--	--	--	--	1930 (-10)
Madrid/Spain	--	10 +	--	1 +	--	--	--	--	--	1930 (-10)
Paris/France	--	9 +	--	3 +	--	--	--	--	--	1930 (-7)
Rome/Italy	--	??	--	2 +	4 -	--	--	--	--	1760-1780, 1920 (-4)
British/Colombi- a	--	--	??	2 -	--	--	--	--	--	1860(+5), 1960 (-3), 1980 (+4)
New York, USA	--	--	3 +	--	--	??	--	--	--	1750 (+6), 1860 (+10), 1950- 1960
San Diageo/USA	--	--	4 -	--	--	--	--	--	--	1790(+5), 1860(+4)
San Francisco	--	--	3 -	--	--	--	--	--	--	1860 (+3)
Seattle	--	--	3 -	--	--	--	--	--	--	1860 (+3)
S. Carolina USA	1 +	--	2 -	--	--	1 -	--	--	--	1860 (+10)
Incas/Ecuador	--	1 +	--	??	??	--	--	--	--	1890-1940
Mexico/Aztecs	2 +	10 +	2 +	--	--	--	--	--	--	1850(10 +)
Brasilia -Brazil	--	--	--	--	??	--	--	--	--	1900-1940
Sydney/ Australia	--	1 -	6 +	1 +	1 +	5 +	--	--	--	1860(+7), 1900 (+5), 1980 (-1)
1760-1780 AD means horizontal change only; 1980 (5 +) means magnetic anomaly intensity of 5; + and – positive and negative changes.										

CONCLUSIONS

The Earth's magnetic field data of the past 430 years, which deduced from the IGRF-13 model, shows that each location on the earth surface has its own Earth's magnetic field relation with time. It could have some effects to the local environments. During the past 320 years, there are clear indications of congruence between changes in the Earth's magnetic field and the influenza pandemics outbreaks times. This type of congruence indicates a possibility of existing a relationship between the change of Earth's magnetic field and life on earth surface. Examining and accurately identifying this relationship could lead to more understanding of the environment and its relation to the life evolution.

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