Applied Science and Innovative Research
ISSN 2474-4972 (Print) ISSN 2474-4980 (Online)
Vol. 8, No. 2, 2024
www.scholink.org/ojs/index.php/asir

Original Paper

The Origin of Geomagnetism

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Received: April 15, 2024 Accepted: May 2, 2024 Online Published: May 8, 2024

doi:10.22158/asir.v8n2p47 URL: http://doi.org/10.22158/asir.v8n2p47

Abstract

The paper clarifies that a magnetic field is not a real material existence and concludes that a magnetic field is essentially a contracting electric field in motion. Based on this new principle, all electromagnetic laws can be derived and proven. Experiments confirm that there is indeed an electrostatic field around a static magnetic field, which is a powerful scientific proof of the new principle that a magnetic field is a contracting electric field in motion. The paper believes that the westward movement of negative ion-containing air in the Earth's upper layers is the fundamental reason for the generation of geomagnetism. Due to the fact that a magnetic field is a contracting electric field in motion, the author determines that people in different motion situations will see different moving electric fields on the Earth, namely, they will see different geomagnetic fields. He further determines that an observer outside the Earth who is stationary relative to the Sun will see a strong geomagnetic field with the North Pole being the South pole.

Keywords

Electric field, magnetic field, electric current, electric fields in motion, special theory of relativity, Lorentz transformation, negative ion, principle of constant speed of light

1. Introduction

So far, there are actually many different views on the origin of geomagnetism at present. What is the reason for this? As is known to all, all results derived from scientific principles should be consistent, for example, the results derived from Newton's three laws are consistent. Obviously, the emergence of different views on the origin of geomagnetism should be attributed to the unscientific and untrue explanation of magnetic fields in electromagnetics. Therefore, exploring the origin of geomagnetism requires a clear and scientific understanding of the essence of magnetic fields. In this paper, the author start from making a serious and in-depth analysis of the essence of magnetic fields and based on the facts, compares and analyzes the sources of the so-called magnetic field. He then concludes that the

so-called magnetic field is definitely not a real material existence. It is still an electric field, but in a moving state only. The author further concludes that a magnetic field is essentially a contracting electric field in motion. Moreover, the generation of some electromagnetic phenomena as inferred based on this new principle is indeed in line with the reality, thus confirming that this new principle is scientifically true. Finally, he analyzes and judges the origin of geomagnetism based on the new principle that a magnetic field is a contracting electric field in motion.

2. Magnetic Field is not a Real Material Existence

According to the principles of electromagnetics, a high-speed rotating permanent magnet must have its surrounding magnetic field rotating at the same speed. The rotation speed of the magnetic field at any point in space is obviously in proportion to the distance from this point to the rotation axis. Undoubtedly, beyond a certain distance, the rotation speeds of all magnetic fields are greater than the speed of light. However, the experimentally confirmed principle of constant speed of light suggests that the speed of motion of any real matter cannot be greater than the speed of light. Therefore, the above analysis deduces that the speed of motion of a magnetic field can be greater than the speed of light, which provides conclusive evidence that a magnetic field cannot be real matter.

In addition, according to electromagnetics, when there is an electric current in a wire, magnetic fields will be generated in all the spaces around the wire, and all magnetic fields will accordingly disappear once the current disappears. This means that the magnetic field at any point around a wire can suddenly appear or disappear. Nevertheless, the law of the conservation of matter states that no real matter can suddenly appear or disappear. The aforementioned deduction that a magnetic field can suddenly appear or disappear also proves that a magnetic field cannot be real matter.

3. A Magnetic Field is a Contracting Electric Field in Motion

Apparently, the viewpoint that the electric current generates magnetic fields in space violates the basic scientific principle of action at a distance and is therefore definitely unscientific, since it does not clarify the pathway and mechanism through which electric current generates magnetic fields in space. Moreover, as demonstrated above, this viewpoint also runs counter to the law of the conservation of matter. Thus, it is imperative that we abandon the view that electric current generates magnetic fields and seek a scientific new viewpoint of magnetic fields. Let's analyze the following example:

On a high-speed train, there is a charged object O. In the eyes of observer A on the train, O is stationary, surrounded only by a stationary electric field. However, observer B on the ground saw that O was moving at a high speed along with the train. According to the principles of electromagnetics, the moving charged object O generates an electric current, thereby generating a magnetic field. In this example, for the same charged object O, B believes that there is a magnetic field around it, but A argues that there is no magnetic field around it. This means that, whether there is a magnetic field around the charged object O depends on the observer's opinion. It is generally known that the existence of any real

matter is absolutely unrelated to the observer, while here the existence of a magnetic field seems to be related to the observer, which further confirms that a magnetic field cannot be real matter. So, how can we solve the contradiction between viewpoints A and B?

We may analyze the following conclusive fact: A notices a static electric field around O; B sees that the electric field around O is moving together with the train, which means that in the eyes of B, the electric field around O is moving. This fact indicates that the only difference between A and B's viewpoints is that A sees the electric field as stationary whereas B sees the electric field as moving. If we use the term magnetic field to refer to a moving electric field, then B sees a magnetic field around O whereas A sees no magnetic field around O. That is to say, both what A and B see are facts, so there is no contradiction between A and B. Therefore, our definition of a magnetic field is as follows: **a magnetic field is an electric field in motion**. Obviously, this definition of magnetic field is not an assumption, but an objective fact. This indicates that a magnetic field is not any new matter that is different from an electric field. It is still an electric field, but only in motion. Thus, electric fields are real matter. According to the special theory of relativity, matter contracts in length in the direction of motion. Therefore, we can finally define **a magnetic field as a contracting electric field in motion**. In combination with existing electromagnetic phenomena, we can obtain the results below through comparison and analysis: The magnetic field intensity B should be the vector product of the electric field velocity V and the electric field intensity E. It can be express in the formula below:

$$\boldsymbol{B} = \varepsilon_0 \mu_0 \boldsymbol{V} \times \boldsymbol{E} \tag{1}$$

Where, $\varepsilon_0 \mu_0 = 1/\mathrm{C}^2$ in the equation is the scale factor, which is the result given by physics.

When an electric field moves at a speed V along the vertical direction of the electric field, according to the special theory of relativity, the distance between electric fluxlines will contract along with the Lorentz length transformation, resulting in an increase in the electric field density and field strength.

The relationship formula is:

$$\boldsymbol{E}' = \boldsymbol{E} \Big/ \sqrt{1 - \mathrm{V}^2/\mathrm{C}^2} \tag{2}$$

Equations (1) and (2) are the two basic formulas for the principle that a magnetic field is a contracting electric field in motion.

4. The Application of the Principle that a Magnetic Field is a Contracting Electric Field in Motion

4.1 Let's apply equation (1) to calculate the magnetic field intensity at **r** for a small segment of current element with a length of dl and a current of **I**:

According to electromagnetics, the current is the macroscopic movement of positron (proton) in the wire. If we represent the linear density of macroscopically moving positrons in a wire with τ, and the

velocity of positrons with $\boldsymbol{V}$, then within dl, the quantity of electric charge of positrons should be $dQ=\tau dl$ and the current should be $\boldsymbol{I}=\tau\boldsymbol{V}$. dQ The electric field intensity generated by at Point P

$d\boldsymbol{E}=\frac{kdQ}{\mathrm{r}^2}\cdot\mathbf{r}_0=\frac{k\tau dl}{\mathrm{r}^2}\cdot\mathbf{r}_0$ ($\mathbf{r}_0$ - r the unit vector in the r direction)

According to equation (1), the magnetic field intensity $d\boldsymbol{B}=P\boldsymbol{V}\times d\boldsymbol{E}$ at **r** should be $d\boldsymbol{B}=P\boldsymbol{V}\times d\boldsymbol{E}$. Then by substituting $\boldsymbol{V}=\mathbf{I}/\tau$ into this equation, we'll get:

$$d\boldsymbol{B}=\mathrm{P}\frac{\boldsymbol{I}}{\tau}\times\frac{k\tau dl}{\mathrm{r}^2}\cdot\mathbf{r}_0=\mathrm{PK}\frac{\boldsymbol{I}dl}{\mathrm{r}^2}\times\mathbf{r}_0 \quad \text{(A)}$$

Due to $P=\varepsilon_0\mu_0$ and $K=1/4\pi\varepsilon_0$, we have $PK=\mu_0/4\pi$. It is evident that equation (A) is the Biot-Savart Law.

By applying equations (1) and (2), we can also derive and prove all electromagnetic laws such as Lorentz force law, electromagnetic induction law, displacement current, and Ampere loop. Due to the length of the proof, it will not be elaborated here. If you have any interest, please refer to Reference 2 (Yao Kexin, Defects and Correction Theories of Electromagnetics, Applied physics Research, Vo1. 8. No. 4, 2016) and Reference 5 (Yao Kexin, Comparison between Motion Effect of Electric Field and Gravitational Field, Applied Science and Innovative Research, Vo1. 7. No. 1, 2023).

Since the principle that a magnetic field is a contracting electric field in motion can be applied to derive and prove all electromagnetic laws, it means that all electromagnetic phenomena should originate from the fact that a magnetic field is a contracting electric field in motion.

4.2 The Principle that a Magnetic Field is a Contracting Electric Field in Motion can be Applied to Correct Erroneous Inferences in Electromagnetics

When deriving the source of the Lorentz force from formulas (1) and (2) based on the principle that a magnetic field is a contracting electric field in motion, we can infer that the Lorentz force is only applicable in the case of a uniform magnetic field. Is this inference correct? It has been proven that the Lorentz force is indeed not applicable to non-uniform magnetic fields. For example, suppose a charged particle is moving at high speed and shooting towards the center of the coil in a direction perpendicular to one side of the current-carrying coil. At this time, based on the Lorentz force law, we may analyze the action force F_1 by the magnetic field generated by the current-carrying coil on the charged particle and the action force F_2 by the magnetic field generated by the charged particle on the current-carrying coil. Inevitably, we'll get the result that the direction of F_1 is the same as that of F_2, that is, the direction of the action force is the same as that of the reaction force. Obviously, this absurd conclusion violates Newton's three laws and is definitely wrong. If we analyze this situation based on the principle that a magnetic field is a contracting electric field in motion, the inevitable result is that the interaction and reaction forces between charged particles and all current elements of the current-carrying coil are equal in magnitude and opposite in direction, and the overall result must also comply with Newton's three laws.

4.3 The Principle that a Magnetic Field is a Contracting Electric Field in Motion can be Applied to Eliminate many Illogical and Ambiguous Problems in Electromagnetics

According to electromagnetics, when a current-carrying circular ring wire rotates around the center of the ring, the magnetic field generated by the current-carrying ring wire must also rotate along with the ring wire. In theory, a current-carrying ring wire can be seen as a combination of a negatively charged ring and a positively charged ring. Regardless of how these two charged rings rotate, the magnetic fields generated by each should be stationary, and the resulting magnetic field should also be stationary. How can the magnetic field rotate along with the ring wire? When analyzing this problem based on the principle that a magnetic field is an electric field in motion, we'll inevitably come to the conclusion that the rotation of positively and negatively charged rings generates their own electric fields in motion, respectively, and with all electric fields being active fields, the electric fields generated by positive and negative electrons move along with their source positive and negative electrons. Here, there is nothing to do with the rotation of electric fields.

In another example, we'll discuss two current-carrying wires with the same current magnitude and direction. According to electromagnetics, the magnetic field generated by the current in wire A passing through wire B is subjected to a force. At the same time, the magnetic field generated by the current in wire B passing through wire A is also subjected to the same amount of reaction force. In theory, each wire can be seen as a combination of a positive and a negative electric body, and there must be observers who are stationary relative to the positive electric body believe that it is the simultaneous movement of the two negative electric bodies that creates mutual attraction. Whereas, observers who are relatively stationary relative to the negative charges argue that it is the simultaneous movement of the two positive charges that creates mutual attraction. This contradictory analysis certainly proves that there are serious flaws with the theory of electromagnetism. When analyzing this problem from the perspective that a magnetic field is an electric field in motion, we'll inevitably conclude that the interaction force between any charged bodies is only related to the relative motion of these charged bodies, and there is no relationship with the observer. We believe that the positive and negative charged bodies of wires A and B each generate their own electric fields, and these charged bodies are each subjected to the force generated by the electric fields of positive and negative charged bodies of other wires. Thus, all interaction forces are equal and opposite, to the overall effect that the interaction force between A and B is always equal and opposite. There are many similar problems in electromagnetics, so this paper will not elaborate on them.

5. The Experimental Results of an Electrostatic Field that Surrounds a Permanent Magnet is the most Powerful Evidence that Establishes the New Viewpoint that a Magnetic Field is a Contracting Electric Field in Motion Instead of the Viewpoint that the Current Generates Magnetic Fields

According to the principle that a magnetic field is a contracting electric field in motion, the side of a

cubic permanent magnet, macroscopically speaking, indicates that all electrons on the surface are moving in the same direction. Therefore, the electric fields generated by them must move in the same direction simultaneously. Based on the new principle formula (2), the contraction of the electric field intensity increases into $\boldsymbol{E}' = \boldsymbol{E} \Big/ \sqrt{1 - \mathrm{V}^2 / \mathrm{C}^2}$. At the same time, the positively charged protons inside a permanent magnet macroscopically appear to be stationary, and its electric field intensity does not increase. The inevitable effect is that the negative electric field intensity on the side of the permanent magnet is greater than the positive electric field intensity, and the macroscopic effect is that a permanent negative static electric field appears on the side of the permanent magnet. Reference 1 (Yao Kexin, Inferring the Fact Static Magnetic Field Existx Along with Electrostatic Field and Conducting Experimental Verification in Accordance With the Theory of Relativity, Applied physics Research, Vo1. 4. No. 1, 2012). Based on the principle that a magnetic field is a contracting electric field in motion, it is possible to accurately infer and experimentally confirm the distribution and specific values of the electrostatic fields around a cubic permanent magnet. However, according to the principles of electromagnetics, permanent magnets belong to non-charged bodies, around which there cannot be any electrostatic field. Undoubtedly, the objective fact that there is an electrostatic field around a permanent magnet negates the scientificity of electromagnetism, refutes the argument that a magnetic field is real matter generated by electric current, and also strongly confirms the statement that a magnetic field is a contracting electric field in motion, which is a scientific and accurate judgment that is in line with reality. Therefore, it should be a reasonable and correct choice to analyze the origin of geomagnetism by applying the principle that a magnetic field is a contracting electric field in motion .

The above analysis and experimental results concerning the permanent magnets, as well as the source of the Lorentz force prove that the Lorentz force and permanent magnets originate from the fact that an electric field contracts in length in the direction of motion. In other words, without the natural law of electric fields contracting in the direction of motion, it is impossible to have a permanent magnet. Permanent magnets are the foundation of chips and various motors, and chips and motors are the foundation of modern science and technology. This means that modern science and technology is based on the natural law of electric fields contracting in the direction of motion. We know that the length contraction of an electric field in the direction of motion comes from the Lorentz transformation as described in the special theory of relativity, while the Lorentz transformation originates from the principle of constancy of the speed of light. Surprisingly, the principle of constancy of the speed of light actually dictates that the speed of light plus the speed of light is still equal to the speed of light, that is, 1+1=1. This is a fact that we human beings cannot understand at all, and it can only be attributed to the gift from God. Therefore, it is fair to say that the law of constancy of light velocity is the most precious gift bestowed upon humanity by God.

We may further analyze the speed of light. The greater the speed of light, the smaller the amplitude of

radio waves. Moreover, the permeability of vacuum is inversely proportional to the square of the speed of light. If the speed of light is too high, there would be no strong magnetic matter in nature, so the speed of light cannot be too high. Likewise, the speed of light cannot be too low. When the speed of light is too small, the propagation speed of radio waves would be too slow, and there would also be serious environmental pollution caused by excessive electromagnetic interference. Therefore, a speed of light that is too low is not something good. Comprehensive analysis and comparison suggest that the speed of light at 300,000 kilometers per second should arguably be the best speed for humans. Therefore, we can fairly believe that the speed of light at 300,000 kilometers per second is the second precious gift bestowed upon humanity by God.

6. Experimental Evidence Shows that the Earth's Atmosphere Contains Abundant Negative Ions

In 2010, while conducting experiments, I found that when metal plates or tin foil were charged with a positive charge, the positive charge disappeared in just a few seconds. However, when they were charged with a negative charge, it could last for several minutes without disappearing. Obviously, this phenomenon could only occur when the air is rich in negative ions. Therefore, I concluded that the atmosphere on Earth was not neutral, but rather containing air rich in negative ions. To further validate this conclusion, I conducted a simple qualitative experiment based on existing conditions. I unfolded the metal shell of a can into a thin sheet of about 100 square centimeters, and placed a piece of tin foil on the thin sheet with a layer of plastic in between them. Then I connected the positive pole of a USB power supply with a voltage of 5 volts to the can shell and connected the negative pole to the tin foil. When the power was switched on, the can shell was positively charged and the tin foil carried a negative charge. Then I suddenly switched off the power, raised the can shell, and quickly connected the can shell to a small freezer on the chair via the voltage range of the multimeter. Then I noticed that the pointer of the voltmeter quickly jumped to 30 millivolts and fell back. This experiment confirms that the small freezer is negatively charged, and the surrounding air must also be negatively charged, which means that the air must contain abundant negative ions, that is, the Earth's atmosphere must contain abundant negative ions.

7. Geomagnetism Originates from the Fact the Earth's Upper Atmosphere Rotates at a Speed Slower than that on the Earth's Surface

When the Earth rotates, the air on the ground must also rotate along with it. Air molecules are not rigidly connected to each other. Due to inertia, the rotation speed of the upper air lags behind the movement speed of the ground air, just like the disk-shaped fireworks we set off during festivals. Only the part of the flame that is close to the edge of the disk rotates at the same speed as the disk. The flame that is further away from the disk rotates at a slower speed than the disk, and each jet of flame looks like a parabola. The air on the ground is similar to the disk flame, with the upper layer of air lagging behind the ground's rotational speed. The actual effect is that the higher the air layer is over the ground,

the faster it moves westward. Due to the abundant negative ions in the atmosphere, this is actually layers of electron flow that moves westward faster at a higher altitude. According to the Biot-Savart Law, which has been proven above, these electron flows generate the Earth's magnetic field with the N pole facing north and the S pole facing south, which is the origin of geomagnetism.

It should be noted that the thickness of the atmosphere is about 20,000 kilometers, and below 18 kilometers is the troposphere. Affected by factors such as sunlight, the air in the troposphere flows from time to time to the east, west, south, and north. Since there is no significant change in air density anywhere on Earth, the air that flows out must flow back. Therefore, we can assume that the probability of air flow in the troposphere in all directions is basically the same, with the overall effect that the air in the upper troposphere tends to flow westward, but the average flow speed is significantly reduced. This does not affect the argument that the air in the upper troposphere generally moves westward and also does not affect our analysis of the origin of geomagnetism.

As proven earlier, a magnetic field is not matter, but an electric field in motion, and motion is always relative. Therefore, people in different motion states will see atmospheres with different speeds of motion, that is, different electric fields in motion, or, different magnetic fields. To a person who is stationary relative to the ground in a helicopter, the magnetic field generated by the atmosphere containing negative ions is the geomagnetic field measured by us on the ground. If the speed of the helicopter moving westward is exactly equal to the average speed of all atmospheres, then the person on board the helicopter cannot see the electric field in motion, and therefore cannot determine the presence of a magnetic field on Earth. If the speed of the helicopter moving westward is even faster, then the person on the helicopter will see the atmosphere moving eastward instead, and he will see that this eastward moving electric field generates a reverse geomagnetic field with the N pole facing south and the S pole facing north. On the contrary, if the helicopter moves rapidly eastward, the person on board will measure a normal strong geomagnetic field with the N pole facing north.

If we observe the Earth from a stationary position relative to the Sun outside the Earth, we will see that the negatively charged atmosphere outside the Earth basically moves rapidly along with the Earth. The rotation speed of the atmosphere above the Equator will exceed 464 meters per second, which means that the negatively charged atmosphere between the Tropic of Cancer and the Tropic of Capricorn of the Earth is rapidly rotating at supersonic speeds. This will create an extremely powerful the Tropic of Cancer and the Tropic of Capricorn of the Earth with the N pole being the S pole, and the S pole being the N pole.

8. Summary

History has shown that all results derived from any scientific and true principle are consistent, for example, those derived from Newton's three laws are the same. According to electromagnetism, magnetic fields, which are generated by the current, are real matter. However, if we analyze the origin of geomagnetism based on such viewpoint, then we can obtain many different views, indicating that the

viewpoint on the origin of magnetic fields in electromagnetics is unscientific and untrue. Therefore, in order to explore the true origin of geomagnetism, it is essential to carefully seek the true origin of magnetic fields. This paper focuses on how to explore the true essence of magnetic fields. Firstly, this paper concludes that a magnetic field is not real matter by presenting the contradiction that, at a certain distance, the motion of a rapidly rotating permanent magnet can be greater than the speed of light. Then, based on how the electric field of a charged object might look like while the object is at rest or in motion, the author concludes that a magnetic field is a moving electric field. Furthermore, according to the Lorentz transformation as described in the special theory of relativity, the author further concludes that a magnetic field is essentially a contracting electric field in motion where the electric field is bound to contract in length in the direction of motion, leading to an increase in field intensity. This new principle is the basic theoretical basis for us to analyze the origin of geomagnetism. It should be pointed out that the viewpoint that a magnetic field is a contracting electric field in motion is not an assumption or a conjecture, but a true reflection of objective facts. It is facts that an electric field can move and an electric field as real matter is contracting in the direction of motion. In other words, the analysis of the origin of geomagnetism using the new principle is based on objective facts.

This paper first explains that the principle that magnetic fields are contracting electric fields in motion can be applied to prove the Lorentz force law, which is only applicable to uniform magnetic fields. Then, it confirms the judgment through the analysis of the interaction force between moving charged particles and current-carrying coils. It also shows that the new principle can solve some logical confusions in electromagnetics. The experiment concerning the existence of an electrostatic field around a permanent magnet also confirms that a magnetic field is a contracting electric field in motion, which is a scientific and true principle. At the same time, it also negates the old unscientific principle that the current generates a magnetic field.

Through experiments, the author confirmed that the Earth's atmosphere is rich in negative ions, therefore, the motion of the atmosphere is the motion of an electric field. He further concluded that geomagnetism originates from the moving electric field generated by the westward movement of air containing negative ions in the upper layers above the ground. A magnetic field, which is not real matter, is only an electric field in motion, and people in different motion states have different judgments on the speed of object movement. Therefore, it is believed that a person flying westward in a helicopter will not be able to determine the existence of geomagnetism at a certain speed. If the flight speed is very high, the person on the helicopter will see that the upper atmosphere is a large electric field moving from west to east, and he will measure a reverse geomagnetic field with the N poles facing south and the S pole facing north. If the person observes the Earth from a stationary position relative to the Sun outside the Earth, he will find that the Earth's charged atmosphere will generate a very strong magnetic field with the N pole being the S pole and the S pole being the N pole.

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