

HYPOTHESIS ON FORMATION OF THE MAGNETIC FIELD OF THE PLANET EARTH

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Abstract. In this paper we have developed the hypothesis based on the dipolar theory on Earth magnetic field with the purpose of identifying and revealing importance of physical process in atmosphere and Earth magma. On the other hand the importance of electrical macrodipolar in convergence of Earth into magnetic macro-dipolar has been shown. This hypothesis can be applied during study in the course of magnetism at physics education process.

Key words: Earth, magnet, magnetite, mineral, whirl, field, dipolar, magma, core, process, scheme, precession, inclination, pole, layer, axis, course, physics

INTRODUCTION

Most of the planets in the solar system possess a magnetosphere to some extent: Earth, Jupiter, Saturn, Uranus, Neptune, Mercury and Mars [Buffett, B. A. (2000)]. The Earth's magnetic field is an area around the planet, where magnetic forces act, which protect the entire living world from cosmic radiation, the intensity on the planet's surface is $5 \cdot 10^{-5} \text{T}$ [Buffett, B. A. (2000)]. Many papers with different have been devoted to the formation of the planet's magnetic field, but the problem of origin of the Earth's magnetic field has not yet been finally resolved [Shipchinsky V.V., (1890-1907) [3]. F. Six. (2009); Constable, Catherine (2007).; Finlay, C. C.; Maus, S.; Beggan, C. D.; Hamoudi, M.; Lowes, F. J.; Olsen, N.; Thébault, E. (2010)]. Planet Earth consists of a solid crust and mantle [Finlay, C. C.; Maus, S.; Beggan, C. D.; Hamoudi, M.; Lowes, F. J.; Olsen, N.; Thébault, E. (2010).] with semi-solid and liquid shells with outer and inner cores [Core of the Earth (1969-1978)]. The height of the gas sphere extends to 690 km, and the dense part is about 400 km, multicomponent in composition [Core of the Earth (1969-1978)]. The gas sphere of the planet is a protective shield for a living organism and civilization. Planet Earth with a radius of 6378.1 km with a density of $5.5 \cdot 10^3 \text{kg/m}^3$, consists of atmosphere with a composition of nitrogen (78.08%), oxygen (20.95%), inert gases, water vapor and dust (0.97%) [Core of the Earth (1969-1978); Burda, H; Begall, S; Cerveny, J; Neef, J; Nemeč, P (Mar 2009); Landau L.D., Lifshits E.M. (1988)]. Under the mantle at a depth of 2900 km there is an outer liquid core with a thickness of 2200 km and an inner core (radius of 1220 km with a density of about 12.5 t/m^3 and a pressure of up to 3.7 million atm., a temperature of $5960 \pm 5000 \text{ C}$) [Landau L.D., Lifshits E.M. (1988)].

RESULTS AND DISCUSSIONS

1. The Earth with an internal high-temperature solid core (magnetic macro-dipole) [Core of the Earth (1969-1978)], rotating along the axis is displaced along an ellipsoidal trajectory around the Sun. When the planet rotates, friction occurs between the gas shell with the crust and the hydrosphere. Due to friction, the multilayer atmosphere is charged positively, whereas the Earth is charged negatively [Shipchinsky V.V., (1890-1907). As a result of this process, a spherical electric capacity is formed, consisting of a vertical n-number of electric micro and macro dipoles [Landau L.D., Lifshits E.M. (1988)] (Fig. 1). Cosmic charged particles (protons 92%, alpha particles 7% and other 1%) and rays (gamma quanta) [Burda, H; Begall, S; Cerveny, J; Neef, J; Nemeč, P (Mar 2009).] fall on the planet's atmosphere. The cosmic flow of particles enters into reaction with the components of the gas sphere and electric macrodipoles formed on the planet's surface (Fig.1).

Fig1. Should be here

In the Earth's ionosphere at an altitude of 90 - 400 km, there are ionized D, E and F layers with a plasma density of $N = 10^{23} \div 10^{24}$ particles per m^3 [Burda, H; Begall, S; Cerveny, J; Neef, J; Nemeč, P (Mar 2009).]. Multi-row vertical electric macrodipoles with the planet's surface are formed in these layers. The cosmic radiation flux coming to the Earth

from the galaxy and the solar wind consists of almost the same number of negative and positive charged particles that rotate with the planet, mutually form and line up as chains of electric dipoles across the thickness of the atmosphere. A schematic representation of the formation of a magnetic field in the atmosphere of the planet Earth is shown in

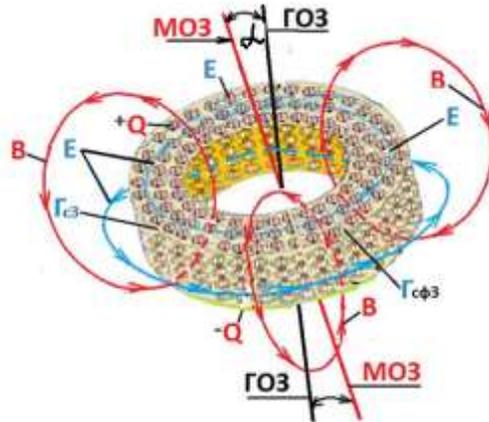
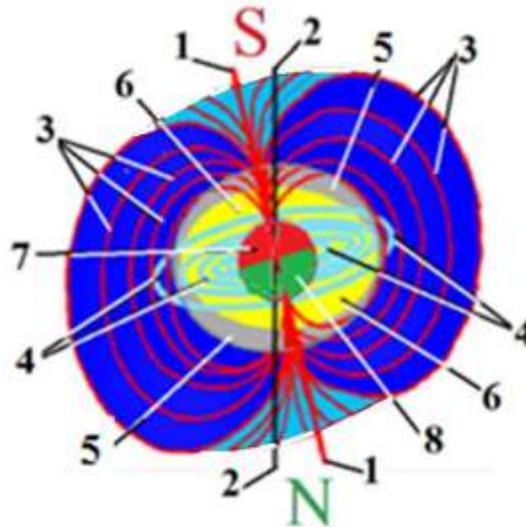


Fig.1

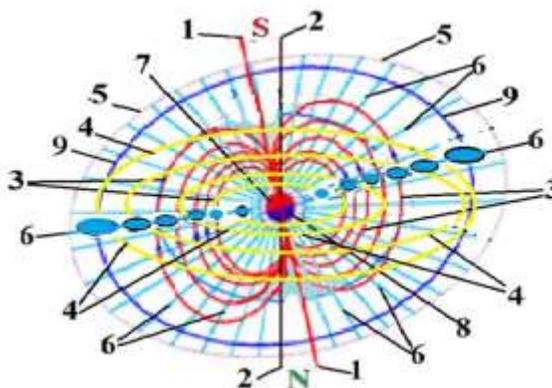
The distance between the poles of the chains of the formed electric micro and macrodipoles fluctuate depending on the density of charges in a gaseous medium from several microns to 1.0 m, for example, for a dry atmosphere, 1.0 mm corresponds to a potential $U \approx 1.0$ kV. With an increase of the charge value between the poles of electric dipoles, annihilation processes with weak discharges occur. Powerful discharges as in the form of lightning with the successive decay of chains of electric dipoles in the atmosphere extend up to 50-150 km. Electric potentials of macrodipoles from the upper layers of 150-200 km to the Earth's surface reach $U \approx 400$ kV with a current density of $j \approx 10^{-12} \text{ A/m}^2$ [Shipchinsky V.V., (1890-1907)]. A vast number of macrodipoles rotate as indicated above together with the planet, some of which can decay with annihilation. In the main part of the layered plasma of the planet's gas sphere, a powerful vortex electric field first excites, i.e. a spherical belt is formed around the Earth. Then a powerful vortex electric field is excited around this belt. The last field excites a vortex magnetic field, which is one of the sources of the magnetic field of the planet Earth [F. Six. (2009)] (Fig. 2).



The cosmic flow of particles enters into a reaction with the components of the gas sphere, formed from approximately the same number of negative and positive charged particles. These particles in the atmosphere rotate with the planet and are mutually formed as chains of electric dipoles along the thickness of the planet's gas layer (Fig. 1).

2. It is known that in the initial period of the formation of a rotating Earth under the action of a vortex centripetal force, its crust gradually became denser, compressed under the influence of the gravity of the upper layers of rocks and in the center of the planet the internal pressure (several million bar) and temperature (several thousand degrees) increased [Finlay, C. C.; Maus, S.; Beggan, C. D.; Hamoudi, M.; Lowes, F. J.; Olsen, N.; Thébault, E. (2010)] and a mantle with layered liquid magma was formed. In this process, the high-temperature magma of the Earth was formed,

consisting of liquid layers and a solid central core (magnetic macrodipole). A component of magma during joint rotation formed charges due to friction between the layers of magma with the core. As a result, chains of electric macrodipoles were formed (Fig. 3), respectively, around the latter, eddy induction currents were excited in the magma layers. Eddy electric and magnetic fields have formed around the induction currents, the latter are also sources of the magnetic field of the planet Earth.



In the initial period of the formation of the Earth, thermonuclear synthesis of hydrogen occurred with formation of light chemical elements, then heavier ones were formed under the influence of high temperature and pressure. Under the action of the force of centripetal vortex motion in completely liquid layers of magma, the process of crystallization of components with iron, nickel, chromium, cobalt, aluminum, titanium, vanadium, magnesium, manganese occurs and the mineral magnetite is formed [Finlay, C. C.; Maus, S.; Beggan, C. D.; Hamoudi, M.; Lowes, F. J.; Olsen, N.; Thébault, E. (2010)]. The crystallization process continued for a long time under the influence of high pressure and temperature. In the process, the solid mass, volume and density increased up to $\rho=14.3 \text{ g/cm}^3$ of the magnetic macrodipole [Constable, Catherine (2007)]. In the course of time, physical processes occurred in the center of the magma: as cooling with a crystal-like solidification of the core due to displacement of its thermal energy to the layers of the mantle and the crust of the planet, a large ($R>106 \text{ m}$) rotating, interlocking cluster of elements as minerals magnetite was formed, i.e. magnetic macrodipole. The mineral magnetite is one of the powerful internal source of the earth's magnetic field. The magnetic south pole of the macrodipole is directed to the north magnetic pole of the galaxy, for this reason the magnetic and geographic poles of the Earth are oppositely located [Core of the Earth (1969-1978)].

3. A rotating high-temperature solid core - a magnetic macrodipole is a source of a magnetic field that excites induction and eddy currents in layers of liquid magma [Finlay, C. C.; Maus, S.; Beggan, C. D.; Hamoudi, M.; Lowes, F. J.; Olsen, N.; Thébault, E. (2010)]. A rotating solid magnetic macrodipole, part of the resulting induction and eddy currents is converted into thermal energy and heats the magma [Finlay, C. C.; Maus, S.; Beggan, C. D.; Hamoudi, M.; Lowes, F. J.; Olsen, N.; Thébault, E. (2010)]. Part of which is in the layers of massive liquid magma induction and eddy currents (Faraday's and Foucault's laws) [Core of the Earth (1969-1978)]. A powerful vortex magnetic field is formed around these currents, which is one of the powerful internal sources of the magnetic field of the planet Earth. Some of the generated induction and eddy currents are converted into thermal energy and heats the magma. Induction currents generated in magma under the action of a magnetic macrodipole field also excite an additional powerful magnetic field. Due to the coincidence of the frequency of the magnetic fields of induction currents with the field of a magnetic macrodipole (according to the law of resonance), the power of the internal magnetic field of the planet sharply increases. Due to the above reasons, the core of the planet Earth has a powerful internal magnetic field.

The magnetic field of the planet Earth consists of the following field sources:

1. Formed electric macrodipoles in the gas sphere of the planet due to friction with the crust and hydrosphere during the Earth's motion, vortex electric fields are excited around the chain of macrodipoles.

2. The magnetic field of the rotating macrodipole of the solid core of magma - the mineral magnetite, is a powerful internal source of the Earth's magnetic field.

3. Induction eddy currents excited with the vortex field of the magnetic macrodipole in the magma layers and eddy currents formed in the massive liquid layers of the mantle in the outer and inner cores of the planet are powerful internal sources of the Earth's magnetic field.

The magnetic and geographic axes of the planet Earth do not coincide since during rotation the planet experiences a precession phenomenon, thus magma with the solid core of the planet is inclined from the vertical axis at a small angle (11,50) from the geographic axis under the action centrifugal and Coriolis forces. Due to this, the magnetic and geographic axes of the Earth do not coincide. According to the above-described fields, the planet Earth possesses a magnetic field as a Geomagnet.

The hypothesis about the formation of the magnetic field of the earth planet can be formulated as: the hypothesis was theoretically justified on the assumption of the regularity of the formation of the Earth's magnetic field which is based on the formation of an electric macrodipole due to the polarization of various layers of the planet during its rotation and transformation of the generated vortex electric field in a vortex magnetic field, whereas a macrodipole can be formed due to the following processes:

- polarization of the gaseous envelope with the planet's crust and hydrosphere;
- friction between layers of liquid magma and solid core of the Earth;
- different ionization of atmospheric layers differing in density and composition;
- declination of the magnetic axis from the geographic to a small angle under the action of the centrifugal and Coriolis force during the precession of the planet with a rotating gas sphere of the atmosphere and a solid core of magma.

CONCLUSION

A review of the available scientific and educational literature related to the magnetism of the planet Earth and their analysis revealed that certain physical concepts and definitions of the essence of magnetism are not sufficiently disclosed. Considering this fact, we propose the above hypotheses for the scientists' reasoning.

1. In the physics course, some concepts and definitions of magnetism can be explained in terms of electric dipole theory.

2. Electrical conductivity in an electric circuit is carried out under the action of a potential difference and due to the rotation of spherical proton-electron dipoles in the atoms of a substance.

3. The electrostatic dipole due to vortex rotation along the axis under the action of an external force at the beginning of the process turns into a vortex electric field, then a vortex magnetic field is excited around the latter.

4. As a result of one-sided vortex rotation (spin) of electric dipoles in the atoms of a substance consisting of proton-electron pairs, eddy currents are formed, which excite a vortex magnetic field around themselves, these substances due to this process have a magnetic property, from which permanent magnets are formed.

CONFLICT OF INTEREST

The authors are claimed that there is absent the potential or clear of conflict interests.

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Fig.1. Schematic diagram of the location of the magnetic and geographic axes of the planet Earth and resulted vortex electric and magnetic fields in the atmosphere: B and E - magnetic and electric fields; + Q and -Q are positive and negative charges in electric dipoles; α -angle between MOZ and GOZ; MOZ and GOZ - magnetic and geographic axes of the Earth.

Fig.2. Schematic diagram of the magnetic field of the macrodipole of its vortex electric and magnetic fields in the magma of the planets: 1 and 2 - magnetic and geographic axes of the Earth; 3 and 4-magnetic and electric fields in the core and magma of the Earth; 5-mantle of the Earth; 6-liquid magma; 7 and 8 - poles of a magnetic macrodipole; S and N - the poles of the planet Earth.

Fig.3. Schematic diagram of the location of the chain of electric dipoles in height in the atmosphere of the planet and magma of the Earth's core and formed vortex electric and magnetic fields around the magnetic macrodipole: 1 and 2-magnetic and geographic axes of the planet Earth; 3 and 4 - vortex electric and magnetic fields of the macrodipole; 5

and 6 - liquid and semi-liquid magma layers; 7 and 8 - poles of the Earth's macrodipole; 9 and 10 - chains of electric dipoles in the atmosphere; 11- @ -declination angle of the magnetic and geographic axes of the Earth.