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International Journal of Current Research
Vol. 10, Issue, 04, pp.67611-67617, April, 2018

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

THE CAUSE OF MAGNETIC FIELD ASSOCIATED WITH EARTH

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ARTICLE INFO

Article History:
Received 07th January, 2018
Received in revised form
25th February, 2018
Accepted 28th March, 2018
Published online 30th April, 2018

Key words:
Earth's magnetic field, Earth's iron core, Ionosphere, Electro-magnetic rules, Mar's Magnetic field, Relative speed.

ABSTRACT

One may see that, planets with no atmosphere like Mars; have not sufficient magnetic field, though whose core is solid nickel iron. And, here is the root of this innovative theoretical paper. We learn that the cause and origin of Earth's magnetic field is its iron core. But, to magnetize an iron core; a magnetic field is to be applied to hot iron in one direction continuously during its smooth cooling process. There is Ionosphere around Earth atop its atmosphere. The ionosphere of Earth contains electrical charges. The ionosphere rotates around Earth in opposite direction of its rotation about its own axis. Then as per electromagnetic laws; the ionosphere must be generating and providing magnetic field passing through Earth's iron core constantly. Then working on this theme electromagnetically, it is found that, the magnetic field of Earth is due to the Earth's Ionosphere. The iron core provides it low reluctance path. The Earth's magnetic field is very complex at its poles, always unstable. This is because of complex nature of ionosphere, containing +ve ions in ionosphere nearer to Earth's surface and -ve charges beyond it. Thus the basic theoretical computational study in respect of the ionosphere and iron core of Earth, and Mars as support to it; is performed in this innovative original paper.

Citation: Dadarao Dhone, 2018. "The cause of magnetic field associated with earth", *International Journal of Current Research*, 10, (04), 67611-67617.

INTRODUCTION

Magnetic field is invariantly associated with varying Electric field. A varying electric field is created by motion of electrons. Magnetic field has not its own existence, basically. It is existed w.r.t. an observer, when an electron moves w.r.t. him. The moving electron changes electric field at a point along the direction of its motion in space. As per Universal Law that to an action there is equal and opposite reaction; magnetic field encircling the changing electric field is generated so as to oppose the changing motion of the electron. Every electron, proton that's an electrical charged particle has self rotating spinning speed around itself like other particles. The linear velocities of electrons' and protons' surface, is the speed of light. Moving electric charge is electric current and it generates magnetic field in direction perpendicular and encircling the path of the current, to oppose its change in any state. Thus, each electrical charge is invariably associated with magnetic field passing through its spin-axis giving property of magnetic dipole giving intrinsic magnetic momentum to each electrically charged particle which have spinning motion. Hence, protons and electrons are magnetic dipoles. In elementary materials having magnetic properties, their atoms and molecules are grouped together where in the atoms and molecules are bonded at random.

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So their fields cancel out in between them and the material behaves as non-magnetic material. When such material in its molten position is put still in a magnetic field and cooled down at very slow rate, it acquires the permanent magnetic properties. Hence, behind Earth's magnetic field, there is the charge in earth's ionosphere. In its magnetic field; earth's solid core had become the permanent magnet during its cooling in the magnetic field of its ionosphere. It is taken for granted that, Earth's Magnetic Field is due to its hot ion core. *But, this Author perceives that, earth's Magnetic Field is due to its Ionosphere and its solid magnetized iron core. Because, if the Earth's field were due to its magnetic iron core only; the ionosphere would have lost very long before and then there on earth, the life would have not been as at present. How it is so; is explained in this article.*

DISCUSSION

As per electrical induction laws, it is the ionosphere of the earth, that is the cause of magnetism associated with earth. Any iron or other magnetic material magnetize when it is subjected to unidirectional external magnetic field for a long period. Though each atom of magnetic material is a magnetic dipole; those atomic magnets are distributed in the material so as to engage their magnetic fields attracting each other and forming a suitable crystalline structure. The solid core of earth has not become magnet of its own. But, it has cooled in magnetic field of the earth's ionosphere, formed from the Sun's

radiations cached by earth's gravitation and relative rotation between the two, produced magnetic field passing through earth's iron core providing a low reluctance path. And the rotating core got magnetized during its cooling. Obviously, magnetic field direction in ionosphere and in core-magnet is the same.

Earth's Core

It is made of solid iron at its centre and molten iron around it. Due to its sufficient high temperatures, it is ionized into +ve ions of iron. The molten core is dragged along the spherical motion of the earth. Hence, the molten core velocity is less than that of the earths. Hence, the molten core moves in opposite direction of the earth's velocity. It being molten iron, is ionized into +ve ions of iron. It forms +ve ionic current (conventional electric current) in opposite direction of earth's rotation w.r.t. us. It creates magnetic field in direction, from geo-north to south inside the earth approximately along the axis of rotation of earth; and in its opposite direction outside the earth in space as its return path. The core is consisted of "solid" inner core with a radius of ≈1,220 km. and a liquid outer fluid core extending beyond it to a radius of ≈3,400 km.

Earth's Ionosphere and Core

The ionosphere is defined as the layer of the Earth's atmosphere that is ionized by solar and cosmic radiation. It lies 75-1000 km (46-621 miles) above the Earth. (The Earth's radius is 6370 km, so the thickness of the ionosphere is quite tiny compared with the size of Earth.) Because of the high energy from the Sun and from cosmic rays, the atoms in this area have been stripped off one or more of their electrons, or they are "ionized," and are therefore formed in two layers. One layer is of electrons and other of +ve ions. Layer of electron formed the outer sphere; because they are lighter in weight. The positive ionic gases layer ozone is inner layer. Mainly there are three spherical capacitors formed by the earth. One is, due to the earth's +ve core and its surface. The second is because of earth's -ve surface and the +ve ionic sphere in atmosphere. The third one is due to atmospheric +ve charge sphere and beyond it -ve electronic sphere (Figure-1).

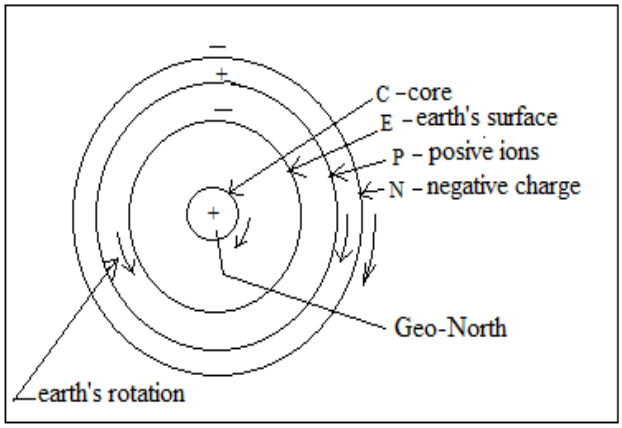

Figure 1. Spherical Capacitor of Earth

It was considered that, earth's iron core rotates at a bit greater speed than the earth in the direction of the earth, as shown in the diagram; but, as per recent observations it is proved that, there is not relative speed between the earth's core and its mantle.

The core is actually moving much slower than previously believed – approximately 1 degree every million years. The core exhibits magnetic south at near geo-north and magnetic North at Geo-south on earth's surface. The Earth is negatively charged, carrying 500, 000 C of electric charge. Hence, earth's core is to have +ve charge, Ionosphere is to have +ve charge in lower layer and -ve charge in outer layer each of all equal to 500,000 C. Ref. Journal of Atmospheric and Solar-Terrestrial Physics, Volume 164, November 2017, Pages 127-131' denies capacitor concept of earth and its atmosphere. But, when we replace the charge regions to resultant spherical surfaces; then it tallies to much extent of understanding the phenomena macroscopically at the first instant. Such approximations are followed in science.

And this is the beauty of the science because of which progress in science takes place. The ionosphere is at the meeting points of the earth's atmosphere and the space. The ionosphere is defined as the layer of the Earth's atmosphere that is ionized by solar and cosmic radiation. It lies 75-1000 km (46-621 miles) above the Earth (The Earth's radius is 6370 km). The formation of ionosphere is scientifically predicted as follows. The Sun's upper atmosphere containing the corona, is very hot and, produces a constant stream of plasma, UV and X-rays, that flow out from the Sun and affect, or ionize, the Earth's atmosphere air into +ve ions and -ve charges, the electrons constituting ionosphere.

The +ve ions being thousands of time massive than an electron (mass of one proton is 1850 times the mass of an electron); The +ve ions in their sphere are more attached to earth than the electrons. Hence electrons are in outer sphere to the +ve ions'. Hence, w.r.t. earth's center as an observer constantly facing the Sun; +ve ionosphere is dragged in earth's direction of rotation much more than the -ve charge-electron. But, their quantity in coulomb is the same and they both rotate in direction opposite to earth's direction w.r.t. earth, around earth's axis. The linear speed of +ve ions is slightly less than that of the -ve charges. A moving charge exhibits magnetic field in direction to oppose the motion of the respective charge. This magnetic field is perpendicular the direction of the current. The total scenario of Earth's magnetic circuit is as shown in figure-2 below.

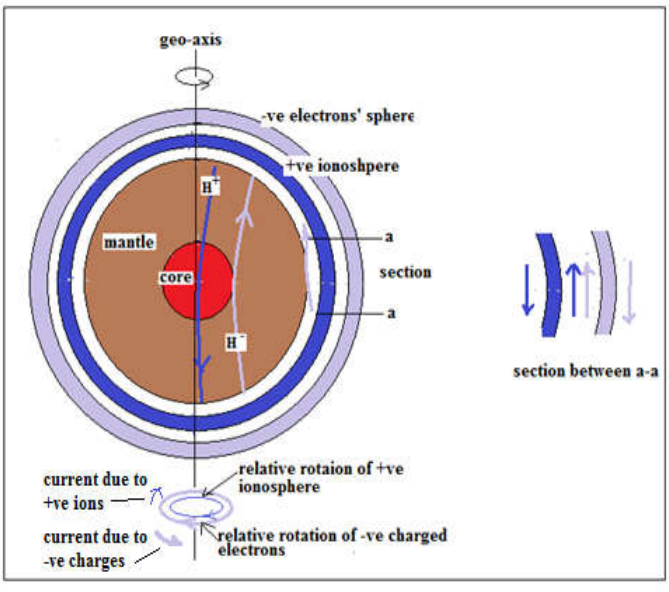

Figure 2. Earth's Magnetic Field due to its Different Components

Both of the spheres +ve and -ve of ionosphere rotate in opposite direction of the earth's direction of rotation. Also they are rotating in clockwise direction w.r.t. earth as seen from geo north pole of earth. Therefore, the +ve ion's sphere forms conventional current in clockwise and the -ve electrons form conventional current in anticlockwise directions w.r.t. the earth's surface. As seen infigure-2, and as mentioned above, Earth's resultant magnetic field is obtained according to electromagnetic rules. The +ve ion's field is somewhat stronger than that of very charged particles the electrons w.r.t. earth because the +ve ionosphere radius being smaller than that of -vely charged sphere and +ve one is nearer to earth than the -ve one. The central iron core works as high permeability path for magnetic field.

Hence, magnetic field due to +ve ions' sphere passes through the earth's centre in the direction from geo north to south. The magnetic field due to electrons' sphere, is repelled by the magnetic field of +ve ions passing through the centre of the earth. And it runs, from geo south to geo north on earth's surface. This description is at the time when all the core of the Earth was molten. As the earth's central volume due to pressure and heat radiations got cooler and solidified in magnetic field becoming a permanent magnet assisting the magnetic field of the +ve ionosphere. Its magnetic field assisted the electrons' magnetic field on earth's surface by attraction of opposite parallel magnetic fields. And as the Earth solidified and permanently magnetized core gave its magnetic field, the depletion of ionosphere has started. Though the Green Gasses are held totally responsible for the depletion of ionosphere and *efforts are being done to reduce Green Gas generation systematically, The world is unaware of the portion of Green Gas depletion due to solidifying of Earth's molten core.* It is explained below, how the solid iron permanent magnetic core of earth depletes the ionosphere.

Earth's magnetic field source; its iton core

17. Please refer the figure-3 below. In the figure-3 the magnetic field of earth is considered due to earth's magnetic-permanent magnetic core. The major portion of the field is due to the Earth's iron solid core magnet. It is quite obvious that, the linear velocity of earth's mantle particle decreases gradually inwards along the earth's equatorial Dia. for the same angular velocity. The central solid core being separated from mantle and it being smaller in dia than the earth; and as it was attached to earth's mantle in the same state of matter, the gaseous state; it has tried to get grater angular speed than the earth during its cooling due to high pressure of mantle on it. Around the solid core it remained liquid iron core because the solidification of core as it went on, empty space in earth's core was created releasing pressure on core and hence most of the outer part of core remained liquid departing the mantle and the solid core from each other.

Thus, the liquid core remained a conman link connection it reduces it to equal to earth's rotation. But, as the molten material bond will be weaker than solid material bonding two solids; a little excess speed in direction of earth, than that of earth; of the iron core is existing. The ions and electrons formed in upper atmosphere, due to solar electro-magnetic radiations; floats in atmosphere top around Earth due to earth's gravity. Here again experience the beauty of the physical nature. Earth's gravity can keep the ions and the electrons floating its overhead but, cannot drive them along its rotation. The gravity of ions and electrons is not enough at such a distance from the earth's surface so that those could be driven by the earth in its direction of rotation. A hit of a massive bat in a small distance and slower speed to a ball of a smaller mass; takes away the ball at higher speed at a much longer distance. But here the case is reverse.

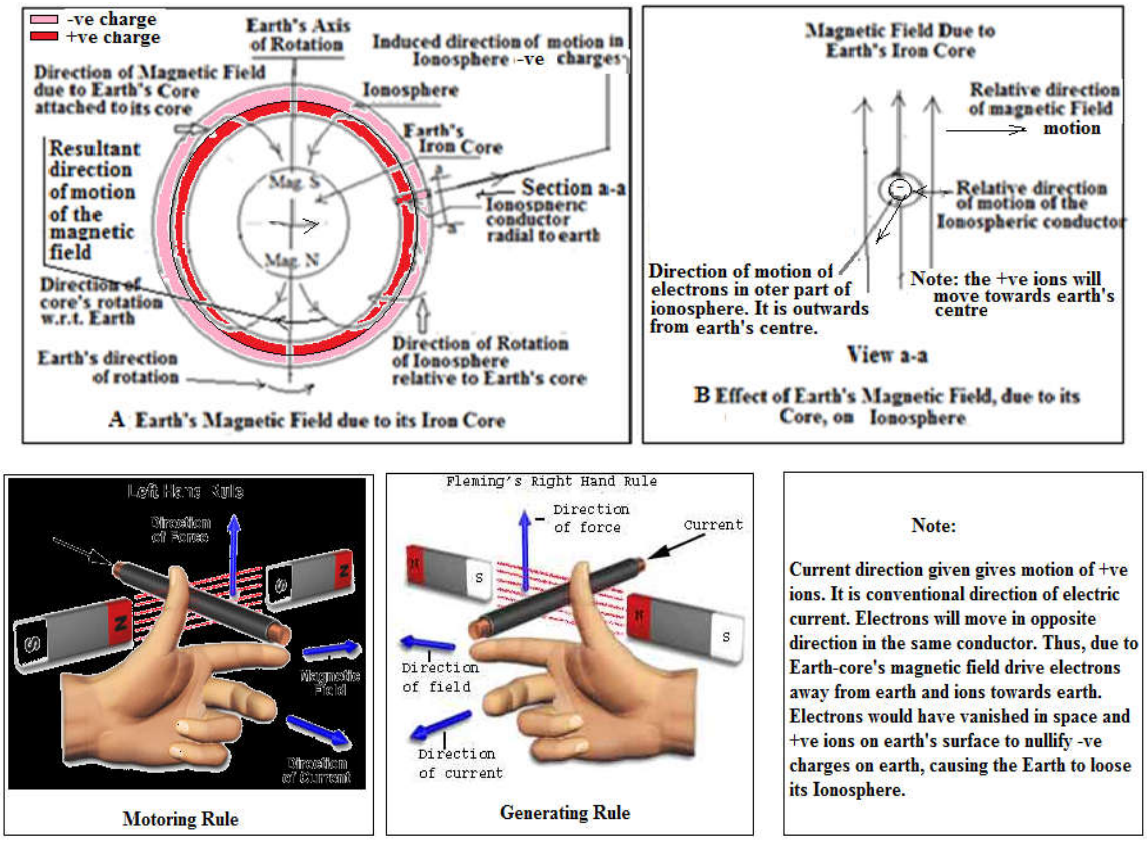

Figure 3. Effect of Magnetic Field on Ionosphere if it were due to Earth's Magnetic Iron Core

The gravitational lines of force of earth's particles become weaker at distant ionosphere and further weaker at electron particles'. Hence, the hit of Earth's gravity line weaker resultant line of force is, like a cricket bat hitting to a big boulder. Hence, the ions and electrons in ionosphere are just hold themselves floating over the slipping gravity lines of the Earth. Such gravity is not able to pull those electrons towards earth's surface against atmospheric up thrust. Therefore, the ionosphere and above it, electron sphere are rotating in relatively opposite direction to that of the earth, that is the clockwise direction (east to west). Now, Please refer the figure 3 above. An ionic-spherical conductor, in radial direction of Earth is taken.

The magnetic field due to Earth's core, passes through it from its geo south to geo north (the magnetic field direction on Earth's surface and in ionosphere). The +ve ions and the -ve electrons in their respective halves in the conductor held by forbidding voltage developed across their boundaries as is built up in solid state junctions in electronics. By applying electromagnetic rules as shown in the figure; it seems that, the electrons get lost in space and the +ve ions get lost in earth's crust; because the Earth's magnetic field due to Earth's magnetic core is spread from its core to beyond ionosphere deep in space, in the same direction as it is the only, the solo magnetic field with earth, as is shown in figure-4 below.. Though the Sun's flares may shower electrons towards earth, above mentioned magnetic field of earth could not held them and protect the ionosphere.

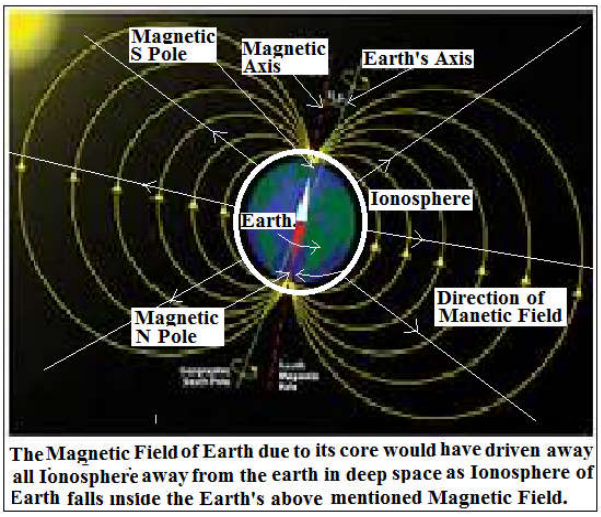

Figure 4.The Earth's Magnetic Field due its Iron Core as Considered at Present

The study of Mar's magnetic field explained below at suitable place, also confirms the above say. Hence, there is much space, to consider another source of Earth's magnetic field. And there remains no other source, other than Earth's Ionosphere and its electrons' sphere covering it. If the Earth's iron core would have source of Earth's magnetic field; the continuing existence of the ionosphere would have lost long before.

Magneic field of ionosphere of +ve Ions

Its magnetic field direction is same that of earth's permanent magnetic core. Its N pole is near geo south and the S pole at Geo North. Now as viewed from the Sun or in more general as viewed from space, the earth is rotating anti clockwise w.r.t. the +ve ions. Still as per electromagnetic rules the direction of magnetic field remain the same, as the magnetic field direction is dependent on relative motion between source and the perceiver. Here source is the +ve ions Ionosphere, the perceiver is the earth and observer is a scientist stationed in solar frame.

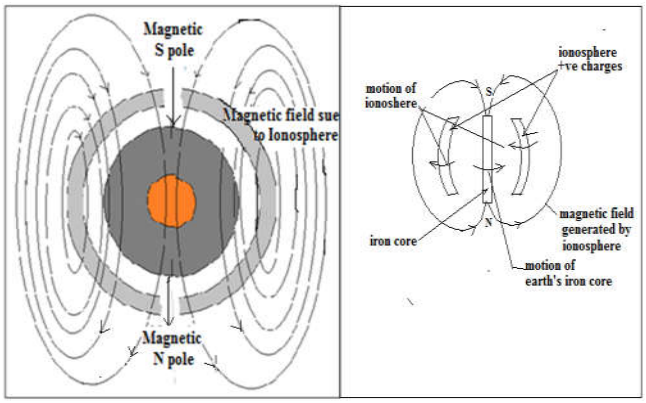

Figure 5. Magnetic field of Earth's Positive Ionosphere

One objectionable thing found here is, the direction of magnetic field on earth surface is reverse that of through its core. There is one more magnetic field that suppresses the effects of above magnetic fields to noticeable extend. It is the magnetic field due to electrons' layer above the +ve ionosphere, equal in electrical charge quantity. We shall see the combined effect of the fields due to +ve ionosphere and electron's -ve charge sphere beyond the +ve ionosphere. Please see the figure-6 below. Both of the spheres +ve ions and electrons rotate in same direction that is opposite to the Earth's rotation. Electrons magnetic field is in opposite direction of the +ve ionic sphere's magnetic field. The self magnetized solid core assists the +ve ions' magnetic field, and the +ve ionosphere is closer to the Earth's solid core. These two facts pass magnetic field of the +ve ionosphere [H^+] through Earth's core. When near say geo south pole; the magnetic field due to electrons' sphere [H^-] tries to enter the Earth at near geo south; but, as similar polarities of magnetism repel; the H^- magnetic field is shifted towards Earth's surface. Hence, on Earth's surface, the direction of magnetic field is from geo south to geo north.

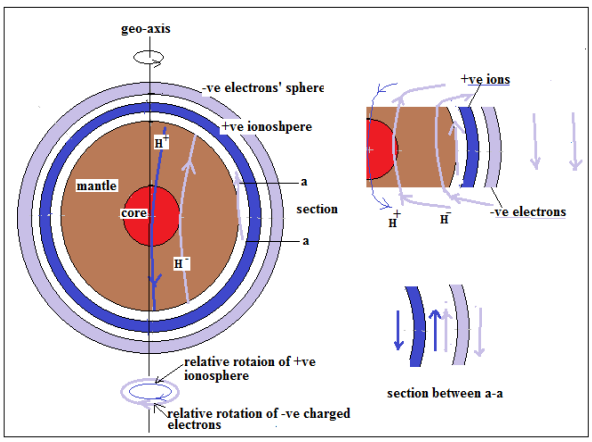

Figure 6. Magnetic field due to Ionosphere's +ve Ions and electrons

Thus, at magnetic pole, opposite to each other magnetic fields play a game of pushing each other. Because, the +ve ions and electrons are in gaseous state constrained under different forces, that are forces of gravity, forces of atmosphere, forces of solar radiations, self and mutual electromagnetic forces

thermal forces, different drift forces etc. Therefore at magnetic poles a drastic dance of Earth's Magnetic Field goes on continuously. We found in Earth crust natural magnets laid buried whose magnetic field directions are reverse to that of Earths. The reason of it lies in this mentioned fact. The Earth's magnetic Field is thus a complicated magnetic field. But, with above explanation to much extent that complication in fact gets removed away.

The Physics today accepts that, the direction of Earth's magnetic field in deep space is as it is on Earth's surface; that's from geo south to geo north. But, with above discussion it ought to be reverse of it. Because, the electrons sphere is, outer to +ve ion's sphere. Electron sphere faces the space. In between the +ve ionosphere and electron sphere; H^- presses the H^+ field and mostly preventing from space. Hence, magnetic field H^- is spread in deep space as Earth's magnetic field in deep space. Hence, verification of direction of earth's magnetic field beyond total Ionosphere of Earth, in deep space is very essentially needed actually, as is done in laboratories with the help of Magnetic Needle. And with above reasoning; the direction of magnetic field associated with Earth; is from geo north to geo south opposite of that on Earth's surface. The rotational axis of Earth, is tilted by 23.5 degrees to its orbital plane. Initially the Earth was rotating around the Sun with its axis perpendicular to its orbit around the Sun. But due to hitting by a massive body passing through solar system after formation of the earth's mantle and the core with same solid core around it the liquid core; the Earth's mantle became tilted to Earth's orbit around the Sun; but, the solid core of earth being separated by fluid core it does not got tilted to Earth's orbital plain as the mantle; but, there is existed an angle of 9.69^0 between the two. Therefore, the solid core wobbles around the geo axis of Earth; and it with longer period of earth's axis wobble; might be shifting the magnetic poles' position as time goes on from gradual shift to flip flop.

As per News

Solar wind Turned mars into dry cold planet: Study. Reuters | May, 31, 2017, 11.19 AM IST; Why is only half of Mars magnetized? Posted by Emily Lakdawalla on dt. 24/10/2008; Mars have lost its magnetic field. It is having feeble magnetic field strength $(1/40)^{th}$ that of earth. The north pole of Mars is flat and south pole is towered. North pole is not having magnetic field to say, but, south pole indicates some magnetic field. A Magnetic shield around a satellite protects the atmosphere of the satellite. It is said, Magnetic field of mars might have because of its molten core and as time passed the molten core cooled down to solid core.

Unstable magnetic field at earth's polar regions

The magnetic poles of Earth are not stable. They shift continuously at the rate of speed 10 to 40 Kms. Per year. from 20th century to now. Another fact observed is that, the Earth's magnetic field has weak end by 10% since 19th century. But it doesn't mean it is going on decreasing. It changes; sometime increasing and some time decreasing. Paliomagnetism studies tell us that, the Earth's magnetic field flips every 300 years on an average reversing its magnetic poles N and S mutually! The reason given that, the magnetic field generated by rotating liquid iron core waxes and wanes pole drifts obtained by simulation doesn't appear satisfactory.

Because, the solid core floats in the liquid core. The liquid core density is much more being it iron and under Earth's mantle pressure; so high that it is converting into solid layers on the existing solid core at about 5000 degrees C temperature. Hence, Earth's mantle and the solid core drifts interact with each other so strongly that, they are rotating at the same angular velocity, Yet, the solid core being floating in liquid core and being smaller than mantle of earth has a higher rotational speed than Earth; but, suppressed by mutual drift to a very small relative velocity up to a few degrees in millions of years. Thus they behave as a single body. After all simulation depends on the input software. The flipping of poles seems apparent. The source pointing towards the flipping of magnetic poles is magnetized iron strips found on earth are at some spots magnetized oppositely. It can happen definitely due to varying balance of magnetic fields of Earth's ionosphere containing +ve ions and -ve charges as electrons beyond.

Their relative strength may vary relative to each other but directions up to flipping don't seem within their reach. For present established results, please refer, NASA's Feature, 'Earth's Inconstant Magnetic Field dt. 29/03/ 12. The variation of magnetic field strength is dependent on the electric charge caught by Earth during Sun's flares. However, Earth's magnetic depletion is bound to happen microscopically due to reasons innovatively revealed in this research paper. In magnetic polar region the magnetic dip varies very much; at times it reverses and comes back during its day today observations. It can happen due to magnetic fields of ionosphere's +ve ions layer and the magnetic field of electrons beyond it. The ionosphere electrically charged particles are of earth's atmosphere and due to thermal air currents and Sun's flares, the ionosphere densities vary much day to day. And main thing is that the magnetic fields of +ve ionic sphere and 0f -ve electron sphere, both opposite to each other meet at poles, peculiarly in the same direction as explained above; therefore, the resultant direction of the magnetic field changes their frequently so that, the dip measuring free needle of the meter practically dances what so ever manner.

Why mars has not ionosphere

Mars is much like similar to Earth Except its atmosphere. Its atmosphere contains CO_2 and it has no remarkable magnetosphere and ionosphere. It has solid nickel iron core. Because of its size smaller than earth and larger distance from the sun compared to that of Earth; its molten hot core cooled down very earlier. We have seen above if earth's core would have been full solid and permanent magnet, how the Earth's Ionosphere would have been lost. The same must have happened with Mars very definitely. Now on Mars, traces of Ionosphere appear and varying weak magnetic field is observed. During solidification of the core of Mars; it solidified earlier getting permanent magnetization due to its then Ionosphere. Once, it completed that process; it drived away Mar's Ionosphere away in deep space. Hence, three is not noticeable magnetic field of Mars. However it is having weak magnetic field in its southern somewhat conical part. Because, during Sun's flares, out of emitted electrons from the Sun, some remain wandering around south cone-like portion of Mars. This Happens due to electrical charge property; that, electric charge accumulates at sharp corners, pointed conductors. The Iron core in southern hemisphere of Mars must be satisfying this condition. Therefore, it holds electrical charge.

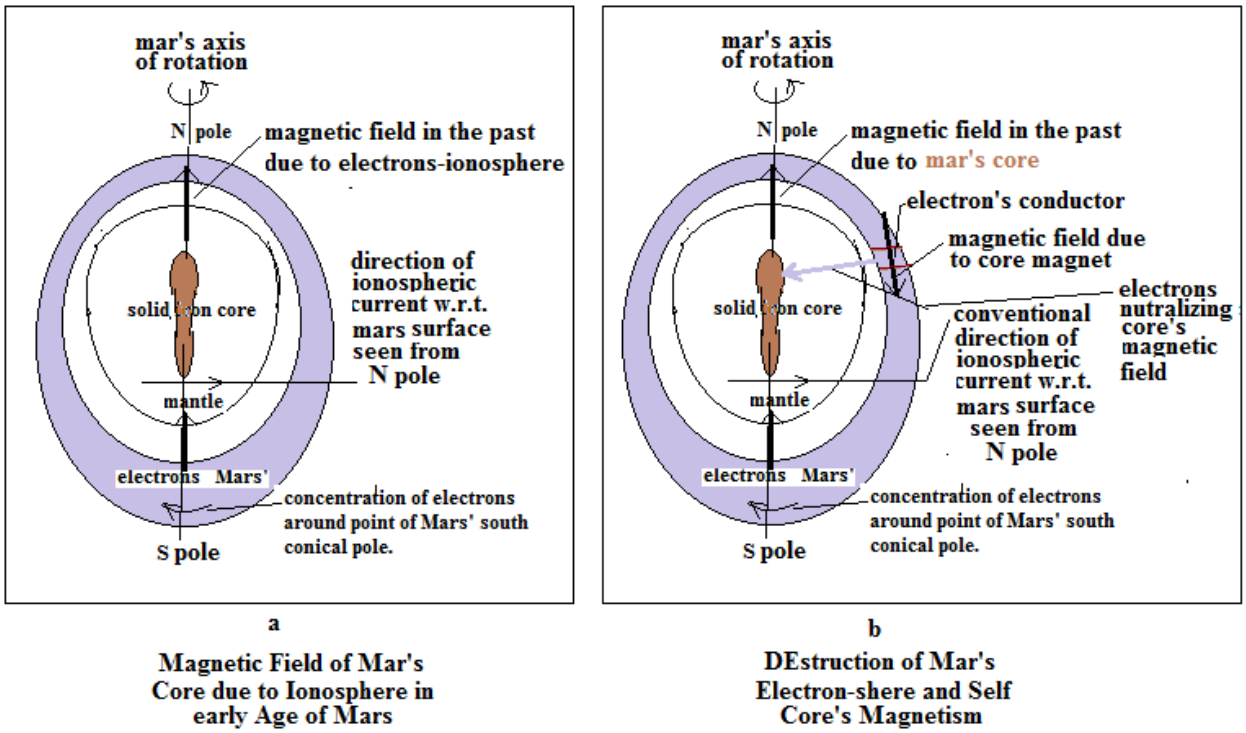

Figure 7. Mar's Ionosphere

And, due to relative motion between the Charge and Mars, weaker some magnetic field of Mars exist. All this analysis leads us to the fact that, Mars Ionosphere is lost due to its solid magnetic core during the fast cooling of the solid hot core, following electro-magnetic rules.

Hence, it is submitted by the author that, in depletion of ionosphere of earth, there is some part, of the Earth's Solid (Permanent) Magnetized Nickel-Iron core. The study of Mar's very weak magnetic field and absentee of ionosphere reveals the similar cause. For, please refer the below figure-7; in which Mars with its oblate shape, internal core and assumed sphere of electrons, caught from the Sun's flares, by Mars is shown. Information of a planet is collected/expressed w.r.t. its surface. The core of Mars is mainly made of nickel iron. Initially the core was hot and fluid. Due to its oblate shape like a 'Play-Top' more or less; its core is ought to be longer along its axis as shown in figure-7.

Suns flare radiate electrons in space around it. Some of those are held by the planets with the help of gravity and induced opposite electric charges on the Planet, any planet. If there is any magnetic field of the Planet, it would also hold the solar radiated electrical charges initially and then drive it away from the planet by electromagnetic forces developed by the rotating magnetic core with its respective planet. As the charged sphere is at a distance from surface of the respective Planet, planet's gravity cannot drag it; but, holds above ground at suitable distance. As per Electromagnetic theory; electrical charge accumulates at corners, pointed edges. Therefore, more electrons were to be there on south hemisphere of Mars than the rather flattened North hemisphere of Mars. As per the pattern of rotation of Mars like Earth; the magnetic field generated by Mar's electron-sphere passes through the Mar's central core from its geo-south pole to geo-North pole because, the magnetic field is due to -ve charges the electrons. Due to more charge on southern hemisphere, magnetic field meets higher permittivity path through southern core than the core in northern hemisphere.

Hence more and more magnetic lines pass through southern magnetic core than passing through mantle of Mars. Therefore, southern core exerts relatively more force on iron core in northern hemisphere and pulling down much fluid of northern core into the southern core, thus reducing magnetic fore of northern core's magnetism. Hence, More charge accumulated on southern hemisphere. The fluid core iron in northern hemisphere being thus reduced, it cooled down earlier and became a solid iron magnetic core. The fluid iron material in southern core also has a cause to cool down early. It being conical the heat radiation path for the hot iron southern core is shorter than that of northern core. So, it also became an iron magnet; though later than the northern yet practically at the same time considering on broad scale view. Then the situation reversed.

The iron core of Mars, started working primarily as a magnet than a low reluctance path. Therefore, it started driving away electrons in solar alpha radiations, electrons, away from the Mars in the deep space. Thus, the Ionosphere is lost by Mars. One can realize pure logically that, when the process of different planets birth is similar, each must have fluid core containing most of the iron as its main major constituent. Second thing is that, a magnetic field is proportional to the speed of electrical charges constituting current w.r.t. the surface of the respective planet. The linear speed on surface due to spinning around itself of a planet , in respect of other remaining planets, than the Earth and the Mars planets is, too small to generate its sufficient magnetic field to work as planet shield, to safeguard the life if any on that respective planet.

Conclusions

The conclusions from above discussions in respect of the earth's magnetic field are as below

- The Earth's magnetic field is due to its Ionosphere and not due to Earth's silicon iron core. The core provides high permeability path to the magnetic field.

- A magnetized core of a planet, drives away its ionosphere into deep space due to electromagnetic action between the magnetic field of the core and electrical charges in its ionosphere.
- Mars' ionosphere is driven away in deep space, because of its magnetized nickel iron core, removing its own magnetic property and becoming a simple iron core. The Mars' core has now a little residual magnetism.
- The planets having low rotational speed around themselves, like venues, Jupiter, Saturn, cannot develop ionosphere around themselves, due to their smaller rotational speeds.
- The cause of depletion of Earth's ionosphere is not only the green gasses but, the solidification of Earth's core as a permanent magnet is also another cause which is not taken so seriously; because, it is a very long process; and hence, perhaps not noticed.

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