

Gravity in Earth's Interior and Geophysics

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Abstract

Considering the primitive virtual negative (PVN) charge, defined for physical mass interacting with electric charges, it is necessary to review both Earth's interior gravitational field and its magnetic field. This is particularly relevant when examining the processes involved in Earth's formation from a massive molten magma ball. This review includes two explanations for the formation of Earth's crust and the subsequent movements of its continental plates: the Pangaea/plate-tectonics model and the hypothesis of an expanding Earth. Current questions, such as the rotation of Earth's inner core, the wandering of geomagnetic poles, and geomagnetic field reversal, are explored for possible explanations. The Appendix further discusses the origin of geomagnetic reversals and how the gravity of progenitor stars can contribute to Type II supernovae explosions.

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Introduction

The origin of physical interactions in electromagnetism and gravity is based on the equilibrium in the distribution of vacuum particles in 4-D complex space, from which mass-charge interactions are expected to arise between gravitational mass and electric charges. For instance, there is an attractive interaction between mass and positive charge, and a repulsive interaction between mass and negative charge. The attractive gravitational interaction can be viewed as a residue resulting from the predominantly dominant electromagnetic interaction. In the context of mass-charge interactions, a primitive virtual negative (PVN) charge is defined for mass. However, these mass-charge interactions are not linear; they depend on the geometry of the mass and charge distribution (KimKiyong, 2008).

Compared to electromagnetic interactions, the strength of mass-charge interactions is negligibly small under normal circumstances. However, the effects of mass-charge interactions become significant in phenomena involving massive objects, such as planets, the Sun, and other astronomical bodies. According to the mechanism of mass-charge interaction described above, gravity in the Earth's interior is nearly negligible. This conclusion may seem surprising and even unrealistic, but it is based on the fundamental principles of mass-charge interaction in 4-D complex space.

With the new physical concept of mass-charge interaction, we will review the processes involved in the formation of the Earth's crust from the beginning and compare two competing theories: Pangaea/plate tectonics and the expanding Earth theory, examining whether they are reasonable enough to be accepted.

Just as we learn from the history of human society and culture, we can study natural science by examining past natural phenomena, as the governing laws and principles in natural science are considered universal. By the same token, we can understand phenomena that occurred in remote places in space that we may never reach. Therefore, we also suggest how the gravity inside the progenitor star contributes to the explosion of Type II supernovae, presenting an alternative mechanism to the energy provided by neutrinos (Wikipedia contributors, 2025).

Expanding Earth

In the history of the Earth, it is said that the Earth's crust, the outermost hard shell, initially consisted of two parts: a supercontinent known as Pangaea and the oceanic crust. The supercontinent has since been divided into several continents, and each continental crust has moved across the Earth's surface to the present day, a process known as plate tectonics in geology. On the other hand, there is a hypothesis suggesting that the Earth is expanding from a single supercontinent that covered its entire surface when the hot magma cooled down. According to this hypothesis, continental and oceanic crusts are generated naturally as the Earth

expands. However, it appears that the expanding Earth theory has been abandoned due to a lack of evidence supporting the idea of an expanding Earth (Wikipedia contributors, 2025), while the plate tectonics theory has been more widely accepted.

In geology, plate tectonics (Wikipedia contributors, 2025) is a theory that explains how continental crusts move. Convection currents, driven by heat from the Earth's core, create a semi-molten layer in the asthenosphere (a layer within the upper mantle), where the rock is more ductile and behaves plastically due to high temperatures. This allows the lithospheric plates, which are rigid and composed of the crust and the uppermost part of the mantle, to move easily. Movement occurs when a cold, dense plate sinks into a subduction zone (slab pull) and/or when magma rises at mid-ocean ridges (ridge push). It is interesting to note how the semi-molten asthenosphere lies beneath the rigid lithosphere, which includes the Earth's crust, on which the continental crust appears to float (EarleSteven).

According to proponents of the expanding Earth theory, plate tectonics cannot adequately explain the distortions in the reconstruction of Pangaea, the coincidence of ocean floor ages, and various paleontological paradoxes. In contrast, the expanding Earth theory offers natural explanations for these phenomena, although it does not clarify how the Earth's expansion is possible (Maxlow, 2016; Burchell, 2018; Collection, 2022; Cosmic Core, 2022). Now, we can supply an important clue for the Earth's expanding theory.

The geological history of the Earth begins with the primordial Earth, a rotating massive ball of magma. In a plasma state, the electric charge distribution within the Earth resulted in overall neutrality. When comparing the strength of electric interaction to gravity, we cannot expect significant charge separation in naturally induced electric charge distributions—especially those from mass-charge interaction—without the involvement of the magnetic (Lorentz) force.

When it cooled, the Earth's crust—a single, hard, outermost shell—formed. As cooling continued, heavy elements sank and light elements moved upward through a process of differentiation, leading to the creation of the Earth's inner and outer cores. Although its strength was minimal, a geomagnetic field already existed. This early field was formed from positive charges induced in the uppermost layer of the outer core (liquid plasma of iron and nickel). This induction resulted from the primitive virtual negative (PVN) charge effect of the solidifying inner core mass and the Earth's rotation. Subsequently, the main geomagnetic field was generated. Over geological time, the geomagnetic field's intensity increased as the inner core fully hardened into solid iron-nickel. This increase was due to the magnetic (Lorentz) force acting on moving charges under the influence of the magnetic field, which induced positive charges in the uppermost layer of the outer core, while negative charges moved beneath the crust.

Considering that seismic velocity increases from the Moho discontinuity, which lies beneath the crust, to the lithosphere-asthenosphere boundary (LAB), and that the asthenosphere is in a semi-molten state, it follows that the negative charge distribution should be located beneath the lithosphere and at the top of the asthenosphere, rather than underneath the crust. This is further supported by the fact that the depth of the oceanic lithosphere is shallow when new oceanic crust is created but becomes deeper with age as the oceanic lithosphere moves away from the ridge and thickens due to cooling (Treatise on Geochemistry (Second Edition), 2014, 2025). Although

the Moho discontinuity is generally recognized as the boundary between the crust and the mantle, it is understood to be a boundary beneath the crust where a higher concentration of magnetic minerals exists compared to the crust, influenced by the geomagnetic field.

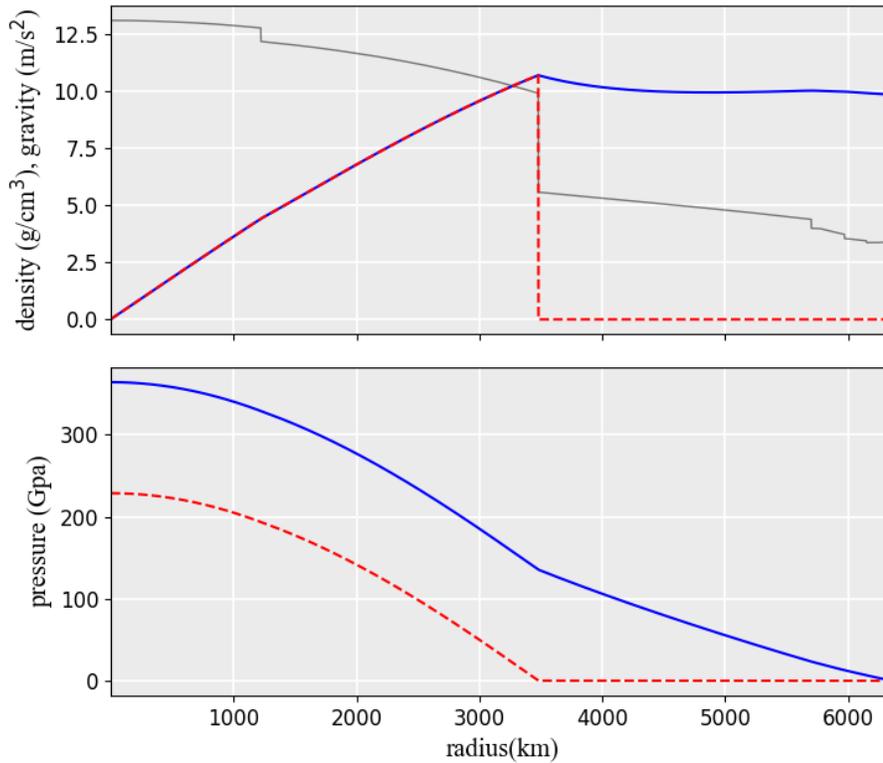


Figure 1: density, gravity, and pressure inside the Earth

Next, we need to consider the gravity in the Earth's mantle. Here, the positive charge distribution within the outer core (mainly its uppermost layer) controls the gravity. This is due to the dominance of its mass-charge interaction under the spherical symmetry in both mass and charge distributions. This effectively nullifies the gravitational influence of the core mass, resulting in only a minimal mass-charge interaction in the space between the outer core and the lithosphere.

In Fig. 1, the density inside the Earth is represented by the gray solid line (BormannPeter, 2002). Using this density profile, gravity and gravitational pressure can be estimated as shown by the blue lines; however, if the mass-charge interaction is taken into account, as mentioned above, gravity in mantle nearly disappears as indicated by the red dotted line, which might be less than $\sim 10^{-3} \text{m/s}^2$ in an ideal case that electric charge distributions are symmetric about the center of the Earth and even reversed due to the Earth rotation, which is $\sim 10^{-2} \text{m/s}^2$, and the corresponding gravitational pressure inside the Earth is shown in red dotted line. In reality, the gravity at the near edges of both charge distributions should be considered with a two-parallel-

plate geometry on such a macroscopic scale rather than spherical symmetry, from which gravity should be connected smoothly at the edges.

Anyhow, according to the mass-charge interaction mechanism, we can expect that the gravity in the mantle decreases significantly. Meanwhile, magnetic pressures act on the positive charge distribution within the outer core, directed toward the center of the Earth, while the negative charge distribution beneath the lithosphere exerts an upward push. (KimKiyong, 2008; 2017)

Now, we have a clue for the hypothesis of an expanding Earth. Let's make a possible speculation: as the Earth expanded, its rigid crust, which initially covered the entire surface, broke into several pieces, including continental crusts, while new oceanic crusts were also formed. The expansion of the Earth was expected to continue until a new force balance was established within the Earth. Moreover, geomagnetic field also increased due to the expansion.

Plate-Tectonics

If the Earth-expanding does not continue and the continental crusts are still moving on the surface of the Earth, we need to understand how such massive plates can be moved easily by such a small enforcement (slab pull, ridge push) without breaking apart. In fact, the question is how the asthenosphere (a semi-molten layer) can exist beneath the lithosphere, which is rigid, rocky outer layer of the Earth consisting of the hard crust and the solid uppermost part of the mantle.

According to the PVN charge dynamo mechanism of Earth's magnetic field generation (KimKiyong, 2008), Earth has two magnetic dipole moments; with Earth's rotation, one dipole moment is created by a negative charge distribution at the LAB, while the other is formed by a positive charge distribution within the outer core. In other words, there are two magnetic dipole moments: one located externally and the other embedded within it, each possessing a different polarity. The strength of the internal dipole moment is significantly smaller—by a couple of orders of magnitude—than that of the external one.

Therefore, there is magnetic pressure pushing up the lithosphere, causing it, including the crust, to be elevated. This results in a buoyancy effect, while the additional pressure beneath the lithosphere leads to an increase in temperature and a decrease in pressure at LAB. This phenomenon helps explain why the asthenosphere is in a semi-molten state.

Similarly, magnetic pressure may explain the temperature increase at the Core-Mantle Boundary (CMB). The magnetic force that pushes positive charges into the outer core could also account for the sudden and distinct increase in mass density at the CMB (Fig. 1). Although the mass differentiation process explains this phenomenon, it's difficult to understand how it's feasible with only gravitation in such an extremely hot environment.

Since the Earth's crust in the lithosphere has the buoyancy effect caused by the magnetic pressure on the negative charge distribution beneath the lithosphere, the continents are not fixed and can move easily under external forces.

Earth's Inner Core Rotation and Magnetic North Pole Wandering

Inner Core Rotation

Regarding the rotation of the Earth's inner core (Maffly, 2024; Ralls, 2025), one might hypothesize a relationship with the Earth's internal geomagnetic field. The inner core, embedded within the liquid plasma of the outer core, possesses significant mobility. Additionally, its moment of inertia is considerably smaller than that of the entire Earth. Therefore, if the geomagnetic field within the Earth changes, the positive charge distribution within the outer core would react against this change, in accordance with Faraday's Law of Induction. This reaction could then be transmitted to the inner core via the viscosity of the outer core. However, some reports indicate that the inner core's rotation is minimal, yet persistent for approximately ten years, and exhibits directional changes. Consequently, this phenomenon cannot be solely attributed to geomagnetic field variations, as no such prolonged geomagnetic field variations have been observed.

A possible explanation lies in the Earth's moments of inertia, which are intrinsically linked to its angular momentum. If there is a density change inside the Earth—possibly in the mantle and outer core, due to internal thermal fluctuations or any external source—the Earth's moment of inertia would be altered. Consequently, the Earth's angular momentum would also change. This variation, in turn, should cause a reaction from the inner core, consistent with the conservation of angular momentum. Furthermore, the magnetic pressure at the boundary between the outer core and inner core, acting in an outward radial direction, makes the inner core move more easily.

Magnetic North Pole Wandering

It has been known that the magnetic north pole has been moved, and that recently its moving is faster than ever before (Hennings & Lynch, 2019; NCEI, 2025). We can find a feasible explanation for why the magnetic north pole is wandering and why its recent movement is faster than before, as follows.

Variations in the geomagnetic field, caused by external or internal factors, can influence the distribution of positive charges within the outer core, resulting in a change in the internal magnetic dipole moment. Hence, it can be inferred that the wandering of the magnetic north and south poles is caused by the magnetic interaction of the internal magnetic dipole moment with the external one. If the variations are not drastic, the wandering of magnetic poles should be confined to drifting in the vicinity of geographic poles, through which Earth's rotating axis passes. Additionally, if the magnetic interaction between two magnetic dipole moments is compared to the motion of a simple pendulum in gravity, the magnetic north pole can move

faster when it passes near the geographic north pole because the potential energy in the magnetic interaction is reduced, and its kinetic energy consequently increases.

Geomagnetic Reversal

Geological records indicate that the Earth's magnetic field has flipped numerous times in the past, as evidenced by magnetic patterns found in volcanic rocks and ocean floors. However, these geomagnetic reversals do not occur at regular intervals; over the past 83 million years, there have been approximately 183 reversals with each polarity transition lasting between 1,000 and 10,000 years (Wikipedia contributors, 2015; BGS Geomagnetism, 2015). The geomagnetic reversals have occurred in geologic time periods measured in millions of years ago (Ma) or billions of years ago (Ga). For example, the last geomagnetic reversal occurred 0.76 million years ago. We humans cannot confirm this occurrence at present, and perhaps we never will in the future. However, we can explain it using our current scientific knowledge and prepare for the possibility of another occurrence in the future.

Given that the geomagnetic field is believed to be generated by the PVN charge dynamo mechanism, it is necessary to investigate how electric charge distributions beneath the lithosphere and within the outer core can be altered. Since these charge distributions are temperature-dependent, changes in the Earth's interior temperature can originate from internal and/or external sources.

Supposing it is the case that the source for this change comes from outside, that should be cosmic rays and/or neutrinos, and their flux would be absurdly high and sustained over a long period. On the other hand, if the source is in the Earth's interior such as radioactive materials, there should be a reason why the nuclear fission rate changes irregularly. For now, however, let's set aside the questions of how the Earth's interior temperature could possibly change.

When the temperature inside the Earth increases, more free ions become available, leading to additional charge accumulation in both layers. However, the negative charge distribution reaches its charging capacity beneath the lithosphere, while the positive charge distribution within the outer core continues to increase. Consequently, the magnetic field generated by these positive charges becomes dominant.

Whenever the Earth's interior temperature returns to its previous state, the geomagnetic field should also be restored through the PVN charge dynamo mechanism, which results in the geomagnetic excursion.

If the temperature of the Earth's interior continues to rise, the magnetic field generated by positive charges within the outer core will strengthen, and it will push out negative charges beneath the lithosphere. This process will induce additional positive charges within the outer core, while negative charges will be expelled to the Earth's surface or into the atmosphere.

First of all, the negative charge distribution is being pushed toward higher latitudes beneath the lithosphere. As the geomagnetic field becomes more dominated by the inner positive charge distribution, the negative charges will disappear beneath the lithosphere and will remain outside the Earth's interior. As a result, these negative charges cannot contribute to the generation of the geomagnetic field. The positive charges within the outer core will then take over the generation of the geomagnetic field.

Now, instead of negative charges, positive charges are induced beneath the lithosphere due to the magnetic force. Within the Earth's interior, the magnetic field generated by these induced positive charges becomes dominant over the magnetic field from positive charges within the outer core, especially when considering the relative radii of the lithosphere and outer core. This causes negative charges to replace positive charges within the outer core. Consequently, the repulsive interaction between negative charges and mass maintains the Earth's internal gravity in a configuration similar to the one described previously. Once the internal temperature decreases, the geomagnetic reversal is complete.

After a significant period on the geological timescale, if the temperature within the Earth's interior increases again, the processes described above all repeat with different charge polarities, and the Earth's geomagnetic field is reversed again.

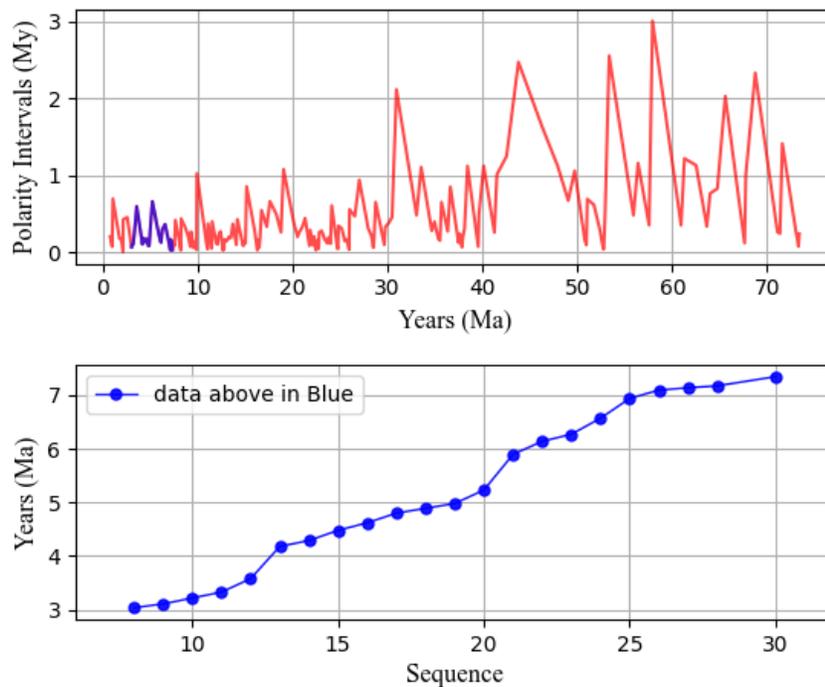


Figure 2: geomagnetic polarity intervals during the last 118 million years.

Now, let's look at the paleomagnetic data recorded in the Earth's history. The Geomagnetic Polarity Time Scale (GPTS) shows randomness in all data (Marine Magnetic Research, 2025). For example, the timeline data of normal polarity Intervals was retrieved for last 118 million years (Cande & Kent, 1995). Fig. 2 illustrates the polarity intervals—normal and supposedly

reversed—over the last 118 million years. In the ‘Polarity Time Intervals Vs. Years (Ma)’ graph, a global trend reveals that these time intervals have progressively shortened.

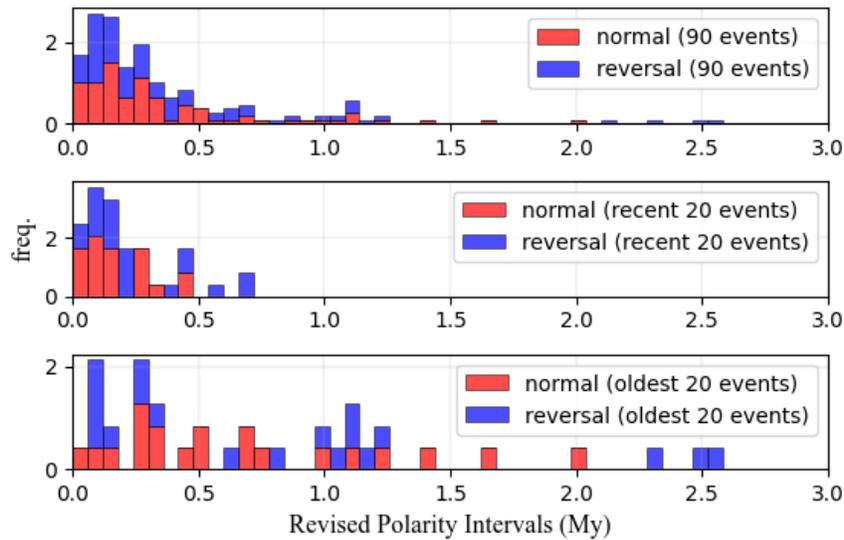


Figure 3: the trend of polarity intervals

This trend is further supported by Fig. 3. While the data generally appears random, a noteworthy stepwise pattern emerges in the ‘Years Vs. Sequence’ graph, where ‘Sequence’ is in chronological order backward. This pattern is observed within the blue-colored partial data (arbitrarily chosen) displayed in the ‘Polarity time Intervals Vs. Years (Ma)’ graph. In addition, the timeline data of geomagnetic reversals for the last 5 million years was retrieved (Wikipedia contributors, 2015; Wikiversity contributors, 2021).

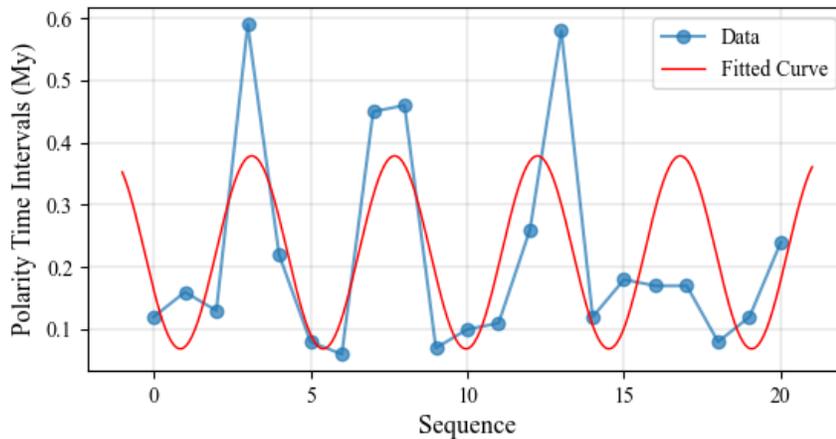


Figure 4: data-fitting with a sine function

For the last 5 million years, the geomagnetic reversals are represented in the ‘Polarity Time Intervals (Ma) Vs. Sequence’ graph in Fig. 4, in which the Sequence ‘0’ indicates the time of the last geomagnetic reversal (0.76 million years ago), which means that the Sequence was given in

backward from the present. A sine function was used to fit the data, indicating that the anticipated polarity time interval of approximately 0.3-0.4 Ma for the next geomagnetic reversal at Sequence '-1' has not been met, as it has already exceeded 0.76 million years. Nevertheless, the data still suggests that another peak at Sequence '-1' can be expected at 0.6 Ma or more.

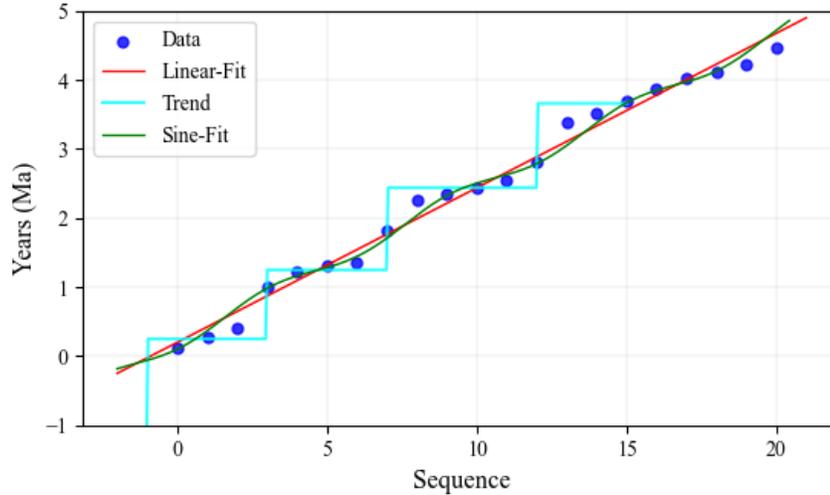


Figure 5: geomagnetic field reversals in history (last 5 million years)

Instead of using mathematical functions for fitting, let's try to find a pattern or trend in the data. In Fig. 5, geomagnetic reversals during the last 5 million years represent with the Sequence. As mentioned in Fig. 2, the stepwise pattern is shown which was drawn with 'cyan' colored line. This pattern indicates that a somewhat longer interval consistently follows a series of short intervals.

As mentioned, fitting the data using mathematical functions like linear or sine functions doesn't seem to work. However, the stepwise pattern suggests another, somewhat longer, interval will occur in the future which means we cannot say that it is already overdue, or that it will occur within the next 100-200 thousand years. If it occurs today, it shouldn't be strange. We discuss more about the geomagnetic reversals in the Appendix.

Summary and Discussion

By reviewing the Earth's formation processes in time sequence from the state of molten magma, we could understand the Earth's crust formation, its core creation, and followed the Earth's geomagnetic field generation. However, according to the PVN charge dynamo mechanism for the Earth's geomagnetic field generation, gravity inside the Earth is reduced significantly in the mantle area while the lithosphere including the crust are being pushed up by magnetic pressure applying on negative charge distribution beneath the lithosphere, in which Moho discontinuity is inferred as a boundary developed between the crust and the lithosphere containing more magnetic minerals.

Now, it seems that the expanding Earth hypothesis, which has been abandoned by the mainstream due to a lack of supporting evidence, may have an important clue above that suggests its possibility rather than the Pangaea, which is supposedly the first supercontinent surrounded by ocean Panthalassa on the surface of the Earth, although the plate tectonics still can explain continental movements on the surface of the Earth.

With the geomagnetic field supposed by the PVN charge dynamo mechanism and followed the Earth's interior gravity, feasible explanations are given consistently for the rotation of the Earth's inner core, the wandering of geomagnetic poles, and the geomagnetic reversal.

Since the gravity in the Earth's mantle is negligible, according to the PVN charge interaction with electric charges and the dynamo mechanism generating the Earth's magnetic field, the gravitational pressure within the Earth's interior is significantly reduced (Fig. 1). This suggests that the temperature of the Earth's core should be much lower than previously estimated (EarleSteven; TranCuong & PhanAnh, 2020). On the other hand, for Mars lacking a global magnetic field, any electric charge distribution within Mars should be induced like a narrow radially-oriented, dipole-like distribution on the surface of its core; consequently, Mars' gravity would not be affected.

For phenomena that occurred in the remote past, not only do we understand nature's history, but we also confirm the sufficiency of our scientific knowledge. Furthermore, we can infer phenomena far in the future and in remote places, even if we never reach those times or places, because the governing laws and principles in natural science are universal. In the Appendix, we speculate on the origins of the geomagnetic reversals and the explosion mechanism of type II Supernovae.

To find truth, we don't have to think of remote places in space, which we may never reach. It's right under our feet: the very Earth we live upon. Let's dig in.

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Appendix

Origin of Geomagnetic Reversals and Data Randomness

The magnetic field reversal doesn't appear to have occurred only on Earth; Mars also shows traces that indicate, or could be interpreted as, a magnetic field reversal associated with plate tectonics (Neal-Jones & O'Carroll, 2005). Hence, it is inferred that the magnetic field reversal is caused by a common source—cosmic rays and/or neutrinos—rather than by the internal magnetic field dynamo mechanism of each planet. Despite ongoing research (Rayne, 2023; Helffrich, 2017), it is suggested that Mars never possessed a solid core due to its low internal pressure.

If that is so, we might speculate that external sources, such as cosmic rays and/or neutrinos could change the Earth's interior temperature. Cosmic rays could agitate the geomagnetic field, leading to increased temperature in the charge distributions beneath the lithosphere and within the outer core. Neutrinos, on the other hand, could directly heat the Earth's core through weak interactions. However, this is unrealistic because the flux of cosmic rays or neutrinos would need to be ridiculously high and sustained for a long period. In addition, the history of universe is much longer than the timescale covered by paleomagnetism data, which, at best, extends back to 4.5 billion years to the creation of Earth. The paleomagnetism data from the Earth should not be sufficient for analyzing information about incoming cosmic rays and neutrinos from the outer solar system. This insufficiency could be one reason why data analysis with mathematical functions doesn't seem to work.

Nevertheless, if the thermal equilibrium within Earth's interior is altered by an enhanced fission rate of radioactive materials, a possible scenario involving neutrinos emerges. If incoming neutrinos interact with radioactive materials (Johnson, 2024), a local temperature increase could result. This increase might then trigger further nuclear fissions nearby, and so on, until new thermal equilibrium is established.

The question now is how the neutrino interaction can realistically occur with such an infinitesimal probability. This brings to mind the metaphorical adage: "If you torture the data long enough, it will confess", which highlights the surprising power of probability. For short time intervals, an infinitesimal probability for the neutrino interaction might seem negligible because it rarely appears to occur. Nevertheless, the interaction will eventually happen, as even an infinitesimal probability can accumulate over time. Then, it is natural on a geological time scale to expect the randomness shown in geomagnetic polarity timescales.

For Mars, self-sustaining nuclear fissions could not be triggered by a neutrino-initiated nuclear interaction, as the planet's interior temperature is too cool (Dacey, 2025) or the nuclear fuel has been depleted. During the transition time in a geomagnetic reversal, estimated to be up to 10 thousand years, Earth could face a significant disaster (Gramling, 2021), potentially leading to events such as earthquakes and volcanoes.

While the origin of geomagnetic reversals and the randomness in their data can be understood through a statistical analysis of neutrino interaction with matter, it is valuable to review the neutrino flux expected from various current sources (Cribier, Verkindt, & Vignaud, 2025) and to also search for possible future sources or cosmic events. As an unconventional perspective, geomagnetic reversals could be linked to a multiverse—a finite number of observable universes, including our own—as neutrinos can survive extended journeys from other universes.

Regarding the proposition that neutrino interaction with radioactive matter—which eventually occurs in geological timescales—triggers nuclear fissions in the Earth’s interior, thereby causing geomagnetic reversals, people might wonder how this is possible. However, we should remind ourselves that we have never been through a geomagnetic reversal ourselves.

Speculation on Type II Supernova Mechanism

Type II supernova, for which the driving force is supposed to be acquired from gravitational energy released from core-collapse of a supergiant progenitor star, is reviewed how the released gravitational energy is converted to a mechanical energy blowing out outer layers of the star leaving the remnant, collapsed core of it.

Without supposing new physical concepts or situations in the name of under-extreme condition, an alternative but possible explanation is searched with primitive virtual negative (PVN) charges that is related with the magnetic field and gravity in astronomical objects.

The observation of supernovae has been a long history in astronomy. However, the first supernova detection patrol was since 1933, and the modern standard model for supernova explosion was since 1973. According to the energy sources for supernovae and following processes resulting in explosions, supernovae are categorized as Type Ia, Type Ib, Type Ic, Type II-P, Type II-L, and Type III. (Wikipedia contributors, 2025; Soker, 2024; Burrows & Vartanyan, 2021; SM., 2017; Bethe, 1990)

In 1987, Supernova 1987A was detected through neutrino emission and observed every band of electromagnetic spectrum, which was a type II supernova, core-collapse supernova. It is known that 25 neutrino events were detected at neutrino observatories about two to three hours before visible light reached the Earth, which was the first detecting neutrinos related with supernova explosions.

Although it cannot be stated with certainty whether the core collapse of this huge macroscopic body occurs suddenly, like a free fall, and symmetrically, we can expect neutrino generation through weak interactions inside the collapsing core due to increasing internal pressure and temperature. However, considering the extremely low probability of neutrino interaction with matter, it is difficult to imagine that these neutrinos provide the main power to blow off outer layers of a progenitor star. Similarly, gravitational waves can also be generated, but they are not considered relevant to this matter either. So, what physical entities transfer kinematic momentum to the outer layers during the explosion?

We haven't considered the positive charge distribution within the outer core and the negative charge distribution underneath the outmost layer of the star, which have been induced with main magnetic field of the progenitor star, in which the gravity in space between these two layers is negligible. When the core is collapsing, the positive charge density within the outer core is increased due to its shrinking. Positive charges are leaving the core due to the electrostatic repulsive interaction.

When the core collapse reaches a limit of mechanical equilibrium, at which point the inner core's density approaches nuclear density, a considerable amount of the positive charges within the outer core (excluding those corresponding to the core mass's PVN charges) and other materials available at the outer core's top leave the core. This outflow occurs by taking some of the rebound kinetic energy and thermal energy conducted from the inner core, thus forming what is known as a shock wave.

When the magnetic field inside the progenitor star is disturbed, gamma rays can be generated through interactions with rising positive charges. These gamma rays are, however, shielded by the outer layers. On the other hand, negative charge distribution beneath the star's outermost layer is pressured outward by the magnetic fields compressed by the rising positive charges. Especially after electric discharges between the rising positive charges and the negative charges beneath the outermost layer, the gravitational force on the outermost layer is significantly reduced. This reduction is due to the PVN charges remaining at the core, creating a momentary effect as if there were no mass at all in the star's core. This phenomenon should be the main driving force for the supernova.