



Causes and Consequences of Geomagnetic Field Collapse

J. Marvin Herndon^{1*}

¹*Transdyne Corporation 11044 Red Rock Drive San Diego, CA 92131 USA.*

Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

Consequences of the next geomagnetic field collapse, concomitant with a magnetic polarity reversal or excursion, have been greatly underestimated as based upon a widely-accepted, but physically-impossible geoscience paradigm. The underlying causes of geomagnetic field collapse are inexplicable in that flawed paradigm wherein geomagnetic field production is assumed to be produced in the Earth's fluid core. Here I review the causes and consequences of geomagnetic field collapse in terms of a new geoscience paradigm, called Whole-Earth Decompression Dynamics, specifically focusing on nuclear fission georeactor generation of the geomagnetic field and the intimate connection between its energy production and the much greater stored energy of protoplanetary compression. The nuclear georeactor is subject to a staggering range and variety of potential instabilities. Yet, its natural self-control mechanism allows stable operation without geomagnetic reversals for times longer than 20 million years. Geomagnetic reversals and excursions occur when georeactor sub-shell convection is disrupted. Disrupted sub-shell convection can occur due to (1) major trauma to Earth such as an asteroid collision or (2) change in the charge particle flux from the sun or change in the ring current either of which can induce electrical current into the georeactor via the geomagnetic field causing ohmic-heating that can potentially disrupt sub-shell convection. Further, humans could deliberately or unintentionally disrupt sub-shell convection by disrupting the charge-particle environment across portions of the geomagnetic field by nuclear detonations or by heating the ionosphere with focused

*Corresponding author: E-mail: mherndon@san.rr.com;

electromagnetic radiation. The use of electromagnetic pulse weapons is potentially far more devastating to humanity than previously imagined, and should be prohibited. During the next polarity reversal or excursion, increased volcanic activity may be expected in areas fed by georeactor heat, such as the East African Rift System, Hawaii, Iceland, and Yellowstone in the USA. One potentially great risk is triggering the eruption of the Yellowstone super-volcano.

Keywords: *Magnetic reversals, corona ejections, electrical transmission networks, GPS blackouts, communications disruptions, solar wind, geomagnetic storms.*

1. INTRODUCTION

The solar wind, a fully-ionized, $\sim 10^6$ K plasma consisting of electrons, protons, alpha particles, and (considerably less-abundant) heavy ions, streams outward from the solar corona [1-3]. The geomagnetic field deflects the solar wind safely away from Earth's surface, shielding our planet from this charged-particle onslaught [4,5]. Massive corona ejections sometimes overwhelm the geomagnetic shield and induce damaging electric currents into metal conductors on the surface, posing particular risks to electrical transmission networks [6-9]. These brief glimpses prefigure the much-greater consequences expected during a geomagnetic polarity reversal or excursion. Loss of that shielding, during the next geomagnetic polarity reversal, will potentially have devastating consequences for our highly integrated, technology-based infrastructure, as abstracted from [10] and quoted from [11]: "*Widespread communications disruptions, GPS blackouts, satellite failures, loss of electrical power, loss of electric-transmission control, electrical equipment damage, fires, electrocution, environmental degradation, refrigeration disruptions, food shortages, starvation and concomitant anarchy, potable water shortages, financial systems shut-down, fuel delivery disruptions, loss of ozone and increased skin cancers, cardiac deaths, and dementia. This list is not exhaustive. It is likely that a geomagnetic field collapse would cause much hardship and suffering, and potentially reverse more than two centuries of technological infrastructure development*".

Global and national security concerns, such as in the above quotation, tend to focus solely on increases of the charged particle assault on Earth resulting from loss of geomagnetic shielding during reversals. Numerous scientists and non-scientists, e.g. [12-19], have drawn attention to instances from the geologic past when previous magnetic reversals and excursions appear to be associated with grand-scale geological phenomena. Examples of these

past associations include continent fragmentation, large igneous extrusions, ocean heating and the potentially its involvement in ice age formation, and concomitant adverse consequences on biota, including major species extinction events. The risk of such major solid-Earth geological disruptions occurring during the next geomagnetic reversal is rarely, if ever, mentioned as the underlying geophysical basis is inexplicable in the current widely-discussed geoscience paradigms whose basis originated 80 years ago, namely, plate tectonics theory and geomagnetic field generation in Earth's fluid core.

Here I review the implications of a new geoscience paradigm [20-46] which affords a logical foundation for understanding how naturally occurring geomagnetic reversals and excursions in the past led to major solid-Earth disruptions, and in the future might trigger major volcanic events, including possibly super-volcano eruptions. I also review the possibility that human assaults on Earth's natural processes might trigger collapse of the geomagnetic field. Examples of these anthropogenic activities that might cause geomagnetic-collapse potentially include, heating the ionosphere with focused electromagnetic radiation [47-49] and detonating nuclear explosions to generate an electromagnetic pulse [50-52]. Consequently, use of electromagnetic pulse weapons is potentially far more devastating to humanity than previously imagined, and should be prohibited.

2. BACKGROUND

In 1755, Kant [53] set forth a hypothesis on the origin of the sun and planets that was modified by Laplace [54] in 1796. Laplace's nebula hypothesis is the forerunner of the modern protoplanetary theory of planet formation, which attracted scientific attention until it became unfashionable by the early 1960s [55-58].

In 1897, Chamberlain [59] set forth the fundamentally different hypothesis of planetary formation by the accumulation of small bodies

that was modified by Moulton [60] in 1900 and became the Chamberlin-Moulton planetesimal theory of planetary formation [61]. Beginning in 1963, the planetesimal theory became the basis of computational models [62-65] which comprised a paradigm that collectively is sometimes referred to as the standard theory of solar system formation [66,67]. Although popular, in instances the models were based upon unjustified *ad hoc* assumptions, such as whole-planet melting and the idea of a magma ocean [68,69].

In 1906, Oldham discovered Earth's fluid core [70]. In 1936, Lehmann conceived of the inner core to explain seismic observations [71]. In 1939, Elsasser proposed that the geomagnetic field is generated within Earth's fluid core [72]. In 1940, Birch explained the inner-core composition as being partially crystallized iron metal [73]. These concepts, with the addition of plate tectonics [74,75], became crucial elements of the foundation of the currently popular Earth-science paradigm. In 1979, I published in the *Proceedings of the Royal Society of London* the fundamentally different, logically-derived explanation of the inner-core consisting of fully crystallized nickel silicide [27] which led step-wise to a new understanding of planetary formation, geomagnetic field generation, geodynamics, and geology.

In a series of publications, I set forth a new Solar System planetary formation paradigm [20-26]. That indivisible paradigm provides compelling evidence that the observed differences in Terrestrial-planet compositions, as well as the asteroid belt, can be understood as (1) consequences of protoplanetary planet formation combined with (2) consequences of the thermonuclear ignition of the sun. Further, I set forth a new geoscience paradigm, called Whole-Earth Decompression Dynamics, which follows logically and causally from the combination of (1) and (2) above [20,27-46]. That indivisible paradigm explains virtually all deep-Earth and surface geological and geophysical observations, including composition of the inner core, fluid core, and lower mantle [27-29,31,32,39], separation of the continents and observed ocean floor topography [35], without fictitious super-continent cycles [44] and without physically-impossible mantle convection [39], nuclear georeactor geomagnetic field generation [37,42], georeactor-fueled volcanism characterized by high $^3\text{He}/^4\text{He}$ ratios [33], origin of mountains characterized by folding [40], origin of fjords and

the primary initiation of submarine canyons [43], mechanism for heat emplacement at crustal base [36], and two fundamentally new energy sources – georeactor nuclear fission energy and the much more powerful stored energy of protoplanetary compression [24,42].

In a series of publications [20,23,24,30,31,33,37,42,46,76,77], I demonstrated the feasibility of a Terracentric nuclear fission reactor, called the georeactor, as the energy source and production mechanism for generating the geomagnetic field, shown schematically in Fig. 1.

Paleomagnetic evidence indicates the existence of several periods of non-reversed geomagnetic polarity that have lasted longer than 20 million years [78,79]. Consideration of the circumstances necessary for maintaining georeactor stability over such long durations of time leads to a new understanding of how geomagnetic field collapse is connected logically and causally to major solid-Earth disruptions.

For a nuclear fission reactor to exist at the center of the Earth, all of the following conditions must be met [42]:

- There must originally have been a substantial quantity of uranium within Earth's core.
- There must be a natural mechanism for concentrating the uranium.
- The isotopic composition of the uranium at the onset of fission must be appropriate to sustain a nuclear fission chain reaction.
- The reactor must be able to breed a sufficient quantity of fissile nuclides to permit operation over the lifetime of Earth to the present.
- There must be a natural mechanism for the removal of fission products.
- There must be a natural mechanism for removing heat from the reactor.
- There must be a natural mechanism to regulate reactor power level.
- The location of the reactor must be such as to provide containment and prevent meltdown.

As described in detail [42], each of the above conditions is fulfilled for Herndon's nuclear fission georeactor at the center of Earth, and not fulfilled for other, later, putative 'georeactors' assumed to be located elsewhere in Earth's deep interior [80,81].

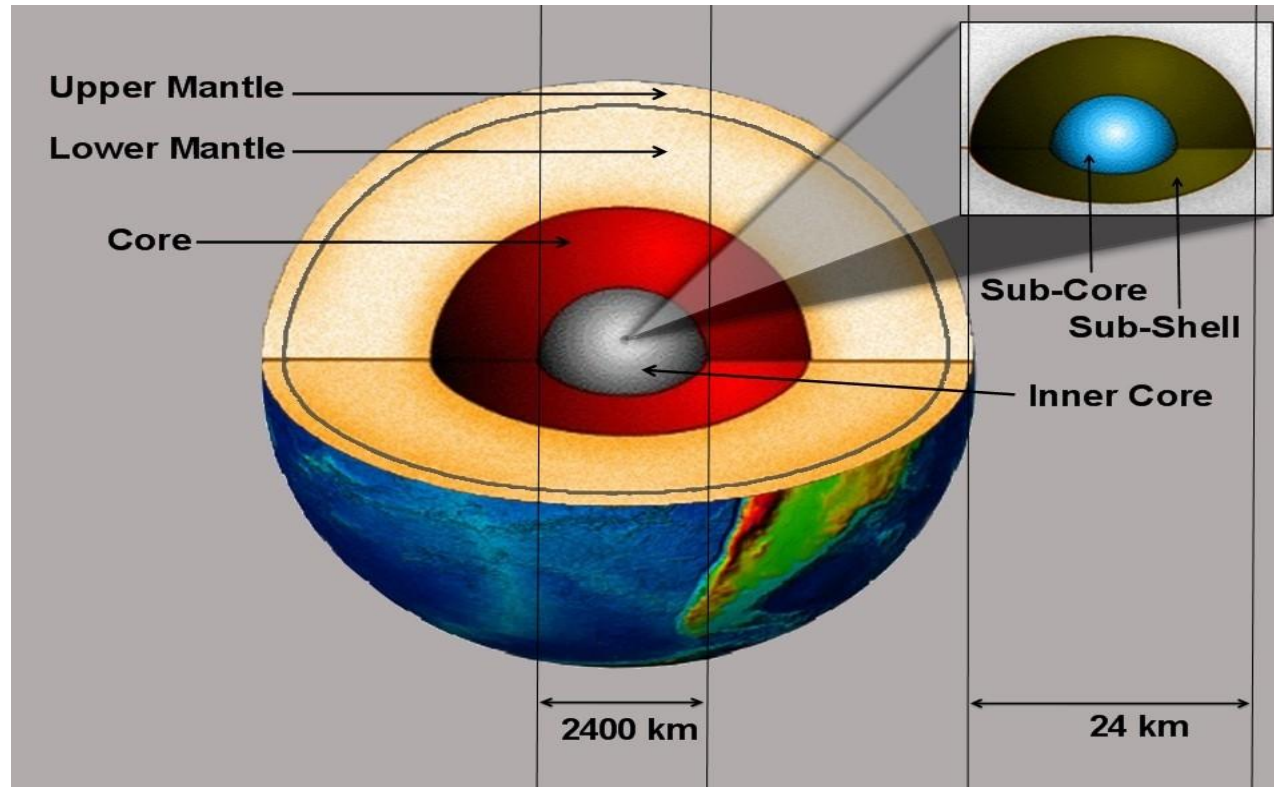


Fig. 1. Earth's nuclear fission georeactor (inset) shown in relation to the major parts of Earth. The georeactor at the center is one ten-millionth the mass of Earth's fluid core. The georeactor sub-shell, consisting of nuclear decay and fission products, is a liquid or slurry, situated between the nuclear-fission heat source and inner-core heat sink, which assures stable convection that is necessary for sustained geomagnetic field production by convection-driven dynamo action in the georeactor sub-shell [23,31,37]. Reproduced from [11].

Paleomagnetic evidence indicates that the geomagnetic field was being produced at least 4.2 billion years ago, just a few hundred million years after Earth's formation [82]. Moreover, the intensity of the geomagnetic field over geologic time has been more-or-less constant, typically within a factor of two, except during reversals or excursions [83-85]. Operational stability of the nuclear fission georeactor is critical for its continued existence into the present. Understanding the factors involved in maintaining georeactor stability allows logical deduction of the nature of its operation.

One result to come from nuclear georeactor numerical simulations, made using the SAS2 analysis sequence contained in the SCALE Code Package from Oak Ridge National Laboratory [86] that was developed over a period of three decades and extensively validated against isotopic analyses of commercial reactor fuels [87-91], was this [33,46,92]: For a given initial amount of georeactor uranium at the time of Earth's formation, there must exist a relatively narrow range of average georeactor operating power levels. If the average operating power is *above* an upper-critical level, the uranium fuel will be consumed at rates that will lead to georeactor demise before the present time. Perhaps that happened to planet Venus that currently has no internally generated magnetic field [93]. If the average operating power is *below* a lower-critical level, insufficient fuel breeding will take place resulting in georeactor shut-down before the present time, which in principle could have occurred anytime during the past two billion years.

Although reversals of the geomagnetic field have occurred numerous times [94,95], there are periods when the geomagnetic field has maintained the same polarity for periods longer than 20 million years [78,96]. Clearly, there exists a natural mechanism capable of maintaining extremely stable georeactor operation in the face of its constantly variable uranium fuel composition caused by the following:

- The two main isotopes of uranium, ^{235}U and ^{238}U , naturally decay at different rates.
- Nuclear fission further alters the isotopic composition by fission and by breeding fissionable nuclides.
- Depending upon circumstances, the nuclear fission chain reaction can progress at different rates ranging from very slow to runaway fast.

- The accumulation of fission products, which contain reactor poisons, can slow and can even halt the nuclear fission chain reaction.

All of these variability-creating potentialities occur simultaneously in the georeactor.

The georeactor, and all planetary and satellite nuclear reactors [23,24], have these circumstances in common which make possible planetocentric nuclear fission reactor operation:

- Uranium is the densest naturally occurring nuclide at planetocentric pressures.
- Fission products are markedly less dense than uranium at planetocentric pressures.
- Micro-gravitational potential exists in the planetocentric environment.

As illustrated schematically in Fig. 2, uranium, being the densest substance, settles at Earth's center, called the georeactor sub-core. The fission products and products of radioactive decay, being less dense, separate from the georeactor sub-core and form the georeactor sub-shell.

3. GEOREACTOR STABILITY CONDITIONS

In the micro-gravity environment at the center of Earth, georeactor heat production that is too energetic will cause actinide sub-core disassembly, mixing actinide elements with neutron-absorbers of the nuclear waste sub-shell, quenching the nuclear fission chain reaction. But as actinide elements begin to settle out of the mix, the nuclear fission chain reaction will restart, ultimately establishing a balance, a dynamic equilibrium between heat production and actinide settling-out, a self-regulation control mechanism [23]. The implication is that much of the uranium is constrained to the nuclear waste sub-shell where it is kept well mixed with neutron absorbers. Consequently, nuclear fission only occurs in the uranium that settles out into the sub-core.

The natural configuration of the georeactor is ideal for heat transport by thermal convection. Heat produced in the georeactor's nuclear sub-core heats the matter at the base of the georeactor's nuclear waste sub-shell causing it to

expand, becoming less dense. The less dense 'parcel' of bottom matter floats to the top of the sub-shell where it contacts the massive inner core heat-sink and loses its extra heat, densifies, and sinks. The nickel silicide inner core [27,29] heat-sink is surrounded by an even more massive heat-sink, the fluid iron alloy core, which helps to ensure the existence of an adverse temperature gradient in the georeactor sub-shell, a necessary condition for thermal convection [97].

Thermal convection in the nuclear waste sub-shell not only is a crucial component for maintaining georeactor thermal balance, but it is also the mechanism for producing the internally-generated magnetic field of planets and their larger satellites. The convection-driven circulation of charged-particle-producing nuclear material in the sub-shell, twisted by planetary rotation, I posit [23,24,37,42], is the basis for internally-generated magnetic field production by self-sustaining dynamo-action [72,98,99].

4. GEOREACTOR EVIDENCE

As noted by Rao [100], a nuclear reactor at the core of the Earth is "*a solution to the riddles of relative abundances of helium isotopes and to geomagnetic field variability*". The helium riddle referred to by Rao [100] is this: Since measurements were first made in the 1970s, the $^3\text{He}/^4\text{He}$ ratio determined in volcanic basalts typically ranged from 4 to 49 times the same ratio measured in atmospheric helium [101-105]. The riddle is that there was no deep-Earth mechanism known for producing ^3He in the requisite quantities, so mantle-mixing computational models were made based upon *ad hoc* assumptions [106-109]. The measured basaltic $^3\text{He}/^4\text{He}$ ratios, however, provided the first compelling evidence of nuclear georeactor existence.

Initially, I made calculations using Fermi's nuclear reactor theory [110] to demonstrate the feasibility of a Terracentric nuclear fission reactor [20,30,31], which provided no information on fission products. Oak Ridge National Laboratory georeactor numerical simulations [33,46], however, demonstrated that the georeactor would produce helium in precisely the range of $^3\text{He}/^4\text{He}$ observed in volcanic basalts, as shown in Fig. 3. This is not only the solution to the above riddle, but is powerful independent evidence for georeactor existence.

In the 1930s, Fermi and Pauli [111-113] discussed the possible existence of a nearly massless particle, later called the neutrino, that was not experimentally detected until 1956 [114,115]. In 1998 Raghavan et al. [116] demonstrated the feasibility of using antineutrino spectroscopy to measure uranium and thorium within the Earth. After learning about the georeactor in 2002, Raghavan [117] showed that the antineutrino spectrum resulting from nuclear fission has a higher energy component than from radioactive decay thus in principle permitting georeactor detection.

Raghavan's article [117] stimulated discussions worldwide [118-121]. The two operational deep-Earth antineutrino detectors, at Kamioka, Japan [122] and at Grand Sasso, Italy [123], to date have not only failed to refute georeactor nuclear fission, but at a 95% confidence level, have measured georeactor energy production of 3.7 and 2.4 terawatts, respectively. Interestingly, the energy production levels used in the Oak Ridge georeactor calculations ranged from 3 to 6 terawatts [33].

5. GEOMAGNETIC FIELD DISRUPTIONS

Earth's georeactor, as I deduced from the properties of matter and described above, if left undisturbed is capable of an extreme degree of stability, as indicated by periods of non-reversed geomagnetic polarity lasting longer than 20 million years [78,79]. But more-frequent geomagnetic polarity reversals (Fig. 4) do occur, and are indicative of external events that disrupt convection in the georeactor sub-shell.

Disruption of georeactor sub-shell convection inevitably leads to disruption of geomagnetic field production. Upon re-establishing sub-shell convection after disruption, the geomagnetic field would be re-established either in the same or reverse direction.

There are two principal, natural means by which disruption of convection in the georeactor sub-shell can occur as a result of the relatively small georeactor mass:

- (1) Trauma to the Earth, such as a large meteorite collision [124,125], could in principle disrupt convection in the sub-shell of the georeactor, which has a mass just about one-ten-millionth that of the Earth's core [42].

- (2) Abrupt changes in the charge particle flux from the sun and/or changes in Earth's ring current system [126,127] that interacts with the geomagnetic field necessarily induces electrical current into the georeactor via the geomagnetic field, which causes ohmic heating in the georeactor sub-shell that can potentially disrupt sub-shell convection [42].

The relatively small mass of the georeactor also means that in principle humans could accidentally or purposefully induce sub-shell convection-disruption which might potentially collapse the geomagnetic field. Detonation of nuclear explosives above the Earth to cause an electromagnetic pulse (EMP) [128] might not only momentarily distort the geomagnetic field, but potentially could induce electrical current into the georeactor by altering the natural charged particle flux across the geomagnetic field. A similar risk is posed by heating the ionosphere with focused electromagnetic radiation [11].

6. SUB-SHELL CONVECTION DISRUPTION CONSEQUENCES

Collapse of thermal convection in the georeactor sub-shell can lead to abrupt settling-out of uranium from the reactor-poison sub-shell environment, which can lead to a period of uncontrolled nuclear fission chain reactions occurring before the dynamic self-regulation balance between heat production and actinide settling-out re-establishes itself. The burst of excess fissionogenic energy production by sub-shell convection disruption, concurrent with geomagnetic polar reversals and excursions, in principle could trigger far greater energy release from the stored energy of protoplanetary compression by replacing some of the lost heat of protoplanetary compression [21, 24].

I have disclosed a new, complete, self-consistent paradigm that describes our planet's composition, structure, geodynamics, surface geology, and energy sources that follow in a logical and causally related way from Earth's origin as a Jupiter-like gas giant by condensing, i.e. raining-out, from within a giant gaseous protoplanet followed by removal of primordial gases and ices during the thermonuclear ignition of the sun [20,21,24,27,30-36,39-41,43-45].

The weight of ~300 Earth-masses of primordial gases and ices compressed the rocky portion of Earth to about two-thirds its present diameter.

Stripped of those gases and ices during the thermonuclear ignition of the sun, the reduced-diameter Earth, encased by an unbroken crustal shell, contained an extremely powerful energy source, the protoplanetary energy of compression. Utilization of this powerful potential-energy source for driving whole-Earth decompression, however, necessitates replacing the lost heat of protoplanetary compression. Georeactor nuclear fission energy, although insufficient to drive whole-Earth decompression, can serve to replace the lost heat of protoplanetary compression [21,35].

To understand by analogy: Georeactor output energy acts as the input signal of a great planetary-scale power amplifier, the output of which causes whole-Earth decompression events. Thus, one may understand mechanistically how a burst of excess fissionogenic energy production from sub-shell convection disruption, associated with geomagnetic field collapse, can also be associated in a causally-related manner with major decompression events.

The geoscience literature is replete with observations that seem to associate geological phenomena with geomagnetic reversals and excursions, including the following:

- Continent fragmentation or attempts [129-131],
- Massive volcanism [132-136],
- Water level variations [137,138],
- Ocean heating and potentially its involvement in ice age formation [139-144], and
- Major species extinction events [15,145-148].

In each of the above instances, no logical, causally-related basis could be previously described as geomagnetic-field production was incorrectly attributed to convection-driven dynamo action in the fluid core, a mass about one-third that of Earth. Thermal convection in the Earth's core is physically impossible for the following reasons [39]: (1) Compression of the core by the weight above makes the density gradient too great for thermal convection, and (2) the core is wrapped in a thermally-insulating blanket which limits heat-loss thus preventing maintenance of an adverse temperature gradient necessary for sustained thermal convection in the core. In the georeactor sub-shell, on the other hand, these limitations do not exist.

Fig. 5. presents a record of recent magnetic polarity reversals. The last polarity reversal event occurred about 786,000 years ago and may have occurred during a time span as short as 13 ± 6 years [149], a time-frame consistent with other observations of rapid geomagnetic reversals [150,151].

No one knows when the next georeactor sub-shell convection collapse will occur, but recent movements of the North Magnetic Dip Pole [152] might imply sooner rather than later [11]. In addition to the devastating consequences on our technologically-based infrastructure, described above, it is of interest to speculate on the geological consequences of the next georeactor sub-shell convection collapse.

Over Earth's lifetime, georeactor fuel has been decreasing due to fuel burn-up and natural radioactive decay. Consequently, the amount of potential flare-up upon collapse of georeactor sub-shell convection will not be nearly as great

as in earlier times. The amount of surface-effects from whole-Earth decompression will certainly be much less than in earlier times. One might, however, expect increased geological activity from volcanic areas fed by georeactor energy, such as the East African Rift System, Hawaiian Islands, Iceland, and Yellowstone among others [105]. Of particularly grave concern is whether a major pulse in georeactor energy might trigger eruption of the Yellowstone potential-super-volcano [153-156] whose georeactor-supplied heat is strongly indicated by high $^3\text{He}/^4\text{He}$ ratios [157,158].

At some yet-unknown point in time, presumably as a consequence of nuclear-fission fuel burning and radioactive decay, the isotopic composition of georeactor-uranium will be unable to sustain nuclear fission chain reactions, marking the permanent demise of the georeactor and the geomagnetic field [33]. At that point in time, humanity would be well-advised to work together for common survival.

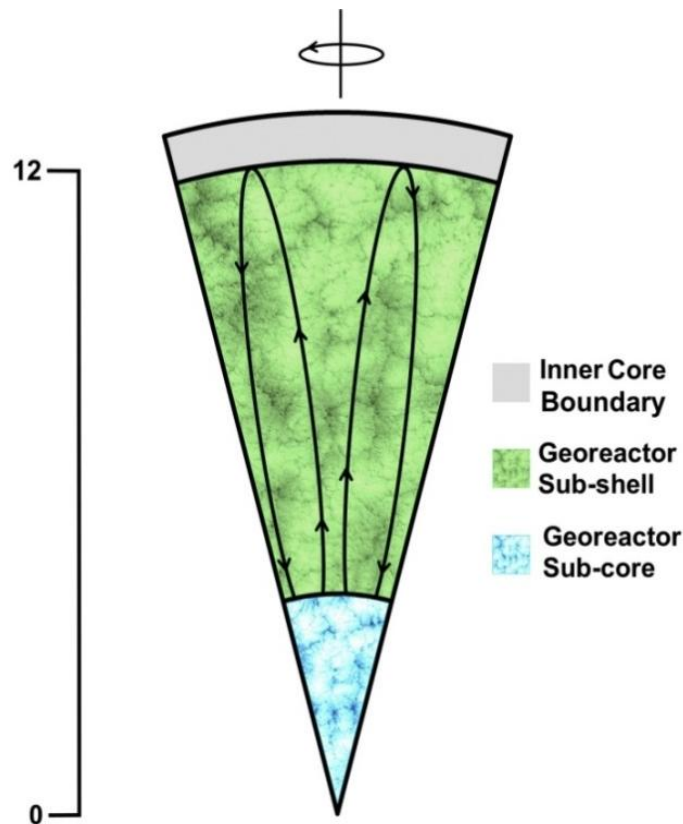


Fig. 2. Schematic representation of the georeactor, not to scale. Planetary rotation and fluid motions are indicated separately; their resultant motion is not shown. Stable convection with adverse temperature gradient and heat removal is expected. Scale in km. Reproduced from [11]

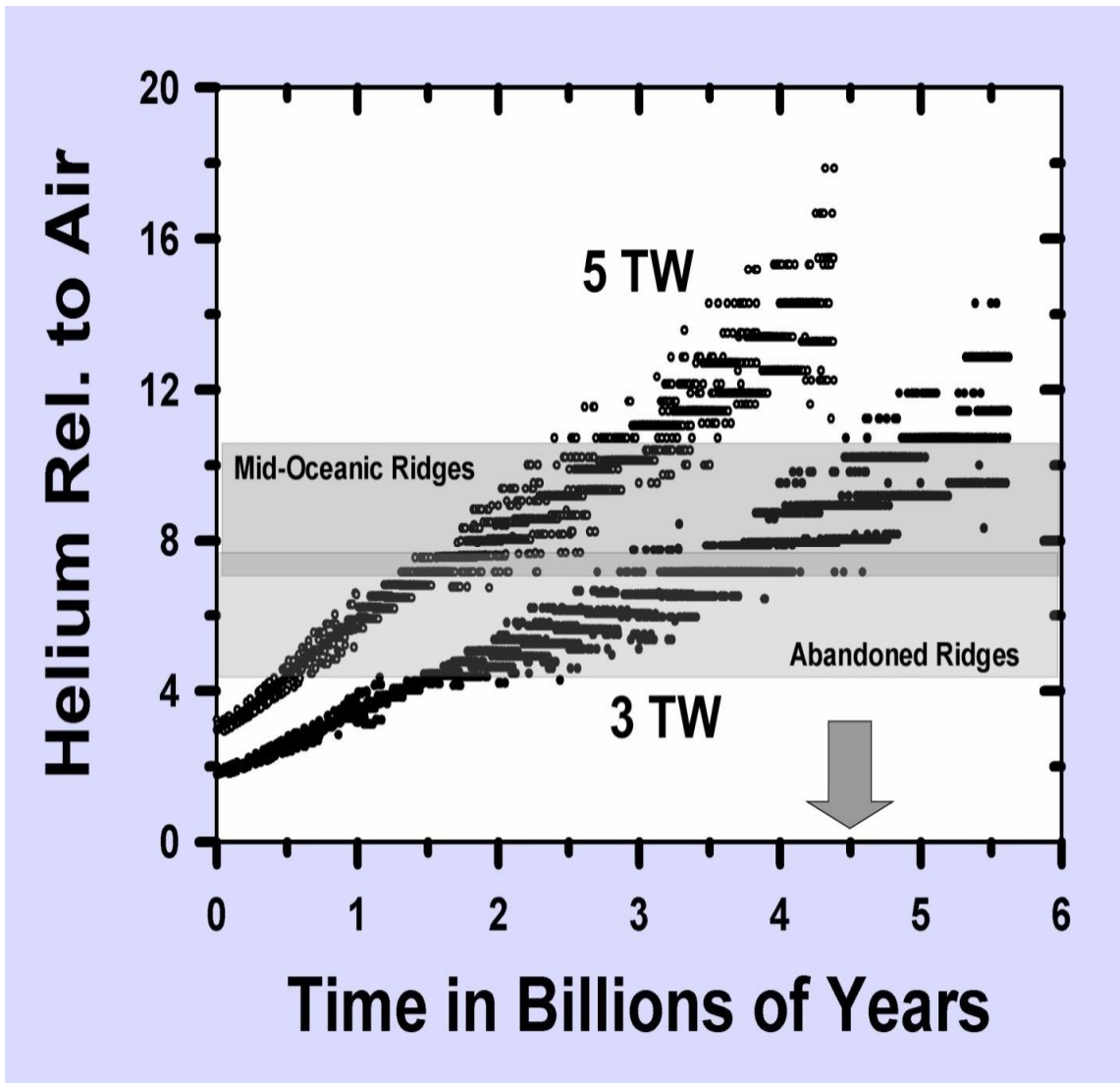


Fig. 3. Oak Ridge National Laboratory georeactor simulation data calculated at energies of 3 and 5 terawatts compared to measured helium ratios in oceanic basalts. Data from [33]. Reproduced from [11]

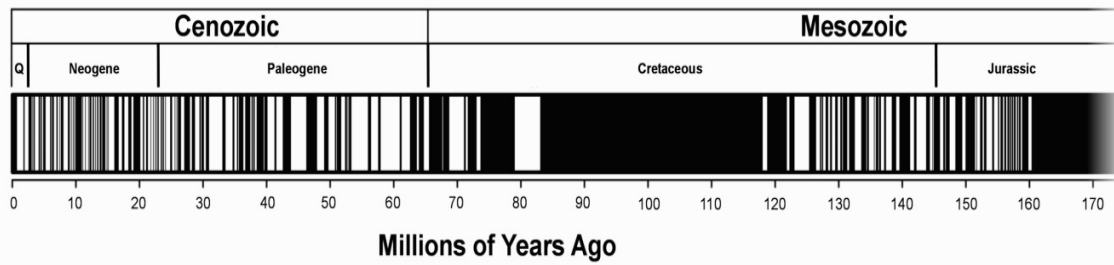


Fig. 4. Geomagnetic polarity since the middle Jurassic. Dark areas denote periods where the polarity matches today's polarity, while light areas denote periods where that polarity is reversed. Based upon published data [94,95]. Reproduced from [11]

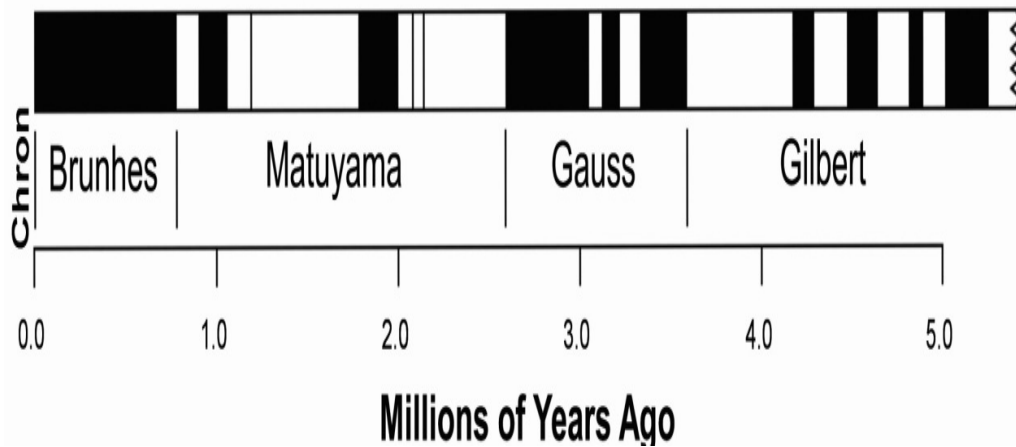


Fig. 5. Recent geomagnetic polarity from rock-magnetism investigations. Dark areas denote periods where the polarity matches today's polarity, while light areas denote periods where that polarity is reversed. Based upon an image by the U. S. Geological Survey. Reproduced from [11]

7. CONCLUSIONS

Consequences of the next geomagnetic field collapse, concomitant with a magnetic polarity reversal or excursion, have been greatly underestimated as based upon a popular, but flawed geoscience paradigm. The potential risks to our technology-based infrastructure from the charged-particle onslaught during geomagnetic field collapse are recognized [11]. Other potential dangers have gone essentially unmentioned, even though observations of some major geological events in the past seem to have been associated with geomagnetic reversals or excursions. The underlying causes of geomagnetic field collapse are inexplicable in that flawed paradigm wherein geomagnetic field production is assumed to be produced in the Earth's fluid core.

Beginning with a new concept for the composition of Earth's inner core, published in Proceedings of the Royal Society of London in 1979, I progressed step-by-step on a logical progression of understanding which ultimately led to a new indivisible Solar System planetary formation paradigm and a new geoscience paradigm, called Whole-Earth Decompression Dynamics. Here I reviewed the causes and consequences of geomagnetic field collapse in terms of that new geoscience paradigm, specifically focusing on nuclear fission georeactor generation of the geomagnetic field and the intimate connection between its energy

production and the much greater stored energy of protoplanetary compression.

The nuclear georeactor, which has a mass about one ten-millionth that of Earth's core, consists of two parts, the sub-core where nuclear fission takes place and the convecting sub-shell that contains fissile material and reactor poisons, i.e., fission fragments and radioactive decay products. The georeactor self-control mechanism consists of a dynamic balance between sub-core nuclear fission and the settling-out of fissile material into the sub-core.

The nuclear georeactor is subject to a staggering range and variety of potential instabilities. Yet, its self-control mechanism allows stable operation without geomagnetic reversals for times longer than 20 million years. Geomagnetic reversals and excursions occur when georeactor sub-shell convection is disrupted.

Here, I disclosed that disrupted sub-shell convection can occur due to (1) major trauma to Earth such as an asteroid collision or (2) change in the charge particle flux from the sun or change in the ring current either of which can induce electrical current into the georeactor via the geomagnetic field causing ohmic-heating that can potentially disrupt sub-shell convection. Further, humans could deliberately or unintentionally disrupt sub-shell convection by disrupting the charge-particle environment across portions of the geomagnetic field by nuclear detonations or by heating the ionosphere with focused electromagnetic radiation. The use

of electromagnetic pulse weapons is potentially far more devastating to humanity than previously imagined, and should be prohibited.

Disruption of stable georeactor sub-shell convection leads to uncontrolled settling-out of fissile material causing a nuclear flare-up, a burst of georeactor energy. That excess energy, channeled to Earth's surface can potentially cause a variety of geological phenomena and/or can replace the lost heat of protoplanetary compression resulting in major geological events powered by the stored energy of protoplanetary compression. The latter explains the basis of associations between geophysical events and polarity reversals and excursions.

During the next polarity reversal or excursion, increased volcanic activity may be expected in areas fed by georeactor heat, such as the East African Rift System, Hawaii, Iceland, and Yellowstone in the USA. One potentially great risk is triggering the eruption of the Yellowstone super-volcano.

At some yet-unknown point in time, the georeactor fuel will have been consumed, sub-shell convection will collapse, never to re-establish, thus marking the end of the geomagnetic field forever. Perhaps Venus has already arrived at that point.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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