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THE GRAVITY THEORY OF MASS EXTINCTION

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The Gravity Theory of Mass Extinction (GTME) [1] is a theory that explains the causation of **mass extinction events** throughout the history of the Earth. It also posits the reason for **dinosaur gigantism**, **flood basalt volcanism**, **rapid changes in marine eustatic sea level**, the Earth's **geomagnetic reversals** and **geomagnetic secular variation**. The theory asserts that all of these phenomena are linked together. **The foundation of the theory is the assertion that the Earth's core elements (i.e., inner core, outer core and the densest part of the lower mantle), under certain conditions, can be displaced from their current Earth-centric position.**

Based on the following evidence supporting the core element's history of displacement, or offset, the GTME asserts that surface gravity on this planet has not been constant over long periods of time including the Phanerozoic Eon (542 Ma - 0 Ma). Specifically, the core elements' offset from the Earth's center is primarily dependent upon the latitudinal symmetry of the net center of mass of all continental tectonic plates on the surface of the Earth relative to the equator (**Fig. 4**).

The linkage between the movement of the core elements and the continental tectonic plates is governed by the Law of Conservation of Angular Momentum. The consolidation of the supercontinent of Pangea with its center of mass well south of the equator displaced all three core elements and caused a worldwide surface gravitational gradient where the magnitude of surface gravity at any point on the surface was dependent on its distance from the Earth's shifted center of mass. The core elements shifted away from Pangea thereby lowering surface gravity on the entire supercontinent; lowest surface gravity near Pangea's equatorial region.

Relative to surface gravity, the GTME posits, in general terms:
The magnitude of the changes in surface gravity on the surface of the Earth for the last several hundred million years was primarily influenced by the degree of asymmetry of the continental tectonic plates relative to the equator.

The **GTME** is a unified theory. It unites all of the following phenomena which it posits are a direct consequence of the offset of the Earth's core elements from their current Earth-centric position:

1. Most, if not all, of the mass extinctions during the Phanerozoic Eon.

2.The gigantism of most life forms, both terrestrial and marine, during the Paleozoic, Mesozoic and Cenozoic Eras resulted from changes in surface gravity.

3. The unusually high sea levels during the above three periods.

4. Almost all of the rapid worldwide sea level eustatic regressive/transgressive couplets which occurred during the above three periods.

5. All of the massive flood basalt eruptions during the above three periods.

6. All geomagnetic reversals of the Earth's north and south poles.

7. The movement of the Earth's geomagnetic poles known as geomagnetic secular variation.

HISTORY

Several theories have attempted to explain the gigantism of the largest dinosaurs of the Mesozoic Era, specifically the sauropods. Expanding Earth and Earth contraction hypotheses have been proposed but have failed to convince the scientific community of their validity. Other hypotheses have suggested that the accumulation of cosmic debris on the Earth's surface has altered its surface gravity, however no convincing explanation has been offered.

The author of the GTME, John Stojanowski, sought to explain dinosaur gigantism and concluded that the Earth's surface gravity had to be less when dinosaurs existed. He developed the hypothesis (in 2004) that the consolidation of the Earth's continental tectonic plates had changed the surface gravity on Pangea. He subsequently theorized that all three of the Earth's core elements must have shifted away from their current Earth-centric position before the dinosaurs existed, lowering surface gravity. And, he speculated that surface gravity must have increased rapidly nearly 65 million years ago as Pangea broke apart causing the extinction of the dinosaurs and other fauna, both terrestrial and marine.

After studying the existing literature relating to dinosaurs and extinction he developed the GTME, a unified theory which relegates most of the currently accepted causes of mass extinction as being the after-effects of rapid changes in the movement of the Earth's core elements. The theory has evolved from 2004 to 2011 to include a novel explanation for flood basalt volcanism, rapid changes in worldwide sea levels, geomagnetic pole reversals and geomagnetic secular variation.

OVERVIEW

The GTME posits a novel mechanism responsible for surface gravitation changes. Displacement of the Earth's core elements, including the inner core, outer core and the densest part of the lower mantle away from their current Earth-centric position is that mechanism. The theory posits that the consolidation of the supercontinent of Pangea would have forced all three of the core elements to move away from their Earth-centric position and away from Pangea based upon the Law of Conservation of Angular Momentum. The amount of core element offset would be determined primarily by the degree of asymmetry of the center of mass of the supercontinent relative to the equator. **The further the center of mass of Pangea moved latitudinally away from the equator, the greater were the core elements' offset, and therefore the greater the reduction in surface gravity on Pangea.** It must be noted that prior to the consolidation of Pangea, the Earth's continental tectonic plates were in a configuration far different from that of today. Therefore, throughout the history of the Earth there were variations in surface gravity on this planet's surface which was dependent on the distribution of the continental tectonic plates.

Based upon Newton's law of universal gravitation, the change to the Earth's surface gravity at any point on the surface would depend on the distance from that point to the center of mass of the Earth. The displacement of the Earth's core elements would cause a shift in the position of the Earth's center of mass resulting in a gravitational field-strength gradient on the surface; lowest field strength at a point on the surface that is furthest away from the shifted center of mass (e.g., the equatorial part of Pangea) and highest gravitational field strength antipodal to that point. Therefore, **a worldwide surface gravitational gradient would have existed on the Earth's surface for most of the Phanerozoic Eon.**

The lowering of surface gravity, as posited by the GTME, would explain the gigantism of life forms, both terrestrial and marine, in prior eras. The gigantic life forms of the Mesozoic, both terrestrial and marine, are well known.

The GTME posits that most **Mass extinctions**, of which the **Big Five Mass Extinctions** are best known, are the result of changes to the Earth's surface gravity resulting from the offsetting of the core elements. And, the distribution of continental tectonic plates on the Earth's surface, which determines the offset of the core elements, has varied markedly for the hundreds of millions of years.[19]

Prior to the GTME there have been no completely unequivocal explanations for the causes of the major mass extinctions. The GTME asserts that the most common causes cited for mass extinction, including flood basalt volcanism, marine regression, climate change and bolide impact are not the primary causes of mass extinction. It also posits that many of these phenomena are the direct result of the rapid movement of the Earth's displaced core elements, which explains why extinction periods immediately preceded the occurrences of most of the above phenomena.

The GTME provides a novel explanation for the reversals of the Earth's magnetic field: **geomagnetic reversals are a consequence of the movement of the inner core, relative to the outer core**. Based on this same concept it also explains the movement of the Earth's geomagnetic poles, the northern geomagnetic pole currently is offset from the geographic pole by approximately eleven degrees. This movement is called **geomagnetic secular variation.**

Key Principles

Earth's Surface Gravity Changes

The rotating Earth must maintain its total angular momentum, according to the Law of Conservation of Angular Momentum. Therefore, when the combined center of mass of all continental tectonic plates moves away from the equator, one or more of the three core elements also have to shift away from their Earth-centric position in order to conserve the Earth's total angular momentum.

If all three of the core elements are displaced, locations on the Earth's surface would experience a significant change in surface gravity dependent upon the amount of core element offset and therefore, their distance from the new center of mass of the Earth; a worldwide surface gravitational gradient would form.

A second factor affecting angular momentum was the redistribution of the Earth's sea level. As surface gravity lowered near Pangea surrounding sea level rose substantially and fell correspondingly antipodal to Pangea. In effect, a positive feedback process occurred; the further Pangea's center of mass moved away from the equator, the higher surrounding sea levels became forcing the Earth's core elements away from Earth-centricity more than that resulting from latitudinal continental plate movement alone.

When a supercontinent, such as Pangea, moves latitudinally it displaces all three of the core elements: inner core, outer core and dense lower mantle, resulting in significant changes in surface gravitation.

When the center of mass of a supercontinent crosses or moves close to the equator, core elements approach their current, relatively Earth-centric position and surface gravity strength on the supercontinent rises to near its current level. Two of the largest mass extinctions, the Permian-Triassic (~251 Ma) and the Cretaceous-Tertiary (~65 Ma), occurred when the center of mass of the supercontinent of Pangea crossed the equator. A chart published recently (2011) by a French research group relating to plate tectonics confirms this timing of Pangea's near equator movement.[2]

The Triassic-Jurassic (~200 Ma) mass extinction occurred under different conditions, but readily explainable. The chart published by the French research group [2] shows Pangea was at its maximum northerly latitude above the equator approximately 200 Ma and had reversed direction and started moving south. This would, according to the GTME, entail a rapid increase in surface gravity from its lowest level in the Mesozoic Era. The extinctions, rapid changes in sea level (i.e., regressive-transgressive couplet) and the lagging flood basalt volcanism of the CAMP (Central American Magmatic Province) all agree with what the GTME would predict at that time. The extinction at this time of the dinosaurs prime competitor, the crurotarsi, is attributed to, by the GTME, to this rapid increase in surface gravity. They were mostly large, splayed-leg terrestrial carnivores and this hip-leg structure made them susceptible to the increase in surface gravitation allowing the dinosaurs to become the dominant terrestrial species for the rest of the Mesozoic Era.

Eustatic Sea Level Changes

Many, if not most, scientists attribute all rapid marine regressive-transgressive couplets to glacioeustasy, the rising and falling of sea level due to ice formation and melting. This has caused a lot of confusion, particularly when the period being studied does not exhibit conditions favorable for ice formation and/or melting.[3] The GTME is able to solve this paradox.

Worldwide sea level height is determined by several factors, one of them being the strength of surface gravity. When Pangea formed, the GTME posits that low surface gravity near Pangea raised the sea level near the supercontinent dramatically as shown in a chart of Phanerozoic sea levels (**Fig. 1**). Worldwide, also known as eustatic, sea levels are determined primarily by three factors: thermal expansion of oceanic crust resulting from the intensity of sea floor spreading related to tectonic plate movement and flood basalt eruptions on the ocean floor, the degree of terrestrial ice accumulation and surface gravity strength. Therefore, at any point on the sea level chart, the height of sea level is determined primarily by the sum of the above three components.

The GTME posits that due to the surface gravitational gradient around the Earth's surface, there was an inverse relationship between the strength of surface gravity and sea level height when Pangea existed, i.e., most of the time there were high sea levels near Pangea and low sea levels antipodally (Fig. 2). This worldwide sea level gradient distorts the meaning of "eustatic sea level."

There were times when sea levels near Pangea varied from very high to very low as can be seen by viewing the sea level chart referenced above. Based on the GTME, during the Phanerozoic Eon there was a worldwide surface gravity gradient, therefore current measurement of sea levels for that period will not be completely accurate because the assumption that is made when sea level charts are drawn is that there has been no latitudinal nor longitudinal variation in surface gravity of any significance at any time.

Extinction periods coincide with periods when worldwide sea level fell and rose rapidly and there were many of these eustatic regressive-transgressive couplets. This coincidence has been well documented by Hallam and Wignall (1997)[4]. Prior to that, Chamberlin (1909) observed the coincidence of regression and extinction as well as Newell (1967). Newell made the observation with respect to six of the largest mass extinction periods.[5] More recently, geology professor Shanan Peters of the University of Wisconsin-Madison (2008)[6] has also supported the sea level/extinction linkage.

According to the GTME, when there is rapid, very large continental tectonic plate movement latitudinally, there is a corresponding rapid change of core element offset along with changes in surface gravity and, by extension, eustatic sea levels change due to the worldwide gravitational gradient that has been described. When the center of mass of very large tectonic plates moves away from the equator, core elements move synchronously away from Earth-centricity. When Pangea existed, this resulted in lower surface gravity on all of the supercontinent.

When a supercontinent moves rapidly and latitudinally so that its center of mass moves toward the equator, a pulse of increasing surface gravity results causing marine regressive-transgressive couplets.

When the supercontinent of Pangea moved north and south during the Phanerozoic Eon, as documented by the French research study cited earlier [2], the movement of this huge consolidated tectonic mass forced the displacement of all three core elements significantly. Today, the separate movement of individual continents cannot displace all of the core elements, only the inner core and to a lesser extent the outer core can be offset from Earth-centricity.

The GTME posits that as the center of mass of the supercontinent Pangea moved rapidly toward the equator, there was a rapid pulse of increasing surface gravity which initiated the marine regressive-transgressive couplets at both the Permian-Triassic (~251 Ma) and Cretaceous-Tertiary (~65 Ma) boundaries, as well as in many other periods. The killing mechanism during the regressive phase was the pulse of increasing surface gravity, negatively affecting both marine and terrestrial life. Hallam and Wignall (1999) have repeatedly emphasized the coincidence of marine extinctions and the transgressive component of a regressive-transgressive couplet.[7]

During the transgressive phase that followed the preceding regression, the killing mechanism of marine life would be due to the simultaneous increase in surface gravity and sea level rise, which would reduce the buoyancy and depth range of some marine life; water pressure increases with depth when surface gravity increases.

For example, the extinction of the ammonites at the end of the Cretaceous period, which has been well-documented by Peter Ward (1992),[8] coincides with the major regressive-transgressive couplet at that time. The ammonite, unlike the nautilus, evolved a shell less tolerant of high water pressure during the Mesozoic and the GTME posits lower surface gravity at that time for that evolutionary change. It also posits that when surface gravity increased rapidly during the late Cretaceous, the ammonites range of sea level depth kept diminishing making them vulnerable to shallow water predators as well as predators closer to the surface. This appears to be in agreement with research that found that early ammonites had shells capable of withstanding high water pressure while the Cretaceous ammonites had shells that limited their habitats to shallower depths.[9]

Near the Permian-Triassic boundary (~251 Ma) there was a third possible killing mechanism in addition to the increasing surface gravity and the regression/transgression effects just described, which was the release of methane from the sea bottom due to the warm temperatures and the major marine regressive half of the couplet which caused the lowest sea levels in the Phanerozoic Eon. The simultaneous occurrence of very low eustatic sea levels and warm climate also occurred during the Paleocene-Eocene Thermal Maximum(~55 Ma) when there was a regressive-transgressive couplet.[10] This would explain the disassociation of methane from the methane hydrates at the bottom of the sea at that time, a factor in the PETM extinctions in the same way it would have been during the Permian-Triassic mass extinction. This would indicate, according to the GTME, a rapid movement of one or more large continental tectonic plates toward the equator.

The work of Hallam and Wignall (1997)[4] supports the above relationship between marine regressive-transgressive couplets and extinction although they attribute extinction during the transgressive phase to the toxic effects of anoxic water. When the regressive-transgressive couplet is the result of glacioeustasy, the extinctions are absent as would be expected based on the GTME and this is confirmed by Anthony Hallam (1992).[11]

Prior to the publication of the GTME scientists, in many instances, attributed almost all rapid marine regressive-transgressive couplets to the formation and melting of ice caps. Yet, most of these couplets occurred when Pangea existed and worldwide temperatures were much higher than they are today. As stated, the GTME solves this apparent paradox. With high sea levels near Pangea and corresponding low sea levels antipodal to Pangea, any rapid marine regression near Pangea caused by a pulse of increasing surface gravity on the supercontinent would cause sea level regression near Pangea followed by a transgressive wave caused by the corresponding rise in sea level antipodal to Pangea.

Eruptions of Flood Basalt Volcanism

The coincidence of periods of extinction and the eruption of flood basalt volcanism is well known. Many scientists have attributed the extinctions to the detrimental effects of outgassing of volcanic carbon dioxide and sulphur dioxide which might have caused an abrupt climate change. Vincent Courtillot is a major supporter of the linkage between extinction and flood basalt volcanism as detailed in one of his books (2002).[12] This type of volcanism is believed to originate at the Earth's core-mantle boundary.

The GTME attributes the flood basalt eruptions to the movement of the displaced core elements as they moved back toward their Earth-centric position (Fig. 3).

This returning movement would create high fluid pressure within the lower mantle by the outer and inner cores moving in a direction that would return them toward Earth-centricity. That pressure would have been highest on the periphery of the outer core's hemisphere nearest to Pangea thereby initiating a plume that would eventually reach the Earth's surface.

Therefore, the GTME posits a linkage between continental tectonic plate movement and flood basalt volcanism.

There would be a lag in time, possibly up to a few million years between the continental tectonic plate movement, which would be coeval with a gravity-induced extinction event, and the eruption of the flood basalt volcanism at the Earth's surface. Paul B. Wignall (2001) confirms this lag between extinction and flood basalt eruptions of the Siberian Traps, the CAMP eruptions and the Karoo eruptions.[13] He includes the end-Guadalupian extinction (~260 Ma) and the following Emeishan flood basalt eruptions in this group. This dual extinction event, of the end-Guadalupian/end-Permian, along with the lagging flood basalt eruptions is what would be expected based on the GTME.

During the late Permian Period, Pangea's center of mass was moving rapidly toward the equator (see prior commentary on chart of the French research group[2]). The GTME explains the proximal relationship of the end-Guadalupian (~ 260 Ma) and end-Permian (~251 Ma) mass extinctions and attendant flood basalt volcanism as follows: The center of mass of the supercontinent of Pangea was in the southern hemisphere (as documented by the French research group cited earlier) and moved north rapidly toward the equator causing a rapid movement of all three core elements toward an Earth-centric position. This would have caused a pulse of increasing surface gravity on Pangea followed by the Emeishan flood basalt eruptions which reached the surface about 1 million years later. The increase in surface gravity resulted in a major regression and the lowered sea levels coupled with the warm temperatures initiated the disassociation of methane from the sea bottom.

There then was a pause in the northward movement of Pangea for several million years and then it accelerated again at which time it crossed over the paleoequator (**Fig.1**). This resulted in the same pattern of events as that of the end-Guadalaupian, namely, a rapid movement of the core elements to near their current earth-centric position, a rapid further increase in surface gravitation to near its current strength, further lowering of sea levels, the initiation of the Siberian Traps flood basalt volcanism which would reach the surface about a million years later. Prior to the flood basalt eruptions would be an increase in the disassociation of methane from the sea bottom's methane hydrates causing further devastation.

An end-Guadalupian research paper notes that the magnitude of the associated extinction event is not solely the function of the size (i.e., volume) of the flood basalt eruptions but more importantly, the eruption rate.[14] Geologist/paleontologist Anthony Hallam was puzzled by the absence of Large Igneous Provinces (LIP), the surface indications of flood basalt volcanism, prior to the Permian Period.[15]. This absence is predicted by the GTME which, as stated above, posits that massive flood basalt volcanism occurs only when the core elements are moving toward Earth-centricity. More precisely, the center of mass of the supercontinent Pangea formed and remained south of the equator throughout the Paleozoic Era until it started moving north ~260 Ma and crossed the equator ~252 Ma. This is why there was no flood basalt volcanism in the Paleozoic Era prior to the Emeishan flood basalt eruptions of ~260 Ma when Pangea started moving north although there is the possibility of prior flood basalt volcanism that occurred on the ocean floor. This most likely would have happened during the end-Devonian (~359 Ma), end-Silurian (~418 Ma) and end-Ordovician (~443) Periods when a substantial drop in sea level occurred indicating a northern movement of the continental masses toward the paleoequator. If this happened, the remnants of the oceanic volcanism would have been subducted.

The largest lava flows from flood basalt volcanism occurred when the supercontinent of Pangea existed and has steadily diminished as the continents have moved further apart. This fact strongly supports the GTME, which has asserted that the forces that cause the movement of the core elements, and initiate flood basalt volcanism, are proportional to the size of the continental mass that moves in the same direction, latitudinally.

Gigantism of Phanerozoic life forms

The GTME attributes the gigantism of a wide variety of life forms during the Phanerozoic Eon (542 Ma to present) to variation in surface gravity as described previously. Some of the most notable are the 390 million-year-old eight foot long scorpion Eurypterid, the 300 million-year-old dragonfly Meganeuropsis with a wingspan of two and a half feet, sauropods and theropods, large marine reptiles, the largest pterodactyls, etc. There has been speculation that other factors such as oxygen levels, atmospheric pressure and land mass area size might have been contributing factors that influenced, for example, sauropod gigantism.

A recent publication on sauropod biology discounts environmental factors (not including surface gravitational changes) as being relevant to their gigantism.[16]Indirectly supporting the GTME's assertion of the gravity/gigantism linkage is the previously mentioned French research study linking plate tectonics and geomagnetic reversals,[2] which graphically displays the movement of Pangea across the equator during two periods (~250my and ~65my) when most life forms became extinct and those that survived were extremely small compared to their predecessors. These were the two periods of the Phanerozoic Eon when the supercontinent of Pangea rapidly approached and crossed the equator which, as previously stated according to the GTME, increased surface gravity to near its current value. The correlation between eras when some terrestrial fauna exhibited gigantism and when the center of mass of Pangea was far from the equator, based on the above mentioned French research study is convincing. The decline in the size of sauropods in the late- Jurassic through early-Cretaceous parallels the movement of the center of mass of Pangea toward the equator at a rate less than that at the Permian-Triassic or Cretaceous-Tertiary boundaries, however the significant drop in eustatic sea level at the J-C boundary indicates a rapid pulse of increasing surface gravity on Pangea at this time.

A research study describing the history of gigantism in bivalves over the last 500 Ma reenforces the assertion of the GTME that surface gravity strength on Pangea was directly linked to the position of the center of mass of the supercontinent relative to the equator.[17] The chart in the research study clearly illustrates the following:

■ The bivalve **Megalodont I** evolved from the early Silurian (~ 450 Ma) and became extinct at the Devonian/Carboniferous boundary (~350 Ma).
■ The bivalve **Alatoconchidae** evolved from early-to-middle Permian (~280 Ma) and became extinct at the end-Guadalupian (~260 Ma).
■ The bivalve **Megalodont II** evolved from the mid-Triassic (~225 Ma) and became extinct in the early Jurassic (~ 185 Ma).
■ The **Rudist coral** evolved from early Jurassic (~ 160 Ma) and became extinct at the K-T boundary (~65 Ma).

The appearances of the last three fauna listed coincide with the periods when, according to the GTME based on the chart of the French research study cited earlier [2] and the Phanerozoic sea level chart, surface gravity was relatively low and ended when there was a major pulse of increasing surface gravitation. The chart does not extend early enough to evaluate the first bivalve. For all four fauna there was also a significant marine regressive-transgressive couplet at the time of their extinction, which also supports the claims of the GTME.

Earth's Geomagnetic Reversals

Scientists believe that the flow of molten iron within the Earth's outer core performs in the same way as an electric dynamo. The rotation of the Earth forces a rotational flow of the molten iron fluid which generates an electric current that produces a magnetic field. Today, the general consensus is that when an asymmetrical thermal effect near the core-mantle boundary exists, the magnetic field starts to become less dipolar and if this effect persists long enough a pole reversal may result. The GTME posits a novel explanation substantially different from the current one for what appears to be the random reversals of the Earth's north and south poles. The GTME, as has been explained above, asserts that:

The inner core is able to move away from its centric position within the equatorial plane of the outer core and it is this asymmetry that results in a non-symmetrical flow within the outer core and causes the magnetic field to transition from a primarily dipolar one to one that is highly non-dipolar and becomes unstable causing a pole reversal.

Again, according to the GTME:
The movement of the inner core is a result of the latitudinal movement of continental tectonic plates based on the Law of Conservation of Angular Momentum.

The study, referenced earlier, by a French research group has hypothesized that the Earth's geomagnetic pole reversals are linked to continental tectonic plate asymmetry relative to the equator. Their hypothesis is similar to that of the GTME with regard to pole reversals, however there is one significant difference. The study published by the cited group hypothesizes that continental asymmetry is able to produce thermal effects at the core-mantle boundary either by descending subducted slabs of oceanic crust or mantle convection processes. Either of these two processes would require a lag in time of many millions of years, some say as much as 40 -50 Ma, between continental plate movement and pole reversals.

The GTME posits a coeval linkage between continental tectonic plate movement and core element movement that would affect spherical symmetry of the inner core within the outer core based on conservation of angular momentum.

This would significantly reduce the potential lag in time between continental tectonic plate movement and pole reversals.

Mass Extinction

The prior sections of the GTME's Key Principles describe how, as posited by the GTME, many currently hypothesized causes of mass extinction are related to mass extinctions but are not the primary cause of them; the extinctions are caused by movement of the Earth's core elements which affects surface gravitation. In almost all of the mass extinctions, both major and minor, the following events happened in this order:

1. Terrestrial extinctions were coeval with the regressive half of a eustatic marine regressive-transgressive couplet; some marine extinctions coeval with the terrestrial extinctions.

2. Eruption(s) of flood basalt volcanism occurs lagging the initial extinctions by about 1 million years.

3. The transgressive half of the marine regressive-transgressive couplet was coeval with marine extinctions and lagging the regressive phase by millions of years. The full R/T cycle being about 5-10 Ma.

Pleistocene Megafauna Extinction

The above three characteristics of mass extinctions apply to all of the major and minor extinctions from the end-Permian until the middle Miocene (~16 Ma), although extinction during this period has not been confirmed. The Columbia River Basalt eruptions of the Pacific Northwest occurred at this time. Possibly the slow, although voluminous, outpouring of basaltic lava explains the lack of extinctions. According to the GTME, this would indicate a very slow movement of the core elements. As explained in an earlier reference, the rate of volcanic outpouring is more significant than the volume of the flood basalt eruptions in order for extinctions to occur.

The most recent end-Pleistocene mass extinction of megafauna (~11,000 Ma) would be explained by the GTME in a similar, but slightly different way. As the north and south polar glaciers formed, the transfer of the ocean water to the poles must have obeyed the same Law of Conservation of Angular Momentum that the latitudinal movement of continents did (e.g., when Pangea existed) and as they do today. The formation of the ice caps at the poles would have moved at least two of the core elements (i.e., inner and outer cores) enough to cause a non-uniform surface gravity around the Earth allowing megafauna to emerge about 6 million years ago. The changing distribution of polar ice during this period implies, according to the GTME, that the locations of lowest surface gravitation would correspondingly change and locations with the largest megafauna would also change. The rapid melting of the ice caps would have caused a rapid pulse of increasing surface gravity due to the global redistribution of ocean water, and therefore, the movement of the core elements toward Earth-centricity causing the megafauna extinction. Alternate current reasoning is that climate change, human hunters and possibly and extraterrestrial impact are responsible for the extinctions.

The three characteristics of mass extinction described above have been observed by many scientists.[15]All of the above events are consistent with the GTME as explained earlier.

There is one anomalous event that has to be addressed:

Bolide impact at the K-T boundary

There is widespread belief that bolide impact was the major killing mechanism at the K-T boundary. The GTME asserts that it was not and that the impact was an indirect result of the primarily longitudinal movement of the continental tectonic plates as Pangea broke apart. As the separated continental tectonic plates of Pangea started to rapidly move away from the other continental plates longitudinally, a major wobble of the Earth occurred. This wobble has been confirmed by scientists although I disagree with their explanation of the cause of it. [20] The GTME posits that it was this wobble that deflected an asteroid that had been dislodged from the Baptistina asteroid family causing it to collide with the Earth. The Earth, wobbling in its orbit would more likely be struck in its equatorial region than at higher latitudes by another object orbiting the sun due to the wider target presented.

The impact site at Chixculub was in the equatorial region.

The eustatic sea level drop at that K-T boundary was perhaps the largest one of the Mesozoic and, according to the GTME, that would indicate a great rapid movement of the core elements and therefore a major pulse of increasing surface gravity causing extinction. The trailing marine transgressive half of the regressive-transgressive couplet would have produced a second wave of marine extinctions. Therefore, according to the GTME:

Neither the bolide impact at the K-T boundary nor the Deccan volcanism was the primary cause of extinctions at the K-T boundary; the primary cause was a major pulse of increasing surface gravitation affecting terrestrial and marine fauna followed by a transgressive phase affecting marine fauna.

Earth's Geomagnetic Secular Variation

Based on the above description of the GTME's explanation for the Earth's geomagnetic pole reversals, the GTME posits that the Earth's geomagnetic secular variation is determined by the movement of the inner core within the outer core and therefore, by extension:

The GTME posits the Earth's geomagnetic secular variation is controlled by total continental tectonic plate center-of-mass asymmetry relative to the equator.

The net latitudinal movements of all of the continental tectonic plates affects the Earth-centric position of the outer core and within the outer core, the spherical symmetry of the inner core. It is the offsetting of one or both cores that affects geomagnetic secular variation.

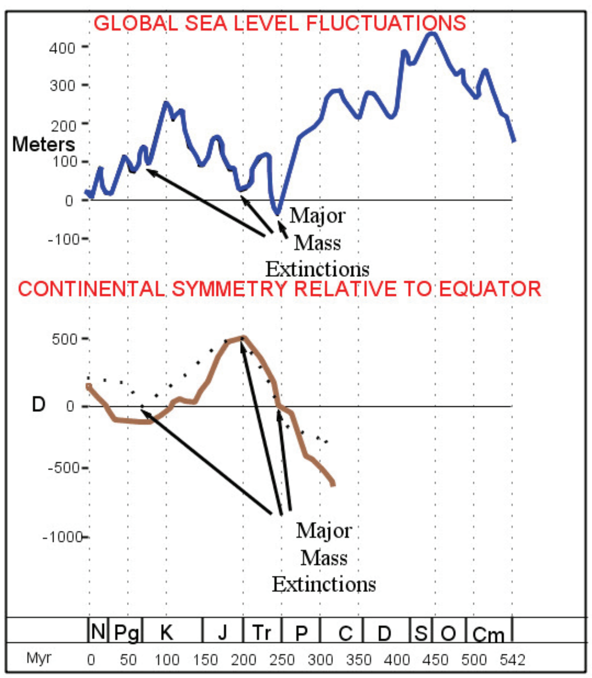

Fig. 1 Comparison of Phanerozoic sea-level curve, modified from Hallam (1992), to continental tectonic plate symmetry (**D**) relative to equator. Solid line curve is modified from French research group [2] and dotted line is modified from reconstruction by C. Scotese. [19]

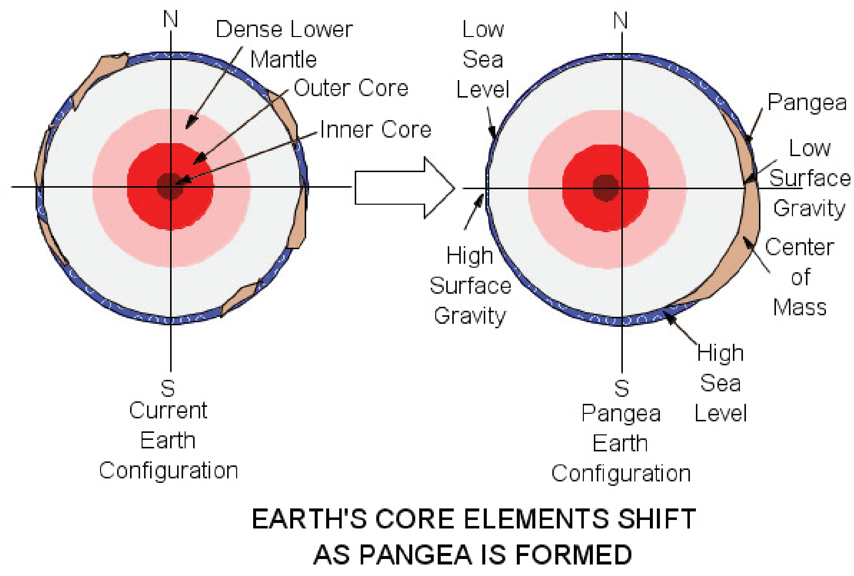

Fig.2 Offset of all three core elements when Pangea consolidated, based on the GTME

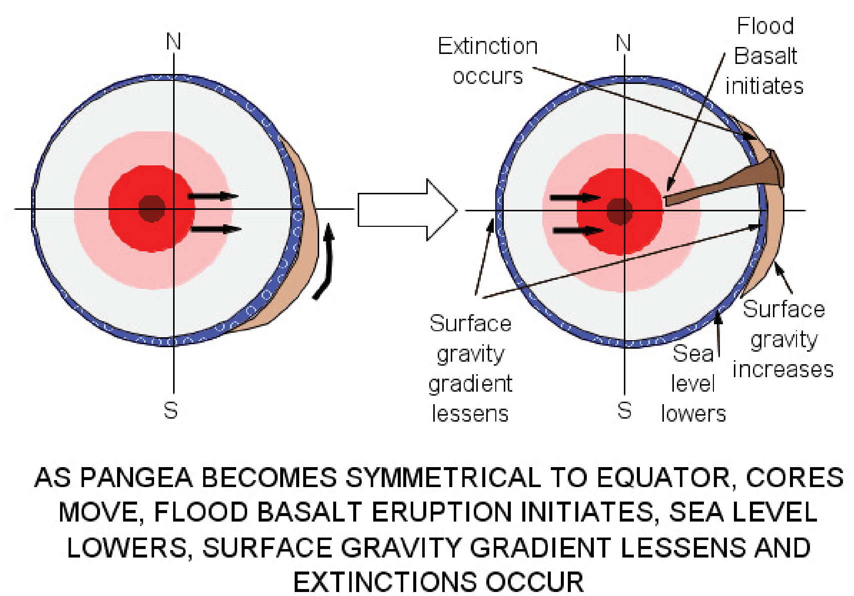

Fig.3 The effect of Pangea's center of mass moving toward equator, based on the GTME

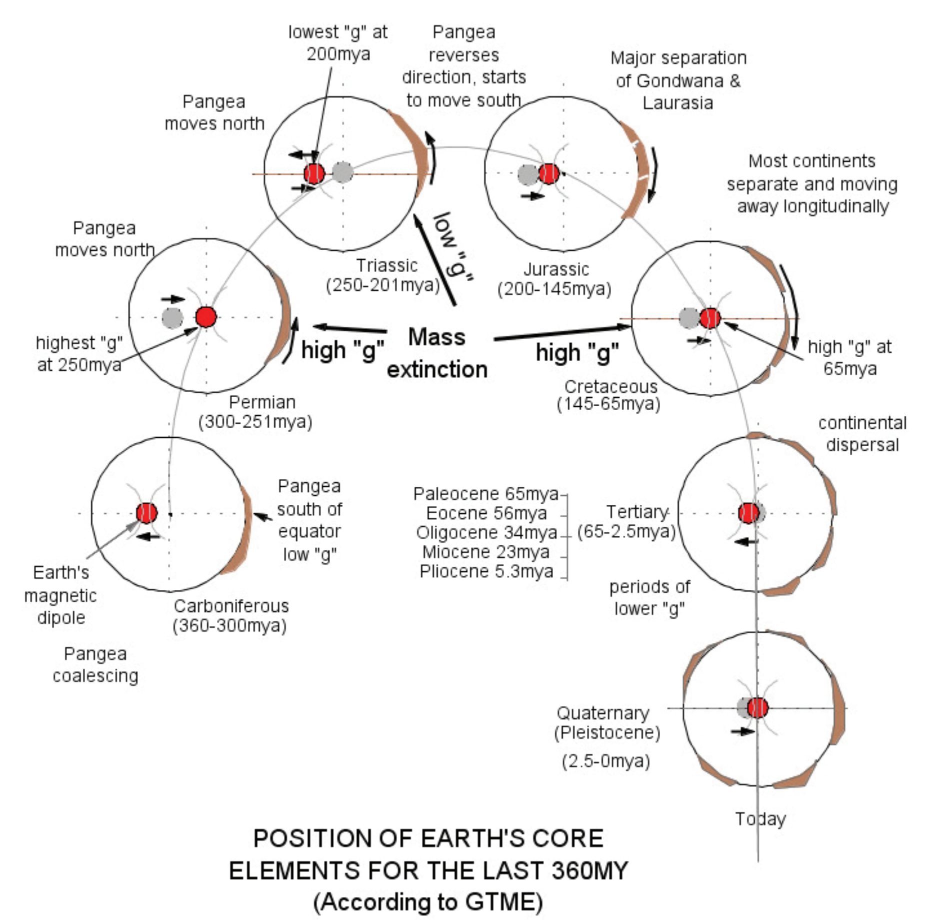

Fig.4 Offset of all three core elements of the Earth during the Paleozoic, Mesozoic and Cenozoic Eras, based on the GTME

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