FLOOD AND POST-FLOOD GEODYNAMICS: AN EXPANDED EARTH MODEL

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Abstract

Several creationist and non-creationist global tectonic models have been put forward to explain the distribution of continents, topographical features, floral and faunal dispersions. An Earth expansion geodynamic model appears to best account for the empirical data and the catastrophism of the Flood-Judgment required by Scripture.

Introduction

This writer's interest in Earth models arises from studies into the archaeological record left by paleohistoric peoples.[1] If an archaeologist accepts the Bible as authoritative in science and history, then development of non-evolutionary Earth models is essential. From Creation there has been no time in the Earth's geologic history that mankind has not been present. If archaeologists are to develop a true understanding about the lifeways[2] of paleohistoric peoples, then knowledge of environment and of peoples, interaction with the environment is required. Post-Flood human, plant and animal populations were affected by Earth's geodynamic processes. These processes determined weather patterns and climate. They affected regional and global geography. The post-Flood dispersion of animal populations and the later post-Babel dispersion of the human population were influenced, perhaps directed, by the changing paleogeography. New lands were opened to habitation and other regions were isolated from further migrations and colonization.[3]

The plan of the article is to critically summarize the major evolution-biased geodynamic models: These are

(1) Models where the oceans and continents are fixed in position and permanent;
(2) Plate tectonic models where continents drift and new ocean floor is formed while old ocean floor is destroyed; and
(3) Earth expansion models where growth of new ocean floor is not compensated by destruction of old ocean floor.

This critique is followed by a Bible oriented *expanded Earth model.* As creationists our attention has been directed to Earth expansion most recently by Glenn Morton.[4] This paper suggests that a feature of Flood-Judgment geodynamics was the rapid expansion of the Earth. This expansion contributed to changes in both the hydrosphere and atmosphere and the distribution of post-Flood land masses. The expanded Earth model presented here is empirical and simplistic, intended to nurture hypotheses explaining the relationship of humankind to the post-Flood environment.

Evolution-Biased Earth Models

Evolution-biased Earth models are creations of the evolution paradigm. As such they require unlimited time for Earth history. These models are at variance with Earth models framed around the historical global Flood-Judgment. Evolution-biased models attribute all geologic history to uniform processes or to chance catastrophes which supposedly operate over billions of years. The Creator is irrelevant and the Bible is myth.[5]

No evolution-biased Earth model can be demonstrated on the global scale for which it is postulated to occur. And herein lies a conflict. These geodynamic models lack a coherent mechanism which explain how their processes could operate for billions of years of geologic history. However, without billions of years the uniformitarian geological processes could not have occurred.

Contracting Earth Models

The idea that the Earth is contracting, cooling from an originally incandescent ball, was doctrine to Earth scientists until the 1960's. Folded mountains were believed to be uplifted surface crust (lithosphere) resulting from contraction of the Earth's interior. Ocean basins were regions of crustal collapse. Vertical movements and compression of the lithosphere were possible, but horizontal plate movements were excluded.[6] But contracting Earth models have some serious problems. According to the model, mountain building processes should be spread evenly over the globe as uniform contraction has occurred. The analogy often raised was to the random wrinkles produced on the surface of a dried apple. But this random occurrence is not the case. Mountain ranges primarily occur in narrow, curvilinear belts, often at the edge of continents.[7] Another anomaly was discovered with the analysis of data on the Earth's topography. Calculations from data taken over the surface confirmed that two distinct levels could be distinguished: the continental crust and the abyssal ocean floor. This bimodal distribution was not predicted by a contracting Earth model. If elevations resulted from random uplifts and subsidence, a normal or bell-shaped distribution of elevations around the median level would be expected.[8]

The relationship of a cooling interior to a contracting surface also produced contradictions. Internal heat, whether primal or radiogenic would be expected to decline exponentially through time. Evolution-biased geology recognized that the sequence of orogenesis did not correlate to a pattern of exponential cooling.[9]

As already noted, a fundamental concept of contracting Earth models is that position of the continents and oceans has been permanent throughout geologic history.[10] One of the most debated problems between biologists and geologists has been the distribution of fossils and geological features common to two continental land masses which are separated by a vast ocean. To allow for such associations land bridges were assumed to have existed in a remote past (particularly, transatlantic land bridges). Land bridges allowed migration of animal and plant populations

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between continents. Where are these bridges today? It was assumed that they collapsed and became part of the ocean basins. When exploration of the ocean floor became possible, fossil and sedimentary evidence for collapsed land bridges was not found. Instead it was found that ocean floor sediments were much thinner than those on the continents. This was not expected. If the oceans and continents were of equal age and in permanent positions, the sedimentation rates and distributions should reflect this.[11] A further problem was that ocean floor sediments were "young;" that is, comparable fossil indicators were the same in the ocean sediments as the topmost sediments deposited on land. Ocean sediments have not been found comparable to the "older" continental sediment profiles. If continents were uplifted ocean floor, then the sediment profile of the oceans should be comparable to those "older" sediments on land.[12]

Drifting Continents

The contracting Earth model rapidly gave way during the 1960's. The associations of trans-oceanic fossil and sedimentary distributions of the continents were eventually accepted and deemed explainable only if the continents were at one time joined. If joined in the past, then the logical extension of this idea is that at some time the continents must have also separated.

Almost 50 years before acceptance, the concept of drifting continents and moving ocean floors had gained the attention of the scientific community. In 1912, a German meteorologist, Alfred Wegener, proposed that the continents on either side of the Atlantic were at one time joined, had rifted and then drifted apart. His theory was inspired, in part, by the apparent jigsaw fit between South America and Africa. Figure 1 is a modern version of the fit between the continents either side of the Atlantic. To Wegener the idea that the continents were once joined explained fossil and stratigraphic links between continents without the problems associated with land bridges. But Wegener's theory of continental drift was rejected by most scientists of the day. The reason for rejection most often given was that the theory failed to provide an acceptable explanation of forces required to start and maintain the continents in motion.[13] However, another reason for rejecting Wegener's theory was that those in control of the scientific media could not accept challenges to popular and cherished theories on which many academic reputations rested. Professor Carey, one of the leading revivalists of the continental drift model in the 1950's, observed:[14]

> During the thirties and forties and early fifties, Wegener's ideas were generally rejected as a fantasy—fascinating but false. *'Ein Marchen,* a pipe dream, a beautiful fairy story' chanted the American bandwagon. During the decades of repudiation, arguments which denied continental dispersion passed without scrutiny or test. They were correct, *a priori,* because everybody knew that continental drift was wrong . . . (p. 6)
>
> But here's the rub. Although any loose statement denigrating or mocking continental dispersion got easy passage and approval for publication, any who was unwise enough to argue for displacement of continents was cold-shouldered by referees and editors and became the butt for snide comments. (p. 9)

Such is the history of "scientific objectivity."

Figure 1. Alfred Wegner was impressed by the apparent fit of the continental shorelines between the continents on either side of the Atlantic. Computer assisted projections have further refined this apparent fit. Geological studies of fossil and sedimentation profiles on adjacent regions of South America and Africa also suggest joining in the past. (After Carey, S., 1976, p. 41).

During the decades of scientific community prejudice and ridicule, a minority of geophysicists continued to support the continental drift model. Geologists of the Southern Hemisphere, for example, A. DuToit of South Africa and S. Carey of Australia, saw evidences that indicated a common ice cap had covered portions of South America, Africa, India and Australia.[15] These areas today are separated by thousands of kilometers of ocean. Distribution of fossils, particularly the fossil flora, *Glossopteris,* also suggested these lands had once been joined.[16] Such evidence continued to keep the idea of continental drift alive. (See Figure 2).

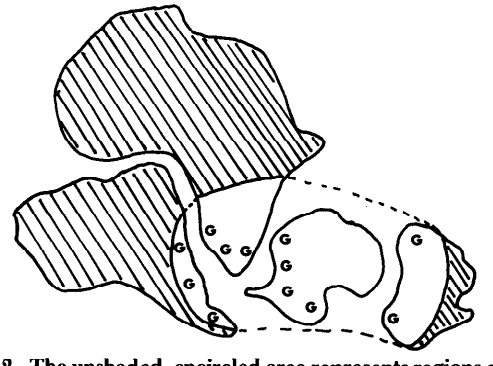


Figure 2. The unshaded, encircled area represents regions of South America, Africa, Antarctica, and Australia thought to have been once covered by a common ice sheet. G represents the fossil plant Glossopteris in sediments also common to these Southern Hemispheric regions.

Spreading Oceans and Plate Tectonics

In the 1920's A. Holmes suggested thermal convection in the mantle was the mechanism driving the continents apart. Holmes assumed this convection acted as a conveyor belt on which the continents rode.[17] In the 1960's several geophysicists put forward the idea that the ocean floor was spreading from mid-oceanic ridges. New ocean floor composed primarily of basalt, was being extruded from the mantle. The assumption was that new oceanic crust was being produced through a global network of oceanic ridge-rift systems. New ocean floor spreads out from both sides of these oceanic ridges. The cooled crust is

displaced by still newer upwellings. The older crust is pushed further from the ridge-rift system. The ocean floor continues to move laterally away from the source until it descends again into the mantle. Descending ocean floor results in the oceanic trenches where the "oldest" ocean floor dives beneath the continental margins or under island arc systems. This process was termed subduction. In this way old floor is removed while new floor is produced. The descending wet oceanic crust supposedly undergoes partial melting as it descends into hotter and higher pressure regions of the mantle (asthenosphere). A portion of the melting, descending crust moves back toward the surface as lava which results in tectonic and volcanic activity. Furthermore, "lighter" oceanic sediments cannot descend into the mantle. These sediments slough-off becoming part of the continental margin. But most of the descending ocean floor is circulated within the mantle convection currents and may later resurface at the oceanic ridge-rift system as new ocean floor. In this way ocean floor is theoretically constantly being renewed throughout geologic history.[18] Figure 3 summarizes some hypothetical features of ocean floor spreading and mantle convection.

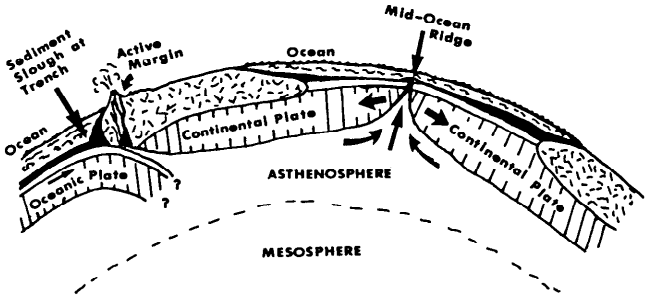


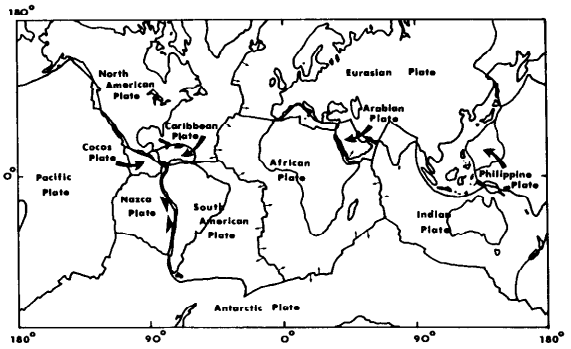
Figure 3. Representation of the major features of the plate tectonic model (After Talwani, M., and Langseth, M., 1981, *Science* 213:23).

Plate tectonics is a synthesis of the hypotheses of continental drift, mantle convection and ocean floor spreading. The plate tectonic model views the Earth's crust as being composed of seven large, fairly rigid plates and several minor ones. The major plates are Indian, Pacific, Antarctic, North and South American, African and Eurasian. Plate boundaries are drawn to coincide with oceanic trenches, oceanic ridge-rift systems, and continental regions of earthquake and volcanic activity (Figure 4). A plate is assumed to be represented by a continental land mass and surrounding ocean floor up to the boundary. Because the continental plates are lighter than the basaltic oceanic crust, they "float" and are carried along by the moving ocean floor. The uniformitarian nature of plate tectonics creates a cyclic picture of plates colliding, joining and separating. This cycle is assumed to be repeated throughout eons of geologic time.[19]

Plate Tectonics and the Geologic Evidence

Plate tectonic models have attained wide-spread popularity and, therefore, are taught with varying degrees of certainty as scientific fact. However, there are major problems between what is predicted by theory and the geologic evidence. A sampling of these problem areas is highlighted below.

A. Africa. The African plate includes the continent



▶ represents area of supposed subduction along the Peru-Chile Trench.

Figure 4. Mercator projection of Earth showing "boundaries" of major lithospheric plates. Note that the African plate is surrounded by oceanic "spreading" zones (After Forsyth, D., and Uyeda, S., 1975, *Geophys. J.* 43:163).

and a surrounding "ocean floor spreading" zone. Assuming that Africa has separated from the other continental land masses, plate tectonic theory requires an area of crust larger than the African continent to have been subducted.[20] But between the Atlantic and Indian ocean spreading ridges, there is no trench system available to swallow "older" crust. In fact Africa is surrounded by a spreading ridge-rift system as shown in Figure 4.

Plate tectonic theorists have suggested that the African plate has remained stationary while new ocean floor growth has been accommodated by the Pacific trench system and towards Antarctica. As Carey observes:

> The Peru-Chile Trench then has to swallow more than 1600 km of Africa's share, plus more than 1400 km of South America's share, plus 3700 km from the South Pacific, making a total of 7000 km of lithosphere underthrust below the Andes.[21]

Towards Antarctica, the Kermadec Trench between Australia and Africa would have had to subduct 1300 km of oceanic crust.[22] Is there any evidence that this massive magnitude of subduction has occurred? The answer is "No."

B. Peru-Chile Trench. In order for the Earth's radius to remain constant the trenches around the globe must swallow oceanic crust at the same rate that ridge-rift systems are producing new ocean floor. However, the sediments deposited on the ocean floors would not all be subducted. Sediments are lighter than the basaltic crust and would "float" on the denser mantle rocks. Scrapings of the lighter sediments should pile up in the trenches and at continental margins. Massive volumes of ocean floor sediments should be found within the trenches and at continental margins. Geological surveys of the Peru-Chile Trench have revealed a different picture. Some sections of the trench are empty of sediments, whereas, other sections contain *undisturbed* Tertiary sediments (see Figure 5).[23] Geologic evidence for massive oceanic crust subduction does not exist in the Peru-Chile Trench.[24]

C. Antarctica. Plate tectonic theory causes even more severe problems for Antarctica than Africa. Figure 6 represents the situation for Antarctica. The

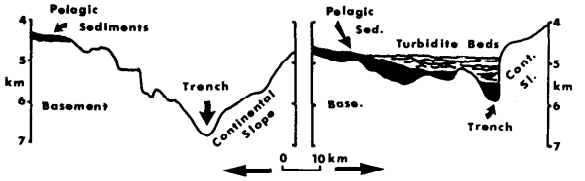


Figure 5. Some regions of the Peru-Chile Trench are empty of sediment "slough" (left above). Other regions contain only undisturbed Tertiary sediments (right above). For the continents to have reached present locations by the processes of plate tectonics, 7000 km of ocean should have underthrusted the Andes leaving lighter pelagic sediments accumulated in the trenches and up the continental slope (After Scholl, D., *et al.*, 1968, p. 870).

Antarctic plate is bounded on all sides by "spreading" zones. Again, according to the theory, an area of oceanic crust no less than the size of the continent would have been subducted. No sign of such a massive subduction exists. The only small trench (South Sandwich) in the region is at right angles to the hypothetical spreading zone.[25]

Theoretical diagrams of ocean floor spreading and subduction may appear convincing. On the other hand, when plate tectonic principles are applied on a global scale, the geologic evidences are lacking.

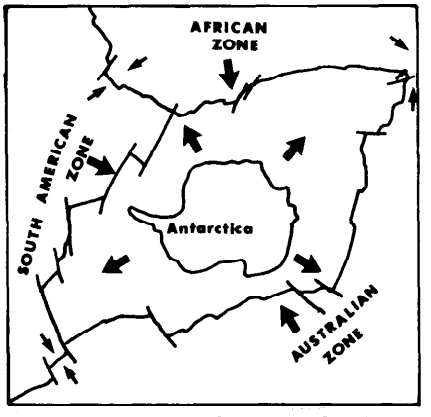


Figure 6. Antarctica is completely surrounded by oceanic plate boundary zones. Where the plate boundaries meet, there are no trenches available to "swallow" the older oceanic crust (After Carey, 1983, p. 383).

D. Convection Currents. Plate tectonics proposes that horizontal plate movements are the cause of all major geotectonic effects. Theoretically, when an oceanic plate collides with a continental plate, the heavier oceanic crust descends beneath the continental plate. To move these plates along, convection currents within the mantle have been assumed.[26] A pan of heated water shows thermal convection. The hotter, less dense water rises from the bottom of the pan and at the surface it loses heat to the atmosphere. The cooler, denser surface water descends toward the bottom of the pan. When applied to the Earth's mantle, the idea is "given enough time," the Earth will behave as an ideal Newtonian fluid. If so, mantle rock should show a convection similar to the thermal convection described above. However, experiments with rock deformation under strain indicate the Earth's mantle may have properties which make it act differently from a normal Newtonian fluid.[27] The obstacle to knowing is that geophysicists cannot adequately test their hypotheses about the Earth's interior. Fluid properties of the mantle, beyond those required for isostasy phenomena of the crust, are unknown.[28] In fact, geophysicists still are unable to determine mantle composition precisely.[29]

One geophysicist has recently observed:

> The results of our respective investigations and deliberations represent no more than clever speculations or, at best, more or less reasonable working hypotheses. We have not really advanced our theoretical thinking and knowledge much beyond that of our teachers twenty or even fifty years ago. We may postulate, or even believe it fervently, that convection is the ultimate and ubiquitous motor in plate tectonics. Yet we cannot prove that friction between mantle and crust—how else can thermal convection be converted into direction motion?—is sufficient to drive crustal plates, large and small.[30]

E. Mythical Tethys. A major gapping area is part of all plate tectonic models. When continental land masses are joined on a modern radius globe, a massive gap is created between Asia, India and Australia (Figure 7). This gapping area is assumed to have been ocean and is called Tethys. Supposedly, Tethys was destroyed by subducting under the Asian continental plate as India collided with Asia. Subduction is why Tethys does not exist today.[31] However, there are problems with this hypothesis. Meyerhoff and Meyerhoff insisted that India has never been "far" from Asia in its geologic history.[32] Carey has shown that India has faunal and paleogeographic ties with Australia, Antarctica, Madagascar, East Africa, Arabia, Iran, Afghanistan, Kazakhstan and Tibet.[33] To account for fossil and stratigraphic similarities paleogeographers have found it necessary to "ferry" Australasian islands back-and-forth across this gapping area. Timor is an example.[34]

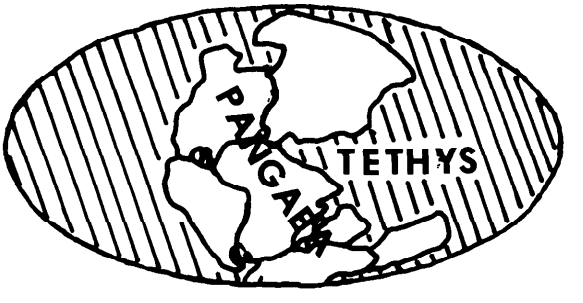


Figure 7. Reconstructions of a single "supercontinent" on a constant radius Earth requires a single superocean. Since the modern ocean is "younger" than the continents, plate tectonic theory supposes that the ancient Tethys was completely subducted into the mantle.

Expanding Earth Models

The failure of plate tectonic models to reconcile theory and geologic data has revived interest among a minority of scientists in expanding Earth models. Most of the early interest in an expanding Earth was from European scientists who were inspired by Wegener's concept of continental drift. Lindemann in 1927 argued that extension and rifting were the predominant features of the Earth's surface. He postulated that continental drift was the result of expansion of the Earth's interior.[35] Helgenberg (1933) was the first to assemble a smaller radius globe of Earth showing land masses "fitting" together with the exclusion of oceans.

His model was about 60 percent of a reference globe of modern dimensions.[36]

Recently, an expanding Earth symposium was held in Sydney, Australia (February, 1981). The meeting of international scientists represented leading proponents of both plate tectonic and earth expansion models. This meeting was followed in November, 1981, by a Moscow conference on Earth expansion. From these meetings evolution-biased theories of Earth expansion fall into four categories:

(1) constant mass, but a superdense, metastable inner core which has changed in phase with time to matter of "normal" density;
(2) constant mass, but declining gravitational constant *G*;
(3) mass of the Earth has increased with time from cosmological phenomena, i.e., expansion is a universal phenomenon driven by a function of pressure, temperature and time; and
(4) significant accretion from asteroidal impacts over billions of years.[37]

Empirically, expanding Earth models build on the observation that continental surface structures fit together more precisely if the Earth's radius is smaller than today. Owen of the British Museum (Natural History) has noted that geometric patterns of continental fit used by plate tectonists suffer from two major inadequacies: (1) reconstructions are made of relatively small areas without reference to effects on surrounding areas; and (2) "—lack of elementary cartographic competency in workers whose geophysical work is, otherwise, of a high standard." Owen has shown how small 'gaps' occur on correctly projected reconstructions using an Earth radius of modern dimensions. These gaps disappear on smaller radius Earth projections.[38]

Regarding the massive subduction required of plate tectonic models of the Tethyan ocean, Stocklin has concluded:

> Palaeomagnetic data for the late Palaeozoic and earliest Mesozoic, if applied to an Earth of present size, require a wide Tethyan oceanic separation between India and Eurasia; if applied to an Earth of smaller size, no such separation is required. The geology of the Himalaya fails to indicate a Tethys Ocean of Paleozoic-earliest Mesozoic age and in this respect supports the theory of Earth expansion.[39]

Compression and Mountain Building

If continental separation involved only Earth expansion, the expansive forces alone should prevent crustal collisions. Apparent collisions are, however, part of the geologic record. The Alps are believed to have resulted in a horizontal compression of several hundred kilometers of lithosphere.[40] To overcome this problem some theorists have proposed models where the Earth expands for a while, then contracts. The major difficulty with expanding-contracting or pulsating Earth models is identification of a reasonable motor that could operate *both* expanding and contracting alternating phases.[41] Carey argues that geosynclinal and orogenic features arise through cycles of lithosphere extension and the diapiric rise of heated mantle, respectively. The orogenic belts are part of the peri-continental expansion polygon system as are the oceanic ridges. The diapiric rise of mantle exhibits gravity spreading at the surface resulting in ultramafic belts, basement horsts, fanned lineations and gravity nappes (which are mistakenly identified as collision features).[42]

Ocean Water Accumulation

Increasing the Earth's radius resulted in enlarging the oceanic crust. It has been suggested that Earth expansion has resulted in massive outgassing of water from mantle material as new ocean floor was formed. Estimates of total oceanic water on Earth today have ranged between 1.4×10^{24} grams (Holmes[43]) and 1.8×10^{24} grams (Anderson[44]). If the radius was 0.6 of the present radius, this volume of water would completely cover the smaller Earth with an average depth of approximately seven to 10 kilometers.[45] Because of the assumptions and limitations of evolution-biased stratigraphy, such an event is considered impossible. The problem is reconciling outgassing of new (juvenile) ocean waters with the inflated time-frame required by evolution-biased Earth models.

Creationist Earth Models

If the catastrophic Flood-Judgment is accepted as historical truth, then Earth models must reconcile geologic evidences with a Biblically developed chronology and sequence of events. Some creationists have devised Earth models which argue permanent positions for the continents and oceans.[46] Others have recognized that the distribution of fossils attests to both the catastrophic nature of the Flood, as well as indicating that the present continental land masses were once joined.[47] Earth models also have been proposed which apply the concepts of plate tectonics to the hypothesis that continental division may have occurred after the Flood.[48] Biblically, support for a post-Flood continental division may come from Genesis 10:25 where we are told that Peleg was so named because during his lifetime the Earth was divided.

If we conclude from the fossil and stratigraphic evidences that continents now separated by thousands of kilometers of ocean were once joined, then continental dispersion must have occurred. And with respect to Earth global tectonic models, either of two possibilities exists:

(1) An "older" ocean floor has been destroyed by subduction back into the mantle as the continents dispersed on a constant radius Earth—the hypothesis of plate tectonics; or
(2) The ocean floor has been produced without destruction of an "older" oceanic crust because the radius of the Earth has expanded.

Glenn Morton, geophysicist and intuitive creationist theoretician, has presented a case for the expanded Earth model and against creationist Earth models built on the plate tectonic hypothesis. Regarding the plate tectonics hypothesis, geodynamic features of mantle convection, when applied to the short time span indicated by Scripture, requires unrealistically high temperatures and massive energy input to move the continents and subduct massive volumes of oceanic lithosphere.[49] Creationist plate tectonic models also suffer from the same lack of evidence for massive subduction as evolution-biased plate tectonics. Morton

sees only two possibilities to explain a prior fit of the continents:

> Either God separated the continents outside of natural agencies or that the earth expanded in such a way that the viscous forces were not involved. The expansion of the earth caused by an expansion of each individual atom due to a change in the permittivity of free space (the electric force) is a possibility which could avoid the viscosity problem.[50]

The lack of evidence for continental uplifting and oceanic sinking and the absence of massive subduction mitigates against models of fixed continents or continental dispersion models involving plate tectonics.

The expanded Earth model which follows will focus on historical consequences rather than mechanism. Whether the motor of this Earth expansion model was miraculous or naturalistic is not the concern of this presentation. A sequence of global tectonic events are described in Scripture and are evidenced in the Earth. It is these evidences that the following Earth expansion model will address.

The Antediluvian Earth

From creation of the Earth until the Flood-Judgment, the Earth's radius was 60 to 70 percent of what it is today. Figure 8 exemplifies the paleogeography resulting from this smaller radius. Land was predominant and the great ocean basins of today did not

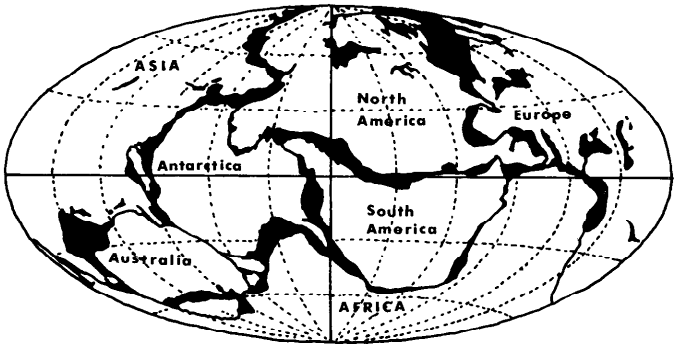


Figure 8. Reduction of the Earth's radius by 60 to 70 percent results in a palaeogeography dominated by land possibly separated by narrow seas. (This reconstruction is after Kirillow, I., 1958, in Expanding Earth Symposium, p. 22).

exist. Instead the land was partitioned by narrow seas and, possibly, shallow epicontinental seas (or marshes) in some regions of the earth. The hydrospheric equilibrium and atmospheric circulation would have been predictably much different from today due to the pre-Flood proportion of land and sea. Creation scientists have often cited evidence from both Scripture and the fossil record which suggests some of the differences of the antediluvian world:

(1) Milder temperatures with less range between highs and lows;[51]
(2) Absence of rain with the principal mechanism for watering the pre-Flood flora being dew rising from the ground;[52]
(3) Absence of cyclonic winds, but an implied presence of gentle breezes;[53]
(4) One central river system, originating in the land of Eden and branching into four rivers which extended into other lands—two branched river systems are noted as "encircling" *(sobhebh)* the lands into which they flowed;[54]
(5) At least five pre-Flood regions are identified—Eden, Havilah, Cush, Asshur and Nod;[55]
(6) Waters were in existence above the Earth's atmosphere, possibly in the form of a high altitude canopy[56] and/or as Earth-Moon orbiting ice rings;[57] and
(7) Abundant and diverse fauna and flora.[58]

The Flood-Judgment

The term Flood-Judgment stresses that the cause of the global Flood catastrophe was not accidental. It was ordained and executed by God, not as an "act of nature," but as an act of judgment against human rebellion directed at God and His Word. Since Scripture faithfully records the chronological history of this judgment, this historical account provides the framework within which scientists are secure to develop Earth models. All extra-Scriptural frameworks devised by men will lead up blind alleys to the extent that they are contra-Scripture. Table I summarizes chronologically some significant events of the flood as recorded in Genesis.[59]

Table I. Chronology of the Flood-Judgment.

Time-frame	Event	Reference
Day 1	The Flood-Judgment begins. The vast body of water beneath the Earth bursts forth and the waters above the atmosphere rain downward.	Genesis 7:11
Day 40	The meteoric waters, which have descended continuously for 40 days, have ceased. The release of the subterranean waters has also ended. The Flood-waters now cover the highest Archean mountains of the pre-Flood Earth.	Genesis 7:17 Genesis 7:18-21
Day 150	The Floodwaters have continued unabated for 110 days. On the 150th day, the Flood-waters begin to subside. Abatement was triggered or accompanied by a cyclonic wind.	Genesis 7:18-21 Genesis 7:24-8:1
Day 224	After 74 days the tops of mountains begin to appear.	Genesis 8:5
Day 278	Fresh growth of plants has begun—the second dove brought a fresh olive leaf back to the Ark.	Genesis 8:11
Day 371	The land in the vicinity of the Ark is sufficiently dry to allow disembarkation of people and animals from the Ark. It has been 221 days since the waters began to subside and 147 days since the mountain tops appeared.	Genesis 8:14

Increase in the Hydrosphere

Two major Flood-Judgment events resulted in the catastrophic increase in surface water on Earth; the influx of meteoric waters from above the atmosphere

and the breaking of the "fountains of the deep."[60] Creationists have interpreted these fountains as being subterranean water sources. The water source for the great river branching out from Eden in an environment of little or no rain also suggests a subterranean supply.[61] Some have suggested that the waters from the "fountains of the deep" were the major contributor to the increased surface water volume.[62]

The old evolution-biased idea that the oceans originated from condensation of a primitive atmosphere has lost support during this decade. An alternative hypothesis is that ocean water resulted from the outgassing of magma as it ascends from depths of higher temperatures and pressures.[63] For example, geochemists have observed that granitic magma is capable of holding six to nine percent water in solution. This applies to magmas having crystallized at pressures indicative of 1,220 to 3,650 meters depth and temperatures not in excess of 870°C.[64]

During the initial stages of the Flood-judgment it is reasonable to assume that both "free" subterranean water (source of ground dew and the Edenic river system) and plutonic water were the waters released by the breaking of the fountains of the deep. Outgassing of magma would also inject gases (other than water) into the atmosphere.[65] Rapid outgassing would mean that both the hydrosphere and atmosphere would be in dynamic disequilibrium, both chemically and physically. Magmatic outgassing would also elevate the temperature of the increasing Floodwaters. The hotter plutonic Floodwaters would be cooled by loss of heat to the atmosphere and through mixing with meteoric water, "free" subterranean waters and pre-Flood surface seas and rivers. Overall, warmer world-wide Floodwaters could be expected. Oard has proposed a model where post-Flood warm oceans initiated the "Ice Age"—massive glaciations of the northern hemisphere and ice caps of the north and south poles.[66]

Earth Expansion and Ocean Basins

Morton has considered the distribution of sediments left by the Flood-Judgment. If continents and oceans existed during the Flood as they are now, sedimentation dynamics require the deposition of thicker sediments in the ocean basins. Since the opposite is true, Morton concludes that the ocean basins have formed after the Flood. Further, the modern global sediment profile suggests an Earth radius, when covered by Floodwaters, of approximately 58 percent of the present radius.[67]

If the oceans were, in fact, created after the major load of continental sediments had been deposited, the thinner and "younger" oceanic sediments can be explained. The ocean basins would have formed in between the continents as the Earth expanded. This delayed expansion would imply that during the initial stages of the Flood, release of both outgassed plutonic and subterranean "free" waters would have occurred either before Earth expansion or at a faster rate. The current volume of oceanic water on a smaller Earth (60 percent of the modern radius) would result in an average Floodwater depth of approximately seven to 10 kilometers.[68] This Floodwater depth is adequately excessive so that some Earth expansion could have occurred during the initial 40 days of the Flood-Judgment. However, if this initial expansion did occur, either it ceased after the 40 days or both expansion and the production of plutonic waters occurred at equivalent rates thus maintaining the Floodwaters for the additional 110 days (Table I). The rate of outgassing elements from mantle rocks depends on many factors; for example, solubility, complexes, and temperature and pressure gradients.[69] To suggest geochemical mechanisms for the production of plutonic waters in an expanding Earth model is beyond the scope of this article.

Psalm 104 provides additional information about events during these 221 days in which the waters receded from the land:

(1) Verse six affirms that the waters of the Flood-Judgment enveloped the whole Earth, even to the extent of covering the Archean (pre-Flood) mountains;
(2) Verse seven affirms that the Floodwaters began to abate only after Divine Intervention and that the waters receded rapidly once God gave the command;
(3) Verse eight adds that the Floodwaters flowed over the mountains and into the valleys (tension rifts) as they receded off the continents; and
(4) Verse nine suggests that a geological boundary exists so that the Floodwaters collected in the ocean basins can never again cover the continental land masses.

Earth expansion would have resulted in dispersion of the continents. The dramatic nature of this dispersion can be seen by comparing the paleogeography of a smaller radius Earth (Figure 8) to the projection of an Earth of modern dimensions (Figure 4). Where continental lithosphere rifted apart, new oceanic crust appeared. Basaltic ocean basins formed with the Floodwaters receding to expose new land. As expansion continued, gravity would dominate and the Earth's curvature would change with the expanding radius. Carey has noted that lithospheric plates described by plate tectonic theory could actually represent "primary polygons" (Figure 4) with their boundaries of tectonic and seismic activity being zones of spreading diaphers (vertical rises of magma).[70] The primary polygons are thousands of kilometers across and may represent rupture of the entire mantle down to the fluid core. These primary polygons are also forced by tensional and gravitational forces into smaller second-order polygons. Second-order polygons are hundreds of kilometers across, representing tensional adjustments down into the asthenosphere of the mantle.[71] Holmes identified these second-order polygons as "basins and swells."[72] Carey argues that these basins result, not from surface depressions, but rather from a lag in rising as the Earth expands. The swells, on the other hand, are regions of tectonic activity showing background seismicity, higher heat flux, faulting and some rift valley formation. (Figure 9). The polygonal pattern dominates the Earth's surface. In a statistical analysis of the lengths and angles of various Earth polygon boundaries, Rickard has made the following observation:

> The preponderance of near 120° intersections suggests that, as in the case of polygonal systems in other materials,—e.g. mud, permafrost, and

basalts, etc.—these polygons were formed in tensional stress field.[73]

As the Earth expanded the continents dispersed, the ocean basins formed and the water receded from the continental platforms.

Figure 9. Basin and swell pattern of "secondary polygons" representing tensional adjustments to Earth expansion down to the asthenosphere of the mantle (After Holmes, 1945, in The Expanding Earth, p. 42).

Asteroidal Impacts

There is ample evidence from fossil craters that during the Flood-Judgment the Earth, indeed the Solar System, was exposed to a massive influx of asteroidal bodies.[74] By comparison to Earth's nearest neighbor, the Moon, there are suprisingly few large impact structures. This is best explained by reasoning that evidence of impacts which occurred during the Flood-Judgment would be destroyed along with the rest of the Antediluvian world. Only those impacts occurring on land after the Floodwaters had sufficiently abated would leave their mark. Asteroidal impacts could have contributed a massive heat flux during the Flood.[75] The energy released could have weakened the mantle triggering further expansive forces thereby hastening Floodwater abatement. When the Floodwaters began to recede, Genesis identifies a great wind associated with this event.[76] Clyclonic windstorms could be predicted from changes in atmospheric heating resulting from the massive asteroidal encounters during the Flood-Judgment.

Quaternary Rifting

Tensional and gravitational forces continued to stabilize after the water receded from off the continental platforms and into the ocean basins. This post-Flood tectonic activity continues through the present although at a much reduced intensity. Major foci of tectonic activity are concentrated primarily at the polygon boundaries (Figure 4). As previously suggested, warm oceans hastened the rapid post-Flood glaciations. World climatic and weather patterns would have varied from one decade to the next as oceanic and atmospheric circulations adjusted to the changed geography and changing temperature gradients. A few large asteroidal impacts continued into this "Quaternary Age."

After the Babel confusion of languages, the human population migrated from Mesopotamia into the unexplored regions. They adapted to a hunting and gathering lifestyle as they continued to push into new environments. In the north an apparently milder climate existed which allowed large herds of cold-adapted animals, such as mammoth and woolly rhinocerous, to graze the tundra and steppe meadows of Siberia to Alaska.[77] In the Southern Hemisphere, Australia was much wetter than today. Regions now desert were places where chains of freshwater lakes occurred.[78] Megafauna, such as mammoth mastodons, giant ground sloths, giant kangaroos, lived after the Flood-Judgment and all adapted to the regions into which they migrated after the Flood.

The Pelegian Extinction

A later article will cite evidences for a short episode of concentrated tectonic activity that occurred soon after the Babel dispersion had begun. The overall result was a penultimate glaciation in the Northern Hemisphere and the rapid desertification in all areas south. The megafauna, as well as some smaller species, suddenly became extinct. Many herds of cold-adapted giant herbivores in the north were quick frozen.[79] In the Southern Hemisphere giant marsupials in Australia died as the freshwater lakes quickly dried and the surrounding grazing lands became arid.[80]

The Pelegian extinction was catastrophic and linked to rapid climate change. Post-Flood tensional rifting can be seen on a massive scale on the continents; e.g., the East African Rift Valley. Volcanic activity is evidenced along the boundaries of the primary polygon features and along some 'swell' features of secondary polygons. Changes in sea level isolating the post-Flood continental bridge between Asia and America and rifting separating Australia from Indochina are possible activities that occurred during the life-time of Peleg. Such post-Flood geological activity would have divided geographical regions and isolated human and animal populations which could explain many biogeographical enigmas concerning biologists today.

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PANORAMA OF SCIENCE

Reality and Radioisotope Age Determination

Randal Mandock[1] covers many topics on radioactive dating in detail. Such subjects as the effect of trace element distribution and isotope enrichment analysis on radioactive "ages" of various minerals are discussed. The very important consideration of the effects of cooling times of subsurface objects is covered. Obviously, not all of a mineral body or a geologic formation cooled at the same instant or at the same rate. This differential cooling would drastically affect any measured radioactive "age" of a crustal material.

Other topics covered are isochron mixing, so-called concordance of various dating methods vs. actual cases of discordance, volume diffusion of daughter products such as radon, and pleochroic halos. Concerning the latter Mandock notes:

> . . . the halos are created by alpha particle emission from radioisotopes. Halos from ^{218}Po are found in granitic crystalline rocks at various depths on every continent surveyed. ^{218}Po has a half-life of about three minutes, and no identifiable precursors have been observed, i.e., ^{218}Po appears to be