

A Scientific Paradigm for the Genesis Flood¹

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The Bible asserts the creation of our habitable earth and the life on it occurred within a single week of seven ordinary days (Gen 1:2–2:3)³ and that a worldwide flood destroyed all terrestrial life except that preserved in the ark

¹ It is a rare thing for *JATS* to publish what is essentially speculation based on significant but not unquestioned scientific studies and a scientific approach to the flood story of Gen 6–8, but when I received the article I found it thoughtful, thought-provoking, and in line with *ATS* affirmations. It also fit in well with the theme of this issue. I sent it to referees who are theologians with a strong interest in the topic and to a biologist. They all told me the article should be refereed by those more expert in the field, such as geologists and physicists who make this their specialty. I sought out such referees, and they devoted a good deal of time to reading the article, poking holes in it, and making suggestions. The authors have dealt carefully with the problems and in so doing strengthened the paper. However, they humbly admit that there are difficulties with every flood scenario (though the alternative evolutionary speculations are much less likely to be true). They present what follows not as the final explanation of what happened during the flood, but as what may have happened. Certainly the article would not be accepted for publication in *Science*. However, it will introduce *JATS* readers to a wealth of recent research in the field and present a synthesis of it that I myself find exciting and plausible. Beyond that humans are unlikely to go in this world. —Editor

² The authors would like to thank some of those who have made this paper possible. Dr. Paul Giem has been a friendly reviewer through the draft stages, adding valuable insights and perceptive criticisms. His work on ¹⁴C has provided a new scientific challenge to Uniformitarian dogma. Next, the anonymous reviewers of the first draft we submitted brought to light the heat calculations by Ross Barnes that had been lost from view, as well as data regarding floods on Mars and true polar wander on Earth. While it would have been convenient to ignore Barnes' work, that would not be good science. We will not further the Lord's work by sweeping inconvenient issues under a rug. Finally, we must give a very special thanks to Dr. John Baumgardner, who gave of his time to help us understand the magnitude of the problem Dr. Barnes exposed. Without his help it would not have been possible to even approach potential solutions to the constraints imposed by cooling new ocean floor. The Lord truly blesses the study of His word written in stone.

³ Gerhard F. Hasel, "The "Days" Of Creation In Genesis 1: Literal 'Days' Or Figurative 'Periods/Epochs' Of Time?" *Origins*, 21/1 (1994): 5-38.

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(Gen 6–8).⁴ Secular scholars have often scorned these accounts as being nonsensical, having little or no resemblance to the evidence preserved for us in the physical materials of the earth. Many have ridiculed any who choose to believe in a salvation based on the message contained in such an obviously fictional book.

Others have been somewhat more tolerant, while still maintaining that the Bible is not a factual record of history. To this end, Stephen Jay Gould has popularized the idea that science and religion are “non-overlapping magisteria.”⁵ He states that the Bible is simply not a book from which scientific information may be extrapolated, claiming instead that it speaks of a different reality from which moral import is drawn, but which has no specific physical meaning. Of a similar philosophical bent are theologians who, while not overtly rejecting the divine inspiration of Scripture, deny that the historical accounts necessarily reflect real events.⁶ These scholars take Bible stories as fables teaching some underlying moral truth, but otherwise not to be taken seriously.

The conflict between these views may be considered on two levels. The issue obvious to all observers is verification. Can we establish the truth or falsity of the Bible from the evidence in the physical record? While this approach seems attractive to the scientific mind, it suffers from two fundamental flaws. First, regardless of our good intentions, we all approach any body of evidence with biases. These color our interpretation of the evidence. Even a superficial review of the scientific literature devoted to just the question of the Genesis flood will reveal that well-meaning scientists interpret of evidence in different ways.⁷ The apologetic literature merely magnifies this chaos. Even more difficult to surmount is the fact that regardless of whether one supports atheistic evolution or the biblical account, the events in question are unique and non-repeatable. Science is only able to give conclusive answers regarding repeatable phenomena. Eyewitnesses are required to testify as to the facts of historical events.

Much more important than verification is salvation. The Bible does not commend itself to us as merely a guidebook for good living. It presents itself as the inspired written guide to how the great controversy between the creator God

⁴ Gerhard F. Hasel, “Some Issues Regarding the Nature and Universality of the Genesis Flood Narrative,” *Origins*, 5/2 (1978): 83-98; Richard M. Davidson, “Biblical Evidence for the Universality of the Genesis Flood,” *Origins*, 22/2 (1995): 58-73; John D. Morris, “The Global Flood of Noah’s Day,” *Vital Articles in Science/Creation*, (May 1999) [The alert reader will note that some of these citations do not give page numbers. We have been able to access a number of articles by internet. While this is convenient, the original page numbers are often lost.]

⁵ Stephen Jay Gould, *Rocks of Ages: Science and Religion in the Fullness of Life* (New York: Ballantine, 1999).

⁶ Langdon Gilkey, *Creationism on Trial: Evolution and God at Little Rock* (Charlottesville, VA: UP of Virginia, 1998).

⁷ Larry Vardiman, “The Sands of Time: A Biblical Model of Deep Sea-Floor Sedimentation,” *Creation Research Society Quarterly*, 33 (Dec 1996).

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of the universe and Satan, the originator of sin, has played out in human history. In this battle mankind is doomed to destruction unless God provides a means of salvation. If the purportedly inspired record is less than completely true, how can we know what portions are true and what parts fable? The very authority of Scripture is jeopardized if the flood account is not true.

The Issue of Evidence: God has never required man to accept the gospel without evidence. He led his people throughout history by providing for them in ways both personal and miraculous (Acts 7:2–50). Jesus worked many wonders intended to lead toward belief (John 14:11). The apostles recorded their message as eyewitnesses (1 Cor 15:3–8, 1 John 1:1–3, etc.) so that those of us who were not present at the time would have an accurate record. Finally, the Holy Spirit continues today by bringing us to the truth (John 16:13) and providing the continual ministry of the Spirit to bring us to belief (1 Cor 13:8–10).

If God has been as careful in the physical record as He has been in the written record, we should expect sufficient evidence to buttress our faith. Indeed, such is the testimony of Scripture (Ps 19:1–6, Rom 1:20). But secular science has aligned itself almost universally with an evolutionary paradigm that stands in stark contradiction to the biblical record. This schema appears to be well fleshed out, with ultimate origins described for both the universe and life on earth. Steps along the way are proposed, giving uniformitarianism the patina of veracity.

Biblical creationism suffers greatly in this respect in comparison to uniformitarianism. Its reliance on a miracle appears mystical to onlookers.⁸ Fortunately, the intelligent design movement has provided good scientific evidence for the reasonableness of divine creation of life.⁹ In this respect, the creationist paradigm stands on a firmer scientific footing than the evolutionary, since to date it has proven impossible to assemble the chemical building blocks of life by purely natural means. But to insist on the physical reality of the flood event seems simply too much *deus ex machina*.¹⁰ Biblical creationists are tarred

⁸ Leonard Brand, *Faith, Reason, and Earth History* (Berrien Springs, MI: Andrews UP, 1997), 58. The term “miracle” need not imply more than an action not explainable within the framework of currently understood science. As Brand points out, much of current science would have been regarded as miraculous a century or two ago. Nothing has changed regarding the laws of nature since then, but our understanding of those laws has increased. In this paper, the term miracle refers to an action taken by the sovereign will of God. It constitutes a divine intervention in the affairs of the world so as to change their course at some point from their otherwise “natural” progression. It may be accomplished either by “natural” or “supernatural” means, as suits His purposes at the moment.

⁹ Michael J. Behe, *Darwin's Black Box* (New York: Simon & Schuster, 1996); Phillip E. Johnson, *Darwin on Trial* (Downers Grove, IL: InterVarsity, 1993); William A. Demski, *Intelligent Design: The Bridge Between Science and Theology* (Downers Grove, IL: InterVarsity, 1999).

¹⁰ *Deus ex machina* (lit. “God from a machine”) is a literary term describing the “miraculous” appearance of a god to determine the final outcome of a Greek or Roman drama. In this

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by this semblance of anti-scientific belief. Many of the apologetic efforts by Christians are thus seen merely as reactionary resistance to scientific inquiry. This appearance is reinforced by the lack of a generally workable overall scientific paradigm for the events of the flood. It is our purpose to propose reasonable global mechanisms that can explain the physical evidence in a manner consistent with the biblical record.

The Task: Given the universal nature of a global flood and the impact such an event would have on every aspect of the planet, the challenge is to present an overall picture of what happened without leaving out essential elements. This task can be comprehensive and overwhelming or broad-brush and manageable, depending on the detail in which the picture is viewed. The amount of evidence that can potentially be considered is beyond the ability of any human to master. If every small item is reviewed, the result will be encyclopedic and incomprehensible. For this reason we will limit our discussion to those key issues which we see as useful in establishing our thesis. Some mathematical discussion will be necessary, but for the most part will be left for other papers, since the purpose of this paper is to present a qualitative model of events, not a quantitative analysis of each element. Some lines of evidence will necessarily be left for other discussions.

Biblical Inferences / Observed Facts: The biblical accounts of creation and the flood give us a number of statements which may be analyzed to infer pre- and post-flood conditions, both geographic and climatologic. Any proposed model must take into account these elements, as well as observed modern circumstances. Issues such as the presence of unique animal populations in isolated locales such as Australia must also be considered.

The most obvious difficulty presented by the flood narrative is to identify the source of the floodwaters and the mechanism of their removal from the flood. While it is possible that God implemented the flood as a massive series of miracles, this seems to be at odds with the orderly way God has worked in other arenas. We believe it is reasonable to believe that the flood was triggered miraculously, with the remainder of the process proceeding by natural mechanisms. As Vardiman states, "Between God's supernatural interventions in the affairs of the world, He normally allows the physical processes to operate according to the laws of science."¹¹

This expectation should not be confused with Deism. Rather, this is a basic belief that God operates in an orderly fashion. He created the natural universe in such a way that miraculous intervention is generally not needed. We believe God would prefer to set natural processes in motion to create and dry up the flood, as opposed to intervening multiple times to create and remove the floodwaters. Natural events will leave traces that can be identified. If the entire

context it refers to an apparently contrived solution to a seemingly insoluble difficulty.

¹¹ Vardiman, "The Sands of Time."

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sequence of events were a succession of miracles, the physical record would become impossible for finite man to interpret. This seems contrary to what we understand of God. Our faith in Him is not expected to be blind, but based on evidence. Thus, when we read of a flood, we should naturally expect to find evidence consistent with it.

At this point it is important to understand that we do not believe the biblical account of the flood is true because we can prove it scientifically. Rather, we believe the biblical account because it is God's word. He was there, He caused the flood, and He caused the story to be recorded in Scripture. That story is not a comprehensive account of what happened, but an eyewitness account (even though we don't know how that witness was received by the author of Genesis). It provides hints, clues, a framework into which to fit our investigations.

What Does Not Need to be Explained: While it is important to account for many lines of evidence, there are certain issues the model does not need to explain. By way of illustration, numerous critics have argued that the ark could not have carried enough food for all the animals for a year. Such a naturalistic criticism fails when we recognize that the Bible includes at least two examples of miraculous multiplication of food (1 Kgs 17:9–16, Matt 14:17–20) that can serve as a model for feeding the animals. The ark is clearly a miraculous singularity (Gen 7:8ff), and all elements of it may properly be attributed to the miracle without harm to the model in general.

It is similarly unnecessary and perhaps even unwise for the model to address lines of evidence affecting only localized geographic areas. The fossilized forests of Yellowstone may very well be evidence for the fact of the flood, but they add little to the understanding of global mechanisms, and as such are better left for papers with a more detailed geographic focus.¹²

Certain bodies of data, such as radiometric dating, have been thought to contradict the young age of life on earth that is an intrinsic part of the biblical record. Qualified commentators have shown that these conclusions are not as secure as long-ages advocates claim.¹³ Therefore, it is neither necessary nor appropriate to deal with them here, except as they directly impact on the global

¹² Harold G. Coffin, "The Organic Levels of the Yellowstone Petrified Forests," *Origins*, 6/2 (1979): 71-82; Harold G. Coffin, "Mt. St. Helens and Spirit Lake," *Origins*, 10/1 (1983): 9-17; Harold G. Coffin, "The Yellowstone Petrified 'Forests'," *Origins*, 24/1 (1997): 2-44.

¹³ Russell Akridge, "Radiometric Dating Using Isochrons," *Vital Articles on Science/Creation*, (Nov 1982); Paul A. L. Gien, *Scientific Theology* (Riverside, CA: La Sierra University Press, 1998), 111-190; Larry Vardiman, Andrew A. Snelling, Eugene F. Chaffin, eds., *Radioisotopes and the Age of the Earth* (El Cajon, CA: Institute for Creation Research, 2000). These, and other authors, have shown that there are scripturally consistent interpretations of all radiometric-dating techniques, while ignoring none of the scientific data. This should not be taken as implying that the debate over long ages is resolved. Much scientific work remains. However, the commonly argued "secure conclusion" of long ages for life on earth based on radiometric data should not be accepted as unassailable.

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flood model.

We should also be aware that for this paradigm to be a valid statement of a scientific theory, it should be falsifiable. That is, it should provide the framework for scientific predictions that can be tested and possibly proven to be incorrect. If the theory fails when tested, then the theory, in whole or part, is incorrect and must be discarded or replaced by a more correct theory.

It is not necessary for this paradigm to be completely correct in order to be useful. Many scientific theories of the past have been useful, providing means for assembling testable constructs. As new information became available, these theories have been discarded in favor of more correct or even contradictory schemata. This paradigm's value will be determined by how well it correlates present data and serves to direct investigation that reveals new information.¹⁴

Pre-Flood Conditions

Seasons: In Eden, we are presented with a Paradise that is unequalled except in the promises of the Kingdom. Adam and Eve were comfortable without clothes. After the fall they were clothed because of nakedness (Gen 3:7), allowing us to infer that clothes were not yet needed for protection or thermal stability. Such comfort requires that there be very little temperature change either from month to month or from night to day.¹⁵ Similarly, there should be little wind, because wind would cause chill and discomfort.¹⁶

The human diet in Eden was recorded to be grains and fruits (Gen 1:29–30). There is no hint of these being “in their season,” as is suggested later (Gen 8:22). This allows us to reasonably infer that the fruiting of food plants in Eden continued year-round, unlike modern plants that predominantly bear seasonally. Temperate thermal stability and year-round fruiting suggest that the pre-flood world had no seasons. This would have only been possible with a near-vertical axis of rotation of the earth, so that days and nights were of near-equal length year-round.¹⁷

Some would take the text of the flood story itself as strongly hinting that seasons began after the flood. When Noah left the ark, God told him that “seedtime and harvest, And cold and heat, And summer and winter” would not

¹⁴ Brand, 56.

¹⁵ Arthur C. Guyton, *Textbook of Medical Physiology* (Philadelphia: W. B. Saunders, 1971), 837. The naked human body is capable of maintaining a normal core temperature over a wide range (about 60-130° F), but the extremes of this range involve considerable adaptive maneuvers (shivering when cold, hyperventilation when hot, etc.) not compatible with comfort.

¹⁶ *Ibid.*, 833. A 4 mph wind will increase convective heat loss by three times compared to still air, and double compared to a 1 mph breeze. We may discount suggestions that Adam and Eve were furry, as the only suggestion of great hairiness in the book of Genesis is in the story of Jacob and Esau, where Esau was hairy “like a hairy garment” (Gen 25:25). The fact that Esau was specifically noted to have this characteristic suggests that it was unusual, and would thus not be an expected characteristic of Adam and Eve.

¹⁷ Peter Van de Kamp, *Basic Astronomy* (New York: Random House, 1952), 67.

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cease thereafter (Gen 8:22). While this inference may in fact be true, we must be cautious in taking this passage that far, because the same verse says that “day and night” would not cease. If this text implies new seasons, then it could also imply new days and nights, something which we know to be incorrect from the story of creation (cf. Gen 1:5, 8, 13, 19, 23, 31). Therefore we must rest this conclusion on other data.¹⁸

Weather and Geography: Extrapolation of modern weather forces to Eden is problematic, as will soon become evident. The daily presence of mist that watered the ground suggests a first approximation of the conditions present in the pre-flood world. Air is capable of holding less water when cool than when warm. Under normal conditions, the atmosphere cools 5.6 degrees Fahrenheit per thousand feet of elevation change.¹⁹ If the ground level temperature is 10° F above the dew point (the temperature at which humidity exceeds the ability of air to hold water), then clouds will form at 1,786 feet above ground level (AGL).

When the temperature in Eden cooled at night to the dew point, mist or fog would form. If Eden were the highest point on earth, then lower elevations would be expected to not have dew unless Eden were cooler than the dew point. How much cooler Eden must be would appear to be dependent on the elevation of Eden above sea level.

If Eden was 4,000 feet above mean sea level (MSL), then the night temperature in Eden would need to be 22.4° F below the dew point in order for the coastline to have dew if weather forces functioned as they do today. But this would leave us with Eden near the base of clouds all the time, a situation unlike what would normally be expected of a paradise. If we place the dew point 11.2° F cooler than in Eden in the day, so that clouds begin forming at 2,000 feet AGL (6,000 feet MSL) then we have a 33.6° F day/night temperature variation. But if this were the case, we would find this temperature swing to be beyond human normothermic limits without protective clothing. This suggests a highest likely elevation for Eden below 2,000 feet MSL.

Genesis 2:6 describes a “mist (that rose) from the earth” over “the whole surface of the ground.” This would be described today as ground fog.²⁰ Ground fog persists only in still air, since even small amounts of wind will cause it to dissipate. Therefore the night air in Eden was relatively still.

Another conclusion may be drawn from this seemingly insignificant datum. There were no substantial high mountains in the ante-diluvian world. We say this for two reasons. First, if the general nature of weather in Eden were similar to modern times, the humidity would cause a high mountain to be constantly

¹⁸ Gen 1:14 has been suggested to imply seasons before the flood, since the sun and moon were made “for seasons.” The Hebrew word *moed* used here speaks of festivals and observances, and is never used to refer to the seasons of the year. Therefore we may disregard this suggestion.

¹⁹ Robert N. Buck, *Weather Flying* (New York: Macmillan, 1978), 7.

²⁰ Michael Hasel, personal communication.

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shrouded in cloud. Such a feature seems out of place in the narrative as given. Also, high mountains create weather. Air moving against mountains is lifted and cooled, resulting in clouds and precipitation. This creates complex airflows that are incompatible with the calm climate of Eden.

Second, Scripture commonly describes the abode of God on earth as Mount Zion. This figurative language suggests that, at least in the theological sense, this is the highest point on earth. Eden was the original home of God on earth, where he visited with Adam and Eve and where the Tree of Life was located (Gen 3:22). God “shakonned” the angel at the gate of the Garden (Gen 3:24), using the same Hebrew root that describes the glory of God in the Most Holy Place of the tabernacle. When we add the fact that a river flowed out of Eden, becoming four which flowed to four major geographic areas (Gen 2:10–14), we have a physical suggestion that Eden was the highest point of the earth.²¹ Based on the physical constraints already discovered about the elevation of Eden, this strongly suggests that no substantial high terrain existed before the flood.

When we consider the water requirement for the flood, the possible elevation of Eden lowers considerably. Every hundred-foot increase in elevation would require a hundred-foot increase in the floodwaters. This depth converts to 3.8 million cubic miles of water, when spread over the earth's surface. Such a large water requirement militates against ante-diluvian high ground.

The river suggests the presence of a feature that will become important later: a large subterranean aquifer. Most rivers have their origin in higher elevation water stores, such as rain runoff or snowmelt. With no such sources available, the river of Eden must have begun at an artesian spring fed by subterranean sources.²² Water from the surface would percolate down to warmer depths, where the heat of those depths would drive the water back to the surface. Just as the underground plumbing in Yellowstone and Iceland forces hot water to the surface, underground plumbing could readily have been arranged to provide for a hydrologic cycle with steady flow and continuous recirculation.

The “Vapor Barrier”: The difficulty of reconciling modern weather forces

²¹ B. Biju-Duval et al., “Geology of the Mediterranean Sea Basins,” in Creighton Burk, Charles L. Drake, *The Geology of Continental Margins* (New York: Springer-Verlag, 1974), 714. The text itself does not directly state that the four rivers watered the whole earth, but merely indicates regions where they flowed. When we note that only one text in Scripture indicates a compound direction (Dan 11:44), and there are numerous statements involving the concept of the “four corners of the earth” (Isa 11:12, etc.) or the “four winds” (Jer 49:36, etc.), we may legitimately suggest that the intent is to describe rivers flowing to the four cardinal points of the compass. It is difficult to be dogmatic about this, since the modern Tigris and Euphrates rivers both flow to the east, although this may be an artifact of the geographic changes brought about by the flood. No modern equivalent to the land of Havilah (Gen 2:11) exists, but B. Biju-Duval et al. note that an ophiolitic complex containing onyx and gold extends across the Mediterranean. This suggests that Havilah was west of Eden.

²² The word for river used in Gen 2:10, *nāhār*, is used in Job 28:11 for an underground source of a river.

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with the climatological conditions in Eden leads us to consider a more potent climatological thesis. Gen 1:6–7 describes the separation of the “waters below the expanse” (“firmament” KJV) from the “waters above the expanse.” Dillow and others have suggested that this implies an invisible “vapor barrier” at high altitude which later provided the water for the flood.²³ If the vapor barrier were clear, however, as proposed by Dillow, “This would imply a significant potential for global circulation . . . If strong global circulations exist, it is likely that strong winds and storms would also exist.”²⁴ Some have argued that such a vapor barrier is impossible due to physical instability.²⁵ Vardiman and Boussetot have shown that if the vapor barrier contained enough water to contribute significantly to the flood, it would cause surface temperatures above boiling and eliminate all life on earth.²⁶ They did, however, find that if a high cirrus cloud cover were added, the temperature would moderate. They note further that, “As the cloud layer thickens it becomes opaque to the solar radiation and the cloud layer becomes the heating source for the atmosphere and the surface below, rather than the surface of the earth. Because the longwave radiation is trapped between two layers in equilibrium, the cloud and the earth’s surface reach equilibrium and the temperature in between becomes isothermal.”²⁷

A high cloud cover could provide a temperature inversion in which no cooling occurs as elevation increases. Vardiman notes that “In the pre-flood atmosphere the inversion would have been very strong and the pole-to-equator temperature difference would have been very small, resulting in light winds, no storms, and no rain!”²⁸ This is exactly the situation found on the planet Venus, where a permanent cloud cover is present with very stable temperatures below the clouds pole-to-pole, and virtually no wind. Above the clouds conditions

²³ Joseph C. Dillow, *The Waters Above: Earth’s Preflood Vapor Canopy* (Chicago: Moody, 1981). The essential character of this construct was that of a transparent blanket of pure water vapor encircling the earth above the atmosphere. Dillow chose the vapor equivalent of 40 feet of liquid water, assuming 1/2 inch of rain per hour for forty days (Gen 7:12). Mathematically, this suggests an atmospheric pressure slightly above twice today’s and a vapor layer beginning at 7 km extending up to about 55 km.

²⁴ Larry Vardiman and Karen Boussetot, “Sensitivity Studies on Vapor Canopy Temperature Profiles,” *Fourth International Conference on Creationism*, (Aug 3-8, 1998).

²⁵ Kevin L. O’Brien, *The Fatal Flaws of the Noachian Deluge: An Analysis of the Physical, Thermodynamic, and Environmental Affects of the Flood of Noah* (Aurora, CO: Self-published, 2000) <http://biochemborg.50megs.com/KLOB/webpages/fatalflaws.htm>.

²⁶ Vardiman and Boussetot.

²⁷ Ibid. Vardiman and Boussetot also note that “This would be a very strange world—uniformly cold at a temperature slightly above freezing, extremely stable, and dark, with little or no visible light.” This places a cautionary hand on our premise, but since these authors admit that many other simulations need to be undertaken with varying conditions, it is not unreasonable to expect that the trend of their investigations will lead to a set of conditions which would be consistent with Eden. It is not the task of this paper to identify the specific input parameters that yield that result.

²⁸ Larry Vardiman, “The Sky Has Fallen,” *Vital Articles on Science/Creation*, (Feb 1984).

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vary wildly from day to night with high winds and large temperature variations.²⁹

Such a visible cloud layer makes more sense to us biblically and physically than a clear vapor barrier. Separating the “waters below” from the “waters above” suggests that “waters above” could be directly observed, and most likely would be seen as clouds. Birds flew in the “expanse,” indicating that it was the atmosphere (Gen 1:20).

Clouds do not remain clouds in the modern world. They form, cause rain, and dissipate. This is a result of two forces acting on the earth. First, the sun warms the earth unevenly. Sunlight striking clouds is partially reflected away into space and does not contribute to surface warming as much as sunlight directly radiating the surface. Differential heating leads to vertical movement of air.³⁰ If the air is humid, as it rises clouds form and then rain falls, causing strong downward movement of the air. In the most violent form of this we see thunderstorms with cloud tops as high as 60,000 feet containing vertical currents approaching one hundred miles per hour. Such action creates a strong vertical mixing of the atmosphere. Differential heating also occurs as we move from the equator to the poles or at high elevations. Sunlight reaching the surface at the poles must travel through a greater amount of air than at the equator. This leads to reduced surface warming at the poles. Cool air will tend to sink at the poles and flow toward the equator, where the air is warmer in patterns determined by Coriolis forces. High elevation also reduces the amount of atmosphere through which sunlight must travel, leading to increased surface heating. The absence of high terrain in the pre-flood world would limit this effect.

The second force that creates weather is orographic lifting. Air moving

²⁹ “Venus,” *Microsoft Encarta 98 Encyclopedia* (Redmond, WA: Microsoft, 1998); R. G. Prinn, “The Sulfur Cycle and Clouds of Venus, in *Recent Advances in Planetary Meteorology, Seymour Hess Memorial Symposium—IUGG General Assembly, August 18-19, 1983* (New York: Cambridge University Press, 1985), 1-15.

³⁰ John Gabriel Navarra, *Atmosphere, Weather, and Climate* (Philadelphia: W. B. Saunders, 1979), 120-130. Differential heating is the result of differing reflectivity or “albedo” of various kinds of terrain. A sandy beach may reflect as much as 79% of solar radiation back to space, while the adjacent water will absorb as much as 97%. The global average albedo, or reflectivity, as measured by satellites, is in the range of 29-34%. A practical example of differing albedo is found on the final approach to runway 25 at Orlando Executive Airport, where a lake is situated about 100 yards from the approach end of the runway. Pilots must add power to deal with cool sinking air over the lake, and immediately remove power on passing the shoreline because of the warm rising air over the land. Chicago’s Midway Airport, located in Lake Michigan, and Toronto’s Island Airport, situated in Lake Ontario, present similar situations for pilots. In a similar vein, we may note that hurricanes form over ocean rather than desert, pointing out that the amount of water on the surface contributes to weather. While this is true *prima facie*, in the final analysis differential heating becomes the major determinant of weather, because without it the differential evaporation that leads to humidity-related storms (thunderstorms, hurricanes, etc.) would not occur.

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against rising terrain cools as it rises, precipitating water leading to rain and vertical mixing. Air moving over orographic features also creates a downward flow on the lee side of the high ground, again yielding vertical mixing. Differential heating and orographic features are responsible for all weather on earth.³¹

If all terrain were low, there would be no substantial orographic features to contribute to weather. A world wide cloud cover would prevent direct sunlight from reaching the surface. This would eliminate direct surface heating, which would otherwise lead to vertical mixing of the atmosphere. Without such heating, there would be no force acting to produce rain by lifting moist air to altitudes where its temperature would fall below the dew point. And without rain, there would be none of its associated vertical mixing to break up the cloud cover. Such weather stability would be required for the climate to be acceptable for unclothed people year round.

A high cloud layer introduces an additional feature of stability. Night/day temperature variation is caused in large measure by daytime heating and nighttime radiation of that heat back into space. But the cloud cover would limit the daytime heating by as much as 50%. At night it would reduce the radiation of heat away by as much as 86%, since the radiation would be reflected back down at night, trapping the thermal energy. There would be some day/night variation, but it would be markedly less than we see today.³²

The Upper Atmosphere: One feature that will become important later derives from the lack of vertical mixing in the atmosphere. Carbon-14 is formed in the stratosphere through an interaction between cosmic radiation and nitrogen in the stratosphere. This reservoir then loses its ¹⁴C by mixing with the biospheric air (air lower in the atmosphere which contributes carbon dioxide to plant photosynthesis).³³ The upper biosphere (land life plus the oceans at or above the continental shelves) then loses ¹⁴C to the lower biosphere (deep oceans) with a modern residence half-life of 259 years.³⁴ Without vertical mixing of the atmosphere, there would be very limited physical forces driving ¹⁴C into the biosphere.³⁵ This would contribute to reduced levels of ¹⁴C in plants and animals of the ante-diluvian world.³⁶

³¹ Richard Taylor, *Aviation Weather* (Greenwich, CT: Belvoir, 1991), 8-9.

³² Donald W. Patten, *The Biblical Flood and the Ice Epoch* (Seattle: Pacific Meridian, 1966), 197-204.

³³ Robert H. Brown, personal communication. The modern half-life of this process is seventy-five years. The mixing results from vertical mixing of the atmosphere.

³⁴ Robert H. Brown, "Compatibility of Biblical Chronology with C-14 Age," *Origins* 21/2 (1994): 66-79; Giem, 118.

³⁵ All isotopes of carbon are chemically identical, so no chemical concentration gradient would exist to mix carbon dioxide from the stratosphere lower into the atmosphere. The very slight mass difference between ¹⁴C and ¹²C might provide some driving gradient, but without substantial vertical mixing, the air masses above and below the cloud cover would tend to mix very poorly.

³⁶ This discussion should not be taken as being the only reason that ¹⁴C would be reduced in

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Stellar Objects: In the text of the fourth day of creation God is described as placing “lights” in the sky (Gen 1:14–16). The “greater light” is to rule the day and the “lesser light” the night. If there were a cloud cover, it would not be possible to observe the sun or moon directly. They would only appear as lights, exactly as described in the creation account. Later in Scripture we see many statements which specifically call out the sun and moon, but none until after the flood. But what should we do with “he made the stars also” (Gen 1:16)? If the sun and moon were not directly visible, then stars would be completely unknown.

There are several places in Genesis which indicate that the original text is of extreme age, and the writer/compiler of the book has added a modern place name so that the readers would understand the current location of the place mentioned.³⁷ These editorial additions form a literary pattern into which the stars can fit. The post-flood reader would be able to see the stars which Adam and Eve could not see, and the “modern” compiler/editor would need to include them in the total creation which is attributed to God, otherwise some other deity could be invoked as being responsible for them.³⁸ The form of the edit appears parenthetical and does not necessarily imply their creation on the fourth day, but only requires that they are God’s creation.

Genesis 9:13 states that God “set” the rainbow in the clouds as a sign of his promise never to destroy the earth again with a flood. This act of “setting” implies new placement. Rainbows are not possible without rain and clear sky. Thus we may legitimately conclude from both this text and the scientific evidence so far examined that rain was not present in the ante-diluvian world. Unfortunately, we must deal then with Genesis 2:5, which can be taken to imply that rain came as an immediate result of the fall.³⁹ Here again, as in the question of stars and the fourth day of creation, we may legitimately consider the thesis that the post-flood writer/compiler of Genesis added this phrase to the original text to account for a post-flood observation not germane to a pre-flood audience.

Volcanism: The Bible does not contain the word “volcano.” Thus, any argument regarding volcanoes in the ante-diluvian world is logically an

the antediluvian environment. A larger antediluvian biomass would reduce ¹⁴C levels by dilution. A more powerful geomagnetic field would also reduce ¹⁴C formation, as would increased humidity. These mechanisms would be expected to work in concert.

³⁷ Gen 14:2, 3, 7, 8, 15, 17; 16:14; 23:2; 35:19.

³⁸ *Matthew Henry’s Commentary*, Genesis 1:16-18; Colin L. House, “Some Notes on Translating יָאָה הַכּוֹכָבִים in Genesis 1:16,” *AUSS*, 25/3 (1987): 241-248. House suggests this verse should be translated to say that God made the moon to rule the night *with* the stars, thus avoiding the need for either editorial redaction or explanation of the apparent creation of the stars on the fourth day. This unusual approach is unnecessary if our theory of a high cloud cover is correct. The linguistic issues that House raises will not be addressed here.

³⁹ Randall W. Younker, in John Baldwin, ed., *Creation, Catastrophe, & Calvary* (Washington, D.C.: Review and Herald, 2000), 69-78.

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argument from silence. But some inferences may be made which we believe are justified. First, because there probably was no high terrain before the flood, volcanoes are very unlikely to have existed then. Second, because volcanoes create a hot spot on the surface and a cool region in the area of the ash plume, they would cause vertical mixing of the atmosphere. This would be expected to disrupt the temperature inversion, and potentially would destroy the Edenic climate. We therefore conclude that volcanoes came into existence at the flood, as will be discussed.

One other feature of the lack of volcanism bears on the upper atmospheric conditions discussed earlier. The protective ozone layer in the stratosphere is broken down by chlorine from chlorofluorocarbons.⁴⁰ With no manufactured CFCs, the only natural source of chlorine would be volcanic.⁴¹ But with no volcanoes to release chlorine into the atmosphere, the ozone layer would be much thicker and far more able to block harmful ultraviolet radiation than at present.

Summary of Proposed Ante-Diluvian Conditions: We propose that the pre-flood world was very unlike our present earth. It had a single continent, located generally around the equator, and a single ocean. There was little high ground, and Eden was most likely the highest point. There were no volcanoes. A large aquifer fed an artesian source for the river flowing from Eden that divided to flow to the four corners of the earth. The earth's axis of rotation was normal to the plane of the ecliptic.

The climate was maintained in a constantly temperate and nearly windless condition by a temperature inversion made possible by a high altitude cloud cover. This cloud cover prevented direct observation of the sun and moon, and completely obscured the stars. There was no force to promote the vertical mixing which is characteristic of modern weather. This absence of vertical mixing had the secondary benefit of reduced levels of ¹⁴C in the biosphere. A thick ozone layer prevented harmful effects from solar UV radiation.

A Proposed Mechanism for the Flood: Events Consequent to an Axis Shift

It is our opinion that the proximate cause of the flood was a shift of the earth's axis from normal to the plane of the ecliptic to its present inclination of about 23.5°. In order to evaluate the scientific plausibility of this premise, we now present a series of events that would be expected to follow such an event.

⁴⁰ L. E. Manzer, "The CFC-Ozone Issue: Progress on the Development of Alternatives to CFCs," *Science*, 249 (1990):31-35. The Nobel Prize in Chemistry for 1995 was awarded to Paul J. Crutzen, Mario J. Molina, and F. Sherwood Rowland "for their work in atmospheric chemistry, particularly concerning the formation and decomposition of ozone."

⁴¹ Gordon W. Gribble, "Natural Chlorine? You Bet!" *Priorities* 6/2 (1994); Stephen Self, Jing-Xia Zhao, Rick E. Holasek, et al., "The Atmospheric Impact of the 1991 Mount Pinatubo Eruption," *U.S. Geological Survey*, (1994) <http://pubs.usgs.gov/pinatubo/self/index.html>.

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Following this presentation, we will consider evidence for the actual occurrence of those events.

Gyroscopic Precession: The earth is made up of a number of layers. For simplicity, we may refer to them as core, mantle, and crust.⁴² Of particular interest to us are the mantle and crust. The crust of the land portions of the earth is proportionally as thin as the skin on an apple. The oceanic crust is much thinner. All of the surface features of the earth, both on land and under sea, are part of the crust. Since the mantle is semi-liquid and denser than the continental crust, the continents float on the mantle and are able to move in response to physical forces. We may also note that because the crust is floating, the thicker parts of it, such as mountain ranges, actually extend further down into the mantle, just as an iceberg is mostly under the water it is floating in.⁴³

The earth is a gyroscope about 8,000 miles in diameter, spinning on its axis once every twenty-four hours. If such a gyroscope were to be tipped, the resulting precession forces would be nearly incomprehensible. Since the crust is relatively fragile, these massive forces would cause tremendous fracturing of the earth's surface. The semi-liquid mantle would act like a skating rink on which crustal fragments would slide, with the larger fragments moving around at considerable speed. The major potential resistance to movement would be subducted oceanic crustal plates.⁴⁴ As fragments slid apart, cracks and subduction would expose the hot mantle. Ocean waters and aquifer exposed to the mantle would then flash into steam. This steam would be contained momentarily by the pressure of miles of water over it, creating immense forces on the sides of the fracture, imparting a massive secondary impulse to the broken continents, accelerating their movement apart.⁴⁵ The immense amounts of steam would cause immediate, massive vertical movement of air, with nearly immediate precipitation of at least part of that water as rain. Unfortunately for our thesis, this leaves us with less water on the surface of the earth, not more. A

⁴² "Inside the Earth," *U.S. Geological Survey*, (May 5, 1999)

<http://pubs.usgs.gov/publications/text/inside.html>

⁴³ Frank Press, Raymond Siever, *Understanding Earth* (New York: Freeman, 1998), 490-493.

⁴⁴ John R. Baumgardner, "Runaway Subduction as the Driving Mechanism for the Genesis Flood," *Third International Conference on Creationism*, (July 18-23, 1994). Dr. Baumgardner shows that runaway subduction would actually facilitate continental movement.

⁴⁵ This force would be on the order of 46 million tons per lineal foot, calculated as follows.

Critical steam pressure = 3,184 psi (No additional pressure will liquefy steam)

3,184 psi / 0.52 psi per vertical foot of sea water = 6,123 feet depth

Mantle depth: 50,000 feet

50,000 ft - 6,000 ft = 44,000 feet overburden pressure of sea water

44,000 ft / 2 = 22,000 ft average depth of sea water overburden (avoids re-calculation for every foot of vertical depth)

(22,000 ft + 6,000 ft) * 0.52 psi per vertical foot = 14,500 psi average

14,500 psi x 144 in²/ft² = 2.1 million psf average

2.1 million psf x 44,000 vertical feet = 46 million tons per lineal foot of rift.

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worldwide flood cannot occur when water is removed from the surface of the earth. This problem will be addressed below.

The earth's magnetic field, while poorly understood, clearly emanates from the semi-liquid deeper parts of the earth.⁴⁶ If the initial tip were accomplished by a force exerted on the surface of the earth, the motion of the mantle and core would proceed by viscous coupling with the crust. Since viscous coupling is not a 1:1 process, this would result in true polar wander.⁴⁷ Gyroscopic forces would send the magnetic poles of the earth precessing wildly, since the semi-liquid mantle would allow them to move with minimal restraint when compared to the crust. With dys-synchronous motion of crust and poles in the presence of solidifying ocean floors we should expect to see paleomagnetic reversal patterns in the oceanic crust.⁴⁸

The Source of the Floodwaters: Genesis 7:11 describes the "fountains of the great deep" bursting open. Hasel has shown that this text refers to massive geyser-like eruptions of water from the earth.⁴⁹ The only possible source of this water is the large subterranean aquifer discussed above. Since the land was floating on the mantle and the aquifer, when this aquifer was vaporized, the land would sink. This would result in a lower ground level and yield a greater amount of surface water, providing a sufficient amount of water to cover all the land, since the initial ground level was quite low worldwide. We may also postulate that portions of the land slid over deeper ocean bottom areas, thus traveling to locations below sea level.

The time course of the flood is of particular interest here. On a single specific day "all the fountains of the great deep burst open, and the floodgates of the sky were opened." This is a sudden, violent event, such as would be expected to follow a sudden violent tipping of the earth. The sequence in the text, where the fountains break open first, followed by the opening of the floodgates of the sky, is a perfect match for the model, even in degree.

Volcanism: The next immediate effect of the fracturing of the earth's crust would be volcanism. Magma is portions of the molten upper mantle being ejected to the surface. With so many cracks, an unimaginable number of volcanic eruptions would begin. They would be located mostly at the boundaries of continents, particularly where a continent began to slide over the

⁴⁶ "The Earth," *Microsoft Encarta 98 Encyclopedia* (Redmond, WA: Microsoft, 1998); Press and Siever, 498-501.

⁴⁷ Thomas H. Clark, Colin W. Stearn, *Geological Evolution of North America* (New York: Ronald Press, 1968), 115. "Polar wandering implies the shifting of the whole outer crust over the inner part of the earth, and although no mechanism to accomplish this has as yet been suggested, the possibility that it has occurred cannot be rejected." A 1:1 process is one in which a specific motion of one part of a mechanism results in an exactly proportional motion in a coupled part of the mechanism. Since the motion of the crust would be variably different than the motion of the mantle, their motions would not be coupled on a 1:1 basis.

⁴⁸ Press and Siever, 498-501.

⁴⁹ Gerhard F. Hasel, "The Fountains of the Great Deep," *Origins* 1/2 (1974): 67-72.

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adjacent ocean floor. These subduction zones would allow magma access to the surface, but only through restricted openings, leading to high-pressure volcanic eruptions.

Massive volcanism would lead to incredible amounts of volcanic ash being ejected into the upper atmosphere where it could persist for a year or more. This would then lower the temperature of the atmosphere by increasing the albedo of the earth, reflecting solar radiation into space rather than allowing it to warm the surface.⁵⁰ This has been seen in miniature in modern times when Mt. Tambora erupted in 1815, leading to what is known as the “year without a summer,” in 1816.⁵¹ Since the sliding of continents would be unlikely to end immediately, continued eruptions would be likely, and the cooling effect of volcanic ash would be extended. This volcanic activity would also release massive amounts of chlorine, disrupting the ozone layer.

Volcanism would not continue indefinitely. As the sliding of the earth’s surface slowed down, subduction would decline. Volcanoes located along subduction zones would subside. Areas of exposed mantle in deep oceanic locations where continents pulled apart would begin to “skin over” as the oceans cooled the surface of the exposed magma.⁵² This cooling would reduce the amount of water being vaporized, allowing the rains to decrease (Gen 8:2). By now warm oceans would lead to the death of many types of marine organisms that were adapted to cooler temperatures. The combination of warm oceans and cold atmosphere would lead to more water being evaporated, with more precipitation, some as snow and ice.⁵³ But with the entire surface of the earth under liquid water all the snow and ice would melt as soon as it reached the surface. The flood would be permanent without one more process coming into play.

Drying Up the Waters: The original level of the land was low enough that the “high hills” were covered by at least 15 cubits of water (Gen 7:20). Since the original surface of the earth sank when the fountains of the great deep were broken up, the water did not have to rise to any great depth.

Gyroscopic precession would have fractured the original continent into multiple fragments that would move rapidly around the surface of the globe. As these fragments collided, the impact would thrust up mountains that would rise

⁵⁰ Michael J. Oard, “The Ice Age and the Genesis Flood,” *Vital Articles on Science/Creation*, (June 1987).

⁵¹ “Tambora,” *Microsoft Bookshelf 98* (Redmond, WA: Microsoft, 1998); “Tambora,” *Microsoft Encarta 98 Encyclopedia* (Redmond, WA: Microsoft, 1998); Donovan Webster, “Inside the Volcano: Rappel into Hell,” *National Geographic* 198/5 (Nov 2000), 50-65.

⁵² Richard S. William, Thorbjörn Sigurgeirsson, “Lava-Cooling Operations During the 1973 Eruption of Eldfell Volcano, Heimaey, Vestmannaeyjar, Iceland,” *U.S. Geological Survey Open File Report 97-724*, (March 22, 2001).

⁵³ Larry Vardiman, “Rapid Changes in Oxygen Isotope Content of Ice Cores Caused by Fractionation and Trajectory Dispersion near the Edge of an Ice Shelf,” *Creation Ex Nihilo Technical Journal* (1997).

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above the level of the waters. This is exactly the imagery of Psalm 104:6–8, where at the end of the flood mountains are described as “rising up” while valleys “sank down.” Because mountains float on the mantle just as plains do, a proportional amount of land below the surface would project down into the mantle.⁵⁴ This mass of earth would be drawn from previously low-lying land, thereby reducing the land surface area of the earth, and similarly increasing the area of the ocean surface. This new ocean area would increase the size of the basin into which floodwaters could recede. If the new mountains had elevations above 24,000 feet above sea level, the air temperature would always be below freezing, even in summer.⁵⁵

The new mountains would provide a place for frozen precipitation to land and stay without returning to the floodwaters. If they occupied a large land area, they would be able to accommodate a large volume of solid water. This process would take place on all high upthrust mountains, and would cause the ocean level to recede (Gen 8:3). As the water level declined, more high terrain would become available to hold snow, and the recession of the flood would accelerate. Thus, the first terrain that would become visible would be high mountains (Gen 8:5).

Volcanic ash in the upper atmosphere cooling the earth would hasten the precipitation of snow and ice. Snow levels would readily come down to lower levels than those we currently see. Eventually, as warm oceans continued to evaporate water and cold atmosphere precipitated snow, we should expect to find sea levels substantially lower than present, with ice sheets extending across large areas.

The precipitation of water as snow and ice would set up large-scale atmospheric convection. Mountainous areas with snowfall would see descending air, which would then move across the land toward the ocean, where the air would be re-warmed and rise again, carrying more water toward the mountains, where it would again be deposited. An observer on the surface would note a wind (Gen 8:1).

Because the earth was cooled due to the upper atmosphere volcanic ash, we would expect to see global warming as the ash fell back to earth. This would begin melting the edges of the ice packs. As this ice melted, it would refill the oceans. Since some ash would fall almost immediately, we should expect to see it in layers of ice deposited throughout the early drying period of the flood.

The presence of high ground after the flood is essential to the lasting survival of life on land. The amount of water on the surface of the earth is sufficient to cover the earth 3-km deep, if all the crust of the earth were to be

⁵⁴ Press and Siever, 490-493; G. A. Milne, J. L. Davis, Jerry X. Mitrovica et al., “Space-Geodetic Constraints on Glacial Isostatic Adjustment in Fennoscandia,” *Science*, 291 (Mar 23, 2001): 2381-2385.

⁵⁵ William K. Kershner, *Instrument Flight Manual* (Ames, IA: Iowa State UP, 1977), 136.

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leveled.⁵⁶ Before the flood, a very large amount of this water was sequestered as aquifer. Without new high ground to rise above this new water level, the earth would become re-flooded. Therefore, all the landmasses of the earth must be substantially higher than ante-diluvian earth, further contracting the earth's land area beyond that contributed by mountainous areas.

The warming of oceans due to exposure of hot mantle as the continents separated would offset the cooling due to atmospheric ash. The exact balance of these opposite influences would be difficult to predict *a priori*. However, given God's concern even for fallen mankind, we would expect that these forces would tend toward a net isothermal status.

Cloud Cover: The atmospheric conditions that existed prior to the flood would be cataclysmically altered. Geysering of the fountains of the great deep would initiate massive vertical air movement, creating great holes in the cloud cover. The evaporation and rain that would follow would tear more holes in it, so that by the end of the forty days of rain (Gen 7:17), no remnant of the original protective cloud cover would remain. Two processes would prevent the cloud cover from re-forming.

First, we have noted volcanism. Even dormant volcanoes present significant elevation changes, and air moving against high ground creates weather. This air movement would produce vertical mixing of the atmosphere. Volcanic eruptions would also initiate vertical air movement. Second, the upthrust mountains would accumulate snow, producing the complex vertical convection mixing just noted as well as orographic lifting. The combination of these forces would prevent a uniform cloud cover from forming. Gaps in the clouds would then promote differential solar heating, making re-formation of a uniform cloud cover impossible.

Weather: Differential heating and orographic features that prevent the vapor barrier from re-forming would create complex weather patterns. Higher elevations and locations distant from oceans would see higher diurnal temperature variations. High elevations would receive greater daytime solar heating, but at night would re-radiate more heat back into space, both because of less atmospheric thickness above them and the absence of a cloud cover. Locations removed from oceans would see more variation because they would have less exposure to the temperature moderating effects of large bodies of water.⁵⁷ The uniform conditions that were present pre-flood would be forever lost. Complex weather patterns would be the rule.

Stratospheric Factors: The massive chlorine release from volcanoes would destroy the ozone layer. It would only re-accumulate to the extent allowed by the balance between formation of new ozone, the dispersion of ozone by vertical

⁵⁶ Lambert Dolphin, "Physics and the Bible: The Terrible Flood of Noah," (Koinonia House Online, 1997) <http://www.khouse.org/articles/technical/19970601-12.html>

⁵⁷ *Encyclopedia Britannica*, op cit; Navarra, 120-134.

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mixing of the atmosphere, and the volcanic production of chlorine. This would lead us to expect complex and changing patterns of ozone in the stratosphere.

The massive vertical mixing of the atmosphere during the flood would thoroughly mix stratospheric air with biospheric air. This would bring ^{14}C down into the biosphere in amounts far surpassing its prior levels.⁵⁸ Because carbon dioxide (the most common form of carbon in the atmosphere) is very soluble in water, most pre-existing ^{14}C would wash into the oceans during the flood. This would prevent a spike in atmospheric ^{14}C concentrations just after the flood. But the complex weather patterns after the flood would ensure that atmospheric mixing would continue to be perpetually thorough. ^{14}C would then distribute into the biosphere at a much higher rate than the trace pre-flood levels and would rise exponentially until it reached a new steady state level.

While the ultraviolet radiation blocked by ozone has little direct effect on humans other than sunburn and skin cancer, it has many effects on lower forms of life.⁵⁹ The ecology of microorganisms would be expected to change significantly so that we would expect to see increased prevalence of pathogens. Viruses would also be affected, and are able to directly insert mutated DNA into host organisms.

Rising ^{14}C levels would be expected to have more direct effects. When ^{14}C decays, it becomes nitrogen 14. If an atom of ^{14}C in DNA were to decay to ^{14}N , it is likely that the DNA would be damaged.⁶⁰ If that DNA were in a germ cell, it could result in a mutation which would be inherited by succeeding

⁵⁸ Brown, "Compatibility of Biblical Chronology with C-14 Age." Again we do not suggest that low concentration of ^{14}C in the biosphere was due solely to poor mixing of stratospheric air with biospheric air. Other factors that are very likely to reduce ^{14}C levels include high humidity, increased geomagnetic field strength, and a much larger biomass in the antediluvian world. The first factors would reduce production of ^{14}C , while the larger biomass would produce a dilutional effect because a given mass of ^{14}C would be distributed through more carboniferous mass than at present. The concentration of ^{14}C would therefore be lower, even though the absolute mass might not be as small as the levels might seem to indicate.

⁵⁹ R. C. Smith, B. B. Prezelin, K. S. Baker, et al, "Ozone Depletion: Ultraviolet Radiation and Phytoplankton Biology in Antarctic Waters," *Science* 255 (1992): 952-959; A. M. Vogelmann, T. P. Ackerman, R. P. Turco, "Enhancements in Biologically Effective Ultraviolet Radiation Following Volcanic Eruptions," *Nature* 359 (1992): 47-49.

⁶⁰ *Supplement to ES310, Introduction to Naval Weapons Engineering* (Annapolis, MD: United States Naval Academy, Jan 2000); Beth A. Montelone, *Supplement to BIOL400, Human Genetics* (Manhattan, KS: Kansas State U, 1998). Many "mechanisms" of mutation are described, but most are merely descriptive, with no causative information. Robust biochemical mechanisms exist to correct almost all new genetic defects, but for reasons which have not been elucidated, these are less than perfectly successful. Deamination, oxidation, and alkylation all result in unrecoverable genetic errors. But many more errors exist that should never occur, such as frameshifts, missenses, and nonsenses. While ^{14}C has not been explicitly implicated in these errors (nor, for that matter, has *any* chemical mechanism), because ^{14}C causes spontaneous chemical changes, it is reasonable to expect that it can be a causal agent in some or all of the mechanisms which till now are described but not causally understood. The first reference cited here does identify ^{14}C as mutagenic, but without identifying mechanisms.

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generations. Similar effects might be seen if the $^{14}\text{C}/^{14}\text{N}$ decay occurred in a transcription enzyme or other critical molecule. Since virtually all mutations are deleterious, this would be expected to result in decreased life spans.⁶¹ The equilibration of ^{14}C would take about 1,100 years, and its biological effects would be expected to result in an exponential decay in life spans over that period.⁶²

Summary of Expected Flood-Era Changes: We propose that the gyroscopic precession from tipping the earth would fracture the pre-flood continent. This would immediately break up the aquifer of Eden. This translocated water would then provide enough volume to submerge all the landmass after the overlying land sank into the space previously occupied by the aquifer. Moving continents would override oceanic plates, subducting them and initiating massive volcanism. Eventually continental collisions would thrust up mountains.

Hot new ocean floor would vaporize large amounts of water, while volcanic ash cooled the upper atmosphere by blocking solar heating. Snow and ice would fall on high mountains, removing water from the flood. This process would continue for an extended period until the sea level fell, volcanism subsided, and the ocean floor cooled. As sea level fell, lower elevations would be covered with ice, creating an ice age. Warmer ocean temperatures would cause extinction of marine organisms unable to tolerate warmer temperatures.

The post-flood atmosphere would become chaotic, with thorough vertical mixing. Differential heating and orographic features would guarantee that the protective cloud cover and temperature inversion would not be re-established. Genetic degeneration from loss of this protection would be expected to show up as an exponential decline in life spans. Eventually as solar radiation impacted on the ice fields, they would melt, transferring water from them back to the ocean.

Observed Post-flood Conditions

Geography: The earth's rotational axis is now tilted about 23.5° from vertical. This creates seasonal variations in incident solar radiation, which lead to warm summers and cold winters. Along with this change, the single low elevation continent in existence before the flood has been radically transformed

⁶¹ A. Eyre-Walker, P. D. Keightley, "High Genomic Deleterious Mutation Rates in Hominids," *Nature* 397 (1999): 344-347; P. D. Sniegowski, P. J. Gerrish, T. Johnson, A. Shaver, "The Evolution of Mutation Rates: Separating Causes from Consequences," *Bioessays* 22/12 (Dec 2000): 1057-1066; J. Ninio, "Illusory Defects and Mismatches: Why must DNA Repair Always Be (Slightly) Error Prone?" *Bioessays* 22/4 (April 2000): 396-401.

⁶² Ronald J. Tallarida, Rodney B. Murray, *Manual of Pharmacologic Calculations with Computer Programs* (Springer-Verlag, 1987), 82-89; Paul A. L. Giam, "Carbon-14 Dating Models and Experimental Implications," *Origins* 24/2 (1997): 50-64. Four half-lives are required for equilibration of ^{14}C levels. With a 269-year half-life of ^{14}C in the upper biosphere, 1,076 years would be needed to reach steady state. This discounts any other effects that might be expected to cause variation in the simple mathematical model.

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into seven with high mountains. The aquifer that underlay the original continent was completely vaporized and no longer exists for us to examine. But examination of Mars shows that floods sufficient to cover the entire surface of that planet to an aggregate depth of 46 meters have occurred, derived from subterranean aquifers.⁶³ This lends credence to the original existence of the aquifer of Eden.

The concept of continental drift has been widely accepted.⁶⁴ The bulk of scientific evidence for continental drift indicates that there was an original single proto-continent centered about the equator.⁶⁵ We may also note that this is consistent with Genesis 1:9, where the waters below the heavens were “gathered into one place,” possibly implying a single ocean surrounding a single continent. The proto-continent broke up into a number of fragments. These slid from their original positions into their current locations in directions consistent with rapid gyroscopic precession and the interaction of large moving continental masses. Conventional models suggest that this drift occurred over extensive millions of years, but they do not otherwise contradict our model. A number of specific changes may be traced.

There are oceanic basins that did not exist prior to the flood. In particular, the Atlantic Ocean is new. As the Americas pulled away to the west, the mantle became exposed. But because this area was pulled apart, it did not tend to form volcanoes. Instead, in most cases the molten magma flowed out into the ocean bottom. This formed the mid-ocean ridges, where we now find many “black smokers,” which are fumaroles under water. Because the magma had wide areas in which to flow, few projectile volcanoes were formed.⁶⁶

In the Pacific Ocean, the opposite is true. Because the western edge of the Americas and eastern edge of Asia were overrunning the existing oceanic crust, subduction zones were formed. In these areas, the downward force of the overriding continent raised mantle pressures so that magma was forced upward to form the many volcanoes we now know as the Ring of Fire.⁶⁷ However,

⁶³ Ronald Greely, “Release of Juvenile Water on Mars: Estimated Amounts and Timing Associated with Volcanism,” *Science* 236 (1987): 653-654; B. K. Lucchita, H. M. Ferguson, C. Summers, “Sedimentary Deposits in the Northern Lowland Plains, Mars,” *Proceedings of the Seventeenth Lunar and Planetary Science Conference, Journal of Geophysical Research* 91/B13 (Nov 30, 1986): E166-E174; V. R. Baker, R. G. Strom, V. C. Gillick, et al., “Ancient Oceans, Ice Sheets, and the Hydrological Cycle on Mars,” *Nature* 352 (1991): 589-594.

⁶⁴ Stuart E. Nevins, “Continental Drift, Plate Tectonics, and the Bible,” *Vital Articles on Science/Creation*, (1976).

⁶⁵ Anatole Dolgoff, *Physical Geology* (Boston: Houghton-Mifflin, 1998), 39-49; Thomas H. Clark, Colin W. Stearn, *Geological Evolution of North America* (New York: Ronald Press Co., 1968), 115; “Continental Drift,” *Microsoft Bookshelf 98* (Redmond, WA: Microsoft, 1998).

⁶⁶ Iceland, the Canary Islands, and the Azores are the best known exceptions.

⁶⁷ E. Seibold, W. H. Berger, *The Sea Floor: An Introduction to Marine Geology* (New York: Springer-Verlag, 1996), 28. 75% of the world’s volcanoes are located in the Ring of Fire around the Pacific rim.

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because of runaway subduction, the Pacific floor is also new.⁶⁸

In areas where continental masses impacted, we find large regions of high mountains. The most notable such area is the Himalayan mountain chain, located where the subcontinent of India slammed into the southern edge of Asia. Others include the Alps and Urals. In the western part of the Americas, the Rockies, Sierras, and Andes were thrust up when those continental masses overrode the submarine portions of the crust which were in their way.

As these areas thrust up mountains, the total horizontal area of the continents decreased. Mountains rising ten times as high as the land did earlier require ten times as much crust extending downward into the mantle to support them.⁶⁹ This means the mountainous regions now occupy substantially less horizontal area than their antecedent landmass did. While the mathematics to model the land mass and ocean geography is beyond the scope of this paper, we may confidently state that the horizontal area of the modern landmass is contracted significantly when compared to the pre-flood continent. Such overall upthrust is essential to the survival of terrestrial life, since without it, the total amount of surface water would threaten the existence of dry land.

A second observation must be made regarding the area of upthrust mountains. When the globe is examined, we find that these areas are vast, with the Himalayas alone occupying hundreds of thousands of square miles.⁷⁰ This is clearly a sufficient space to deposit large volumes of frozen water to begin the process of drying up the floodwaters. As other mountain ranges came up out of the water, the area available multiplied.

We have noted that mountains create weather by orographic lifting. When wet air comes against them, it is cooled and water precipitates out. Rain will occur in warmer temperatures, or snow in colder. Since there were thousands of volcanoes, which radically cooled the atmosphere, all precipitation over the high ground would be expected to be snow and ice.

Warm Oceans: “[T]he average global sea-surface temperature is about 18° C.”⁷¹ Based on Oxygen-18 measurements of ice laid down either during or just after the flood, Vardiman further notes that the “sea-surface temperature at the end of the Genesis Flood may have been about 24° C,” or 6° C warmer than

⁶⁸ Baumgardner, “Runaway Subduction”; John Baumgardner, personal communication.

⁶⁹ The Rockies have numerous peaks of over 14,000 feet MSL. This is about ten times the highest probable ante-diluvian elevation, and significantly more above the average ante-diluvian elevation. If we consider higher ranges such as the Himalayas and Andes, it is possible that the average increase in mountainous elevation may be as much as ten times. There are also numerous high areas, such as the Great Plains east of the Rockies, where many thousands of square miles are at elevations approaching 5,000 feet MSL. Because the crust floats on the mantle, a large volume of crust must protrude into the mantle below these high elevation areas to support them. And just as an iceberg has more volume below the waterline, a mountain has more volume protruding into the mantle than is exposed above.

⁷⁰ “Himalayas,” *Microsoft Bookshelf 98* (Redmond, WA: Microsoft, 1998).

⁷¹ Vardiman, “Rapid Changes in Oxygen Isotope Content of Ice Cores.”

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present. Work on ¹⁸O measurements in foraminifera lead to similar conclusions.⁷² These data are consistent with our prediction that ocean water would be warmed by contact with hot mantle. The fossil record shows a great extinction of many of the marine species that are present in the Cambrian layer, as was predicted.⁷³ As the sea temperature increases, we find that the amount of water transported from the ocean to be deposited as snow elsewhere also increases.⁷⁴ This water is transported by winds that simulations indicate would be on the order of 45 mph at the surface.⁷⁵ This is the “great wind” to which Genesis 8:1 attributes the drying up of the flood.

A Key Difficulty: At this point, we must address a serious challenge to the paradigm that we have been developing. Multiple lines of evidence indicate that the sea floor is of the same age as the flood.⁷⁶ As the continents slid, the sea floor ahead of them subducted into the mantle.⁷⁷ Hot magma was injected at the mid-ocean ridges and spread to form new sea floor as old crust was subducted. Barnes has pointed out that this presents a serious thermal difficulty.⁷⁸ The new oceanic crust had an initial temperature of about 1,100° C. A 6.5 kilometer thick layer of magma this hot contains enough “heat to boil away all the water at the earth’s surface 2.8 times.” Barnes further calculates that over 250 years would be required to radiate this heat away by black body radiation if the atmosphere were maintained at the boiling point of water. This is obviously incompatible with life on earth, which the Bible clearly speaks of as resuming in relatively normal fashion immediately after the flood. Unfortunately, Barnes is almost certainly underestimating the magnitude of this problem.

The oceanic plates, of which any one is the same age from top to bottom, are not 6.5km thick, but range from 50 to 100km thick. If we assume for simplicity that they are a total of 65km thick on average and the increase in

⁷² Larry Vardiman, “Out of Whose Womb Came the Ice?” *Vital Articles on Science/Creation*, (Aug 1994).

⁷³ Robert F. DeHaan, John L. Wiester, “The Cambrian Explosion,” *Touchstone* 12/4 (1999): 65-69; L. J. Gibson, “A Catastrophe with an Impact,” *Origins* 17/1 (1990): 38-47.

⁷⁴ Larry Vardiman, “Numerical Simulation of Precipitation Induced by Hot Mid-Ocean Ridges,” Fourth International Conference on Creationism, Pittsburgh, PA, (Aug 3-8, 1998).

⁷⁵ *Ibid.*

⁷⁶ Vardiman, “The Sands of Time.” R. Dietmar Müller, Walter R. Roest, Jean-Yves Royer, et al., “Digital Isochrons of the World’s Ocean Floor,” *Journal of Geophysical Research* 102/B2 (1997): 3211-3214. The problem resulting from new ocean floor is common to all global flood scenarios that accept the stated Biblical chronology. However, we must not casually accept the idea that the entire ocean floor is new, as assumed by Barnes (below). Müller et al. note that “There is a significant area of ocean floor that is older than the oldest mapped isochrons.” This may represent pre-flood oceanic plates that were incompletely subducted. Visual estimation of this area from the graphics in Müller’s article suggests that they may occupy up to 20% of the ocean floor.

⁷⁷ Baumgardner, “Runaway Subduction.”

⁷⁸ Ross O. Barnes, “Thermal Consequences of a Short Time Scale for Sea-Floor Spreading,” *Journal of the American Scientific Affiliation* 32/2 (1980): 123-125.

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temperature with depth is linear, then the total heat load is five times what Barnes proposes. While obviously oversimplified, this demonstrates that dissipation of this heat load is not an inconsequential problem.

At this point we must make one point very clear. No definitive answer is as yet available to Barnes' problem, and no detailed simulations have been published on our proposed approaches to this problem. Thus, the following suggestions, while initially plausible, will require verification. However, in keeping with our faith in God's truthfulness, this cannot be an absolute bar to our thesis. At each step of unraveling the scientific evidence confirming the scriptural record, investigators have approached unsolved problems. Step by step these have fallen away as careful work has resolved difficulties. We believe God will allow this problem to be solved as he has allowed others to be.

We propose that the first step to address Barnes' conundrum is to look at the tectonic changes during the flood. Massive vertical movements of crust accompanied the runaway subduction of the flood.⁷⁹ This allowed the mid-ocean ridge to be above sea level. At the edges of the ridge, seawater would be vaporized, leading to strong vertical movement of air. This would drive convection currents at either side of the ridge, tending to create a clear area directly above the ridge. This would allow this extremely hot material to radiate much of its heat directly to space. At 1,100°C this radiation would be 640 times as efficient as black body radiation from steam at 100°C. The exact amount of heat radiated away would depend on the width of the exposed ridge, the temperature of the magma and the time of exposure before it was submerged.

Earlier we suggested that hot magma would "skin over" when exposed to water. This is a solidification of the surface of the magma from rapid external cooling. In a marine convective environment this proceeds initially at about one meter of solidification per day.⁸⁰ While the lava is still hot, it has lost a significant part of its excess thermal energy. Heat from below the surface will continue to be conducted to the surface, but as cooling proceeds it slows down, since the heat must be conducted through more thickness of rock. This prolongs the time for the thermal load to be dissipated. The specifics of this cannot be directly predicted, since no extended direct measurements of this process have been made, and most natural systems display non-linear dynamic behavior.⁸¹

Based on ¹⁸O measurements, Vardiman places the temperature of the entire ocean floor at about 24°C shortly after the flood.⁸² He suggests that this

⁷⁹ John R. Baumgardner, "Computer Modeling of the Large-scale Tectonics Associated with the Genesis Flood," *Third International Conference on Creationism* (July 18-23, 1994); Michael Gurnis, "Sculpting the Earth from Inside Out," *Scientific American*, 284/3 (2001): 40-47.

⁸⁰ William and Sigurgeirsson.

⁸¹ James Flinders, John D. Clemens, "Non-linear dynamics, chaos, complexity and enclaves in granitoid magmas," *Trans R. Soc. Edinburgh Earth Sci*, 87 (1996): 217-224.

⁸² Larry Vardiman, "Cooling of the Ocean After the Flood," *Vital Articles on Science/Creation*, (July 1996).

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temperature dropped to its present 4°C over about 2,000 years. Such a prolonged cooling period for the oceanic crust would be consistent with maintenance of atmospheric temperature within the bounds required for life. It should be noted that even today the crust has not finished cooling. A layer of magma 100 meters thick requires 300 years to cool to ambient temperature in an air environment.⁸³ Crustal rock, as determined from bore holes and mines, increases in temperature two to three degrees C per hundred meters of depth. Yet natural caves, even to the depths of Carlsbad Caverns (478m), do not increase in temperature with depth since their surfaces have been exposed for extended periods. This implies that unexposed crustal rock is still cooling.

More speculative mechanisms may be considered. Some researchers have suggested that the antediluvian atmospheric pressure was at least double that at present. This would be necessary for certain prehistoric avians such as pteranodon to be aerodynamically viable.⁸⁴ In such a circumstance, water would boil at increased temperature. The resulting steam would radiate energy away more rapidly due to its higher temperature. Also, steam formed at great depths below floodwaters would expand against the extreme pressure of those waters. This pressure would create high-speed steam jets, potentially allowing the resulting steam to reach escape velocity.⁸⁵ This steam would carry its heat energy into space as kinetic rather than thermal energy. It would also tend to carry air with it, reducing the earth's atmospheric pressure.

Another option is suggested by Humphreys.⁸⁶ The expansion of the universe can become an infinite heat sink into which the crustal heat can be dissipated. If God rapidly expanded the universe at the time of the flood, this extra heat could have simply vanished. To most of us this seems far-fetched, but the underlying physics of this premise are quite well established.

Volcanism: Drifting continents that override oceanic plates are found around the Pacific basin. These continents have large numbers of volcanoes in their subduction zones, exactly as predicted by the movement of continental fragments.⁸⁷ While most of the Ring of Fire is now dormant, it is very likely that the bulk of it was created and erupted during the continental motions of the flood. The amount of ash these volcanoes ejected into the stratosphere would be incalculable. And the cooling effect of that ash would be immense.⁸⁸ Ash in the upper atmosphere would raise the albedo of the earth, reflecting the bulk of solar

⁸³ Press & Siever, 495-497.

⁸⁴ Dillow; Larry Vardiman, "The Sky has Fallen," *Vital Articles on Science/Creation*, (Feb 1984).

⁸⁵ John Baumgardner, personal communication.

⁸⁶ D. Russell Humphreys, "Accelerated Nuclear Decay: A Viable Hypothesis?" in Vardiman, et. al., *Radioisotopes and the Age of the Earth*, 333-379 (esp. 369-373).

⁸⁷ Seibold and Berger, 28.

⁸⁸ Please forgive the authors for the repetitious use of superlative adjectives. The English language fails of adequate descriptors for the magnitude of the events of the flood.

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radiation away.

This would offset atmospheric heating from the cooling of oceanic crust. Oard suggests that the eruptions probably continued for at least a century.⁸⁹ This is sufficient time to move large amounts of water to polar ice sheets. It is of interest that the rate of volcanism would be expected to fall off exponentially, in parallel with the heat load.⁹⁰ After the volcanism declined, the large ice sheets would be expected to continue to reflect solar radiation away.

An amount of ash sufficient to cool the earth could also darken the surface sufficiently to make it inhospitable to life. But the flood account clearly indicates that Noah emerged from the ark to find clear skies and bright sunlight (Gen 9:13). Vardiman has shown that the winds of the flood would favor a drier, more temperate climate in the region where the ark landed than in the rest of the world.⁹¹ This inhomogeneity would be likely to cause volcanic ash to be thicker in some areas and thinner in others. The remoteness of this region from the Ring of Fire would also allow ash to rain out more simply because of distance. For both of these reasons we find it reasonable to expect that Ararat and its surrounding area would be one of clearer skies than the rest of the world. Since volcanism would decline over time, the area of ash obscuration would similarly contract, leaving behind an expanding region of good land and clear skies for man and animals to occupy.

The massive amount of ice formed in this process would create an “Ice Age.” Because the ice would be laid down at the same time as volcanic ash was raining out of the stratosphere, we should find ash in the ice. Volcanic ash is found buried in deep ice layers of Greenland and Antarctica.⁹² The extent of the Ice Age as noted by detailed ocean bottom corings was so great that the oceans declined to a level at least 500 feet below modern sea level.⁹³ Since volcanic ash would continue to promote the deposition of polar snow for at least a century after the flood, the waters of the oceans would recede for at least that long. Once the worst of the volcanic winter ended, the ice could begin to melt.⁹⁴ Such a large volume of ice would take a considerable length of time to melt, and some “ocean bottom” would be exposed as dry land for enough time to allow

⁸⁹ Oard.

⁹⁰ Vardiman, “The Sands of Time”; Steven A. Austin, “The Declining Power of Post-Flood Volcanoes,” *Vital Articles on Science/Creation*, (Aug 1998).

⁹¹ Vardiman, “Out of Whose Womb Came the Ice.”

⁹² Larry Vardiman, “Ice Cores and the Age of the Earth,” *Vital Articles on Science/Creation*, (April 1992).

⁹³ William Ryan, Walter Pitman, *Noah's Flood* (New York: Simon & Shuster, 1998), 155; E. James Dixon, “Coastal Navigators,” *Scientific American Discovering Archeology* 2/1 (2000): 34-35; Michael Parfit, “Dawn of Humans,” *National Geographic* 198/6 (Dec 2000): 40-67.

⁹⁴ “Volcanic winter” is a relative term. It describes the cooling of the earth that results from volcanic ash raising the albedo of the earth. The warming due to heat transfer from the new oceanic crust would offset this to some degree, particularly in the locations of the mid-oceanic ridges.

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migration of animals and man.

An examination of hydrologic charts shows that the entire Bering and Chukchi Seas were dry land during this period.⁹⁵ Similar evaluation of charts for southeastern Asia and the archipelagoes that extend toward Australia again reveals probable dry land at this time. Other data indicates that the Southeast Asian archipelagoes are actually drowned mountain ranges.⁹⁶ Vertical motion of landmasses around the flood epoch later lowered the level of this area. These dry land “bridges” allowed the Americas and Australia to become re-populated after the flood. When the Australian “bridge” flooded, it isolated the animals living there, leaving no way for them to return to the rest of the world. While those types may have lived in other areas at one time, various natural forces such as predation and competition appear to have left Australia as the sole remaining habitat for kangaroos and their similarly unique neighbors.

Archeological evidence of early man in the Americas consistently dates younger than about 13,500 years by conventional ¹⁴C techniques.⁹⁷ When adjusted for the accumulation of ¹⁴C after the flood, these dates are consistent with the biblical chronology for a dispersion of man (to the Americas) after of the Tower of Babel incident (Gen 11:1–9).⁹⁸

Carbon 14: Conventional ¹⁴C dating assumes that a steady state level of ¹⁴C was present over extended periods of time, implying that measurement of present-day levels can be expected to yield valid ages for artifacts of up to 60,000 years. That assumption is open to serious challenge. As we have seen, in the pre-flood world, the vertical mixing present in today’s atmosphere was not present.⁹⁹ Therefore, no substantial force existed that would tend to mix ¹⁴C into the lower portions of the atmosphere to be taken up by the biosphere. Brown has also shown that the high humidity of the pre-flood atmosphere would also substantially reduce ¹⁴C production. The large mass of the biosphere would decrease ¹⁴C concentrations by dilution.¹⁰⁰ Some ¹⁴C would be present in the biosphere, but in very low amounts. All pre-flood terrestrial life was destroyed by the flood (Gen 7:21–22), and much was converted into the coal and oil we now recover as “fossil fuels.”

When accelerator mass spectrometry techniques are applied to coal and oil, there is nearly always ¹⁴C present, and the standard age determined nearly always seems to be less than 55,000 radiocarbon years.¹⁰¹ Post-flood mixing of the

⁹⁵ Dixon.

⁹⁶ Gurnis.

⁹⁷ Dixon.

⁹⁸ Brown, “Compatibility of Biblical Chronology with C-14 Age.”

⁹⁹ Larry Vardiman, *Climates Before and After the Genesis Flood*, (El Cajon, CA: Institute for Creation Research, 2001), 23.

¹⁰⁰ Gien, *Scientific Theology*, 181-183.

¹⁰¹ *Ibid.*, 184; Robert H. Brown, “The Upper Limit of C-14 Age?” *Origins* 15/1 (1988): 39-43; Robert H. Brown, “C-14 Age Profiles for Ancient Sediments and Peat Bogs,” *Origins* 2/1

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atmosphere would create a new steady state level of ^{14}C in about 1,200 years. If the Septuagint chrono-genealogies are correct, we should see good standard dates for artifacts no further than 4,300 years before present. However, there is an unexplained anomaly in the English Oak and Bristlecone Pine ^{14}C calibration curves between 450 BC and 765 BC. An exactly dated archeological artifact from 612 BC has now been dated at a calibrated date older than 800 BC. Subsequent statistical analysis of the two curves in this area shows that the probability that they represent the true historical values of ^{14}C is less than 1 in 10^{-14} .¹⁰² This places the entire dendrochronological calibration of ^{14}C earlier than 450 BC in serious doubt.¹⁰³ Three reported older specimens show standard radiocarbon ages for various parts of single animals that vary from 2,700 to 14,000 years.¹⁰⁴ This wide variance in ^{14}C levels in a single animal is consistent with the flood schema, but not with uniformitarian expectations.

The exponential increase up to a steady state of ^{14}C after the flood would be expected to result in an exponential decrease in life spans because of the biological effects of ^{14}C decay. When the life spans of the post-flood patriarchs are plotted against the time after the flood they were born, we find that there is an almost perfect exponential decay of life spans to a steady state 74 years (cf. Ps 90:10).¹⁰⁵

Tectonic Activity: Our model for the flood shows rapid tectonic movement early in the catastrophe, with the continents slowing down as events progressed. This would suggest that events related to tectonic activity should also slow down. Very few major volcanic events are noted today. Such a paucity of eruptions is fully consistent with our model.

Seismometry has been well implemented for about a century, yielding a sufficient volume of data to allow determination of the trend of earthquake

(1975): 6-18.

¹⁰² Paul A. L. Gien, "An Anomaly in the Carbon-14 Calibration Curve and its Implications," *Conference on Science and Faith*, Andrews University, (July 28, 1998).

¹⁰³ Dendrochronology involves the matching of growth rings from one tree to growth rings of another and the construction of a master sequence longer than can be made from single trees. In this process, each step is dependent on the step before it. With the 450-765 BC period calibration clearly in error, any earlier dates based on this erroneous segment are necessarily suspect. We do not believe it too strong to say that no ^{14}C date earlier than 450 BC can be relied upon to represent the actual calendar age of an artifact.

¹⁰⁴ Troy L. Péwé, "Quaternary Stratigraphic Nomenclature in Unglaciated Central Alaska," *Geological Survey Professional Paper 862* (Pittsburgh: U.S. Gov. Printing Office, 1975), 30.

¹⁰⁵ Philip M. Holladay, Jonathan M. Watt, "De-generation: An Exponential Decay Curve in Old Testament Genealogies," 52nd Annual Meeting of the Evangelical Theological Society, (Nov 16, 2000). The correlation coefficient for the curve fit is 0.9425, indicating an excellent fit, while scatter about the curve attests to the naturalness of the data. In order to fabricate such data, it would have been necessary for Moses to be aware of the underlying mathematical principles. Since the mathematics of the curve were unknown until modern times, we should expect that the data are authentic.

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activity.¹⁰⁶ When analyzed, this data shows a steady decrease in earthquakes, as predicted.¹⁰⁷ Of additional interest is the fact that the frequency is oscillating about the mean with a period of about thirty years. When plotted, this looks remarkably like a tracing of uterine contractions in labor, or “birth pangs.” (cf. Matt 24:8, Mark 13:8)¹⁰⁸ Unfortunately the detailed data does not extend far enough back to establish the expected exponential decline in earthquakes from the time of the flood to present.

The Ice Age: We have already mentioned that the evaporation of ocean water and precipitation of snow at high elevations initially dried up the flood. But this initial drying was not the end of the process. High elevations and polar regions hold immense amounts of ice year-round today, and have held far greater amounts in the past. In particular, during the period just after the flood, virtually the entire area of Canada and large parts of Europe were under hundreds of feet of ice.¹⁰⁹ At this same time, the oceans were hundreds of feet below current levels. Vardiman has shown that the winds that would result from the conditions of the flood would flow in such a pattern as to deposit the bulk of the snow in the locations described for the ice sheets of the Ice Age.¹¹⁰

The volume of ice deposited was substantially greater than that required to return the oceans to their previous levels. As mentioned before, the volcanic winter and warm oceans persisted for a number of years, so that the sea level continued to recede for that time. This implies that the end of the flood as observed by Noah was a somewhat incomplete view. Sufficient dry land had appeared to support the re-establishment of ecosystems, but more was yet to appear. The volcanic ash that cooled the earth to promote the precipitation of snow at the poles also rained out on the new land, making it very fertile, as needed for the re-establishment of the world’s life.

The winds that deposited the bulk of precipitation at the poles also led to relative dryness in central Europe, the northern Mediterranean, mid-East, and

¹⁰⁶ Seismic data is cataloged in the National Earthquake Information Center, the Council of the National Seismic System, and the National Geophysical Data center. These data must be synthesized prior to analysis.

¹⁰⁷ Steven A. Austin, “Twentieth-Century Earthquakes: Confronting an Urban Legend,” *Vital Articles on Science/Creation*, (Jan 1998).

¹⁰⁸ We cannot leave tectonics without a bit of editorial comment on the apparent implausibility to us of the Uniformitarian hypothesis as regards mountain building. This theory states that the upthrust mountains were slowly pushed up over millions of years. Major modern earthquakes result when fault lines slip a foot or two. The destruction from these earthquakes is immense. Each step of upthrust would result in a major earthquake. As one stands looking at a mountain rising many thousands of feet, the number of catastrophic earthquakes this mountain would represent in the Uniformitarian model boggles the mind. This must be then multiplied by the number of upthrust mountains in the world. To the authors, the catastrophic events of the flood appear to be a more rational explanation for the origin of upthrust mountains than the repeated small movements of Uniformitarianism.

¹⁰⁹ Dixon.

¹¹⁰ Vardiman, “Numerical Simulation of Precipitation Induced by Hot Mid-Ocean Ridges.”

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central Asia.¹¹¹ Since the ark came to rest in the center of this region (Gen 8:4), it was ideally located for the restoration and replenishment of life on earth. Vardiman estimates that this airflow pattern and its accompanying Ice Age probably lasted until the time of Abraham.¹¹² Thus, the land promised by God to Abraham (Gen 12:1) was not the arid land of present-day Palestine, but was instead a lush fertile land which extended many miles into area which is now covered by the Mediterranean Sea. Similarly, when he went into Egypt (Gen 12:10), that country extended many miles to the north.¹¹³

Weather: It hardly seems necessary to comment on the weather. Its chaotic nature is evident to all. Seasonal variations in temperature and the length of days are obvious. The tilted axis of the earth, the absence of a cloud cover, and the new mountainous regions are responsible for all weather on earth. Differential heating results from both axis tilt and direct exposure of land and sea to sunlight. This creates complex airflows that are further complicated by orographic features. The diurnal variation in the temperature at the surface of the earth now ranges from 5.4 to 41.4° F.¹¹⁴ The ozone layer is thin and variable, exactly as would be expected from complex vertical mixing of the atmosphere.

Gyroscopic Precession: Our brief review of key evidence cannot end without revisiting the primary disturbance that led to the flood. We have noted that the major surface phenomena are generally consistent with the consequences of gyroscopic precession resulting from the earth's axis being tipped. We must now look to two final pieces of evidence: one below and one above the surface of the earth.

Archeomagnetic data shows that the magnetic field of the earth before the flood was substantially stronger than it is today, reducing the intensity of cosmic rays striking the earth, further decreasing the levels of ¹⁴C below the already low levels resulting from other causes.¹¹⁵ This level of magnetism fell dramatically at the time of the flood, and its polarity reversed as rapidly as once per week during the year of the flood, as would be expected from a precession-induced spinning motion of the magnetic poles. The magnetic poles continue their motion even today. This movement is generally recognized as being

¹¹¹ Vardiman, "Out of Whose Womb Came the Ice."

¹¹² Vardiman, "Cooling of the Ocean After the Flood."

¹¹³ Ryan and Pitman, 97.

¹¹⁴ "Global Variation of Mean Temperature." (Chicago: Encyclopedia Britannica, 2000 online edition, <http://www.britannica.com>); Navarra, 120-132. About half of all daily warming is due to direct absorption of solar radiation by the surface. This is enhanced by high elevation (less atmosphere to transit), long distance from oceans (less moderation by air movement from areas of stable temperature), and absence of clouds (more surface exposure to solar heating). At night these same factors operate in reverse, enhancing heat loss by direct radiation to space. Thus, areas with these features will have the greatest diurnal temperature variation.

¹¹⁵ Russell Humphreys, "The Mystery of the Earth's Magnetic Field," *Vital Articles on Science/Creation* (Feb 1989).

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precession, as predicted by our model.¹¹⁶ The rapid initial movement followed by a slowing pattern is also what would be expected from precession in a fluid medium. New research has identified evidence that the inner parts of the earth are moving at a different rate than the crust. This true polar wander is contemporaneous with the appearance of the Cambrian fossil layer, which many creationists identify as the first layer of flood-borne sediments.¹¹⁷

The final item of evidence comes from the skies. Since the earth itself was the gyroscope that was made to precess, we should be able to see that precession in astronomical measurements. The earth's axis wobbles slightly between 22° and 24°. This should not be surprising, since a tilted gyroscope not only precesses, but tries to right itself. But more important is the fact that the equinoxes precess. The period of this precession is about 20,000 years, while the axis tilts just half as fast, with a period of 40,000 years.¹¹⁸ Again we find evidence consistent with an axis shift.

Discussion

We have considered a variety of evidence in our quest for a paradigm explaining the physical events of the flood. The biblical data regarding Eden suggests to us a paradise that was completely climate controlled by a high altitude cloud cover, with no significant surface weather. It had little or no high ground of substance. A single continent was located around the equator of a world whose axis of rotation is normal to the plane of the ecliptic.

Because of man's sin, God destroyed that earth with a flood by tipping the axis of rotation of the earth. Gyroscopic precession spun the magnetic poles of the earth wildly. The surface of the earth was dramatically fractured, and the aquifer which supplied the river of Eden was split open to provide the water for the flood. The entire earth became covered with water.

Oceans of water were evaporated by contact with the exposed hot mantle of the earth. Subduction led to massive volcanism. Sliding continents thrust up high mountains where precipitation fell as snow to begin the drying up of the floodwaters. Volcanic ash in the stratosphere cooled the earth to accelerate the process. Oceans of floodwater were deposited as snow and ice to create the Ice Age. A great wind created by convection led to depositing snow where great ice sheets were eventually located. It also led to favorable conditions for the re-establishment of life in the area where the ark landed. Volcanic ash raining out from the stratosphere fertilized the earth to help with re-growth of vegetation.

¹¹⁶ Ibid.; Robert H. Brown, "Reversal of Earth's Magnetic Field," *Origin*, 16/2 (1989): 81-84.

¹¹⁷ Joseph L. Kirschvink, Robert L. Ripperdan, David A. Evans, "Evidence for a Large-Scale Reorganization of Early Cambrian Continental Masses by Inertial Interchange True Polar Wander," *Science* 277 (July 26, 1997): 541-545; Vardiman, "The Sands of Time."

¹¹⁸ Larry Vardiman, "A Faulty Climate Trigger," *Vital Articles on Science/Creation* (Mar 1995).

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The drying up of the flood did not end for many years. The atmosphere continued to be cooled due to extensive amounts of volcanic ash in the stratosphere, but the oceans did not cool immediately. This led to continuing transfer of ocean water to polar ice caps. About the time of Abraham, this process finally ended, and the Ice Age began to melt. By then, men dispersed at Babel had traveled to the farthest parts of the world, and animals had re-populated everywhere.

As the ice caps melted, ocean levels rose, leading to the geography with which we are familiar. The land connections to the Americas and Australia flooded, leaving those areas isolated from the Eurasian landmass. If this process continues unimpeded, it is likely that all low elevation polar ice will eventually melt, raising the world's oceans above their current levels.

Remaining Difficulties: A number of problems need to be addressed. Further simulations need to be done on problems ranging from the motion of continents to the dissipation of the ocean floor heat and the exact nature of the cloud cover of the antediluvian earth. The dendrochronological ¹⁴C calibration curves need to be redone. We could extend this list *ad infinitum*. The discovery of solutions will be exceeded only by the appreciation of new problems.

Some might suggest that we must wait until all problems are solved to propose this paradigm. Instead, in accordance with Brand, we hope that this paradigm leads to testing by experimentation and observation.¹¹⁹ It would be satisfying to be able to show that the physical data demand the conclusion that the biblical account is correct. However, the progress of science has always been that of skepticism, revision, and innovation. Regardless of the status of our knowledge at any point in time, these forces will move forward. Thus, every scientific conclusion will remain tentative until the only eyewitness to all these events makes Himself known to all.

A Bit of Theological Speculation: At this point, we would like to leave the world of hard science to tread lightly on apocalyptic theology. God destroyed the original earth with a flood. In it, every part of the surface of the earth was moved out of its place. The sixth seal of Revelation (Rev 6:12-17, cf. Matt 24:29) describes every mountain and island of the sea being moved out of its place. The wicked cry out for the rocks to fall on them to protect them from the wrath of God. This is an uncanny parallel to the events of flood, and only events of that degree can truly fully fulfill the imagery of the prophecy. Could it be that at the Second Coming God will tip the earth back upright in preparation for its re-creation into a paradise for mankind?

Comment: We have investigated the possibility that, contra Gould, the Bible is in fact a book that describes physical reality. We have found that while not designed as a textbook of science, the Bible contains sufficient physical statements to allow us to infer fairly detailed scientific information. That

¹¹⁹ Brand, 56.

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information, when tested against the physical evidence, has been found to in general conformity with that evidence. Should we expect any less when the author of the book is also the author of the universe?

Apart from Christ we are still incapable of rightly interpreting the language of nature....

God has permitted a flood of light to be poured upon the world in the discoveries of science and art; but when professedly scientific men reason upon these subjects from a merely human point of view, they are sure to err. The greatest minds, if not guided by the word of God, become bewildered in their attempts to investigate the relations of science and revelation. The Creator and His works are beyond their comprehension; and because these cannot be explained by natural laws, Bible history is pronounced unreliable.

Those who question the reliability of the Scripture records have let go their anchor and are left to beat about upon the rocks of infidelity. When they find themselves incapable of measuring the Creator and His works by their own imperfect knowledge of science, they question the existence of God and attribute infinite power to nature.

In true science there can be nothing contrary to the teaching of the word of God, for both have the same Author. A correct understanding of both will always prove them to be in harmony. Truth, whether in nature or in revelation, is harmonious with itself in all its manifestations. But the mind not enlightened by God's Spirit will ever be in darkness in regard to His power. This is why human ideas in regard to science so often contradict the teaching of God's word.¹²⁰

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¹²⁰ Ellen G. White, *Testimonies for the Church*, 8:257-258 (Washington, D.C.: Review and Herald, 1904).