MINISYMPOSIUM ON VARIABLE CONSTANTS—IX*

THE IMPERATIVE OF NON-STATIONARY NATURAL LAW IN RELATION TO NOAH'S FLOOD

JOHN R. BAUMGARDNER**

Received October 10, 1989; Revised January 18, 1990

Abstract

Massive tectonic changes must have been associated with Noah's Flood if the Flood and its after effects are correlated with the record of fossils in the earth's sedimentary rocks. The required tectonic changes include the sinking of all the pre-Flood ocean lithosphere into the mantle, the formation and cooling of all the present-day ocean lithosphere, and displacements of the continents by thousands of kilometers. Such large-scale tectonic change cannot be accommodated within the Biblical time scale if the physical laws describing these processes have been time-invariant.

Introduction

Straightforward reading of the Bible allows no place for large-scale destruction of life on earth prior to the Flood of Noah. The general absence of multicellular fossils in Precambrian rocks and the abrupt initial appearance at the Precambrian-Cambrian boundary of a wide diversity of complex multicelled lifeforms, frequently in high concentrations, seems therefore logically to imply that the onset of the Flood catastrophe must correlate with this striking discontinuity in the geological record. The Precambrian-Cambrian boundary not only marks the sharply defined beginning to the abundant global occurrence of fossils, it generally also represents a catastrophic, physical unconformity in the rocks themselves.

The genealogies recorded in Genesis 10 and 11 link the Flood with the remainder of Biblical history and require the Flood to be no more than a few thousands of years ago. If the earliest Cambrian rocks do indeed represent the initial stage of the Flood catastrophe, then a staggering amount of geological change must be associated with the Flood itself, and the upper portion of the geological record must describe a period of post-Flood adjustment as the earth recovered from this planet-wrecking upheaval. Abundant observational evidence attests to catastrophic conditions associated with most of the geological record, from the Cambrian to recent. Strong evidence that most of the earth's major coal deposits are of catastrophic, allochthonous origin (Austin, 1979) in itself testifies to the pervasiveness of global catastrophe throughout the record.

A major problem arises, however, as one attempts to apply the principles of physics, as we now observe them, to understand how a catastrophe of this magnitude could unfold in such a brief span of time so recently in the earth's past. The remainder of this note will attempt to highlight some examples of this problem to argue that the most likely explanation is that the physical laws were somehow altered by God to cause the catastrophe to unfold within the time frame of the Biblical record.

Plate Tectonics and the Flood

Evidence for large-scale tectonic change is tightly correlated in a temporal sense with the fossil record. The most direct correlations are obtained from deep sea drilling (Maxwell *et al.,* 1970) which reveals the kinds of fossils that lie directly on top of igneous ocean floor. Another means of correlation is by comparison of magnetic reversal data—data for the pattern of magnetic reversals in ocean sediment cores versus depth (Tauxe, Butler and Herguera, 1987), data for the spatial pattern magnetic stripes that are imprinted in the igneous rocks of the ocean floor, and data for the pattern of magnetic reversals in successive lava flows on the flanks of volcanoes in continental environments. The evidence argues compellingly that during the time that thick fossil-bearing sediment sequences were deposited on the continents, major plate tectonic activity was also taking place, involving the sinking of huge areas of oceanic lithosphere into the mantle at deep ocean trenches and the formation of new ocean floor from molten upwelling magma at mid-ocean ridges. Indeed not one square kilometer of ocean floor older than Mesozoic has been identified on the face of the entire earth (Sclater, Jaupart and Galson, 1980).

This latter fact implies that the Flood catastrophe involved not only the earth's surface in generating thick layers of sediment, but the earth's interior as well, with significant movement of material within the earth's silicate mantle (Baumgardner, 1986). It seems to require that all the pre-Flood ocean lithosphere—likely representing some 65 percent of the earth's surface area—be absorbed into the earth's interior and be replaced with new lithosphere formed from molten material at a mid-ocean ridge. It requires relative motions of continental blocks of thousands of kilometers. The entire Atlantic Ocean opens during this time span as North America migrates away from Europe and South America moves away from Africa. Similarly, the Indian Ocean comes into existence as what had been a stable continental block usually referred to as Gondwanaland breaks apart to produce the fragments India, Australia, and Antartica that move away from the piece now known as Africa (Smith, Hurley and Briden, 1981).

The evidence is so overwhelming the logic seems unassailable that massive tectonic changes have un-

*Parts I-VIII are in *CRSQ* 26:121-31; 27:6-15, 60-72.

**John R. Baumgardner, Ph. D., 1965 Camino Redondo, Los Alamos, NM 87544

folded since abundant fossils began to appear in the sedimentary record. It is therefore the author's strong conviction that any attempt to reconstruct the physical events associated with the Biblical Flood must recognize and account for the plate tectonics aspects of geological history.

Two Severe Challenges

Two of the major challenges in accounting for large-scale tectonic change in a time frame of only a few thousand years concern the deformation rate of mantle rock and the cooling rate of lithospheric plates. Let us first consider the issue of mantle rheology. There are good reasons to suspect that a sizable fraction of the pre-Flood ocean lithosphere sank during the year of the Flood itself (Baumgardner, 1986). If, on the average 2500 km of ocean floor migrated toward a trench and sank during the Flood year, the mean plate velocity was about 2.5×10^6 cm/yr (or about 3 m/hr). This is about a million times higher than the mean present-day plate velocity. Since both today and almost certainly during the Flood also, the primary driving mechanism (Oxburgh and Turcotte, 1978) for producing motions in the mantle is buoyancy forces (such as those associated with cold sinking lithospheric slabs), the change that allowed much higher velocities during the Flood almost has to be associated with the mantle's intrinsic rheology. Expressed in a slightly different way, the basic forces responsible for moving the plates and producing circulation within the mantle, both during the Flood and now, almost certainly must be the same, namely, buoyancy forces. The forces then were probably similar in magnitude to those now, since the temperature differences responsible for the buoyancy were likely of comparable magnitude—at most only a factor of a few different. This suggests that the essential physical phenomenon responsible for the million times higher velocities has to do with the deformational properties of the mantle rock itself.

Even though the silicate material comprising the mantle is in the solid state, it deforms plastically and flows when under stress through the migration of minute defects or dislocations. Surprisingly, too, a good approximation is possible to treat mantle rock as a linear or Newtonian fluid and to quantify its creep behavior in terms of a shear viscosity. Because the migration of dislocations in a solid is a thermally activated phenomenon, this viscosity depends exponentially on the local temperature (Kirby, 1983). It depends on pressure and the state of stress as well. The strong temperature dependence suggests one conceivable way to have the mantle deform more readily—namely to make its temperature closer to its melting temperature. As a rough rule of thumb, a 100 K change in this difference changes the viscosity by a factor of 10. If one wants to postulate a mantle several hundred degrees warmer during the Flood than at present, however, he is faced with the problem of how to cool the volume of the mantle by that much in the brief period of time since the Flood.

This leads us to a second major challenge in accounting for the data of plate tectonics in the context of the Flood, that of explaining how new lithosphere can migrate away from a spreading ridge and attain an effective elastic thickness of up to 50 km within the Biblical time frame. Based on experimentally measured values for the thermal diffusivity of mantle rocks, the amount of conductive cooling a lithospheric slab tens of kilometers thick experiences during a few thousand years is negligible.

As a quantitative illustration of this situation, consider the idealized problem of a solid that extends to infinity in the x direction, has a uniform temperature T_0 at time t = 0, and is bounded by a plane at x = 0 whose temperature for positive times is fixed at zero. This cooling problem has the analytic solution for the temperature T inside the solid as a function of time and position given by $T = T_0 \operatorname{erf}[x/(4\kappa t)^{1/2}]$ (Turcotte and Schubert, 1982), where erf represents the error function and κ is the thermal diffusivity. The temperature reaches a value of $0.5T_0$ when $t = 1.10\ x^2/\kappa$. If one uses this idealization as a model for the cooling of ocean lithosphere with a value for $\kappa = 1.2 \times 10^{-6}\ m^2/s$ (Stacey, 1977) representative of igneous rock, one finds that rock at a depth of 50 km requires 73 million years to cool by an amount equal to half the temperature difference between the deeper mantle and the ocean water. To be even more specific, suppose the initial temperature difference is 1000 K. After 5000 years, the temperature drop at 0.5 km is 408 K, at 1 km is 104 K, and at 2 km is 1 K. The cooling at depths greater than 2 km can be ignored entirely.

Although hydrothermal circulation of ocean water does play an important role in cooling the upper few kilometers of ocean floor near a spreading ridge (Sempere and MacDonald, 1987), this mechanism does not appear to be important once a modest blanket of sediment is present on the ocean bottom. Therefore, it seems essential to invoke some additional mechanism to account for the cooling of the present oceanic lithosphere to its current thickness in just a few thousand years. It can be added that these same comments also apply to the cooling of large magmatic bodies in continental environments known as batholiths.

Discussion

These two challenges—how to account for deformation rates in the mantle on the order of 10^6 times those presently observed and cooling rates in large rock bodies at least 10^4 times those implied by easily measured rock thermal diffusivities—involve principles of physics believed to be so well understood, that the author is convinced that the resolution of the challenges logically demands abandoning the usual assumption of time invariance of natural law. (In this brief note I have avoided discussing nuclear decay rates, but I am convinced that these rates must also have been many orders of magnitude higher during the Flood catastrophe.) The observation that many diverse physical phenomena seem to require many orders of magnitude revision in their fundamental controlling parameters suggests that by studying the systematic of the directions the various fundamental parameters need adjustment, clues possibly can be found that identify a single adjustment underlying all the others. Of course, such an investigation is allowable from a philosophical standpoint within a theistic worldview which holds the cosmos itself is an open system. It is, however, essentially excluded from a naturalistic framework which assumes the cosmos is all there is and, as such, is closed.

It is the author's suspicion that God modified some single fundamental aspect of the natural order which in turn affected all the fundamental forces—including the gravitational force, the electrostatic force, and the nuclear forces—in a manner that did not fatally disrupt the delicate balances that exist in living systems and whose signature in the astronomical data may be subtle. The author believes that the sooner the community of scientists who are aware of the integrity of the Bible is convinced the system of natural law that normally describes the orderly behavior of the cosmos cannot have been time-invariant, the sooner genuine progress will be made in establishing the framework that accounts for Noah's Flood and the geological history of our planet in a robust and satisfying way.

References

Austin, S. A. 1979. Depositional environment of the Kentucky no. 12 coal bed (Middle Pennsylvanian) of western Kentucky, with special reference to the origin of coal lithotypes. Ph. D dissertation. Pennsylvania State University.

Baumgardner, J. R. 1986. Numerical simulation of the large-scale tectonic changes accompanying the Flood in Walsh, R. E., C. L. Brooks and R. S. Crowell, editors. Proceedings of the First International Conference on Creationism, volume II, Creation Science Fellowship. Pittsburgh. pp. 17-30.

Kirby, S. H. 1983. Rheology of the lithosphere. *Reviews of Geophysics and Space Physics* 21:1458-87.

Maxwell, A. E., R. P. von Herzen, K. J. Hsu, J. E. Andrews, T. Saito, S. F. Percival, Jr., E. D. Milow, and R. E. Boyce 1970. Deep sea drilling in the south Atlantic. Science 168:1047-69

Oxburgh, E. R. and D. L. Turcotte 1978. Mechanisms of continental drift. *Reports of Progress in Physics* 41:1249-1312.

Sclater, J. G., C. Jaupart, and D. Galson 1980. The heat flow through oceanic and continental crust and the heat loss of the earth. *Reviews of Geophysics and Space Physics* 18:269-311.

Sempere, J. C. and K. C. MacDonald 1987. Marine tectonics: processes at mid-ocean rid es. *Reviews of Geophysics* 25:1313-47.

Smith, A. G., A. M. Hurley, and J. C. Briden 1981. Phanerozoic paleocontinental world maps. Cambridge University Press. New York.

Stacey, F. D. 1977. Physics of the earth. John Wiley. New York. p. 334.

Tauxe, L., R. Butler, and J. C. Herguera 1987. Magnetostratigraphy: in pursuit of missing links. *Reviews of Geophysics* 25:939-950.

Turcotte, D. L. and G. Schubert 1982. Geodynamics. John Wiley. New York. pp. 158-62.

MINISYMPOSIUM ON VARIABLE CONSTANTS—X

RADIOHALO EVIDENCE REGARDING CHANGE IN NATURAL PROCESS RATES

R. H. BROWN*

Received 2 October 1989; Revised 17 January 1990

Abstract

Radio halos provide a direct comparison of the results of identical physical processes that occurred over a period encompassing a large fraction of Earth's history. Accordingly they can demonstrate changes in natural process rates, i.e., in basic physical law, that occur too slowly to be demonstrated by observations made during the epoch of modern science, or that occurred episodically before the development of modern investigative capability.

The identifiability of radiohalo rings with the alpha-particle sources that produced them, together with the sharpness of these rings indicate that radioisotope half-lives over a range of 21 orders of magnitude have not varied by more than a factor of two during the time the geological formations of the Earth which contain radio halos have been in existence, and probably over the entire time represented by geological formations. A plausible further deduction from this evidence is that there has been no significant variation in the nuclear long-range force, the nuclear short-range force, or the electrical interaction force during this time interval.

Introduction

Since the beginning of modern scientific insights there has been intense curiosity over whether the basic physical processes (interactions) of the natural world are universal in both space and time, or have been characterized by evolutionary change. Biblical creationists are particularly interested in this topic because of difficulties that have developed with respect to some chronological conclusions which have been drawn from specifications in the Bible.

The basic physical interactions of the natural world appear to be so complexly interacting and so finely balanced as to exclude large change in the associated "laws." Such evidence supports the theist viewpoint that the Creator has optimally designed and optimally maintains the physical universe. Speculation concerning either constancy or variability of fundamental natural process rates, i.e., basic physical laws, over the history of the physical universe calls for data which clearly favors one possibility against the other.

Within the short time span of modern scientific measurements there has been no firm indication of change in basic physical relationships (laws). Within the constraints of soundly interpreted experimental data, one must conclude that whatever changes in basic physical processes (laws) may have occurred, either take place too slowly to be apparent over the time span of modern observational capability, or have occurred episodically before the era of modern science.

Radiohalos provide a direct physical means for comparison of results of identical processes which have operated over most of the history of the present geologic features of Earth's crust. Consequently they may be expected to provide straightforward evidence concerning the constancy of basic relationships (laws) in the natural world.

*R. H. Brown, Ph. D., Geoscience Research Institute, Loma Linda University, Loma Linda, CA 92350.