COULD THE FLOOD WATERS HAVE COME FROM A CANOPY OR EXTRATERRESTRIAL SOURCE?†

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Various tentative models for an atmospheric canopy of water in vapor or other form, as well as proposed extraterrestrial sources of water or ice, have had four purposes in the overall creation-flood model of origins. These have been explanation of a pre-flood semitropical climate, provision of substantial waters for the flood, explanation of glacial action and catastrophic freezing after the flood, and possible reduction in the pre-flood rate of carbon-14 production. The usual aim has been to provide explanations which involve only natural forces without divine miraculous intervention. Critical analysis of these models shows that the provision of a substantial part of flood waters or of ice either from a canopy or from extraterrestrial sources is impossible apart from special divine miraculous intervention. All of the models fail to meet the requirements of the laws of physics and/or physiology. Preliminary guidelines for the quantitative modeling of a limited water vapor canopy are offered.

Introduction

Creationists often deplore, and rightly so, the adventurous speculations often practiced by evolutionists. Classic examples of such speculation are to be found in *The Origin of Species* in which Darwin, to use W. R. Thompson's words, "engendered those fragile towers of hypothesis based on hypothesis, where fact and fiction intermingle in an inextricable confusion."[1] Thompson went on to suggest that "these constructions correspond to a natural appetite" common to man, and in particular to evolutionists.

But does it not appear that creationists have often evidenced a tendency toward excessive speculation? Creationist literature is replete with speculations, far-out theories, and rather extreme models. A common characteristic of many of these speculations of creationists is the effort to explain some aspect of creation or deluge history in naturalistic terms which involve no direct divine intervention. Creationists have been at times almost as ingenious as evolutionists in devising explanations which exclude divine miracle, as much as possible, from prehistory.

An important area of creationists' speculative concern has been that of atmospheric canopy models and extraterrestrial sources of flood waters. A brief catalogue, probably incomplete, of speculations relative to an atmospheric canopy or an extraterrestrial source of water or ice at the time of the flood includes the following:

1. A water vapor canopy which possibly provided a substantial portion of the flood waters.[2]

2. A rigid, spherical ice shell around the earth, supported due to structural strength, which finally collapsed to produce flood and glaciation, or a spinning ice shell supported by centrifugal force, which collapsed to produce flood and glaciation.[3]

3. Water or ice in orbit around the earth which descended to produce flood and glaciation.[4]

4. Water vapor or ice from deep space which collided with the earth to produce flood and glaciation.[5]

All of these ideas have been offered in the past as *scientific* models which supposedly could explain the source of flood waters, pre-flood climate, or post-flood

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deep-freezing and glaciation effects *by natural rather than supernatural causes*. However, all of them suffer from conflicts with established physical law or physiological limitations. They are all impossible without special divine intervention to overrule the laws of physics, and some of them, even with miraculous intervention, would require such drastic reconstruction of the earth environment as to make them seem most untenable as models for the pre-flood earth. It is proposed to examine these ideas with respect to the most obvious flaws, some of which have no doubt been recognized by other students of the subject.

Critical Examination of Canopy and Other Models

1. A water vapor canopy containing a substantial part of the flood waters

For purposes of discussion let it be assumed that the vapor canopy contained on the order of 1000 feet of liquid water equivalent. If clouds were present they could only account for a small fraction of the total water, for clouds containing large amounts of water (i.e., a few inches) can only continue suspended in the atmosphere through the effect of violent thermal convection currents. Therefore, the model is that of an earth surrounded by an envelope of clear water vapor which when condensed would produce a layer of liquid water 1000 feet deep to account for an appreciable portion of the waters of the flood of Noah. A number of serious problems arise in such a canopy model.

a. The problem of light transmission

Studies made in the clear, pure waters of Crater Lake in Oregon indicate that at a depth of 1000 feet the downwelling irradiance is only about 0.2 percent of that in the surface layers of the lake water.[6] Of course in liquids, absorption is the main effect which reduces light penetration, whereas in gases scattering is the major effect except in the wavelength ranges of absorption bands of the particular gas.

Theoretical calculations of scattering of sunlight in the atmosphere by water vapor show that with only one centimeter liquid water equivalent in the atmosphere, the attenuation due to scattering by water vapor is two to four percent in the visible range.[7] But in this hypothetical model the atmosphere would contain 30,000 times this amount of water vapor. Thus it is doubtful that more than a few percent of the sun's light could

reach the surface of the earth. And it is certain that no stars would be visible, although Genesis 1:16 implies that stars were visible.

b. The problem of increased atmospheric pressure

Very serious difficulties would also result from the increased air pressure produced by the load of water in the upper atmosphere. This additional pressure would be equivalent to that 1000 feet beneath the surface of a body of water, about 29.5 atmospheres or 450 lbs/inch². It has been thought by some that since scientists have lived under high pressures in undersea laboratories, it is conceivable that such conditions existed on the earth prior to the flood. But there are at least two seemingly unsolvable problems associated with this idea.

1) First, at depths greater than 150 feet the nitrogen in air begins to have a narcotic effect upon divers.[8] This makes it impossible to use air at great depths. The practice is to replace the nitrogen with helium. Therefore, to make the idea work in the pre-flood world the earth's atmosphere would have to have all of the nitrogen replaced by helium. This is a gross absurdity, especially since the plant world needs the atmospheric nitrogen.

2) The higher pressures required at greater depths make the oxygen in air toxic, even deadly, because living tissues cannot stand the effects of oxygen at partial pressures greater than 0.65 atmospheres.[9] Therefore, at great depths the oxygen content of the gas sent to the diver is much reduced, even to as low as one percent at a depth of 1000 feet. So a canopy model would require that the oxygen content of the atmosphere be reduced to this very low level.

c. Further difficulties

In addition, rudimentary consideration of such a model for the pre-flood atmosphere soon reveals other embarrassing difficulties. First, the additional pressure of 29.5 atmospheres would compress an atmosphere like the present into a layer only about 1000 feet thick. Above this there supposedly would be the canopy of water vapor equivalent to 1000 feet of liquid water. The pressure at the lower part of this canopy, 29.5 atmospheres, would require a temperature no less than 234 °C or 453 °F to prevent the water vapor from condensing into liquid form.[10]

Under such conditions the world would be a treacherous place in which to live. Mountain climbing would be a dangerous sport, and birds dare not fly high. And just a slight "cold snap" in the canopy might precipitate rain at a temperature of over 400 °F!

It seems obvious that any model of the pre-flood atmosphere requiring such modifications of the earth's air supply is unacceptable. A vapor canopy may well have existed in the antediluvian world, but its total water content could only supply a very minor part of the flood waters, on the assumption, of course, that the canopy was sustained by natural forces rather than supernatural.

To this author's knowledge there is no way that any gas can be added to the earth's atmosphere without increasing the surface pressure correspondingly. There is no force known to physics which could suspend a large

amount of water vapor in the outer atmosphere without increasing the surface pressure proportionately to the total mass of the water vapor. With an assumed canopy water vapor temperature of 453 °F, then 99 percent of the water vapor would be within 68 miles of the earth's surface, and half would be within 10.3 miles.[11]

It has apparently been assumed by some that if the water vapor were raised to a very high temperature, this would somehow help to keep the water vapor suspended without increasing surface atmospheric pressure. Such is not the case. The effect of raising the temperature is to expand the vapor envelope against the attracting force of gravity, but the resulting decrease in surface pressure would be minor.

For example, if the temperature of the vapor canopy were raised to 2000 °K (3140 °F), half of the water vapor would be within 40.5 miles and 99 percent within 270 miles of the earth's surface. This is calculated neglecting the fact that the earth's gravitational field diverges, so that the equipotential surfaces are spherical rather than planar.

However, in this atmospheric model three-quarters of the mass is within about 80 miles of the earth's surface, which is only about two percent of the radius of the earth. Since the force of gravity varies inversely as the square of the distance from the earth's center, the decrease in gravity corresponding to an altitude of 80 miles would only be about twice two percent, or four percent. Consequently, the alteration of a canopy model due to the divergence of the actual gravitational field of the earth would be an expansion of not more than about four percent.

Thus these conclusions are not substantially affected by the simplifying assumption of a uniform gravitational field. A model for the water vapor canopy which features a very high temperature does not solve the problem of excessive surface pressures resulting from a large amount of water vapor in the canopy.

Another idea that some have entertained is that water in an ionized form could possibly account for large amounts of water in the canopy without a large resulting surface pressure. However, for this to work, all of the suspended water molecules would have to be ionized. But the mutual repulsion of ions in a space charge so huge (2.5 × 10³⁶ statcoulombs) would blast the ionized water completely out of the galaxy and explode the galaxy in the process.[12] The ionized water scheme is entirely untenable.

It can be concluded from all of the above considerations that a pre-flood water vapor canopy model which postulates a water content sufficient to account for an appreciable part of the flood waters is unacceptable, unless special divine intervention is postulated to maintain the canopy prior to the flood and to deliver it to the earth as water at the appointed time.

2. A rigid, spherical ice shell around the earth, supported either by structural strength or by centrifugal force, which finally collapsed to produce flood and glaciation

It has been supposed by some that such a shell could be supported due to structural strength. However, calculation of the compressional force upon such a shell shows this model to be impossible also.

If M is the mass of the earth; G, the universal gravitational constant; ρ, the density of ice; and r, the radius of the shell, then the crushing pressure on the ice in the shell is $P = MG\rho/2r$. Taking the radius of the shell to be 4160 miles (i.e., 200 miles above the earth's surface), then $P = 3.9 \times 10^6$lbs/inch^2. But the crushing strength of granite, surely stronger than ice, is only 34,000 lbs/inch^2. The ice shell would crumble instantly. It could never exist supported by structural strength. And, of course, the problem of light absorption would be about the same as or greater than that for water considered above.

Others have supposed that a spinning ice shell could be suspended by centrifugal force against the force of gravity. However, only a rudimentary knowledge of physics is required to see that the centrifugal force is directed radially outward, perpendicular to the axis of rotation of the shell. Thus there would be a force to suspend the ice shell only around the equator, and the rest of the ice shell would immediately collapse. Also, the crushing stress at the equator would be the same as for the stationary shell.

Another problem vitiates the idea of a spinning shell, for such a shell would carry a vast amount of kinetic energy. The average amount of this kinetic energy per gram of the ice shell is given by the formula $KE = MG/3r$, if the spin rate is just sufficient to make the centrifugal force equal to the opposed force of gravity at the shell's equator. Given the same shell as that hypothesized above, according to this formula one could predict a kinetic energy of $KE = 4740$ calories/gram. But to convert a gram of ice at $0\,^\circ K$ (i.e., $273\,^\circ C$ below zero) into steam at $100\,^\circ C$ requires only about 860 calories. Therefore, if such a spinning ice shell were to collapse onto the earth, it would produce neither a flood nor any freezing effect. Containing over five times the energy needed to vaporize the ice, it would instead scourge the earth with a scalding hot, superheated steam bath.

3. Water or ice in any kind of orbit

The results of delivery to the earth from orbit would be the same as for the spinning ice shell considered above—a scalding hot, superheated steam bath, not a flood or freezing.

4. Water vapor, water, or ice from deep space

The escape velocity from the earth's surface, given by the formula $V = \sqrt{2MG/r}$, is about 6.95 miles/sec, when r is the radius of the earth. Any object falling from deep space will attain at least this velocity by the time it strikes the earth's surface. The corresponding kinetic energy is 6.25×10^{11}ergs/gram or 14,900 calories/gram. This is about 17.5 times the amount of heat required to convert ice at absolute zero to steam at $100\,^\circ C$. Again, a steam bath would result instead of a flood, or a deep freeze effect, or glacial ice caps.

One widely discussed model has a "visitor" to earth's vicinity from deep space which brings with it an icy satellite. Supposedly the icy satellite collides with the earth to produce flood, deep freeze, and glaciation effects. Consider the following model, which is something like Patten's in Reference 5.

Assume that the mass of the visitor is one-tenth that of the earth, that its apogee distance is 10,000 miles, that its orbit about the earth is parabolic, and that the satellite orbits the visitor at a distance of 10,000 miles. Then the following data on the orbits are obtained: apogee velocity of the visitor relative to earth is 7.0×10^5 cm/sec.; velocity of the satellite in its orbit relative to the visitor is 1.6×10^5cm/sec.

Without making a computer study of a three-body problem, which is beyond the current abilities of this author, it does appear that the satellite could not possibly arrive at the surface of the earth with a relative velocity less than $(7.0 - 1.6) \times 10^5 = 5.4 \times 10^5$cm/sec. It would surely be more, but this velocity corresponds to a kinetic energy of $KE = 3500$ calories/gram, sufficient to vaporize $0\,^\circ K$ ice four times over.

It has also been proposed that the ice from deep space was electrically charged so that it could interact with the earth's magnetic field. Protons, electrons, and ionized atoms from space do so interact and are strongly deflected, but their charge-to-mass ratio is millions of times greater than could possibly be the case for any charged ice crystal. Thus any deflection would be small; and kinetic energy would not be affected anyway. Electrical charge on the ice crystals could not prevent a heat catastrophe upon their collision with the earth.

Non-supernatural Models Fail

This critical examination of models which hypothesize the provision of substantial amounts of water or ice by means of a water vapor canopy, ice or water in orbit, an icy shell, or ice or water vapor from deep space, strictly in accord with natural law and without miraculous supernatural intervention into the natural order, shows that all models are doomed to failure. They cannot be made to fit with the established laws of physics or with the physiological requirements of life.

There were numerous supernatural aspects of the deluge, notably the divine announcement and purpose, the divinely given plans for the ark, the perfect timing and coordination of various geological and atmospheric events, the voluntary gathering of the animals, the maintenance of those animals for a year on the ark, and the preservation of the ark and eight souls during a year of global violence unequalled in the history of the world since creation.

Why, then, should creationists feel inadequate if they cannot devise a detailed natural mechanism for other aspects of that great cataclysm? God is not inadequate, after all, for any need or circumstance. There is no need for naturalistic speculation in the attempt to explain these events, when each speculation can be negated as shown.

Suggested Guidelines for Canopy Models

The earlier considerations do in no way rule out an antediluvian atmospheric regime far different from the present conditions, a regime which may have been maintained by natural and/or supernatural means. The pre-flood atmosphere may have and (in this author's

opinion) probably did have a water vapor canopy which produced a powerful "greenhouse effect" upon global climate.

The history of canopy models has thus far been marked by highly speculative discussions with little effort at quantitative modeling. Perhaps efforts at quantitative modeling can now proceed since some idea of the limitation that must be placed upon the total water content of the atmosphere can be known. Consider now a very simple model.

The total water content of the present atmosphere is about equal to only one inch of liquid water.[13] If this were increased to no more than, say, six inches of water, the effect upon the global climate pattern would certainly be radical. Even in the present atmosphere the water vapor and clouds account for the major part of the absorption of energy by the atmosphere. Addition of five inches of water to the atmosphere would result in only a negligible increase in surface pressure.

For a highly simplified initial model, then, let us assume that the atmosphere contains six inches of water and that the dry air has a composition at sea level of 21 percent oxygen and 79 percent nitrogen. Assume further that the uniform temperature is 27 °C (80.6 °F), that thermodynamic equilibrium is maintained throughout, and that all gases obey the perfect gas law. (The six inches of water corresponds to a water vapor partial pressure at sea level of 11.2mm Hg.)

If total pressure at sea level is 760mm Hg, the partial pressures of oxygen and nitrogen will be 157mm Hg and 591mm Hg, respectively. With a water vapor partial pressure of 11.2mm Hg, since the saturation vapor pressure of water at 27 °C is 26.74mm Hg, the sea level relative humidity will be 42 percent.

Assuming that all of the gases obey the perfect gas law, that acceleration due to gravity is uniform, and that thermodynamic equilibrium prevails, the partial density of each constituent gas varies as an inverse exponential function of the altitude. (See Reference 11 again.) In the upper regions of the atmosphere the relative amounts of the lighter gases will be increased over present sea level values.

Thus in this model the sea level water vapor content is 9.4×10^{-3} grams per gram of dry air. But at an altitude of 30km (18.6 miles) the water vapor content is increased to 33.6×10^{-3} grams per gram. In the present atmosphere the water vapor content in the stratosphere is much lower, about 2×10^{-6} grams per gram.[14] Thus in this model the water vapor content of the upper atmosphere is increased by a factor of about 17,000.

With this highly oversimplified model as a starting point, estimates can be made of the energy absorption and radiation characteristics of the atmosphere, and some preliminary conclusions can be drawn about how the dynamic model would have to differ from the beginning equilibrium model. It might then become evident whether or not such a model has the potential for producing the type of climatic regime which creationists have postulated from the Biblical record of the pre-flood era and from the data of paleontology. To do so here would make this article far too long; the matter must be followed up later.

It can be noted in passing that the degree of increase postulated above for upper atmosphere water vapor would not substantially alter the rate of carbon-14 production by neutrons generated by cosmic rays. There would have to be an additional increase by a factor of 10 to 100 before a large-scale effect on carbon-14 production would occur, with correspondingly large effects upon carbon-14 age estimates.

Quantitative modeling of atmospheres is an exceedingly complex enterprise, one which this author is not at all qualified to undertake. The sliderule estimates in this paper are only offered as a preliminary approach to the problem in the light of the rough limitation on total water content which has been established. Certainly in a detailed model other atmospheric constituents such as carbon dioxide and ozone would have to be taken into account, along with water vapor, in radiation and absorption calculations.

It would seem that the most difficult problem in modeling the type of atmosphere generally assumed by creationists for the pre-flood world would be the maintenance of stability on a rotating planet receiving radiation from the sun. No doubt many other difficulties would arise in such a modeling effort. However, if creationists are going to continue assuming the effects of a pre-flood water vapor canopy, it is time to get the models bounded by the known physical requirements and proceed to work on quantitative details.

Waters from the Windows of Heaven

A final remark concerning the source of flood waters is in order. The language of the Scriptures seems to suggest supernatural provision. For example, Stanley Udd has presented exegetical and grammatical evidence for the view that the "waters above the firmament" of Genesis 1:7 were liquid waters.[15] If this be the case, these waters were sustained in some arrangement in space by supernatural fiat, and they may have been the source of waters supernaturally delivered through the "windows of heaven" as recorded in Genesis 7:11.

Acknowledgement

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[8]McGraw-Hill Encyclopedia of Science and Technology 1971, Vol. 4, p. 284.

[9]Ibid., pp. 284-285.

[10]Handbook of Chemistry and Physics, 56th Edition 1975-1976, p. E-19.

[11]For an atmosphere containing one constituent gas in accord with the perfect gas law at a uniform temperature and in a uniform gravitational field, the density expressed as a function of altitude is $\rho(h) = \rho(0)e^{-ah}$
where

$$\rho(0) = \frac{Mp(0)}{RT}$$

$$a = \frac{Mg}{RT}$$

M = molecular weight
R = gas constant
T = absolute temperature
$p(0)$ = surface pressure
g = gravitational acceleration

The formula for the altitude below which a given fraction f of the total atmospheric mass resides is $h(f) = \dfrac{-2.303 \log(1-f)}{a}$

[12]The electrostatic energy of a charge Q placed on a sphere of radius r is $E_e = Q^2/r$. To concentrate a charge $Q = 2.5 \times 10^{36}$ statcoulombs on a sphere of radius $r = 8000$ km would require energy imput of 7.8×10^{63}ergs. The gravitational self energy of the galaxy is of the order $E_g = GM^2/R$, where G is the gravitational constant, M the mass, and R the average radial distance of mass from the center. The magnitude for our galaxy is about $E_g = 1.3 \times 10^{59}$ergs. So such a hypothetical charged earth could blow up 10,000 galaxies!

[13]McGraw-Hill Encyclopedia of Science and Technology 1971, Vol. 6, p. 630.

[14]Ibid., Vol. 1, p. 678.

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WHAT ABOUT DENDROCHRONOLOGY?

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The field of dendrochronology is reviewed and probable sources of error, especially for the bristlecone pine chronology, are indicated.

Creationists are interested in all dating schemes, including dendrochronology.[1] An attempt will be made in this paper to outline the state of this science, based on a very readable work by Avery[2], and point out probable sources of error in a tree-ring chronology.

Origin of Dendrochronology

Andrew E. Douglass, an astronomer in Arizona, became interested in the early 1900s in the cyclic nature of solar activity, especially sunspots, as possibly related to climatic variations on earth. He surmised that variations in the width of tree rings might indicate past climatic changes.

Studies by Douglass showed that precipitation is the most limiting climatic factor affecting tree growth in the southwestern United States, with narrow rings associated with years of low precipitation. As climatic variations tend to encompass large regions, narrow rings in two or more trees may be matched although they grew over 200 miles apart. This matching of corresponding growth rings is called crossdating.

Crossdating

By matching tree-ring patterns of old living trees and long-dead wood, with special attention to narrow rings, a chronology can be established reaching far into the past. A wood sample, from an Indian ruin, for example, may be found to match that chronology at some point, thereby indicating the date the tree was felled and the structure was built.

Ring patterns of ancient wood which do not fit the "absolute chronology" established from the present

backwards provides a "floating chronology". The discovery of a wood specimen which bridges the gap between an absolute chronology and a floating chronology is of great value.

Generally, trees growing under adverse conditions provide more distinctive ring patterns. Most studies in the United States have used ponderosa pine (*Pinus ponderosa*), pinyon pine (*P. edulis*), limber pine (*P. flexilis*), bristlecone pine (*P. aristata*), Rocky Mountain juniper (*Juniperus scopulorum*), Douglas-fir (*Pseudotsuga menziesii*), and giant sequoia (*Sequoia gigantea*). Conifers tend to display "sensitive" ring patterns in contrast to the more "complacent" ring patterns of hardwoods.

Methods of Ring Pattern Matching

The matching of ring patterns is usually done by one of three methods: (1) memory, (2) skeleton plots, (3) graphic plots of ring widths. Also, computer-programmed correlation routines are sometimes used to evaluate all possible matches between two series of ring indices.

How reliable are these techniques? This is an important question to creationists, for by these techniques the oldest living bristlecone pine ($\approx$ 4000 years) and dead wood have been crossdated to provide a chronology assumed to extend back 8200 years, about twice the time allowed in some creation models.

Few workers would claim much reliability for the **memory method**, which requires committing entire ring series to memory; although it appears Douglass had unusual ability in this respect.

Skeleton plots consist of a graphic representation of relative ring widths over dates, with the greatest value assigned to "missing rings", almost as great a value for a microscopic ring; and average ring widths are often

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