THE SKY HAS FALLEN

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ABSTRACT

Of the various canopy models proposed to describe the climatic conditions before the flood of Noah and the 40-day, world-wide occurrence of rain, the vapor canopy model seems to provide the best explanation. Mathematical models of the vapor canopy are being developed to show its stability and implications on climate and weather prior to the flood. Model predictions are compared with historic evidences.

INTRODUCTION

The world-wide flood recounted in Genesis has no parallel in today's world. The tropical climate prior to the flood, with its lack of rain and rainbows, would imply that the atmosphere (firmament) was different from that of today. Few serious attempts have been made to explore the meteorology of the flood and the atmosphere of the antediluvian world. This paper will attempt to develop a model of the atmosphere that Adam and his descendants likely experienced. The implications of this model will be compared with Biblical accounts and evidence from geologic strata. These attempts to understand what the atmosphere was like before the flood help us to realize that, indeed, "The Sky Has Fallen."

THE EARTH'S ATMOSPHERE TODAY

In today's atmosphere most of the radiation from the sun shines through the thin layer of air surrounding the earth to the surface. A relatively small amount is absorbed directly by the air (~15%). Most of the radiation is either returned directly back to space by reflection (~35%) or absorbed at the ground (~50%) and converted to heat. This means that the atmosphere is warmed from the bottom like a pan of water on a stove. In the lower atmosphere, because of the heating from below, the temperature decreases with altitude. This is why many people drive to the mountains in the summer to escape the heat. On an average day the temperature at sea level might be 80 degrees F while it may be only 50 degrees F in the mountains and -10 degrees F at 20,000 feet above sea level. This decrease in temperature with altitude causes the lower atmosphere to occasionally be unstable and tend to overturn like water boiling in a pan on the stove. When air overturns and mixes vertically, it produces clouds, storms, and precipitation.

The pressure at the bottom of the atmosphere today averages about $14.7\#/in^2$ at sea-level. Pressure is the weight of the overlying air per unit area. As one climbs a mountain, more of the air is beneath him and the weight of air above is less, therefore, the pressure is less. If more air were added to the earth's atmosphere, the pressure at the surface of the earth would be greater.

If all of the water vapor in the air surrounding the earth today was condensed into liquid and precipitated to the earth's surface, it would form a layer less than 1 inch deep. Local floods occur today where it has rained several inches per hour for a few hours and even greater rates for a few minutes at a time. But, at no time since the great flood of Noah has it rained for 40 days and nights over the entire earth and covered the earth with great depths of water. Today's atmosphere does not contain enough water to even come close to such a flood.

On today's earth the polar regions are extremely cold and the equatorial region very hot. This temperature difference between the equator and the poles is due to the unequal radiation balance in the two regions. At the poles more long-wave infrared radiation is given off to space than is received in the form of direct, short-wave visible and ultraviolet radiation from the sun. At the equator more short-wave radiation from the sun

is received than is given off to space as long-wave radiation. This means the poles are tending to cool and the equator is tending to warm. However, over a long period of many years, the poles are not getting colder nor is the equator getting warmer. The reason the temperature is not changing is because heat is being transferred from the equator to the poles in the atmosphere and oceans. This transfer of heat is what causes winds, jet streams, highs, lows, and storms in the atmosphere. Rainy climates and deserts are also associated with the circulation patterns caused by this transfer of heat from the equator to the poles.

Clouds tend to form in regions of the atmosphere where the air is rising. Clear skies occur where air is sinking. Clouds form in layers called stratus when the air rises gently over large areas and in cotton-candy shapes, called cumulus, when air rises quickly in small areas. High in the atmosphere where the temperature is below freezing the liquid cloud droplets turn to ice and produce clouds called cirrus. Cloud formation is an important feedback mechanism in the radiation process because clouds are such effective reflectors and absorbers of radiation.

A BIBLICAL DESCRIPTION OF THE PRE-FLOOD ATMOSPHERE

> Then God said, 'Let there be a firmament in the midst of the waters, and let it divide the waters from the waters.' Thus God made the firmament, and divided the waters which were under the firmament from the waters which were above the firmament; and it was so. And God called the firmament Heaven. So the evening and the morning were the second day. Genesis 1:6-8 NKJV

On the second day of creation God formed the atmosphere (firmament). It would appear from the description in Genesis that God took some of the water He created on the first day and placed it above the atmosphere to form a type of "canopy." Insufficient information is provided to determine if this canopy was in direct contact with the atmosphere or what form the water took. The water could have been in any of four phases--liquid, solid, vapor or ionized molecules. If the canopy was in the liquid phase, the water would probably have been distributed as droplets in clouds completely surrounding the earth. However, it is unlikely that a large quantity of water took the form of cloud droplets because the sun, moon, and stars would have been obscured. Genesis 1:17 states that "God set them (the sun, moon, and stars) in the firmament of the heavens to give light on the earth . . .".

If the canopy was in the solid phase, the water would probably have been distributed as small ice particles in equatorial rings similar to Venus. Such rings would allow for a large quantity of water to be stored above the atmosphere without fully obscuring the sun, moon, and stars.

If the canopy was in the form of vapor, it would have surrounded the entire earth and rested directly on top of the lower atmosphere. Because of temperature constraints, which we will explore in a moment, the quantity of water which could have been stored in such a canopy is limited. However, only minor obscuration of the sun, moon, and stars would have occurred.

If the canopy was in the form of ionized molecules, it would have appeared similar to a vapor canopy except it would not necessarily have been in direct contact with the lower atmosphere. Since the molecules are charged, the water could have been maintained in higher shells above the earth due to electromagnetic forces similar to the Van Allen belts today.

It is my conclusion that God probably placed the water above the firmament in all four phases. I tend to believe that the majority of the water was in the solid phase in rings surrounding the earth, but that the orbits of these rings were slowly decaying. Water was probably being slowly fed to the ionized regions and to a vapor canopy in immediate contact with the lower atmosphere. Some thin cloudiness probably occurred seasonally and diurnally.

The climate that Adam and Eve experienced in the Garden of Eden gives the impression that it was a tropical paradise. Genesis 3:7,8 says that they were naked. The implication is that they were comfortable without clothing even in the cool of the day. The discussion of the plants which Adam tended leads one to believe that the plants grew in a fertile, moist environment. Yet, Genesis 2:5-7 says that there was no rain on the earth during this time, but rather a mist watered the ground.

Now this picture is completely different from that which we experience today. Rain is a common feature of the climate over most of the earth. Only in desert regions or frozen polar regions is there no rain today. A condition on the earth where there was no rain yet tropical vegetation abounds would require a vastly altered atmosphere from today. No rain would suggest no clouds, at least none which precipitated. No precipitating clouds would imply no storms and no storms would imply a weak to non-existent general circulation

pattern over the earth. This would mean no winds, no high and low pressure areas, no jet stream, and very little temperature difference between the equator and the poles. In other words, the lack of rain on the earth requires a quiescent, tropical, greenhouse type of environment over the entire earth.

The covenant God made with Noah never to again send another worldwide flood even supports this concept of a pre-flood tropical climate. Although God may have supernaturally changed the physical laws of our universe to allow rainbows as the sign of the covenant following the flood, it is likely that rainbows never occurred before the flood because there was no rain. Rainbows require bright sunshine to fall on rain-sized precipitation drops. Before the flood, mist-sized droplets were not adequate to produce a rainbow. In addition, the appropriate wavelengths to form rainbows may have been absorbed by a canopy above the atmosphere.

One of the reasons God's message to Noah of judgement on the earth by a flood was rejected by his neighbors during the 120 years it took Noah to build the ark was the lack of familiarity people had with floods and rain. It is hard to imagine the fear which must have entered the hearts of Noah's neighbors when the clouds began to form, winds began to blow, lightning and thunder occurred for the first time, and rain began to fall in greater quantities than even we have ever seen. The first-time occurrence of such awesome spectacles must have frightened adults more than children are frightened at night by thunderstorms today.

A MATHEMATICAL MODEL OF THE PRE-FLOOD ATMOSPHERE

One method used to study geophysical phenomena is to construct models and compare observations with model predictions. These models may be conceptual, physical, or mathematical. For example, Fultz (1) has built a physical model of the earth's global circulation called a dish-pan experiment. By rotating a doughnut-shaped pan of liquid with a temperature differential between the inner and outer surfaces, he was able to simulate motions we observe in today's atmosphere. This same apparatus has been used to simulate atmospheric motions on other planets by rotating the pan at different rates and using different temperature gradients.

Whitcomb and Morris (2) have developed a conceptual model of the vapor canopy which Dillow (3) has expanded significantly. Dillow (4) has made other important strides forward by attempting to quantify the theory. He has developed mathematical models of portions of the vapor canopy theory and compared the results with related observations in the geological record. We will describe Dillow's model and show how the results of his model agree with the Biblical description of the pre-flood atmosphere.

Dillow assumed that the equivalent of about 1 atmosphere of liquid water in vapor form rested on top of today's atmosphere before the great flood. The value of 1 atmosphere was selected because of the concern for oxygen poisoning over long periods of time at pressures greater than about 2 1/2 atmospheres at sea-level. The equivalent of one atmosphere of water resting on top of today's atmosphere would increase the surface pressure to twice what it is today. Dillow actually chose a value of 40 feet of liquid water based on the assumption that 1 foot of rain fell each day (1/2" per hour) for 40 days and nights. Since this is only an approximate value limited by constraints such as oxygen poisoning, a value of 1 atmosphere was assumed in this paper for the initial model. If some of the constraints can be relaxed, the different values of the vapor content can be studied. However, most of the features which we believe are important to this model will be illustrated with this value. It is obvious that the condensation of such a canopy covering the earth with 30-40 feet of water is not sufficient to explain the great flood of Noah. I believe that the major portion of the flood waters may have come from sources above a vapor canopy, such as ice rings or ionized belts. The water may also have come from within and beneath the crust of the earth during tectonic and volcanic activity in the flood. The Bible calls these subterranean sources "the fountains of the deep."

In order for the equivalent of 1 atmosphere of liquid water to exist in vapor form in the earth's gravitational field, its temperature would have to be such that the pressure at any level in the canopy would not exceed the saturation vapor pressure of water at that level. Otherwise, the canopy would collapse by condensation. Since the saturation vapor pressure of water is an exponential function of temperature, increasing as the temperature increases, the temperature at the base of the canopy will determine how much water vapor can be maintained in the canopy above.

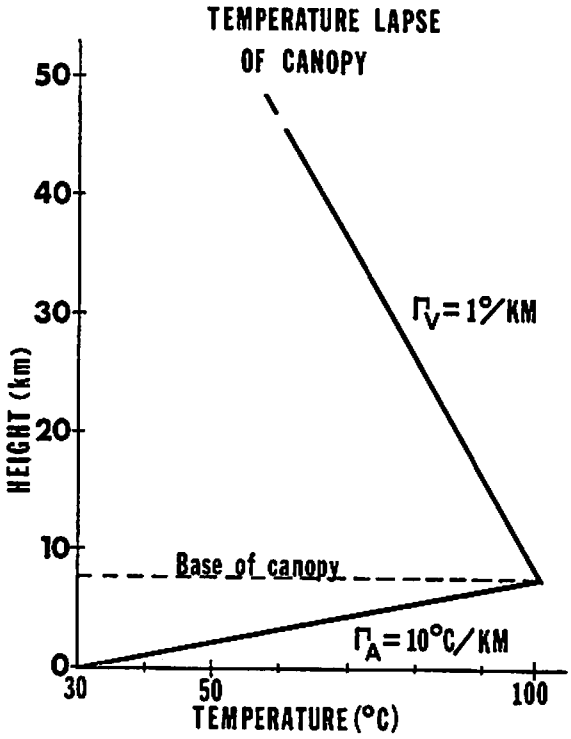

Figure 1. Plot of Temperature vs. Height in the canopy and air beneath.

Figure 1 shows an assumed temperature distribution from the surface of the earth up through the layer of air beneath the canopy and on up through the vapor canopy. This two-layer model with air below and water vapor above agrees with the Biblical description where God divided the waters which were under the firmament (atmosphere) from the waters which were above the firmament. The air beneath the canopy is assumed to be the same air we breathe today except it was compressed by the weight of the vapor above to a layer about 7 kilometers deep. When the flood occurred, removing the vapor above, this air was able to expand to the depth we observe today. The vapor canopy before the flood had a similar vertical mass distribution to that of the atmosphere today with its exponential decrease in density and pressure into space.

The temperature distribution in Figure 1 assumes the shape displayed because the temperature at the base of the canopy required to prevent 1 atmosphere of water vapor from collapsing is 100 degrees C. The temperature at the surface of the earth where Adam and Eve and their descendants lived could not be as warm as 100 degrees C or they would have been parboiled. The temperature must have decreased from the base of the canopy to the earth. The base of the canopy in this model is 7 kilometers above the surface. Since 30 degrees C would seem to be a warm but comfortable temperature in the Garden of Eden, an average temperature change of 10 degrees C/kilometer would seem reasonable.

The temperature distribution from the base of the canopy upward may have had some complicated distribution due to absorption and scattering of sunlight, but it must eventually have decreased to near absolute zero in space. However, each level had to be kept warm enough to keep the vapor pressure higher than the saturation vapor pressure in order to prevent condensation. A decrease of 1 degree C/kilometer upward is sufficient to maintain the vapor canopy while, at the same time, decreasing toward absolute zero. It is likely that the presence of such a large quantity of water vapor will absorb and scatter most of the direct solar radiation before it reaches the earth's surface. This means the canopy was probably the source of heat in the pre-flood atmosphere rather than the ground surface, as it is today.

These exact values of temperature lapse rate are only assumed but are close to those required by the earlier assumptions. These values can be used to test further implications of the model. For example, if the vapor canopy is not to collapse during the 1600 years or so from it's creation to the flood, the vertical temperature distribution must be maintained by solar absorption and emission. If solar radiation can not maintain a lapse rate similar to that in Figure 1, the model is not a valid description of the pre-flood atmosphere.

Figure 2 shows the vertical pressure distribution of such a two-layer model with the temperature distribution assumed in Figure 1. Notice that the total pressure curve crosses the saturation vapor pressure curve at the base of the canopy. This means that unless the temperature is slightly hotter than 100 degrees C, some of the vapor at the base of the canopy will condense to liquid and precipitate out as rain until the total pressure is reduced below the saturation vapor pressure. Beneath the canopy water vapor will condense in the colder air until it is again below saturation.

A new constraint is encountered at this point in the analysis. Mixing of water vapor from the canopy above into the air beneath must be minimal. If this is not true, all the vapor above will eventually condense in the air beneath and precipitate to the ground. It turns out this constraint may not be as bad as it initially sounds. First, the amount of mixing

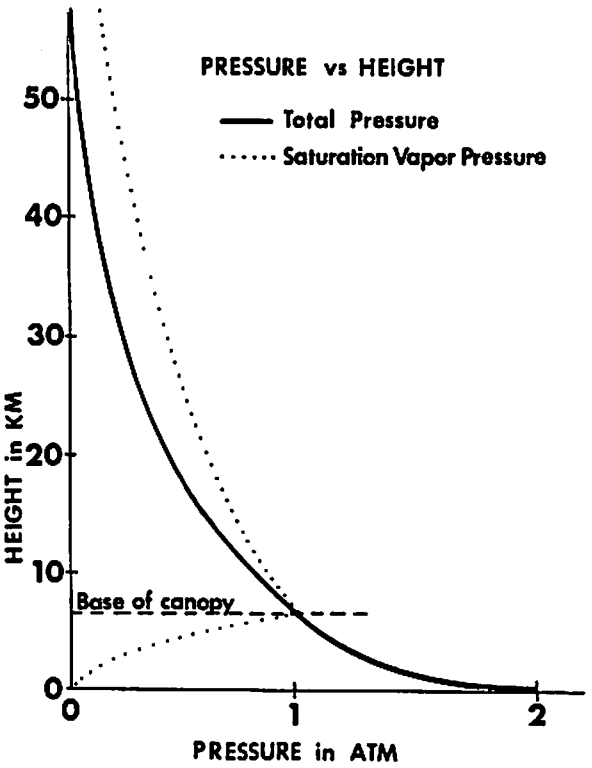

Figure 2. Plot of total pressure and saturation vapor pressure vs. height in the canopy and air beneath.

is likely to be very small based on the temperature distribution. In the canopy and particularly in the layer of air below, the temperature distribution produces extremely stable conditions. That is, no convection or organized vertical mixing would occur because the air and vapor have no tendency to turn over. Under these conditions, vertical mixing by turbulence would be negligible. Second, if other sources of water are available from ice rings or ionized regions, losses from the bottom of the canopy by mixing into the air below could be compensated by gradual input from above.

THE GREENHOUSE EFFECT

The greenhouse effect gets its name from the observation that the air inside a greenhouse is warmer than the air outside because heat is trapped by the glass windows. Shortwave radiation from the sun travels relatively unimpeded through the glass but longwave radiation returning from the plants and earth inside the greenhouse cannot easily be transmitted back through the glass. Consequently, the heat is trapped and the temperature in the greenhouse rises. A similar effect occurs in our atmosphere today. If it were not for this effect, the surface of the earth would be like the moon which gets extremely hot during the day and extremely cold at night.

Prior to the flood, the greenhouse effect would have been amplified greatly. An amplified greenhouse effect not only would have caused the atmosphere to be warmer but would have tended to create a uniform temperature distribution from equator to poles. In addition, it is likely that the temperature in the canopy would have been greater than that near the surface of the earth. In the pre-flood atmosphere, if one were to have gone to the mountains to cool off, assuming there were any mountains prior to the flood, he would have found that the temperature increased rather than decreased as he got higher. Such a condition is called an inversion. We know that such conditions lead to pollution episodes around large cities today because under an inversion the air is very stable and the winds are very light to non-existent. 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! The entire earth, including the poles, would have been much warmer than it is today.

There is abundant evidence that the polar regions were much warmer at one time. A fallen 90-foot fruit tree with ripe fruit and green leaves still on its branches has been found in the frozen ground of the New Siberian islands. The only tree vegetation that grows there now is the one-inch high willow. Palm tree fossils have been found in early tertiary strata in Alaska. Large fossil leaves of tropical plants have been found in Permian sandstone 250 miles from the South Pole. Crocodiles were once prolific in New Jersey and England. It is estimated that the mean sea-level air temperatures at the poles was 45 degrees F during the Cretaceous period. Today, the temperature is -4 degrees F.

The evidence of warm polar regions is so extensive that the theory of continental drift was developed by evolutionary geologists to help explain how tropical fossil material can be accounted for at the poles. The vapor canopy theory on the other hand, explicitly predicts tropical vegetation at the poles without the need for refinements to the theory.

INCREASED ATMOSPHERIC PRESSURE

There are several features in the geologic record which might be explained by greater atmospheric pressure at some time in the past. One of the puzzles of natural history is the gigantic flying reptiles called the pteranodon. This flying reptile had wingspans of up to

20 feet. Many authors have questioned how such an animal could launch itself in the air from flat ground. The minimum speed for the pteranodon has been computed to be more than 15 mph in today's atmosphere. Since the pteranodon could not run, this meant that a wind of more than 15 mph would have had to occur before the reptile could become airborne. Pilots know, however, that it is easier to take off at lower altitudes where the pressure is greater. If the atmospheric pressure were twice what it is today prior to the flood, it would have been much easier and required much lighter winds for the pteranodon to take off. Calculations show that it would have required a wind of just over 10 mph for the pteranodon to get airborne in the pre-flood atmosphere.

Even more intriguing is the recent discovery of the pterosaur, a variation of the pteranodon. The Texas pterosaur is estimated to have had a wingspan of over 50 feet. The minimum flight speed in today's atmosphere would have been just over 25 mph.

If these reptiles flapped their wings to initiate and maintain flight, the power requirements likely would have exceeded the ability of the birds to maintain flight for a long time in today's atmosphere. In the pre-flood atmosphere with its greater pressure, however, it is likely the pteranodon and pterosaur would have had an easier time. In either environment, however, the biomechanics of these reptiles was near the margin of their ability to fly. This may explain why they are extinct today. After the canopy collapsed, the atmospheric conditions were no longer suitable for this type of creature.

Another illustration of the possible effects of greater atmospheric pressure before the flood is the presence of gigantism in the fossil record. Giant dinosaurs weighing over 40 tons, insects with 25-inch wingspans, and giant shell creatures, spiders, and other invertebrates once lived on the earth, but not today. Is it possible that the greater pressure in the pre-flood atmosphere was able to help supply more oxygen to the bio-mass of these animals allowing them to live longer, healthier lives and grow larger?

Evidences that higher oxygen pressures are beneficial to biological systems was discovered in the aquanaut program. One of the aquanauts reported that a severe cut on his hand healed completely within 24 hours while submerged in a diving bell at a pressure of 10 atmospheres. It was theorized that the higher pressure forced more oxygen into the tissue surrounding the wound and healed it at a greater rate. Based on this observation, experiments in hyperbaric surgery were started with excellent results. Higher atmosphere pressure has been found to result in relief from some effects of aging and the cure of some other diseases. It is not hard to believe that such an effect could be related in some way to gigantism and the longevity of life evident before the flood.

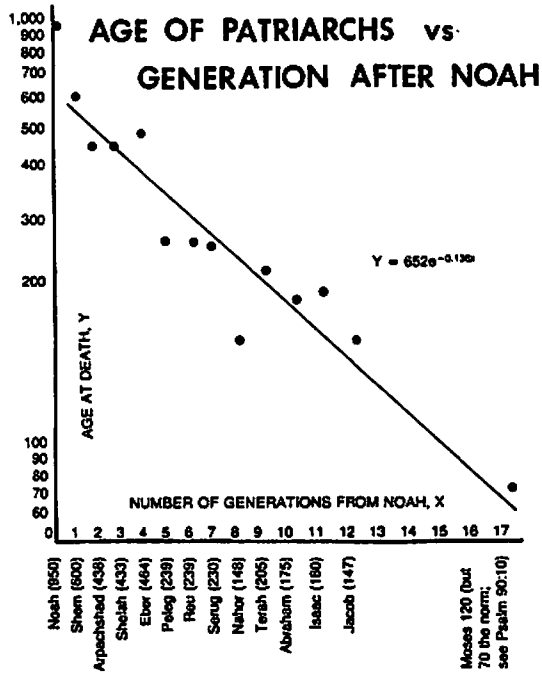

Figure 3. Plot of the age of the patriarchs vs. generation after Noah. After Dillow (3).

COSMIC SHIELDING AND LONGEVITY

Fluorocarbons have recently been replaced by less reactive propellents in aerosol cans because they are believed to destroy the ozone layer in the upper atmosphere. This ozone layer is credited with absorbing the majority of cosmic radiation which produces cancers in animal and human tissue. If a minor constituent like ozone in a thin layer of the upper atmosphere could be so important to our health, what would the impact be of an additional atmosphere of water vapor? Vail (5) first proposed that a vapor canopy surrounding the earth before the flood could have protected Adam and his descendents and "impelled" long life. He also suggested that its removal following the flood led to the reduction in human longevity to about 70 years which we experience today. Dillow (3) has analyzed the Biblical genealogies from Noah to Moses as shown in Figure 3. The decrease in the age of the patriarchs from Noah to Moses shows a good straight-line relationship on a semi-log graph of age versus generation after Noah. Such a relationship, when mathematically treated, shows an exponential decay process. This kind of relationship is normally related to a sudden change in conditions. In this

case, the primary change occurred during Noah's lifetime. Since we don't know the direct agent responsible for longevity, it's not possible to connect any particular feature of the flood with a decrease in longevity. However, from Figure 3 it is evident that something changed in the flood which, in turn, caused a change in the longevity of humans. One of the prime candidates for explaining such a change is the probable increase in cosmic radiation after the canopy collapsed.

CONCLUSIONS

Such a controversial model is bound to create discussion and criticism. At the same time, however, it will increase the interest and enthusiasm of specialists in the atmospheric sciences and the canopy theory. More quantification of such mathematical models is desirable and will result in further improvements of our understanding of the flood and the antecedent atmosphere. The final result will produce even greater confidence in the Word of God.

RECOMMENDATIONS FOR FUTURE RESEARCH

The primary need at this point is for modeling of the absorption and emission of solar radiation in the canopy. Dillow (3) has already begun work in this direction, but such models need to be made more complete and then extended to two dimensions. The main difficulty to be resolved is how the surface temperature can be maintained at 30 degrees C or less when the base of the canopy is about 100 degrees C only 7 kilometers above. This is expected to be difficult to achieve because the temperature would normally be expected to increase toward the ground in an "amplified greenhouse effect" environment. Venus has a similar environment and the surface temperature is about 700 degrees C. The introduction of cloud layers at selective altitudes, latitudes, and times of day may be of help.

If this problem can be resolved, the next step would be to incorporate such a radiation model into a global circulation model to study the wind fields and circulation patterns over the whole earth. These plans would require a sizeable computer and large quantities of computation time. The result would be a credible model of the pre-flood atmosphere.

ACKNOWLEDGMENTS

Many of the thoughts and issues presented in this paper were developed in discussions and letters with Joseph Dillow. More detail on these topics and many others may be found in his book, The Waters Above.

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