

Pastor Jeremy M. Thomas
Fredericksburg Bible Church

107 East Austin

Fredericksburg, Texas 78624

830-997-8834 jthomas@fbgbible.org

C1027 – August 4, 2010 – The Ice Age

We want to finish what we ended with last time. I wanted to fill your mind's eye with a possible scenario of the global Flood of Noah. To do that I borrowed from the work of Dr Walt Brown. Dr Brown got his Ph.D. from MIT in mechanical engineering and taught in the Air War College for over 20 years. He's been listed as one of the top 12 minds in the biblical creationist movement in the last 50 years. His model is called the Hydroplate Theory. Understand what we're doing here, we're not saying his model is correct down to the nth detail. We're saying that here is a Christian man who takes the biblical text seriously, he's been careful with the text and he's thought through the implications of the text in terms of his scientific expertise in order to give a possible scenario of the Global Flood of Noah. He's got all the mathematical equations and physics to back this up. This isn't just fluff, someone's grand idea. Understand there are years and years of study and calculations behind what he's saying.

Phase 1 is the Rupture Phase, this is Gen 7:11. Brown is thinking on this text describing the fountains of the deep bursting open. "In the six hundredth year of Noah's life, in the second month, on the seventeenth day of the month, on the same day all the fountains of the great deep burst open, and the floodgates of the sky were opened." That's describes this Rupture Phase and the formation of the Mid-Oceanic Ridge which is 46,000 miles long. Brown's point is that in the pre-Flood world large amounts of water was held in subterranean chambers about 10 miles under the earth's crust, and the pressure it exerted on the overlying crust eventually caused it to crack in verse 11 and that's when the earth burst open and released in supersonic jet stream of all the

subterranean waters. That's the physical evidence of God's initiation of the Flood in Gen 7:11.

Phase 2 is the Flood Phase is Gen 7:12-24, the waters came to prevail upon the earth due to the supersonic jet stream of water that erupted out of the earth. It spewed up into the atmosphere causing torrential rainfall all over the earth for forty days and forty nights, verse 12, "The rain fell upon the earth for forty days and forty nights," Erosive forces due to the spewing water caused a widening of the Mid-Oceanic Ridge causing sediments to bury billions and billions of organisms that we today find in the fossil record. The waters continued to get higher and higher until every high mountain under heaven was covered. So most of the rain came from within the earth not from a canopy above the earth. God says I will destroy the earth with the earth, not with the atmosphere. I'm not saying that it's impossible to have a canopy. God can do whatever He wants. I just pointed out that there are many problems with any kind of canopy you propose and they're not just scientific problems, they're textual problems. So the Flood Phase is Gen 7:12-24, at the end of which is stated, "The water prevailed upon the earth one hundred and fifty days."

Phase 3 is the Continental-Drift Phase, this is also occurring in Brown's model during Gen 7:12-24. During the prevailing period as the waters rose the gap of the Mid-Oceanic Ridge widened decreasing the pressure on the underlying new sea floor causing it to buckle up. It rose several miles high causing the continental land mass adjacent to it to begin sliding in opposite directions along the lubricated layer of water underneath. When the continents ran into obstacles they caused massive mountain building and ocean trench building.

Finally, Phase 4 is the Recover Phase; this is described in Gen 8:1-13, the retreat of the Flood waters began on the 150th day. Verse 1, "God caused a wind to pass over the earth, and the water subsided," verse 3, "and the water receded steadily from the earth," except in the Hebrew there is more violence, it wasn't a steady retreat. It was a back and forth retreat, sort of tidal, the waters would rise and then lower, rise and then lower in a retreat. The waters would run off the continents and collect in the newly formed ocean basins. That's the model.

Now, after this, what is the earth like? What is the post-Flood world like? Michael Oard, for 30 years professional meteorologist for the National Weather Service says, “The picture emerges at the end of the flood catastrophe, the earth is a barren world with no trees, no plants, no animals or birds except on the ark, all air-breathing land based animals had died and were fossilized or were in the process of being fossilized in the sediments of the flood. The newly formed stratosphere would contain a thick shroud of volcanic dust and aerosols due to the extensive volcanic and tectonic activity during the flood. It probably was a dark, depressing world. The oceans would have been uniformly warm; the initial conditions would be established for a second, much lesser, catastrophe, a post-flood transition to the present day climate, this would be a post-flood ice age.”

Our challenge is to go into this thing called the Ice Age. We do have physical evidence of an ice age.

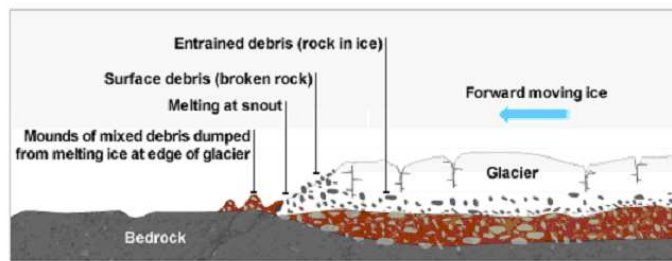
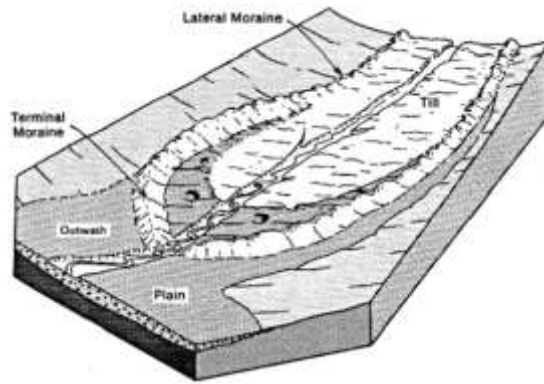
1. Physical Evidence

a. Glacial Boulders

Glacial boulders or what are also called “erratics” are large boulders left by retreating glaciers. These are kind of fascinating, huge boulders just sitting, apparently in the middle of nowhere. They can be small of course but the large ones are impressive. How did those get there? Glacial retreat.

b. Terminal Moraine

Let’s look at some other evidence, terminal moraines. Terminal moraines mark the maximum advance of the glacier. How far did the glacier grow, there’s physical evidence left called the terminal moraine. You can also see the lateral moraine in this picture, the sides.



As ice melts at the snout of the glacier, rock debris is dumped at the forward edge

As these things grow they pick up rocks and debris and push them to the leading edge. All along the way its carrying rocks in the ice. And they are sort of like conveyor belts inside, the ice actually moves the rocks at the bottom toward the front of the glacier as it grows. And so when the glacier stops growing and retreats it leaves a huge pile of rocks and debris.

This is how we can draw maps like this showing the southernmost border of the glaciers. It's the terminal moraines, piles of rocks and debris that mark the glaciers leading edge.¹



Ice Age glaciers covering North America, Greenland, and Iceland



Ice Age glaciers covering Europe and Asia

Extent of ice glaciers in North America Extent of ice glaciers in Europe

You can see from the map that ice once covered all of Canada and reached into North America. Those physical evidences we just covered can be seen in the Northern United States. Also in Europe, extending far south into Europe and in Western Asia physical evidence it was once covered in ice is observed. All this data shows is that there have been major periods of glaciation in the past. And if you travel in these regions you may want to do a little investigating before you go and see if you can take a few short side trips to see some of these phenomena. Much of Long Island was formed by a glacial moraine.

So was Martha's Vineyard and Nantucket. The best place to see these is southwest of Chicago. But the big point is that no one creationist or evolutionists doubt there was an Ice Age that extended into North America, Europe and Western Asia.

Today we can study glaciers and watch how the physical evidence forms because many glaciers are or have been retreating. From 1850-2000 it does appear we have undergone a period of global warming. The issue is not whether there has been global warming or not but the

cause of the global warming. Is the cause human, anthropogenic or is it natural, non-anthropogenic, something beyond human control. The evidence is that CO2 introduced by human emissions is far too slight to cause the warming that has occurred in the last 150 years. It seems rather that issues occurring on the sun, such as sun spots, are the cause of global warming. But since the year 2000 it appears we are entering a period of global cooling. But what the period of global warming allowed us to do was watch how glacier retreat formed physical evidence.

2. Biblical Evidence

Now let's turn to the Biblical evidence. Does the Bible give any evidence of an ice age?

a. Job 37:9-10; 38:22-23; 38:29-30

To start let's look at some verses. Job 37:10. Job is the earliest known writing in the OT. Job, we think, lived just after the Flood in the time leading up to Abraham. Time frame wise Job lived in the Gen 10-11 era. Job would have been an eyewitness, along with his friends, of the environment of the world after the Flood in their region. What was their region? Job lived in what is now the Arabian Desert, modern day Saudi Arabia. Yet look at the description of the Arabian Desert after the Flood. Verse 10, "From the breath of God ice is made, And the expanse of the waters is frozen. ¹¹"Also with moisture He loads the thick cloud; He disperses the cloud of His lightning." I admit we don't have a lot to make exposition with, but we want to pay close attention to any details we get of this period. Obviously ice, large sheets of ice are described in verse 10 and thick clouds of moisture above that continue to drop their moisture on the earth. That's something that was going on in apparently in Saudi Arabia after the Flood. Turn to the next chapter, Job 38:29, here's God to Job, "From whose womb has come the ice? And the frost of heaven, who has given it birth? ³⁰"Water becomes hard like stone, And the surface of the deep is imprisoned." Here we have thick deposits of ice and that's significant, how did these form, how did so much ice accumulate? It takes a lot of moisture to form thick, glaciated ice sheets.

b. Gen 12:10; 13:10; 26:1; 41:54-57; 42:5

A little after Job's time we come to more textual evidence of climate change with Abraham. Turn to Gen 12:10. We know where Abraham was at the time, he lived in the Promised Land and what's going on in the Promised Land at this time? ¹⁰Now there was a famine in the land; so Abram went down to Egypt to sojourn there, for the famine was severe in the land." You say a famine in the Promised Land, what happened to the milk and honey? That comes later, right now we have a dry climate in the Land of Promise, Abraham was forced to go down to Egypt. Yet then what's interesting if you turn to Gen 13:10 the climate situation is the exact reverse, "Lot lifted up his eyes and saw all the valley of the Jordan, that it was well watered everywhere—*this was* before the LORD destroyed Sodom and Gomorrah—" See that note, before Sodom and Gomorrah, that's put in because you wouldn't have believed how well-watered that area was before the judgment. Before he says it was "like the garden of the LORD, like the land of Egypt as you go to Zoar." And you say, what? I've seen the Dead Sea area and it is not a very well-watered region today, there's nothing but salty desert rock. "Lot picked out that area?" Yeah, apparently it wasn't just a hunk of salty rock when Abraham and Lot were walking around. It was a well-watered place, these guys were ranchers. Need lots of water for your herds. Then, turn over to Gen 26:1, this is Isaac and look at the climate he faces, "Now there was a famine in the land, besides the previous famine that had occurred in the days of Abraham." So we have another famine, apparently the climate was shifting radically; you never knew what it was going to be like. Now Gen 41:57, here's another famine in the time of Jacob and this one's far worse than Abraham's famine. Look carefully at the text, "*The people of* all the earth came to Egypt to buy grain from Joseph, because the famine was severe in all the earth." All the earth, a global famine? What happened? The text reports that all the people of all the earth had to go to Egypt to buy grain from Joseph. So during the lives of Abraham, Isaac, Jacob and Joseph some tremendous climate shifts must be taking place to cause all this famine. We cite all that data from Job and Genesis to show you a very different climate during the centuries after the Flood. That data covers about seven centuries of Middle East climatology involving

Israel, the Jordan Valley and Egypt. And it tells you some major climate changes were going on.

3. Mechanism for Initialization

a. Pagan

Now, if you were educated during the 1950's and 60's then you were taught that there were four ice ages. This was the scientific consensus for over 60 years. They believed that the evidence "proved" these four ice ages. Since the mid 1970's this idea has been considered wrong. Glacial scientists now believe there were between 10 and 30 ice ages, the ice supposedly melted back between each ice age, and the ice ages repeated in cycles every 100,000 years. How do they come up with 10 to 30 ice ages?

All of these scientists base their conclusions on earth's tilt, wobble and cyclical orbits around the sun which are presupposed to be constant. We've already seen Peter warn against that. This is the game that's being played that we Christians have got to tune in to or else we get duped. Present processes are not the key to unlocking past knowledge. That is the doctrine of uniformitarianism and that is the key doctrine of paganism and that is a sinful technique used to suppress the knowledge of God.

But presupposing it, here's what they say. The earth travels in an ellipse, not a circle around the sun. The actual orbit of the earth is now more like an egg shape. So from this a number of hypotheses derive. One hypothesis derived from this is what I call the Greater Distance Hypothesis (the Milankovitch Model).ⁱⁱ These scientists argue that the elliptical orbit of earth is on a cycle such that every 100,000 years the earth reaches its greatest distance from the sun, ~94.5 million miles. When this happens less heat from the sun reaches the earth and this causes the earth to plunge into an Ice Age. The Ice Age will last ~10,000 years and then the ice will retreat.

A second hypothesis is what I call the Increased Debris Hypothesis (Muller-McDonald Model).ⁱⁱⁱ These scientists argue that the elliptical

orbit of the earth is on a tilt such that every 100,000 years the earth passes through areas in our solar system that have a lot of dust and debris. This dust and debris come into our atmosphere and block sunlight from reaching the earth. This causes the earth to plunge into an Ice Age. Each Ice Age then lasts about 10,000 years and retreats. The cycle repeats itself on a 100,000 year cycle.

So in both hypotheses the idea is that we have to cool the earth significantly in order to get an Ice Age going. Cooling is the key they say to getting an Ice Age. And that sounds on the surface like it makes sense. One view says earth's increased distance from the sun makes it cool enough to start an Ice Age. The other view says the earth passes through debris fields which block sunlight making it cool enough to start an Ice Age.

But here's the problem. To get an Ice Age started you need two things. There's a little principle of physics involved. If you ask the question of how much water can air hold at different temperatures, it turns out that cold air doesn't hold much water. You've heard the expression "It's too cold to snow." It does get that way. So if the air is too cold you can't get snow. So what you have to do is have warm air, as the temperature goes up water evaporates and the warm air holds water, that's why it gets so humid in hot weather, because the hot air is full of water. The problem that uniformitarians have is getting the ice age started because you need both of those things to get an Ice Age started. One - you have to have high temperatures so you can get the moisture in the air needed to make snow. But two, you have to have low temperatures so when it does snow it doesn't melt off through the summer. Over the course of a few summers, if this continues, mass glaciers will form rather quickly. But how do you get high and low temperatures? Those contradict. Very simple problem, but it's a very complicated one and they've tried and tried and tried to figure out how do you do this but their models can't get the temperatures warm enough to get enough moisture in the air to create enough snow to glaciare.

In conclusion, here's Michael Oard again. He says, "Many geologists and glaciologists over the years have admitted that the cause of the ice age is unknown. One of the latest is David Alt (2001...)" who says,

“Although theories abound, no one really knows what causes ice ages.” So neither the Milankovitch model or the Muller McDonald model or any other model, and there are about 60 different models, but none of them can account for these two necessary conditions. They locked in to models that stem from uniformitarian thinking and they simply cannot produce the conditions necessary to get an Ice Age going within those parameters.

b. Biblical

What’s so interesting is that the Bible has an answer to that problem, but people aren’t ready to accept the answer to that problem because they don’t like the event that caused it or the timing. What did Peter say they forget? Willfully forget? The Flood. When did that occur? Just 4,350 years ago. Oard’s model based on the Flood predicts both high and low temperatures, the precise conditions necessary to start an Ice Age. He says, “The newly formed stratosphere would contain a thick shroud of volcanic dust and aerosols due to the extensive volcanic and tectonic activity during the flood. It probably was a dark, depressing world. The oceans would have been uniformly warm; the initial conditions would be established for a second, much lesser, catastrophe, a post-flood transition to the present day climate, this would be a post-flood ice age.”

Let’s see what he’s talking about, how did the Flood produce these conditions. First, he says we have uniformly warm oceans, how does the Flood produce uniformly warm oceans. You can at least see how the temperatures would be uniform; the whole thing was shaken up like a bottle of water. But how did they get warm. Go back to our Flood model, any Global Flood model has tremendous tectonic plate movements. What does that cause? Earthquakes and volcanoes. Ever see those occur around faults? There’s this little thing called the Pacific Ring of Fire, maybe you’ve heard of it. The whole thing is encircled by earthquakes and volcanoes.

i. Earthquakes

Let me make a side-note here about earthquakes and their frequency and intensity. Some people, wanting to see Matt 24:4-8 now being fulfilled, have claimed that “earthquake frequency and intensity have been increasing significantly in recent times, and that this is fulfilling prophecy. This is an illusion caused...by more frequent detection of earthquakes” due to more seismographs distributed around the world and the greater sensitivity of these seismographs. Further the illusion is enhanced by the fact that population is higher and more urbanized and so the devastation affects more people. And third, the illusion is further enhanced by the advancement of communication tools so that more people in distant places hear about them. “Since good seismographs went into operation late in the 1890's, no steady trend suggesting increased frequency or intensity has been demonstrated.” The fact is there has been a slight *decrease* in earthquake intensity and frequency in the last 100 years. As Dr Steve Austin says, “The 1940s was the decade of our century [20th century] with the most energetic earthquakes (mean=30 events per year with standard deviation of 5.8) and the 1980s was the decade with the least energetic earthquakes (mean=11 events per year with standard deviation of 4.1). The global earthquake frequency data can be used to argue just the opposite of the popular urban legend; earthquake frequency through the century appears to indicate overall a slight decrease.” And further, this is exactly what the Flood model would predict and what I’ve been teaching you all along. Namely, that after the Flood there was an exponential decay curve as we went from one steady state before the Flood to another steady state after the Flood. Though we, for all intents and purposes, are at a steady state, we are still on a slight downward curve and would expect to see a slight decrease in earthquake frequency and intensity. The data from the National Earthquake Information Center for the 20th century shows just such a slight decrease. The earthquakes in Matt 24:4-8 occur within the 70th week of Daniel and not before. There is no ramp up to indicate such superquakes are on the horizon. They occur suddenly and without any physical indications just as the Global Flood of Noah began with a sudden rupture in the earth’s crust. So don’t confuse today’s earthquakes with any biblical prophecy. The Bible doesn’t teach it and the data don’t support it. It’s an urban legend

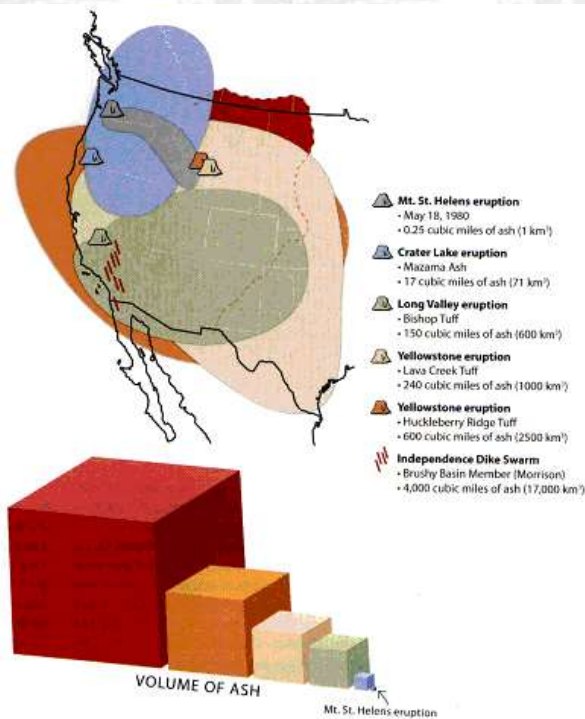
But the superquakes that occurred during and after the Flood due to massive plate tectonics activity did generate a lot of heat from the mantle that was transferred to the ocean waters, heating them to fulfill condition one, warm ocean temperatures.

ii. Volcanoes

In addition to earthquakes, volcanoes also occurred on massive scale. “Publishing in the *Journal of the Geological Society*, researchers investigated drill core data from the Norwegian Sea showing that the sea floor was once littered with massive craters. As reported in *ScienceNOW*, “The area experienced volcanic upheaval on a scale warping anything in human history.” This can be said for most of the earth’s ocean floors. Such volcanoes did two things. First they also released heat into the oceans. But second, they also released massive amounts of ash into the atmosphere which blocked the sun.

Again, Oard says, “The Flood involved unprecedented, widespread volcanic and tectonic activity. After the continents and mountains rose out of the floodwaters and/or the water subsided, a shroud of volcanic dust and aerosols remained in the atmosphere, obscuring part of the sun. This would cause the land to cool dramatically.” We’ve seen this, of course, with recent eruptions like Mt Pinatubo in 1991, it caused a cooling of the atmosphere.

So let’s look at some volcanoes. We’ll start with some statistics on Mt St Helens. Mt St Helens erupted on May 18, 1980. It expended 440 million total tons of TNT energy. The equivalent of 33,000 Hiroshima atomic bombs leveling 150 miles of forest in just 6 minutes. Harry Truman, the guy who wouldn’t leave his house was buried under 200 feet of ash. Now you say, that’s powerful stuff, this is amazing. But look at this chart.



Mt St Helens is the gray and you can follow the ash trail. It released 0.25 cubic miles of ash. Then you come to the Crater Lake eruption, here in the blue, it released 68 times the amount of ash as Mt St Helens. If you come to the long valley eruption in the olive green, it released 150 cubic miles of ash which is 600 times more ash than Mt St Helens. And that's little compared to the orange one, the Yellowstone eruption. Yellowstone national park is a volcano, it generated 600 cubic miles of ash which is 2,400 times greater than Mt St Helens. Can you imagine the devastation? If Mt St Helens ash layer buried Harry Truman under 200 feet of Ash how many feet of ash do you think Yellowstone would have buried him under. Try 90 miles. That's just to show you the scale of volcanoes we're talking about in this post-Flood earth. Think how much ash that would put in the atmosphere and how that would block out the sun making it a dark, depressing place.

Perhaps our atmosphere was filled with ash for several hundred years following the Flood. Evidence that this occurred is a constant enigma for those who choose to ignore the biblical account. In conclusion, what Oard has done is show that the Global Flood of Noah would involve massive magmatic earthquake and volcanic activity which would heat the earth's oceans to a high temperature, but the volcanic ash would enshroud the earth causing a cooling of the air temperature. This

produces the perfect conditions for a massive snow dump and initiation of an Ice Age.

iii. Hypercanes

“If the geologic processes of the Genesis Flood were as catastrophic as biblical and scientific evidence suggests, the oceans would have been strongly heated by the release of magma from the mantle and the conversion of geologic work to heat. During and following the Flood, tremendous quantities of heat and water vapor would have been released into the atmosphere from the oceans. Local weather and global climate would have been dramatically altered for many years.”

If this happens and the waters are warmer, as they are in tropical regions, then what happens? You get more hurricanes. But the size and scope of the hurricanes that would form are so great that MIT professor, Kerry Emanuel refers to them as “hypercanes,” with winds exceeding 300 mph.

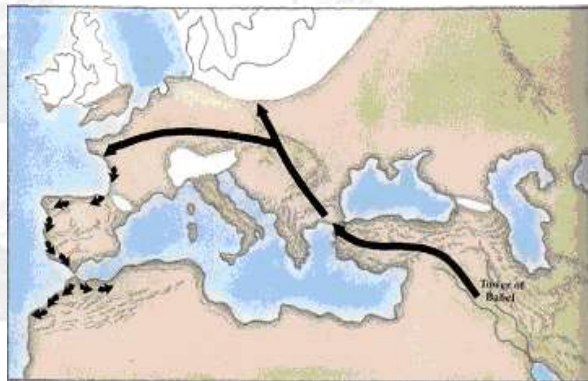
iv. Duration (500 Years + 200 Years)

Here’s Oard’s Model. Here we have an amazing example, and it may be rough around the edges, but what I’m pointing out is not that this is a total answer. I’m just suggesting that if people would submit their mentality to the Scripture and think from the data God has given us, we might not be too worried about the conflicts we face with uniformitarian scientists. But we have this reticence to start with the Scriptural data, we want to just investigate science and history apart from Scripture and then we find this big conflict with the Bible and say “Uh-oh, how did that happen?” The problem is we’re *not* starting with the most important data, the Scriptures as the interpretive key to nature, but here’s an example of a guy who did, Michael Oard. He’s not a flaky guy. He’s got all the math and physics to prove it, just plug the data into the computer and this is what you get. How long would the Ice Age last? On a time scale, here’s what it would have looked like. You have the Flood in Gen 6-8, during which catastrophic earthquakes and volcanoes heat the oceans to 86F, that’s very hot, average water temperature across the whole earth is only 39F today, that’s pretty

cold, but at 86F can you imagine a lot of water evaporating out of the oceans? Think of when you sit in a hot tub in the wintertime, what do you see? Evaporation, lots of it, that's the picture after the Flood, hot oceans. At the same time the volcanic ash and aerosols are blocking sunlight causing the air to be cooler over the land surfaces. As the moisture rich air moves over the cooler land surfaces you have conditions perfect for a massive snow dump right in the glacial regions we saw on the map. So you have 500 years of glacier building, by that time the oceans have cooled down so you're not getting the evaporation needed to create more snow. The volcanism has decreased so the ash and aerosols are allowing more sunlight through and deglaciation begins. He calculates that from the thickness of the ice sheets over North America and Europe it would take no more than 200 years to melt back. So the whole Ice Age lasts for 700 years, from the time of the Flood, through Job, Abraham, Isaac, Jacob and Joseph, all those climatic disturbances are consequences of the Flood which tripped this Ice Age.

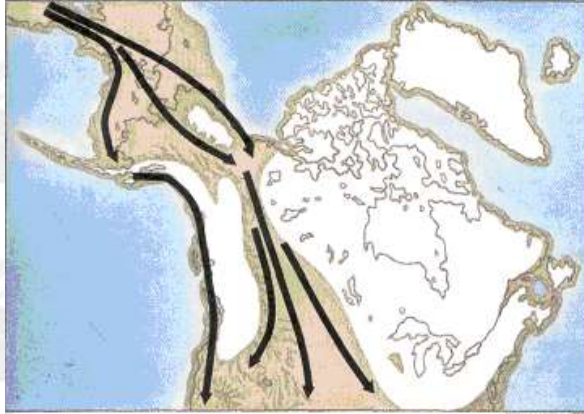
c. Land Bridges

Now what does this do, this answers a lot of questions. As long as you have so much water captured in glaciers over the land, what does that do to sea level? It lowers it. And if you have lower sea level then more land is exposed and you have land bridges that connect enabling migration of men and animals along routes. That's what these maps are depicting.



Look at this one, this depicts some of the exposed land bridges after the dispersion from the tower of Babel. Notice they can cross to the north

and east through Turkey and walk across what is today the Bosphorus Straits. Farther east they can move through what is now France down into Spain and across the straits of Gibraltar right into Africa. That was all exposed because so much water was taken out of the oceans and enclosed in these glaciers.



This is the land bridge exposed from Siberia over to Alaska. We have discovered evidence of communities under water that once lived along that route. What does that mean? It means people used to live there. When did that happen? During the Ice Age after the Flood. Then what happened? We have a period when massive amounts of ocean waters are trapped in glaciers, but it didn't last forever, the glaciers started to melt and as the ice melted the water ran off the continents back into the oceans and the water level rose.

Imagine how many animals were killed, just swept away. Imagine how many communities were swept up by the waters and destroyed, particularly the Japhethites because after the tower of Babel when the languages were divided the Japhethites began to settle toward the coastlands, that's Gen 10:5. "From these the coastlands of the nations were separated into their lands, etc..., etc..." those are our people, most of us here are descendants of Japheth. As the waters run off imagine the rivers gorges that were cut by all that water returning to the oceans, running off the continents. Do you think that captured some life, rapidly burying it and creating conditions ripe for fossilization? Of course it did. Clearly during this period you have fossilization occurring. That would be largely what is referred to as the Cenozoic, those are post-Flood sediments laid down by local flooding. By the way, if the Noahic Flood was just a local flood over in the Mesopotamian Valley then what happens to God's promise to never flood the earth

again? Obviously He's broken His promise over and over and we should give up the Bible because He's an untrustable God and this is an untrustable book. So we have to take it all or nothing. The Scriptures are all or nothing, you can't pick and choose, this isn't a buffet of beliefs, pick what you want, leave the rest.

ⁱ http://en.wikipedia.org/wiki/Terminal_moraine

ⁱⁱ

http://en.wikipedia.org/wiki/Ice_age#Variations_in_Earth.27s_orbit_.28Milankovitch_cycles.29

ⁱⁱⁱ <http://www.lbl.gov/Science-Articles/archive/ice-age-sediments.html>

[Back To The Top](#)

Copyright (c) Fredericksburg Bible Church 2010