Ice core oscillations and abrupt climate changes: part 3—large-scale oscillations within biblical Earth history

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The Greenland and West Antarctic ice cores show only one ice age. The bottoms of the ice cores show quite warm temperatures, which are expected in the Creation/Flood/Ice Age framework. Because of the bedrock elevation of the sites of the Greenland cores at the beginning of the Ice Age and their distances to warm water, ice did not start accumulating at those locales until about 175 years after the Flood. Those at Byrd and WAIS Divide delayed until about 200 and 300 years, respectively, because of their initial bedrock altitudes. The bedrock elevations for the ice core locations on East Antarctica were above 900 m and so ice started accumulating within 50 years of the Flood. It appears that the bottom 1,500 m of ice on East Antarctica built up within 200 years of the Flood with an accumulation rate of about 10 m/yr. Comparing this rate with snowfall analogues today shows that 10 m/yr is consistent with the unique climate conditions of Antarctica and the warm ocean water offshore. The deuterium isotope oscillations, and all the variables correlated to it, can be explained by decadal volcanic peaks and lulls in the Southern Hemisphere for the first 200 years. Two pieces of evidence show that the ice sheets built up quickly not that long ago.

The Antarctic[1] and Greenland[2] Ice Sheets formed after the Flood, building up especially during the post-Flood Ice Age. How do creation scientists explain these ice sheets, especially the difference between the East Antarctic Ice Sheet and the other two ice sheets? This part 3 will offer an explanation for the large-scale features and correlated variables, while part 4[3] will delve into the explanation of the 'millennial-scale oscillations'.

Greenland and West Antarctica ice cores show only one ice age

The Greenland ice cores (see part 1, figures 11 to 14)[1] mainly show only one ice age. It is the same on the West Antarctic Ice Sheet. The Byrd ice core (part 2, figure 2) shows one ice age while the WAIS Divide ice core shows only about half the Ice Age. The bottom 300 m of these ice cores have been variously interpreted. The oxygen isotope ratio in the bottom fluctuates considerably.[4,5] Scientists were quick to claim that the bottom of the GRIP ice core was from the 'previous interglacial', the Eemian in Europe and the Sangamon in North America. Dansgaard *et al.* even dated the GRIP ice core to 250,000 years (within their uniformitarian worldview) showing not only the previous interglacial, but also the previous glacial and interglacial, based on oxygen isotope fluctuations![6] And the previous claimed interglacial also had abrupt climate changes,[7] which would suggest that the present climate could have abrupt changes also (see part 4).[3]

However, it was later discovered that the bottom 10% of the GRIP ice core was disturbed and therefore they could only date it to about 110,000 years, the beginning of the 'last' ice age within their paradigm.[8] It is readily admitted that the nearby GISP2 core has disturbed bottom layers also.[9] It was deduced that the bottom 10% of the two ice cores were deformed and mixed as the ice sheet moved. Such deformation in the centre of the Greenland Ice Sheet with its cold bottom temperatures, colder than the pressure-melting point, was a surprise: "their occurrence hundreds of metres above the bed in the central region of an ice sheet has surprised many workers."[10] The reason for such deformation is unknown. Therefore, the dating is now considered reliable only to about 105,000 years,[11] although the GISP2 ice core is claimed to have annual layers dated to 110,000 years.[1] Oxygen isotope changes near the bottom of the cores do not represent abrupt climate changes, but deformation. However, the oxygen isotope ratios in some of the deformed ice do indicate temperatures about 5°C warmer at the beginning of the 'last' ice age.

Because of the disturbed bottom few hundred metres of ice in GRIP and GISP2, European scientists drilled North-Grip (NGRIP) (part 1, figure 1)[1] about 325 km north-northwest of the GRIP ice core. They believed that the bottom of the Greenland Ice Sheet was well below freezing.[12] Thus, the glaciologists expected undisturbed Eemian interglacial layers above bedrock.[13] They were surprised to find that the bottom of the ice core was melting at 7 mm/yr, and that the Eemian was mostly missing. Because of melting, the bottom ice on flat bedrock was not disturbed, although mysterious, large 200 m amplitude folds, based on radio-echo layers, occur.[14] They dated the bottom to 123,000 years ago, the very end of the 'previous interglacial' and the beginning of the 'last' ice age. The beginning of the last ice age did not begin with an abrupt cooling, just a gradual cooling to about 119 ka with abrupt warming at 115 ka during the Ice Age, which was the time of a strong Milankovitch radiation *minimum* at 65°N.[15] This is the opposite of what should have occurred if the Milankovitch theory were true and their dating correct.

European scientists were anxious to find Eemian ice to better understand interglacials, such as the Holocene. They then drilled another deep ice core to the bedrock, north-west of NGRIP, abbreviated NEEM.[16] The bottom of this ice reached what they believed to be the Eemian interglacial at 128,000 years ago, although the bottom ice was disturbed and folded. During this supposed interglacial, researchers claimed that the temperature at which the ice was deposited was about 8°C warmer than today.[17] The researchers considered that this temperature was caused by a much warmer previous interglacial than today's interglacial, which, like before, provides fuel for the global warming scare. Climate models do not support such warm temperatures, and these high oxygen isotope ratios have been called a 'paradox'.[17]

The large-scale plots of oxygen isotope ratios with depth in the Greenland and Byrd ice cores show warmer beginning temperatures, just before the single post-Flood Ice Age, as expected in the biblical Ice Age model. But in their paradigm, such warm temperatures are a mystery to them. Because the bedrock where GRIP, GISP2, NGRIP, NEEM, and Camp Century were drilled would be of relatively low elevation right after the Flood with a surrounding warm ocean, these areas would not glaciate for a while. The mountains of Greenland would glaciate right away, but the lowlands probably glaciated 100–200 years after the Flood (see part 1, figures 17 to 19).[1]

How are the East Antarctic ice cores explained?

The deep ice cores drilled on the East Antarctic Ice Sheet are much different from the Greenland and West Antarctic ice cores. How are the large oscillations in deuterium isotope ratio and the claimed old ages to be explained? Based on methane correlations of the ice cores between the hemispheres, it looks like the top 1,600 m of the East Antarctic ice cores correspond to the whole depth of the ice cores on Greenland and the Byrd ice cores. So, it appears that the bottom approximately 1,500 m of ice in the Dome C, Vostok, and Dome F ice cores formed *before* the other ice two ice sheets began. This seems to be the only logical way to explain the deeper part of the East Antarctic ice cores, which implies very heavy accumulations early in the Ice Age. How heavy?

I will focus on Dome C, since it is claimed to have eight glacial/interglacial oscillations. If ice began to accumulate at the location of Dome C soon after the Flood, then 1,500 m of ice had accumulated up to 100–200 years before the start of the Greenland and West Antarctic Ice Sheets. Thus, 1,500 m of ice built up in at most 200 years for an average accumulation of 7.5 m/yr. If the difference in timing between the start of lowland Greenland accumulation and East Antarctica

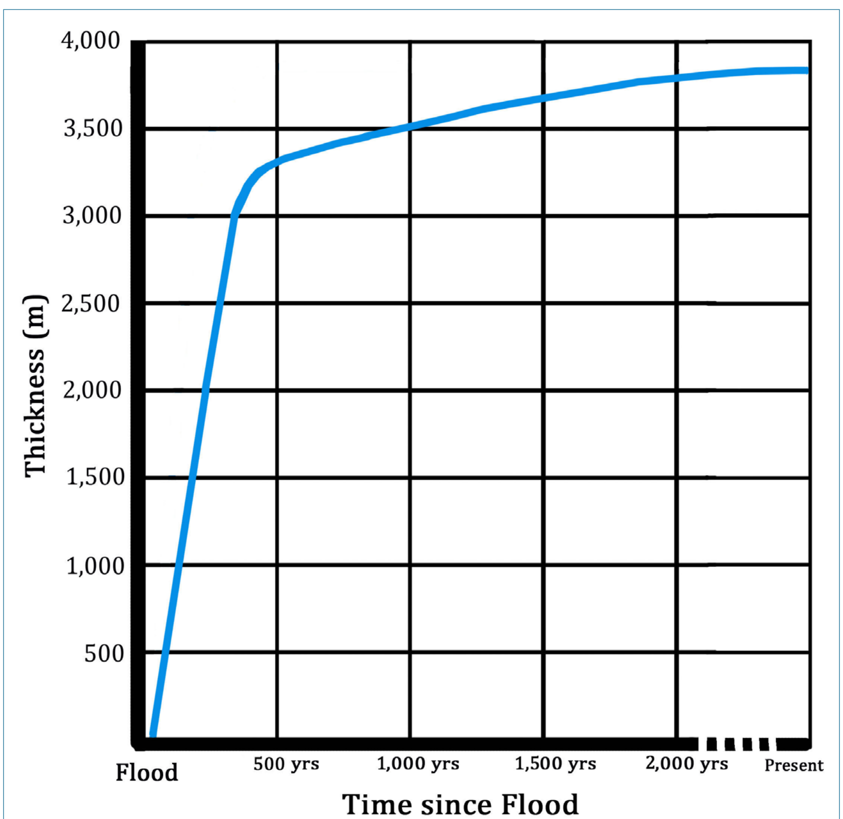

Figure 1. Ice thickness increase with time for the Dome C ice core within biblical history. Note the very rapid rise within about 200 years.

accumulation was less than 200 years, the ice accumulation rate would be larger than 7.5 m/yr. But including thinning by the weight of ice above for 4,500 years, the accumulation rate was probably around 10 m/yr or more (figure 1). Note that 10 m/yr is an average with more thinning the deeper in the ice. So, the ice accumulation rate could have been near 20 m/yr at the very start of the Ice Age, tailing off to around 5 m/yr within 200 years. It also means that most of the major changes in the deuterium isotope ratio occurred within the first 200 years of the Ice Age on East Antarctica. Is this possible?

In the biblical Ice Age model, the Antarctic Ice Sheets started on the high terrain. Cirques, bowl-shaped amphitheatre-like depressions seen in the mountains by ice-penetrating radar, are evidence of mountain glaciation that also occurred at the beginning (figure 2). Such cirques imply quite warm temperatures at lower elevations:[18] "We found maximum, minimum and average coastal temperatures of 27.8°C, 16.3°C, and 21.6°C."[19] These numbers were projected downward from 2.4 km by assuming cirque temperatures at about 4°C during the start of glaciation and using a standard lapse rate for high latitudes. The lapse rate is the rate of cooling as the altitude increases. Such warm temperatures are unheard of for Antarctica, but they are expected in the biblical Ice Age model, due to the warm ocean water surrounding Antarctica. The offshore temperature could have been as high as 30°C, the average assumed for the whole ocean at the beginning of the Ice Age.[20]

Because of volcanic aerosols high in the atmosphere and the fact that Antarctica straddles the South Pole, temperatures over the higher land would have quickly fallen below freezing and glaciation likely would have begun within 50 years. With the cold air over Antarctica adjacent to a warm ocean, a very strong horizontal average temperature difference was likely present near the coast. By the thermal wind equation, the strongest winds aloft would have been above the strongest horizontal temperature difference. Thus, the storm tracks would be just offshore of Antarctica early in the Ice Age (figure 3). Numerous storms would continually move east around Antarctica, generally in a circle at about 65°S latitude.

Because West Antarctica was about half ocean and half mountains early in the Ice Age, the main storm track would have sometimes passed through West Antarctica. Once West Antarctica was totally glaciated, the main storm track would have become nearly circular. As the Ice Age progressed, the average storm track slowly shifted from 65°S, northward into middle latitudes by the Antarctica Ice Age maximum. The storm track occasionally dipped further northward to produce ice caps on the Andes Mountains, the mountains

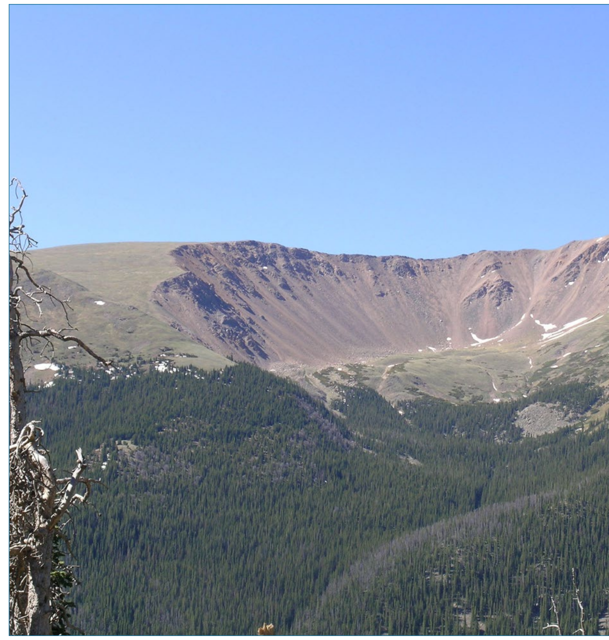

Figure 2. Cirque formed during the Ice Age in the Colorado Rocky Mountains

Figure 3. Postulated major (solid line) and minor (dotted line) storm tracks around Antarctica early in the Ice Age (drawn by David Oard and enhanced by Melanie Richard)

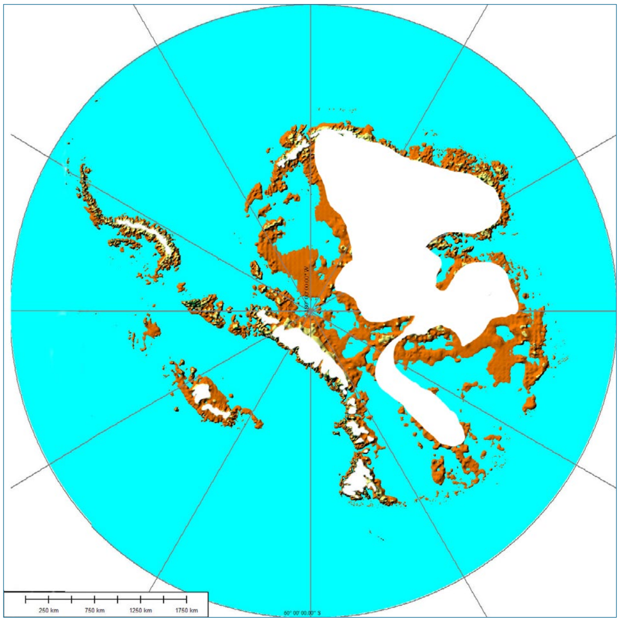

Figure 4. Postulated snow and ice on Antarctica after 50 years (by Melanie Richard)

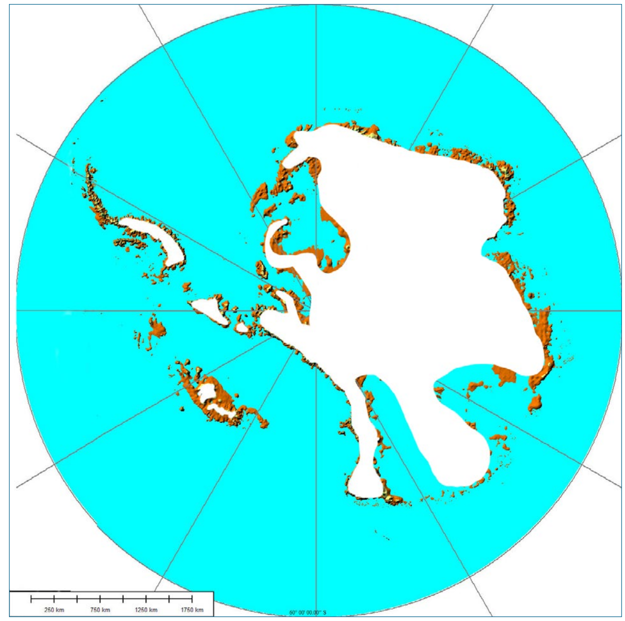

Figure 5. Postulated snow and ice on Antarctica after 100 years (by Melanie Richard)

of New Zealand, Tasmania, and the highest mountains in south-east Australia.

The cold air in the storms would have come from Antarctica and picked up abundant moisture just offshore. Such warm offshore temperatures would have been slow to cool because of the larger ocean/land distribution in the Southern Hemisphere, and the cold air to cool the ocean would have come mainly from Antarctica. The highest precipitation in a storm was in the cold sector, mainly over Antarctica. Therefore, the snow and ice on Antarctica accumulated rapidly. Figures 4 to 9 show the postulated snow and ice accumulation on Antarctica for 50, 100, 200, 300, 400, and 500 years after the Flood, respectively, assuming the same bedrock heights as today with no correction for isostatic effects.

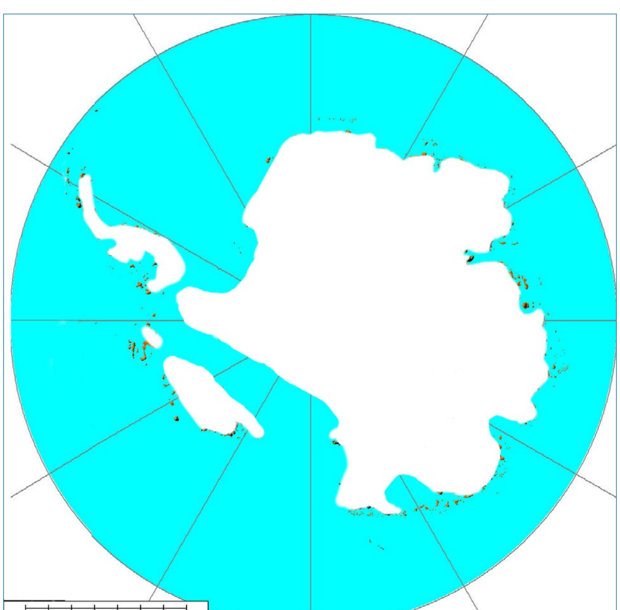

Figure 6. Postulated snow and ice on Antarctica after 200 years (by Melanie Richard)

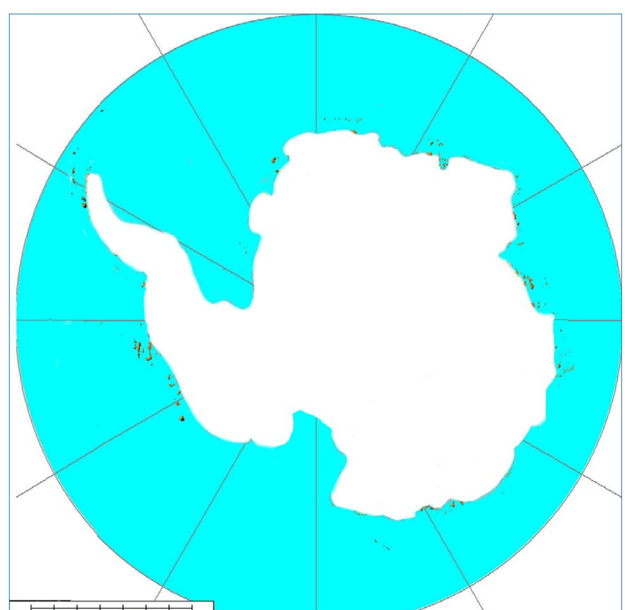

Figure 7. Postulated snow and ice on Antarctica after 300 years (by Melanie Richard)

Table 1. The average precipitation and snowfall at Paradise Ranger Station at the 1,646 m level from 1916 to 2016 in metres

Month	October	November	December	January	February	March	Total
Precip.	0.25	0.41	0.46	0.44	0.31	0.30	2.17
Snowfall	0.7	2.1	3.0	3.3	2.4	2.7	14.2

Present-day snow records

Could East Antarctica have sustained an average ice accumulation of 10 m/yr for about 200 years? Comparing the snowfall at some locations around the world today may help us visualize that this accumulation rate is possible under the unique post-Flood Ice Age climate.

The greatest average snowfall in the world, year after year, occurs in north-west Japan in winter. The lower elevations receive about 6 m/yr and the higher elevations over 13 m/yr of snowfall (figure 10).[21] The Cascade Mountains of western Washington State, USA, receive nearly the same snowfall. The world record snowfall is Paradise Ranger Station, Mount Rainier, in Washington State, which received, from February 19, 1971, to February 18, 1972, 31.1 m of snowfall.[22] Snowfall is not the same as snow depth, which represents the compressed snow.

The high snowfall in Japan is caused by cold, dry winds coming from Siberia, blowing over the Sea of Japan, and picking up abundant moisture that slams into north-west Japan. The mechanism is similar to the lake effect snowstorms around the Great Lakes of North America, but in the case of Japan, it is a sea effect. The winter sea surface temperatures in the Sea of Japan are not conducive to great evaporation, ranging from about 3°C close to Siberia to 12°C near the north-west coast of Japan in December, cooling to 1°C near the north-west coast of Siberia to about 8°C off Japan by the end of the winter.[21] Snow for the Washington Cascade Mountains comes from mid-latitude winter storms with a sea surface temperature off the Washington coast around 8–12°C.

The average snowfall and precipitation at Paradise Ranger Station at the 1,646 m level of Mount Rainier from October to March, the period of the main accumulation, is shown in table 1.[23] A small amount of this precipitation is rain, but with a snow cover it would mostly be added to the water equivalent of the snow pack.

The situation would have been similar though different over Antarctica and the surrounding ocean compared to Japan or Washington state. The meteorological dynamics over Antarctica were similar for north-west Japan in that cold air

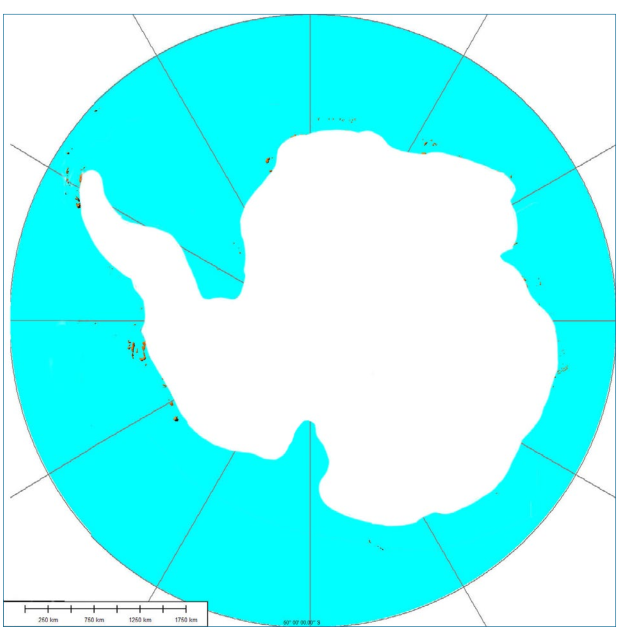

Figure 8. Postulated snow and ice on Antarctica after 400 years (by Melanie Richard)

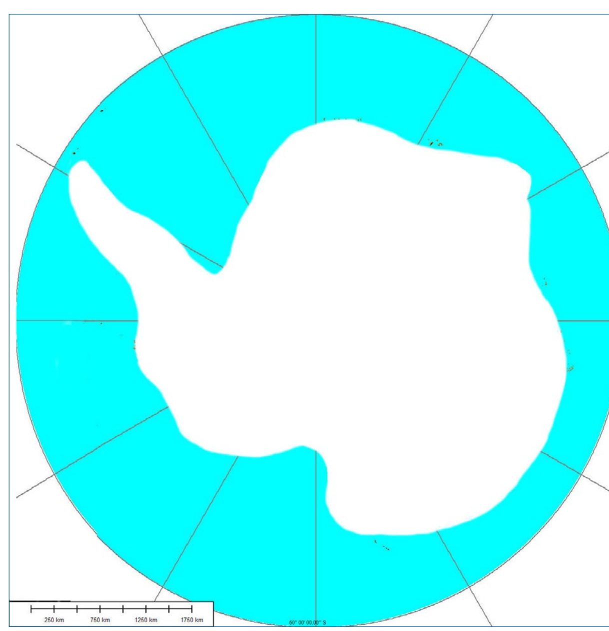

Figure 9. Postulated snow and ice on Antarctica after 500 years (by Melanie Richard)

Figure 10. Snow walls on Tateyama Kurobe Alpine Route, Japan, that connects the Japanese municipalities of Tateyama and Omachi

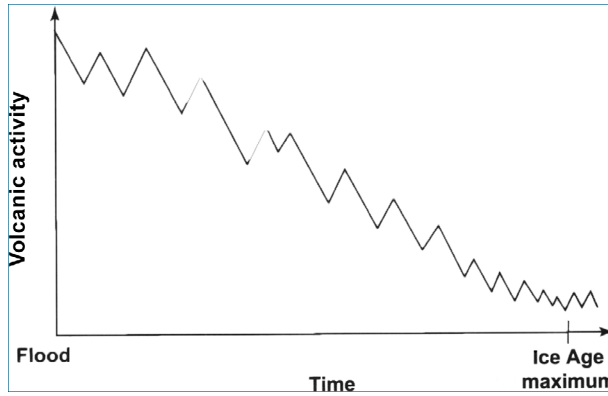

Figure 11. Postulated Ice Age volcanism with peaks and lulls in general decreasing activity with time to glacial maximum[39]

from Antarctica would have blown out over the ocean and caused rapid evaporation. One difference is that Antarctica would have received snow all year around, while it snows at Mount Rainier for only about half a year. So, if the precipitation were the same in the summer six months at Mount Rainier as the winter six months, the total precipitation in water equivalent would be 4.34 m, which amounts to 4.72 m of ice accumulation. The record year at Mount Rainier with 31.1 m of snowfall would have been close to 10 m/yr of ice accumulation. Another difference is the sea surface temperatures off Antarctica would have been much warmer than the Sea of Japan and the Pacific Ocean off Washington state in winter. The warmer the water, the more the evaporation.

Decadal volcanic oscillations can explain the major ice core oscillations

I consider that the deuterium oscillations in the first 200 years of the East Antarctic Ice Sheet were caused by decadal oscillations of volcanism during the post-Flood Ice Age (figure 11). The large-scale deuterium isotope fluctuations likely occurred in one or two decades with ice accumulation rates of 10 m/yr in the bottom 1,500 m of the East Antarctic ice cores. During periods of high volcanism in the Southern Hemisphere, low deuterium isotope ratios likely were produced and vice versa for lulls in volcanism. The climatic effects of each hemisphere are semi-independent with tropical eruptions spreading into both hemispheres.[24] But extratropical eruptions produce 80% more cooling than tropical eruptions, and the aerosols mostly remain in that hemisphere.

There are more deuterium oscillations at Dome C and Dome F than in the Greenland and Byrd ice cores because East Antarctic ice cores started building quickly after the end of the Flood. But Vostok started later than Dome C and records only four ‘glacial/interglacial oscillations’ because the Vostok ice core was drilled over a large deep lake, delaying ice build-up.

The variables correlated with isotopic ratios

How are so many other variables correlated to the isotopic ratio fluctuations, such as calcium, sodium, methane, carbon dioxide, and dust (see part 2, figure 8)? During enhanced volcanism, more sunlight is reflected back to space causing colder continental temperatures. Colder air blowing out over the warm oceans increased the cooling rate of the ocean surface, causing more evaporation and vertical motions in the oceans. The colder the sea surface temperature, the more the absorption of CO_2 occurs, since there is an equilibrium balance between the atmosphere and the surface layer of the ocean. Furthermore, volcanic ash and dust contain iron, which is a major limiting factor for plankton growth in most of today’s oceans. After the Flood, the combination of stronger upwelling and the addition of iron from volcanism likely resulted in great phytoplankton blooms. The phytoplankton are at the bottom of the oceanic food chain and take in carbon dioxide. As these organisms die, they sink to the bottom, taking the carbon dioxide with them. This is called the biological pump.[25] This would have depleted the surface layer of CO_2 causing more absorption of CO_2 from the atmosphere.

Colder air temperatures after the Flood resulted in greater wind velocities, which picked up more continental dust, as measured by the higher calcium ion concentration. Strong winds over the oceans would have picked up more sea spray with more sodium ions ending up in the atmosphere.

Although there are many sources, methane in ice cores likely came from tropical and polar wetlands. The addition of methane to the atmospheric is correlated to temperature. Methane oscillates by about 200 to 400 ppbv and is anticorrelated with deuterium isotope ratios in the East Antarctic ice cores.[26] That is because during intervals of low deuterium isotope ratios, indicative of cooler temperatures, less methane enters the atmosphere from the wetlands and vice versa with high deuterium isotope ratios.

Evidence of the rapid build-up of the ice sheet

There are several indicators that suggest the ice sheet built up rapidly. The most powerful indicators are the little amount of erosion of the mountains and thick volcanic layers.

Little erosion in the mountains

One indicator of rapid ice sheet build-up is that little erosion is evident on the mountains below the ice. For instance, the Gamburtsev Mountains are located below the centre of the Antarctic Ice Sheet and are about 1,200 km long, about the length of the European Alps. A recent airborne radar survey, completed in early 2009, penetrated through the ice and showed isochronal ice layers, likely caused by volcanic acids, and the basal topography beneath the ice. The remote sensing data revealed a jagged mountain landscape with sharp peaks and high relief, similar to the Alps.[27] The relief averages 2.25 km but is up to 4 km along the edges of the mountain chain. The radar survey exposed a major problem: the mountains showed little evidence of glacial erosion:

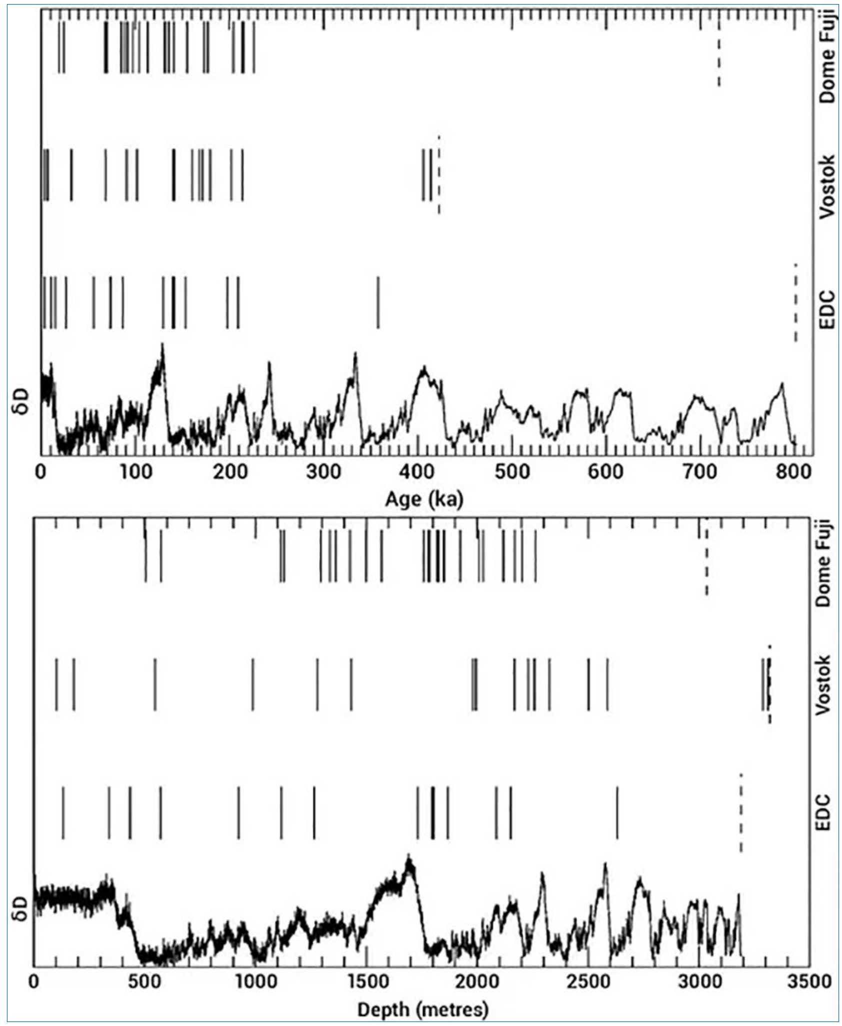

Figure 12. Tephra layers in the Antarctic Dome Fuji, Vostok, and Dome C cores, along with the deuterium isotope ratios from Dome C, as a function of uniformitarian age assignment (above) and depth (below) (courtesy of Jake Hebert of ICR). Dashed lines indicate greatest approximate ages/depths of core sections that were inspected for tephra layers. Dark tephra bands indicate multiple, closely spaced tephra layers. Not shown are two 'extraterrestrial' dust layers between 400 and 500 ka in the Dome Fuji and EPICA Dome C cores.

> "Reporting this week in the journal Geophysical Research Letters, an international team of scientists describe how they were surprised to discover that the Gamburtsev Subglacial Mountains show little sign of erosion, and that its saw-toothed towering crags resemble the modern ranges like the European Alps or Rocky Mountains."[28]

If the ice sheet was millions of years old, there should be abundant evidence of ice-sheet erosion. This calls into question the age of the ice sheet.

The researchers attempt to claim that the ice sheet has been cold-based so that little erosion would have occurred. The ice sheet is not cold-based today, so why should it be cold during the 14 Ma it supposedly has been thick? During build-up supposedly 34–14 Ma ago, the ice likely would have been warm based. Besides, the Gamburtsev Mountains supposedly existed over 100 Ma before the Antarctic glaciation,[29] so should have been well eroded by weathering, fluvial erosion, etc. Although secular scientists are searching for explanations, the direct implication is that there has not been enough time to erase sharp peaks.[30]

Thick volcanic layers

When we analyze tephra layers in the East Antarctic ice cores, plotted with depth, we see very few layers in the bottom 1,000 m.[31] Since the bottom 1,000 m in the deep ice cores represents much more time in the uniformitarian model,

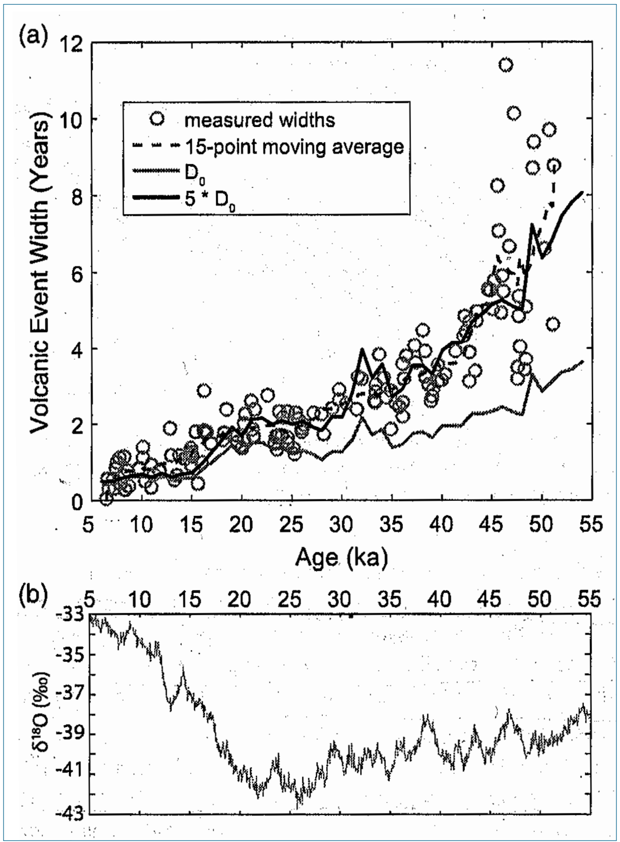

Figure 13. Measured widths of volcanic events converted to years based on thickness of volcanic acid layers (a) and the oxygen isotope ratio in per mil (b) for the Wais Divide ice core to 55 ka[40]

than the ice above, the tephra layers show a near absence of volcanism reaching the ice sheet from 800 to 200 ka. There is an abundance of tephra layers from 200 ka to the present (figure 12). This makes no sense if each major deuterium isotope oscillation represented a separate ice age of 100 ka long. These observations make more sense when we place the tephra layers into the rapid, early build-up of the East Antarctic Ice Sheet in the biblical Ice Age model.

Jake Hebert of the Institute for Creation Research has also documented the stretched-out timescale of the Greenland cores from a PBS show featuring Bill Nye examining a Greenland ice core.[32] Nye noticed a tephra layer at about the 27,000-year level that spanned, unbroken with no gaps, 15–17 years. Another tephra layer in GRIP and GISP2 from a volcano that erupted about 10,300 years ago was spread out over seven 'annual layers'.[33] Volcanic eruptions are usually quick and rarely last more than a year. It is more logical to conclude that the uniformitarian interpretations of the ice cores greatly exaggerate the amount of time.

In the GRIP core, two cryptotephra layers at depths of 1727.75 m and 1734.00 m could not be distinguished geochemically.[34] The 6.25 m of ice separating these two cryptotephra layers corresponds to 106 years within the uniformitarian timescale. It is unlikely these were two separate eruptions, indicating much faster ice deposition.[35]

The stretched-out timescales of the Greenland and Antarctic Ice Sheets is also shown by chemicals that can be traced over multiple 'years'. Such features show up with acids, presumed derived from volcanism. It was noted that the WAIS Divide core could be correlated to the timescale on East Antarctica by a 150-year-long acid deposition event.[36] In fact, it is generally observed that the measured widths of volcanic acid bands in years increases with depth in the WAIS Divide ice core (figure 13).[37] The same broadening unexpectedly occurs with depth in the Dome C.[38] Uniformitarian scientists assume that the explanation for the thick acid layers is diffusion in the ice, but that cannot be the case for tephra that does not diffuse.

Conclusions

The Greenland and West Antarctic ice cores show one ice age that started with warm temperatures, just as expected in the Creation/Flood/Ice Age model. Based on the elevation of the bedrock below the ice cores at the start of ice build-up, it is estimated that the ice did not develop in the ice core locations in the lowlands of Greenland until 150–200 years after the Flood. That is because of their low elevation and because Greenland was surrounded by *warm* ocean water. Also, Byrd and WAIS Divide did not start accumulating ice until 200 and 300 years, respectively, after the Flood. On the other hand, the deep ice cores on East Antarctica likely started accumulation within 50 years of the Flood. This difference in timing likely explains the bottom 1,500 m of ice accumulations on East Antarctica with supposedly about 600 ka of deuterium isotope fluctuations due to differential volcanic dust loading in the Southern Hemisphere. The unique Creation/Flood/Ice Age model provides a solution to this rapid ice build-up with warm ocean water adjacent to a cold continent that straddles the South Pole. It can also explain the other variables correlated to the deuterium isotope ratios. The snowfall over north-west Japan and the Washington Cascade Mountains are a partial analogue for such rapid accumulation of ice on East Antarctica. A number of objective indicators indicate rapid deposition of ice: (1) the little erosion over the Gamburtsev Mountains, and (2) the thick tephra and volcanic acid layers in the ice cores.

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