

The current state of creationist ice core research

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Although the ability of the Flood to explain the Ice Age is one of the great strengths of the Creation model,^{1,2} Bible skeptics claim the vast ages assigned to deep Greenland and Antarctic ice cores are insurmountable challenges to the Bible’s 6,000-year chronology.

However, thick ice sheets do *not* need millions of years to form. Uniformitarian glaciologists acknowledge thick ice sheets can form in thousands of years, given sufficiently high ice accumulation rates.^{3,4} Hence, the high Ice Age accumulation rates posited by the Creation Ice Age model can plausibly enable thick ice sheets to have formed in the 4,500 years since the Flood.

Moreover, dating of ice cores is not easy. If annual accumulation rates are high enough, as is the case in central Greenland, visible bands within the ice may be counted directly. However, if accumulation rates are too low, as is the case for the deep cores in East Antarctica, direct counting of layers is not possible,^{5,6} so glaciologists use theoretical age-date models to assign ages to different depths within the ice. These models attempt to take into account thinning of the ice, but without performing the ‘brute force’ calculations discussed below.

These models implicitly assume ‘millions of years’ by taking the height of the ice sheet to be constant or nearly constant.⁷⁻⁹ The rationale for this is that any error introduced into the age model by neglecting the thousands of years for the ice sheet’s formation will be negligible compared to the millions of years during which the ice sheet has supposedly been in existence. Hence, the ‘constant height’ assumption implicitly assumes ‘deep time’, and the vast ages assigned to the deep Antarctic cores are unsurprising.

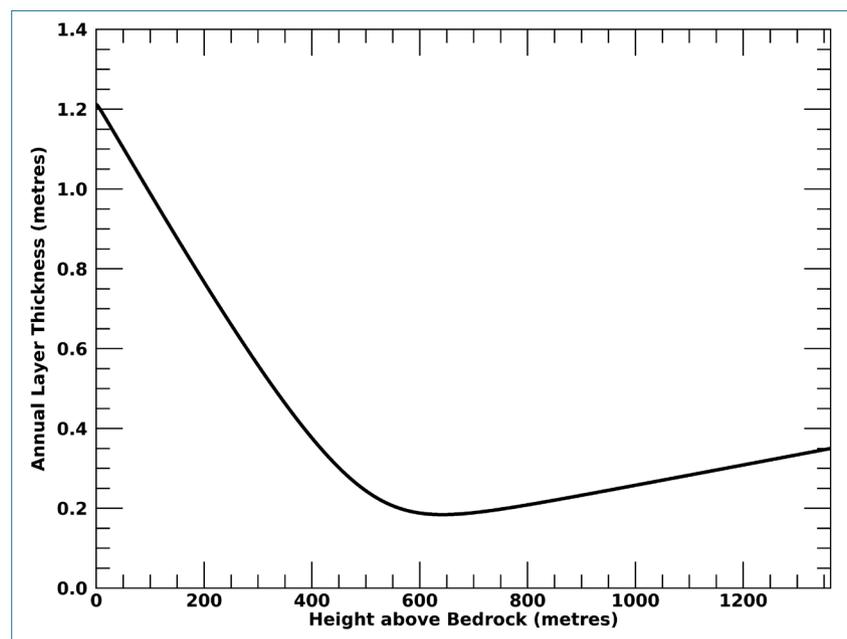


Figure 1. Annual layer thicknesses in the Camp Century, Greenland ice core, calculated using Vardiman’s ice sheet model. After figure 11 in Hebert.²⁷

The ages assigned to the deep Greenland cores *are* obtained by counting of visible ice layers.¹⁰ Hence, some Bible skeptics see the deep Greenland ice cores as unanswerable challenges to biblical creation.¹¹ However, multiple layers are deposited per year, and the number of these layers can vary from year to year.¹² Hence, scientists must make educated guesses about how many visible bands should be grouped together and counted as representing a single year, which is *not* a trivial task. In fact, some glaciology pioneers suggested that counting could yield ages of 10% accuracy or better only for ice less than 200 years old!¹³ Secular glaciologists now think they can count back tens of thousands of years with an accuracy of 10%.¹⁴ This earlier pessimism is more realistic, as demonstrated when uniformitarian glaciologists increased their assigned age for the bottom of the GISP2 core from 85,000 years to 111,000 years simply by increasing the resolution of their dust measurements in the bottom 500 m of the core!¹⁵

Interestingly, in the upper halves of the Greenland ice cores, creationist and uniformitarian age assignments agree to within a factor of two or three of one another.^{16,17} Only in the bottom halves of the Greenland cores do uniformitarian and creationist age estimates dramatically diverge. Yet, the counting process is most difficult and uncertain in the bottom core sections, where ‘jumps’ in dust content are assumed to represent seasonal cycles.¹⁸ However, several factors together can plausibly account for overcounting in the bottoms of the Greenland cores.¹⁷ First, seventyfold variations in dust content in the core bottoms complicate the counting process.¹⁹ Second, individual storms (thousands of which would be expected in a post-Flood Ice Age lasting hundreds of years) can change ice dust content.²⁰ Third, uniformitarian expectations of very thin

annual layers in the bottom core sections contribute to overcounting.¹⁷

Moreover, creationists have pointed out that the frequencies and thicknesses of tephra layers within the deep Antarctic ice cores are more consistent with young-Earth expectations^{21,22} as is the lack of erosion of the Gamburtsev Mountains beneath the East Antarctic ice sheet.^{23–25}

For the above reasons, I think creationists have refuted claims that ice cores demand an old Earth. However, we have done very little actual modelling of the ice sheets. In theory, one can use a physics-based model to simulate the formation and thinning of a thick ice sheet without making the usual ‘old Earth’ assumptions. This is the ideal way to model the growth of an ice sheet: finding the stresses (forces per unit area) on parcels within the ice to directly determine how much thinning has occurred. Uniformitarians would likely never attempt to

simulate the entire multi-million year assumed history of an ice sheet with a physics-based computer model, due to the enormously high computational demands. However, creationists could conceivably use such models to simulate the relatively short history of an ice sheet in the creation model.

In 1993 Larry Vardiman of the Institute for Creation Research published a one-dimensional mathematical model for the rapid formation of an ice sheet in the time since the Genesis Flood.²⁶ This model assumed high Ice Age accumulation rates that exponentially decayed to today’s ‘slow and gradual’ rates. This model did not directly calculate the stresses on a parcel of ice but implicitly assumed that thinning of the ice at any time was proportional to the current thickness of the ice sheet.

More recently I used Vardiman’s model and a simple computer code to numerically calculate the thicknesses

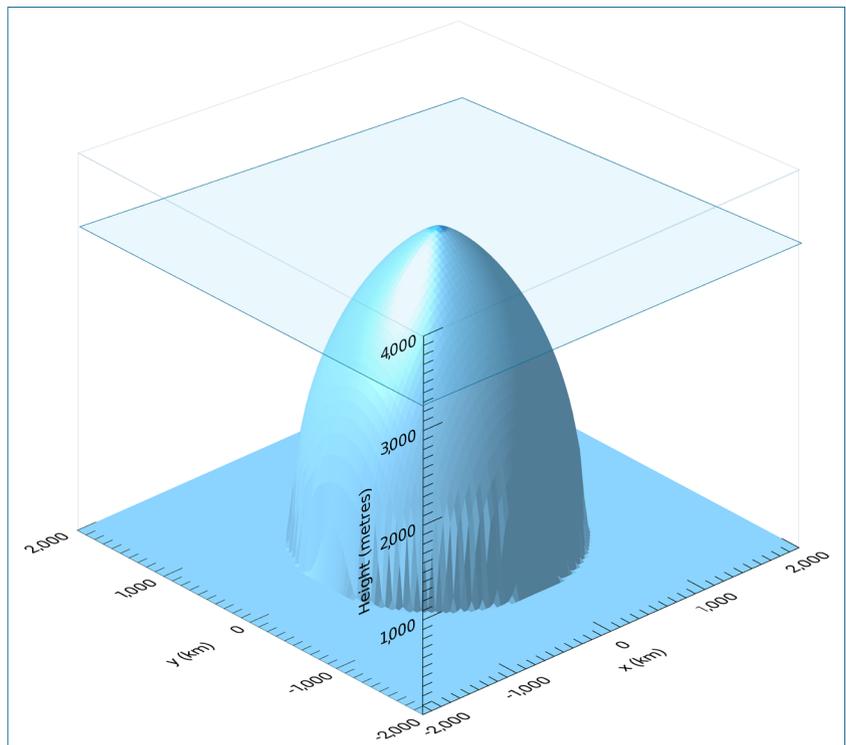


Figure 2. A 3,278-m-tall ice dome ‘grown’ in 4,500 simulated years using the Mahaffy ice flow model and Vardiman’s ice accumulation model. Image courtesy of Jake Hebert and the Institute for Creation Research.

of annual layers within Vardiman's model,²⁷ as shown in figure 1. One interesting result is that in creation-based ice models the thinnest annual layers are not necessarily found at the very bottom of the ice, but can occur at intermediate depths.

However, there is a need for more sophisticated, physics-based creation ice sheet models. All such models simplify the mathematics using the fact that the height of the ice sheet is very thin compared to its horizontal dimensions (the 'shallow ice approximation').

One such model is the Mahaffy model, used to create figure 2.²⁸ I have submitted a paper describing the model for publication. One of the weaknesses of the model is that it does not take into account spatial variations in the temperature of the ice. Moreover, the physics is oversimplified in that certain stresses are ignored in order to make the mathematics tractable.

A more sophisticated 'higher order' model is the Blatter–Pattyn model,^{29,30} utilized by the Community Ice Sheet Model (CISM).³¹ This CISM computer model is freely available to the general public, although implementation of this model may be difficult for those unfamiliar with it. I am currently working on using the Blatter–Pattyn model in some simple two-dimensional problems.

The ability of the creation model to explain the Ice Age and its associated mysteries is one of its great strengths. Nevertheless, creation researchers have some 'catching up' to do when it comes to computer modelling of ice sheets, and we are working to that end.

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