The first discovered Cretaceous glacial deposit

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The Cretaceous period is suppose to be one of the warmest intervals in uniformitarian earth history.[1,2] Assuming the evolutionary/uniformitarian paradigm, there is much evidence for this, especially the existence of warm-climate plants and animals from mid to high latitudes, including assumed high paleolatitudes.[3,4] Now comes a report of the world's first Cretaceous 'glaciation'.[5] It is recorded in South Australia at a presumed early Cretaceous paleolatitute of 66°S.

Ancient glaciations have been postulated for the Precambrian and Paleozoic. Now the Cretaceous of the Mesozoic has to be added to the list if this deposit is accepted by mainstream geologists as a glacial deposit. Regardless of what uniformitarians think, any ice age deposits within rocks laid down by the Flood are a challenge to the creationist paradigm. Geologist Davis Young from Calvin College considers these ancient 'glaciations' as one of the strongest pieces of evidence against the Flood interpretation of the sedimentary rocks:

> 'Other deposits which render the Flood hypothesis untenable are those of glacial origin. There are evidences of glacial deposits from various localities and in rocks of various ages. One of the best known glaciations prior to the last great ice age is the glaciation of Late Paleozoic age in India, southern Africa, Australia, and southern South America. It takes a lot of time to form glaciers and have them flow and transport sediments over great distances.'[6]

However, such deposits need not be glacial as has been shown for Precambrian and Paleozoic sites,[7] and as we will see with this Cretaceous outcrop in South Australia.

The geological evidence

The claimed tillite (a lithified glacial till) was found at Trinity Well, at the northern extremity of the Flinders Ranges, which is considered to be the southern part of the ancient Eromanga Basin. The 'tillite' has a maximum thickness of 2 m and occurs in limited outcrops with up to 500 m of exposure along strike. The outcrops consist of two units. The lower unit is 5 m thick and is composed of a rapidly varying sequence of claystone to sandstone with beds of conglomerate, conglomeratic sandstone and the 'tillite.' The upper unit is composed of 15 m of massive to laminated silt containing isolated stones. These stones are interpreted within the glacial framework as dropstones from icebergs and are up to 80 cm in diameter.

The 'tillite' consists of rocks up to small boulder size. These rocks range from well-rounded to angular with many smoothed, polished and faceted pebbles. Other indications for the glacial origin are crushed quartz grains, contorted sediments interpreted as solifluction deposits in a permafrost environment, and a wedge shaped deposit thought to be an ice wedge cast.

The authors realize that an alternative interpretation (mass movement) is possible:

> 'As with all diamictites, however, it is necessary to consider other modes of origin in addition to glacial ice, such as deposition from mudflows and other types of mass movement. There are few reliable field criteria for distinguishing among diamictites of varying origins. Clast-fabric studies have not proved to give consistent results … .'[8]

A diamictite is the general term for an unsorted or poorly sorted sedimentary rock that contains a wide range of particle sizes. If the diamictite is considered to be from a glacial environment it is called a tillite. Although the authors admit that there are few diagnostic criteria for the tillite interpretation, they nevertheless reject the mass movement interpretation. They base their interpretation on only one of the three major glacial diagnostic criteria, which is 'dropstones' in fine-grained sediments, and other more minor indicators. A discussion on glacial indicators and their validity is provided

Figure 1. *Geological exposure purported to be a fossil ice-wedge cast (Alley and Frakes, Ref. 5). Alternative explanations include sediment collapse or the escape of water or gas.*

in reference 7. The authors note that a second significant glacial indicator (a striated pavement) is absent. This is not surprising since striated pavements are rather rare in association with diamictites. There is only one striated rock (the third major indicator) in the diamictite, which is not significant in this case.

The interpretation

Neither the authors, nor many other geologists that specialize in supposed ancient ice age deposits, seem to realize that the three major indicators of an ancient glaciation, plus the minor indicators, are all equivocal and can be duplicated by mass movement.[7] I have observed debris flow deposits that contained striated clasts on top of a striated pavement.[7] The striations occurred during the mass movement and are not related to glaciation. Thus, two of the main 'glacial' diagnostic features were duplicated by this debris flow.

The main diagnostic criteria used for identifying the supposed Cretaceous glaciation (isolated stones in the siltstone) could have been emplaced laterally in a thick mass movement of fine-grained sediment.[9] Schermerhorn states: '… scattered stones in laminated or massive sediments need not have been dropped in but may have been emplaced by later transport … '.[10] Postma, Nemec and Kleinspehn report:

> 'Many turbidites appear to contain floating megaclasts … . Reported examples include the deposits of inferred high-density turbidity currents that contain isolated, floating megaclasts up to a few decimeters or even a few metres in their longest dimension … .'[11]

Thus, the upper unit containing isolated rocks could easily be the fine-grained aftermath of a large mass movement that first deposited its coarse sediments in the lower unit. The mass flow would be similar to a thick turbidity current that deposits a fining upward sequence. The fine-grained nature of most of the sediment would be expected to polish some stones, and there are enough rocks in the lower unit to striate and facet stones. Striated and faceted stones can be produced in a variety of environments, especially mass flow.[12]

It is interesting that the sediments enclosing the stones are not silt/clay laminites, so they cannot claim they are varvites—lithified varves of one-year deposition in a pro-glacial lake at the edge of a glacier. Modern-day pro-glacial lake environments are where real glacial dropstones are recorded. The lack of varvites is positive evidence for a mass movement origin.

What about the minor indicators of glaciation? The angular crushed quartz grains can be the result of a number of environmental processes besides glaciation.[13–16] Contorted sediments can easily occur during soft sediment deformation. The presence of glendonite pseudomorphs after metastable ikaite are equivocal as they may be formed under varying conditions.[17] The suggested fossil ice wedge cast is rather interesting. It is more difficult to explain its origin but can conceivably be the result of the filling of a pit that formed from sediment collapse or the escape of water or gas. The picture shown in the main article[8] (Figure 1) reveals a rather broad depression with layering of the sediments in the pit parallel to the sides of the structure. Alley and Frakes indicate that this wedge-shaped structure could be due to deformation of sediments and that it only '… appears to represent an ice-wedge cast … '.[18]

All these indications of a Cretaceous glaciation are equivocal. It could just as well, if not better, be interpreted as a product of mass movement, which is consistent with a young-earth, recent ice-age model.[7]

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