Do five dropstones define another Proterozoic cold period?

Michael J. Oard

There are three main diagnostic indicators used to support ancient ice ages[1] that are supposedly hundreds of millions to billions of years old.[2] These indicators are striated and faceted rocks, striated bedrock, and dropstones in varvites. Faceted rocks have been ground down by friction to a flat surface, presumably by glacial movement. A dropstone is a rock that is larger than the containing layers, while varvites are believed to be lithified varves—rhythmites believed to have been laid down in one year. Rhythmites are regularly repeating laminae of two or more lithologies. Striated bedrock is solid rock typically underlying unconsolidated surface materials that has small (often parallel) grooves scratched into its surface.

Varves form today in lakes and are often composed of silt (summer) and clay (winter) laminae. However, it is known among some geologists that rhythmites can be duplicated by other processes, such as mass movement (see below).[3,4] Unfortunately, many geologists, when they find dropstones in fine-grained sediments, simply assume glaciation is the cause, or at least that sea or lake ice picked up rocks from near the shore. They assume glaciation depending on the age of the enclosing rocks.

Lonestones in thin-bedded sediments

Based on just five dropstones found in lithified fine-grained sedimentary rocks, several geologists added another cold period within the Neoproterozoic.[5] The outcrop is dated as very early Neoproterozoic at little less than 1000 Ma, near the Mesoproterozoic and Neoproterozoic boundary. Although the stones were found in northwest Scotland, the paleolatitude is thought to be 35°S.

The dropstones are isolated and restricted to a single horizon over a distance of 250 m. Therefore, the dropstones should be called 'lonestones', because they are isolated within the formation. The lonestones are from the Lewisian gneiss basement with amphibole dykes that outcrop close by. They are small (around 3.5–9 cm long), and so are easier to incorporate in fine-grained sediments by some mechanism other than by being dropped. Four of the lonestones are parallel to bedding and one forms a 60° angle (figure 1). Hartley *et al.* list four possible mechanisms of emplacement: biological rafting, flotation, ice rafting, and projectiles. They miss other mechanisms, such as swimming animals, waterspouts, and mass movement. Because they believe in evolution, they eliminate biological rafting and swimming animals. They propose ice rafting, since they believe in Proterozoic 'ice ages'. They do briefly discuss mass movement, but eliminate it because they think the strata should be comprised of more coarse-grained sediments, which is not necessarily true. Debris flows can be mudflows and can carry outsized clasts.

So, they conclude the lonestones were dropped from ice, and as their proof they point to the deflection and penetration of the layers. It appears from figure 1 that only two lonestones, (a) and (d), have deflected the layers below, as if they were dropped.

The layers were not considered varves but thin-bedded ancient lake sediments. The scientists determined that the lonestones must have been dropped from lake ice because there is no other evidence of glaciation. Besides, there is not supposed to have been a major glaciation at about 1,000 Ma. The Neoproterozoic has about three (supposed) global or nearly global glaciations, but all are 'dated' younger than 700 Ma.[6] Another reason is its relatively low paleolatitude of 35°S, but even for lake ice to form, the location must have been at high altitude. So, the authors deduce at least another Proterozoic cold period.

A Flood mechanism alternative

More explanations for these lonestones are possible within the Genesis Flood framework. Creation scientists are divided on the location of the pre-Flood/Flood boundary and the location of the Mesoproterozoic and Neoproterozoic in sedimentary rocks within biblical Earth history. Some think Proterozoic sedimentary rocks are pre-Flood,

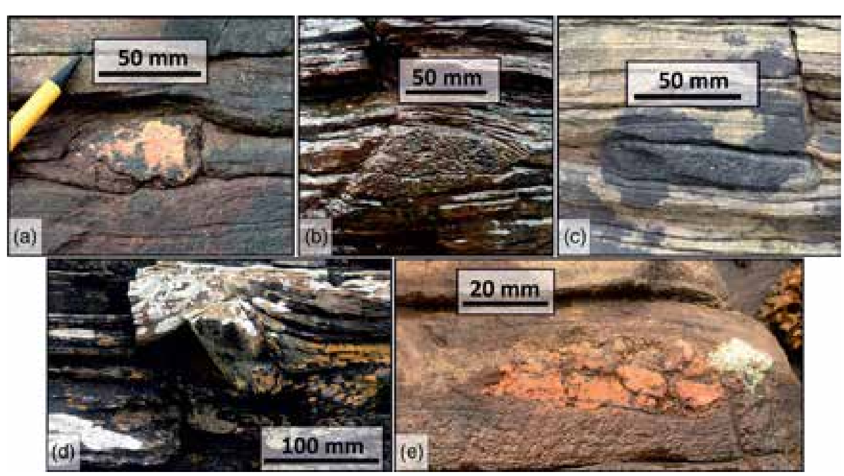

Figure 1. The five lonestones in fine-grained layers.[26] Note the deflection of laminae above and below the clasts in (a) and (d) and the variations in size, shape, and composition. Figure 1 (c) looks like a concretion, but it is an igneous rock and therefore a lonestone.

Creation Week rocks, or early Flood rocks deposited in basins and rifts. More research is needed. I prefer the latter possibility and have given reasons why I think it is likely that Proterozoic sedimentary rocks are from the very early Flood.[7–9]

Just because the beds are thin, it does not mean they are from a lake. In the Flood and even in a uniformitarian model, thin-bedded layers can form by turbidites and hyperconcentrated flows that leave numerous rhythmites. Hyperconcentrated flows are flows that contain 40–80% by weight of sediment in water, which is intermediate between turbidity currents with less sediment and debris flows with more sediment.[10] Many rhythmites can form in one year by several different mechanisms, such as turbidites.[11] In today's climate, numerous varve-like rhythmites are being formed in one year in Muir Inlet, Alaska, after glacial retreat.[12]

The two lonestones that disrupt the layers in figure 1 probably were dropped, and it is possible all five were dropped and would be real dropstones. However, that does not mean ice had anything to do with their emplacement. The lonestones could have been dropped from a floating log, kelp, or from stomach stones from swimming animals.[13] These were eliminated by the authors of the report because they do not believe kelp, logs, or swimming animals existed in the Proterozoic. But, in a Flood model, all would have existed from the very beginning of the Flood. The fact that all five rocks are found on one horizon could mean a sudden drop from the roots of a tree or from kelp that lasted only a short time, or it could mean sudden horizontal emplacement in a mass flow. If the rocks were dropped by lake ice, from kelp, or from floating logs, why are there so few and none in the many more horizons of the hundreds-of-metres-thick formation? During the early Flood, where sediment is being deposited rapidly, it is more likely that the lonestones were deposited by mass flow.

Disrupted layers below a stone are not necessarily indisputable proof of a dropped stone. Ovenshine states:

> "Unfortunately, penetration and deformation of strata below an iceberg-rafted stone may be very slight (Hardy and Legget, 1960), absent, or *indistinguishable from the later effects of compaction*. … Thus there are ambiguities in determining whether iceberg rafted components occur in a particular sedimentary section [emphasis added]."[14]

So, the lonestones could have been emplaced by mass movement, especially turbidity currents and hyperconcentrated flows that leave rhythmites. Schermerhorn states: "scattered stones in laminated or massive sediments need not have been dropped in but may have been emplaced by later transport."[15] Others support Schermerhorn's deductions:

> "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 decimetres or even a few metres in their long dimension."[16]

In the early Flood, massive tectonics, strong turbulent currents, and the shattering of rocks would be expected in many areas.[17] Eroded rocks from the Lewisian gneiss from the edges of 600-m-deep paleovalleys in the gneiss could have added lonestones to fine-grained sediments by turbulent plucking. The rocks then could have fallen through sediment-filled water until they came to rest at the bottom.

There are many instances of dropstones in thin-bedded strata that are not associated with glaciation or no longer glaciogenic, such as the Cretaceous of South Australia in which dropstones up to 80 cm were found in massive to laminated silt.[18,19] Many claimed glacial deposits defined by dropstones in thin-bedded sediments have been reinterpreted as mass flow deposits; for instance, the so-called glacial deposit in northern Norway.[20,21] The classic dropstone varvite supporting the 2.2-Ga-old glaciation in the Gowganda Formation was interpreted to be a distal turbidite by Miall.[22] Presumed Neoproterozoic glacial deposits based on dropstones in fine-grained sediments were reinterpreted as the product of subaqueous mass flow.[23] Dropstones in fine-grained sediments are reported from tropical environments as well as many other non-glacial environments.[24] Other instances are reported in the scientific literature.[25]

Conclusion

The five lonestones found in the very early Neoproterozoic in northwest Scotland do not necessarily indicate they were dropped, or that the thin-bedded layers were lake deposits. Several mechanisms form dropstones in fine-grained layers. The lonestones need not be dropped by lake ice, suggesting another Proterozoic cold period. There are other interpretations, especially considering the Flood and mass flow.

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