Long-distance transport of sediments

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Secular scientists are sometimes forced by evidence into some radical conclusions that defy their own starting assumption—uniformitarianism or present processes. For instance, it was discovered in recent decades that large amounts of sand and other sediments likely were transported for thousands of kilometres over a wide area from their presumed source. Creation scientists have been pointing out the implications of such transport.[1–4]

Sand transport for thousands of kilometres

In 1992, Rainbird *et al.* deduced that sands in sandstones from various areas of north-west Canada mostly originated from south-eastern North America, travelling from one side of North America to the other.[5] The sediments analyzed were originally deposited in two arcuate Precambrian basins—the Mackenzie and the Amundsen basins. These basins contain thousands of metres of sedimentary rocks, 'dated' from about 1.5–1.7 Ga. Portions of the basins have uplifted into mountains, where the sedimentary rocks can be sampled. The paleocurrent directions in the sandstones are also consistently from the south-east, supporting their conclusions.

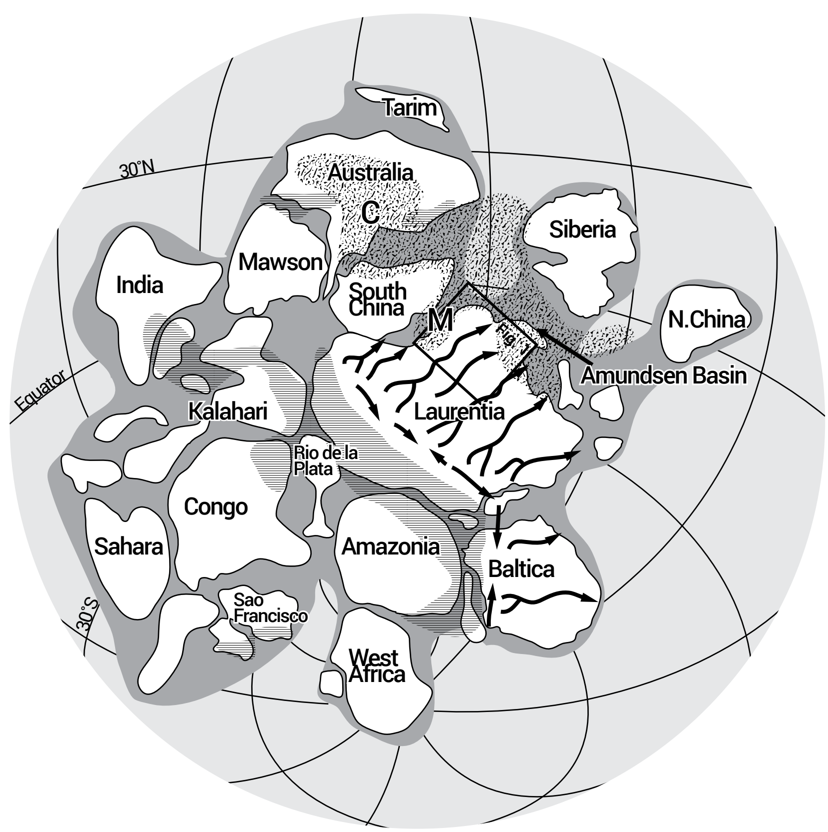

Figure 1. One possible configuration of the supercontinent Rodinia showing mountain uplift (converging arrows) on Laurentia and Baltica caused by continental collisions that occurred during the Grenville orogeny. Eroded sediments are carried across the two continents (longer arrows with tributaries). (From Rainbird *et al.*[6], p. 1409.)

In their original research, Rainbird *et al.* used few samples. However, in their most recent research they used many more,[6] and obtained the same results (though more local sources were found in the lowest sandstones just above the upper crustal igneous and metamorphic rocks). They found sand grains embedded throughout considerable thicknesses of strata, over 4,000 m thick in the Amundsen Basin, likely originated from the area of the Grenville orogeny and other faraway Precambrian terranes near the Appalachian Mountains, about 3,000 km away. They emphasize that the 'river' or 'rivers' that flowed toward the north-west were at least *1,200 km wide*! This is "much wider than any modern fluvial system on Earth".[7]

The Grenville orogeny supposedly occurred about 1.5–0.98 Ga when the supercontinent Rodinia was formed by continental collision. According to paleomagnetic data (mainly from apparent polar wander paths), this is claimed to have taken place along about 4,000 km of crustal convergence of Laurentia with presumably Amazonia, which currently resides in South America (figure 1).[8] Hence, the size of the mountains in the Grenville orogeny are believed to have been at least the height of the Himalayas, which supposedly represent only 2,000 km of shortening. The Grenville mountains have since eroded away; most of their 'roots' are found in south-east Canada and the north-east United States, with a few root areas extending south-east into Texas.

Basis for long-distance claim

Rainbird *et al.* claim that the sand had travelled such long distances based on the 'ages' of zircon crystals in the sand. This field of study is called provenance analysis, which is the attempt to reconstruct the source of sediments for a particular sedimentary feature under investigation. Dating of zircons is only one method used in provenance analysis. The method involves separating out numerous zircon crystals from the sand and dating them by the U-Pb method, which has become very efficient and cost effective. Since transported sand can originate from almost anywhere, the variable zircon dates are thought to indicate the specific Precambrian terranes from which the sand eroded. The dates can be highly variable, but they usually cluster into discrete 'age bins'. These age bins are then believed to reveal the source of the zircon crystals, and hence the sand and other sediments. Secular scientists have worked out age bins associated with major Precambrian terranes across the continents.

Many of the dates in north-west Canada give ages that coincide with the Grenville orogeny. Other dates are thought to indicate origination from other faraway terranes.

Grenville-age zircon dates are also found in basins of north-east Canada, east Greenland, Svalbard, Scotland, and Norway.[9–11] These are also attributed to the erosion and transport north and east from the Grenville orogeny after the supercontinent Rodinia was assembled and the Grenville mountains formed.

Sandstones of south-west North America and Alberta also mostly from Grenville orogeny

Not only are the sand and other sediments of north-west North America believed to have originated from eastern North America, but so are most of the sands in south-west North America and Alberta.[12] These sandstones range in age, based on uniformitarian assumptions, from Neoproterozoic (1,000–542 Ma) to Mesozoic (252–66 Ma), and most are assumed to have been deposited by wind. However, there is substantial evidence that the sands were deposited from water,[13] but this is unacceptable to uniformitarian thinking because it would involve cataclysmic water flows. Neoproterozoic and Cambrian strata in the south-west United States and north-west Mexico are believed to come from the Grenville orogeny. This is supported by the predominant paleocurrent directions for the strata coming from the east.[14] In this case, the nearest Grenville terrane is in Texas about 1,000–1,500 km away.

The huge Permian and Jurassic 'eolian' sandstones on the Colorado Plateau of the south-west United States are believed to have blown in from the north, as far as Canada, according to paleocurrent directions. Nearly half of the original sand is believed to have been transported 1,000–2,000 km from the east, from around the Appalachian Mountains.[15–17] Rainbird *et al.* think this westward-transported sand was then picked up by northerly winds and spread into south-west United States. Most of the upper Paleozoic sands from Grand Canyon are also thought to have come from the Appalachian region and been spread by large rivers.[18] Some of the strata from the western Canadian Sedimentary Basin in Alberta are also deduced to have come from the Grenville orogeny and the Appalachian area.[19] It appears all the sandstones (as well as other sediments) from north-west Canada to north-west Mexico originated from the eastern part of North America.

Unfortunately for the secular model, evidence for their postulated ancient transcontinental rivers does not show up in the sedimentary rocks of middle North America.[20]

Implications

Assuming the ages of the Precambrian terranes accurately reflect a relative chronology, the uniformitarian conclusions are radical. They defy explanation by presently occurring processes, the common assumption behind uniformitarianism. The greatest challenge uniformitarians face is explaining how parallel flowing rivers can transport sand over 3,000 km over a width of thousands of kilometres (figure 1). Adding to their difficulties is the thickness of the sediments thus transported, such as those in the Mackenzie Basin, which has sedimentary rocks several thousand metres thick. When one considers the sedimentary material transported from north-west Canada into the south-west United States, a staggering amount of sediment was transported across North America. Furthermore, by uniformitarian reckoning, this sediment probably only represents a small amount of that transported, since rivers normally deposit only a small fraction of their load along their path.

A much better explanation, if we can trust the relative dates, is that the sand and other sediments were transported westward long distances over wide areas during the Genesis Flood. This evidence is better explained by wide, fast water currents picking up the sand and depositing it during the Flood. All this sediment in western North America transported from eastern North America does imply a large mountain uplift in the east.

Such Precambrian activity also raises the question of where to locate the pre-Flood/Flood boundary. Are possible mountain uplifts in eastern North America, and the transport to deep basins in western North America—exceeding 3,000 km of transport at their greatest—an activity that occurred on Day 3 of Creation?[21] On Day 3, the dry land appeared, which does not necessarily imply uplift and erosion. Since Creation Week involved supernatural activity, I suspect that there was no tectonic uplift, erosion, transport, or deposition at that time. But if such geological activity did occur, the Bible also states that on Day 3 vegetation sprouted on the land. Such long-distance transport of sediment would have to be extremely rapid and finished for vegetation to also sprout on Day 3 over most of North America, which seems unlikely. It also seems unlikely that this level of activity could occur during the pre-Flood period because one would not expect such powerful erosion and long-distance transport from high mountains with accumulations in thousands of metres of sediment between Creation and the Flood. Rather, it seems this cataclysmic sediment transport would better fit the early part of the Genesis Flood.[22]

The arcuate shape of the southern and eastern parts of the Mackenzie and Amundsen basins is also intriguing, and may indicate impact cratering. Impacts are expected to form saucer-shaped craters that fill with sediment, some of which would be expected to later rebound.[23] The Precambrian has many intriguing types of sedimentary rocks and features, such as banded iron formations and large greenstone belts, that need to be incorporated into biblical Earth history. The location of the pre-Flood/Flood boundary is a key to solving such questions about earth history, and is an issue that needs further research.

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