

# Stokes' Law, Burrows, and an Ordovician Ice Age – Why Noah's Worldwide Flood Never Happened and Why the Earth is More Than 6,000 to 10,000 Years Old

Lorence G. Collins [lorencecollins@gmail.com](mailto:lorencecollins@gmail.com)

January 2019

## Introduction

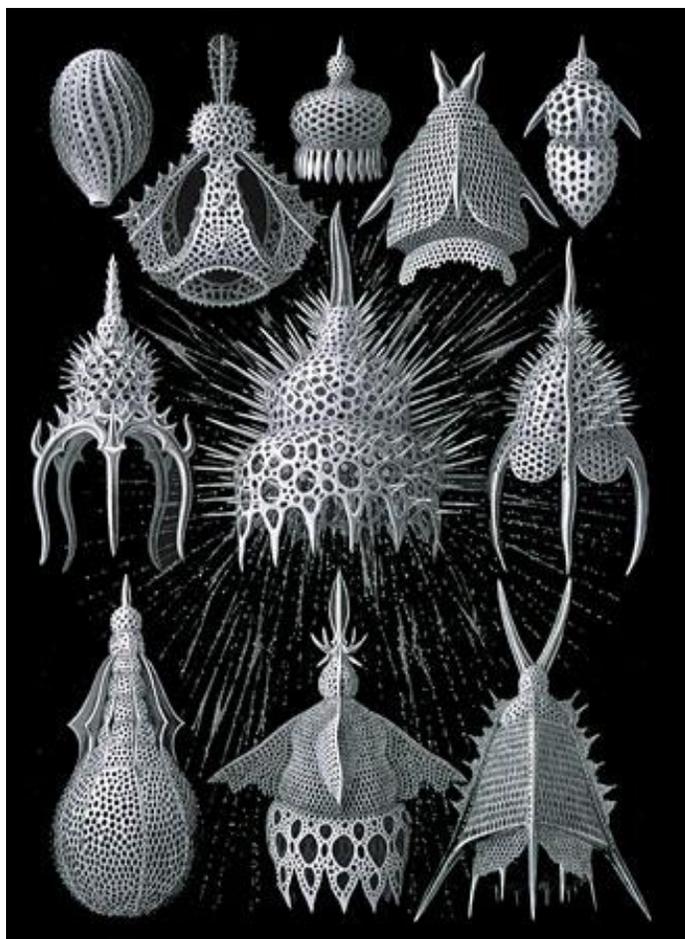
Young-Earth creationists (YEC) say that conventional geologists should learn to think biblically rather than thinking that the earth is millions and billions of years old ( Hill et al., 2016) and rather than thinking like uniformitarians who YEC say believe all geological processes in the past operated in a slow way like what is observed today. In contrast, YEC say rates in early biblical times were much faster. Some YEC also say that there were elevation differences in the past in which ecological communities of animals and plants were different in successive higher topographic elevations (e.g., Clarey and Werner, 2018ab). On the basis of that model, they say that when the level of water in the Flood rose, each different community was overwhelmed in succession in the order that is seen in the fossil record in the geologic column. In that way, dinosaurs were killed prior to when large mammals, flowering plants, and humans were swept off the highest land under the advancing water. This model of topography/ecology was thoroughly debunked by Glenn Morton in an article in a journal in 2001 that is not commonly read by the general public. See: <http://www.talkorigins.org/faqs/geocolumn/> Therefore, the YEC could ignore his evidence and pretend that such did not exist and go on believing what they wanted to believe. Morton has nine bits of evidence/reasons as to why Noah's worldwide Flood never happened. In order to bring the conventional view to the attention of the public in a readily available source, this article is published in a website <http://www.csun.edu/~vcgeo005/creation.html> and includes five of Morton's bits of evidence and adds a sixth (Ordovician glaciation) that shows that a global flood never happened. **However, a local flood is certainly possible.** See: <http://www.csun.edu/~vcgeo005/Collins2.pdf>

## Stokes' law

George Gabriel Stokes in 1851 derived a formula from experimental work, now known as Stokes' law, for the frictional force – also called drag force – exerted on spherical objects with very small Reynolds numbers in a viscous fluid. (In fluid mechanics, the **Reynolds number** (Re) is a dimensionless **number** that gives a measure of the ratio of inertial forces to viscous forces for given flow conditions.) See: [https://en.wikipedia.org/wiki/Stokes%27\\_law](https://en.wikipedia.org/wiki/Stokes%27_law), if interested in the formula. If YEC are creation *scientists* as they claim to be, then, as scientists, such a law should be accepted as a law that the Creator made because Stokes' law is dependent on the physical laws that the Creator also made. On that basis, the rates at which fossils and sediment settled in water and were transported by the supposed worldwide Flood should be the same in the past as observed today. The rates of settling, however, will be slower when objects settling in water are not spherical and offer greater resistance to settling because of increased friction. Four examples of non-spherical objects having greater friction are described below: (1) radiolarian fossils, (2) coccoliths fossils, (3) clay minerals, and (4) volcanic ash.

### 1. Radiolarian fossils

Layers of radiolarian fossils are found in various ages (Cambrian, Devonian, Jurassic, and more) that range between 50 and 100 meters (164 to 328 feet) thick. <https://en.wikipedia.org/wiki/Radiolaria> (<http://adsabs.harvard.edu/full/1986AREPS..14..455J>) and in modern oceans, as much as 1,400 meters (4,000 feet) thick. See: <http://www.csun.edu/~vcgeo005/Collins5.pdf>. Their silica skeletons have pointed spines and pores that cause them to sink in water exceedingly slowly. See **Figure 1**.



**Figure 1. Ernst Haeckel's radiolarian images.**

Around the world thicknesses of Paleozoic and Mesozoic sedimentary rock layers are commonly 15,000 feet thick or more, and YEC believe that all these layers were deposited by the Flood (Hill et al., 2016). There are no radiolarian deposits in the Grand Canyon, but for 164 to 328 foot-thicknesses of radiolarians to be deposited in proportion to the 15,000-foot-total-thickness in one year (365 days), these radiolarians would have to be deposited in 3.9 to 7.9 days. So, how fast do radiolarian skeletons accumulate on an ocean floor? Japanese scientists have made such a determination and have found that it takes 14 to 392 days for radiolarians to fall through a water column that is 5,000 meters deep, which is far longer than the theoretical 3.9 to 7.9 days that are available in the young-earth model for radiolarian deposition. (See <http://www.csun.edu/~vcgeo005/Collins3.pdf>). Thicknesses of 4,000 feet of radiolarians on the modern Pacific Ocean floor would require millions of years of

deposition, and, thus, the Earth cannot be 6,000 to 10,000 years old. In 3.9 to 7.9 days there would not be enough silica dissolved in the water to almost immediately produce skeletal structures for zillions of radiolarians nor could thicknesses of 164 to 328 feet containing zillions of radiolarians be floating close enough to the ocean surface so that all radiolarians received the sunlight (energy) they would need to reproduce. The upper layers of radiolarians would block the sunlight from the underlying layers. Thus, the radiolarian fossil-bearing layers in the geologic column could not have formed during a one-year Noah's Flood.

## **2. Coccoliths fossils**

A similar calculation and result could be made for coccoliths (a kind of floating marine algae) that are found in 300-foot-thick chalk layers in the White Cliffs of Dover and in Kansas, containing zillions of fossils of coccoliths. See: <http://www.csun.edu/~vcgeo005/Nr38Reasons.pdf> and <http://www.csun.edu/~vcgeo005/Nr42Response.pdf>.

## **3. Clay minerals**

A third example is particles composed of clay. Clay minerals are produced from the weathering of feldspars in igneous rocks. But the feldspars have to be generated in these igneous rocks ahead of time prior to the Flood. Most are in granitic rocks that had to be intruded into the Earth's crust as molten magma, then cooled at depth to crystallize as solid rock, and finally, uplifted so that the overlying rock can be eroded off to expose the granitic rocks before the feldspars can be weathered. These processes would take millions of years because of the very slow rate to grow large crystals and the slow rate at which heat is lost to the Earth's surface. Then, weathering can also take even more millions of years to make enough clay minerals that can be washed away and transported during the supposed Flood to make the abundant and thick sedimentary shale layers of Paleozoic and Mesozoic age that are said by YEC to be deposited during the Flood. Significantly, granitic rocks contain about 70 percent anhydrous feldspars that are weathered to become hydrous clay minerals. Therefore, it is not surprising that, of the three major crustal sedimentary rocks (shale, 60%; sandstone, 20%; carbonates [limestone], 15%; and all others, 5%), – shales that contain the clay minerals have the greatest volume and compose 60% of the Paleozoic and Mesozoic rocks

supposedly deposited by the Flood.

[https://simple.wikipedia.org/wiki/Sedimentary\\_rock](https://simple.wikipedia.org/wiki/Sedimentary_rock) The abundant shale beds are generally not seen because shale is composed of soft clay that is easily eroded and occur underlying valleys where they are covered by vegetation and river sediment, whereas harder limestones and sandstones form the adjacent mountains or hills.

The great thickness of shale layers in the Earth's crust is illustrated by the Cretaceous Mancos Shale in Colorado which is capped by a 200-foot-thick layer of sandstone where ancient Indian cliff dwellings are found, and this shale formation is as much as 4,000 feet thick. See **Figure 2**.



**Figure 2.** Mancos Shale (grey) with a cap of Cretaceous sandstone (tan). River channels (discussed later) that cut down into the Mancos Shale and which are filled with sand and gravel are not shown in this image.

Now, according to Stokes' law, clay particles settle at an extremely slow rate because of their small size and angular shapes. For example, a simple lab experiment can be done in which a mixture of small pebbles, sand, and clay can be put in a bottle with water. When this bottle containing this mixture is shaken, all the sedimentary particles of different sizes are suspended in the water. But when the bottle is set on a table where the water becomes quiet, the pebbles settle out first, followed in order by sand, and finally after a couple of weeks the finest clay particles settle on top. This observation means that 60 percent of the sedimentary rocks in the Earth's crust that were supposedly deposited by the Flood had to be deposited in quiet water and were not deposited from rushing water moving globally across the Earth's surface. Therefore, for most sedimentary rocks in the

Earth's crust the time to deposit the clay minerals to form shale must have taken millions of years and not one year of the supposed Flood.

Glenn Morton also points out that the Cretaceous Hammond beds in Texas, which is 1300 meters (4265 feet) thick, contains 15,000 alternating layers of shale and sandstone. This means that the deposition of clay minerals and sand grains in a geologic basin consisted of periods of very quiet times in which clay minerals were washed into the basin where they slowly settled out of the water and this was followed by storms that washed in sand grains that were rapidly deposited on top of each clay-bearing layer. That alternation of clay and sand, 15,000 times (back and forth) cannot possibly happen in one year of the Flood when rain is said to be continuous for 40 days and 40 nights. (Genesis 7:12)

#### **4. Volcanic ash**

The fourth example that Glenn Morton points out is the presence of multiple thin bentonite layers that are interlayered with Cretaceous shale layers in North Dakota. Bentonite is formed from the conversion of volcanic ash into clay. Volcanic ash particles settle even slower than clay particles because the ash particles are quite angular, irregular in shape, tiny, and offer greater resistance to settling. If the Flood waters were not quiet but were rushing across the Earth's surface when both clay and volcanic ash were being deposited, the ash particles should have been whirled and mixed in with the clay so that no distinct layers of bentonite would exist. The coexistence of bentonite and shale layers clearly shows that the Flood waters were quiet most of the time that deposition of both ash particles and clay minerals occurred. Certainly, that time of co-deposition was much more than one year.

If the above is understood, and if the YEC claim that rates of settling were faster in biblical times, then during those earlier times water (having faster rates of settling powers) would have had to have extremely lower viscosity. If that were true, the water in the Flood would be unable to suspend and transport any sedimentary fragments. Therefore, greater rates of settling in biblical times did not occur, and this is also further evidence that a worldwide Flood never happened.

## Burrows

Glenn Morton also indicates that in the Cambrian Deadwood Formation in North Dakota skolithos burrows are in the shales. These burrows were created by an early animal that munched its way through the shale by swallowing the clay to get nutrients from the shale, leaving fecal material behind.



[http://www.sjvgeology.org/geology/trace\\_fossils\\_skolithos.html](http://www.sjvgeology.org/geology/trace_fossils_skolithos.html)

The end result were tunnels (burrows) through the shale. The information in the above section shows that the shales must have taken a long time to be deposited. Therefore, the animals would have had lots of time to create their burrows. Overlying the shales are sands in sandstone that were quickly deposited and covered and filled in the burrows with sand. The fact that there are no burrows in the sand proves that the sand was deposited rapidly. Morton then points out:

"If the entire geologic column in this area is 5000 meters thick and the Haymond beds are 1300 m thick,  $1300/5000 \times 365$  days = 95 days for the Haymond beds to be deposited. Since there are 15,000 of these layers, then  $15,000/95$  days = 157 layers per day need to be deposited. The problem is that the animals which made the burrows mentioned above, need some time to re-colonize and re-burrow the shale. Is it really reasonable to believe that 157 times per day or 6.5 times per hour, for all the burrowers to be buried, killed, and a new group colonize above them for the process to be repeated? Even allowing for a daily cycle, would require 41 years for this deposit to be laid down."

These observations and calculations certainly negate a worldwide Flood that lasted one year.

### Ordovician Ice Age

An additional bit but not final bit of evidence (more given in later parts of the article) that negates a one-year worldwide Flood is the existence of an Ice Age during the Ordovician. The evidence for such glaciation includes parallel grooves and striations on an early Paleozoic sandstone layer in the Sahara Desert and in other places. See: <http://the-earth-story.com/post/82180880097/glaciation-in-the-sahara-440-million-years-ago>

See **Figure 3**. No other erosional process produces such parallel grooves.



**Figure 3.** Glacial grooves and striations on sandstone in the Sahara Desert.

Of course, ice does not form near the equator in Africa where this region is very hot in today's world. Therefore, for ice to have accumulated there and glacial erosion to have happened in the Sahara Desert, Africa had to be positioned closer to the South Pole. On that basis, Africa has moved to its present position by continental drift. But even if accelerated plate tectonics were possible, as proposed by Baumgardner: [http://creationwiki.org/Catastrophic\\_plate\\_tectonics](http://creationwiki.org/Catastrophic_plate_tectonics),

simultaneous accelerated weather patterns would also have had to occur if the Ordovician sedimentary rocks were deposited during the first few days of the Flood. Snow fall would have had to have been extremely fast (say, 10,000 inches per day or more). Moreover, for ice to form as a continental mass thick enough to flow over a nearly flat surface, that creation of great amounts of ice and subsequent erosion of underlying sandstone could not have possibly happened in 2 or 3 days of the supposed year-long worldwide Flood, regardless of whether YEC insist that rates were different and faster in biblical times.

### **How old is the Earth and the Grand Canyon?**

No carbon-bearing plant fossils exist in the Grand Canyon sedimentary rocks for which C-14 dating methods can be used to show that the canyon is more than 6,000 to 10,000 years old, but a recent publication in *Perspectives in Science and Christian Faith* has reported that varves in the Suigetsu Lake in Japan have been dated by C-14 studies to be as much as 50,000 years old. (Davidson and Wolgemuth, 2018). Moreover, volcanic basalt has come through the Paleozoic and Mesozoic rocks in the Grand Canyon several times during the Pleistocene Epoch to fill the bottom of the canyon 13 times, one lava flow of which built a dam as much as 600 feet high that blocked the flow of the Colorado River until the river eroded it out as well as eroding out each of the other 12 dams (Dalrymple and Hamblin, 1998). These basaltic rocks have been dated by K-Ar methods to be 400,000 to 684,000 years old. Other dating methods, not using radiometric isotope methods but using three different modern methods for determining ages (fission tracks in apatite crystals, cosmogenic radionuclide dating, and optically stimulated luminescence dating) give dates for the carving of the canyon to be 5 to 6 million years (for apatite dating) and the deposition of river terraces on the side of the canyon in hundreds of thousands of years. See:

<http://www.csun.edu/~vcgeo005/GrandCanyon.pdf>. Furthermore, U-Pb dating of a limestone on top of the Coconino Plateau shows that the Grand Canyon first started to be eroded 60.5 to 66.3 million years ago (Hill, Polyak, et al., 2016). And, U-Pb dating by Polyak et al. (2016) of calcium carbonate mammillary deposits in caves found in a limestone in the walls of the Grand Canyon give ages for carving of the canyon that ranged from 17 to 3.7 million years ago as time for the carving of the canyon progressed. Therefore, where different totally unrelated methods of dating give the same consistent dates in many different places in the canyon for the same

dating methods and by different laboratories, such a correlation gives confidence that the ages can be trusted. Therefore, the dating of varves in Japan and dating of rocks and erosional features in the Grand Canyon clearly show that the age of the Earth and of the Grand Canyon are both much older than 6,000 to 10,000 years.

### **Predictions that are possible from knowing how shales are created**

When it is understood how shales are formed and that their formation happens where clay is carried to quiet bodies of water and where this clay settles out very slowly, then such an environmental condition allows one to recognize that other kinds of environments on the Earth's surface are possible and predicted where conditions are right for different kinds of sedimentary deposits to form, such as limestones and sandstones. If that is true, one can also recognize that the different environmental conditions allow for different ecological communities of plants and animals to occur in such different places. In contrast, a worldwide Flood model cannot make such predictions because rushing water that is advancing across the Earth's surface would not necessarily exhibit progressive predictable changes in the kinds of sedimentary rocks that are produced. The reason is because rushing water can only produce a chaotic product like what occurs where a tsunami has happened that jumbles everything.

### **Dinosaur families that cannot have been overwhelmed by rising Flood waters**

As an example of the lack of chaos, the following is a situation involving the dinosaurs. In the Flood model, dinosaurs are supposedly drowned when rising flood waters overwhelmed them as they were fleeing to higher ground. But in Bolivia, outcrops are found in the Cal Orko quarry showing dinosaur footprints on sedimentary layers tilted at a 70 degree angle and on which 402 trackways of **eight** different species of dinosaurs are found: See:

<https://www.youtube.com/watch?v=4nTje0Y-ggo> (Video produced by Joel Duff, professor of biology at the University of Akron) It should be obvious that dinosaurs did not walk up a slope tilted at 70 degrees, that they must have walked at this place when soft sediment was deposited in a horizontal position, and that the sediment hardened into rock before it was tilted, else the sediment would have slumped. It should be also obvious that the Flood should not have the power to tilt sediments into a 70 degree angle and erode the layers away to form the mountain

in which this quarry occurs. During the quarrying process **eight** different layers have been found on top of each other that have such trackways. Presumably with more quarrying, still more trackways will be found at higher levels up the stratigraphic sequence of layers. These footprints and their spacings indicate that the dinosaurs were likely walking in family groups and not running to escape an advancing Flood. Moreover, because the footprints are in the same general place and the layers are on top of each other, the dinosaurs had to be living in this same place for many years, time enough for several hundred feet of more sediment to be deposited at this site – not just in the one year of the Flood.

These observations are particularly *contradictory* to the Flood model because these rocks in which the footprints occur are Cretaceous in age and supposedly consisted of sediment that was deposited by the Flood in the first place – prior to the time in which the dinosaurs were walking there. What kind of miracle is that? What is apparent is that the dinosaurs were walking along the shore of a lake (or sea) in soft limey muds (**clay slowly deposited**) that allowed their weight to produce the footprints, that this lake was slowly being filled up by limey mud that settled out of the water, and that in each successive later time, overlying deposited mud covered the footprints to preserve them. On that basis, the shore line must have slowly risen in place as the lake filled with more sediment, and the bottom of the basin sank from the weight of the added sediment to make room for more water and sediment. Thus, the environment gradually changed, perhaps over thousands of years – not in one year of the Flood.

### **Marine and brackish water shales as a clue for oil exploration**

An example that applies to predicting changing environments was told to me by a petroleum geologist. In his search for oil, the oil company did "wildcat" drilling at a certain place (which did not discover any oil) and the coring showed at a certain depth – fossils of animals in shale which he recognized as occurring in a marine environment. A second "wildcat" drilling was done a mile away (which also did not discover any oil) and at the same depth, shale was found with fossils of animals that he recognized as occurring in a brackish water environment. How can that be? Aha! Between the two places must be an offshore bar consisting of sand that separated a marine sea from a lagoon containing brackish water. So, he recommended drilling between the two places to this predicted sandbar, and the

company found the sandbar containing huge quantities of oil. Thereafter, the company continued tracing this sandbar across the area mile after mile, drilling oil wells one after another. The point here is that a model for a worldwide Flood of rushing water cannot make such a prediction. The Flood cannot have produced such an environment with changes from marine to brackish conditions by rushing water in such a short distance of less than a mile.

### **Chemically precipitated calcite in limestone**

On the basis of this shale example, limestones and sandstones must also have special environmental places where they are deposited, and these places can be different from where shales are found. Commonly, some limestones are produced in relatively shallow environments where calcium and carbonate ions are concentrated because of water evaporation and these ions are chemically precipitated to form calcite in limestone. These environments can be either continental **freshwater** or **marine** in character. How can rushing Flood water produce both freshwater and marine water environments? Below is an image of the Silurian Hopkinton Limestone in a quarry in Iowa in which individual layers are consistently the same thickness for hundreds of square miles and in which the fossil communities are undisturbed (**Figure 4**). It is logical that the calcite in this limestone was chemically precipitated in quiet water and not carried there in rushing water in less than one year (say two or three days).



**Figure 4.** Silurian Hopkinton Limestone.

## Limestone reef environments

In other places, calcite-bearing limestones are produced where marine animals subtract calcium ions from ocean water and form calcareous shells or skeletons that accumulate through time. In some of these places, such as a tropical coral reef, it is common that the animals continue to grow on top of each other without being disturbed from where they started growing. An example is the Permian Capitan Reef in the Guadalupe Mountains of Texas (**Figure 5**).

<https://www.nps.gov/gumo/learn/nature/geologicformations.htm>



**Figure 5.** Permian Capitan reef in Guadalupe Mountains of Texas.

YEC seem to ignore that this reef, which is as much as 200 feet thick, has both fore reef and back reef sediments that are well preserved adjacent to the main reef. Moreover, the 200-foot thickness of this limestone mostly composed of fossils cannot possibly be created during the one-year-Flood because the animals do not grow that fast to produce such a thickness. In fact, in the Flood model they would all have to grow perhaps in much less than a month. Moreover, how can rushing water of the Flood produce both fore reef and back reef sediments that exist on either side of the main reef and preserve their particular animal communities for each environment? This limestone reef in Texas is one of the special limestone environments that occurred on Earth that are better explained by natural processes rather than by a Flood model.

### **Animal communities in limestone communities disturbed by storm waves.**

Of course, other places are found where limestone was formed in a shallow sea where sunlight could penetrate the water to provide energy for communities of

corals, brachiopods, crinoids (marine sea lily growing on tall slender stems), and bryozoans could live. Periodically, through geologic time, these communities could have been disturbed by storm waves breaking them loose from where they were growing and mixing loosened shells and broken crinoid stems in jumbled masses. One example of such a limestone is the Redwall Limestone exposed in the Grand Canyon. <http://www.csun.edu/~vcgeo005/Nr46Credible.pdf>. See **Figure 6** for broken crinoid stems.



**Figure 6.** Jumbled and broken crinoid stems in Redwall Limestone.

The point here is that these different kinds of limestones (chemically precipitated or formed from animal fossils) have different explanations for their origins that are more plausible than explaining that **all** limestone beds of Paleozoic and Mesozoic age resulted from the transportation of already-formed calcite crystals, for miles and miles. The reason that the Flood model is not logical is because the calcite in these limestones (if deposited by the Flood) had to have been crystallized prior to being transported and because to produce such pre-formed crystals, millions of years of weathering of calcium-bearing rocks (such as volcanic basalt layers) must have occurred to release the calcium ions to make the calcite crystals that were supposedly transported by the Flood.

### **Sandstone environments**

Sandstones are produced in many, many different environments. Some are channel sands in meandering rivers. Others are beach sands, desert dune sands, offshore barrier bars, turbidite sands produced where beach sands have slid into

deep basins, delta sands, sands deposited from rivers draining away from glaciers, cross-bedded sands formed in torrential streams, rippled sands by water affected by shallow waves, and several more possibilities. For example, I have seen channel sandstones in Colorado where ancient meandering rivers of Cretaceous age eroded down into the underlying Mancos Shale and in the channels are large logs of trees (now petrified) that were transported there by the river when the trees were uprooted upstream by the river cutting into its former banks where the trees were growing. The rushing waters of the Flood could not have produced such a meandering river nor would large volumes of Flood water carry trees for miles and miles to specific narrow channel deposits at the base of a sandstone deposit. A huge volume of rushing water should disperse the trees and not concentrate them.

Other channels occur in the base of sandstone layers where rivers have cut underlying shales (former river flood-plain deposits composed of mud [clay minerals] – also slowly deposited) of Permian, Triassic, and Jurassic age in the Colorado Plateau area near the Grand Canyon. Thus, many examples of surface river-erosion occur at several different geologic-formation-levels and ages which could not have happened if the created sandstones resulted from the deposition of sand grains that were carried there by rushing waters of an advancing Flood. In some places in these channels, logs, leaves, and wood fragments that were carried by the rivers contained carbon that was replaced by uranium, vanadium, and radium of sufficient quantity to become ores of these elements.

<https://pubs.usgs.gov/pp/0320/report.pdf> Surely, the trees did not have these elements in them prior to the Flood when they were alive. Therefore, the fluids that brought these elements to the wood must have moved into the sandstones after the trees had been eroded and transported by the rivers. In the Flood model, this emplacement of uranium, vanadium, and radium into the wood would have had to happen quickly, if not soon after the one year of the Flood – at least in less time than 4,350 years when the supposed Flood occurred. It is also certain that these elements were not carried in solution by the Flood waters because they are not very soluble in cold water and because the huge volume of the Flood water would not concentrate these elements. Therefore, fluids carrying these elements must have been hot hydrothermal fluids that came up from the mantle, and these fluids had to move up through several thousand feet of Paleozoic sediments to reach the Permian, Triassic, and Jurassic sandstone channels. Such movements would likely

take much more time than 4,350 years. Hence, the ores of these elements are also evidence that the Earth is more than 6,000 to 10,000 years old.

Sandstones produced by the supposed worldwide Flood cannot choose the environment of deposition because transported sand in a tsunami-like Flood is just dumped with no special sorting or selection of where the sand becomes deposited. All the different kinds of sandstones (mentioned above) with special conditions of deposition exist around the world, but YEC tend to ignore those places that do not fit their Flood model and choose only places that seem to fit it. That is not how science is properly done. All data must be considered.

### **Topographic high ground as evidence against a worldwide Flood**

It is true that higher topographic elevations existed in the past which contained rocks that were eroded to produce the sediments that became transported and deposited to become sandstones and shales that were supposedly created by the Flood in the Grand Canyon area, according to some YEC (e.g., Clarey and Werner, 2018b). The observation is made that all megasequences thinned toward the crystalline shield areas on all three continents where cross sections were made and that the sedimentary units did not merely show evidence of erosion and truncation but they became thinner in the direction of the shields, and this thinning implied that they were deposited on the flanks of extensive uplands. What these YEC do not seem to realize is that when these high topographic places (the uplands) are examined as to (1) where they were, (2) what they were composed of, and (3) what happened in these places, such give evidence against a worldwide Flood. For example, the Appalachian Mountains are largely composed of Paleozoic sedimentary rocks that are in elongated belts of folded and thrust units that resulted from mountain-building during plate tectonic collisions in late Paleozoic time. During the earliest Paleozoic Era, the continent that would later become North America straddled the equator, and at that time shales, sandstones, and limestones were being deposited in a shallow basin in nearly horizontal positions. Then in the Ordovician Period (about 440-480 million years ago) the Iapetus continent began to move and it collided with this area and subducted underneath it. This action caused rocks in this area near the equator to be folded, thrust, and uplifted to form the Appalachian Mountains. Likely peaks in these mountains at that time were as high as 12,000 feet or more on the basis of

projecting the angles of the tilted layers that are now eroded to lower elevations. Because of further continental collisions that continued into the Pennsylvanian Period, sedimentary rocks with ages of Cambrian through Mississippian in the Ozark-Ouachita region and into Texas were raised, folded, and thrust to produce mountains on a Himalayan-scale. Thus, both the Appalachian Mountains and the Ozark-Ouachita Mountains were topographic high grounds that were eroded through time and became sources of sediment that was transported to the Grand Canyon area for rock layers with ages younger than Pennsylvania age for sediment coming from the Ozark-Ouachita Mountains and perhaps as old as the Silurian age for sediment coming from the Appalachian Mountains. On that basis, many sedimentary layers in the Grand Canyon area are re-cycled sediments. Such recycling cannot happen in a one-year Flood in the YEC model and particularly because of the accompanying mountain building and plate tectonics that involved millions of years and which enabled sediment to be supplied to the Grand Canyon area. Thus, these observations give further evidence that a worldwide Flood did not happen. See: <https://geomaps.wr.usgs.gov/parks/province/appalach.html>.

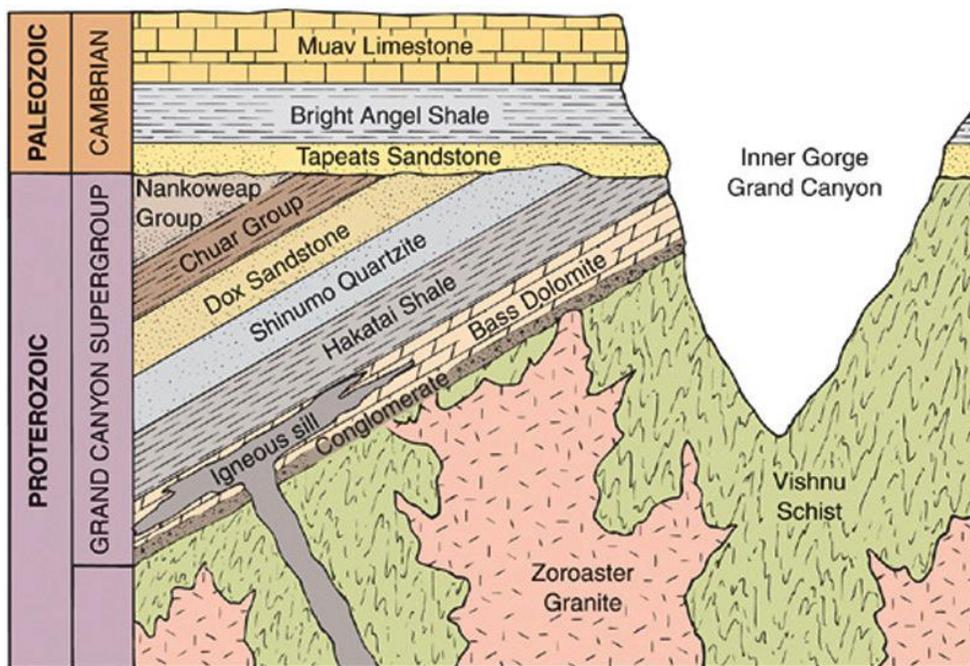
### **Thinning of megasequences toward the shields**

It is true that the megasequences *thin* toward the shields (Clarey and Werner, 2018ab), but there is a logical reason for this. The Precambrian shield areas have gone through many geologic episodes of mountain building involving deposition of sedimentary rocks (shales, sandstones, and limestone) that were deeply buried under high temperatures and pressures to form metasedimentary gneisses, quartzites, and marbles. In many of these places the marbles became so deeply buried that under higher temperatures the carbonate part of the calcite composition (hardness 3 on the Moh's hardness scale) was driven off to leave behind calc-silicate rocks (hardness 6 to 7). Thus, the shield areas do not contain the relatively softer sediments (like those found in the Appalachian Mountains of the Ozark-Ouachita Mountains) in which the quartz grains are mostly cemented by soft calcite cement, but instead the quartz grains in the sandstones were welded together, the calcite cement is driven out, and the rock then became quartzite composed entirely of quartz with a hardness 7. And, the soft clay minerals in the shales were recrystallized as feldspars with a hardness of 6 in gneiss, and the feldspar crystals were strongly interlocked and bonded with no interstitial pore spaces. Moreover, these metasedimentary rocks in the shields were intruded many

times by granitic masses which also contained hard quartz and feldspars. Through long geologic time, these hard rocks (metasedimentary and igneous) were uplifted to form high mountain ranges that through this long time were eroded down to their roots. This erosion produced Precambrian sedimentary rocks like those in the Grand Canyon Supergroup (**Figure 8**) and in many places in Canada (e.g., 2000+ foot-thicknesses of the Killarney quartzite in the Ontario area).

[https://www.mndm.gov.on.ca/sites/default/files/geotour\\_pdf\\_files/geotours\\_killarney\\_e.pdf](https://www.mndm.gov.on.ca/sites/default/files/geotour_pdf_files/geotours_killarney_e.pdf) Therefore, the shield areas did not consist of high uplands from which sediment could be easily derived and be transported to be deposited in the megasequences that compose Paleozoic and Mesozoic rocks around the world. The combination of hardness and lower elevations of the shield areas as potential source rocks of sediment are the reasons why the megasequences thin toward the shields.

An example of such an ancient geologic environment that includes a shield area that was eroded down to a former low elevation can be seen in the bottom of the Grand Canyon where the Grand Canyon Supergroup and the Zoroaster Granite occur below the Great Unconformity (an ancient shield surface). See the following image **Figure 7**.



**Figure 7.** Cross section through inner gorge of the Grand Canyon.

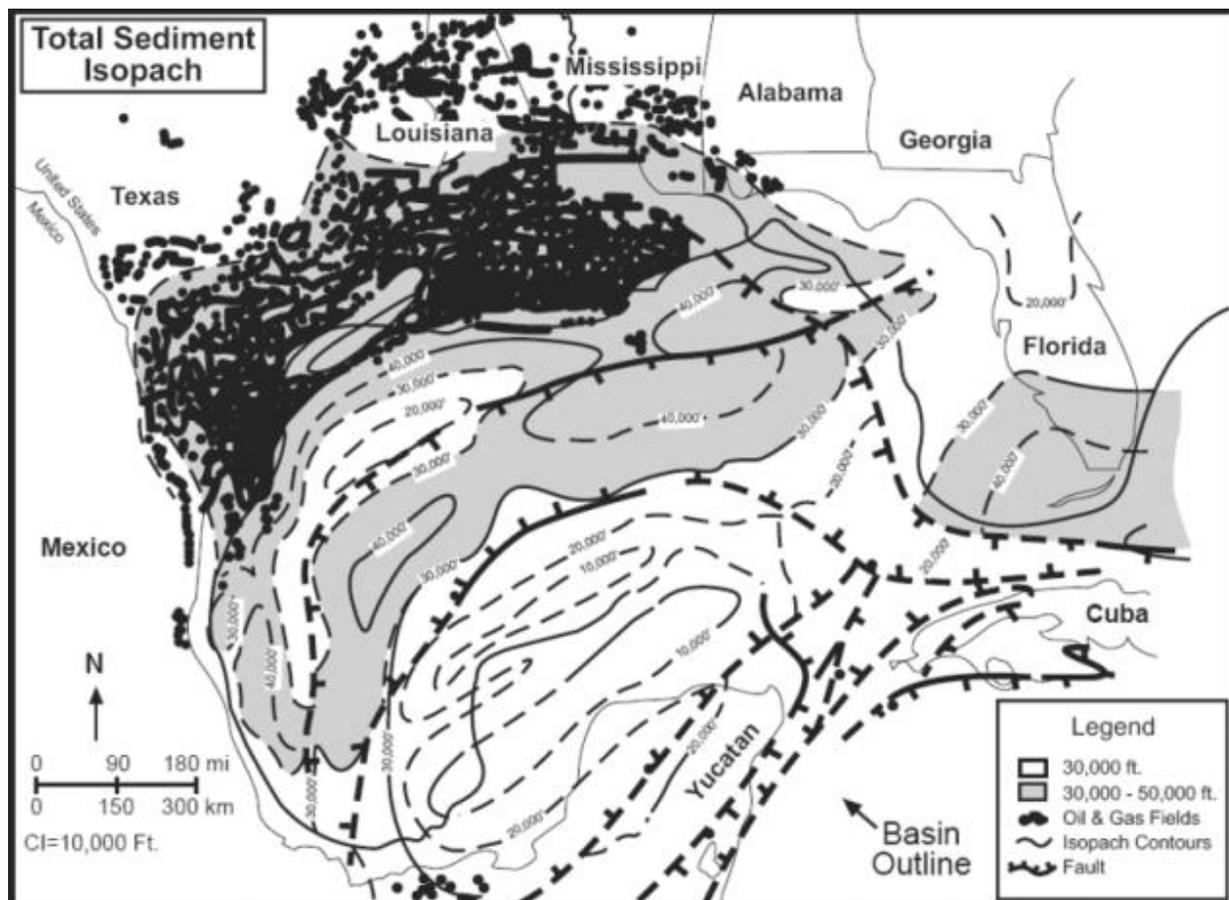
The Grand Canyon Supergroup is 11,500 to 13,100 feet thick. If such thicknesses of sedimentary rock are alleged to be deposited by Noah's worldwide flood, was there an ancient flood that the biblical authors somehow did not report? The Vishnu Schist is composed of metasedimentary and metavolcanic rocks that are older than the Grand Canyon metasedimentary rocks in the Grand Canyon Supergroup. The intrusion of silicate magma that crystallized as the Zoroaster Granite and the time for this magma to cool so that coarse crystals could form in a solidified rock would have taken millions of years.

(<http://www.csun.edu/~vcgeo005/Nr46Credible.pdf>). This fact alone shows that the Earth cannot be 6,000 to 10,000 years old.

### **Sediments in the Gulf of Mexico as evidence against a Flood model**

Final bits of evidence against a worldwide Flood are (1) sediment thickness in the basin that occurs in the Gulf of Mexico, (2) ages of rocks that are the sources of the sediment, and (3) the ages of the sediment in the Gulf of Mexico.

[https://wiki.aapg.org/Sediment\\_thickness\\_and\\_field\\_location\\_maps:\\_Gulf\\_of\\_Mexico\\_example](https://wiki.aapg.org/Sediment_thickness_and_field_location_maps:_Gulf_of_Mexico_example) An isopach map (**Figure 8**) shows that the thickness of sediment is as much as 40,000 feet thick in the deepest part. The ages of the sediment range from Recent to the oldest that is upper Cretaceous and may be Jurassic in age. Both Cretaceous and Jurassic ages are alleged to be times of the Flood. It should be obvious that the sediments in the Gulf of Mexico were not deposited by rushing waters in a supposed worldwide Flood coming from a distant source but were deposited because of progressive continuous erosion of Paleozoic sedimentary rocks that form the bedrock of North America immediately to the north and then by transport of the eroded sediment gradually through time directly to the Gulf of Mexico. Actually, some of this transported sediment comes from glacial deposits scraped off Precambrian rocks in Canada and pushed on top of the Paleozoic rocks. All this sediment from both glacial and bedrock origins was brought to the Gulf by the Mississippi River and other rivers, and these rivers are (and were) carrying recycled sediment. How can all of this happen at the same time in a one-year Flood and how can Paleozoic sediments (of supposed Flood origin) be the source of Jurassic and Cretaceous sediments (also of supposed Flood origin)? A Flood model makes no sense.



**Figure 8.** Isopach thicknesses of sediment in the Gulf of Mexico. The thickest parts (more than 40,000 feet) are in two elongate areas in the center and left center of the image and near the southern tip of Florida.

## Conclusion

If the Bible is supposed to be a science text, as YEC seem to want to make it, why doesn't the Bible mention the first appearance of abundant oxygen in the atmosphere when early anaerobic bacteria evolved to become aerobic bacteria that could do photosynthesis so that modern life that breathes oxygen, including humans, could evolve? Also, why doesn't the Bible mention when the Earth was a snowball Earth? <http://www.csun.edu/~vcgeo005/Nr40tillites.pdf>

If sedimentary rocks on the Earth are supposed to be deposited by the Flood, why doesn't the Bible mention the oldest sedimentary rocks, some of which are quartzites and metaconglomerates, that are in Australia in the Narryer Gneiss

terrane which have been dated in various place with ages of 3.35 to 3.75, 3.35 to 3.45, 4.1 to 4.2, and as much as 4.4 billion years old?

[https://en.wikipedia.org/wiki/Narryer\\_Gneiss\\_Terrane](https://en.wikipedia.org/wiki/Narryer_Gneiss_Terrane)? Did the Bible authors somehow miss to mention some really old Floods? The absence of such data clearly suggests that the Bible was not written to be a science text.

All discussions in this article that describe different shales, sandstones, and limestone and how they are formed provide good evidence that a worldwide Flood never happened and that the Earth is more than 6,000 to 10,000 years old. Uniformitarian models have been used in these discussions, but the arguments that are presented in favor of natural slow rates of origins for these sedimentary beds are based on the Creator's natural laws that He made. Therefore, YEC should accept what is presented. When a Gallop poll shows that 38 percent of the adults in the U.S. believe in the false views that YEC present, that high percentage is sad. <https://news.gallup.com/poll/210956/belief-creationist-view-humans-new-low.aspx>. These adults are being misled.

Moreover, in their Flood model, YEC seem totally to ignore 90 percent of Earth's geologic history that exists in Precambrian time because they are focused only on what happened after the Precambrian, and this narrowed view to the late 10 percent of time forces them to put all Precambrian history into **Day Three** of the **Genesis Week**. This extreme compression of history into a single day clearly shows that the Bible was never intended to be a science text. I examined a very small part of that Precambrian history in a study of the origin of iron concentrations in magnetite in metamorphic gneisses in New Jersey. See **Appendix 1**. Here I describe more evidence that indicates that the Earth is much older than 6,000 to 10,000 years.

Furthermore, many intelligent people recognize that what the YEC promote is false and when they are told by the YEC that they cannot be a true Christian unless they believe in a literal interpretation of the Bible in the same way that they do, they have decided to become atheists. As Christians, the YEC need to reconsider their understanding of science and religious beliefs, recognize that the Bible is not a science text but a book that gives wonderful theology, and teach what is true so that this making of atheists does not happen.

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What occurred in this area was a very complex, geologic, sequential history of (1) the deposition of sedimentary rocks, followed by (2) their deep burial at high temperatures and pressures to convert these rocks into metamorphic gneisses, (3) igneous intrusions of sills, (4) tight folding into an anticlinal structure, (5) uplift to bring the rocks back to the Earth's surface, and then (6) erosion to remove the overlying rock to expose these Precambrian rocks so that I could examine them. All these geologic processes took millions of years which the Bible does not mention. If the Bible is truly a science text, it certainly left out some interesting history, and what I studied is only a tiny part of the 4.5+ billion-year-history that the Creator has observed.