

# Megasequences assist our understanding of the rock record in a biblical framework

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Sequences, more recently called megasequences, are one of the best ways to correlate Flood sediments across the globe. The six (mega) sequences, first identified by conventional geologists, record six stacked flooding events globally. Evolutionary scientists claim these megasequences are separated by many millions of years. In contrast, creationists assert the separate 'floods' were all a part of one global Flood, with little time in between each megasequence. Our methods included correlating the megasequence boundaries across six continents. We discovered rock units, such as sandstone layers, track consistently at the base of many of the megasequences across many continents simultaneously. Furthermore, we correlated unique rock types, such as salt/gypsum and chert beds, that track within the confines of megasequence boundaries across vast regions. Finally, we present several maps of specific layers, like the Coconino Sandstone, and equivalent units, across the American West. These readily identifiable layers also stay within the respective encapsulating megasequence boundaries, validating the megasequence boundary correlations. Results of this study confirm that megasequence boundaries are a legitimate method to track the progress of the Flood across the globe. An additional advantage is that they are not exclusively dependent on fossils, nor does their use depend on evolutionary philosophy.

The conventional geological column has been criticized by many creationists for well over 50 years.<sup>1</sup> In 2006, an entire book was published by the Creation Research Society in an attempt to tackle this issue.<sup>2</sup> However, for some, this issue remains unresolved. The nature of the geological column continues to be questioned due to its obvious ties to evolutionary theory, leading to renewed criticism by some creationists.<sup>3-5</sup>

Likewise, the use of sequences or megasequences to study Flood sedimentation has been criticized by some of the same creation scientists.<sup>6</sup> They claim, "The heart of the issue of using Sloss-based megasequences is their dependence on the geological timescale."<sup>7</sup> Some creationists have championed the robustness of the global geologic column based on correlations of both paleontological and physical geological data.<sup>8</sup> Marcus Ross emphasized,

"The ability to correlate rocks on the basis of fossils contained is not dependent on evolutionary reasoning. Rather it is based on sound recognition of similar *patterns of fossils* found in disparate locations [emphasis original]."<sup>9</sup>

Nonetheless, Ross also argued that the type of rocks, and their distinctive chemical signals in some of the rocks, allows consistent correlations across large regions. He contends that it is not just the fossils that can be correlated from place to place.<sup>8</sup>

Nonetheless, the general pattern of the fossils within the geologic column remains a mainstay of conventional education and practice supporting evolution (figure 1).

And many creation geologists do support the notion of the geologic column. They recognize that the true fossil record does not reflect evolutionary patterns or even deep time. Instead, the fossils are indicative of the order of burial during a one-year global Flood.<sup>10,11</sup>

In addition, many creationists have been equally critical of using the conventional names of the standard geologic column. Unfortunately, these names are universal and are, in many ways, unavoidable if studying the sedimentary rocks of the earth. However, in creationist literature, names such as Cambrian, Ordovician, etc. ... are only used to identify globally common levels of deposition in the Flood year. Their use does not imply any evolutionary activity or timeframe. These traditional names are also found in conjunction with megasequence names such as the Sauk and Tippecanoe. Although these names and the so-called geologic eras, such as Paleozoic, Mesozoic, and Cenozoic, were originally based on evolutionary thinking and deep time, we do not accept these meanings. Neither do we use the word 'period', as is common in evolutionary geology, but instead refer to these layers as 'systems'. The Jurassic System (Period), for example, was not a 'period' of time that existed millions of years ago. It is merely a common stratigraphic level deposited in the Flood year at about the same time all over the globe. That's why it contains many of the same fossils. The Jurassic Period (and all the names on the conventional chart) simply marks a nearly common water level in the Flood when water was inundating a similar ecological zone.<sup>12</sup>

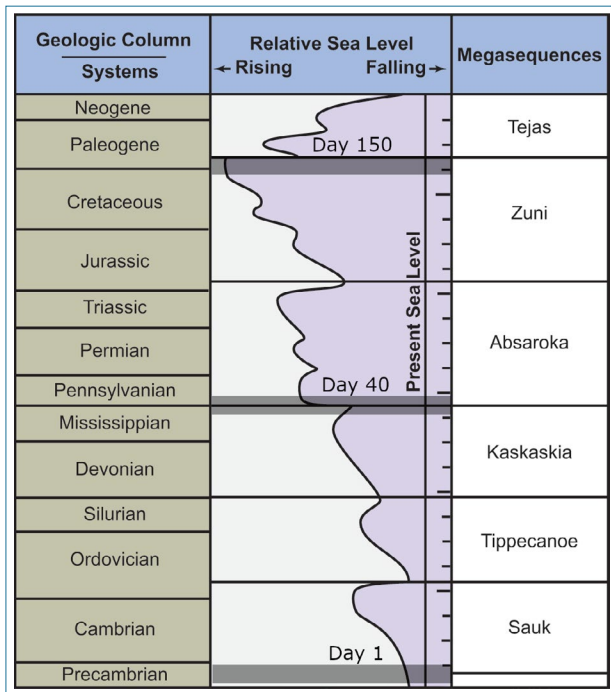


Figure 1. Progressive Flood model (diagrammatic) sea level curve and megasequences chart, showing Days 1, 40, and 150 of the global Flood

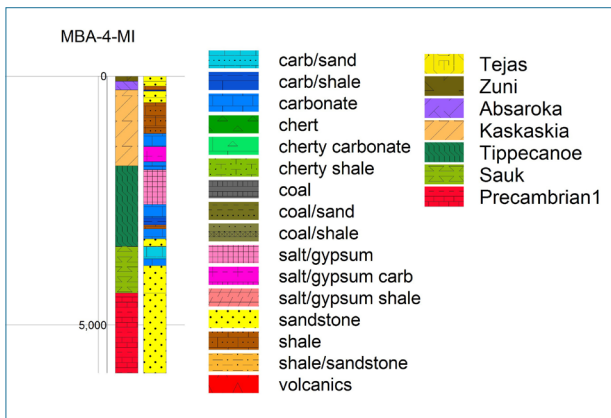


Figure 2. Example of stratigraphic column from the Michigan Basin, USA, showing the rock types (lithology) used for classification and the megasequence boundaries, including a Pre-Sauk interval

### Why sequences?

The *Glossary of Geology* defines a sequence as:

“... a major informal lithostratigraphic unit of greater than group or supergroup rank, traceable over large areas of a continent, and bounded by unconformities of interregional scope such as in the cratonic interior of North America (Sloss, 1963).”<sup>13</sup>

Furthermore, the glossary defines sequence stratigraphy as:

“... the study of rock relationships within a chronostratigraphic framework of repetitive, genetically

related strata bounded by surfaces of erosion or nondeposition, or their correlative conformities (Van Wagoner *et al.*, 1990).”<sup>13</sup>

Interestingly, Exxon geologists suggested that the six Sloss-type sequences were driven by global sea level changes or what is called ‘eustacy’.<sup>14,15</sup> In other words, sequences supersede, and include, multiple geologic systems and, in most instances, can be recognized by their bounding erosional surfaces and sudden changes in rock type, independent of fossil content. They are essentially a massive, definable package of sediment deposited in a single ‘flooding’ event, deposited globally at about the same time (chronostratigraphic). While conventional geologists claim there are millions of years between each sequence, Flood geologists recognize they were deposited as part of a progressive global Flood, one sequence upon the other, with little time in between.<sup>16</sup>

Sloss initially defined six sequences across the interior of North America.<sup>17</sup> He used Native American tribal names to differentiate his sequences from the standard, and often European-derived, geologic systems (i.e., Cambrian). Oil industry geologists quickly extended these sequence boundaries to the offshore regions surrounding North America with wells and seismic data patterns (many due to abrupt truncations) as well as sudden rock-type changes (called ‘xenconformities’).<sup>18</sup> They even extended the boundaries to adjacent continents, similarly using well logs, seismic data, and outcrops.<sup>19,20</sup>

Sequences provide one of the standard methods available to record the sedimentology of any given region. Fossils within the sedimentary layers record the flora and fauna buried within each sequence, but somewhat independently of the sequence boundaries. Sequences differ from the standard geologic timescale in that they are not solely based on changes of fossil content, as are the traditional eras, periods, and epochs. It is primarily the erosional boundary between sequences, or surfaces of little or no deposition, that defines the boundaries of each sequence.<sup>17</sup>

More recently, we have traced these six sequence boundaries across six of the world’s continents (Antarctica being the exception), and have previously published many of our results (except Australia).<sup>16</sup> Figure 1 shows the relationship of the six sequences to the standard geologic systems and our interpreted sea level curve, showing a progressive global Flood.<sup>16</sup> We have also added our estimates of where Days 1, 40, and 150 possibly intersect the sea level curve, assuming the peak of the Flood was on Day 150.<sup>16</sup>

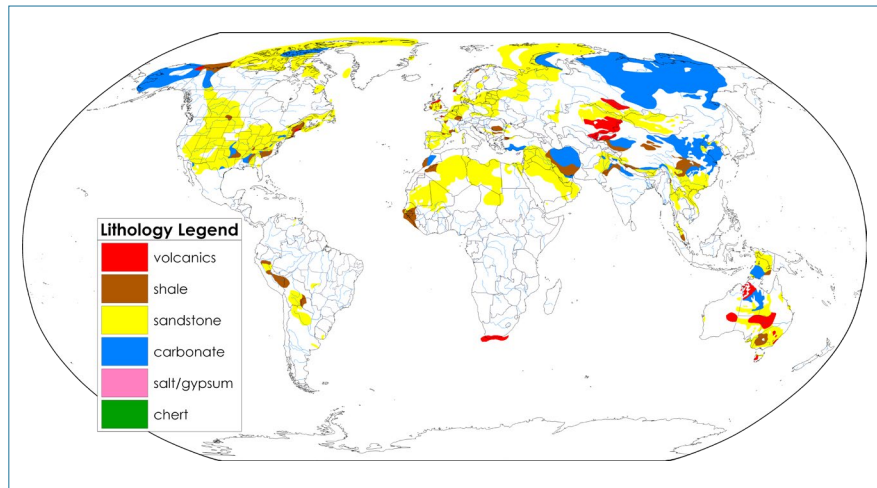
Since Sloss defined the six sequences, terminology associated with sequence stratigraphy has ballooned.<sup>14</sup> Van Wagoner *et al.* and the Exxon geologists referred to the Sloss-type sequences as ‘supersequences’.<sup>15</sup> Haq *et al.* used the term ‘megasequence’ to designate First Order sequences, or the largest scale sequences, equivalent to Sloss ‘sequences’.<sup>21</sup>

Other conventional and creation scientists have followed, using the term ‘megasequence’ to describe rock-stratigraphic units traceable over vast areas bounded by unconformities (or erosional surfaces).<sup>22–25</sup> Hereafter, the term ‘megasequences’ will be used to designate the six Sloss-defined ‘sequences’.

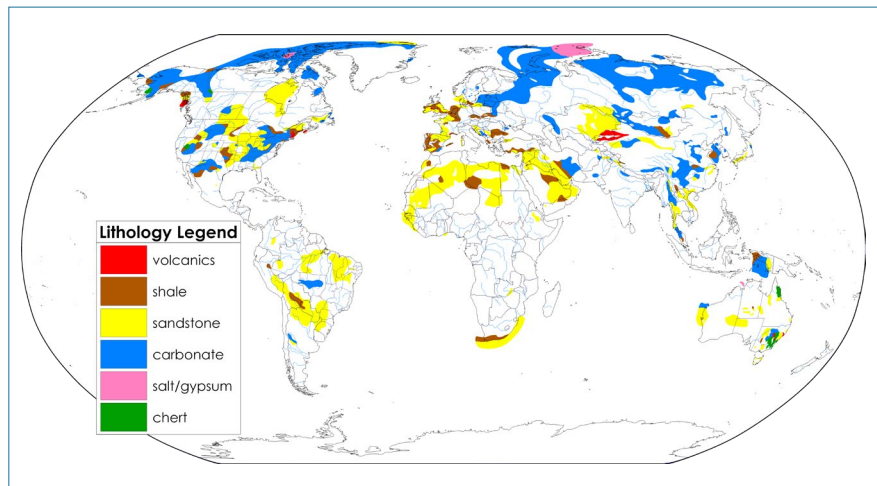
The fact that megasequence names are based on Native American tribes that lived in the USA is an additional advantage to us. The names do not have any connection to evolution and deep time as do terms like ‘Paleozoic’, which literally means ‘ancient life’. And we contend that megasequences are identified by physical attributes (erosional surfaces) rather than simply by fossil content. In this interpretation, the fossils are passively placed within each megasequence, whereas the erosional bounding surfaces of each megasequence play the active defining role.

**Methods**

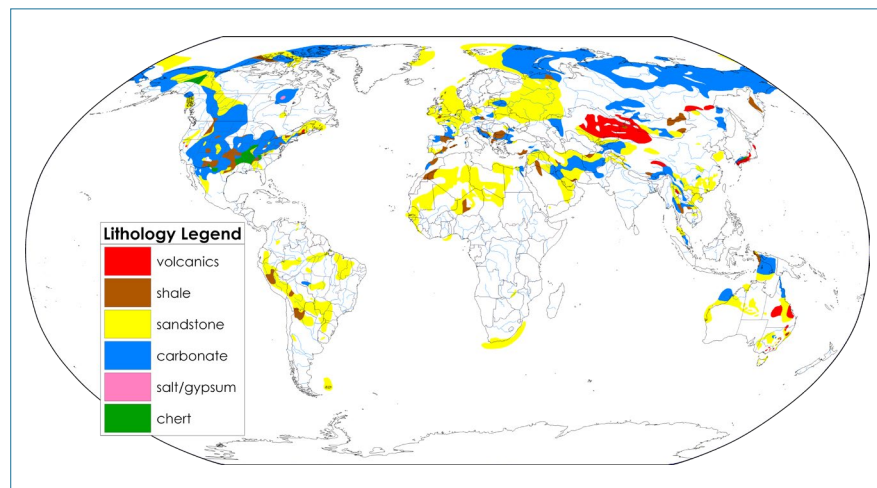
Over 3,200 stratigraphic columns were compiled from close to 1,000 published papers and available oil wells, measured sections, cross-sections, and seismic data from every major basin and uplift across six continents. Within each column, we identified the rock types present and the stratigraphic megasequence boundaries. We paid particular attention to the basal rock type, or lithology. We assumed the basal lithologic unit was best preserved in the transgressive/regressive depositional/erosional cycle. Most erosion likely occurred as water was flowing back off the continents at the end of each megasequence cycle. This is referred to as the regressive part of the cycle. This would have removed some of the deposited layers off the top.



**Figure 3.** Global basal lithology (rock type) map of the Sauk Megasequence



**Figure 4.** Global basal lithology (rock type) map of the Tippecanoe Megasequence



**Figure 5.** Global basal lithology (rock type) map of the Kaskaskia Megasequence

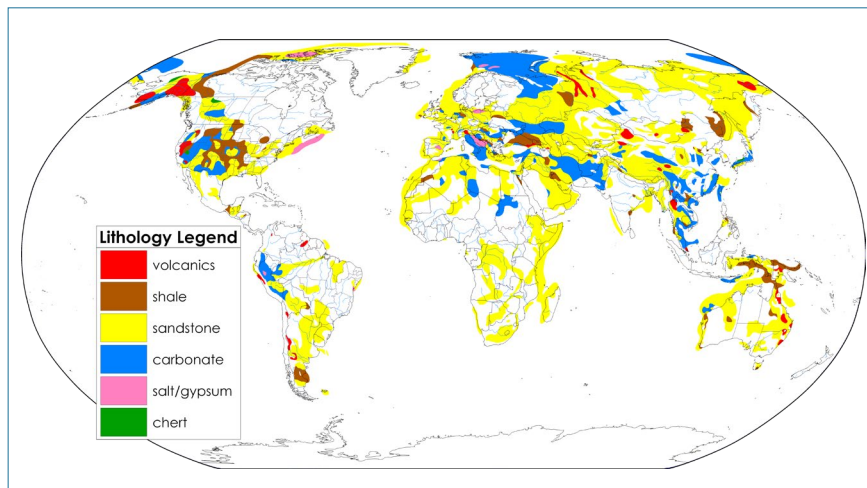


Figure 6. Global basal lithology (rock type) map of the Absaroka Megasequence

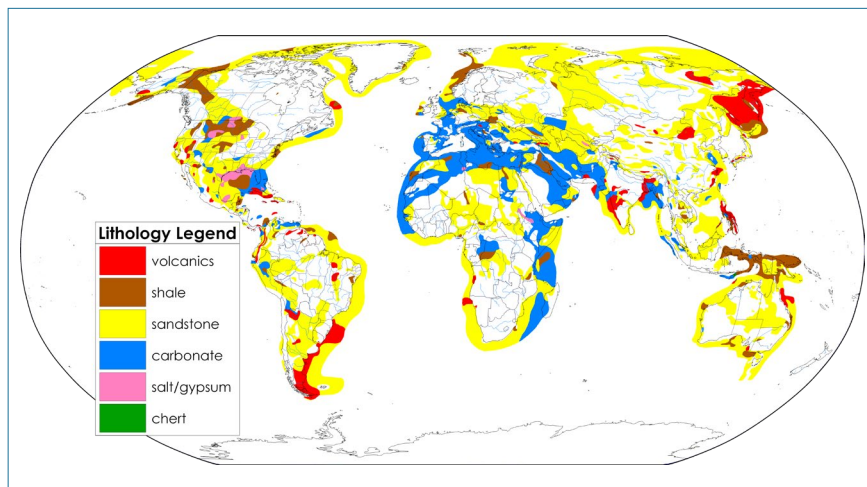


Figure 7. Global basal lithology (rock type) map of the Zuni Megasequence

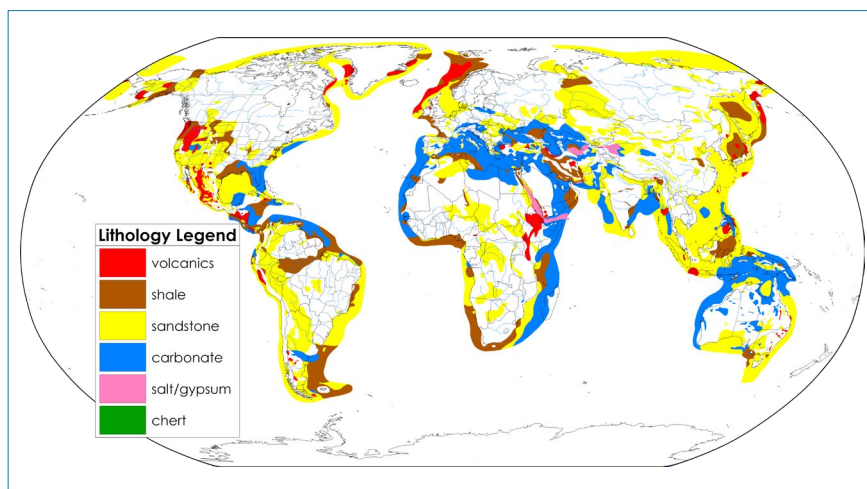


Figure 8. Global basal lithology (rock type) map of the Tejas Megasequence

The transgressive part occurred as new waves rose and advanced over the previous megasequence strata, depositing new sediments in the process and a new megasequence on the earlier one.

We inputted detailed lithologic data, megasequence boundaries, and latitude and longitude coordinates for each column into RockWorks, a commercial software program for geological data, available from RockWare, Inc. Golden, CO, USA. Figure 2 is an example stratigraphic column showing the 16 rock types (or lithology) that we used for classification and the six megasequences, including a seventh as the Pre-Sauk. Depths shown in all diagrams are in metres. Furthermore, our methods employed the identification of megasequence boundaries within each stratigraphic column. These were correlated across each continent and, again, globally.

Construction of basal lithology maps

Maps of the basal rock type in each megasequence were constructed across all six continents (figures 3–8). We also constructed isopach, or thickness, maps of each of the six megasequences, not shown in this paper,<sup>12,16</sup> but having the same surface extent as the basal lithology maps.

Construction of stratigraphic cross-sections of unique rock types

We created two intracontinental cross-sections across part of the United States to examine more closely regional deposits of salt/gypsum and bedded chert (figures 9–11). The correlation of these unique lithologic units also allowed us to test our megasequence boundary picks on a regional scale. For example, we assumed megasequence

correlations were validated if the salt-rich or chert-rich layers remained in the same relative location, running parallel, within the megasequences, from column to column, and did not cross-cut the megasequence boundaries.

Construction of maps of unique sediments of regional extent

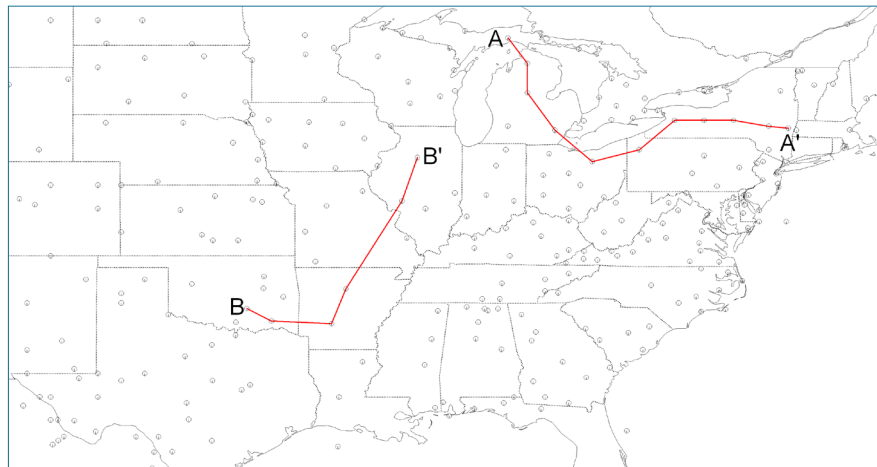
We also examined published maps of extensive and distinctive rock units, such as the Morrison Formation, Coconino Sandstone, and Pierre Shale in the Western USA. These semi-regional (multi-state units in the USA) formations were also tracked with reference to the megasequence boundaries to test the validity of the megasequence correlations.

## Results

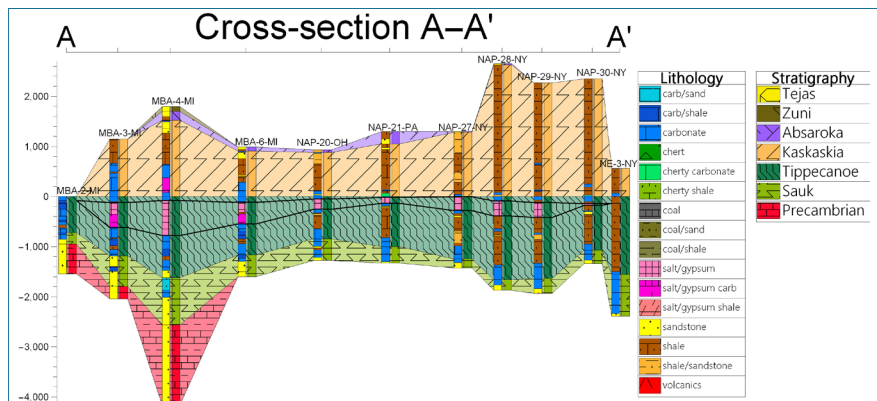
### Basal lithology maps

The six basal lithology maps allowed the identification of global sedimentological patterns. Some of the most prominent patterns we observed within some of the megasequences are discussed below.

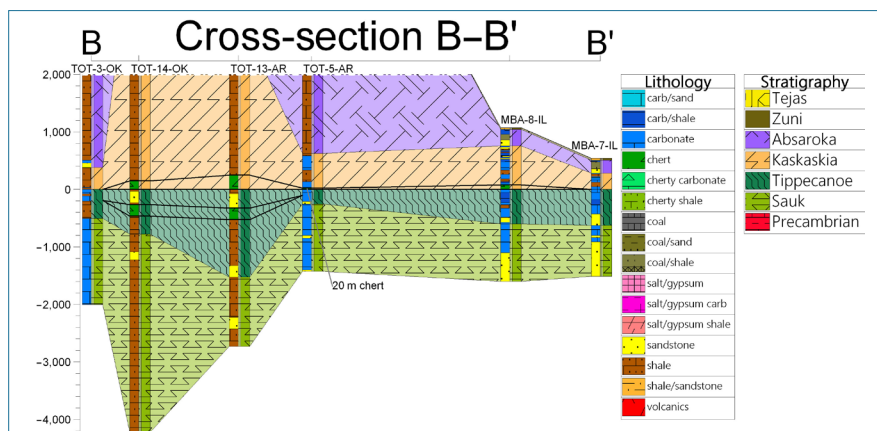
The Sauk Megasequence extends from the Lower Cambrian system to the Lower Ordovician system (figure 1). The basal Sauk lithology across North America consists of the Tapeats Sandstone and equivalent sandstones (figure 3). This megasequence has the most extensive sandstone layer at its base compared to all subsequent megasequences across North America. However, much of this sandstone layer is very thin, often less than 100 m. The continuity of the basal Sauk sandstone layer, or blanket sand, across the North American continent is a testimony to the extent and uniformity of the first marine transgression of the Phanerozoic. Where it is



**Figure 9.** Base map of the United States, showing the locations of the stratigraphic columns used for cross-sections A–A' and B–B'



**Figure 10.** Cross-section A–A', showing the correlation of salt-rich layers from Michigan to New York. The megasequences and lithology are shown to scale for each column. The section is flattened on the top of the Tippecanoe Megasequence. Notice how the salt layers in pink run parallel with the megasequence boundaries.



**Figure 11.** Cross-section B–B', showing the correlation of chert-rich layers from Oklahoma to Illinois. The megasequences and lithology are shown to scale for each column. The section is flattened on the top of the Tippecanoe Megasequence. Notice how the chert layers in green run parallel with the megasequence boundaries.

present, the base of this layer is also known as the ‘Great Unconformity’.<sup>16</sup>

In addition, a similar basal Sauk sandstone layer was found across parts of all six continents (figures 3). Many creationists recognize this layer as the first extensive Flood deposit that spread across large portions of the continents, with some local exceptions.<sup>11</sup> The demonstrable correlation of the basal Sauk sandstone beds across vast regions of all six continents illustrates a common starting point for a global geologic column. It is a chronostratigraphic surface. Where present, the basal Sauk Megasequence is also coincident with the Great Unconformity, and the so-called ‘Cambrian Explosion’, where marine fossils representing all animal phyla suddenly appear in the rock record. Therefore, the observable extent of a continuous thin sandstone layer across parts of all continents, and, in some places, an extensive limestone layer (northern Asia), reinforces the correlation of these rock types and their use as the starting point for the Sauk Megasequence’s lower boundary. In other words, it verifies the reality of the boundary.

Similarly, maps of the basal rock type in other megasequences also show common patterns. For example, the basal Tippecanoe map (figure 4) shows a thin sandstone layer across North Africa, southern Europe, the Middle East, South America, and in the centre of North America (St. Peter Sandstone). However, Eastern Europe, Asia, and northern North America show an extensive limestone layer at the base of the Tippecanoe. Regardless of rock type, the presence of similar, and correlated, lithologies across such vast regions verifies the reality of the lower Tippecanoe boundary globally.

The basal map of the Kaskaskia Megasequence likewise shows extensive swaths of either limestone or sandstone across large segments of all of the continents (figure 5). The continental-scale limestone in North America includes the Redwall Limestone in Grand Canyon and creates caves across the USA. And the basal map of the Absaroka Megasequence shows even more sandstone spread across Africa, Asia, Australia, Europe, and South America (figure 6). Again, the continuity of these same rock types, from column to column, across such vast regions, reinforces that the boundary was chosen correctly, independent of fossil content.

The basal map of the Zuni Megasequence shows extensive sandy layers along the offshore edges of many of the continents and vast sandstones across parts of all of the continents too (figure 7). The offshore sands were emplaced as the continents split apart from rapid plate motion during the Flood year.<sup>16</sup> Interestingly, a vast limestone bed was found at the base of the Zuni across northern Africa/southern Europe, the Middle East and eastern Africa also. And more volcanic rocks show up at the base of the Zuni in eastern Asia and eastern South America.

The basal map of the Tejas Megasequence (Tertiary System) is again dominated by vast sandstone beds across all of the continents, including the offshore regions (figure 8). Significant amounts of basal Zuni limestone were found to extend along the edges of much of Africa, southern Europe, the Middle East, and northern Australia. The presence of this vast limestone at the base of the Zuni also supports a high Cenozoic Flood boundary, as noted previously by Clarey and Werner.<sup>16</sup> Obviously, the floodwaters could not have fully drained off the continents at this point, as so much marine carbonate was still being deposited globally, including in the areas where the Ark landed and the Tower of Babel was built.<sup>16</sup>

Collectively, the consistency in the basal rock types across all six continents (whether sandstone or limestone or other), at the base of all six megasequences, indicate that the lower boundaries in each megasequence are valid. In addition, these rocks were correlated by lithology from column to column, nearly independent of the fossil record. In summary, each basal lithology (and boundary upon which it lies) provides a near chronostratigraphic surface of deposition in each of the megasequences. Therefore, these boundaries, and the megasequences, can be used effectively to reconstruct the history of the global Flood.

Distinctive layers of unique lithology: maps and cross-sections

We mapped extensive and salt-rich beds within the Tippecanoe and chert-rich beds at the base of the Kaskaskia Megasequence across large segments of North America (figures 9–11). These unique lithologic units were easily correlated from column to column.

Stratigraphic section A–A’ (figure 10) shows salt and gypsum-rich rocks within the Tippecanoe Megasequence extending about 1,500 km, from Michigan to New York (figure 9). We flattened this stratigraphic section on the top of the Tippecanoe. And we correlated the salt-rich layers on the cross-section with solid black lines at the top and base of the salt. Notice, in cross-section A–A’, how the salt-rich layers conform to the megasequence boundary and do not cut across it. They are found consistently near the top of the Tippecanoe, whether there is limestone below or shale. If these salt-rich layers crossed from one megasequence into the next, it would invalidate the megasequence boundaries. Instead, they parallel the megasequence boundary, confirming their validity.

Stratigraphic section B–B’ (figure 11) shows chert-rich layers within the Kaskaskia Megasequence at the base of the megasequence from Oklahoma and Arkansas to Illinois, an approximate distance of 1,200 km. We flattened this stratigraphic section on the top of the Tippecanoe, just like

A-A'. And we correlated the chert-rich rocks with solid black lines. Notice, there are chert layers within the Tippecanoe also, not just the Kaskaskia. These Tippecanoe cherts were correlated from Column TOT-14-OK to Column TOT-13-AR, over a distance of about 200 km (figure 11). The consistency of these chert-rich layers at the base of the Kaskaskia and within the Tippecanoe Megasequence validates the identification of the basal Kaskaskia boundary, independent of fossil content.

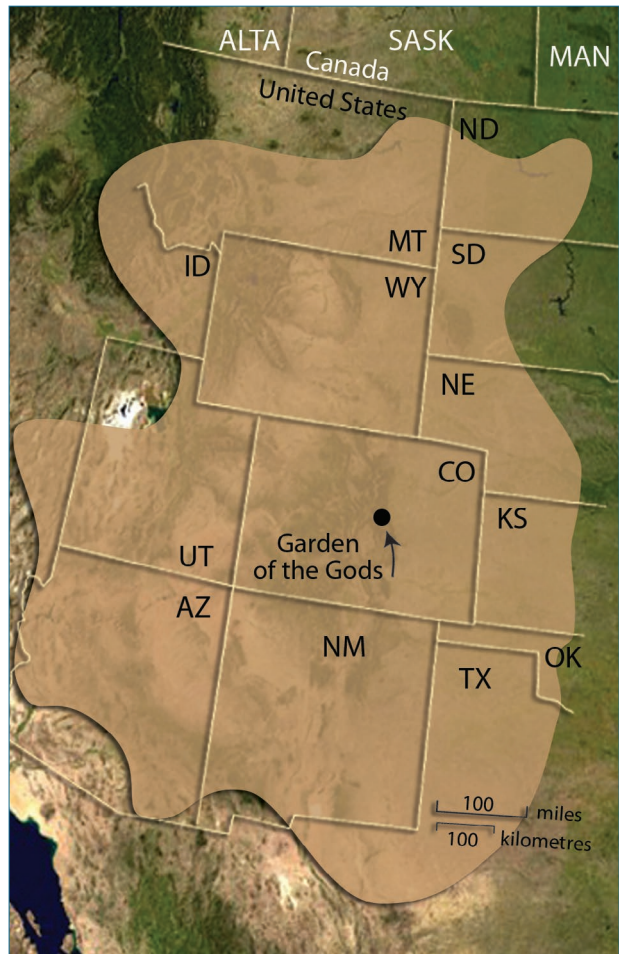
The unusual nature of these rock types (both salt and chert) makes the correlations all the more convincing and profound. In summary, we contend that these extensive salt-rich units and chert-rich units independently confirm and validate the correlation of these megasequence boundaries.

Maps of unique sediments of regional extent

Furthermore, we correlated several easily recognizable and regionally extensive rock formations across North America. These included the Permian Coconino Sandstone (Absaroka) (figure 12), Jurassic Morrison Formation (Zuni) (figure 14) and the Cretaceous Pierre Shale (Zuni) (figure 16).

Flood geologist John Whitmore found that the Coconino Sandstone (and equivalent units), commonly about 100 m thick, extends nearly from Canada to Mexico and from the western edge of Utah to western Kansas (figure 12).<sup>27</sup> He found that the Lyons Sandstone at Garden of the Gods in Colorado Springs, Colorado, is equivalent to the Coconino Sandstone in Grand Canyon.<sup>27</sup> Interestingly, even the cross-bedded layers within these sands show a similar flow direction (southward), which supports a common origin for the entire unit.<sup>27</sup> That suggests the entire sand complex was deposited quickly as a blanket sand at the same time in a single event (figure 13). In addition, these same sandy layers have been correlated to other units deposited at the same position during the Flood on several other continents, including Europe and South America, as well as the Middle East.<sup>27</sup> The Coconino–Lyons Sandstone is in the Permian layers of the Absaroka Megasequence. It also parallels the megasequence boundaries and does not cut across them.

The extent of the Morrison Formation and the Pierre Shale (including individual bentonite-rich beds)<sup>28</sup> across the American West further confirm and validate the Zuni Megasequence and its boundaries, as they also are found in the same relative locations within



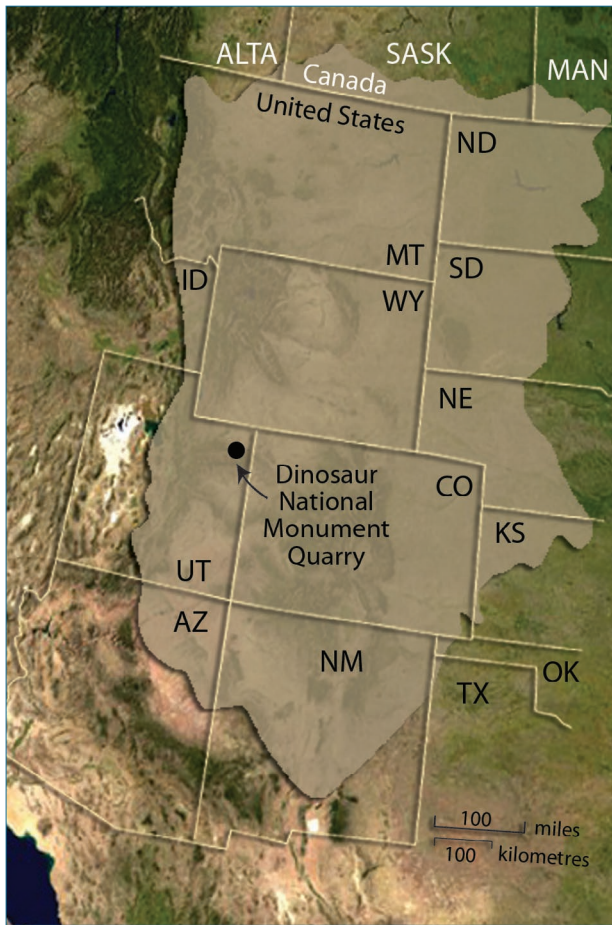
**Figure 12.** Map of the American West, showing the extent of the Permian Coconino Sandstone and equivalent units (Absaroka Megasequence). The location for Figure 13 is shown, at the Garden of the Gods, Colorado.

Courtesy of Susan Windsor



Photo by T. Clarey

**Figure 13.** Photograph of near vertical sandstones of the Permian Lyons Formation at Garden of the Gods, Colorado. This unit is equivalent to, and has been correlated with, the Coconino Sandstone in Arizona and other sandstone units across the American West.



Courtesy of Susan Windsor

**Figure 14.** Map of the American West, showing the extent of the Jurassic Morrison Formation (Zuni Megasequence). The Morrison is so consistent in colour and pattern that the same name is used for it in every state. The location for Figure 15 is shown, at Dinosaur National Monument, Utah.

the megasequence (figures 14, 16). The Jurassic Morrison Formation is always near the lower portion of the Zuni Megasequence, and the Cretaceous Pierre Shale is always near the top. In addition, the Morrison is one of the few geological units that maintains the same name across state boundaries because of its easily recognizable colour pattern and its consistent order of rock types (figure 15). Both the Morrison and the Pierre are quickly recognized in the field and in well bores by their unique characteristics and electric log signals.

In addition, many of the Cretaceous System (Zuni) shales found across the American West have unique highly radioactive well log signals that also allow correlation across vast regions. These units also fall in the same relative locations within the Zuni Megasequence, not cutting up or down within the megasequence. All of these aforementioned correlations are independent of any fossil content. These rocks are as empirical and factual as any data set.

These three massive intracontinental units were tracked consistently within the same relative section of their respective megasequence boundaries. And, again, these correlations are independent of any reference to fossils. The results showed a remarkable match. Each of the intracontinental and distinctive rock units further validates our megasequence boundaries.

#### Fossil patterns in the megasequences

We also found that the fossils reflect the megasequence patterns and can be used as additional correlation tools, just as geologists have been doing since the days of William Smith in the early 19<sup>th</sup> century in England (figure 17).<sup>8</sup>

The first three megasequences (Sauk, Tippecanoe, and Kaskaskia) contain about 99% marine fossils and are limited

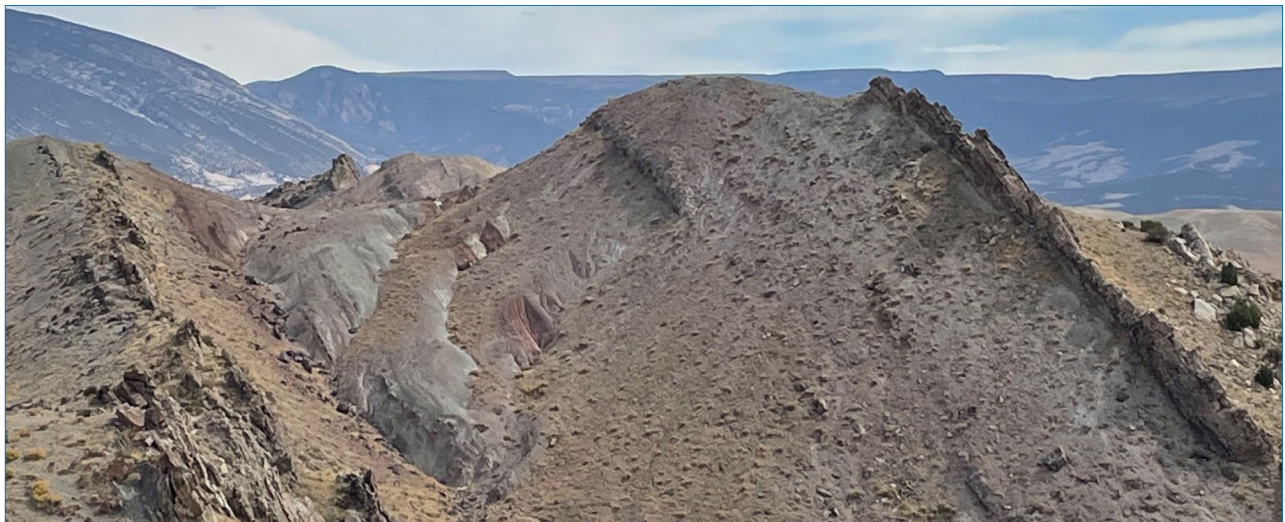


Photo by T. Clarey

**Figure 15.** Photograph of tilted exposures of the Jurassic Morrison Formation at Dinosaur National Monument, Utah. This unit has been found to contain many dinosaurs across the American West.

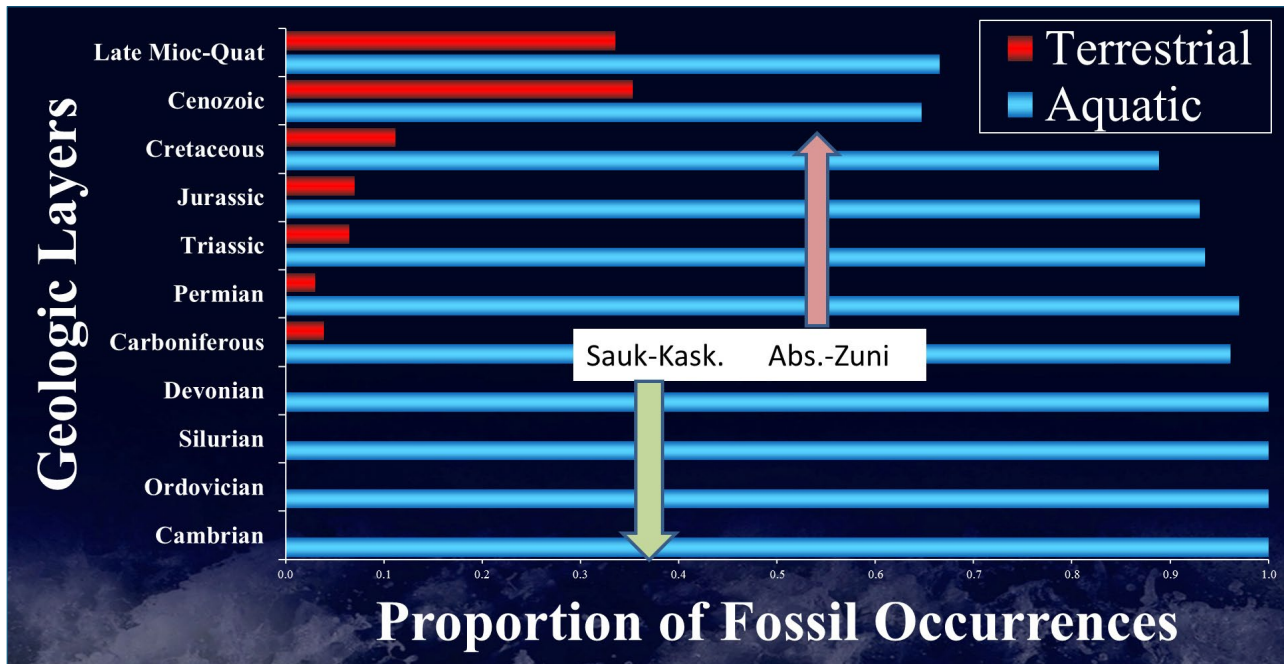
to select locations on the present-day continents (figures 3–5).<sup>16</sup> By the fourth megasequence (Absaroka), fossils of terrestrial flora and fauna became deposited in significant numbers, although mixed with marine organisms.<sup>12</sup> Globally, the Absaroka Megasequence contains the first massive coals. It also shows much more extensive coverage of the continents, compared to the earlier three megasequences.<sup>12</sup>

The Zuni (5<sup>th</sup> megasequence) shows about the most extensive coverage across all of the continents.<sup>16</sup> It also contains the last of the dinosaur fossils and reflects another major shift in flora and fauna, ending just above the K-Pg boundary. However, so-called major ‘extinctions’ merely mark common levels in the pre-Flood topography, where an entire ecosystem was completely destroyed and a new ecosystem was subsequently emplaced on top. In the rocks, this appears as a sudden shift in both the flora and the fauna. Evolutionists claim these are extinction events, but Flood geologists recognize them as a simple shift in the type of plants and animals being inundated at that point in the Flood. They are global changes because it was a global Flood. So, we see the same types of fossils were buried in the same approximate order on every continent. It is not evolution, but the result of a progressive Flood.<sup>16</sup> These patterns suggest the fossil record is simply a record of systematic and progressive inundation of global ecological zones.<sup>16</sup>



**Figure 16.** Map of the American West, showing the extent of the Cretaceous Pierre Shale (Zuni Megasequence). The black, organic rich Pierre was deposited near the high-water point of the Flood.

Courtesy of Susan Windsor



Courtesy of Dr Nathaniel Jeanson

**Figure 17.** Graph of fossil occurrences of the major animal phyla by land or water environment and the geologic layers. Notice the dramatic shift in fossil type at the end of the Kaskaskia and the onset of the Absaroka, when the floodwaters began impacting dry land. This is the same point in the Flood where massive coal beds begin to show up in the rock layers globally. Data from the Paleobiology Database.

## Discussion

Our six-continent study demonstrates that megasequences are related to major cycles in global sedimentology. They also coincide with major shifts in the global fossil record. In fact, many of the claimed largest mass extinction horizons correlate closely with the highest water levels of each megasequence cycle.<sup>29,30</sup> In this regard, it is no surprise a connection is observed between megasequences and the fossil record, as both reflect sudden shifts in depositional pattern, including water volume and energy.

The fossil pattern observed across six continents is best explained by the systematic flooding of progressively higher and higher elevations of the pre-Flood continents, as described in Genesis 7.<sup>31,32</sup> As water levels increased and coverage became more extensive, the observable pattern of fossils changed accordingly. We observe the same progressive pattern across each of the six continents in this study. In fact, one could build an independent geologic column on each of the three continents. Comparison of these would result in essentially the same ‘global’ column across each continent.

The lowermost extensive Flood sediments (Sauk Megasequence) contain the same fossil taxa on each continent. And each subsequent megasequence on top of the Sauk contains the same fossil taxa, and in the same order on all three continents. This is the very basis for the Principle of Faunal Succession; the recognition of a global pattern of fossils that abruptly changes with deposition of subsequent sedimentary layers.

Figures 3–8 show the basal rock types for each of the six megasequences. They show remarkable consistency across all six continents and can be easily correlated to the base of each megasequence. The lowermost Sauk boundary establishes a beginning of the Flood (although many Precambrian rocks may be part of the Flood also) as it is the first globally extensive unit across all continents. Furthermore, it coincides with the Great Unconformity and even the Cambrian Explosion at many locations. It is no coincidence that these three events (the megasequence boundary, the Great Unconformity, and the Cambrian Explosion) overlap at this level globally. The onset of the Sauk Megasequence is the physical reason for the Cambrian Explosion. It carried in the marine fauna and buried them as the waves crashed across portions of each continent.

Each subsequent megasequence boundary (erosional surface) also establishes a framework for the entire Flood, which can be used to track the advancement across the continents of the world. The pattern we observe is a progressive Flood.<sup>16</sup> After establishing the lower boundaries, each megasequence was correlated from region to region and across the globe. These correlations were not established based on the fossil content, but on the erosional boundary

upon which the sands and limestones (and a few other types) were deposited. However, they do match the fossil pattern, which confirms the overall robustness of the geologic column.

In particular, the Absaroka Megasequence documents a dramatic shift from almost exclusively marine fossils in the first three megasequences to a more mixed land and marine fauna (figure 17).<sup>16</sup> This trend of more and more land animal fossils continued upward through the deposition of the Zuni and Tejas.<sup>16</sup> The increasing number of coal beds and land animal fossils, combined with more extensive sedimentation across the continents, all indicate that the floodwaters were likely advancing across significant portions of the pre-Flood land surfaces during the deposition of the Absaroka and Zuni Megasequences.<sup>32</sup> This is confirmed by the findings of Clarey and Werner, who demonstrated that the global volume of sedimentation also peaked during the Zuni Megasequence (figure 1).<sup>16</sup>

## Conclusions

We conclude that the use of megasequences (sequence stratigraphy) is one of the best ways to examine the pattern of the global Flood. It should be no surprise that the rocks (and fossils) on all continents show the same basic patterns everywhere as sea level rose progressively, flooding each continent simultaneously. As each unique ecological level was inundated, similar environments became entombed globally, creating a common and recognizable rock and fossil record across all continents.

Each megasequence reflects a major advance and retreat cycle (transgression and regression) across the continents. And each is recognizable by its bounding erosional surfaces. Jointly, they establish a framework for study of the Flood, similar to the frame of a building. All of the rocks in between each boundary fall into place once the frame is established. Results show extensively consistent lithologic units (i.e., blanket sandstones and limestones) covering vast segments of every continent, which can be correlated from continent to continent. These include sandstones such as the Tapeats Sandstone, and equivalent layers, spread across North America (and the world) at the onset of the Sauk Megasequence (figure 3). In addition, many megasequences contain distinctive lithologies, such as salt-rich and chert-rich beds, which allow intracontinental correlations using outcrop and well data.

The column-to-column correlation of the six basal megasequence units, the unusual rock types (i.e., salt and chert layers) that parallel the megasequence boundaries, and the extent and consistency of intracontinental deposits (i.e., Coconino Sandstone), collectively serve to validate the use of megasequences on a global scale. The fossils contained within the megasequences are merely those of

the passive ‘victims’ of these major depositional cycles as the floodwaters rose higher and higher. Taken together, megasequences provide compelling evidence of a progressive global Flood. Furthermore, they confirm the robustness of the geologic column. Creationists should embrace the use of megasequences as a means to better understand both the Flood and the geologic column.

## References

- Whitcomb, J.C. and Morris, H.M., *The Genesis Flood*, The Presbyterian and Reformed Publishing Company, Philadelphia, PA, 1961.
- Reed, J.K. and Oard, M.J., Introduction; in: Reed, J.K. and Oard, M.J. (Eds.), *The Geologic Column: Perspectives within diluvial geology*, Creation Research Society Books, Chino Valley, Arizona, pp. 1–6, 2006.
- Matthews, J.D., The stratigraphic column—a dead end, *J. Creation* 25(1):98–103, 2011.
- Matthews, J.D., The overthrusting paradox: a challenge to uniformitarian geology and evolution, *J. Creation* 30(2):83–91, 2016.
- Oard, M.J., Is the geological column a global sequence? *J. Creation* 24(1):56–64, 2010.
- Froede, C.R., Jr, Akridge, A.J., and Reed, J.K., Can ‘megasequences’ help define biblical geologic history? *J. Creation* 29(2):16–25, 2015.
- Froede *et al.*, ref. 6, p. 21.
- Ross, M.R., Improving our understanding of creation and its history, *J. Creation* 28(2):62–63, 2014.
- Ross, M., The Flood/post-Flood boundary, Letter to the Editor, *J. Creation* 27(2):43–44, 2013; p. 43.
- Austin, S.A., Baumgardner, J.R., Humphreys, D.R., Snelling, A.A., Vardiman, L., and Wise, K.P., Catastrophic plate tectonics: a global Flood model of earth history; in: Walsh, R.E. (Ed.), Proc. 3<sup>rd</sup> ICC, pp. 609–621, 1994.
- Snelling, A.A., *Earth’s Catastrophic Past: Geology, Creation & the Flood*, Institute for Creation Research, Dallas, TX, 2009.
- Clarey, T., *Carved in Stone: Geological Evidence of the Worldwide Flood*, Institute for Creation Research, Dallas, TX, 2020.
- Neuendorf, K.K.E., Mehl, J.P., Jr, and Jackson, J.A. (Eds.), *Glossary of Geology*, 5<sup>th</sup> edn, American Geological Institute, Alexandria, VA, p. 589, 2005.
- Vail, P.R., Mitchum, R.M., and Thompson, S., III, Seismic stratigraphy and global changes of sea level, part 3: relative changes of sea level from coastal onlap; in: Payton, C.W. (Ed.), *Seismic Stratigraphy Applications to Hydrocarbon Exploration*, AAPG Memoir 26, American Association of Petroleum Geologists, Tulsa, OK, pp. 63–97, 1977.
- Van Wagoner, J.C., Mitchum, R.M., Campion, K.M., and Rahmanian, V.D., *Siliciclastic Sequence Stratigraphy in Well Logs, Cores, and Outcrops: Concepts for High-Resolution Correlation of Time and Facies*, AAPG Methods in Exploration Series, No. 7, American Association of Petroleum Geologists, Tulsa, Oklahoma, 1990.
- Clarey, T.L., and Werner, D.J., A progressive global Flood model confirmed by rock data across five continents; in: Whitmore, J.H. (Ed.), Proc. 9<sup>th</sup> ICC, pp. 412–444, 2023.
- Sloss, L.L., Sequences in the cratonic interior of North America, *Geol. Soc. Amer. Bull.* 74(2):93–114, 1963.
- Carroll, A.R., Xenconformities and the stratigraphic record of paleoenvironmental change, *Geology* 45 (7):639–642, 2017.
- Salvador, A., Chronostratigraphic and geochronometric scales in COSUNA stratigraphic correlation charts of the United States, *Amer. Assoc. Petrol. Geol. Bull.* 69(2):181–189, 1985.
- Sloss, L.L., Synchrony of Phanerozoic sedimentary-tectonic events of the North American craton and the Russian platform, *International Geological Congress*, 24<sup>th</sup>, Montreal, Canada, Sec. 6., pp. 24–32, 1972.
- Haq, B.U., Hardenbol, J., and Vail, P.R., Mesozoic and Cenozoic chronostratigraphy and cycles of sea-level change; in: Wilgus, C.K., Ross, C.A., Posamentier, H., Van Wagoner, J.C., Ross, C.A., and Kendall, C.G.St.C (Eds.), *Sea-Level Changes: An integrated approach*, SEPM Special Publication 42, Claremore, OK, pp. 71–108, 1988.
- Davison, G.E., The importance of unconformity-bounded sequences in Flood stratigraphy, *J. Creation* 9(2):223–243, 1995.
- McDonough, K., Bouanga, E., Pierard, C., Horn, B., Emmet, P., Gross, J., Danforth, A., Sterne, N., and Granath, J., Wheeler-transformed 2D seismic data yield fan chronostratigraphy of offshore Tanzania, *The Leading Edge* 32(2):162–170, 2013.
- Reijers, T.J.A., Stratigraphy and sedimentology of the Niger Delta, *Geologos* 17(3):133–162, 2011.
- Thomson, K. and Underhill, J.R., Frontier exploration in the South Atlantic: structural prospectivity in the North Falkland Basin, *Amer. Assoc. of Petrol. Geol. Bull.* 83(5):778–797, 1999.
- Peters, S.E. and Gaines, R.R., Formation of the ‘Great Unconformity’ as a trigger for the Cambrian explosion, *Nature* 484:363–366, 2012.
- Whitmore, J.H., Lithostratigraphic correlation of the Coconino Sandstone and a global survey of Permian “eolian” sandstones: implications for Flood geology, *ARJ* 12:275–328, 2019.
- Bertog, J., Huff, W., and Martin, J.E., Geochemical and mineralogical recognition of the bentonites in the lower Pierre Shale Group and their use in regional stratigraphic correlation; in: Martin, J.E. and Parris, D.C. (Eds.), *The Geology and Paleontology of the Late Cretaceous Marine Deposits of the Dakotas*, Geological Society of America Special Paper 427, Geological Society of America, Boulder, Colorado, pp. 23–50, 2007.
- Snelling, A.A., Five mass extinctions or one cataclysmic event? *Answers Magazine*, answersingenesis.org, accessed 2 Aug 2017.
- Clarey, T., *Dinosaurs: Marvels of God’s design*, Master Books, Green Forest, AR, 2015.
- Clarey, T.L. and Werner, D.J., The sedimentary record demonstrates minimal flooding of the continents during Sauk deposition, *ARJ* 10:271–283, 2017.
- Clarey, T.L. and Werner, D.J., Use of sedimentary megasequences to re-create pre-Flood geography; in: Whitmore, J.H. (Ed.), Proc. 8<sup>th</sup> ICC, pp. 351–372, 2018.

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