Paleosols: digging deeper buries 'challenge' to Flood geology

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Paleosols are a favourite objection used against the global Flood and the 6,000-year biblical age of the earth. Uniformitarians believe that paleosols (ancient soil horizons) are common throughout the stratigraphic record. Soils are believed to take hundreds to thousands of years or more to form and represent periods of Earth history when the area was not covered with water. Thus, it is argued, paleosols could not have formed in the midst of a global flood. However, when two examples of alleged paleosols are examined, one in Missouri, USA and the other in Queensland, Australia, they do not stand up to scrutiny. The loose, friable horizons do not have the diagnostic characteristics of soils and the interpretation of a paleosol is inconsistent with the sequence of geological events required. Instead, the field evidence fits the biblical framework much better than the uniformitarian one. The soils examined did not form by subaerial weathering over a long time but by *in situ* 'weathering' during and after the global Flood.

One of the favourite objections against the global Flood and the 6,000-year biblical age of the earth is the claim that ancient soil horizons (paleosols) are common throughout the stratigraphic record. Soils are considered to have formed on land from bedrock due to chemical and biological weathering over long periods. The time envisaged for a soil profile to develop is of the order of hundreds to thousands of years or more.[1] Since soils represent periods of Earth history when the area was not covered with water, paleosols could not have formed in the midst of a global flood—so the argument goes.

One example of this claim is by Joseph Meert, Assistant Professor of Geology at the University of Florida, who used a baseball analogy to assert that paleosols are one strike of 'three strikes against young-earth creationism'.[2] Which he states are an 'anathema to young-earth (ye) creationism because they pose such a problem for the concept of the young earth'.

Meert says:

> 'If you look at the photo at the top of the [web] page, you will see an excellent example of a well-developed paleosol in Missouri. [Reproduced here as Figure 1] The paleosol is developed on a granite dated to *1473 Ma* and underneath the upper Cambrian-age Lamotte sandstone[5]. Paleosols are fairly common features throughout the standard geologic column … Why are paleosols so troubling for ye-creationism?
>
> 'Ye-creationists assert that the the [*sic*] geologic record is mainly a recording of a global *Gilgameshian flood* (the Hebrews referred to this myth as the Noachian flood) and that most of the sedimentary rocks observed on Earth resulted from deposition during this flood. Obviously, there is no chance for mature and thick soils to form during a global tempest such as the flood of Noah. …
>
> '[Paleosols are] data that clearly refute the notion of a global flood. Paleosols are ancient soils that develop during periods of *extensive sub-areal* [sic] *weathering* and they are sometimes preserved in the geologic record. The key is that paleosols are found *throughout the geologic column* and represent periods of Earth history when the region they were found in WAS NOT covered by water. Paleosols in the midst of a global flood are not possible' [emphasis in original].

Clearly Meert considers that paleosols have the potential to refute the global Flood. We agree! The concept of paleosols provides a good test for any biblical geological model. That we can use the Bible to develop a geological

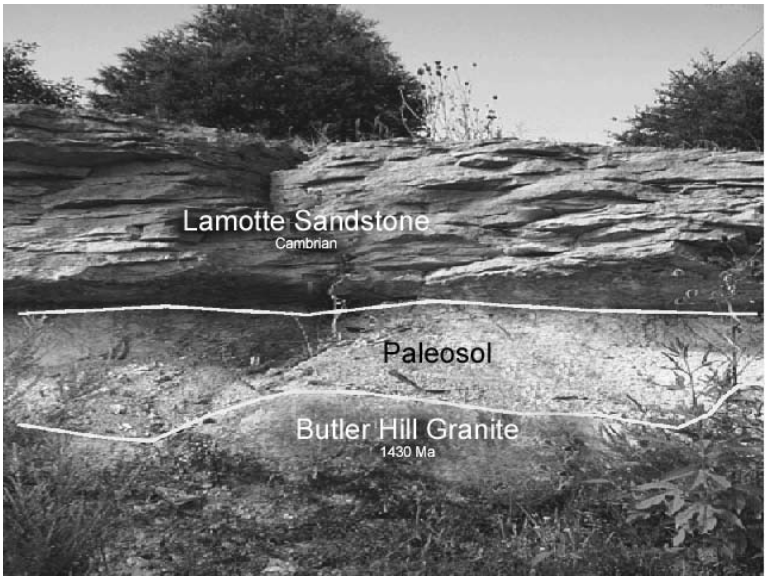

Figure 1. *Alleged 'paleosol' located between the Precambrian Butler Hill Granite and the Cambrian Lamotte Sandstone. Photo taken by Joe Meert along Missouri State Highway 67 (from Meert).*[2]

model that can be scientifically tested destroys the oft-repeated claim by evolutionists that 'creation science' is not science because it cannot be tested. We're pleased that Meert acknowledges that biblical geology is a valid, scientific approach. But we do not agree that the biblical flood has been falsified. Let's consider the evidence a little more closely, because we will see a different story.

Clearing up some misconceptions

Before we do, we need to clear up a couple of misconceptions that slipped in without noticing. First, paleosols are not troubling to young-earth creationists, nor are they an anathema, as Meert imagines. Froede has published an excellent treatment on paleosols in the stratigraphic record in his book *Field Studies in Flood Geology*,[3] comparing and contrasting the field evidence from a uniformitarian and biblical Flood perspective. Also, Klevberg and Bandy have recently published two articles on soil formation and the biblical Flood.[4]

Second, Meert links the global Flood of the Bible to the Epic of Gilgamesh—a flood story recorded on ancient clay tablets excavated from the ruins of Nineveh more than a hundred years ago.[5,6] Parallels with the Bible are obvious but the Gilgamesh story has clear fictional characteristics such as an ark the shape of a cube, and rainfall lasting only six days and nights. The tablets are conventionally taken to be the older version of the two stories, so the biblical record is interpreted as being derived from the Babylonian one. This not only implies that the biblical record is fictional, but second rate fiction at that. However, the sheer quality of the biblical record, including plausible dimensions of the ark[7] and the quantity of detail, all described in a sober, matter-of-fact way, mean that the biblical record is eminently credible. John Woodmorappe demonstrated that even the smallest particulars are reasonable.[8] If we ignore the conventional dates assigned to the epic (Middle Eastern chronology is currently in a state of flux and dates are being revised lower[9]), the more plausible interpretation is that Noah's Food and the Epic of Gilgamesh record the same real event in history. The biblical record is the accurate, reliable testimony while the Epic of Gilgamesh is a corrupted version. So, we shouldn't allow this subtle linkage to Gilgamesh to distract from a proper consideration of paleosols.

Finally, we need to ignore the million-year ages quoted in the text and written on the photo. As pointed out on many occasions,[10] the rocks do not have ages labelled on them. The ages are an interpretation based on assumptions about how the rocks formed—assumptions which are unprovable.[11,12] You can obtain any age you like depending on the assumptions that you make. Since they were deposited during the Flood, we would write on the photo that the true age of both rocks, based on a written eyewitness account, is 4,500 years.

Interpretive frameworks

Now, with regard to ancient soils in the fossil record, it is understandable that Meert believes paleosols are found throughout the geologic column because the concept of paleosols is firmly entrenched in uniformitarian thinking. It is simply a logical application of the uniformitarian framework which takes the processes we see happening today and extrapolates them into the past without discrimination. There is a voluminous literature on paleosols,[13,14] including numerous books[15,16] and courses at university level.[17] So it is understandable that people would think paleosols are an open-and-shut case. However, it is only when we consider an alternative interpretive framework and examine the field examples in detail that we find things are not as they are said to be.

Thus, we first need to consider the place of paleosols within an alternative geological framework—one based on the biblical record. There are two periods when soils would be present on the earth:

1. Soils would exist in the **pre-Flood period**. However, it is doubtful that any soils from before the Flood would have been preserved through that cataclysm. Most likely they would have been destroyed.[18–20] Nor is there conclusive geological evidence for the existence of pre-Flood paleosols.
2. Soils would form in the **post-Flood period** and we see soils everywhere today. There would have been rapid development of soil profiles at the end of the Flood as soil-forming reactions would have been accelerated when the land surface first emerged and air was drawn into the exposed layers. Also, the drainage of floodwaters through the surface layers would have caused rapid leeching of fine material and ionic species from one horizon to another. In fact, specific horizons of soil formation are identified in the stratigraphic record in eastern Australia where 'deep weathering of planation surfaces' occurred.[21] Such unique windows of soil formation may well have been associated with geological processes in the very last phase of draining floodwaters. Finally, after the Flood, normal weathering would have formed soils on the post-Flood land surface within years.

Soils that formed at the end of the Flood and at the beginning of the post-Flood period could have been buried by subsequent geological processes such as flooding, volcanism, and wind blown processes. These would be true paleosols. In fact, the whole idea of paleosols was first developed by geomorphologists and soil scientist to explore soils in the Quaternary. The study of these post-Flood soils was then extended throughout geologic time to more ancient rocks based on the assumption of uniformitarianism.[22]

A good place to look for a true paleosol is where a landslide has occurred at a road cutting. Because the government builds and maintains roads, money is readily available to

clear away the debris, and the slide makes the news, so it is well documented. At such a location we can see the soil profile in section where the road crews have cut away the debris. However, the colluvium (slide debris) needs to be thick enough to isolate the former surface from modern soil-forming processes, typically a couple of metres or more. One important point to make about such paleosols is that their status as a paleosol has been historically established.

Meert's 'paleosol' example

Let's look at Meert's paleosol (Figure 1), which supposedly refutes the global Flood. There would be no question among most creationists that the Cambrian sandstone in Meert's picture is a Flood deposit. Most creationists would also interpret the granite as a Flood rock although some would possibly consider it to have formed during Creation Week. The way the photograph has been annotated with lines depicting the contact between the 'soil' and rock could give the impression that this is a tight case for a paleosol. But we would not expect the material in the photograph to be a soil horizon. (Even if the granite formed during Creation Week, which would mean there was enough time to form soil in the pre-Flood era, we would not expect the soil to remain in place during the Flood). We will see that, not only is it *not* a soil horizon, but this particular example has more problems than most, and Meert would have been better served to select one that could have been more plausible.

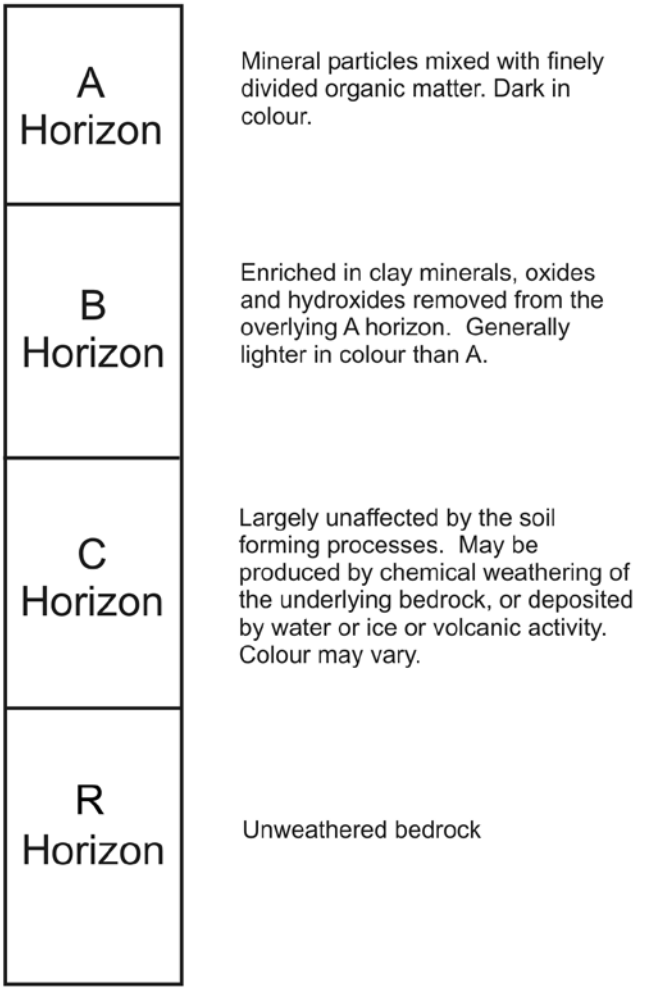

Figure 2. *A hypothetical soil profile. The A horizon has mineral particles mixed with finely divided organic matter that produces a dark colour. The B horizon is enriched in clay minerals, oxides and hydroxides removed from the overlying A horizon, and is lighter in colour. The solum or true soil is represented by the A and B horizons. The C horizon is largely unaffected by the soil forming processes and may be produced by chemical weathering of the underlying bedrock, or deposited by water or ice or volcanic activity. The R horizon is bedrock.*

Look more closely at the outcrop photographed by Meert along Missouri State Highway 67. Of course, it is not possible to positively identify rocks from a photo at such a distance. One can't clearly see minerals or textures, or easily discriminate between rock, lichen, mould and shadow. It would be preferable to visually inspect the outcrop. However, at the bottom of the outcrop in the photo we can see a small exposure of pale-coloured rock. It has a granular texture but does not show any clear fabric (e.g. layers or cross-bedding). We can accept that it is granite as Meert has labelled it. Sitting on the Butler Hill Granite on an uneven contact (marked by a line, but otherwise not a particularly obvious contact) is a material of similar colour and texture. However it appears to be loose and friable. To the left there are a few larger clasts scattered on the surface. There does not appear to be any horizontal layers or horizons in this loose material. This material is labelled 'Paleosol' on the photo and appears to be about half a metre thick (judging from the height of the plants). Sitting on this 'loose' material on a distinct, straight, horizontal contact is a thin exposure of a slightly darker rock about a metre thick at the most. It is labelled 'Lamotte Sandstone' and seems to have a thin (5 cm) horizontal bedding, suggesting it was deposited from flowing water. The apparent bedding also suggests that the strata have not been significantly tilted or disturbed since being deposited. Grass and small plants are growing on top of the sandstone. It is not possible to identify the soil layer in which they are growing but it must be quite thin.

Assessing Meert's claim

Anyone wishing to understand paleosols first needs a basic understanding of modern soils and soil forming processes. Soils can develop from bedrock (such as hardened lava) as it weathers or from unconsolidated sediments.[23] Most soils have three main horizons (layers) identified as A, B, and C horizons (Figure 2).[23] The A horizon is found at the soil surface and is described as topsoil by most people. It is usually somewhat dark in colour due to additions of organic carbon from decaying plants. The B horizon is directly below the A horizon and has experienced leaching into or out of the horizon.[23] B horizons tend to be lighter coloured than A horizons and browner than C horizons. In mature soils, the B horizon is typified by increased amounts

of clay due to migration of clay from the A horizon. Clay films can be found in the B horizon which indicate clay movement into this horizon from above. The C horizon is usually weathered parent material.

The three main field features used to interpret a paleosol are root traces, soil horizons, and soil structures. Additional complications associated with the way the 'paleosol' fits into the rock sequences also need to be considered.[24]

The first point about the alleged paleosol in Figure 1, which Meert described as an 'excellent example of a well developed paleosol', is that there is no reference to any root traces. The photo is too distant to distinguish them and their existence or otherwise is not mentioned in the text. In other words, the first and 'most diagnostic feature'[25] of a paleosol is not addressed. However, even when root traces are described for claimed paleosols (ones clearly from Flood deposits) the roots are often simply interpreted from plant fragments, or even from empty tubular cavities interpreted as root trace fossils.[26] These features can be just as easily interpreted as the product of processes consistent with the Flood framework, such as plant material being transported into place, or water escape cavities.

The second and most important thing to notice about this 'excellent example' is that there is no evidence of any soil profile development. The alleged paleosol has the same colour as the granite from which it has been derived, and at best could be described as decomposed granite. There is no hint of any development of either a B horizon (with the addition of clay or precipitates due to leaching) or of an A horizon (with the addition of organic carbon).

The third field characteristic used to interpret paleosols is soil structure. Soil structures appear massive or hackly at first sight.[27] Presumably Meert used this characteristic as his criteria for interpreting the paleosol in Figure 1. However, just because a geological horizon is loose and friable does not mean that it developed by subaerial weathering over a long time. There are other plausible ways of explaining this characteristic within a framework consistent with the biblical Flood, as we will see.

Thus, there is no indisputable diagnostic evidence in the photograph to support Meert's claim that the unconsolidated material is a well developed paleosol. In other words, just because someone calls something a paleosol and labels it as such does not mean it really is.

Rock sequences

Apart from the three main field features discussed, there are other complications that need to be considered and these have to do with the way paleosols fit into the rock sequences.[28] When we consider the sequence of events imposed on the geology of the area by Meert's claim we can see that the idea of a paleosol is even more problematic. This is because of the types of rocks involved. Let's think of the implications of Meert's idea. The sequence of steps required under a uniformitarian framework is illustrated in

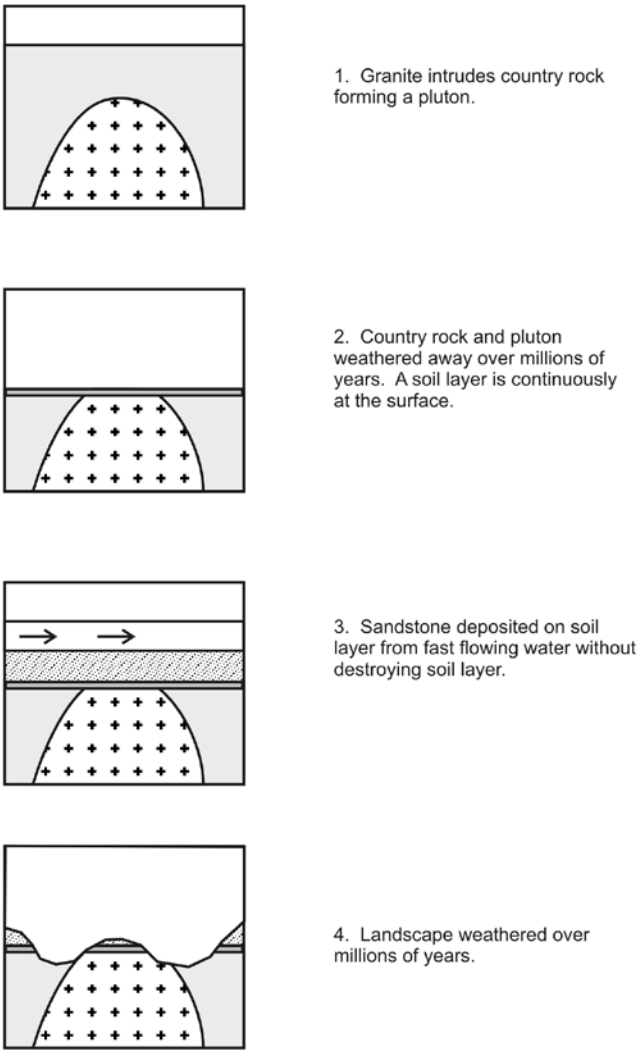

Figure 3. *Sequence of geological processes needed to produce and preserve a paleosol on Precambrian granite within a uniformitarian framework.*

Figure 3 and outlined below:

1. Granitic magma intruded the country rock (which is now no longer present) forming and filling a large magma chamber, which eventually cooled to form a granite pluton. (Uniformitarians generally believe plutons form at considerable depth within the continental crust and took millions of years to cool. These misconceptions have been addressed in a number of articles about the formation of granites.[29–32])
2. The overlying country rock (perhaps tens of kilometres thick) was slowly and completely eroded away by normal subaerial weathering processes until the granite pluton was exposed. For the whole of this period of weathering, a soil layer was continuously being produced at the surface and continuously being removed.
3. The land was then inundated by water which deposited sand (which later turned into sandstone) on top of the soil layer. The bedding in the sandstone indicates that

the water was flowing and very energetic.

4. Finally, the sandstone was weathered away by subaerial processes until the small metre-thick section observed in the road cut today is all that is left.

Step 3 is the one that presents a major problem for Joe Meert's paleosol claim. How could flowing water, energetic enough to carry volumes of sand and produce horizontal flat bedding not remove the soil—a thin surface layer, which is friable and loose? Why wasn't the granite washed clean like the rock outcrops we see jutting into the sea at the coast? What sort of amazing process could have preserved this soil layer on the granite in the midst of fast-flowing current of water? It seems that Meert's choice of an 'excellent example of a well developed paleosol' is not helpful for his argument.

A more plausible example?

A more plausible example of a paleosol, at least from a rock-sequence point of view, is in a basalt exposure on the Mapleton-Maleny plateau, Queensland, Australia (Figure 4).[33] Here we see a series of basalt flows with red earthy horizons between them, which have been interpreted as ancient soils that have been buried by subsequent lava flows. The thickness of one 'soil' in particular has been interpreted as indicating that 'there was a considerable time gap (probably thousands of years) between the eruption of one flow and the next.'

At least the sequence of events required to produce such a 'soil' layer is feasible, unlike those in Meert's example above. The first basalt flow could have been deposited subaerially. Then, over time, the basalt surface could have weathered into a soil layer as shown. And finally, a subsequent basalt flow could have flowed across the land and covered the soil. This rock sequence is at least plausible.

The basalt plateau has been 'dated' as Late Oligocene, which places it late in geological history. The basalt plateau has also been extensively dissected by broad valleys suggesting that it was eroded during the last phase of the Flood by the considerable volumes of floodwaters still receding from the continent. Thus, from a Flood perspective we would expect the basalt to be a Flood deposit and the friable horizon would *not* be a true, subaerially weathered soil.

When we examine the alleged paleosol in the field we find that it is simply a thick horizon of loose, friable, material. There is no evidence of root traces within it. Neither is there an A or B horizon. The evidence needed to convince us that the alleged soil is a soil is lacking. But there is more. First, if the thick friable horizon had been a soil layer before the subsequent eruption, we would expect to find a baked zone immediately under the basalt flow in the 'old soil layer', but none is present. Second, note the difference in topography between the present landscape and the landscape of the 'old soil layer'. The present landscape has a significant vertical relief—it is a hilly terrain. Yet the old soil layers are straight, horizontal and parallel across the plateau. How could thousands or tens of thousands of years of weathering produce such a thick layer of soil without producing any topographical relief? Thus, even though the setting at Mapleton-Maleny has a better chance than Meert's, it still does not make the grade as a real paleosol.

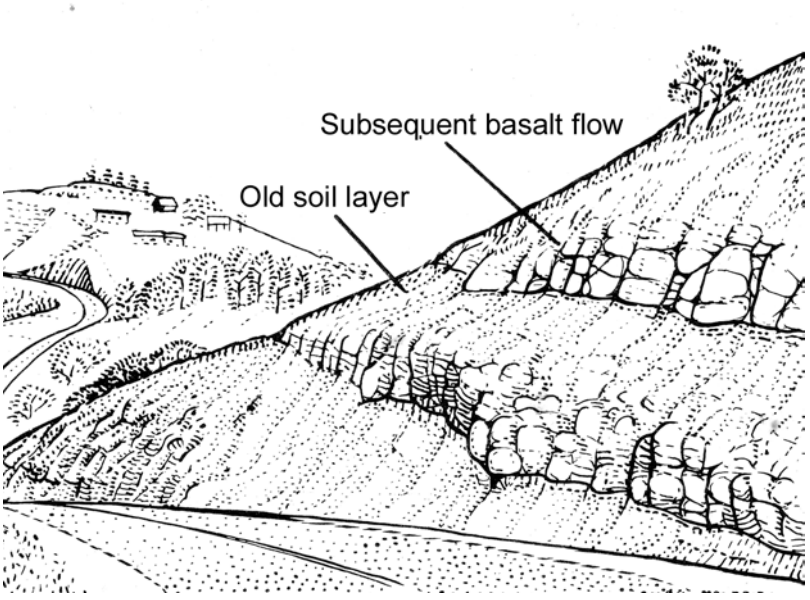

Figure 4. *Line drawing of alleged 'old soil layers' between basalt flows on the Mapleton-Maleny Plateau, Queensland, Australia. Compare the flat topography of the 'old soil layers' with the present hilly landscape (from Willmott and Stevens).*[40]

A Flood interpretation

How did the loose, friable layer form beneath the sandstone under the granite as shown in Meert's photograph? Can Flood geology provide a plausible answer? Of course. This friable layer of material is not a 'troubling' problem for young-earth geology. One simple Flood scenario is illustrated in Figure 5 and described as follows:

1. During the first half of the global Flood, as a consequence of tectonic movements, granitic magma intruded the country rock (which is now no longer present) forming and filling a large magma chamber and eventually cooling to form a granite pluton. The intrusion need not have been particularly deep, nor did it need to cool slowly to produce the granitic texture.[29,32]
2. Later, still during the first half of the Flood, water flowing rapidly over the land eroded the country rock, exposed the granite, and deposited the sandstone on the granite.
3. In the second half of the Flood, water receding from the continent eroded the sedimentary strata leaving only the thin sandstone layer in this area.[34–36]
4. After the Flood, the granite at the interface decomposed as a result of water pooling

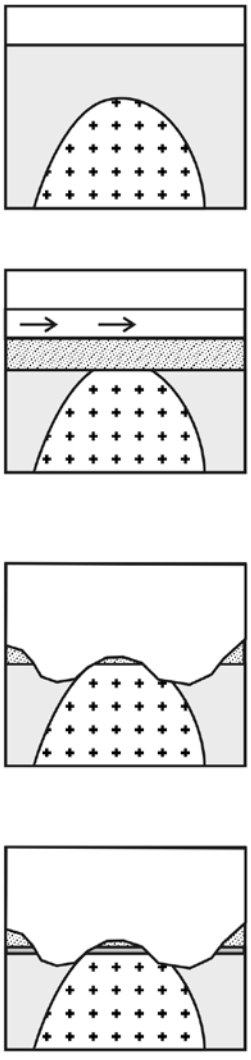

Figure 5. *Sequence of geological processes needed to produce and preserve a paleosol on Precambrian granite within a biblical Flood framework.*

at the interface.[37] The sandstone would be permeable and readily allow precipitation to flow through it to the interface. The granite would act as an impermeable barrier and cause the water to pool. Perhaps underground channels formed in particular areas as routes for the removal of the water from the landscape. Also, oxygen and organic acids would penetrate to the interface because the sandstone layer is so thin at this point. These are particularly aggressive in breaking down the minerals in the rocks, especially the more susceptible minerals in the granite such as biotite and amphibole, leaving the more resistant minerals such as quartz and feldspar.

This is a simple, plausible model and does not invoke any miraculous processes to keep the 'soil' layer intact as needed in Meert's paleosol hypothesis. A similar model can be applied to the loose, friable layers between the basalts on the Mapleton-Maleny plateau. In fact, the disintegration of the basalt *in situ* would have been much more rapid because heat from the basalt flows would have accelerated the chemical reactions. Thus, these two examples of paleosols are not troubling to Flood geology. Instead of paleosols, the friable horizons only have a superficial appearance of soil—they are pseudosols.

In the uniformitarian literature there could be thousands of geological horizons which have been interpreted as paleosols. In fact, the whole paleosol methodology assumes the uniformitarian paradigm and is geared to interpret paleosols throughout the stratigraphic record. Although paleosols are common in the Quaternary they are rare in the earlier rocks and this makes sense within the biblical Flood framework and a post-Flood boundary in the late Cainozoic. It is not consistent with the idea of uniformitarianism which holds that recent geologic processes have applied through all geologic time.

Most geologists have no insight into the biblical Flood framework and so are not alert to field clues which would discriminate between a true paleosol and a pseudosol. It would be an interesting (and almost endless) exercise to examine a wider range of alleged paleosols and reinterpret them within the Flood paradigm. Froede[3] and Kleveberg and Bandy[4] have addressed many of the issues on the topic and provide a good foundation for further field work.

The uniformitarian claims about paleosols are similar to their claims about paleokarst. It was shown by Silvestru that alleged paleokarst in the Pre-Cenozoic is not karst at all, but pseudo-karst.[38] True karstification occurred in a very specific window geologically—a window that is best explained from a Flood geology perspective.[39] In the same way, soil formation from a Flood perspective fits into a very small window which can provide a great tool for field geologists to properly interpret the stratigraphic record.

Conclusion

The presence of a loose, friable layer between the Butler Hill Granite and the Lamotte Sandstone in a road cut on Missouri State Highway 67 represents no 'strike' against the biblical Flood or young-earth creationism. Neither does the alleged 'old soil layer' on the Mapleton-Maleny Plateau, Queensland, Australia. Rather than an 'anathema' to young-earth creationists, when we look at the field evidence from a biblical perspective, we find it fits the biblical framework much better than the uniformitarian one. The alleged soils did not form by subaerial weathering over a long time, but by *in situ* 'weathering' during and after the global Flood. In the final analysis, unless it has been historically attested, the concept of a paleosol is merely an interpretation, not an observed scientific fact.

Acknowledgements

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