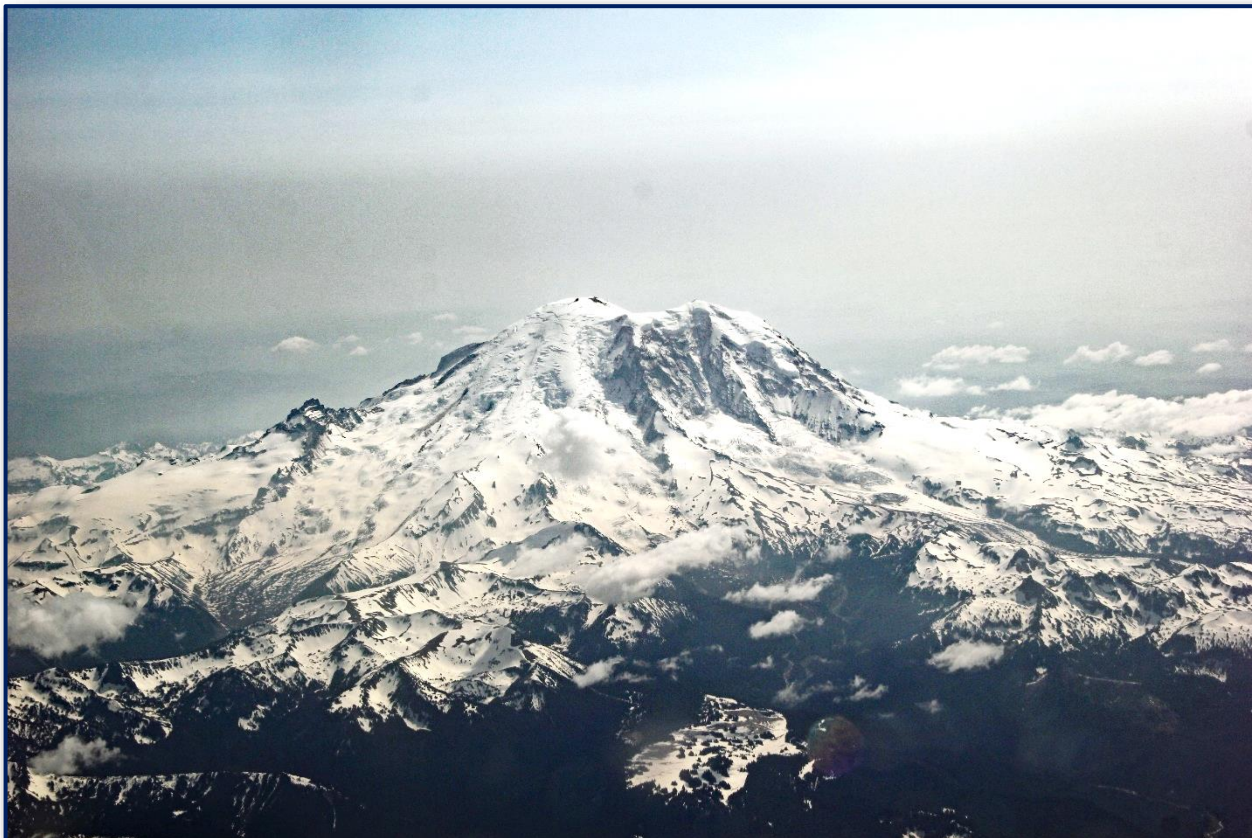
# *Issue #9: Volcanos*

Stephen Mitchell June 1, 2021

Email: Jesus.inHistandS@gmail.com



Mt Rainier, Washington, a stratovolcano that was formed by many events over a period of at least 840,000 years

**Assertions:**

1. We observe ancient volcanos of many types. Some developed in the Cretaceous in shallow marine settings at multiple stratigraphic levels with reefs and carbonate shoals around them.
2. These volcanos took time to develop, be buried and have later volcanos form that also were covered with later sediments.
3. Units with such volcanos did not develop during a one-year flood period.
4. We can recognize volcanics that were formed in marine settings, both today and in ancient deposits.

5. The Cenozoic deposits of Mexico and the western U.S were not formed in marine settings and thus were not part of global flood deposition.

6. Cenozoic volcanics in these areas were often very well hardened and resistant to erosion, yet we see them today highly eroded, as also are the underlying well indurated sediments.

7. The series events from deposition, erosion and soil development found in such places took far longer to develop than the few hundred years allowed in YEC flood models.

**Key assumptions:**

a) Ancient volcanos and extrusive rocks can be recognized and indicate the same or similar processes to those today.

b) Volcanos took some period to deposit and cool and harden.

c) Volcanos at higher stratigraphic levels formed later than lower ones

d) We can distinguish between recognize sediments that were not deposited by rapid catastrophic processes.

**Discussion:**

Volcanos are spectacular examples of dynamic geology. There are many types but basically, they are large piles of volcanic rock formed by many different volcanic events. Most volcanologists agree that these took thousands of years to form. I recommend as a resource Dr. Lorence Collins's 2021 book, "*A Christian Geologist Explains Why the Earth Cannot Be 6,000 Years Old*". It includes in the first chapter examples of volcanic issues, particularly from the Hawaiian Island and Emperor Island Chain that demonstrate deep time relationships. His expertise in igneous petrology makes him a great resource for questions in this area.

I want to start by pointing out Cretaceous examples from my study area that demonstrate relationships that are difficult to explain in the flood geology (FG) timeframe.

1. Pilot Point, Austin, Texas: a fairly wimpy volcano today on the surface (**Figure 1**). This is one of a number of volcanos that we find today in Texas from the Cretaceous period. They grew in shallow seas and were bathymetrically positive features and because they were shallower than other areas, they developed carbonate shoals around them. How would this have happened in a flood?

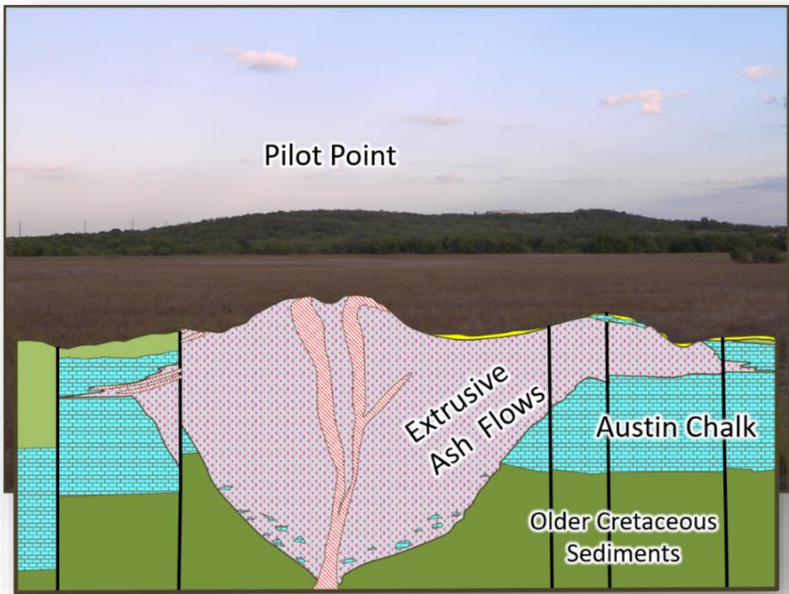



**Figure 1**. View of Pilot Point, a Cretaceous volcano near Austin, TX with a simplified profile. Volcanic rocks are interbedded with the Austin Chalk, a Cretaceous limestone unit (Young, et al., 1982; Matthews 1986)



2. Buried volcanos, now altered to serpentine and drilled in wells. (**Figure 2**) As you see, multiple volcanos are found that developed at different stratigraphic levels. In this case, Anacacho limestone reefs grew over one volcano and then were cut by another. This didn’t take place over a few weeks or years, but that is exactly what FG models demand.

The Cretaceous period was followed by the Cenozoic era. In the western U.S. and Mexico, huge volumes of volcanic rock came out. (**Figure 3**). Here we don’t have any evidence that these formed in marine settings. Unlike the Cretaceous, the time equivalent rocks all have non-marine flora and fauna. Lava flows under the ocean today and in the rock record, often form “pillow lavas” (**Figure 4**). Surely many of these would have formed through western North America, if these were formed under flood waters. We find some in Washington and Oregon as will be discussed later, but they are otherwise rare. In many YEC models, these lavas were deposited while flood waters were near their maximum height.

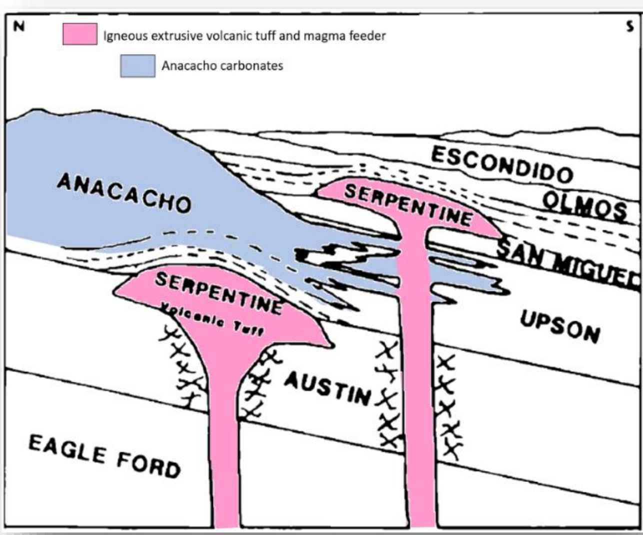



**Figure 2.** Cretaceous volcanoes and limestone biostrome, a deposit of a biologic community that formed on the bathymetric high that the older volcano left. This was then cut by a younger volcano. (Matthews, 1986)

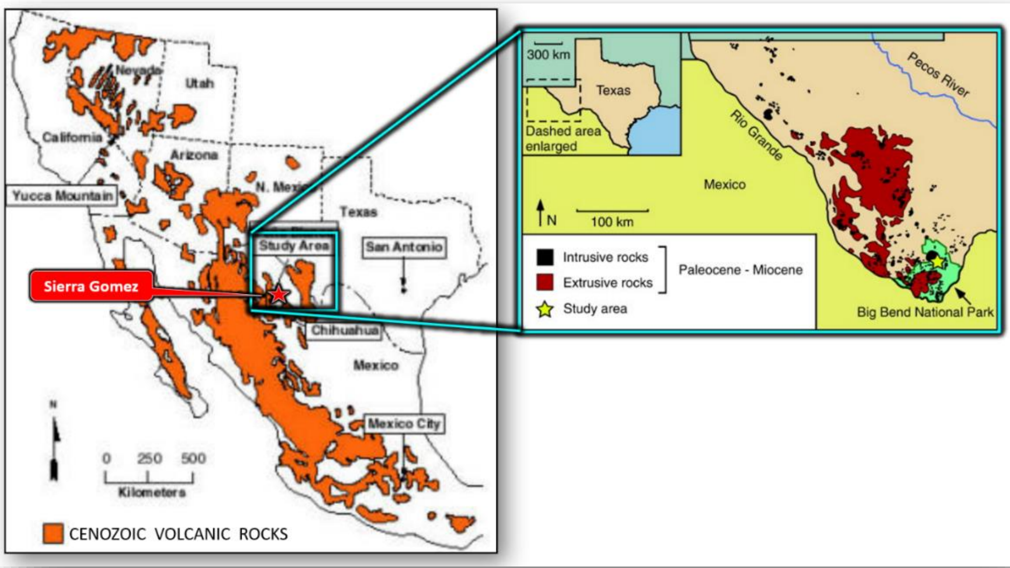



**Figure 3**. Maps showing Cenozoic volcanic fields. Expanded box shows Texas volcanic rocks. The intrusive rocks show the location of the necks of volcanos from which the lavas flowed. The volcanos themselves are typically long eroded away but many of the flows remain, at least as remnants. ((Befusa, et al., 2009; NM Resources, 2007-2008; Prikryl, nd) The location of my thesis area, Sierra Gomez is labeled.

**Figure 4.** Basalts deposited under water are distinct and recognizable. The photo shows pillow lavas forming on the ocean floor today (National Oceanic and Atmospheric Administration 2002).

**Figure 5.** The last photo shows ancient pillow lavas from New Zealand [Barth 2011]). One would expect if the ancient volcanics were all deposited under flood waters, many such pillow lava deposits should be found.

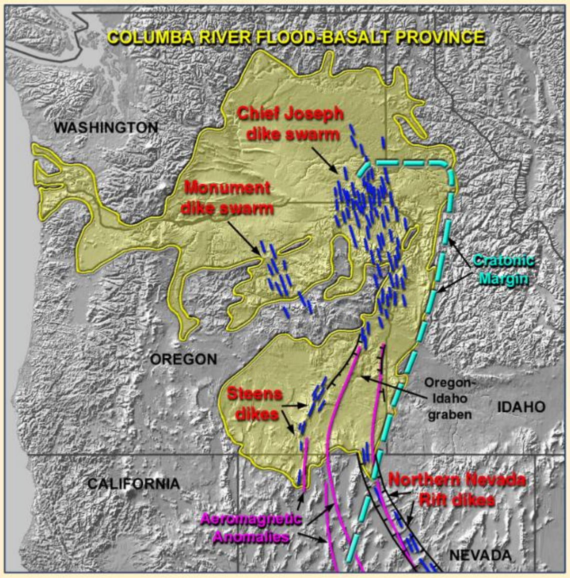
***Post-flood***

Another problem comes with trying to place these volcanics into the post-flood period. Many of these volcanos and volcanic regions are deeply eroded today. Some of these were volcanic ash deposits and loose volcanics, such as are found in the Mount St Helens area today. Such "rock" can be eroded easily and quickly. Many others are volcanic flows and "welded tuffs" that were sufficiently hot at the time of deposition to weld together. Some of these formed units that erode very slowly. As part of my geology master's thesis, I mapped in a small limestone range, Sierra Gomez in northern Mexico, labeled on Figure 3. Today, no volcanics are present but nearby tiny remnants are all that is left of a thick, very hard volcanic pile that formed in the Oligocene. A whole series of events are documented here. The rocks that I mapped were Cretaceous limestones that were hardened to rock, folded into tight folds, eroded deeply and developed ancient caves in them. Later, they were covered with thick terrestrial volcanics. Water percolated through the volcanics and leached out uranium that was then deposited along faults and in ancient caves (paleokarsts). Later yet, the rocks were faulted with normal faulting as a part of what is called the "basin and range province." This created the series of upthrown mountain ranges and downthrown valleys that cover large parts of Mexico, New Mexico, Arizona, and Nevada. The volcanics were later eroded away and the limestones themselves were deeply eroded as well to give the present landforms. Alluvial fans were deposited that filled in much of the downthrown blocks adjacent to the mountains and thin alluvial deposits were laid down in the valley through the center of my study area. Later a modern arid soil was formed. To borrow a phrase from fellow Christian geologist / Geographic Information Specialist, Kevin Nelstead, "*too many events, too little time*".

Examples of extrusive igneous rocks, (those that reached the surface) are found all around the world and involved many events with clear indications of timeframes too long to fit YEC models. Kevin Nelstead wrote this regarding a part of Washington where he worked: (**Figure 5**)

> *"Another example of volcanic rocks that cannot be squeezed into flood geology is the Columbia River Basalts (CRB) of the inland Pacific Northwest. The CRB consists of about 300 individual basalt flows, with an average volume of over 500 cubic kilometers of lava. In most places, these are stacked like sedimentary rock layers, but they are igneous rocks, not sedimentary. The thickest part of the pile of layers is about 1800 meters (5900 feet) thick.*
>
> *Evidence for the passage of vast amounts of time include:*
>
> *1. The overall thickness of the pile of flows.*
> *2. The time it would have taken to cool all this lava, if it had all come out at once.*
> *3. Each flow was a separate event, as indicated by cooling structures on the tops and bottoms of flows.*
> *4. The dikes for later flows (dark blue lines on the map from Wikipedia) cut through older flows, which must have been solidified.*
> *5. Some of the flows have paleosols (ancient soils) on their upper surfaces.*
> *6. There are stream and lake deposits between many of the flows.*
> *7. The flows dammed streams along the mountains of northern Idaho, creating lakes that contain a rich fossil community.*
>
> *The CRB is mostly Miocene. Some YECs would classify this as late flood, which means that the CRB would have formed during late in their flood year. In order for this to happen, there would have to*

*have been several flows per day, each with a volume of about 500 cubic kilometers, some of which flowed from the Washington-Idaho border all the way to the Pacific Ocean. There would have to have been enough time for weathering on the top of some of these flows, plus deposition of stream and lake sediments between some flows."*

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Sentinel Bluffs flows of the Grand Ronde Formation, Palouse River Canyon, WA

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**Figure 5:** Columbia River Basalts distribution

Even larger lava flows covered parts of India near the end of the Cretaceous and earliest Paleocene. (**Figure 6**). This quote helps to put them in perspective:

*"The Deccan volcanic province (DVP) formed during India's northward migration as it passed over the Reunion hotspot (which is today the Reunion Island). This hotspot is still active today and last erupted on April 7, 2007. The DVP is one of the largest volcanic eruptions in Earth history and today covers an area of 500,000 km2, or about the size of France, or Texas. The original size prior to erosion is estimated to have been at least twice as large. The volume of lava extruded is estimated to have been about 1.2 million km3 and today can be seen in mountains as high as the Alps (~3500 m)" (Keller, nd)*

A geologist is amazed to think that these were deposited over a period of just 8 million years (Verma, 2019). The Deccan volcanics consist of hundreds of flows, many of which are separated by paleosols or boles as they are known there. How long did the soils take to develop before they were covered by another lava flow? This quote helps to explain:

> *“From a comparison with formation of paleosols developed on volcanic deposits under various climatic conditions, we propose that many of the red boles we observed in the top part of the Deccan lava pile were formed in less than 1000 years. In order to further constrain the duration of volcanic quiescent intervals, this study was conducted in parallel with a detailed magnetostratigraphic study. During cooling, lava flows record quasi-instantaneously the direction of the Earth’s magnetic field. Secular variation of the geomagnetic field can then be used as a relative time proxy, which allows an estimate of the time needed to generate a red bole. … For instance, because a red bole is sandwiched between two flows which have recorded the same transitional direction between chrons C29R and C29N, the duration of formation of that particular red bole cannot be longer than a few decades.”* (Gérard, 2006)

The volcanic events included ash deposits that spread over a larger region. Interestingly dinosaur egg clutches have been found by the hundreds between these ash beds (Edwards, 2009). Imagine all of these lava flows cooling, weathering, and forming many soils in one year, yet that is what most YEC models tell us happened.


**Figure 6:** Deccan Trap Volcanics from India

**YEC explanations:**

I have not found YEC discussions of volcanics with the type of stratigraphic relationships that I discussed in Texas. I found two articles dealing with flood basalts, including the CRB, written from a YEC view. The first, "Continental Flood Basalts Indicate a pre-Mesozoic Flood/post-Flood Boundary" was written by YEC author, Paul Garner in 1996. As the title suggests, Garner recognized many continental flows around the world in the Mesozoic and Cenozoic and saw the significance of this:

> *"Continental flood basalts appear to have been erupted in a subaerial environment, as indicated by the tectonic environment of continental flood basalt provinces and by the characteristics of continental flood basalt lava flows. Such lava flows could not therefore have accumulated while the continents were under water."*

Garner identified a number of characteristics of continental flood basalts: tectonic environment, flow characteristics, widespread flow, columnar jointing, interflow sediments (including paleosols for weathering surfaces, and associated fauna and flora. Among his examples of subaerially formed continental flood basalts, he specifically describes the CRB and Deccan plateau. He cites articles by well known YEC geologist, Steven Austin, in support of his interpretations, particularly for the CRB. Interestingly, a presentation online by Garner in 2021 shows that he has changed his interpretation of the flood/post-flood boundary (see Issue 7: Finding the Flood). This revised view now places all of these continental flows within his 1-year long flood interval.

In 2002, YEC authors, John Woodmorappe and Michael Oard published this article: *Field studies in the Columbia River basalt, Northwest USA.* Here is his summary:

> *"The thick lava flows comprising the Columbia River Basalt Group (CRBG) in the US state of Washington, and adjacent parts of the state of Oregon, contain a significant number of pillow lavas and palagonites—all indicative of subaqueous extrusion. Individual lava flows invariably show 'knifesharp' contacts between flows, which is consistent with the flows occurring one after the other in rapid succession. The nature of these contacts is inconsistent with the uniformitarian time intervals of millions of years indicated by isotopic dating. Claimed 'weathered horizons' and 'fossil soils' between individual lava flows are very uncommon, suggesting they are the product of chemical reactions between the hot lava and water, not fossil-soil material. The observations are consistent with the lava flows being extruded catastrophically, emplaced rapidly and cooled quickly, all during the global Flood recorded in the Bible. Taken together, the features of the Columbia River basalts suggest that they were mostly extruded and emplaced during the Late Abative Phase of the Recessive Stage of the Flood."*

This article's interpretation of the flows within the flood interval is sharply different from the Garner article. Moving the flood boundary higher in the geologic column does mean that there is less rock that would have been deposited during the short period following the flood, but it increases issues to explain within a 1-year flood.

Both proposed models demand that the 300+ major flows of the CRB were extruded over a very short time. The sheer amount of heat to dissipate as they solidified is enormous as noted by Nelstead. All of the lavas flowed out on the surface, filling topographically low areas and solidified, at least to some degree before others buried them. If the flows were post-flood, a few years were available, though very few. If they were part of the flood, only a few days were involved. If Dr Clarey's estimate of days is typical of this type of flood model, the Miocene might have 45-60 days. Even if the flows occurred over the entire Miocene epoch, 300 flows would be an average of 5-6 flows per day is incredible. Actually, Miocene sediments above and below the lavas tell us that less than the 45-60 days would have been available. As Nelstead pointed out above, a stack of flows over 1 mile thick took time to deposit and cool.

It is interesting that Garner saw columnar basalts as evidence of slower cooling, while Woodmorappe and Oard saw them as implying rapid cooling. Who is correct? In a sense, both are, but it is a matter of what is slow and what is rapid. In terms of the few days available in the flood model, the cooling and development took too much time, but in terms of many geologic processes, columnar units develop relatively rapidly. Many flows have columnar portions. What do they tell us about the time involved? Philips, et al. (2013) examined columnar jointing in Scotland and concluded that cooling timeframes of 12-20 months would allow such lavas to cool to depths of 8m below the flow top. Many articles agree that some water was involved but there are no indications that columnar basalts form into major bodies of water, much less require them.

Water definitely was involved. Both YEC articles also discuss the presence of pillow lavas, which clearly form only by extrusion into water. It is interesting that there are many examples in the CRB, though in most areas with Cenozoic igneous volcanics in North America, they are almost non-existent. The author, Dr. Aaron Waters, provided this description of their formation in 1960 and it is still good:

> *"When flood basalts build an extensive lava plain, there is sure to be much disruption of the former drainage. Streams are ponded against the margin of the lava flood and shallow lakes spread widely over the edges of the newly congealed lava. Flows from new eruptions pour into these marginal lakes, filling them with a complex of pillow lavas and granulated basalt glass. The process is repeated again and again. The glass of these subaqueous breccias is nearly always partly altered to yellow earthy palagonite (Peacock and Fuller, 1928). Palagonite, too, is unstable and is generally at least partly decomposed to clay minerals, zeolites, and other products. In older rocks such as the submarine flows of Eocene age in Western Oregon and Washington (Water, 1955, p. 704-707), the palagonite has generally been completely altered to a sooty black or dark green argillite composed of varying amounts of montmorillonite, nontronite, saponite, celadonite, and other clay minerals, along with chlorite, zeolites, carbonates, opal and chalcedony.*
>
> *Pillow lava-palagonite complexes are widespread along the margins of the Columbia River basalt. They show much variation in structure, depending chiefly on the viscosity of the lava and the depth of water. These variations and also the use of certain structures in determining the direction of low have been ably summarized by Fuller (1931). The following section is largely abstracted from his paper, but is supplemented by additional observations that bear on the problem of determining the direction of flow."*

It is significant that pillow lavas can be formed in lakes and rivers and did not require larger bodies of waters or large global floods. The setting in the Columbia River Plateau was ideal for such, as ancestral river systems to today's Columbia River and its tributaries carved through the area, though at times they were diverted or ponded by lava flows. Similarly, Woodmorappe and Oard claim that the columnar basalts suggest large amounts of water, but Long and Wood, 1986 described the water required to initiate and develop columnar basalts this way:

> *"For the Columbia River basalts, the concept of flooding flows with water as they cool is geographically and geologically reasonable. The flooding could be accomplished either by deranged drainage or by extremely heavy rainfall or by a combination of both."*

Thus, Woodmorappe and Oard are quite right that water was often involved in the formation of the CRB, but this does not really imply a global flood connection.

Both Garner and Woodmorappe and Oard are of course skeptical of paleosol development between the lavas of the CRB. Even one soil profile among the lava flows is a problem for placing the pile in the flood interval. Ancient soil development becomes a "too many events, too little time" problem for any FG model. Woodmorappe and Oard are right that not every package between basalt flows is a soil. Sheldon, 2003 also recognized this, as he wrote here:

> *"Sequences of basalt flows commonly preserve spectacular red interflow intervals. Although most of these reddened zones have though most of these reddened zones have been labeled ''baked zones,'' a number of them show evidence of pedogenesis, or soil formation, that occurred between periods in which basalt flows were emplaced."*

Notice that they also recognize that many interflow deposits were not real soils, but point out that some do show evidence of real soil development. Hobbs and Parrish (2016) identified and studied ten paleosols in two of the formations of the basalts, based on soil horizon development, root traces and deep weathering profiles. They used them to learn about the climate during the Miocene in this area. Similarly, Sheldon, 2003 learned this about the soils they studied:

> *"The root traces and continuous Bt horizon of the Ilukas pedotype indicate a forest with a closed canopy. A small number of terrestrial gastropod fossils have been recovered from the Ilukas pedotype, but no vertebrate or invertebrate fossils have been recovered from the Monana pedotype. Swamps typically have acidic pHs that inhibit fossil preservation, and this likely explains the dearth of faunal fossils."*

Placing these as flood deposits would mean that all of these lavas flowed out very rapidly, in many cases were weathered, and soils developed on them that grew trees and grass. These soils were buried by more flows. All of that had to take place in a few days or weeks. Too many events, too little time.

For any of the volcanic regions, it is worth thinking about when man entered into the scene, relative to the volcanics. A case in point for the CRB comes from the discovery in 1996 of the complete skeleton that came to be known as the Kennewick Man (KM). Carbon dated to 8,900 to 9,000 years ago, KM shows that humans came to the area a long time ago. He was wounded in the pelvis and a "Cascade point" arrowhead extracted from the bone. Cascade points come from a society known to live in the Pacific Northwest during this period. The CRB were cooled and buried long before he lived there. YEC cannot accept carbon dating, even KM were as young as the time of Abraham, his burial in the sediments above the CRB brackets the time available. In a post-flood proposal as little as 3-500 years would have passed for the lava extrusion to the death of KM.

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