
THE GRAND CANYON
AND THE GENESIS FLOOD
PART 1. Laying Down the Layers
Ariel A. Roth
www.sciencesandscriptures.com

1. INTRODUCTION
TWO MAJOR QUESTIONS

1. Were the rock layers of the Grand Canyon laid down by the waters of the great Genesis Flood?

2. Was the Canyon carved by the receding waters of the Genesis Flood?

The first question is the topic of this discussion, under the title LAYING DOWN THE LAYERS.

The second question will be addressed in Part 2 of this series titled: CARVING THE CHASM.

1. INTRODUCTION

OUTLINE OF PART 1: LAYING DOWN THE LAYERS.

1. INTRODUCTION
2. BRIEF OVERVIEW OF GRAND CANYON
3. INCREDIBLY WIDESPREAD LAYERS
4. KARST IN THE REDWALL
5. THE COCONINO
6. FLAT GAPS
7. CONCLUSIONS

1. INTRODUCTION

TWO CONTRASTING VIEWS

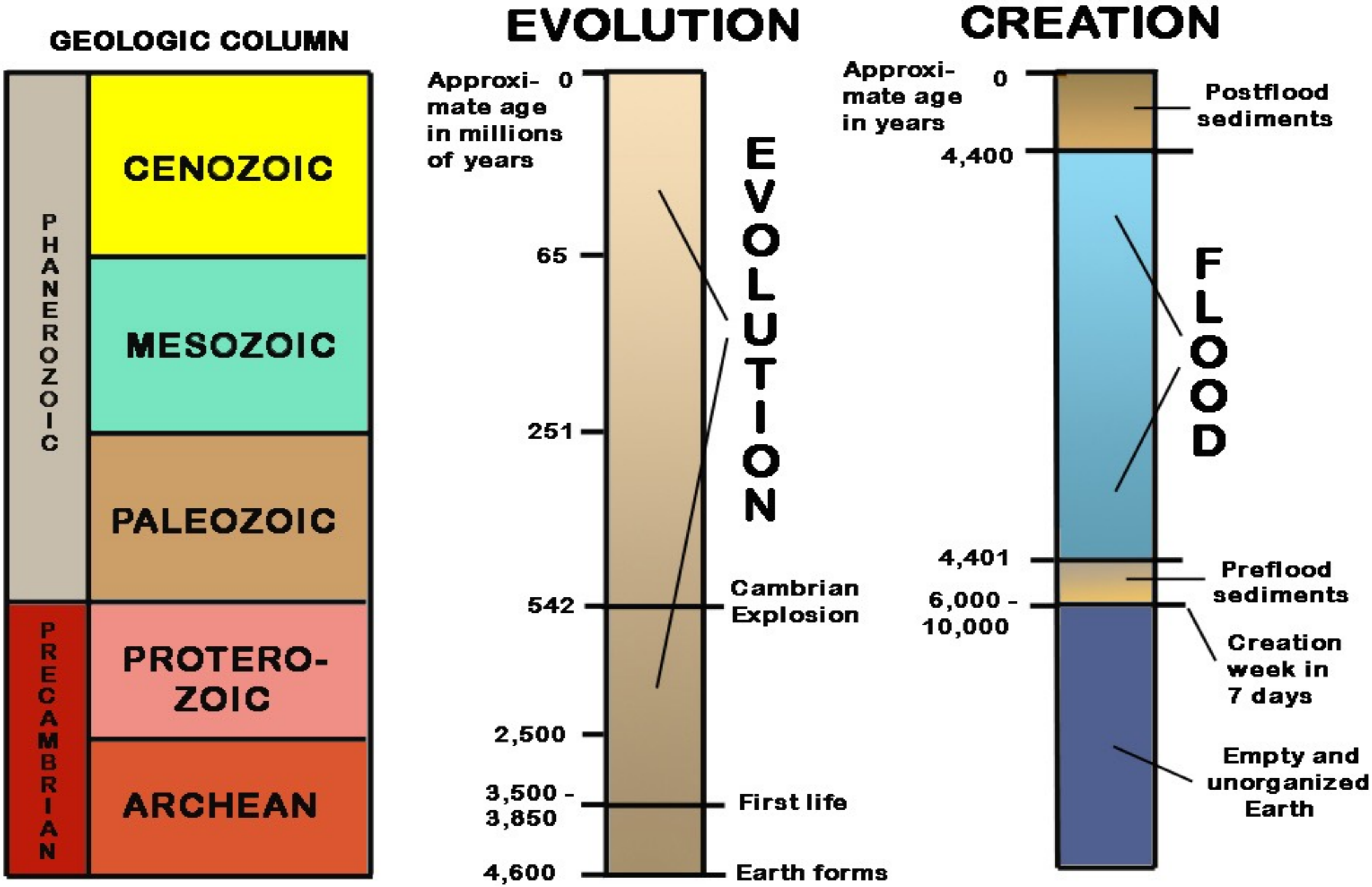
At issue here are two world views. Did life evolve gradually over millions of years as generally endorsed by the scientific community; or did life originate a few thousand years ago as indicated in the Bible?

For the evolutionary view, the layers of the Grand Canyon and their fossils are interpreted as representing eons of years. For the biblical model, the layers represent mainly the effects of the astonishing Genesis Flood.

The next slide illustrates the difference between these two views. Note the striking contrast in time between the two models. The layers you see in the Grand Canyon belong mainly to the Paleozoic portion of the geologic column.

For further information by the author and references see: DISCUSSIONS 7-16 in the BIBLE AND SCIENCE series of the author's webpage www.sciencesandscriptures.com. For a "hardcopy" see: Roth AA. 2000. The Grand Canyon and the Genesis Flood. Creation, Catastrophe & Calvary. Review and Herald, p 69-78.

TWO MODELS FOR THE GEOLOGIC COLUMN



1. INTRODUCTION
THE BIBLICAL RECORD

THE FLOOD WAS "UNIVERSAL"

The Bible repeatedly speaks of the Genesis flood as a worldwide event, i.e. "all the high hills under the whole heavens were covered" and "all flesh died that moved upon the earth" (Genesis 7:19, 21).

MAJOR PHASES OF THE GENESIS FLOOD:

The Bible states "And the rain was upon the earth forty days and forty nights." Genesis 7:12

"And the waters prevailed upon the earth an hundred and fifty days." (Genesis 7:24).

"And the waters returned from off the earth continually [going and returning]: and after the end of the hundred and fifty days the waters were abated." (Genesis 8:3)

2. A BRIEF OVERVIEW OF THE GRAND CANYON

2. OVERVIEW
THE "GRANDEST" CANYON

Considered the world's grandest natural architectural masterpiece.

It is 446 kilometers (277 miles) long. Cannot drive across. One dirt road to river. Hike across is 34 kilometers (21 miles).

President Theodore Roosevelt who set it aside in 1908 stated: "Do nothing to mar its grandeur." and Grand Canyon is "the one great sight which every American should see."

NOT ALL AGREE

Some call it just a bad case of soil erosion!

Lieutenant Ives in 1857 is reportd to have stated: "It can be approached only from the south and after entering it there is nothing to do but leave. Ours has been the first and will doubtless be the last party of whites to visit this profitless locality."

Now, the Grand Canyon has around five million visitors per year. It is a marvelous sight as illustrated in the next slide.

2. OVERVIEW

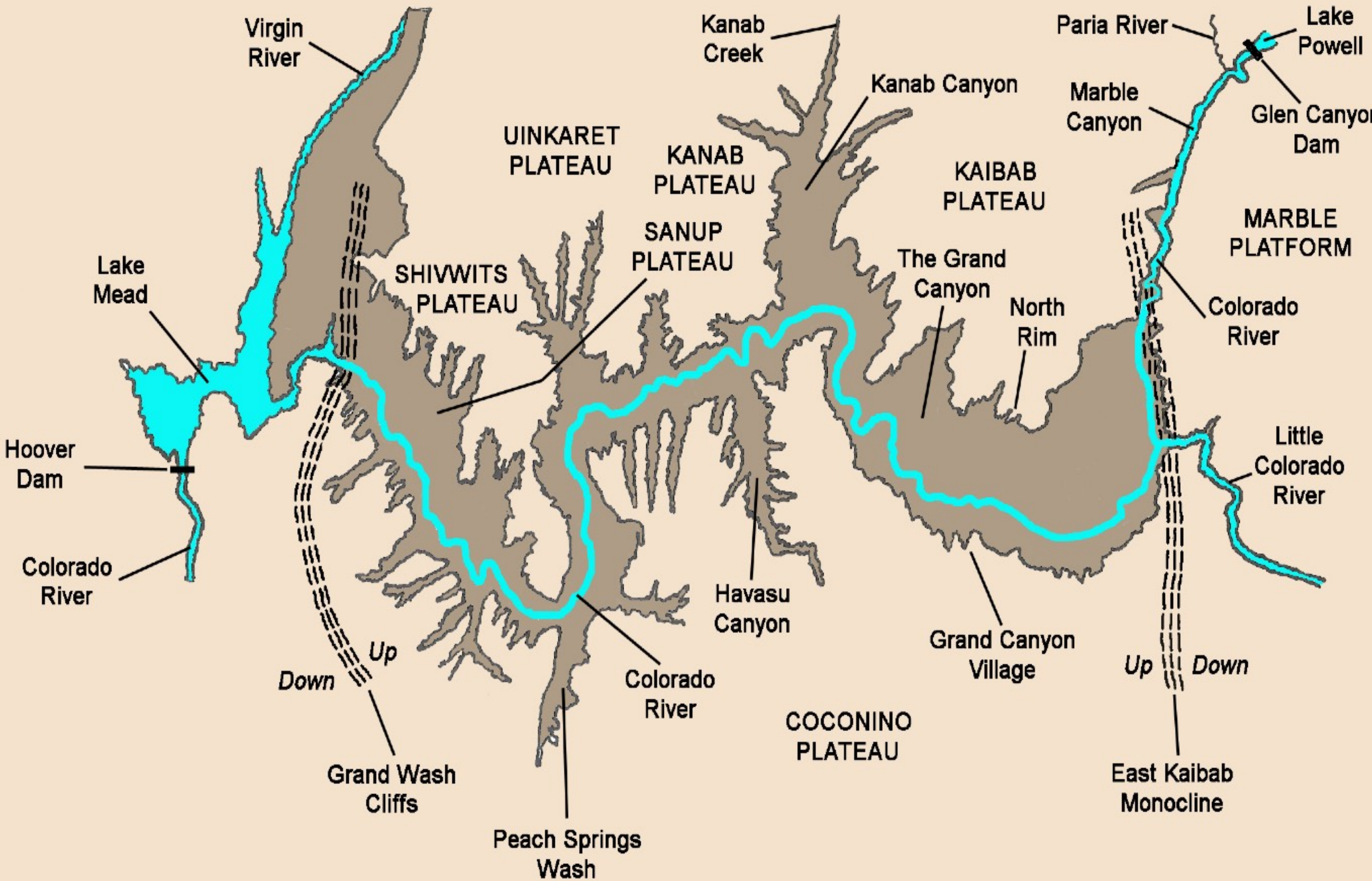
The next two slides are maps. The first gives you a general location of the canyon and regional rivers. Note especially the gray Grand Canyon Plateau. The Grand Canyon is where the Colorado River traverses the Plateau region.

The second map provides details of the Grand Canyon. The Plateau is the region between triple dashed lines with Grand Wash Cliffs on the west and the East Kaibab Monocline on the east.

Other views follow.

COLORADO RIVER

GRAND CANYON REGION



View to the south from Cape Royal, in region where the Canyon is widest.

View east from Toroweap Overlook
where Canyon is narrowest

2. OVERVIEW

The arrow in the last slide points to the Great Unconformity. This is the line between the Phanerozoic and the Precambrian. This is where the Cambrian Explosion of fossils begins. Very soon above this line most animal phyla appear suddenly as expected for the creation model.

The main divisions of the geologic column are represented in the next slide. Note especially the main divisions on the left, including the Paleozoic, Mesozoic, and Cenozoic. Most of the layers in the Grand Canyon are Paleozoic, the Mesozoic and Cenozoic layers are found in regions especially north and east of the Grand Canyon region.

Cross sections of the Grand Canyon Plateau and other general pictures of this wonder follow.

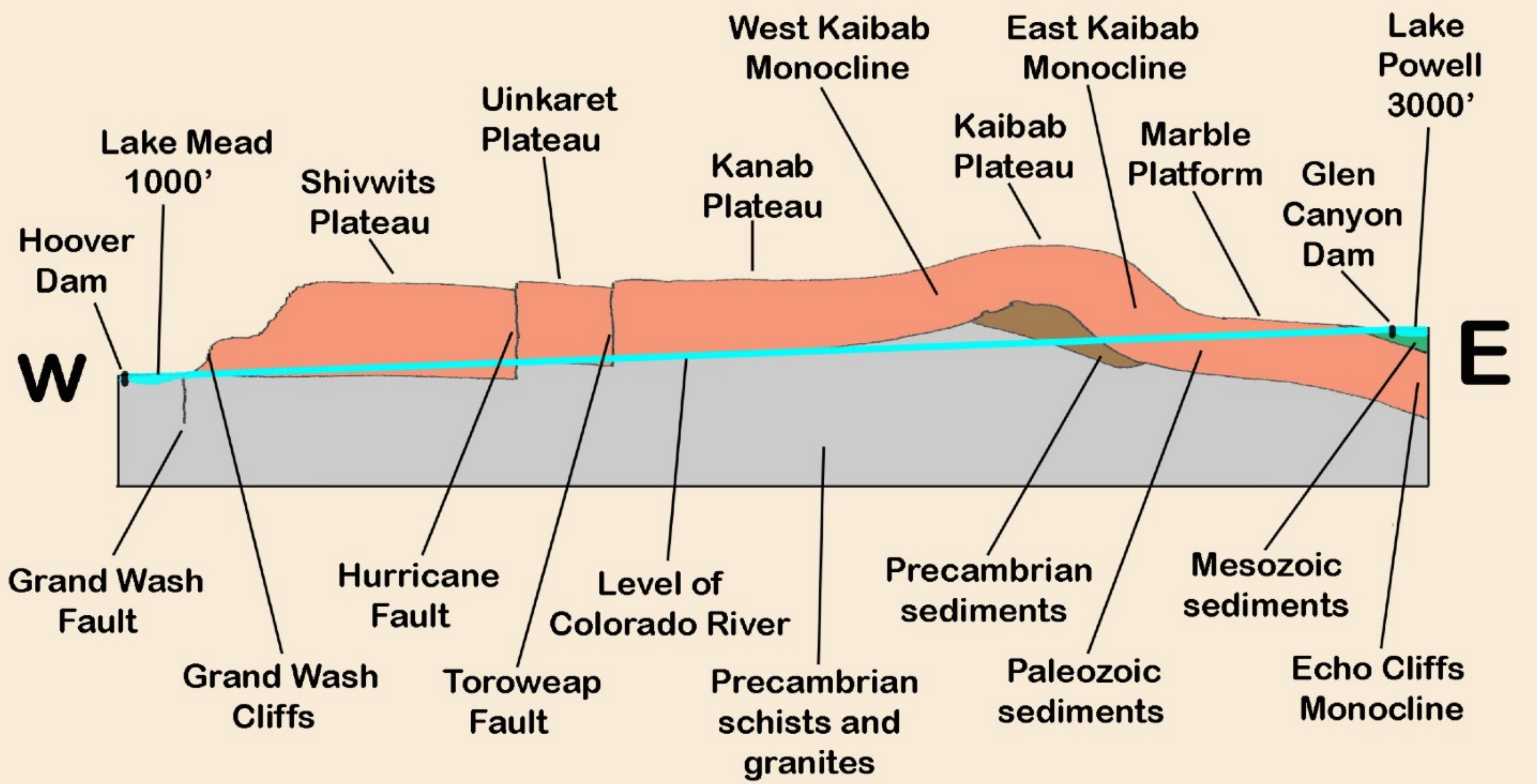
MAIN DIVISIONS OF THE GEOLOGIC COLUMN

EON	ERA	PERIOD	EPOCH	Putative age in Ma*
Phanerozoic	Cenozoic	Quaternary	Holocene	0.01
			Pleistocene	1.6
		Tertiary	Pliocene	5.3
			Miocene	24
			Oligocene	34
			Eocene	55
			Paleocene	65
	Mesozoic	Cretaceous		144
		Jurassic		206
		Triassic		248
	Paleozoic	Permian		290
		Carboniferous		354
		Devonian		417
		Silurian		443
		Ordovician		490
		Cambrian		540
PRECAMBRIAN Proterozoic Eon				2500
Archaean Eon				4600

*Ages given represent beginning of time period in millions of years (Ma).
Dates not endorsed by author.

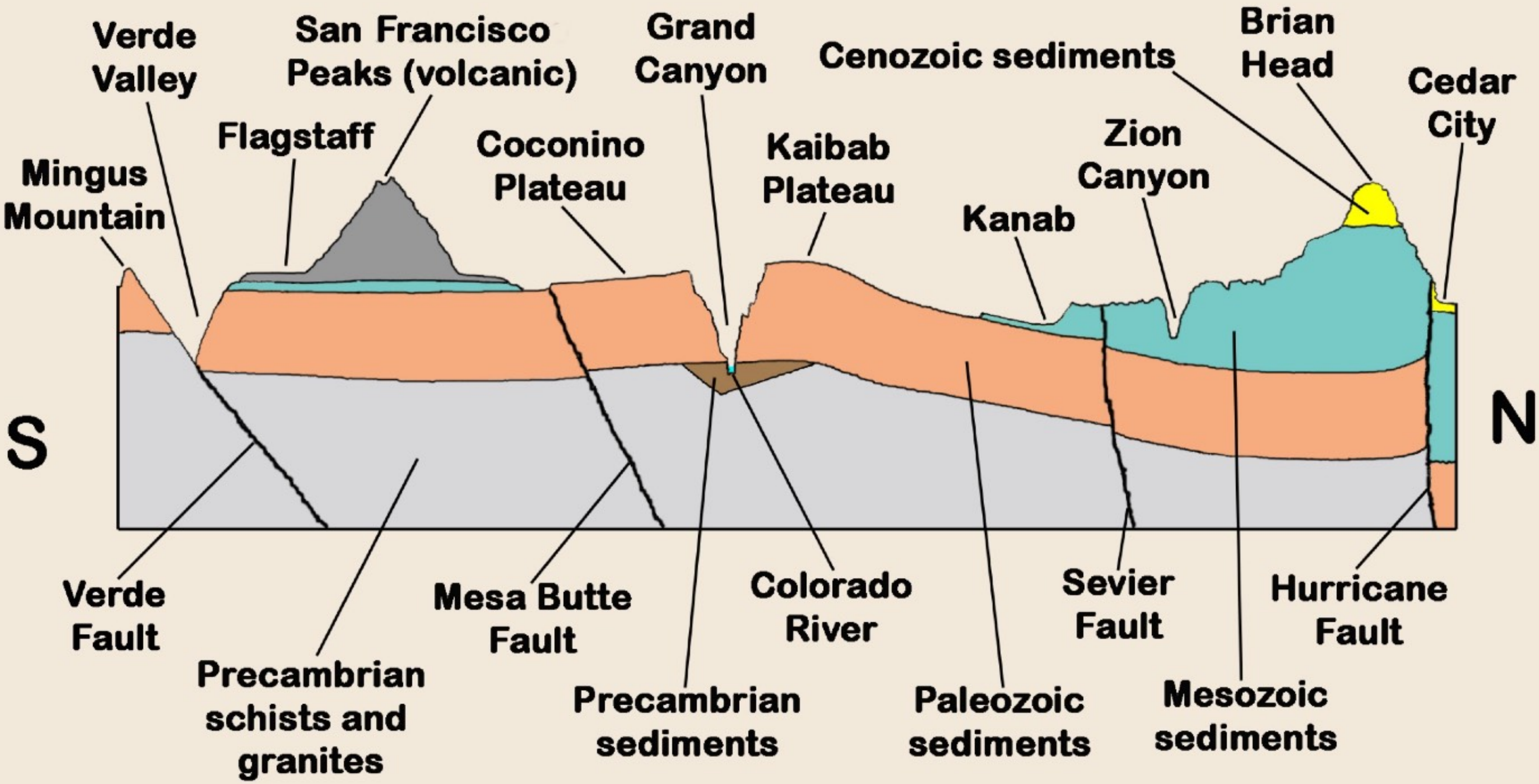
GRAND CANYON

East-West Cross Section. Vertical Exaggeration 18 X



GRAND CANYON REGION

North-South Cross Section. Vertical Exaggeration 15 X



A view from the Colorado River

Rafting through rapids


Deep irregular erosion over time


Precambrian schists (dark) and granites (pink) at Colorado River level

Chuar Butte displays the whole Paleozoic sedimentary sequence


A side canyon

3. INCREDIBLY WIDESPREAD LAYERS

3. WIDESPREAD LAYERS

The layers you see in the Grand Canyon are very widespread. The top formation, the Kaibab, is also found in California, Nevada, Utah, and New Mexico. The Redwall layer that forms the vertical cliff half way up is spread over the top half of Arizona, well beyond the Grand Canyon Plateau.

The layers had to be spread over incredibly flat areas to produce such widespread relatively thin layers of sediment. There is no way you could deposit these widespread flat layers on most of our present irregular continental topography. This represents entirely different depositional conditions than what we find now, and is more like what we would expect from a worldwide Flood.

3. WIDESPREAD LAYERS

One of the pioneer geologists, in a premier reference on the Grand Canyon, expresses the widespread pattern one notices. "The strata of each and every age were remarkably uniform over very large areas, and were deposited very nearly horizontally. …Nowhere have we found thus far what may be called local deposition, or such as are restricted to a narrow belt or contracted area." (Dutton, Clarence E. 1882. Tertiary history of the Grand Canyon district. U.S. Geological Survey Monograph 2:208-209.) While local deposition has been reported since then, local deposition is also expected during most any flood event.

3. WIDESPREAD LAYERS

Geologists group sedimentary layers with similar characteristics into larger units called formations. In the Grand Canyon we have over a dozen formations that are almost all essentially continuous across the whole 160 kilometers of the Plateau. This is illustrated in the next three slides that identify formations.

Note the following qualifiers. The first view is towards the east end; there the label “Supai” is a group of four reddish formations. The Temple Butte formation may take on a channel fill presence at this end, hence identification at a distance is not secure. The occasional Surprise Canyon Formation at the top of the Redwall may not be a valid formation, and is not designated.


Kaibab
Toroweap
Coconino
Hermit
Supai
Redwall
Temple Butte
Muav
Bright Angel
Tapeats
Precambrian
GRAND CANYON: East

3. WIDESPREAD LAYERS

The following slide shows the west end. There some of the Supai formations start to take on more limestone and a different designation. The Grand Wash label indicates a significant dolomite layer and will be referred to later. It is a member of the Muav Formation identified just below.

Note the remarkable lateral continuity of most of the formations that extend across the whole Canyon and their moderate variation in thickness.

The slide after the next is a view just a few miles west of the second and exposes good Tapeats at river level.


Kaibab, Toroweap
Coconino
Hermit
Supai
Redwall
Temple Butte
Grand Wash
Muav
Bright Angel
GRAND CANYON: West


Tapeats

3. WIDESPREAD LAYERS

A challenge to the idea that these layers represent millions of years is the highly varied environments of deposition for the various formations as proposed by most geologists. Can you have plate tectonics movements, and the environmental changes proposed and still maintain such flat formations over such wide areas? For instance note some of the proposed environments for the formations:

Kaibab: Marine shelf

Toroweap: Marine to desert dunes

Coconino: Wind deposited desert dunes

Hermit: River

Esplanade (top of Supai Group): Mainly desert

Rest of Supai: General increase in marine environment as you go down through the group

Layers below Supai: Marine, except Tapeats that also has rivers

The many formations are too flat, too thin, and too widespread to fit the ordinary depositional environments suggested above. In a Flood perspective, they would come from varied sources and would be laid down quite rapidly, one on top of the other, in a broad depositional basin.

3. WIDESPREAD LAYERS

Depositional environments proposed in the geological literature for various formations are subjective and quite often modified. Some are hard to accept. Many suggest that the Hermit is supposed to have been deposited by rivers, but it seems unlikely that rivers would spread a thin layer over 90,000 square kilometers with virtually no topography. The Esplanade, which is the top unit of the Supai group, on which the Hermit rests, lies very flat across the Grand Canyon and beyond indicating little topography for the rivers of the Hermit.

3. WIDESPREAD LAYERS

The thinness of these formations compared to their widespread distribution is striking. Keep in mind that the Supai group, which lies between the Hermit and the Redwall, consists of four formations found across almost all of the Grand Canyon region. These are listed on the next slide.

Even more striking is the prominent cliff-forming Redwall. That formation is divided into four successive units, "and all four can be traced throughout the Grand Canyon and beyond." (Beus SS, Morales M, editors. 2003. Grand Canyon Geology, 2nd ed. Oxford, p 115). It is hard to envision any normal depositional environments that are so flat that you could spread four successive units over 40,000 square kilometers of a Redwall that averages only 200 meters in thickness. The names of the four units are also listed on the next slide. A view of these units in the Canyon follows.

3. WIDESPREAD LAYERS

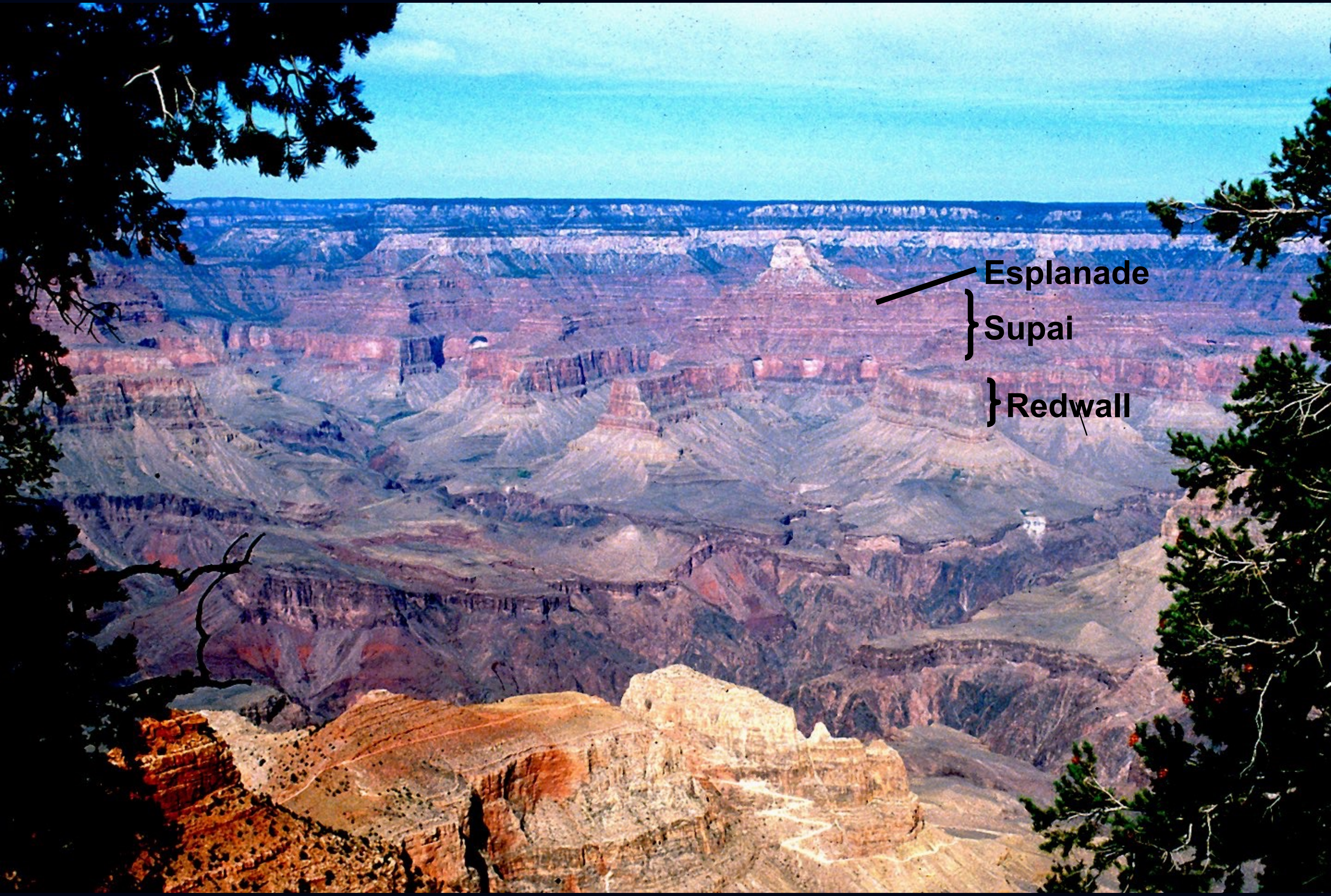
DIVISIONS OF REDWALL AND SUPAI GROUP

SUPAI GROUP FORMATIONS

- Esplanade
- Wescogame
- Manakacha
- Watahomigi
  - Some varied interpretations at the far west end of Grand Canyon.

REDWALL LIMESTONE MEMBERS

- Horseshoe Mesa
- Mooney Falls
- Thunder Springs
- Whitmore Wash


Esplanade
Supai
Redwall

3. WIDESPREAD LAYERS

The quotation below is from a geologist who does not endorse the Flood but recognizes the need for some catastrophic interpretation as the sedimentary record is studied.

"… beds may persist over areas of many hundreds to thousands of square kilometers precisely because they are the record of truly, oversized events."

"The accumulation of the permanent stratigraphic record in many cases involves processes that have not been, or cannot be observed in modern environments. … there are the extreme events … with magnitudes so large and devastating that they have not, and probably could not, be observed scientifically."

"I would also argue that many successions show far more lateral continuity and similarity at a far finer scale than would be anticipated by most geologists." Brett, Carlton E. 2000. A slice of the "Layer Cake": The paradox of "Frosting Continuity." PALAIOS 15:495-498.

3. WIDESPREAD LAYERS
THE TONTO GROUP

The three lowest Phanerozoic formations of the Grand Canyon are all Cambrian and collectively are called the Tonto Group.

They are found in the following vertical order as seen in the next slide:

Muav Limestone
Bright Angel Shale
Tapeats Sandstone


Muav
Bright Angel
Tapeats
The Tonto Group

3. WIDESPREAD LAYERS

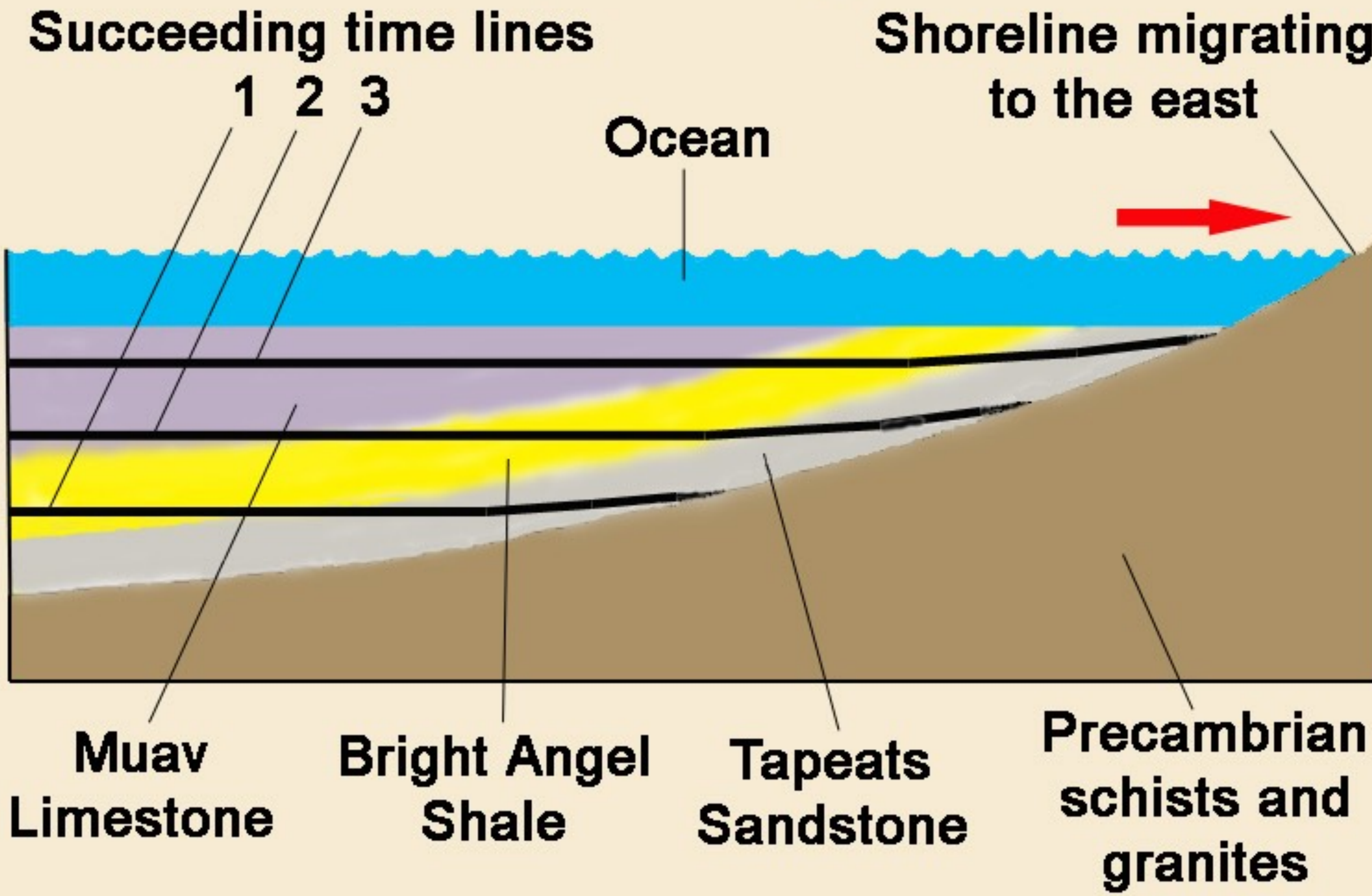
THE TONTO GROUP

Geologists usually consider that these three formations of the Tonto Group have been laid down together in a time transgressive pattern as the sea encroached across the area from west to east. In this migration, the Tapeats represents coarse sediments at the shoreline, the Bright Angel finer sediments a little deeper and further out from shore, and the Muav as limestone still further out. But that order is the reverse of their present relationship

The proposed process of time transgression is illustrated in the next slide. Follow the time lines (1, 2, 3) and note how the originally higher Tapeats at the shoreline ends up at the lowest level as it is later covered with Bright Angel and Muav as rising levels deposition proceed to the east. The Tonto Group is a classic geologic example of time transgression, where parts of apparently continuous horizontal layers, are considered to be of different age.

TIME TRANSGRESSIVE DEPOSITION

(Tonto Group)



3. WIDESPREAD LAYERS

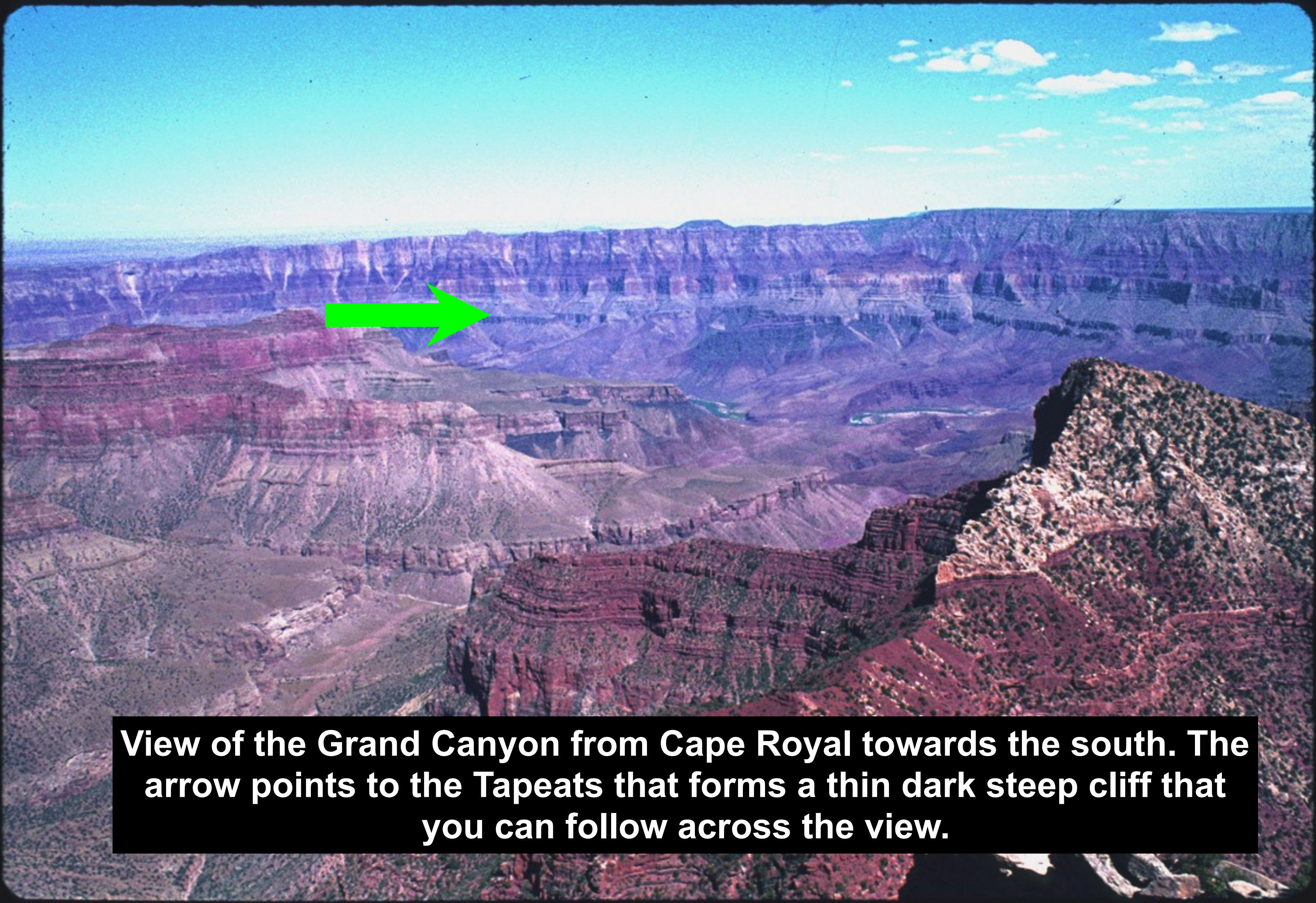
THE TONTO GROUP

It is difficult to imagine that for an area of 40,000 square kilometers across the Grand Canyon and beyond, and during many millions of years, the migrating transgressive shoreline conditions for the deposition of the three members of the Tonto Group remained so constant that the three formations maintained separate identity. It is true that the contact between the three formations is not very sharp and there is some overlap, but just one major storm, earthquake or hurricane would be expected to send lots of Tapeats sediments well onto Bright Angel territory, etc. Also it is difficult to imagine that the time transgressive conditions, that had to keep rising to facilitat the effective reversal of the order of the three formations, were so constant over such a wide area. Time transgression for the Tonto Group would be an extremely consistent pattern of sedimentation over the millions of years.

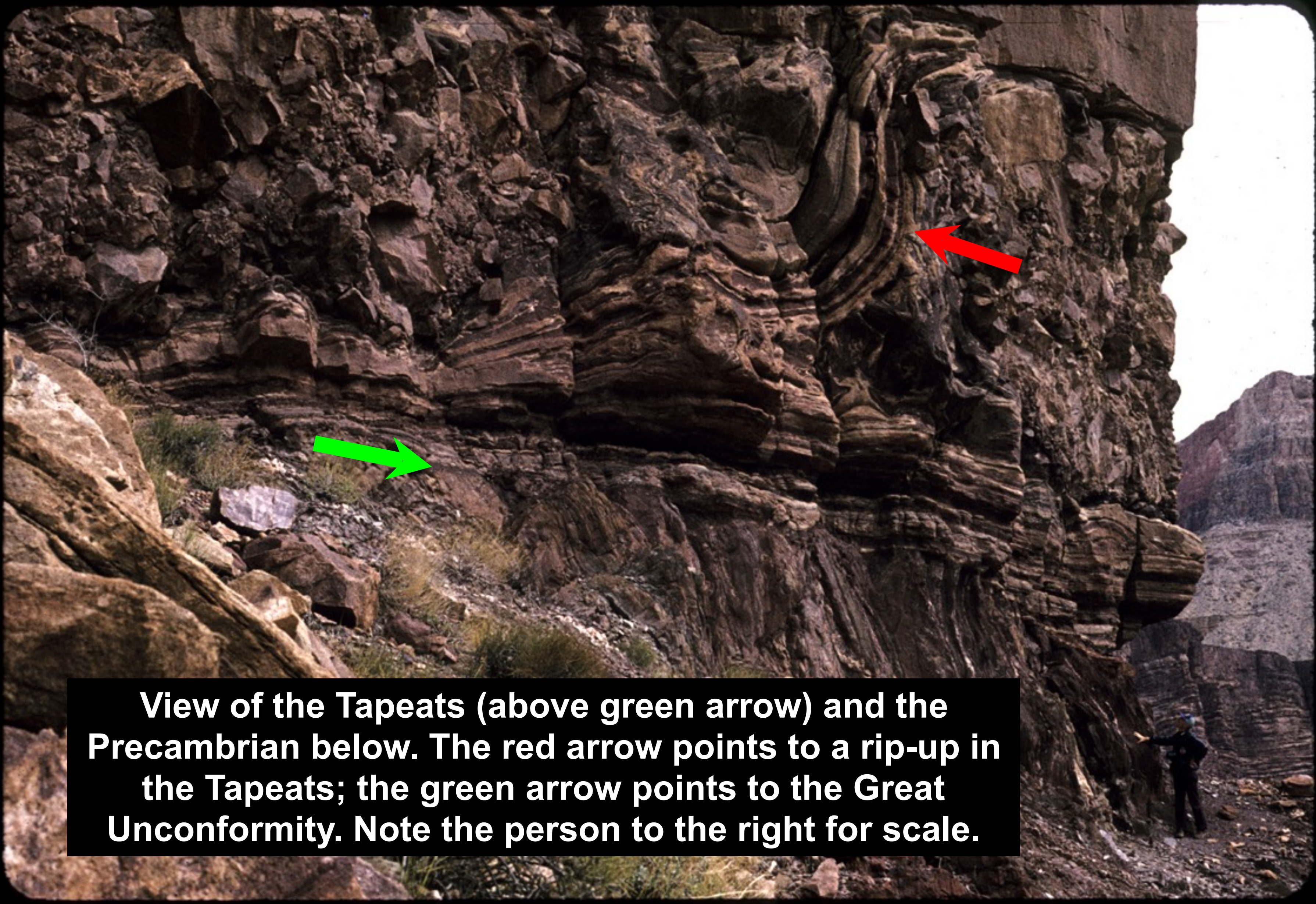
3. WIDESPREAD LAYERS

THE TONTO GROUP

It would seem more likely that one formation was laid down on top of another as different sources of sediment were spread over the area, thus facilitating the unique identity of the three formations. For further discussion see Kennedy EG, Kablanow R, Chadwick AV. 1996. A reassessment of the shallow water depositional model for the Tapeats Sandstone, Grand Canyon, Arizona: Evidence for deep water deposition. GSA Abstracts With Programs 28, No. 7, A-407. The next slide illustrates the incredibly widespread thin Tapeats that spreads over the whole Grand Canyon and beyond. The following slide illustrates some catastrophic activity in the Tapeats. Both of these features favor a more catastrophic model than time transgression.



View of the Grand Canyon from Cape Royal towards the south. The arrow points to the Tapeats that forms a thin dark steep cliff that you can follow across the view.



View of the Tapeats (above green arrow) and the Precambrian below. The red arrow points to a rip-up in the Tapeats; the green arrow points to the Great Unconformity. Note the person to the right for scale.

3. WIDESPREAD LAYERS
KEY BEDS IN THE MUAV

The most comprehensive reference on the Tonto Group is: McKee ED, Resser CE. 1945. Cambrian History of the Grand Canyon Region. Carnegie Institution of Washington Publication 563. On pages 24-28, 69, these authors suggest many long age interpretations and do not endorse a Flood model. They do describe 17 widespread horizontal key markers in the Muav, all but one spreading 30-95 miles. Such incredibly widespread distribution would seem to fit better with more rapid catastrophic Flood activity than either time transgression or the usual irregular topography we find at our present continental shorelines. Two quotations from these authors follow.

3. WIDESPREAD LAYERS
KEY BEDS IN THE MUAV

"One intraformational conglomerate zone that serves as a good key bed lies between the Havasu and Gateway Canyon members throughout most of central Grand Canyon. It is found in this stratigraphic position at Havasu Canyon, Gateway Canyon, Toroweap, Granite Park, and Diamond Creek. In all these localities it is associated with thin bedded limestones which contain abundant fragments of small *Solenopleurella porecata* [a clam]. The conglomerate layers are only a few inches thick but form a zone of several feet. The maximum lateral extent of this zone is 55 miles."

Another comment:

"It is a fine, evengrained, reddish or gray sandstone, only a few feet thick, which extends from Grand Wash Cliffs eastward at least 35 miles to the vicinity of Granite Park."

4. KARST IN THE REDWALL

4. KARST IN THE REDWALL

An argument proposed against a Flood model for the deposition of the layers of the Grand Canyon is the presence of an irregular karst topography at the top of the Redwall. Karst is the term used for the irregular erosion common on the surface of weathered limestone layers. The Redwall is a limestone formation and is easily eroded, as occurs now in limestone layers over the world. The argument is that since it takes years for a karst topography to develop, the layers of the Grand Canyon could not have formed during the year of the Flood.

4. KARST IN THE REDWALL

The top of the Redwall is sometines irregular. Channels (Surprise Canyon Formation) are reported, but one expects channels during a Flood. However, there are other irregularities, and the question arises as to when they were formed. These could be from long exposure over many years as advocated for the long ages model, or they could have formed later underground after all the layers were laid down, as expected for the Flood model. Many limestone caves and collapses onto caves over the world testify to the abundance of that phenomenon.

4. KARST IN THE REDWALL

The two contrasting models are illustrated in the next slide.

LONG-TIME MODEL

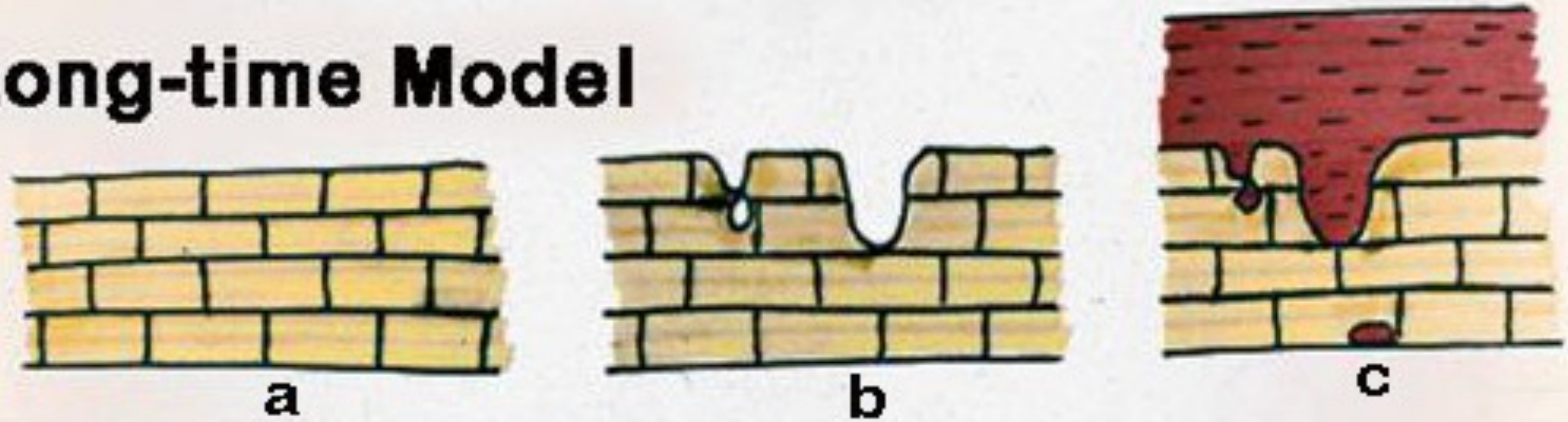
In a, the tan Redwall Limestone is laid down. This is followed by a long period of exposure and a karst topography develops by solution of the limestone as shown in b. After that, the karst is covered up by sediments forming the red Watahomigi of the Supai group. Sediments are usually laid down in flat horizontal layers as shown in c.

SHORT-TIME MODEL

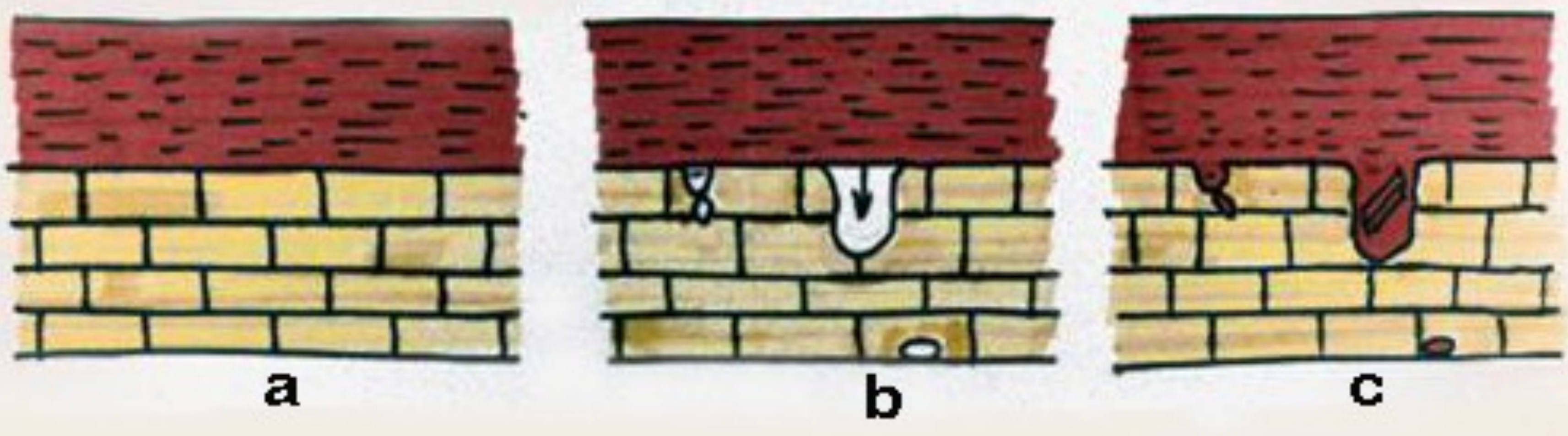
In a, the Redwall and Watahomigi are laid down rapidly with no significant time interval between. Much later, water dissolves cavities in the Redwall as commonly occurs in limestone, b. Later when the Watahomigi collapses into these cavities, upset layers, and not flat horizontal layers, are expected as shown in c.

KARST IN THE REDWALL?

Long-time Model



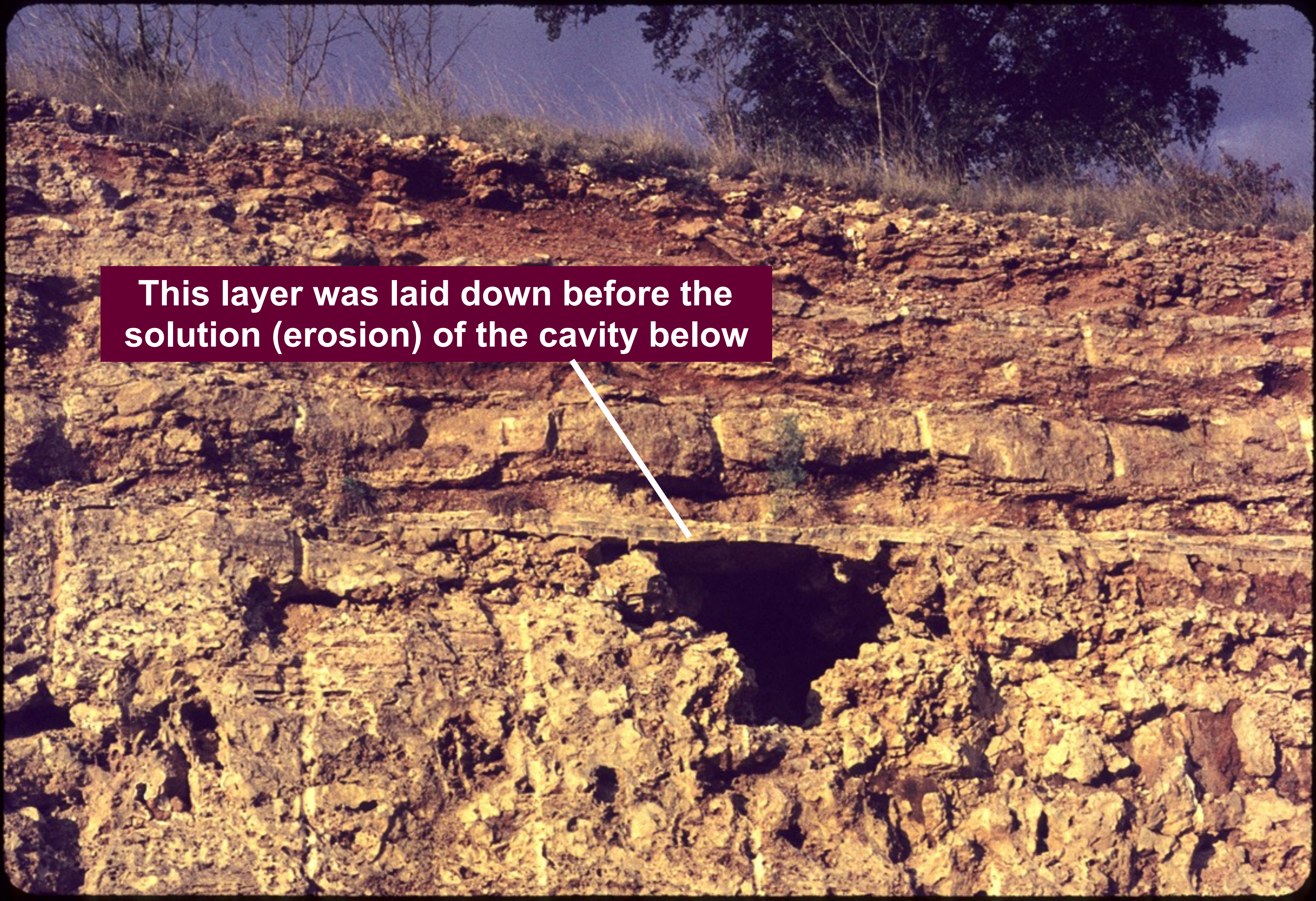
Short-time Model



4. KARST IN THE REDWALL

The next slide illustrates underground limestone solution (Edwards Formation, Texas).

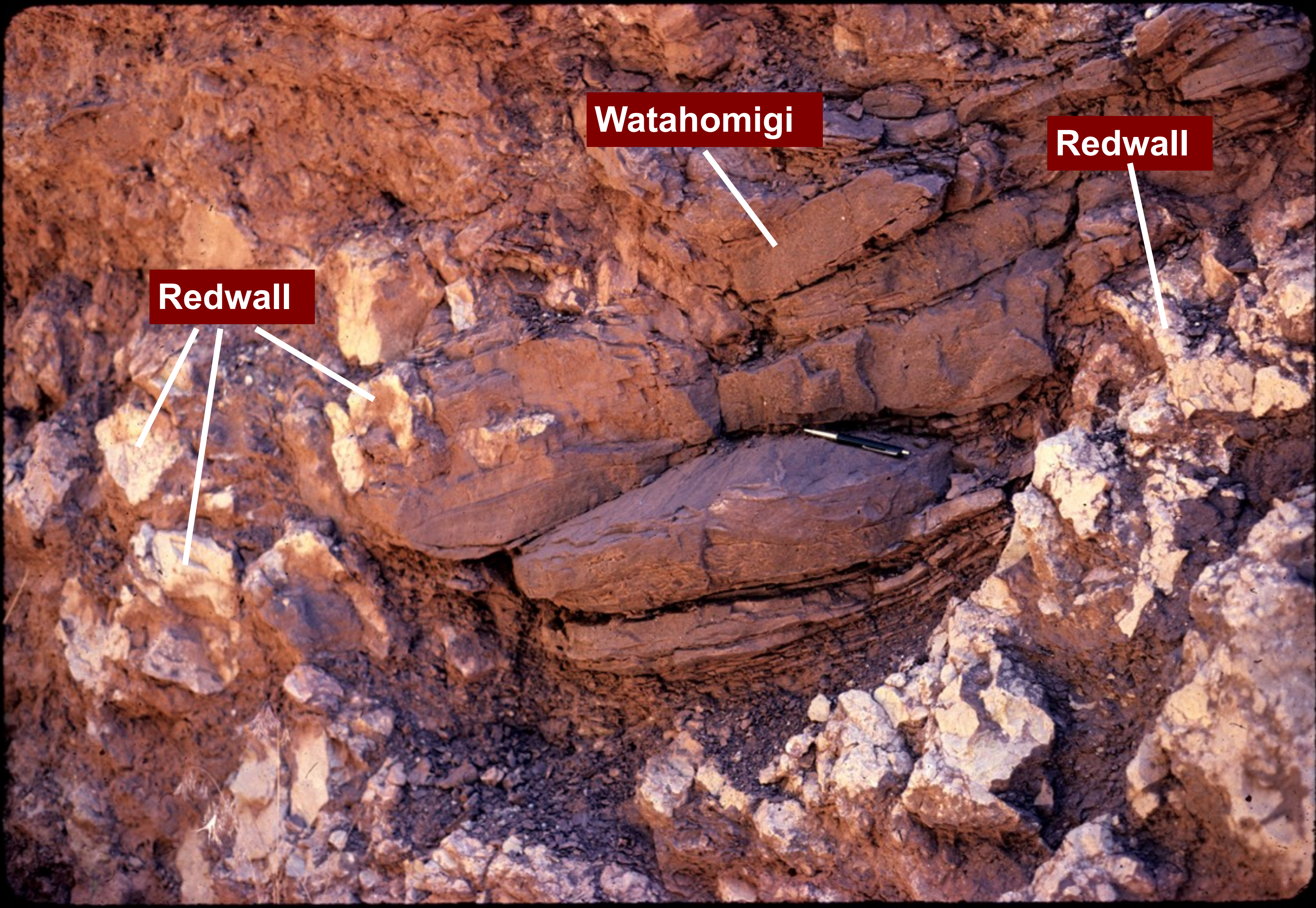
The black cavity obviously was formed after the layers were laid down. If it had formed before, the flat layer that forms the roof of the cavity would not have been laid down horizontally across. Hence, a long time for solution of the cavity before the flat layers above were laid down does not seem feasible. This is not karst topography, and illustrates clues that can be used to detect timing for post depositional solution.


This layer was laid down before the solution (erosion) of the cavity below

4. KARST IN THE REDWALL

Along the North Kaibab Trail of the Grand Canyon and very close to the top of the Redwall a collapse of Watahomigi into a cavity of the Redwall seems evident. The layers of Watahomigi are at an angle and some appear to have been soft enough to have incorporated some Redwall blocks when formed or as the crash proceeded. The Watahomigi layers would have been formed before the collapse cavity developed. This is as would be expected for the short time model, where internal solution of the Redwall occurred sometime later. This is not what would be expected for a karst model.

The feature is shown in the next slide. Note the pen for scale.



Watahomigi
Redwall
Redwall

4. KARST IN THE REDWALL

I do not know of any study that approaches the karst question in the Gand Canyon from the perspective of the two models being considered here. However further north in a similar situation at the same locality in the geologic column, a geologist has studied a proposed karst interpretation and disagrees with it. He concludes:

"In my opinion, the late Mississippian karst story in the Rocky Mountains is completely fallacious." Bridges LW Dan. 1982. Rocky Mountain Laramide-Tertiary subsurface solution vs. Paleozoic karst in Mississippian Carbonates. Thirty-Third annual Field Conference. Wyoming Geological Association Guidebook, p 264.

4. KARST IN THE REDWALL

ANCIENT RIVER CHANNELS IN THE GRAND CANYON

Some suggest that river channels found in the Grand Canyon negate a Genesis Flood model (Hill C. 2009. Flood Geology and the Grand Canyon: a critique. Perspectives on Science and Christian Faith 61:Source Issue 2. Moshier S, Hill C. 2016. The Grand Canyon Monument to an Ancient Earth, p 103.) Channels in the top of the Muav (Temple Butte Formation) and Redwall (Surprise Canyon Formation) are examples. Such suggestions tend to ignore the expectations of channel carving for Flood models.

4. KARST IN THE REDWALL

ANCIENT RIVER CHANNELS IN THE GRAND CANYON

The argument does not seem valid because rapid channeling and filling of channels is what is expected during widespread Flood activity. Different source areas for sediments filling channels would be facilitated as tectonic activity and patterns of flow of flood waters and runoff varied. Indeed some of these channels have fossils from both land and marine sources.

On the other hand, the suggestions of slow channeling especially ignores the very deep erosion expected over the proposed long geological ages at the time gaps (missing layers) just above the Muav, Hermit, and within the Supai (Manakacha). This will be considered a little later below.

5. COCONINO SANDSTONE AND RELATED FEATURES

Grand Canyon, view to north. The arrow points to the Coconino

5. COCONINO SANDSTONE

There are several features of the Coconino Sandstone that are of interest to the Flood versus long ages controversy:

a. Incomplete ecology of the fossil assemblage

b. A proposed desert environment

c. Cracks in the Hermit Formation that lies just below are filled with Coconino

5. COCONINO SANDSTONE

a. Incomplete ecology of the fossil assemblage

Many hundreds of track ways of various organisms, mostly all climbing uphill, are found especially in the lower half of the Coconino. They may have been climbing uphill as they were escaping the rising waters of the Flood. We don't know what kind of animals laid down these tracks since their body fossils have not been found. Even more peculiar is the fact that, at least to date, no plant fossils have been found in the Coconino. No food for the animals! Some argue that sand does not preserve fossils, but that seems to be an invalid suggestions since even just small tracks are well preserved. What did the animals eat over the millions of years proposed for Coconino time. Water is a great sorting agent, and an explanation for the Coconino is that the animals and plants were washed away by the great Flood. For further discussion see: Roth AA. 1998. Origins: Linking Science and Scripture. Review and Herald Publishing Association, p 219-222.

COCONINO SANDSTONE

b. A proposed desert environment

The Coconino is usually interpreted as ancient sand dunes in a dry environment. This view is not what one would expect from a Flood. However, as mentioned above, there is a great abundance of animal track ways, and tracks do not preserve fine details in dry sand. Experiments with animals on wet sand shows that the tracks in the Coconino were more likely produced under wet conditions than dry ones.

The next slide shows three tracks in the Coconino. Note details of toe marks and soft deformation of the sand.

For more details see: Brand LR, Tang T. 1991. Fossil vertebrate footprints in the Coconino Sandstone (Permian) of Northern Arizona: evidence for underwater origin. Geology 20:668-670.

Tracks in the Coconino. Note the toe marks and the bulge to the left.

5. COCONINO SANDSTONE

c. Cracks in the Hermit Formation that lies just below the Coconino Sandstone are filled with Coconino.

These cracks are found at this contact especially near major faults, some as deep as 7 meters. The cracks pose a problem for those who believe in long ages, because according to the standard geologic time scale, there is a gap of 6 million years of missing sediments between the Coconino and the Hermit. How could the cracks in the Hermit remain open for millions of years waiting for the Coconino? Wind and rain would quickly fill them with sediments.

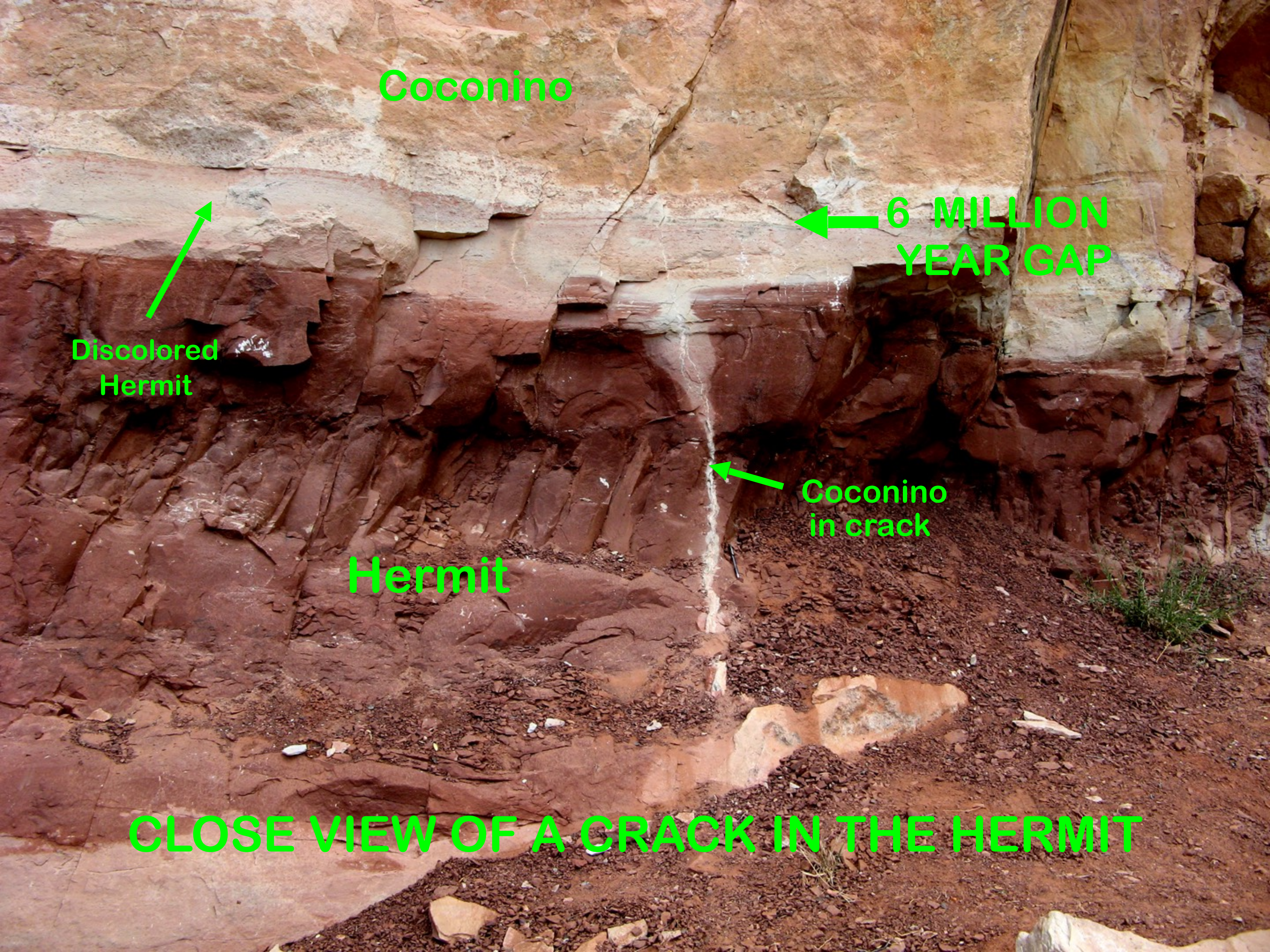
5. COCONINO SANDSTONE

c. Cracks in the Hermit Formation that lies just below the Coconino Sandstone are filled with Coconino.

Those who believe in the Flood think both layers were laid down rapidly during the Flood and were at first soft. Some suggest the Coconino was injected into the soft Hermit (Whitmore JH, Strom R. 2010. Sand injectites at the base of the Coconino Sandstone, Grand Canyon, Arizona (USA). Sedimentary Geology 230:46-59). Some shrinkage by syneresis, i.e. the ejection of water from colloidal clays, may have contributed to crack formation.

The next two slides illustrate some of the cracks.


Red arrows point to cracks in the Hermit
filled with overlying Coconino


Coconino
6 MILLION YEAR GAP
Discolored Hermit
Coconino in crack
Hermit
CLOSE VIEW OF A CRACK IN THE HERMIT

5.COCONINO SANDSTONE

c. Cracks in the Hermit Formation

The next slide summarizes the two contrasting models.

LONG GEOLOGIC AGES MODEL

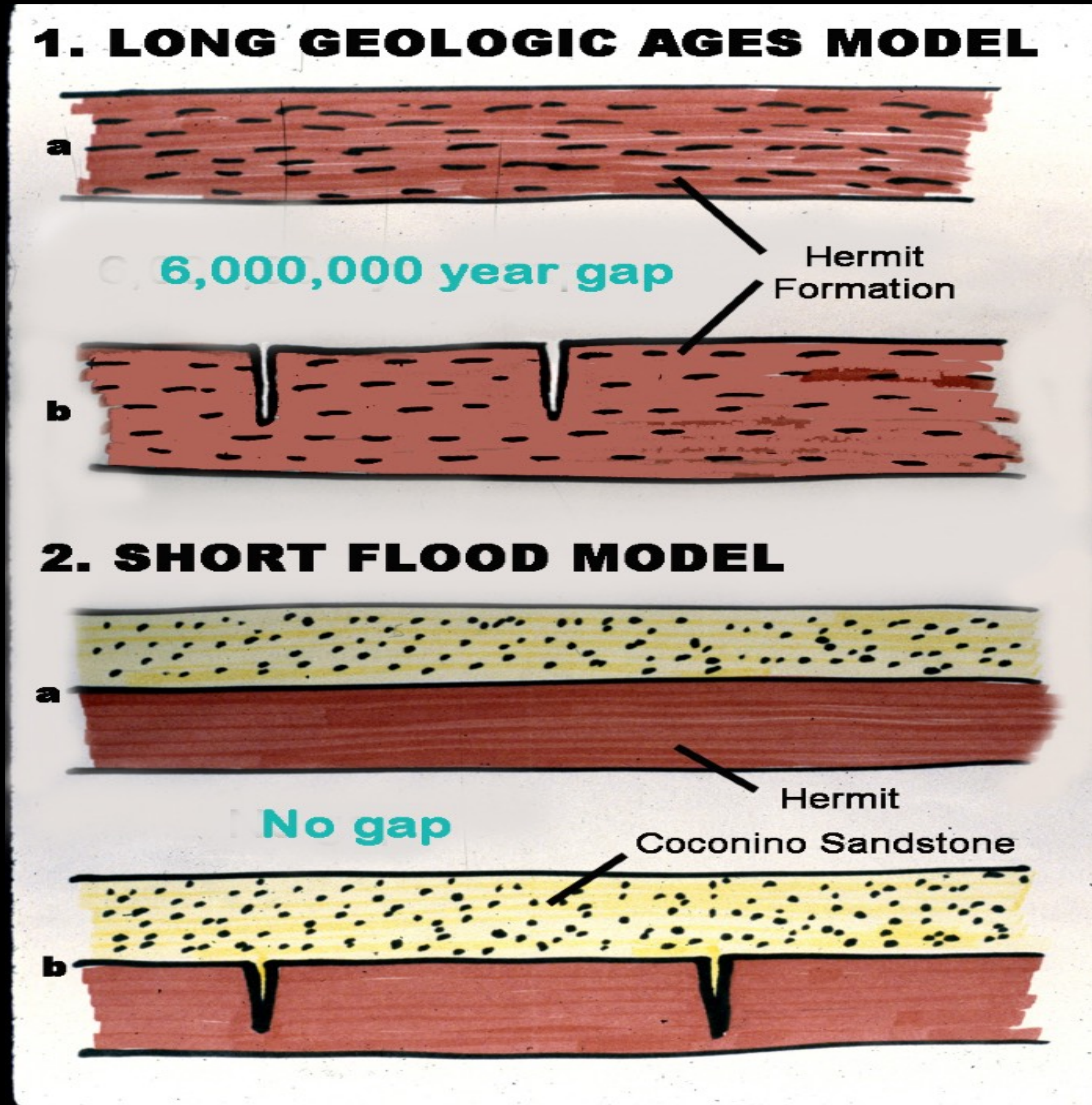
a. Hermit is laid down

b. There is a 6 million year period when nothing is deposited. This will be discussed in the next section. Because of this, desiccation cracks formed due to drying and hardening of the Hermit, would have to remain open for millions of years, waiting for the Coconino sediments to fill the cracks. This seems extremely unlikely!

SHORT FLOOD MODEL

a. Both the red Hermit and the tan Coconino are laid down during the Flood and are wet and soft.

b. Soon after deposition, the cracks are formed in the Hermit by injection of Coconino or possibly by shrinking from underwater syneresis, and the Coconino flows down into the Hermit. Whatever the process, this short-time model seems more plausible.


1. LONG GEOLOGIC AGES MODEL
a
6,000,000 year gap
Hermit
Formation
b
2. SHORT FLOOD MODEL
a
Hermit
No gap
Coconino Sandstone
b

6. FLAT GAPS

(PARACONFORMITIES)

6. FLAT GAPS: PARACONFORMITIES

Paraconformities are gaps found between the sedimentary layers of the earth that are assumed, according to the standard geologic time scale, to represent a considerable amount of time. Furthermore at a paraconformity, the layers just above and below the gap are flat and parallel. Hence, these can be called flat gaps or flat time gaps. You can tell that you have a paraconformity because in other regions of the earth, you can find the missing parts (layers) of the geologic column with their special fossils. These missing layers are assumed to have taken a long time to be deposited and their fossils are assumed to have taken a long time to evolve, and that long time determines the amount of assumed time at the gap where the layers are missing.

6. FLAT GAPS: PARACONFORMITIES

At these flat gaps (paraconformities) you would expect a great deal of irregular erosion over the millions of years of assumed time for the gaps, yet the contacts are usually very flat with little evidence of erosion of the underlayer of the paraconformity contact. Over the long ages, these surfaces are assumed to have been elevated, hence no depositon, but they should be eroded. This lack of erosion indicates that the long time proposed for the gap (paraconformity), and consequently the long geologic ages, never occurred.

6. FLAT GAPS: PARACONFORMITIES

The next two slides illustrate a paraconformiy in the Grand Canyon.

The first slide designates three formations found 100 kilometers south of the Grand Canyon in Sedona, AZ. The middle formation, called Schnebly Hill, is assumed to have taken some 6 million years to be deposited.

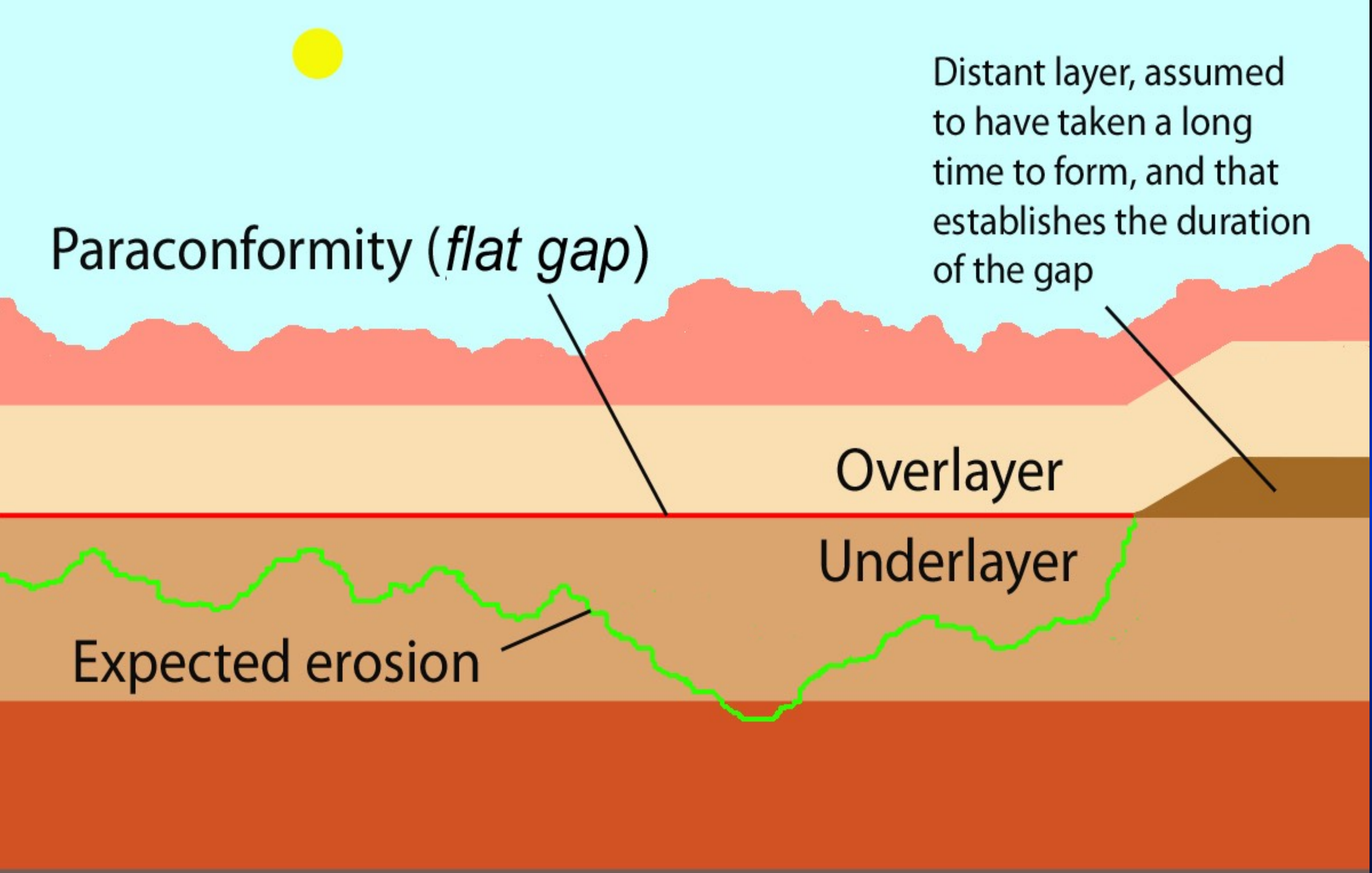
The second slide shows the formations at the Grand Canyon and there the Schnebly Hill is missing between the Coconino and the Hermit. Hence there is a gap of 6 million years (Ma) between the top of the Hermit and the bottom of the Coconino. Also the contact between is very flat, hence the time gap qualifies as a paraconformity (i.e. flat gap) or what is sometimes also called a disconformity.

View to the northwest from Sedona, Arizona

Grand Canyon, Arizona. The arrow points to an assumed 6 million year paraconformity. The Schnebly Hill Formation is missing here.

6. FLAT GAPS: PARACONFORMITIES

The next slide also illustrates a paraconformity (flat gap). It is the red line between the underlayer and the overlayer. The brown layer at the right is between part of the layers, and the time suggested for its deposition determines the time between the underlayer and the overlayer, i.e. where the brown layer is missing. For instance, if the brown layer is assumed to have taken 10 million years to be deposited, then the gap is assumed to have lasted for 10 million years. The green line suggests erosion expected if there was a lot of time at the gap.



CROSS SECTION THROUGH GEOLOGIC LAYERS SHOWING A PARACONFORMITY

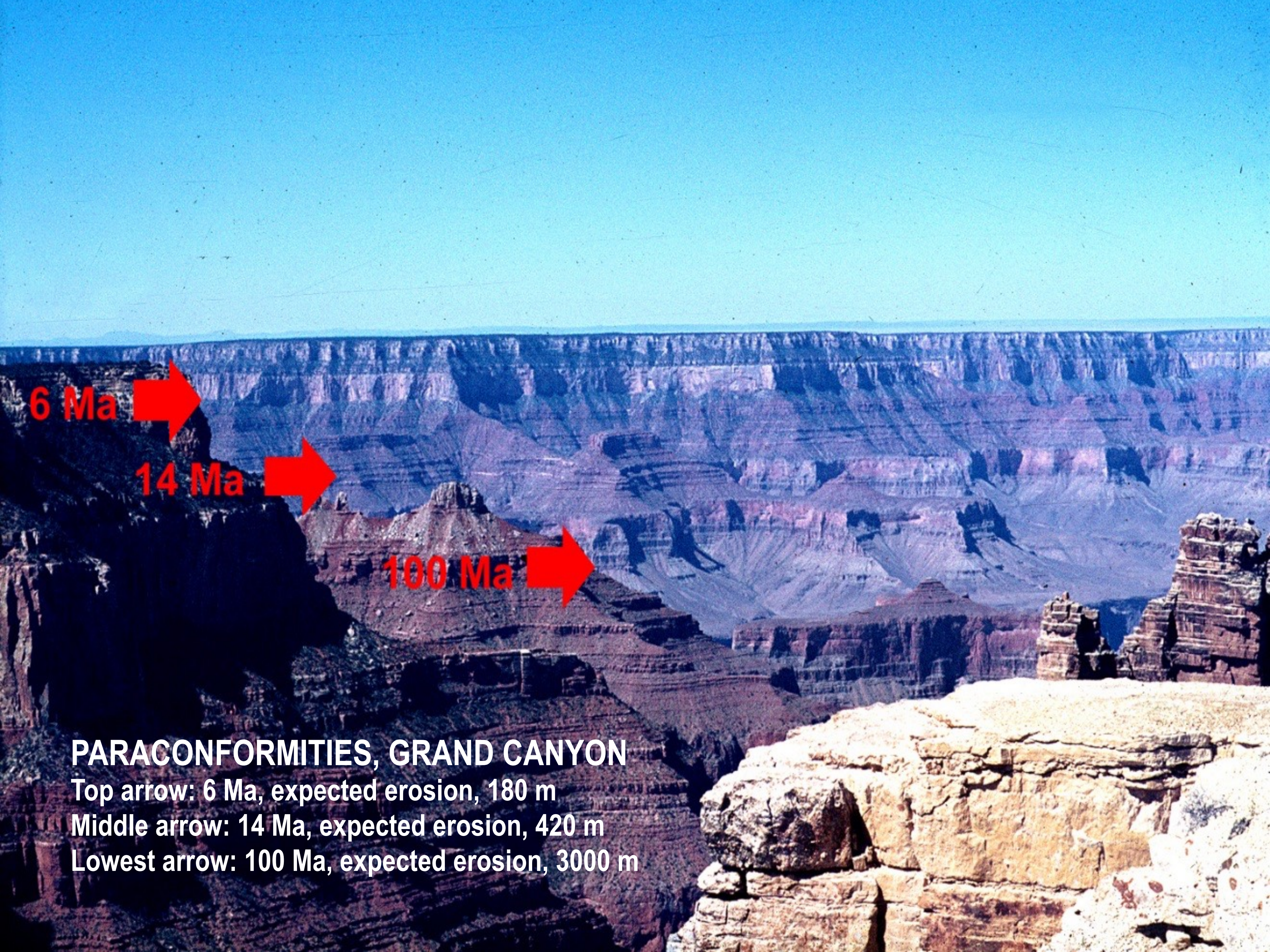
6. FLAT GAPS: PARACONFORMITIES

One can estimate how much erosion one might expect at these gaps based on average rates of erosion for the earth's continents. The average of 12 studies indicates lowering at a rate of 61 m/million years (For details and references see Roth AA. 1998. Origins: Linking Science and Scriptures. Review and Herald, p 263-267). This rate of erosion is so fast that our present continents could have been eroded over 100 times during their assumed billons of years of geologic age, even when corrected for the enhancing erosion effects of agriculture. However when you look at the extended time gaps of paraconformities, the contacts are usually inconspicuous and flat, while erosion is usually irregular, thus indicating that little time has elapsed.

Paraconformities suggest that there has been little time for the deposition of the geologic layers, as would be expected for the catastrophic Genesis Flood.

6. FLAT GAPS: PARACONFORMITIES

In the following slide of the Grand Canyon in Arizona, the top arrow points to an assumed gap of 6 million years (6 Ma). There we would expect an average of some 180 meters (590 feet) of erosion (corrected for agricultural effects by 0.5) over that time, but the contact between the underlayer and overlayer (arrow) is very flat. The next arrow points to a gap of 14 million years with an expected average erosion of 420 meters (1400 feet). At the lowest arrow, the Ordovician, Silurian and part of the Devonian geologic periods are missing, representing a 100 million year gap, and an expected 3000 meters (10,000 feet) of erosion, which is twice the depth of the Grand Canyon itself! Yet the contacts are essentially flat, showing very little erosion and time. There are also other shorter gaps in the Grand Canyon.


6 Ma
14 Ma
100 Ma
PARACONFORMITIES, GRAND CANYON
Top arrow: 6 Ma, expected erosion, 180 m
Middle arrow: 14 Ma, expected erosion, 420 m
Lowest arrow: 100 Ma, expected erosion, 3000 m

6. FLAT GAPS: PARACONFORMITIES

The fact that these gaps are not always easy to locate further substantiates the challenge to the long time proposed for them. Lots of erosion and weathering should be evident at these gaps. Two of the top leading geologists of the Grand Canyon comment on the difficulty of sometimes finding them.

"Contrary to the implications of McKee's work, the location of the boundary between the Manakacha and Wescogame formations [where the 14 Ma gap is] can be difficult to determine, both from a distance and from close range." Blakey RC. 2003. Supai Group and Hermit Formation. In: Beus SS, Morales M. Grand Canyon Geology, 2nd edition. New York: Oxford University Press, and the Museum of Northern Arizona Press, p 145.

6. FLAT GAPS: PARACONFORMITIES

"In parts of the Grand Canyon, including the type section on Temple Butte (where the channels are absent), the Cambrian-Devonian strata appear in local exposures to be without angular discordance, and the contact is planar with gray dolomite beds below and above. Here, the unconformity [gap], even though representing more than 100 million years may be difficult to locate." Beus SS. 2003. Temple Butte Formation. In Beus SS, Morales M, editors. Grand Canyon Geology, 2nd edition. Oxford University Press, p 110.

6. FLAT GAPS: PARACONFORMITIES

It needs to be kept in perspective that in the eastern Grand Canyon the Devonian Temple Butte Formation is sometimes represented only by channels, it becomes continuous further east and west. Channels of Temple Butte that may reach 30 meters in depth have been reported over the Grand Canyon region, and there the contact with the Cambrian Muav on which it rests is not flat. In the context of a Flood model, channeling is expected since it is common to flood activity. In the context of long geological ages, a 30 meter channel only represents 1% of the average depth of erosion expected during a 100 Ma gap, and where there is no Devonian, you have a 150 Ma gap to contend with.

6. FLAT GAPS: PARACONFORMITIES

These flat gaps (paraconformities) can be very widespread. The next slide is of the same 100 Ma gap mentioned above, but found near the western edge of the Grand Canyon, 150 kilometers from the previous locality. The gap here, as for earlier, is at the top of the Muav Formation, and is identifiable as the top of a lighter gray layer seen across the landscape. That light grey bed, called the Grand Wash Dolomite, is also Cambrian in age. Immediately over it is the slightly darker gray thin bedded Temple Butte Formation that is Devonian in age. While the Ordovician, Silurian, and part of the Devonian are missing between these two units, you can see the contact as remarkably flat across the view.

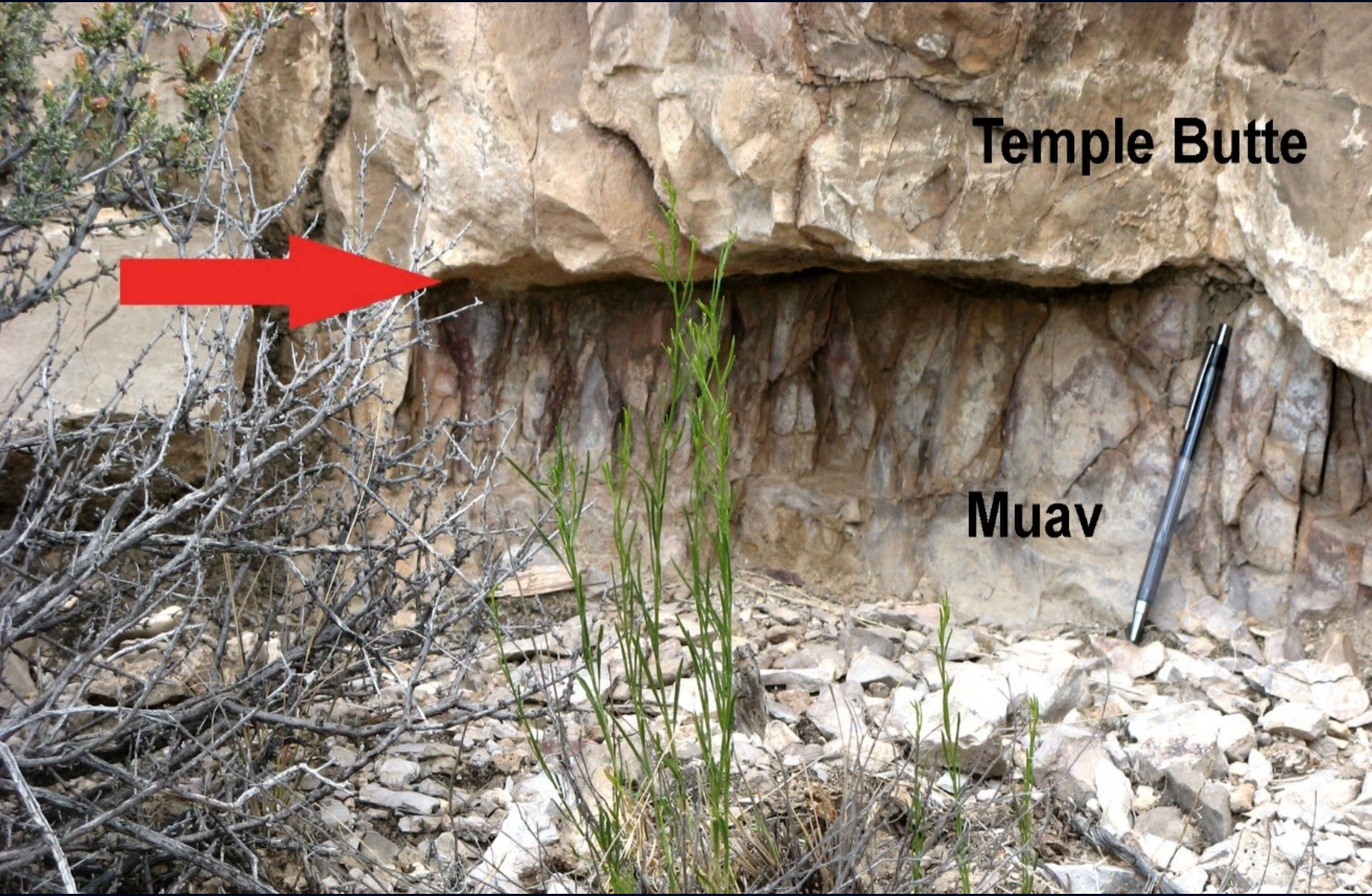
The slide following the next one points to a closer view in the region of the same gap. The Grand Wash Dolomite is a slightly lighter gray than the overlying Temple Butte Formation.


100 Ma
Western region of Grand Canyon


100 Ma

6. FLAT GAPS: PARACONFORMITIES

The next slide is a real close up of the contact. Note the arrow that points to the 100 Ma gap and the pen for scale. The gap does not seem to reflect the ravages of weathering and three kilometers of erosion as expected during 100 Ma of exposure as implied from the standard geologic time scale!


Temple Butte
Muav

6. FLAT GAPS: PARACONFORMITIES

The difficulty with these extended “flat time gaps” for the long geologic ages is that you cannot have deposition of sediments, or there would be no gap; and if you had erosion over the long times postulated the contacts would be highly irregular, sometimes resulting in erosion even deeper than the Grand Canyon itself! However, the contacts of the layers are nearly flat as if they had been laid down rapidly.

In the context of long geological ages the scarcity of erosion at the paraconformities is challenging. Over the long times postulated you not only would expect a lot of irregular erosion of the underlayers, but in terms of the average rates of erosion we now observe, we would expect our continents to have been eroded down to sea level over 100 times!

6. FLAT GAPS: PARACONFORMITIES

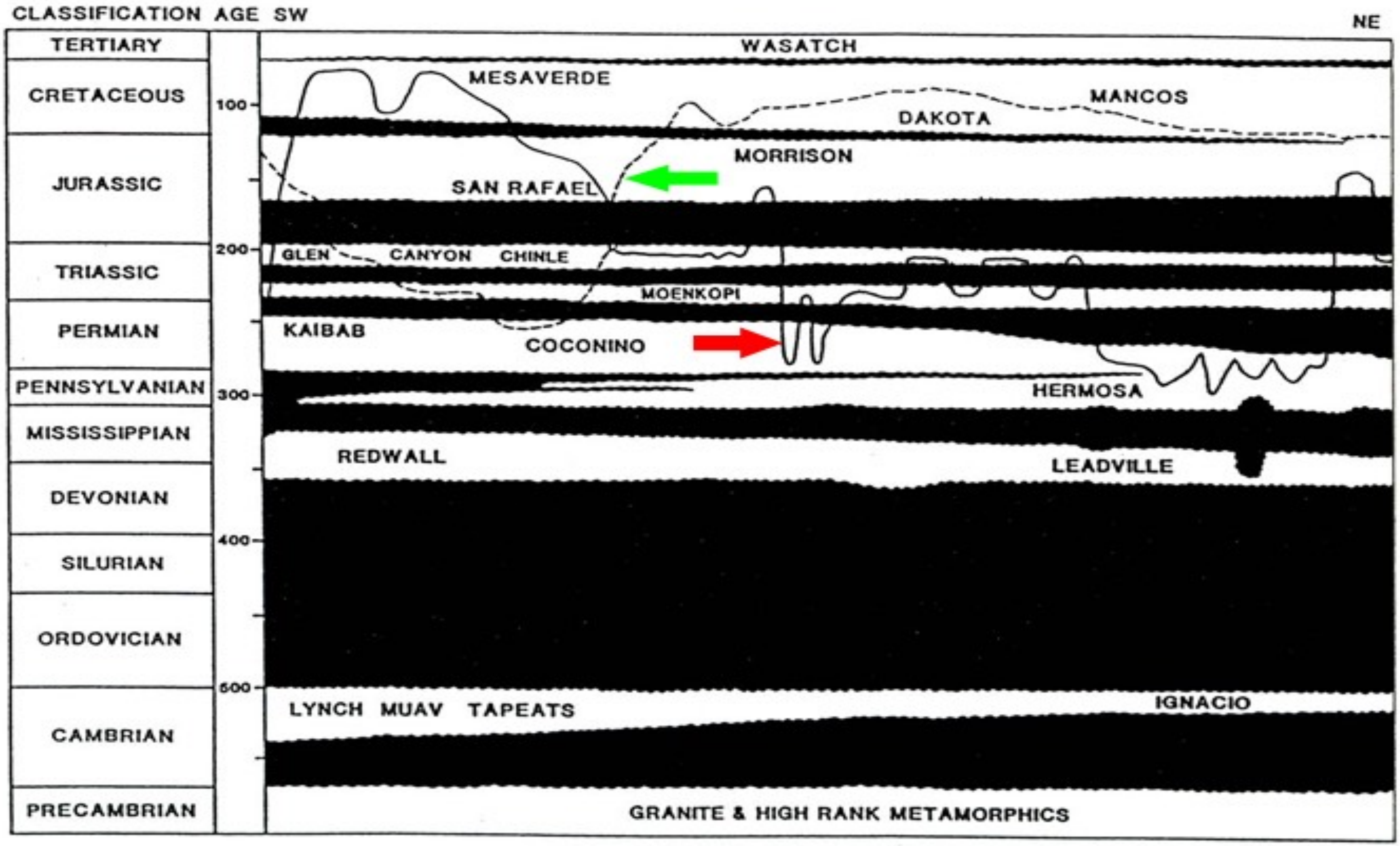
Paraconformities are found over the earth, and are common enough in various parts of the geologic column that they challenge its whole time framework. For questions and discussions see: Roth AA. 2009. "Flat Gaps" in sedimentary rock layers challenge long geologic ages. Journal of Creation 23(2):76-81.

This is the kind of data that is hard to explain unless you believe that the major part of the geologic column was deposited rapidly as would occur during the Genesis Flood described in the Bible. More details about paraconformities and erosion are considered in Discussion 16, of the Bible and Science series on the author's webpage: www.sciencesandscriptures.com, that deals with evidence for the great Genesis Flood.

6. FLAT GAPS: PARACONFORMITIES

The next figure represents the geologic layers found northeast of the Grand Canyon, displayed according to their assumed age, which is given in the column near the left in millions of years. Many of the Grand Canyon formations persist here in layers up to the top of the Permian. The rock layers are the white parts on the figure, and they actually lie directly on top of each other, while the black parts are the time gaps (paraconformities) whose thickness reflects their assumed length of time according to the standard geologic time scale. Most of the black layers are flat enough that they represent the flat gaps of paraconformities. The chart represents rock layers that are 3.5 km thick, and a 133 km horizontal distance, hence there is about a 15X vertical exaggeration in the illustration.

CONTRAST BETWEEN PRESENT SURFACE TOPOGRAPHY (narrow black lines) AND FLAT GAPS (thick black regions)



6. FLAT GAPS: PARACONFORMITIES

In the figure above, the present irregular erosional surface of the land in the region, in two different localities, is represented by the dashed line (green arrow) that is probably the flattest in the region, and the solid line (red arrow) that reflects more pronounced erosion found further south. Note the striking contrast between the irregularity of the present surface (thin lines at arrows) with the flatness of the rock layers (white layers). If the rock layers had been laid down over millions of years, you would expect lots of irregular erosion of the underlayers, especially at the very long gap illustrated by the thickest black layer. This data is what would be expected for the rapid deposition of these layers.

CONCLUSIONS

- The various formations of the Grand Canyon represent very widespread and very flat deposition. This is more as would be expected for the Genesis Flood than for slow local geologic processes over millions of years for varying environments.
- Within these formations one finds extremely widespread flat layers.
- It would not be possible to lay down such extremely flat layers on the irregular topography of our present continents.
- The Coconino Sandstone presents several features that are better explained by a Flood model than by slow geological ages.
- Where major gaps occur between these widespread layers, one does not find the effects of the long geologic ages proposed for these gaps. This indicates rapid deposition.
- These factors authenticate the Genesis Flood and a short time for the deposition of most of the sedimentary layers. There is significant scientific data that supports the biblical model of origins.

ADDITIONAL REFERENCES

For further discussions by the author (Ariel A. Roth) and many additional references, see the author's books titled:

1. ORIGINS: LINKING SCIENCE AND SCRIPTURE. Hagerstown, MD. Review and Herald Publishing Association.
2. SCIENCE DISCOVERS GOD: Seven Convincing Lines of Evidence for His Existence. Hagerstown, MD. Autumn House Publishing, an imprint of Review and Herald Publishing Association.

Additional information is available on the author's Web Page: Sciences and Scriptures. www.sciencesandscriptures.com. Also see many articles published by the author and others in the journal ORIGINS which the author edited for 23 years. For access see the Web Page of the Geoscience Research Institute www.grisda.org.

Highly Recommended URLs are:

Earth History Research Center http://origins.swau.edu

Theological Crossroads www.theox.org

Sean Pitman www.detectingdesign.com

Scientific Theology www.scientifictheology.com

Geoscience Research Institute www.grisda.org

Sciences and Scriptures www.sciencesandscriptures.com

Other Web Pages providing a variety of related answers are: Creation-Evolution Headlines, Creation Ministries International, Institute for Creation Research, and Answers in Genesis.

USE PERMIT