6. RAPID SEDIMENTATION

INTRODUCTION

Time is a major difference between the Biblical model of a recent creation by God and the billions of years proposed for evolutionary development. Time is probably the most contentious topic in the ongoing battle between the Bible and science. The improbabilities of evolution need a lot more time than the billions of years proposed, while the God of the Bible does not need any. Some of the sedimentary layers of the earth have something to say about time.

There are many localities in the Colorado Plateau that give evidence of rapid sedimentation. A lot of this evidence is at the contacts between two sedimentary layers. Some data indicate that both the layer below and the one above the plane of contact between the two were soft. This is usually interpreted by geologists to indicate that they were deposited at about the same time, because sediments tend to harden over time, and it doesn't take very long for a mud layer to gain some physical competence as water migrates out of it.

Some of this evidence is at major gaps between units and gives evidence that the proposed long time between the layers never occurred. For instance two geologists (Roca-Argeim and Nadon, 2003) propose that the Buckhorn Conglomerate which is at the base of the Cedar Mountain Formation is part of the Brushy Basin Member of the Morrison Formation that lies just below it. They come to this conclusion because the Brushy Basin shows numerous mud injections into the Buckhorn, indicating that both were soft. The significance of this and the problem for the traditional geological time scale here is that there is supposed to be some 20 million years between the Brushy Basin and the Buckhorn. It appears that those 20 million years never occurred!

One must be cautious and keep in mind that a time problem in one locality does not invalidate the whole geologic time scale of itself. On the other hand there is significant evidence for soft sediments, in many instances not at major time gaps, but of themselves evidence of rapid deposition as expected during the Genesis Flood. Every locality is part of the total picture.

We also mention *turbidites* (Figure 6), that are a persistent interpretation of many sedimentary deposits, (e.g. Carvajal and Steel 2006); and a significant factor in the rapid sedimentation picture. Turbidites are deposited quite instantaneously; they form as sediments flow underwater, and are just what one would expect during the Genesis Flood. They produce many layers in one depositional event. Unfortunately their identification is usually difficult. Figure 10 illustrates the various parts of an ideal turbidite. In their process of deposition, first only the lower parts of the ideal sequence, i.e. A, B, is deposited, in the middle all parts may be deposited, while towards the end only the higher units of the ideal sequence, i.e. C, D, are deposited. When forming, turbidity currents can travel at 100 kilometers per hour and can deposit a layer as much as 200 meters thick. Most are much thinner. A recent turbidite in the North Atlantic deposited some 100 cubic kilometers of sediment.

DESCRIPTION AND INTERPRETATION

Below, several soft sediment localities are illustrated and briefly discussed. We will visit most of them.

FIGURE 1. Location: Mile marker 461 on US highway 89, S of Cameron, AZ. Contact between the Triassic Moenkopi Formation, dark brown (red arrow) and the lighter colored Shinarump Conglomerate. The Moenkopi intrudes into the Shinarump rock indicating it was still soft when the Shinarump was laid down, yet the Moenkopi is supposed to be around 10 million years older than the Shinarump.

FIGURE 2. Location: On main road into Arches NP, 1.6 miles W of junction to Windows Section. Top massive layer is Jurassic Entrada, bottom red layers are Jurassic Dewey Bridge (Carmel). Note major foundering and penetration of middle grayish layer into the Dewey Bridge (of Entrada or the Carmel Formation). You would not expect this from slow gradual deposition.

BALL-AND-PILLOW FEATURES

We will have a chance to see several ball-and-pillow localities that are illustrated in subsequent figures. A few introductory comments should help you understand these fascinating structures. While the cumbersome term ball-and-pillow is highly descriptive, some geologists opt to just call them pillows, although some are very much ball like and the term pillow is used for other geologic structures.

These structures form in unconsolidated sediments, usually with a sandy layer, which can have a density of 2, overlying a muddy layer with a density of 1.5. Plumes of mud arising between units of sand can isolate the sand into ball like structures, or flatter pillows can form by sinking into the mud. The mud has to be quite fluid for this to occur.

Ball-and-pillow structures are interpreted by most geologists as representing rapid action (Figure 3). A good supply of sand has to cover the mud before it consolidates, so both the mud and the sand have to accumulate quite rapidly. The term *foundering* is often used in describing the breakdown of the original sedimentary system into balls and pillows. These structures do not necessarily prove the Genesis Flood, but they lend good support to the concept because they are the kind of activity expected during that flood in contrast to the slow accumulation rates of sediments usually going on now on our earth.

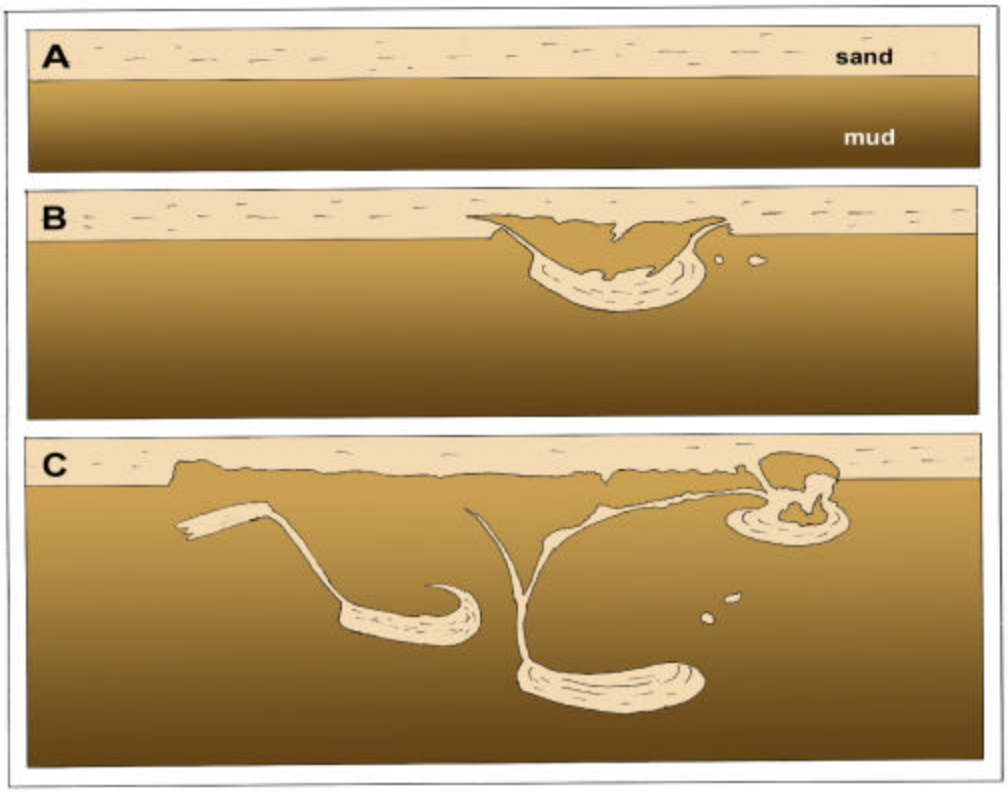

FIGURE 3. Laboratory experiment producing pillows. (A) Sand is laid over mud in a tank; (B) tank is shaken to simulate an earthquake thus producing a pillow; (C) more shaking, more pillows. Based on Howard and Lohrengel (1969) reporting on Kunnen's classic experiments in The Netherlands.

FIGURE 4. Location: Horse Gulch path, at the E end of 3rd Street, N side , at the gate to the path, in Durango, Colorado. Note the three prominent balls at the base of the overlying tan Cretaceous Point Lookout Sandstone. Note the flat tan sandstone pillows below, imbedded in the black Cretaceous Mancos Shale. Their emplacement must have taken place before the Mancos was consolidated. (Dunbar 1992, Lucas 1997).

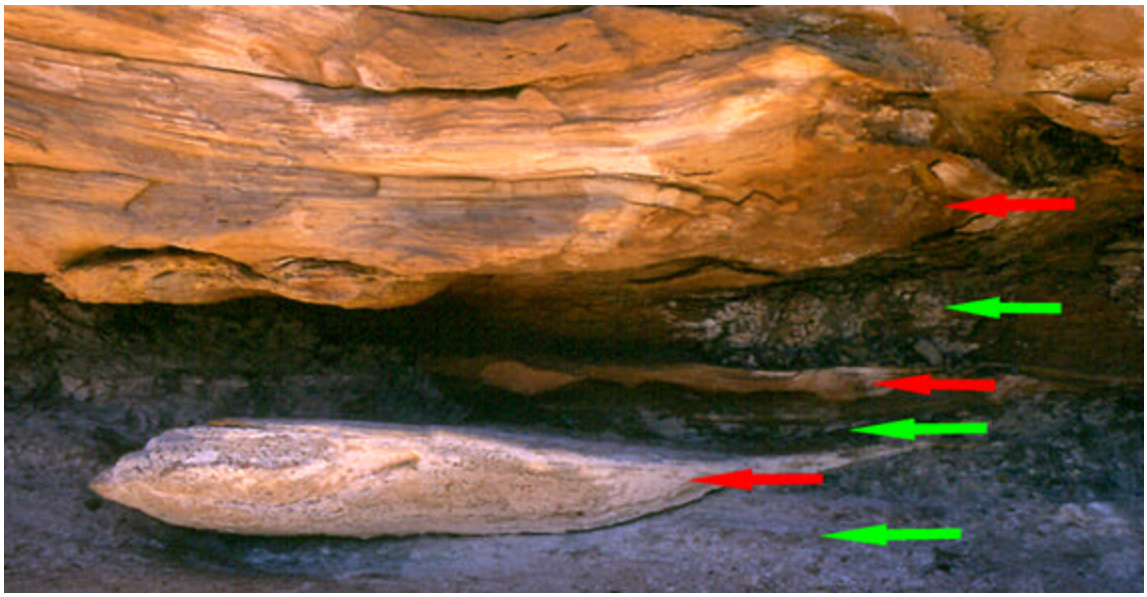

FIGURE 5. Location: Near the S end of the main paved Scenic Drive road in Capitol Reef NP, Utah. View is on the E side of a wash E of the road just before the road turns sharply to the E to go to the Capitol Gorge parking area. In the figure above, the red arrows point to the Upper Triassic Shinarump Conglomerate, and the green arrows points to the Lower Triassic Moenkopi Formation found between and below the Shinarump. The Middle Triassic, that represents some 10-12 million years, is missing between these two formations. It is very doubtful that the Moenkopi would remain soft for 10 million years so as to facilitate this kind of deposition. Height of the total view is about one meter (3 feet).

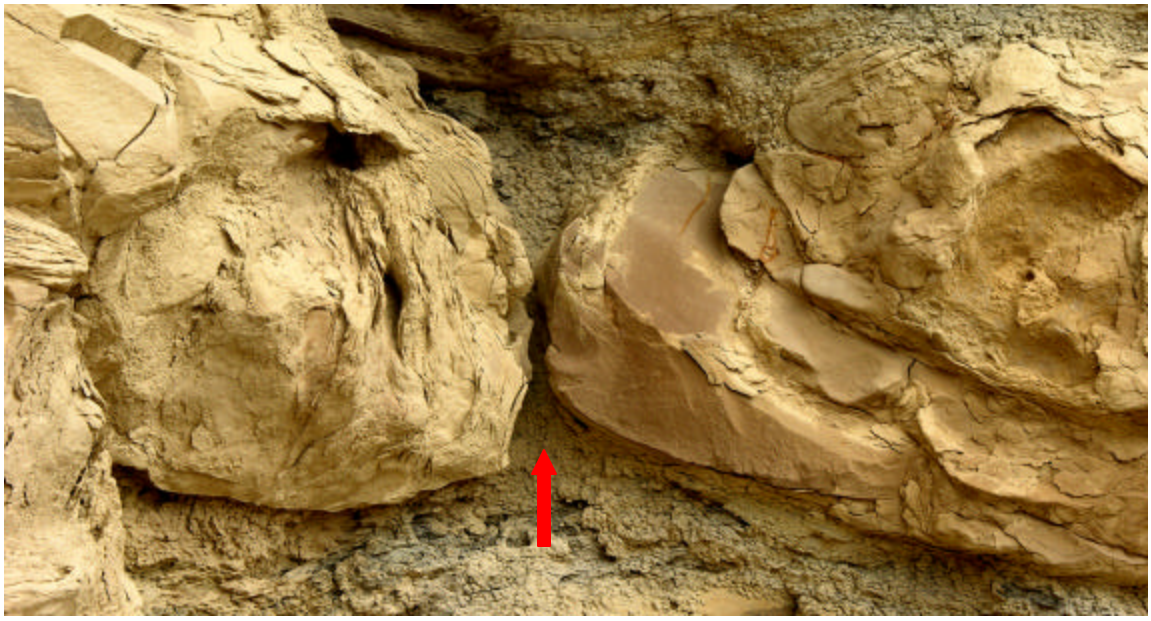

FIGURE 6. Location: Start on E end of Green River, UT. Go 9.5 miles east on Old Highway, turn N on dirt road just before a small bridge, go to railroad tracks, walk N towards end of small canyon. Features are high on W side. This is in the Kenilworth member of the Cretaceous Blackhawk Formation. The two thick sandstone units above the shale are interpreted as turbidites (Pattison 2005). Picture above is of the lower one and shows details of two ball structures with soft mud that went up between the two (arrow), suggesting rapid deposition.

FIGURE 7. Location: This is just S of Hiawatha, UT. Follow State Highway 122 W to the railroad track, the features can be seen for a mile to the west along the tracks. This is Cretaceous Panther Sandstone. Howard and Lohrengel (1969) have reported on these pillows. They propose that originally there was a thick mud layer between the pillow layer and the thinner sandstone layer below. The tip of the red arrow is where the mud layer was. That layer flowed up between the pillows thus forming them and placing the pillows directly over the thinner sandstone layer that is only moderately deformed. This all occurred as one event in soft sediments.

FIGURE 8. Location: South of Wellington, UT. Go S on 100 East Street for 5.7 miles, turn E and go 3.6 miles on a dirt road that veers S. The features are in the top of the cliff to the west. The resistant cap rock is the widespread Cretaceous Ferron Sandstone. Below is Mancos Shale. This locality highlights the foundering of the Ferron into soft mud. Note the curvature of the layers in the balls and the squeeze up of mud (red arrow) between large balls.

FIGURE 9. Location: Up Spring Canyon Road W of Price, UT, drive up into the coal seams and look. Contact is between black coal and light colored overlying sediments. Note that the coal intrudes in several places into the sediment or vice versa, indicating that both must have been soft when coal forming vegetation was covered up by the sediments. Foundering of the sediment suggests rapid action; however, here geologists do not propose any major time period between the deposition of these two units. View is about half a meter (1.5 feet) across.

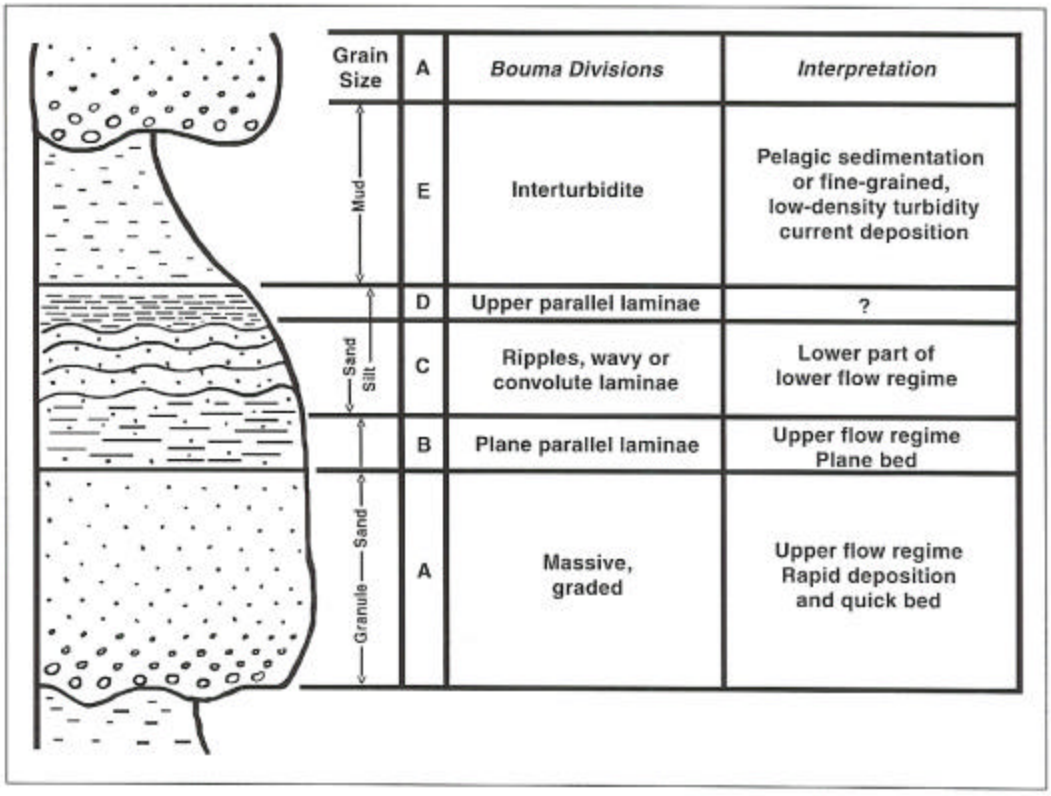

FIGURE 10. Sediment characteristics of an ideal turbidite (Bouma sequence). Units A, B, C, D, are all laid down at about the same time, very rapidly, by the turbidity current. Unit E, the interturbidite is laid down between turbidite deposition events and is not necessarily present.

REFERENCES

Carvajal CR, Steed RJ. 2006. Thick turbidite successions from supply-dominated shelves during sea-level highstand. Geology 34:665-668.

Dunbar RW, et al. 1992. Strandplain and deltaic depositional models for the Point Lookout Sandstone, San Juan Basin and Four Corners Platform, New Mexico and Colorado. In: Lucas SG, et al., editors. San Juan Basin IV. New Mexico Geological Society Forty-third Annual Field Conference, p 199-206.

Howard JD, Lohrengel CF. 1969. Large non-tectonic deformational structures from Upper Cretaceous Rocks of Utah. Journal of Sedimentary Petrology 39:1032-1039.

Lucas SG, et al. 1997. Second-Day Road Log, from Cortez to Mesa Verde National Park, Mancos and Durango. In Anderson OJ, Kues BAS, Lucas SG, editors. Mesozoic Geology and Paleontology of the Four Corners Region. New Mexico Geological Society Forty-Eighth Annual Field Conference, p 19-20.

Pattison AJS. 2005. Recognition and interpretation of isolated shelf turbidite bodies in the Cretaceous Western Interior, Book Cliffs, Utah. In: Pederson JL, Dehler CM, editors. Interior Western United States. Boulder, CO: The Geological Society of America, p 479-524.

Roca-Argemi X, Nadon CG. 2003. The Buckhorn Conglomerate as the upper member of the Morrison Formation: New evidence from the type section, Cedar Mountain, Utah. Geological Society of America Abstracts With Programs, Rocky Mountain Section 35(5):38.