The Feasible Same-Site Reappearance of the Tigris-Euphrates River System after the Global Flood

John Woodmorappe*

Abstract

Those who recognize the reality of the global Flood have always appreciated its destructive and erosive power, and have accordingly concluded that the antediluvian Tigris and Euphrates Rivers were obliterated. So long as river courses had been understood as forming as the result of shallow-crustal processes, such deductions are entirely consonant with available evidence. New geologic evidence, however, indicates that the courses of major rivers are governed by deep-crustal features. This opens up the serious possibility that the postdiluvian Tigris-Euphrates River system has reappeared at or close to the location and trend of its antediluvian counterpart—all despite the deposition of thousands of meters of Flood sediment. New geologic evidence undercuts the claim of compromising evangelicals that the retention of antediluvian place-names necessarily implies a local flood instead of a global one.

Introduction

The Tigris and Euphrates Rivers play a major role in Biblical history. These bodies of water, for example, are associated with the Garden of Eden (Genesis 2:10–14) as well as events surrounding end times (Revelation 9:14 and 16:12).

The question has been raised as to the identity of the two rivers before and after the Flood. The compromising-evangelical proponents of the local flood have insisted that the continued existence of these rivers proves that the Genesis Flood was local (e.g., Munday, 1996; Ross, 1998). Their supposition hinges on these two premises: 1) The river systems are identical before and after the Flood; and 2) The antediluvian topography had not been removed by erosion. Those who recognize the global extent of the Flood (Whitcomb and Morris, 1961, p. 83), on the other hand, point out that the antediluvian Tigris and Euphrates River systems likely had been completely obliterated. Only the names themselves of major antediluvian rivers had probably been re-used for the most familiar rivers of the post-Flood world. After all, the re-use of names was a frequent practice in Biblical times no less so than in modern times. Other commentators (for instance, the 19th-century Diluvialist Granville Penn; Mortenson, 1997, p. 371) believed that the ascription of the Tigris-Euphrates system to the pre-Flood world had been the result of a copyist's error. However, this opinion has apparently never found substantiation in fact.

I fully support the reality of the global Flood. In this work I present geologic evidence that, counterintuitively, the Tigris-Euphrates River system very probably redeveloped in very much the same geographic area that it had occupied before the Universal Deluge. If this is correct, it not only means that the same *names* had been re-used after the Flood, but also that the pre-Flood and post-Flood Tigris-Euphrates river systems are essentially the same *in spite of* the obliteration of the pre-Flood topography and the deposition of thousands of meters of Flood strata. Obviously, this could only have happened if the courses of major rivers was governed by something more than superficially-placed earth-surface processes. Recent geologic evidence indicates that such is indeed the case. It is also a striking fact that the regional sequences of sedimentary rock trend, in terms of thickness and depositional axes, are parallel to the present-day Tigris-Euphrates system (Ronov et al., 1984; 1989). If we further grant the premise that Noah's Ark landed, perhaps providentially, within a few thousand miles of its launching point, the two large rivers would have been the first ones encountered by the crew. It would have been natural for the Ark inhabitants to name the postdiluvian Tigris and Euphrates rivers after their antediluvian Flood counterparts, although in this case the rivers would have been essentially the same, and not merely the same names used for different rivers.

*John Woodmorappe. MA Geology, BA Biology. 6505 N. Nashville #301, Chicago, IL, 60631-1724.

Received 28 July 2001; Revised 11 December 2001

Antediluvian Earth-Surface Features: Implications of Deep-Seated Faults

Whenever attempting to decipher the exact origins of topographic features such as rivers, we must determine the nature of the factors which govern the locations and directions of existing river valleys. Do rivers make their appearance at essentially random geographic locations as water flows from higher to lower elevation, or are there other factors involved which predetermine the courses of at least some of the earth's rivers? Let us briefly examine both alternatives in light of the Flood.

According to the first idea, rivers are, geologically speaking, strictly surficial features, and the result of incidental earth-surface processes. Following this line of reasoning, the antediluvian topography became obliterated during the worldwide Flood, and the locations and courses of the antediluvian rivers were erased forever. The post-Flood river systems originated as water flowed from higher to lower elevations. However, the locations of these new rivers otherwise had nothing in common with the numbers and courses of the antediluvian rivers that had preceded them.

Indeed, to the extent that they are entirely surficial systems, rivers could be likened to scratches on a wall of plaster. Whenever sufficient paint, wallpaper, or plaster is scratched off, the scratch is completely obliterated. This corresponds to the erasure of the pre-Flood topography (Whitcomb and Morris, 1961). As a new layer of plaster, wallpaper, paint, etc., is applied to the wall, it eventually may be subject to new scratches. However, the new collection of scratches will have nothing in common (in terms of numbers, locations, and directions) with the older set of scratches, except perhaps by coincidence. In my analogy the new scratches, of course, represent the post-Flood rivers.

Now let us consider what happens if, to the contrary, river systems (their locations, courses, etc.) are actually governed by deep-seated faults. Commensurate with the earlier analogy of the scratched wall, this situation may be likened to a deep-seated crack in the masonry of a building. This crack manifests itself also in the plaster of the adjoining wall, as it cuts through wallpaper and paint. Now suppose that the owner simply fills in the crack and adds a thick layer of plaster. He then covers up the cracked area with fresh wallpaper or paint. Since the underlying problem (the crack in the masonry) has not been repaired, the problem will re-emerge as soon as the building shifts slightly. The crack will propagate anew through the new layer of plaster, etc., and will re-appear at exactly or almost exactly the same position it did before.

In the above analogy, the crack in the masonry represents a fault in the Precambrian basement rocks underneath the Tigris-Euphrates Valley. The old crack in the wall represents the antediluvian Tigris-Euphrates system. The thick new layer of plaster represents the thousands of meters of Flood-deposited sediment. The new fault represents the post-Flood (and present-day) Tigris-Euphrates Valley.

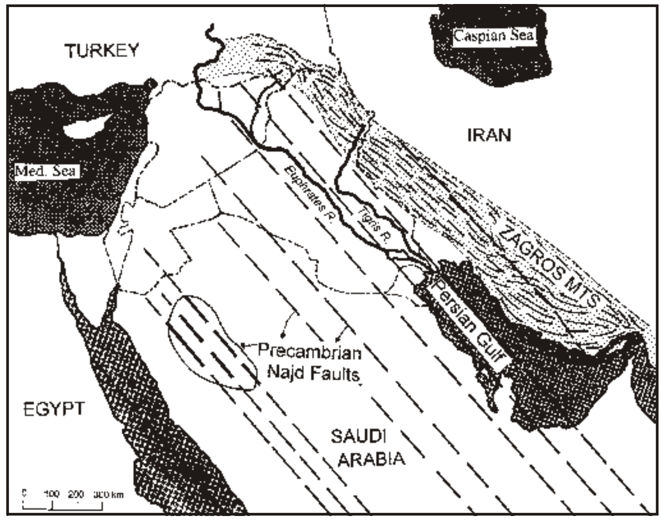

Figure 1. The entire region from the Red Sea to the Zagros Mountains appears to be dissected by largely-concealed northwest to west-northwest trending Precambrian faults. The present-day Tigris-Euphrates system also parallels these structures, suggesting an origin in terms of the latter. Because these faults appear to predate the Flood, the course of the antediluvian Tigris and Euphrates rivers was probably also governed by these faults.

Geologists now realize that faults are in fact a characteristic feature of the deep-seated geology of this part of the world:

> Northwest-trending structures are apparent all over the northern Arabian plate, from the Red Sea to the Zagros Mountains... The Najd deformation may have imparted a deep-seated regional fabric that controlled the locus of later episodes of deformation... The fault trends mapped in this study generally are consistent with the exposed Najd faults, lending credence to those interpretations... (Litak et al., 1998, p. 1185).

All of this is illustrated in Figure 1. Landsat photos have been used to study these features, and studies on directional frequency demonstrate the fact that the rifts or faults tend to trend northwestward (Al Khatieb and Norman, 1982). It is believed that the Najd belt shows evidences of strike-slip action, reflecting the importance of shearing action (Moore, 1979). Further evidence that the Najd system continues eastward is provided by the geometry of the sedimentary beds of Oman and adjacent regions (Mattes and Morris, 1990).

The striking fact is that the Tigris-Euphrates River system *also* follows this NW-SE trending system of partly-exposed, but largely-buried deep-seated faults. Because these pre-existing structures are Precambrian, they most likely have existed prior to the Flood[1]. And, since the course of the present Tigris-Euphrates system is governed by these faults, it seems quite probable that any antediluvian river system in this general location *also* exhibited a course parallel to that of the present Tigris-Euphrates system. Of course, it cannot be ruled out that the antediluvian Tigris-Euphrates system existed at an entirely different location on earth from its present counterpart. However, we should be open-minded to the possibility that the antediluvian and postdiluvian versions of these rivers are essentially one and the same, especially in the light of the geologic evidence discussed in this paper.

Some Failures of Uniformitarian Geology in the Middle East

Consider index fossils. The use of fossils to date rocks often results in unpredictable revisions of expected age, and illustrates once again the circular reasoning of using index fossils. It also underscores yet again the neo-Cuvierist fallacy of assuming that sedimentary beds can be dated according to appearance and/or lithostratigraphic position. For example, a sedimentary formation near Tehran suddenly changed from Devonian to Early Cambrian for the following reason:

> ...the discovery of *Redlichia* trilobites of Early to Middle Cambrian age in the area northwest of Tehran. The mainly continental beds of the Lalun Formation, *formerly assigned to the Old Red Sandstone* [Devonian] *before their age was established*, give way to a Middle Cambrian to Ordovician succession of carbonates... (Alsharhan and Nairn, 1997, p. 137) (emphasis added).

In other words, the trilobite *Redlichia* establishes a sedimentary rock as Cambrian in age, and then the circle of reasoning closes whenever we are informed that *Redlichia* is found only in Cambrian rocks.

There are various ways that strata are massaged in order to force them to conform to the dictates of the evolutionary-uniformitarian geologic column. For example, irrespective of the final resolution of the following age-dating conflict in Iraq, it is clear that time-transgressive formations are always standing by to help the uniformitarian explain away any conflicts between lithology and age:

> The relatively abundant fauna in the Sargelu beds indicates an age ranging from the latest Liassic [Early Jurassic] to Bathonian [Middle Jurassic]. However, as a possible Middle Jurassic age has been assigned to *Posidonia* faunas found in the underlying Sekhanian Formation, there must either be an error in the age assignment, or the boundaries between the two formations may be diachronous or simply facies-controlled (Alsharhan and Nairn, 1997, p. 285).

That the standard uniformitarian geologic column could be false is, of course, not a possibility entertained by Alsharhan and Nairn! Moreover, a number of paleontologic puzzles have emerged as the sedimentary rocks of the Middle East have been explored for fossils. For instance, a series of beds on Socotra Island (in the Gulf of Aden) contain fossils suggestive of an age near the Permo-Triassic (PT) boundary, except for the following uncomfortable find:

> The similarity of the crinoid columnals to Devonian forms is marked; however, similar columnals are associated with what must be an Anisian [Triassic] ammonite (Bott et al., 1995, p. 227).

Many of the biostratigraphic considerations which I had discussed in my work on cephalopods (reprinted in Woodmorappe 1999) have recently been found to be very relevant to the ammonoids recovered on Socotra Island:

> The macrofossil samples include a number of ammonites that are endemic to the limestone platforms of the paleo-tropical belt. A factor that makes age determinations even more difficult is that there are convergent homeomorphs of just these forms occurring in the Middle to Upper Triassic, the Albian-Cenomanian [Middle Cretaceous] and the Campanian-Maestrichtian [Upper Cretaceous]. Therefore, an accurate age based upon these homeomorphs is particularly difficult (Bott et al., 1995, p. 227).

Of course, the foregoing citations are hardly exhaustive. To the contrary: They are only examples that have come to my attention while researching the main topic of this study.

The Inapplicability of Plate Tectonics

Had continents drifted before or during the Flood, it would have been very difficult for the Tigris-Euphrates river system to reappear at its nearly-identical pre-Flood location, for reasons discussed below. Some creationist researchers (e.g., Watson 1997) have discussed the geologic activity surrounding the Dead Sea Rift and its actual or possible implications in Biblical history. However, one does not need drifting continents in order for faults such as the Dead Sea Rift to have been operative. Moreover, at least in a young-earth context, the slippage of earth's crust along the Dead Sea Rift need not have any direct relation to the geologic events surrounding the geographic region of the Tigris-Euphrates River System.

[1] I assign most of the Phanerozoic sediments to the Flood as well as the fossiliferous parts of the Precambrian. However, I reject the view which would have the entire Precambrian forming during the Flood.

According to the ruling plate-tectonics paradigm, the Zagros Mountains formed when the Arabian plate collided with the Asian plate. Before that, an ocean separated what is now the Arabian Peninsula from what is now the remainder of Asia. It is believed by uniformitarians that, in much earlier geologic history, the Arabian Shield itself had been produced from the collision and suturing together of microcontinents. Such views are, of course, incompatible with the idea, discussed below, that the antediluvian Tigris-Euphrates system was located at the site of the Zagros geosyncline. It is therefore necessary to take a critical look at plate tectonics as it relates to the area of the present-day Zagros Mountains. It should thus be noted, at the outset, that continental-drift theories are not particularly convincing. To the contrary:

> Numerous, often contradictory, plate tectonic models have been proposed to explain the evolution of the Arabian-Nubian Shield (Jackson and Ramsay 1980, p. 624).
>
> Disagreements on the plate tectonics of the Middle East region are many... Nearly all of these hypotheses are mutually exclusive. Most would cease to exist if the field data were honored (Kashfi, 1992, p. 119).

Even the creation of ophiolite, believed to be the outcome of orogenesis resulting from motions of the Arabian plate, is the subject of at least three mutually-exclusive plate-tectonics hypotheses (Alsdorf et. al., 1995).

In like manner, contradictory models have been proposed to clarify the nature of the alleged suture zone comprised by the Zagrosides (see Alavi, 1980). Moreover, not everyone with firsthand familiarity with the geology of the region believes that it is compatible with a plate-tectonics origin at all. In fact, some evidence at least suggests that what is now the Arabian Peninsula has *always* been a part of Asia:

> The Zagros geosyncline is interpreted by many workers in terms of plate tectonics; they disregard many years of thorough geologic investigations in order to explain the geology of this part of the world... These data demonstrate that the concept of plate tectonics is completely in error in the Tethys region... some stratigraphic units of Early Cambrian to Middle Triassic age in Arabia and northeastern Africa can be traced through Iraq, Iran, and into Soviet Central Asia...structural continuity between Arabia, Pakistan, and western India since late Paleozoic time (Kashfi, 1976, p. 1488–1489).

One should seriously question the *necessity* of plate tectonics in the Creationist-Diluvialist paradigm (Reed, 2001). Proponents of Catastrophic Plate Tectonics (CPT) have argued that continental motion is necessary in order to maintain convection cells in the mantle that will allow rapid orogeny on a young earth. Only further research will determine whether or not this is the case. However, when it comes to the local geology, the answer is in the negative:

> The simple subsidence of the crust and accumulation of sediments in the subsiding trough, coupled with simple isostatic balance and compressive movements, were sufficient to produce the Zagros geosyncline. *There is no need to call for collision of Africa with Asia to produce it* (Kashfi, 1976, p. 1489) (emphasis added).
>
> These data show that there is nothing in the geologic record to support a past separation of Arabia-Africa from the remainder of the Middle East (Kashfi, 1992, p. 119).

It would appear that vertical crustal tectonics are sufficient to explain the geology of at least the Middle East. Therefore, I have therefore adopted the position that, whatever structural changes took place in the geology of the whole region, it was entirely in the context of static and permanent continental masses.

The History of the Tigris-Euphrates River System During and After the Flood

In this section, I consider some probable locations of the antediluvian rivers in question. The deductions are based on the deep-seated geology of the region. Since the sedimentary rocks were deposited during the Flood, trends in their thickness can be used to discern the locations of deep-crustal features, and thus also to narrow down the prospective locations of the antediluvian Tigris-Euphrates River system.

The Zagros Geosyncline and Fold-belt.

The Zagros geosyncline and later fold-belt are believed by some geologists to have originated from a reactivated Precambrian lineament (Mattes and Morris, 1990, and citations), possibly related to the previously-discussed NW-SE trending Najd fault system (Figure 1). I thus consider the Zagros geosyncline as a possible site of the antediluvian Tigris-Euphrates system. To begin with, if correct, it means that the present Tigris-Euphrates system is almost exactly parallel to the antediluvian one, but located 200–300 km west (Figure 2). It is also worth noting that the sedimentary pile in the geosyncline became subject to compressive tectonic forces only towards the final phases of its filling:

> In the Zagros folded belt, quiet and conformable sedimentation continued from Cambrian to Pliocene times. Only gentle epeirogenic movements and salt diapirism affected this belt before the Late Tertiary Zagros orogeny when the sediments became folded into a series of parallel anticlines and synclines (Takin, 1972, p. 148).

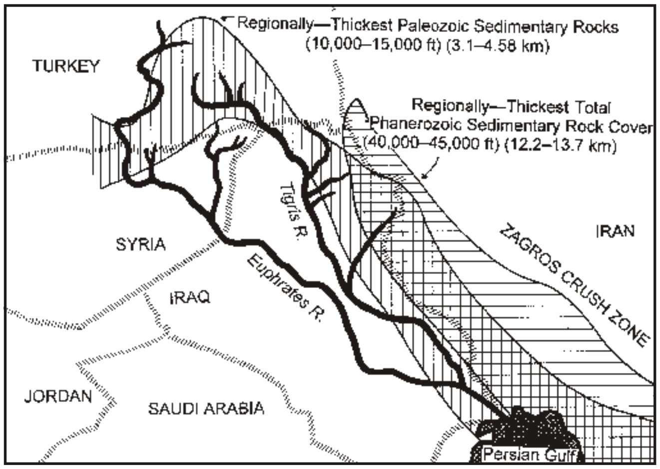

Figure 2. Greatest regional thickness of the oldest Flood-deposited rocks, and the greatest regional thickness of all Flood-deposited sedimentary lithologies. Data condensed from Beydoun (1991). In this and succeeding maps, the modern Tigris-Euphrates system and major political boundaries are included for clarity.

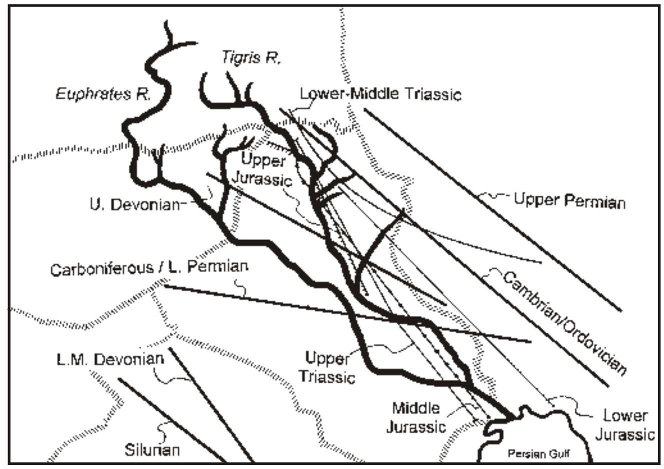

Figure 3. Major depositional axes of Flood-deposited rocks (Paleozoic—heavy lines, and Lower through Middle Mesozoic—thin lines). Data summarized from Ibrahim (1979).

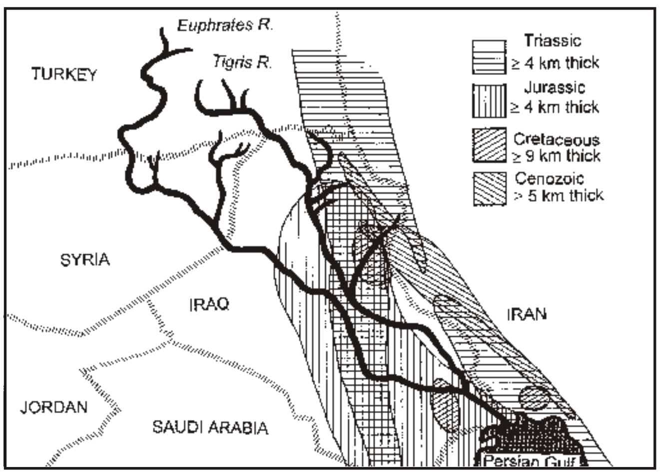

Figure 4. Greatest relative thickness of sedimentary rocks deposited primarily during the middle through latest stages of the Flood (Mesozoic and Cenozoic). Data combined from Alsharhan and Nairn (1997), Goff et al. (1995), and Setudehnia (1978).

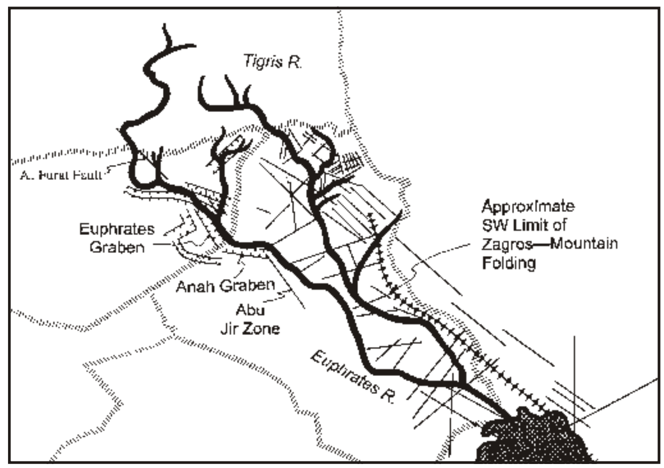

Figure 5. Schematic portrayal of major regional deep-crustal tectonic elements. Width of grabens is exaggerated for clarity. Data synthesized from Ameen (1992), Lovelock (1984), de Ruiter et al. (1995), Sawaf et al. (1993), Searle (1994), and Wells (1969).

We can understand this process in the light of the following sequence of events: The deep-seated rift system, which had governed the course of the antediluvian Tigris-Euphrates rivers, became reactivated during the Flood. The entire trough became filled with sediment. It then subsided, and accumulated a great thickness of sediment throughout much of the Flood. The trend of this thick accumulation of sediments is reflected by the thickest belt of Paleozoic and/or Phanerozoic sedimentary rocks in the region (see Figure 2). Not until late in the Flood, or in the post-Flood, did the sediment become folded. And even then, only the eastern part became folded (the limits of Zagros folding are shown in Figure 5). The remaining unfolded sedimentary column gradually thins westward, underneath the present-day Tigris-Euphrates system, from 12 km to 7 km of total thickness (Alsinawi and Al-Banna, 1992).

Phanerozoic Depocenters as Alternate Locations of the Antediluvian Tigris-Euphrates

If the Zagros geosyncline is not the actual site of the antediluvian rivers in question, alternative locations can be considered based on isopach and depositional-axes data for specific systems. The data shown in Figures 3 and 4, although necessarily incomplete, is relevant to these concerns. Unlike the thicknesses of Mesozoic and Cenozoic sediments (Figure 4), those of Paleozoic sediments are generally not sufficiently demarcated, in all locations of the region of interest to this study, to provide the basis for reliable isopach maps (Best et al., 1990; Sawaf et al., 1993). However, the available data indicates that trends in thickness of many Paleozoic systems show NW-SE trends comparable to that of younger rocks. For example, the belt of thickest Middle Cambrian to Lower Ordovician rocks (Husseini, 1989; 1990) covers very much the same area as the belt of thickest Paleozoic rocks as a whole (Figure 2). On the other hand, the thickest accumulations of Permo-Carboniferous sediments occur in relatively small areas within the Zagros Mountains and in east-central Syria (Al Jallal, 1995; Al-Laboun, 1988).

Let us examine the relevance of Phanerozoic depocenters to the question raised by this investigation. For example, suppose that the basement lineation which governed the course of the antediluvian Tigris-Euphrates did not become activated until the deposition of Triassic sedimentary rocks. The valley of these antediluvian rivers would then have become completely eradicated and subsequently buried by a thick carpet of early-Flood sediments. However, as the fault-system became active, the downfaulted area would subside, and Triassic sediments would then have been forced to accumulate to regionally-unusual thickness along the axis of this area. The thick belt of Triassic sediments (Figure 4) would thus end up marking the site of the antediluvian Tigris-Euphrates River System.

Of course, had the rift or fault which determined the course and location of the antediluvian river system become activated while rocks assigned to another geologic period had been deposited, the trend of deposition of these rocks would then mark the site of the antediluvian Tigris-Euphrates system. Any of the depositional axes (Figure 3) or major isopachs (Figure 4) would then indicate the site of the antediluvian river system. Note from Figures 3 and 4 that *all* of these trends are subparallel to each other and to the extant Tigris-Euphrates River system. This is clearly suggestive of a causal relationship between the manner of deposition of the Phanerozoic sediments, and the later appearance of the Tigris-Euphrates river system.

Let us now contrast the foregoing discussion in light of the two paradigms of origins. In conventional uniformitarian thinking, it is believed that Proterozoic structures were repeatedly reactivated during the Phanerozoic, giving rise to geologic features in different times in accordance with the standard geologic time scale (Best et al., 1993). For instance, it has been even suggested that the Precambrian Najd faults of the Arabian Peninsula had been reactivated in the Neogene-Quaternary to produce enigmatic volcanics having northwesterly-striking vents (Litak et al., 1997, p. 664; see Metwalli et al., 1974, p. 1782). To the Diluvialist, the time element is both artificial and erroneous. Proterozoic, Cenozoic, Quaternary, and everything in between are virtually contemporaneous in the Creationist-Diluvialism paradigm, and there is no need to believe in the cumbersome process of repeated *ad hoc* episodes of activation and dormancy of Precambrian faults and rifts over hundreds of millions of years. Instead, if we are to accept the reality of renewed activity along basement faults and rifts between the time of Creation Week and some stage of the Flood, we are talking about a passage of time of only 1600 years or so.

The depocenters of the Phanerozoic systems appear to migrate with time on the Arabian Peninsula (Figures 3–4). The fact that both the depositional axes of Phanerozoic systems (Figure 3), as well as isopach extremes of the same (Figure 4) tend to occur in different geographic locations, has implications for the overall stratigraphic separation of fossils during deposition by the Flood. Thus, these observations are very consonant with the TAB model, which predicts an association between tectonic activity and age of the sediment (For further discussion of the TAB model, see the Diluviological Treatise, reprinted in Woodmorappe, 1999). As different areas of crust underwent downwarp, they simultaneously generated a stratigraphic differentiation of fossils as well as a geographic differentiation of especially thick accumulations of rocks assigned to successive geologic periods.

Reappearance of the Tigris-Euphrates at Its Exact Former Location?

I now consider the most extreme possibility: That at least part of the extant Tigris-Euphrates is located at the identical site of its antediluvian counterpart. To do this, we need to pursue the same reasoning behind that of the crack in the wall discussed at the beginning of this work. Is the crack merely an incidental earth-surface phenomenon, or is it governed by some process deep in the wall or even the building? To begin with, the pattern of sediment transport by the Tigris-Euphrates river system can hardly be characterized as recent or surficial. To the contrary: It is deeply rooted within the lithologies of (the presumed) geologic periods. The only question is this: *Just how early* in the Phanerozoic column do the effects of the present-day river system first appear? At a minimum, studies of paleocurrent directions in the Mesopotamian geosyncline indicate the following:

> The persistence of the current pattern through all the geological ages from Triassic up to Pliocene speaks also for the persistence of the same trends of tectonic movements (Kukal and Saadallah, 1970, p. 684).

As for vertical movements of earth's crust, it is obvious that the faults which comprise the Euphrates graben are hardly surficial in nature:

> Deeply penetrating faults have been identified in the Euphrates graben system, demonstrating the

thick-skinned tectonic style of this region (Brew et al., 1997, p. 628).

The Euphrates graben, and its satellite grabens (Figure 5) serve as depocenters for sediments that are Cretaceous and younger (deRuiter et al., 1995, p. 361). At least 3 km of Mesozoic and Cenozoic sediments have accumulated there (Sawaf et al., 1993).

Of course, these observations do not mean that the deep-seated features were necessarily absent at the time of the deposition of presumably older rocks. In fact, there is evidence that at least part of this feature which controls the course of the present-day Euphrates was in existence at least since the deposition of Early Paleozoic rocks:

> The corresponding, albeit lesser, increase in thickness between the interpreted base Cretaceous (near the base Shiranish) and the top Silurian horizons *seems to indicate the presence of an earlier period of extension* (Litak et al., 1997, p. 657) (emphasis added).

A limited amount of borehole data suggests that the Paleozoic is somewhat thicker in the Euphrates depression than in surrounding areas, and the variation in isopach thickness is interpreted to be Paleozoic in origin (Best et al., 1993, p. 182). The Palmyride Mountains apparently developed over a pre-existing rift environment, with the northwest-trending Euphrates Graben forming contemporaneously with, and orthogonal to, the Palmyrides (Alsdorf et al., 1995). Moreover, at least part of the fault system may have antedated the Flood itself:

> Although largely unexpressed by surface features, the Euphrates fault system represents an aborted rift system, striking roughly NW-SE and extending completely across Syria (Brew et al., 1997, p. 619).
>
> The postulated Proterozoic Euphrates Suture may have extended through this area, making the present-day Palmyride/Euphrates intersection a Proterozoic triple-junction (Litak et al., 1997, p. 665).

This deep-seated feature is illustrated in Figure 6. More on this shortly. To further appreciate the possibility that the antediluvian river systems and their present-day counterparts and present-day occur at essentially the same location, we must examine the tectonic features which control the course of the present-day Tigris-Euphrates River system. These are illustrated in Figure 5. As discussed earlier, these feature parallel the well-known Najd fault system (Figure 1), and, in all probability, are essentially a continuation of the Najd system under the sedimentary cover (Litak et al., 1998). Let us follow the course of the Euphrates River as it is governed by these mostly-buried faults:

> Recent geophysical work in Syria has resulted in identification of another important transcurrent fault zone, here called the *Al Furat fault zone*, which extends from the Turkish border in the northwest to the Syria-Iraq border in the southeast. This fault controls the course of the Euphrates River not only in Syria but also for a considerable distance downstream in Iraq...Further southeast, the Al Furat Zone passes into a rather narrow graben...This element, here called the *Euphrates Graben*...controls the course of the Euphrates... The Euphrates Graben is offset eastwards at an angle of 60 [degrees] at the Syria-Iraq border, where it forms the *Anah Graben*... Downstream of Anah, the Euphrates turns abruptly back again to a southeasterly course and runs in this direction for a further 100 km, as far as Hit and Aqabah. The section of the valley is controlled by the *Abu Jir fault zone*... (Lovelock, 1984, p. 581) (*em*phasis in original).

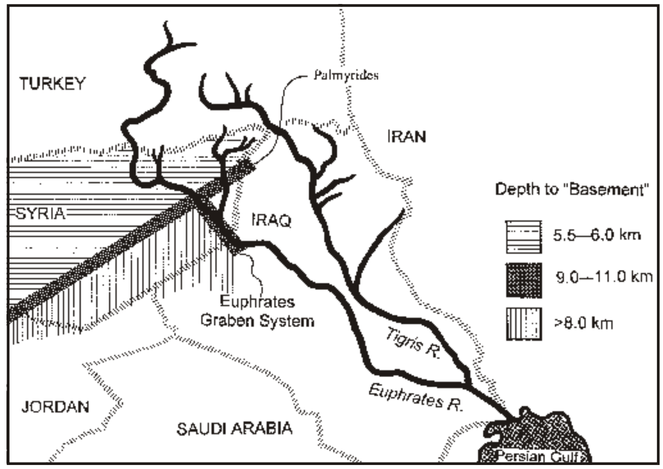

Figure 6. Overall sedimentary thickness in the western part of the Tigris-Euphrates system within and adjacent to the Euphrates graben system and Palmyride Mountain chain. Note the dramatic difference in sedimentary thickness north and south of this deep-seated system. Modified after Seber (1993) and Brew et al. (1997).

More recent research (Litak et al., 1997, p. 655) suggests that, instead of a single fault (El Furat), there exists a swarm of mostly-collinear NW-SE trending faults. In either case, the trend of this long system invites speculation that it (and, by implication, the course of much of the extant Tigris-Euphrates River system) owes its origin to basement faults which pre-date the Flood:

> The Al Furat-Anah-Abu Jir Zone is a major cratonic lineament that crosses the north Arabian plate NW-SE for a total distance of about 600 km. It is *strikingly parallel* to the fold trends in the foreland and, as mentioned already, this raises the possibility that these trends are in some way controlled by old lineaments within the Arabian craton (Lovelock, 1984, p. 581) (*em*phasis added).

Also, recent research (Brew et al., 1997) has shed additional light on the dynamics of the Euphrates graben system at depth. We now have an idea of the depth of the sediments in it, and in areas surrounding this lineament. This information is summarized in Figure 6. Even more striking is the discovery of the fact that the Euphrates graben system may be likened to a crustal glue which holds two essentially different crustal systems together:

> The obvious difference in basement depth on either side of the Euphrates graben system could be evidence of a terrane boundary along the Euphrates trend... The stark difference in basement depth across the Euphrates could be an indication of two different crustal blocks accreting somewhat to the southwest of what is now the Euphrates graben system... The possible accretion event in Syria would have to be Proterozoic, or very early Phanerozoic, in age since seismic reflections from the Mid-Cambrian Burj limestone...are continuous across most of Syria... (Brew et al., 1997, pp. 627–628).

Of course, the sharp difference in crustal dynamics on either side of the Euphrates graben need not be understood as two microcontinents having been sutured together. Instead, it may simply indicate that the Euphrates graben is so deep-seated and of such ancient vintage that regions of Earth's crust are free to operate somewhat independently of each other on either side of this lineament. Furthermore, this evidence, along with the Precambrian stratigraphic placement of it, is very consistent with the proposition that the Euphrates graben system existed before the Flood, and governed major tectono-sedimentary processes in the region during the Universal Deluge. If indeed at least part of the antediluvian Tigris-Euphrates River system once existed there, it is easy to see how the Euphrates graben system must have served as the bridge between the antediluvian and post-Flood worlds. It would have governed the course of the antediluvian Tigris and Euphrates Rivers, and then caused the reappearance of these two rivers at essentially the same location after the Flood. This would complete the analogy of a crack in a wall reappearing in the same location despite the addition of a thick new layer of plaster—all because the crack is of deep-seated (not surficial) origin.

Implications Regarding Other Antediluvian Rift Systems

Attention is now focused on some broad applications of the fact that Precambrian rifts have exerted control over various Flood-related depositional events all over the Earth. For example, there is evidence that a variety of other sedimentary basins, are genetically connected by a system of zones of crustal weaknesses (Thomas, 1974). These give rise to lineaments. As areas of crust are stretched or compressed, movement along these deep-seated lineaments causes successive downwarp and uplift of basins:

> Depositional sub-basins appear to be controlled in extent and configuration by the many blocks defined in the framework... Thus, the block system of Precambrian age could to some degree control depositional conditions *throughout the stratigraphic section* (Thomas, 1974, p. 1309) (emphasis added).

One might, at first glance, suppose that large modern rivers are relatively recent features that have little or nothing in common with the underlying geologic structures. Such is far from the case, and it is hardly limited to the Tigris-Euphrates system. According to modern plate tectonic theory, the Amazon, Congo, Niger, and Mississippi Rivers are believed to have formed in failed rift valleys (aulacogens) that had developed orthogonally to the main rift valley which eventually became the Atlantic Ocean. Yet even if one does not believe in continental drift, one can still appreciate the fact that many large rivers of the world are in fact intimately associated with aulacogens that have a long history relative to the fossiliferous strata which covers most of the continents.

Take, for instance, the Mississippi River. Parts of its present course follow aulacogenic structures which are imprinted in Precambrian rock (Ervin and McGinnis, 1975; Dart and Swolfs, 1998). Because, according to mainstream Diluviological thinking, Precambrian rock is largely pre-Flood in origin, and dates back to Creation Week, it follows that at least part of the rift valley which later became the modern Mississippi River was in existence since this planet had been created. It is therefore likely that some form of waterway existed, in at least part of the course of the present-day Mississippi River, before the Flood.

During the Flood, the entire antediluvian topography had most likely been obliterated, and thousands of meters of sedimentary rock had been deposited all over the region. The fault thus became temporarily obscured by the thick carpet of sediments. During and/or after the Flood, however, the aulacogen had at least episodically been tectonically active. In between such episodes of tectonic activity, sediment would fill the rift after each episode of its opening. Eventually, however, there was not enough sediment being deposited to continue plugging up the rift. A linear rift thus eventually opened up permanently, and a valley was thus created for the present-day Mississippi River. This general sequence of events, albeit of course in a uniformitarian context, is show in Figure 5 of Ervin and McGinnis (1975, p. 1293) as well as Figure 1 and Figure 8 of Dart and Swolfs (1998), to which I refer the interested reader.

Theological Implications

Would it not have been infinitely improbable for the Ark to have landed in the same general region, after the Flood, from which it had originated before the Flood? Only if it had been free to drift anywhere over the Earth with equal probability. The Bible is silent on the question of how far the Ark eventually landed from the spot from which it had been launched. We must remember that the Flood currents most probably were far from unidirectional, and hence most likely tended to push the Ark in all directions. This would have been inconsistent with the movement of the floating Ark all over the Earth, for which a strong unidirectional current would have been necessary. More likely, the net distance of Ark travel had been no more than a few thousand kilometers from its original launch site. We must also consider any providential purposes of having the Ark land near this theologically-special region of Earth. In any case, the putative survival of the Tigris-Euphrates system through the Flood requires us to rethink our tacit assumptions about the Ark being moved all over the globe during the Flood. Of course, it is not here suggested that the postdiluvian Tigris-Euphrates river system had been *identical* to its antediluvian counterpart. This follows from the fact that, not only had the topography around the rivers been completely changed as a result of the Flood, but even the Persian Gulf had been smaller in the immediate post-Flood period than it is today (Lambeck, 1996).

The discovery of the fact that the courses of major rivers are governed by deep-seated crustal fault systems completely changes the landscape (pardon the pun) of the argument between compromising evangelicals and those who recognize the clear Biblical teachings on the global extent of the Noachian Deluge. Until now, acceptance of the temporal continuity of antediluvian place-names with their present usage has been taken as *ipso facto* rejection of the global Flood in favor of the local-flood compromise. This is no longer the case. It is astonishing to realize that the antediluvian Tigris-Euphrates system could have survived the deposition of thousands of meters of sedimentary rock on a planet-covering Flood, and then re-emerged in the post-Flood world. We can thus go as far as granting the compromising evangelical his argument about antediluvian place names, as he has now lost his remaining quasi-Biblical argument for a local flood.

Followup Research

If subsequent research verifies the premise that the northwest-trending Najd fault system is unique, in scale and direction, on earth, it would greatly strengthen the conclusion that the present-day northwest-trending Tigris-Euphrates system reflects the reappearance of a very similar northwest-trending antediluvian river system in the same general location and very likely bearing the same name. Further investigation of the Paleozoic rocks located beneath the present-day Tigris-Euphrates River system, extending the research conducted by Brew et al. (1997), is necessary to help clarify how the Euphrates graben, which governs part of the course of the present river system, was active at the start of the Flood. If new evidence corroborates the activity of this structure during deposition of the earliest Phanerozoic sediments of the region, it would strengthen the possibility that the present Tigris-Euphrates system is actually located at the same site as its antediluvian counterpart.

The fact that the courses of the Tigris-Euphrates, and Mississippi, Rivers are controlled by deep-seated rifts can only inspire curiosity about the origins of the world's other major rivers. Once the entire Earth has been tectonically mapped in great detail, it will be possible to determine if most of the world's large rivers are indeed governed by such faults in the Precambrian basement. If such turns out to be the case, we could then conclude that the main antediluvian river systems had re-appeared at nearly the same locations on the post-Flood Earth.

Acknowledgments.

I thank Dr. Steven Austin (ICR) for commenting on an earlier version of this manuscript, and Marv Ross (now-retired ICR artist) for drafting part of the figures.

References

AAPG: American Association of Petroleum Geologists Bulletin
GB: Geological Society of America Bulletin
GE: Geology
GJ: Geophysical Journal International
GL: Journal of the Geological Society of London
GM: Geological Magazine
PE: Journal of Petroleum Geology
TJ: Creation Ex Nihilo Technical Journal

Al-Husseini, M. 1995. GEO 94, 2 Volumes, Gulf Petro-Link. Bahrain.

Al-Jallal, I.A. 1995. The Khuff Formation (pp. 103–119) *In* Al-Husseini, editor, GEO 94, 2 Volumes, Gulf Petro-Link. Bahrain.

Al Khatieb, S.O. and J.W. Norman. 1982. A possibly extensive crustal failure system of economic interest. *PE* 4(3):319–327.

Al-Laboun, A.A. 1988. The distribution of Carboniferous-Permian siliciclastic rocks in the greater Arabian basin. *GB* 100:362–373.

Alavi, M. 1980. Tectonostratigraphic evolution of the Zagrosides of Iran. *GE* 8:144–149.

Alsdorf, D.M., M. Barazangi, R. Litak, D. Seber, T. Sawaf, and D. Al-Saad. 1996. The intraplate Euphrates depression—Palmyride mountain belt junction and relationship to Arabian plate boundary tectonics. *Annali di Geofisica* 38:385–397.

Alsharhan, A.S. and A.E.M. Nairn. 1997. *Sedimentary basins and petroleum geology of the Middle East*. Elsevier, Amsterdam, New York.

Alsinawi, S.A. and A.S. Al-Banna. 1992. An E-W transect section through central Iraq. *Basement Tectonics* 9: 195–200.

Ameen, M.S. 1992. Effect of basement tectonics in hydrocarbon generation, migration, and accumulation in northern Iraq. *AAPG* 76(3):356–370.

Best, J.A. M. Baranzangi, D. Al-Saad, T. Sawaf, and A. Gebran. 1990. Bouguer gravity trends and crustal structure of the Palmyride Mountain belt and surrounding northern Arabian platform in Syria. *GE* 18:1235–1239.

Best, J.A., M. Baranzangi, D. Al-Saad, T. Sawaf, and A. Gebran. 1993. Continental margin evolution of the northern Arabian platform in Syria. *AAPG* 77(2):173–193.

Beydoun, Z.R. 1991. *African plate hydrocarbon geology and potential*. AAPG Studies in Geology 33. American Association of Petroleum Geologists, Tulsa, OK.

Bott, W.F. 1995. Remote Socotra and Ancillary Islands (pp. 216–233), in Al-Husseini, editor, GEO 94, Gulf Petrolink, Bahrain.

Brew, G.E., R.K. Litak, D. Seber, M. Barazangi, A. Al-Imam, and T. Sawaf. 1997. Basement depth and sedimentary velocity structure in the northern Arabian platform, eastern Syria. *GJ* 128:617–631.

Dart, R.L. and H.S. Swolfs. 1998. Continental mapping of relic structures in the Precambrian basement of the Reelfoot rift, North American midcontinent. *Tectonics* 17(2):235–249.

Ervin, C.P. and L.D. McGinnis. 1975. Reelfoot rift: Reactivated presursor to the Mississippi embayment. *GB* 86: 1287–1295.

Goff, J.C., R.W. Jones, and A.D. Horbury. 1995. Cenozoic basin evolution of the northern part of the Arabian plate (pp. 402–412), in Al-Husseini, editor, GEO 94, Gulf Petrolink, Bahrain.

Husseini, M.I. 1989. Tectonic and depositional model of late Precambrian—Cambrian Arabian and adjoining plates. *AAPG* 73(9):1117–1131.

___. 1990. The Cambro-Ordovician Arabian and adjoining plates: A glacio-eustatic model. *PE* 13:276–288.

Ibrahim, M.W. 1979. Shifting depositional axes of Iraq: An outline of geosynclinal history. *PE* 2:181–197.

Jackson, N.J. and C.R. Ramsay. 1980. Time-space relationships of Upper Precambrian volcanic and sedimentary units in the central Arabian shield. GL 137:617–628.

Kashfi, M.S. 1976. Plate tectonics and structural evolution of the Zagros geosynclines, southwestern Iran. *GB* 87: 1486–1490.

___. 1992. Geological evidence for a simple horizontal compression of the crust in the Zagros Crush Zone (pp. 119–130), in Chatterjee, S. and N. Hotton III., editors, *New concepts in global tectonics*. Texas Tech University Press, Lubbock, TX.

Kukal, Z. and A. Saadallah. 1970. Palaeocurrents in Mesopotamian geosyncline. *Geologische Rundschau* 59(2): 666–686.

Lambeck, K. 1996. Shoreline reconstructions for the Persian Gulf since the last glacial maximum. *Earth and Planetary Science Letters* 142:43–57.

Litak, R.K., M. Barazangi, W. Beauchamp, D. Seber, G. Brew, T. Sawaf, and W. Al-Youssef. 1997. Mesozoic-Cenozoic evolution of the intraplate Euphrates fault system, Syria. *GL* 154:653–666.

Litak, R.K., M. Barazangi, G. Brew, T. Sawaf, A. Al-Imam, and W. Al-Youssef. 1998. Structure and evolution of the petroliferous Euphrates graben system, southeast Syria. *AAPG* 82(6):1173–1190.

Lovelock, P.E.R. 1984. A review of the tectonics of the northern Middle East region. *GM* 121:577–587.

Mattes, B.W. and S.C. Morris. 1990. Carbonate/evaporite deposition in the Late Precambrian—Early Cambrian Ara Formation of southern Oman (pp. 617–636), in Robertson, A.H.F., editor, *The geology and tectonics of the Oman Region*. Geological Society (of London) Special Publication No. 49.

Metwalli, M.H., G. Philip, and M.M. Moussly. 1974. Petroleum-bearing formations in northeastern Syria and northern Iraq. *AAPG* 58(9):1781–1796.

Moore, J.M. 1979. Tectonics of the Najd transcurrent fault system, Saudi Arabia. *GL* 136:441–454.

Mortenson, T. 1997. British Scriptural geologists in the first half of the nineteenth century, part 2. *TJ* 11(3): 361–374.

Munday, J.C. 1996. Eden's geography erodes Flood geology. *Westminster Theological Journal* 58:123–154.

Reed, J.K., ed. 2001. *Plate tectonics: A different view*. Creation Research Society Books, St. Joseph, MO.

Ronov, A.B., V. Khain, and S. Seslavinsky. 1984. *Atlas of lithological-paleogeographical maps of the World-Paleozoic*. Leningrad (St. Petersburg).

Ronov, A.B., V. Khain, and A.N. Balukhovsky. 1989. *Atlas of lithological-paleogeographical maps of the World-Mesozoic and Cenozoic of the Continents and Oceans*. Leningrad (St. Petersburg).

Ross, H. 1998. *The Genesis question*. NavPress, Colorado Springs, CO.

Ruiter de, R.S.C., E.R. Lovelock, and N. Nabulsi. 1995. The Euphrates Graben of eastern Syria (pp. 357–368), in Al-Husseini, editor, GEO 94, Gulf Petrolink, Bahrain.

Sawaf, T., D. Al-Saad, A. Gebran, M. Barazangi, J.A. Best, and T.A. Chaimov. 1993. Stratigraphy and structure of eastern Syria across the Euphrates depression. *Tectonophysics* 220: 267–281.

Searle, M.P. 1994. Structure of the intraplate eastern Palmyride fold belt, Syria. *GB* 106:1332–1350.
Seber, D. 1993. Upper crustal velocity structure and basement morphology beneath the intracontinental Palmyride fold-thrust belt and north Arabian platform in Syria. *GJ* 113:752–766.
Setudehnia, A. 1978. The Mesozoic sequence in southwest Iran and adjacent areas. *PE* 1:3–42.
Takin, M. 1972. Iranian geology and continental drift in the Middle East. *Nature* 235:147–150.
Thomas, G.E. 1974. Lineament-block tectonics: Williston-Blood Creek Basin. *AAPG* 58(7):1305–1322.
Watson, J.A. 1997. The division of the Earth in Peleg's days: Tectonic or linguistic? *TJ* 11(1):71–75.
Wells, A.J. 1969. The crush zone of the Iranian Zagros Mountains and its implications. *GM* 106(5):385–514.
Whitcomb, J. and H.M. Morris. 1961. *The Genesis Flood*. Presbyterian and Reformed, Nutley, New Jersey.
Woodmorappe, J. 1999. *Studies in Flood Geology*, Second Edition, Institute for Creation Research, El Cajon, CA.

Note from the Panorama of Science

Time Warp I: The Permian-Triassic Boundary in the Texas Panhandle

John K. Reed*

Time: Whose Problem?

Lyell preceded Darwin: even before organic evolution, uniformitarian deep time was attacking Christian natural history (Reed, 2000), and it has proven an even more intractable problem than evolution for a host of Christians ever since. Many opposed to evolution cannot bring themselves to challenge the bastion of uniformitarian natural history. In fact, old-earth/young earth seems to have formed a major divide between those opposed to organic evolution. Many apparently cannot conceive how a "swimming pool" of uniformitarian earth history can fit into the "tea cup" of biblical history, and they explicitly reject a young earth while knowingly or unknowingly rejecting the Genesis Flood in the process. After all, the biblical presentation of a year-long Flood and its inferred effects can find no place in the geologic column.

But whose problem is time? What if the "swimming pool" is filled with strongly-shaken, warm, carbonated soda? In that case, the pool is full of air trapped in bubbles with only a veneer of "history", and the real substance of uniformitarian natural history is actually insignificant. I believe that this analogy is valid and that most of uniformitarian earth history is hot air, waiting to be revealed as such when the "bubbles" are burst. As creationists are able to do so they accomplish two tasks: (1) resolving their time "dilemma", and (2) presenting uniformitarians with one of their own. For if the physical evidence does not support all those millions of years, then their case is supported only by an argument from a lack of evidence. This problem becomes all the more acute when we realize that as Naturalists, their only possible evidence is empirical (Reed, 2001).

*John K. Reed, Ph.D., 915 Hunting Horn Way, Evans, GA 30809

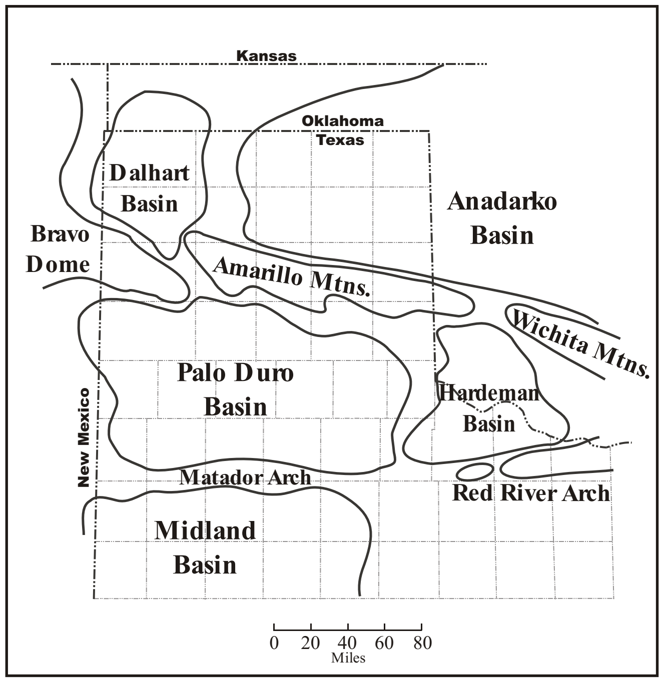

Figure 1. Tectonic sketch of the Texas Panhandle showing basins and arches.

I propose to begin bursting the bubbles of uniformitarian history by documenting "time warps"; places where conflicts arise between the physical evidence of the rock record and the framework of the uniformitarian geologic column. As the bubbles burst, the time problem for uniformitarian natural history will become more and more evident; hopefully encouraging all opposed to Naturalism in its biological manifestations to similarly oppose it in its geological expression. I encourage other creationists to look for similar "warps" and document them in this series.