Is catastrophic plate tectonics part of Earth history?

Michael J. Oard

Catastrophic plate tectonics seems to be sped-up plate tectonics, a paradigm assumed too quickly and with many uniformitarian assumptions, including 'precise' radiometric and fossil dates. New geophysical data sets on subduction zones are contrary to plate tectonic expectations and indicate that subduction is unlikely. Without subduction, plate tectonics and catastrophic plate tectonics is impossible, unless the Earth expands. A cursory description of some of the many other problems associated with plate tectonics is provided. These problems should generally apply to catastrophic plate tectonics. A few unique problems are associated with catastrophic plate tectonics, such as excess heat caused by sliding plates and lava resurfacing, Wilson cycles, and copious post-Flood catastrophism as the ocean-bottom lava cools over a few hundred years. Although I do not need to provide an alternative mechanism in this forum, I lean toward the hypothesis of vertical tectonics, possibly combined with meteorite impacts.

The catastrophic plate tectonics model of Austin *et al*. is a sophisticated Flood model that deserves much attention.[1] I am impressed with all the hard computer modeling work by John Baumgardner. I commend the authors involved in this model for all their effort.

However, I have a number of problems with the model. In this initial presentation of a catastrophic plate tectonics forum, I will state the philosophical problem of borrowing so many uniformitarian deductions from plate tectonics. Then I will briefly mention evidence from new geophysical data sets that subduction is unlikely. This information in more detail has been published elsewhere.[2,3] Without subduction, plate tectonics is impossible unless the Earth expands. I will give a very cursory description of some of the many other problems associated with plate tectonics, which should generally apply to catastrophic plate tectonics. A few unique problems with catastrophic plate tectonics will be brought to the attention of the readers. It is preferable to be able to provide an alternative model, which is briefly introduced in the final section.

Uniformitarian assumptions and 'data' must be substantiated

One of the most significant problems of catastrophic plate tectonics is that the model assumes the truth of many of the data in support of plate tectonics. Plate tectonics itself is based on a host of uniformitarian assumptions and *'precise' radiometric and fossil dates*. Can the authors justify the use of plate tectonics and its many uniformitarian assumptions in their model?[4,5] I might add that even a number of uniformitarian scientists are either totally or somewhat skeptical of plate tectonics or aspects of that paradigm.[6–10]

One of the main philosophical problems with plate tectonics is that in the 1960s scientists accepted plate tectonics too quickly with little critical thought. Those who accepted plate tectonics the earliest were the least familiar with the literature, while later advocates believed plate tectonics more by faith.[11] Plate tectonics was little accepted by scientists until the magnetic anomalies in the ocean crust were discovered in the 1960s.[12] (I may add that it was the very symmetrical *Eltanin*-19 anomaly profile, bolstered by 'precise dates', that was very instrumental in persuading many to believe in plate tectonics. Other anomaly profiles are not as good.[13]) Consequently, there was a wholesale and rapid conversion—a bandwagon effect—to belief in plate tectonics. Because of such uncritical acceptance of plate tectonics, creationists should *thoroughly* examine the paradigm before using it.

There are many problems associated with plate tectonics,[10] some of which will be mentioned below. However, this multitude of problems fails to concern advocates of plate tectonics or catastrophic plate tectonics. Anita Harris believes plate tectonics is a sacred cow; it is too generalized, and crucial knowledge of geology is lacking:[14]

> 'The geology has refuted plate-tectonic interpretations time and again in the Appalachians. Geology often refutes plate tectonics. So the plate-tectonics boys tend to ignore data. The horror is the ignoring of basic facts, not bothering to be constrained by data.'[15]

She says that plate tectonics advocates just look at faunal lists and then match continents,[16] and that much of plate tectonics is story telling.[17] With all these problems within plate tectonics, how can the advocates of catastrophic plate tectonics justify the incorporation of the paradigm into a Flood model?

Subduction unlikely—catastrophic plate tectonics improbable

In view of the quick acceptance of the plate tectonics paradigm, and the practice of fitting almost any observation into it, I have critically analyzed geological observations of subduction zones.[2,3,18] Trenches were envisioned as linear belts of thick sediment accumulated during millions of years of convergence. However, many trench segments are either empty or nearly empty of sediments! The remainder of trenches have moderately thick and *horizontally layered* sediments, indicating a lack of convergence during the time of filling. The trenches were presumed to have been filled with pelagic and hemipelagic sediments from the ocean plate, but instead are filled by turbidites from the land. These anomalous features of trenches are explained by several *ad hoc* mechanisms that seem far fetched.

During the initial enthusiastic days of plate tectonics, oceanic and trench sediments were simply assumed to accrete against a continent or island arc—a backstop as it is called. McCarthy and Scholl remind us:

> 'Prior to the investigations of the Deep Sea Drilling Project and to the acquisition of multi-channel seismic reflection profiles, many geologists envisioned that one general mechanism of subduction accretion operated along underthrust continental margins.'[19]

This makes theoretical sense, but later observations have shown that this is not the case. Many unexpected complexities and anomalies have been discovered over the years. These include the following:

1. 44% of trenches have no accretionary prism,
2. all accretionary prisms are too small,
3. the sediments in these 'accretionary prisms' are predominantly terrigenous,
4. some 'accretionary prisms' have subsided instead of uplifted, and
5. large areas of the continental margin have supposedly been subducted.

Despite the secondary hypothesis of sediment subduction, one can legitimately ask whether landward and arcward slopes show compelling evidence for plate tectonics at all.

Compressive features associated with trenches should be common and obvious, considering that plates supposedly have been converging in the trench area for millions of years, but they are rare.[3,18] The landward slope, if anywhere, should show massive evidence for compressive strain, but except for the lower landward slope, extension is ubiquitous. McNeill *et al*. write:

> 'Listric normal faulting is a common feature of passive margins, where fault movement contributes to crustal thinning and margin subsidence. Extension and normal faulting are also *a fairly common phenomenon on convergent margins throughout the world*. … Discovery of these extensional structures requires a reevaluation of structures previously interpreted as folds and faults related to plate convergence [emphasis mine].'[20]

Von Huene corroborates:

> 'At first glance it may seem paradoxical that in a dynamic system dominated by plate convergence, this convergence does not control structural style.'[21]

Early hypotheses on subduction zones predicted abundant and obvious compressional features, and the fact that there is little evidence for compression should be enough to discredit the hypothesis of plate subduction and hence plate tectonics. Even the convergent features of the lower continental or arc slope could be the lower portions of slumps, as suggested above by McNeill *et al.*[20]

The earthquakes that define the Wadati-Benioff zone are pointed to as proof that one plate is sliding below an upper plate. However, there are many complications with this simple interpretation. The Wadati-Benioff zone comes in many patterns that change along strike. It can even be regionally horizontal, as in the Peru-Chile subduction zone. Seismic gaps commonly occur in the Wadati-Benioff zone near the trench and at intermediate depths, which seems anomalous, especially at shallow depths where the frictional force should be substantial. Wadati-Benioff zones can be vertical, like the Mariana subduction zone. Most interesting is that at intermediate levels the underthrust shearing of one plate past another does not seem to occur; it is more the opposite with a tendency for tension. And most anomalous is that the direction of earthquake fault motion is usually *not* in the plane of the Wadati-Benioff zone but at an oblique angle to it. Furthermore, some deep quakes occur relatively distant from the Wadati-Benioff zone. Double seismic planes are a further complication. There is still a theoretical problem understanding how deep quakes can occur at all when the mantle should be ductile below about 100 km. All these complications point to another mechanism. Vertical tectonics in which the island arc represents *upwelling* of hot mantle, while the trench and Wadati-Benioff zone represent a response to this upwelling, seems to fit most of the observations, including heat flow data and gravity anomalies.

The explanation of mountain building is supposed to be one of the great achievements of plate tectonics. However, a close look reveals many serious problems. First, it is difficult to relate all mountains, volcanoes and deep basins in intracontinental areas to ancient plate tectonics. Secondly, the melting and bubbling up of magma from the subduction zone starting about 100 km deep has troublesome scientific problems, such as how does the liquid gather together and make room for itself? The great chain of the Andes Mountains was supposedly made in this way, but the plate tectonics model is hard pressed to explain this.

Newer data show that subduction is unlikely to have occurred in the past. This makes plate tectonics, as well as catastrophic plate tectonics, impossible unless the Earth expands.

Additional plate tectonics problems

One main problem with plate tectonics is that geophysicists have difficulty providing a mechanism for it.[22] Advocates should not be faulted for this lack, because such a mechanism would be difficult to establish. There are mainly three candidates for a mechanism: 1) horizontal rafting of plates on mantle convection cells, 2) ridge push, and 3) slab pull in subduction zones. Model builders now favor slab pull, where the gravitational potential energy during subduction provides a suction force to drive the plate. However, the potency of slab pull is questionable. Hence the driving mechanism for plate tectonics is still unsolved, and the models of plate motion include many assumptions and simplifications that may be unrealistic.[23] VanDecar, James and Assumpçao[24] believe that slab pull and ridge push appear inadequate to drive large plates.

The earliest evidence used to support continental drift, and hence plate tectonics, was the fit of the continents across the Atlantic Ocean. This inspired meteorologist, Alfred Wegener, early in the 20th century to propose continental drift. The fit seems impressive, as indicated by Bullard's famous fit, although there are some contrary elements to this fit.[25] Woodmorappe questions this and other supposed fits.[5]

There may be other mechanisms besides plate tectonics that cause this 'fit,' such as integrated subsidence and uplift during one global event. Hast[26] hypothesized that the 'fit' of continents could be explained by a common horizontal stress field. Anfiloff suggested:

> 'Moreover, the good fit between the matching coastlines of Africa and South America could be explained in terms of crustal subsidence framed by orthogonal fractures, without requiring sea-floor spreading.'[27]

Anfiloff and Hast have a good suggestion. Thus, the 'fit' could have been caused by differential vertical tectonics in a common stress field that occurred in one world-wide event, namely the Genesis Flood.

Paleomagnetism, especially polar wander paths, early helped persuade scientists for continental drift and eventually plate tectonics. It is important to realize that these old data sets were based on supposedly *accurate K-Ar dates*. Other data sets that depend upon radiometric dating are magnetic anomalies in the ocean crust.[28] It is interesting that most of the authors of the main catastrophic plate tectonics article are involved in questioning radiometric dating,[29] while it is radiometric dating that undergirds much of plate tectonics. Furthermore, paleomagnetism is fraught with problems, most notably the problem of remagnetization.[30,31]

In regard to paleomagnetism, it is interesting how scientists can come up with so many impressive 'data' in support of plate tectonics. I attribute this to the *reinforcement syndrome*, whereby a hypothesis is repeatedly reinforced by further 'data'.[32] Furthermore, I believe that many of the 'proofs' of plate tectonics look impressive at first glance because of the reinforcement syndrome.

Many people have seen pictures of a mid-ocean ridge, which is commonly offset 90° to the ridge axis. These offsets are called 'transform faults.' These faults continue away from the ridge as long fracture zones that can continue across the ocean basins for thousands of kilometers. The mid-Atlantic ridge is especially intriguing because it lies midway between the continents and makes the sea floor spreading scenario appear reasonable. There is now a wealth of complications in interpreting mid-ocean ridges and their 90° offsets by fractures as due to sea floor spreading.[33] There are also other mechanisms that can cause such a ridge-fracture pattern. A special problem is why segments of mid-ocean ridges should end abruptly and begin again up to several hundred kilometers away at a 90° angle.[34] How can such a sharp pattern represent the surface expression of upwelling mantle convection?

On the other hand, an experiment in pulling apart freezing wax resulted in a similar pattern as the mid-ocean ridges with their orthogonal fractures.[35,36] Hast believes that indeed the pattern of the mid-Atlantic ridge and east-west fractures represent an orthogonal fracture system.[26] The pattern of mid-ocean ridges and their 900 fractures could simply be the expression of differential vertical tectonics between the ridge and adjacent abyssal plains.

Supporters of plate tectonics often point to the matching geology and paleontology across the Atlantic as a proof that the continents were joined at one time. However, the geological and paleontological 'fit' across the Atlantic Ocean is exaggerated.[5,37,38] Geologist Anita Harris (formerly Anita Epstein) once wrote papers supporting plate tectonics by showing a conodont match across the North Atlantic, but she more recently states that her previous results are meaningless now, since she has found the same conodonts in Nevada.[39]

There are several large-scale features on the ocean bottom that indicate little plate movement.[40] For instance, the huge Zodiac terrigenous fan lies south of the western Aleutian Islands in the Gulf of Alaska and extends down to about 44°N at 160°W. It is estimated to cover an area greater than 1,000,000 km^2 with a volume of 280,000 km^3. The northern proximal part of the fan lies on the southern lip of the Aleutian trench. The material came from the north in western Alaska *across the eastern Aleutian Trench*. The fan is considered of early Cenozoic age, indicating that the Aleutian Trench is a relatively recent feature within the uniformitarian time scale. Since the fan is on the Pacific plate, and the Pacific plate has been moving generally northwest, this fan would have been well out in the Pacific Ocean, 1,500–3,000 km from the nearest continental landmass, in the early Cenozoic.[41] If it was well out into the ocean, where did the fan collect all its terrigenous sediment, assuming plate tectonics is true?

The above are only some of the major problems with plate tectonics. There are many more, such as Africa and Antarctica surrounded by spreading ridges with no compensating subduction zones.[42] In fact, the African plate is well known for extensional features, such as the Eastern African rift, which is the opposite to that expected.

Unique problems with catastrophic plate tectonics

Although catastrophic plate tectonics may 'solve' a few of the problems of plate tectonics, such as providing a possible mechanism, it creates new problems. One of these problems is the high heat generated by rapid plate sliding.

Another problem is how do advocates handle all the claimed pre-Mesozoic plate motions, such as Wilson cycles,[43] suggested by mainstream scientists?

A further problem is that all the ocean basins were resurfaced by hot lava during the Flood. This hot lava not only contributes to the heat problem of the Flood, but also as the lava cools the ocean floor would subside for hundreds of years.[44] Hence, advocates of catastrophic plate tectonics must believe in copious post-Flood catastrophism, in which the continents rise to balance the sinking ocean basins. This post-Flood catastrophism is relegated to the Cenozoic within the geological column. One of the problems with this is that the Cenozoic is supposed to be a very catastrophic period, especially if telescoped within a few hundred years. According to mainstream geologists, mountains were built, eroded, and rebuilt during this period. Volcanism was extensive. Thick continental shelves were mostly formed from copious continental erosion during the Cenozoic. Earthquakes must have been monstrous. One can seriously question whether humans would have survived all this post-Flood catastrophism. There are many more problems with the suggestion of post-Flood catastrophism.[45–50]

Vertical tectonics—an alternative mechanism

Advocates of catastrophic plate tectonics will likely challenge me to provide an alternative mechanism. Although philosophically I have no need to provide an alternative, nevertheless I have an hypothesis to offer. It is the mechanism of vertical tectonics with a little horizontal motion, alluded to in the sections above. (At this moment in time, I lean towards meteorite impacts to start and/or sustain the Flood.) Evidence for *vertical tectonics* is ubiquitous on the continents. For instance, most of the mountain ranges of the world have marine fossils. Mount Everest is capped by limestone that contains marine crinoid fossils. This represents at least 9 km of vertical uplift, sea level fall, or both.

I believe the evidence used in support of plate tectonics can support vertical tectonics. With proper understanding, I believe mid-ocean ridges, ocean floor magnetic anomalies, and the 'fit' of the continents across the Atlantic, etc. can be explained within the paradigm of vertical tectonics during the Flood. I interpret the forearc areas of trenches as caused by rapid sedimentation and downward vertical tectonics of the ocean basins during the later stages of the Genesis Flood. This was a time when Flood water was draining off the uplifting continents, first as sheet flow and second by more channelized flow, according to the Biblical Flood model of Tas Walker.[51] The continents were uplifted while the ocean basins subsided. At the margins of continents, massive slumping and mass movement of newly deposited, consolidated to semi-consolidated sediments would be expected at many scales. The normal faults on the continental shelves and upper slopes are evidence for this slumping. Thus, the lower slopes would simply be the toe of large slumps or mass movement debris. Forearc ridges and basins would be the topographic expression of these processes, as suggested by McNeill *et al*.[20]

References

1. Austin, S.A., Baumgardner, J.R., Humphreys, D.R., Snelling, A.A., Vardiman, L. and Wise, K.P., Catastrophic plate tectonics: a global Flood model of Earth history; in: Walsh, R.E. (Ed.), *Proceedings of the Third International Conference on Creationism, Technical Symposium Sessions,* Creation Science Fellowship, Pittsburgh, pp. 609–621, 1994.
2. Oard, M.J., Lack of evidence for subduction renders plate tectonics unlikely: Part I—Trench sediments and accretionary prisms, *CRSQ* **37**(3):142–152, 2000.
3. Oard, M.J., Lack of evidence for subduction renders plate tectonics unlikely: Part II—Extension dominant at 'convergent subduction zones', *CRSQ* **37**(4):227–234, 2001.
4. Reed, J.K., Bennett, C.B., Froede Jr., C.R., Oard, M.J. and Woodmorappe, J., An introduction to plate tectonics and catastrophic plate tectonics; in: Reed, J.K. (Ed.), *Plate Tectonics: A Different View*, Creation Research Society Monograph **10**, St Joseph, pp. 11–23, 2000.
5. Woodmorappe, J., Continental fits revisited as a non-evidence for continental drift; in: Reed, Ref. 4, pp. 77–92.
6. McPhee, J., *In Suspect Terrain*, Farrar, Straus and Giroux, New York, 1983.
7. Beloussov *et al*. (Eds), *Critical Aspects of the Plate Tectonics Theory—Volume I (Criticisms on the Plate Tectonics Theory)*, Theophrastus Publications S.A., Athens, 1990.
8. Beloussov *et al*. (Eds), *Critical Aspects of the Plate Tectonics Theory—Volume II (Alternative Theories)*, Theophrastus Publications S.A., Athens, 1990.
9. Chatterjee, S. and Hotton III, N. (Eds), *New Concepts in Global Tectonics*, Texas Tech University Press, Lubbock, 1992.
10. Oard, M.J., Literature criticisms of plate tectonics; in: Reed, Ref. 4, pp. 25–64.
11. Nitecki, M.H., Lemke, J.L., Pullman, H.W. and Johnson, M.E., Acceptance of plate tectonic theory by geologists, *Geology* **6**:661–664, p. 662, 1978.
12. Glen, W., How science works in the mass-extinction debates; in: Glen W. (Ed.), *The Mass-Extinction Debates: How Science Works in a Crises*, Stanford University Press, Stanford, pp. 39–91, 1994; p. 75.
13. LeGrand, H.E., *Drifting Continents and Shifting Theories*, Cambridge University Press, New York, p. 216, 1988.
14. McPhee, Ref. 6, pp. 120, 121.
15. McPhee, Ref. 6, p. 209.
16. McPhee, Ref. 6, p. 130.
17. McPhee, Ref. 6, p. 140.
18. Oard, M.J., Subduction unlikely—Plate tectonics improbable; in: Reed, Ref. 4, pp. 93–145.
19. McCarthy, J. and Scholl, D.W., Mechanisms of subduction accretion along the central Aleutian Trench, *Geological Society of America Bulletin* **96**:691–701, 1985; p. 691.
20. McNeill, L.C., Piper, K.A., Goldfinger, C., Kulm, L.D. and Yeats, R.S., Listric normal faulting on the Cascadia continental margin, *J. Geophysical Research* **102**(B6):12123–12138, 1997; p. 12123.
21. von Huene, R., To accrete or not accrete, that is the question, *Geologische Rundschau* **75**(1):1–15, 1986; p. 3.
22. Oard, Ref. 10, pp. 44–45.
23. Kerr, R.A., Earth's surface may move itself, *Science* **269**:1214–1215, 1995.

24. VanDecar, J.C., James, D.E. and Assumpçao, M., Seismic evidence for a fossil mantle plume beneath South America and implications for plate driving forces, *Nature* **378**:25–31, 1995; p. 25.
25. Snelling, A.A., Plate tectonics: have the continents really moved apart? *CEN Tech. J.* **9**(1):12–20, 1995, p. 13.
26. Hast, N., The state of stress in the upper part of the Earth's crust, *Tectonophysics* **8**:169–211, 1969.
27. Anfiloff, V., The tectonic framework of Australia; in: Chatterjee and Hotton III (Eds), Ref. 9, pp. 75–109; p. 90.
28. Snelling, Ref. 25, p. 15.
29. Vardiman, L., Snelling, A.A. and Chaffin, E.F. (Eds), *Radioisotopes and the Age of the Earth: A Young-Earth Creationist Research Initiative*, Institute for Creation Research and Creation Research Society, El Cajon and St Joseph, 2000.
30. Oard, Ref. 10, pp. 29–35.
31. Woodmorappe, Ref. 5, pp. 82–83.
32. Oard, M.J., *Ancient Ice Ages or Gigantic Submarine Landslides*? Creation Research Society Monograph **6**, St. Joseph, pp. 11–13, 1997.
33. Oard, Ref. 10, pp. 35–38.
34. Hill, M.L., Transform faults; in: Kahle, C.F. (Ed.), *Plate Tectonics—Assessments and Reassessments*, American Association of Petroleum Geologists Memoir **23**, Tulsa, pp. 240–243, 1974.
35. Oldenburg, D.W. and Brune, J.N., Ridge transform fault spreading pattern in freezing wax, *Science* **178**:301–304, 1972.
36. Ghosh, S.K., An experimental study of ridge offsets in relation to trends of ridge and transform faults, using wax models; in: Chatterjee and Hotton III (Eds), Ref. 9, pp. 23–32.
37. LeGrand, Ref. 13, p. 56.
38. Oard, Ref. 10, pp. 38–41.
39. McPhee, Ref. 6, p. 127.
40. Oard, Ref. 10, pp. 45–46.
41. Stevenson, A.J., Scholl, D.W. and Vallier, T.L., Tectonic and geologic implications of the Zodiac fan, Aleutian abyssal plain, northeast pacific, *Geological Society of America Bulletin* **94**:259–273, 1983.
42. Froede, Jr., C.R., The expanding African plate: a problem within plate tectonics and catastrophic plate tectonics; in: Reed, Ref. 4, pp. 65–76.
43. Froede, Jr., C.R., Questions regarding the Wilson cycle in plate tectonics and catastrophic plate tectonics; in: Reed, Ref. 4, pp. 147–160.
44. Austin *et al*., Ref. 1, p. 615.
45. Holt, R.D., Evidence for a Late Cainozoic Flood/post-Flood boundary, *CEN Tech. J.* **11**(1):128–167, 1996.
46. Oard, M.J., Where is the Flood/post-Flood boundary in the rock record? *CEN Tech. J.* **10**(2):258–278, 1996.
47. Oard, M.J., Dinosaurs in the Flood: a response, *CEN Tech. J.* **12**(1):69–86, 1998.
48. Morris, H.M., The geological column and the Flood of Genesis, *CRSQ* **33**:49–57, 1996.
49. Woodmorappe, J., Studies in Flood geology: clarifications related to the 'reality' of the geological column, *CEN Tech. J.* **10**(2):279–290, 1996.
50. Froede, Jr., C.R. and Reed, J.K., Assessing creationist stratigraphy with evidence from the Gulf of Mexico, *CRSQ* **36**:51–60, 1999.
51. Walker, T., A Biblical geologic model; in: Walsh, R.E. (Ed.), *Proceedings of the Third International Conference on Creationism, Technical Symposium Sessions,* Creation Science Fellowship, Pittsburgh, pp. 581–592, 1994.

Dealing carefully with the data

John R. Baumgardner

Michael Oard's first contribution in this forum lays out a valid criticism of uniformitarian plate tectonics—namely the quantity and character of the sediments in the deep ocean trenches. His paper is to be considered a valuable contribution to the discussion for that reason alone. This single difficulty for uniformitarian plate tectonics, however, is not sufficient justification for ignoring other key issues or not treating them carefully. It seems to me Oard's conviction that the data from trenches falsifies the entire concept of plate tectonics, somehow in his mind, gives him authority to be careless with other issues. On several points his approach is to construct a straw man, one hardly anyone in the Earth-science community would consider representative of the observational facts, and then criticise it. This gives the impression to people not familiar with these facts that the case for plate tectonics is not to be trusted. He does this for the evidential basis for plate tectonics as a whole, as well as for specific issues such as Wadati-Benioff zones, the fit of continents across the Atlantic, transform faults, spreading ridges surrounding Africa and Antarctica, among others. On the other hand, I believe Oard's arguments concerning the quantity and character of the sediments in the deep ocean trenches to be valid. He is correct in pointing out that these observations are contrary to what uniformitarian plate tectonics predicts. However, in assuming these same inconsistencies also apply to catastrophic plate tectonics, he fails to appreciate that most of the plate motion takes place during the most intense, transgressive phase of the Flood, before the runoff producing the trench sediments occurs. Sediments now filling the trenches are almost entirely a product of that runoff from the continents during the regressive stage of the catastrophe itself and the centuries since when plate speeds were minuscule by comparison. Finally, his claim to have a genuine alternative mechanism involving vertical tectonics is hollow if, as for the case of catastrophic plate tectonics, the term 'mechanism' is taken to include a clearly defined source of energy and a clearly defined means that harnesses this energy to perform the geological work demanded by the observational data.

A more complete picture of the evidential basis for plate tectonics

As I emphasized in my first contribution to this forum, the issue on which the ultimate validity of the plate tectonics