

Issue #11: Tectonic Rates

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Assertions:

1. The Earth's crust is split into tectonic plates that are constantly in motion.
2. Currently plates move at rates that do not exceed a few inches per year.
3. YEC propose "catastrophic plate tectonics" (CPT) that demands that the continents moved at enormous rates (meters/sec)
4. Geologic data of many types support slow rates of movement

Key assumptions:

- a) any ancient catastrophic rates for the continents would be evident from the deformation and temperature effects recognizable in rocks
- b) fossil and sediment deposited in oceans that opened at catastrophic rates would reflect that rapid sedimentation and mixing of fossils

Discussion:

The earth's rocks show us that many different episodes of mountain building (orogeny) have occurred. What drives them? Whitcomb and Morris (1961) picked up on this question. Here is their comment:

"In general, there are currently two main hypotheses of mountain-building. One depends on thermal contraction of the crust, the other on subcrustal convection currents. Another, the theory of continental drift is at present running a poor third."

Once again, time has not helped or increased the credibility of their book. Modern scientists and many YEC authors recognize the validity of plate tectonics and continental drift. YEC authors such as Austin, Baumgartner, Snelling and Clarey embrace plate tectonics, often using the same evidence that other scientists use. Dr. Clarey's book, "*Carved in Stone*" includes a full chapter explaining why plate tectonics fits his model. The YEC version, CPT, places almost all the motion during Noah's flood. A tremendous number of events had to occur within that one year.

Here are some of the observations that support the deep time explanation:

- Radiometric dates agree with GPS rates Why?

"Rates of plate motion predicted from dating ancient rocks yield the same rates as GPS measurements of real-time plate motions." (<https://thenaturalhistorian.com/2014/09/10/smoking-gun-evidence-of-ancient-earth-gps-data-confirms-radiometric-dating/>) If one rejects the validity of radiometric dates,

then this observation provides another issue to be explained by some other mechanism. The data is the data regardless. **(Figure 1)**

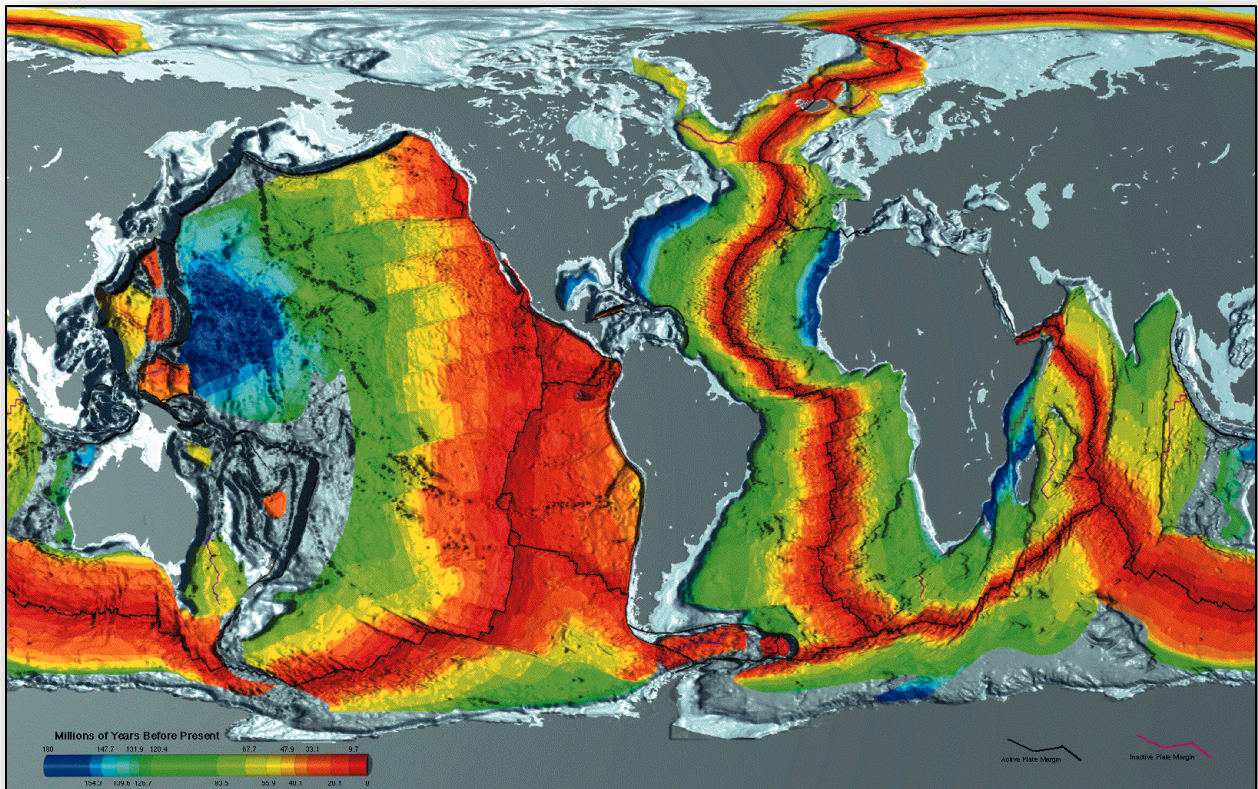


Figure 1. Age of the oceanic crust based on radiometric dating. The oldest crust, green and blues are near the continents, while the youngest is along divergent margins.

There are many examples such as today, the Arabian Peninsula is colliding with Asia (**Figure 2**). GPS

tracking shows it is moving at 19mm/yr, one of the highest rates of plate movement on earth (Hessami et al, 2006). This opens up the Red Sea as a rift basin, such as we find over and over down the Atlantic margin from the Mesozoic.



Figure 2. Map based on reconstruction of the plate motion that has brought the Arabian and African plates against Eurasia. This resulted in large scale compression and the uplift that formed the Zagros Mountains.

Christian geologist, Dr. Lorence Collins wrote this article: “*Emperor Seamount Chain and Hawaiian Ridge – Ancient Age or 4,350 Years Old*” (<http://www.csun.edu/~vcgeo005/Nr61Hawaii.pdf>) In it, he describes how radiometric data along the volcanic island chain consistently fit the deep time model of plate movement rates.

- We see uplift today where we should

It is not just horizontal movement that fits. With today's GPS technology, we can measure uplift in the Himalayas, Sierra Nevadas, and a host of other places where geologist's predicted uplift to be occurring and it has been confirmed.

- Present earthquakes (**Figure 3**)

Earthquakes today follow plate boundaries as one should expect if plates were moving at the rates that we see today. Evidence suggests similar rates in the past.

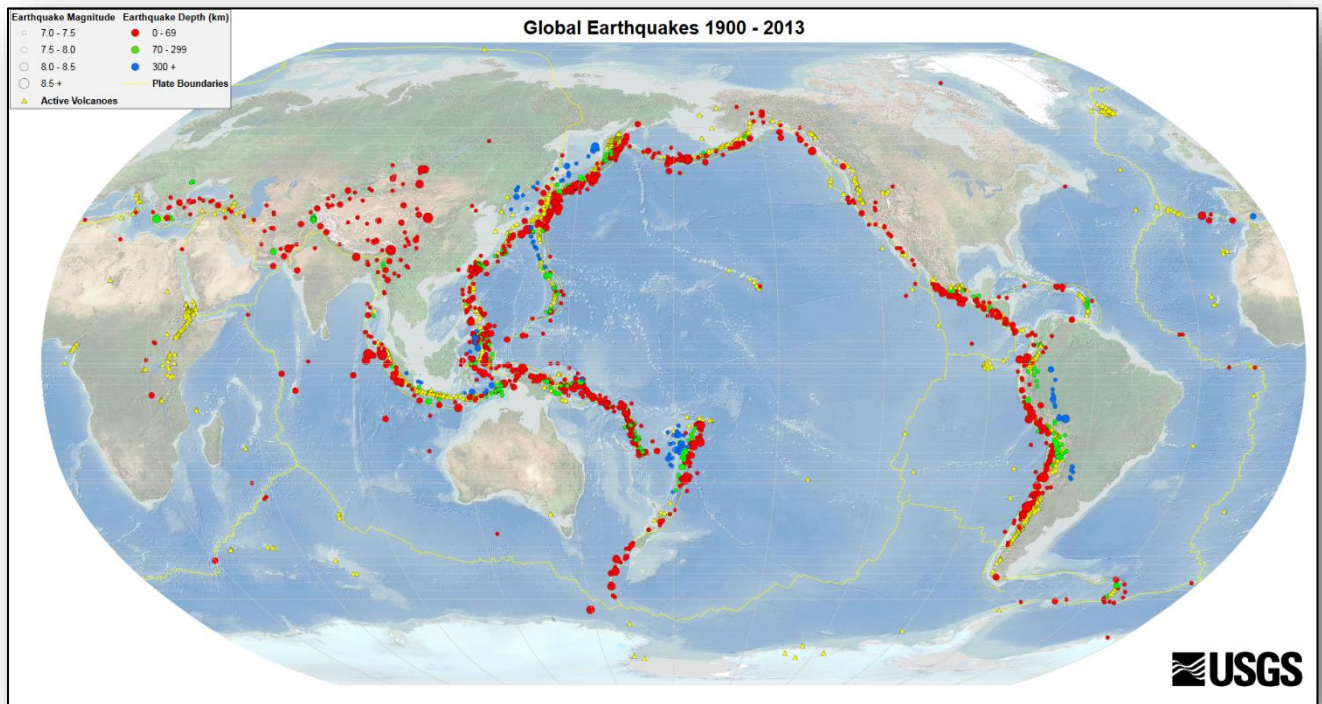


Figure 3. Global earthquake map that helps define the plate boundaries

- Deformation styles

We see a series of styles of plate boundaries and the activity along them is consistent with that slow rate of movement. Consider the active volcanics in Iceland today. **(Figure 4)** The fault movements and volcanics are consistent with slow plate movements as the North American and European plates are moving apart.

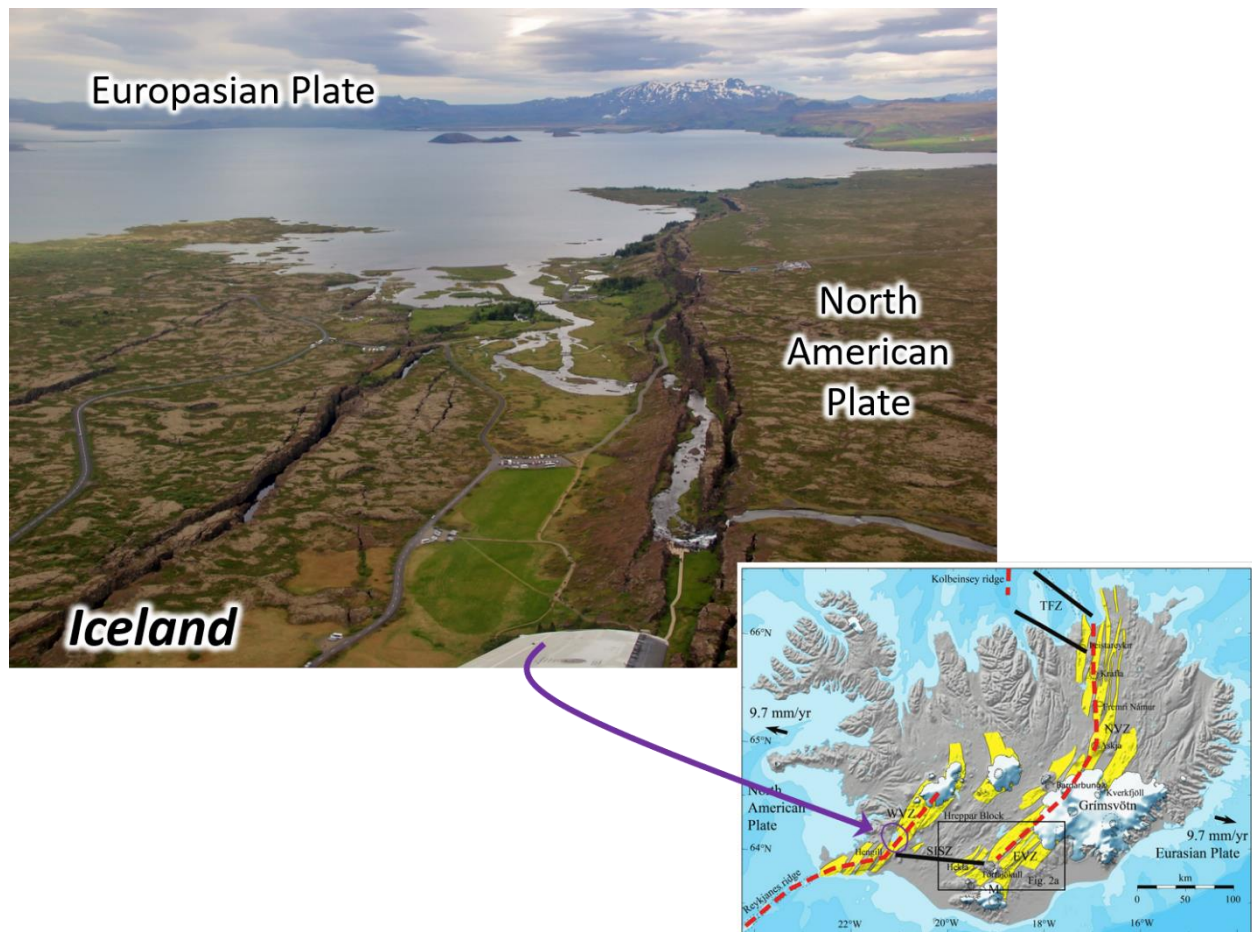


Figure 4. Photo that I took in Iceland showing a divergent plate boundary. Volcanos remain very active today.

We find rifting, thrust faults, strike-slip zones as plates slide past each other such as along the San Andreas fault. We find major collision zones from plate collisions such as in the Zagros and Himalaya Mountains. We find older collisions that gave us the Appalachians and the Marathon-Ouachita fold belt highlighted in Issue 2. The scale of deformation is quite consistent with modern rates.

Using John Baumgartner's published models, Dr. Clarey claims that driven by CPT the continents moved at rates of "meters per second" (p. 131). The deformation associated with such movement would be drastically more than we see evidenced. God could have moved them at such rates, but would hardly have hidden the evidence.

Sean Ovis commented in another group:

"Plates currently move at cm per year. If you increase the speed to metres per second, then you are increasing the rate by a factor of over 3 billion. That means the kinetic energy involved in moving the plate increase by a factor of around 10^{19} .

*Putting aside the issue of where the energy comes from, it is where the energy goes to that is the problem. **Stopping a continental plate moving at metres per second would generate phenomenal amounts of heat - quite sufficient to melt the plate.**"*

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I remember waiting on my brakes to cool while driving down mountains in the Rockies. Slowing down a continent would have generated heat that would be reflected in the rocks.

- Biostratigraphy & tectonic rates

The fossil record is consistent with the timing we find across the various continents. For instance, between Africa and Brazil, the oldest rift sediments in the southern areas are older than those in Northern Africa because the plates started moving from the south as the Atlantic was created by the opening or unzipping that started in the south. We find such relationships along every continental margin.

- Magnetic stripes

As lava cools, iron in it freezes into position, based on the magnetic field at the time. The north and south magnetic poles have flipped repeatedly through the rock record. We see this preserved in magnetic stripes across the oceans. We also see that in lavas and other magnetic rocks onshore. We find that vertically as we drill wells. Significantly the age based on fossils, radiometric dating, and magnetic polarity changes all give the same picture of plate movement. The magnetic poles were not flipflopping every few days through any flood.

- Seismic profiles

Seismic profiles extend across all of the continental margins today. I have interpreted thousands of these, particularly in the Gulf of Mexico and Atlantic basins. The styles of sedimentation and structure revealed are quite variable, but do not show any pattern that reflects a flood. We see river deltas, salt movement, folding, faulting, rifting, strike-slip movement...many forms and styles but they reflect deposition and deformation over deep time... not CPT.

YEC explanations:

Do YEC models work? Have YEC generated models that explain the sediment load that we observe? Tim Helble pointed out that Dr. Clarey's statement in *"Carved in Stone"*: *"Dr. John Baumgardner demonstrated that cavitation..."* is loaded with hidden issues that his readers will likely not be aware of. It turns out Baumgardner never actually demonstrated that the cavitation process could accomplish such phenomenal erosion. (Tim Helble, personal communication).

"When Baumgardner set up his tsunami erosion model, he misused a simple expression from a scientific publication (Whipple et al., 2000) that was intended to describe what cavitation is proportional to in a steep gradient, bedrock river channel. He then converted this expression to an equation to calculate cavitation by creating a proportionality constant "E" and assigned this parameter a constant value (1.0×10^{-6}). This value seems small, but there wasn't really any research to substantiate it. When Baumgardner executed his model, his value for "E" caused the equation to simulate an astounding amount of continuous erosion from coastal zones -- about 25 vertical feet per day for the first 20 days of the Flood and similar amounts after that. The parameter value is clearly unrealistic, because known river gorges exist with high flow velocities that are close to those in Baumgardner's global Flood scenario. While Whipple et al. showed that cavitation occurs in such gorges, the channels have existed for at least hundreds of years with barely perceptible change and

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haven't been obliterated by cavitation as Baumgardner's erosion equation would suggest. For example, water flowing over Niagara Falls reaches speeds up to 68 mph, yet the falls have only migrated upstream about 1,000 feet since recorded observations started in 1678."

Models often just prove that some assumptions are wrong. They involve initial conditions, inputs and equations, any of which can be wrong. Dr. Baumgardner's model may generate the outcome he wants, but it doesn't provide any real support for the CPT model. In general, if my explanation for geology required continents running around the Earth at the proposed rates, I would be very hesitant to show it. Remember, YEC authors are claiming to show a series of cause and effects, not a long series of unexplainable miracles.

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