Chapter 7

The Continents Rise and the Ocean Basins Sink

At the same time that individual mountain ranges rose and valleys and basins sank, there was also a large-scale uplift of the present continents and sinking of the ocean basins. There is much evidence for large-scale differential vertical tectonics, which will be briefly summarized in this chapter.

The Continents Uplifted out of the Floodwater

During large-scale rearrangement, the continents rose out of the Floodwater relative to the ocean basins. (It is possible that only the continents uplifted or only the ocean basins sank, but the results would be the same.) Water would pour off the continents and into the ocean basins. Figure 7.1 presents a schematic of the large-scale rising of the continents and sinking of the ocean basins as well as some of the large-scale events that took place early in the Retreating Stage of the Flood.

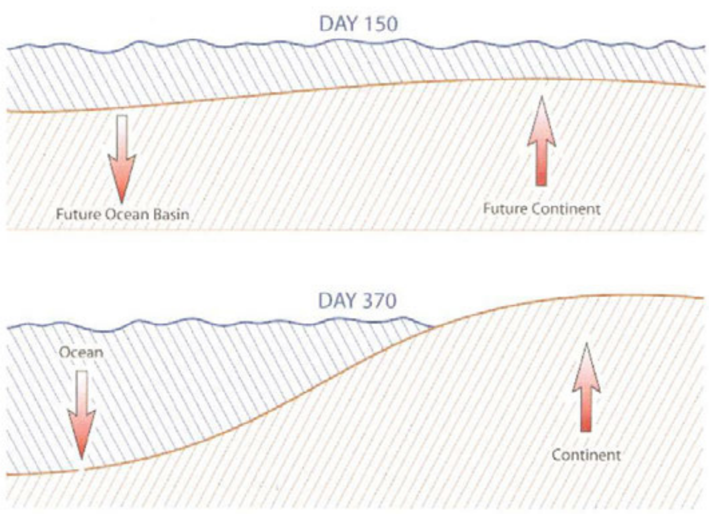

Figure 7.1. Schematic of vertical uplift of the future continents and subsidence of the ocean crust during the Retreating Stage of the Flood (drawn by Mark Wolfe).

When large scale differential vertical tectonics began in the United States, strong Flood currents were most likely moving from west to east. This is based on the huge amount of quartzite cobbles and boulders that were transported and found today to the east of their source in the western Rocky Mountains (see Part IV of this volume). The predominantly eastward direction could have been caused by the Coriolis force generated from the spin of the earth.[1] As the Retreating Stage progressed and mountains and plateaus became exposed, more channelized currents flowed from the rising land toward the

[1] Barnette, D.W. and J.R. Baumgardner, 1994. Patterns of ocean circulation over the continents during Noah's Flood. In, Walsh, R. E. (editor), *Proceedings of The Third International Conference on Creationism*, Technical Symposium Sessions, Creation Science Fellowship, Pittsburgh, PA, pp. 77–86.

ocean basins. The large current flowing east would have been broken up by the northern Rocky Mountains causing the flow to be more channelized and flow both east and west of the rising Rockies (Figure 7.2).

During the Retreating Stage, there would have been much faulting from extension of the surface rock during uplift. Much of the vertical motion would have been concentrated at normal faults, steeply dipping faults where one side rose and/or the other side dropped. If the faulting intersected magma chambers below the ground, there would have been eruptions of volcanoes and large flows of lava, such as the Columbia River Basalts in the Pacific

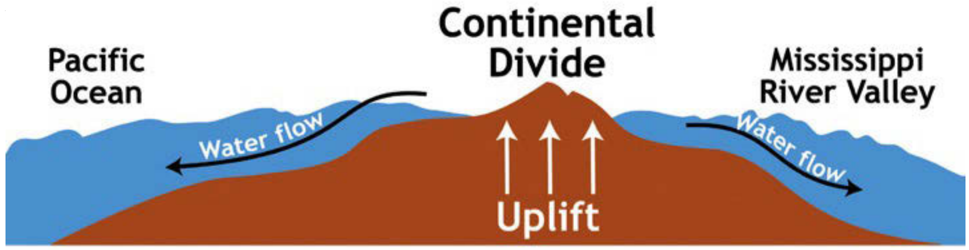

Figure 7.2. Schematic of the water rushing east and west off the rising Rocky Mountains of the western United States, USA (drawn by Daniel Lewis).

The Ocean Basins Sank

There is also evidence that the ocean basins sank at the same time. There are two main pieces of evidence: 1) the subsurface geology of the continental margins, and 2) the presence of flat-topped submarine volcanoes on the ocean bottom far from land, called guyots.

The energy of the Floodwater runoff would have been *increased* by the coordinated continental uplift and oceanic subsidence. The combination likely would have produced currents moving well over 100 mph (160 kph) at times, causing massive, deep erosion of the continents. The combination can be likened to lifting a dish up in the dishwater while the drain is fully open causing the water to rush off the plate.

Huge Differential Vertical Tectonics Continental Margins

Evolutionary geomorphologist Lester King, as well as many other scientists, recognized that offshore areas of continents have sunk by many thousands of feet (well over 1,000 m).[2,3] Sinking accommodated tens of thousands of feet of sediments in some areas just offshore (see Chapter 30). In southeast Africa, King recognized this pattern as *the land rising and the ocean basins sinking* along the continental margin with the dividing line between rising and sinking, the hinge line, near the coast: "These displacements are (or can be) always in the same sense, land up—ocean floor down." [4] A quote by King in Chapter 5 says it all and is worth repeating (notice the adjectives):

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[2] King, L.C., 1982. *The Natal Monocline*, second revised edition. University of Natal Press, Pietermaritzburg, South Africa.

[3] King, L.C., 1983. *Wandering Continents and Spreading Sea Floors on an Expanding Earth*, John Wiley and Sons, New York, NY.

[4] King, Ref 2, p. 35.

> So the fundamental tectonic mechanisms of global geology are *vertical, up or down*: and the normal and most general tectonic structures in the crust are also vertically disposed … But one must bear in mind that every part of the globe—on the continents or in the ocean basins—provides direct geological evidence that formerly it stood at different levels, up or down, and that it is subject *in situ* to vertical displacements (emphasis his).[5]

The same pattern is seen along other continental margins the world over. Chardon and others describe the tectonics along the continental margin of northwest Africa:

> Furthermore, subsidence of the outer slope of the Guinea passive margin was fast and constant during the Late Jurassic and Lower Cretaceous … These movements indicate downwarping of the pre-break-up land surface (i.e. the paleoplain of Ollier and Pain, 1997) and corresponding inland surface uplift.[6]

Wigley and Compton concluded that southwest Africa uplifted while the adjacent continental shelf sank late in geological time.[7]

Such differential vertical motion is also recognized in the eastern United States and the offshore continental margin. Poag and Sevon stated: "The primary forcing mechanisms considered have been tectonic and isostatic uplift and subsidence…"[8] Tectonic uplift of the eastern United States is believed to have caused massive erosion of the Appalachians, while the total amount of subsidence along the continental margin is believed to be 45,900 feet (14 km)![9,10] That is a huge amount of differential vertical tectonics in a short distance! The water would rush off the eastern Appalachians at high speeds. No wonder the Appalachians are highly eroded (see Appendix 4). The differential vertical tectonics just in the eastern U.S. and its margin is much greater than that of Mount Everest which rose out of the Floodwater by over 30,000 feet (9,145 m) (see Chapter 4).

Differential vertical tectonics along the East Coast of the United States caused the rocks to crack and extend causing deep rift basins to be aligned parallel to the coast and the Blue Ridge Mountains.[11,12,13] The basins below the coastal plain, continental shelf, and continental slope filled up with sediments. One of the deepest basins along the continental margin is the Baltimore Canyon Trough off the central East Coast of the United States extending from just off Cape Hatteras to Long Island.[14] The Baltimore

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5 King, Ref 3, pp. 16, 71.

6 Chardon, D., V. Chevillotte, A. Beauvais, G. Grandin, and B. Boulangé, 2006. Planation, bauxites and epeirogeny: one or two palaeosurfaces on the West African margin? *Geomorphology* 82:278.

7 Wigley, R.A. and J.S. Compton, 2006. Late Cenozoic evolution of the outer continental shelf at the head of the Cape Canyon, South Africa. *Marine Geology* 226:19.

8 Poag, C.W. and W.D. Sevon, 1989. A record of Appalachian denudation in postrift Mesozoic and Cenozoic sedimentary deposits of the U.S. middle Atlantic continental margin. *Geomorphology* 2:119.

9 Poag, C.W., 1992. U.S. middle Atlantic continental rise: provenance, dispersal, and deposition of Jurassic to Quaternary sediments. In, Poag, C.W. and P.C. de Graciansky (editors), *Geological Evolution of Atlantic Continental Rises*, Van Nostrand Reinhold, New York, NY, pp. 100–156.

10 Poag and Savon, Ref. 8, pp. 119–157.

11 Hack, J.T., 1989. Geomorphology of the Appalachian Highlands. In, Hatcher, Jr., R.D., W.A. Thomas, and G.W. Viele (editors), The Geology of North America, Volume F-2, *The Appalachian-Ouachita Orogen in the United States, Geological Society of America*, Boulder, CO, pp. 459–470.

12 Schlische, R.W., 1993. Anatomy and evolution of the Triassic-Jurassic continental rift system, Eastern North America. *Tectonics* 12(4):1,026–1,042.

13 Pazzaglia, F.J. and T.W. Gardner, 1994. Late Cenozoic flexural deformation of the middle U. S. Atlantic passive margin. *Journal of Geophysical Research* 99 (B6):12,143–12,157.

14 Pickering, K.T., R.N. Hiscott, and F.J. Hein, 1989. *Deep-Marine Environments*. Unwin Hyman, London, U.K., pp. 263–269.

Canyon Trough parallel to the coast is 250 miles (400 km) long with a maximum depth of 11 miles (18 km) of sedimentary rock![15] This basin or trough covers 78, 000 mi^2 (200,000 km2). Another deep basin off Newfoundland, Canada, is the Jeanne d'Arc Basin. It contains a depth of 12.5 miles (20 km) of sedimentary rock.[16] Truly, differential vertical tectonics along the continent margins was stupendous and would have caused high velocity seaward flowing currents and a rapid filling of these deep coastal rifts.

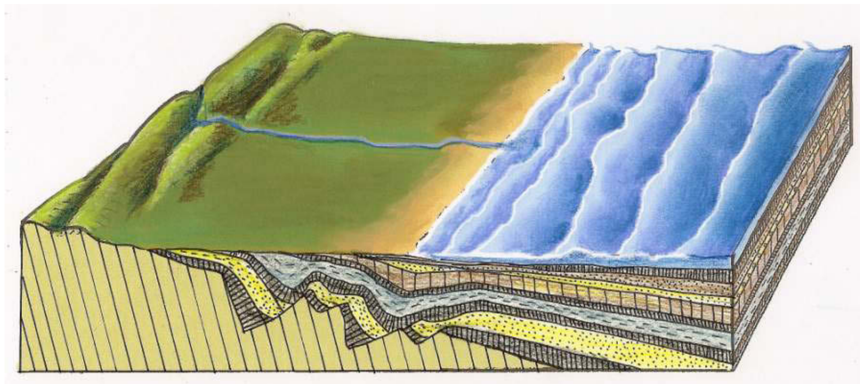

Figure 7.3. Seaward thickening wedge of sedimentary rocks (drawn by Mrs. Melanie Richard).

The rift basins would have filled up with sediment eroded from the continent. Then the continental margin would be covered by a sheet of sediments forming the continental shelf and slope, which is a seaward thickening wedge of sedimentary rock (Figure 7.3).

Guyots Indicate Oceanic Subsidence Far from Land

Guyots are an indication the ocean basins also sank far but this time far from land. A guyot is a flat-topped seamount, which is defined as simply an elevation of the sea floor greater than 3,300 feet (1,000 m) high above its immediate surroundings. They are either flat-topped (a guyot) or peaked.[17] (However, there is a definition problem with seamounts because not all marine geologists define a seamount as higher than 3,300 feet (1,000 m). Besides adding to the confusion, such a loose definition also results in more than a million seamounts on the floor of just the Pacific Ocean.[18] I will stick with the original definition.) Most seamounts are extinct volcanoes. Figure 7.4 shows a schematic of a guyot while Figure A2.1 in Appendix 2 shows the actual silhouette of Resolution Guyot in the underwater Mid-Pacific Mountains. The in-depth section at the end of the chapter provides more information on seamounts and guyots.

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[15] Pazzaglia, F.J. and T.W. Gardner, 2000. Late Cenozoic landscape evolution of the US Atlantic passive margin: insights into a North American Great Escarpment. In, Summerfield, M. A. (editor), *Geomorphology and Global Tectonics*, John Wiley & Sons, New York, NY, pp. 283–302.

[16] Deptuck, M.E., R.A. MacRae, J.W. Shimeld, G.L. Williams, and R.A. Fensome, 2003. Revised Upper Cretaceous and lower Paleogene lithostratigraphy and depositional history of the Jeanne d'Arc Basin, offshore Newfoundland, Canada. *AAPG Bulletin* 87:1,459–1,483.

[17] Neuendorf, K.K.E., J.P. Mehl, Jr., and J.A. Jackson, 2005. *Glossary of Geology*, fifth edition, American Geological Institute, Alexandria, VA, p. 581.

[18] Smith, D.K. and T.H. Jordan, 1988. Seamount statistics in the Pacific Ocean. *Journal of Geophysical Research* 93(B4):2,899–2,918.

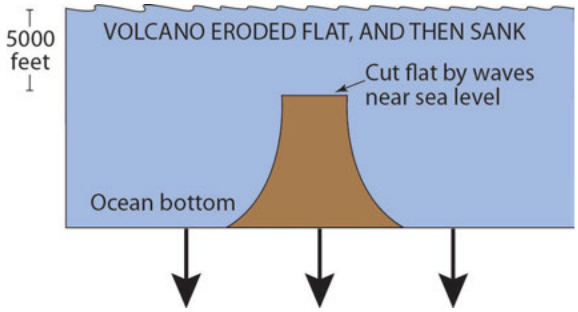

Figure 7.4. Schematic of a guyot, a volcano likely truncated at sea level producing a flat top. Guyots are currently at an average depth of 5,000 feet (1,525 m) below sea level. There are thousands of guyots on the ocean bottom, especially in the western Pacific, indicating that the ocean basins have sunk (drawn by Jes Spykerman).

The most important point is that guyots are believed to have been flattened near sea level, but are now found at an average of 5,000 feet (1,525 m) *below* sea level (see Appendix 2)! Guyots suggest that the ocean basins have *sunk* thousands of feet in areas far from land.[19] The depths vary significantly indicating that some areas have sunk much more than other areas.[20] Maximum subsidence seems to be centered around deep-sea trenches. A guyot near the Japan Trench has sunk about 12,100 feet (3,700 m) below the surface.[21] Capricorn Guyot is located at the edge of the Tonga Trench and has been tilted slightly down toward the trench during subsidence, indicating the trench has sunk more than areas outside the trench since the formation of this guyot.[22] Hoernle and colleagues discovered new guyot-like seamounts on the volcanic Hikurangi Oceanic Plateau east of New Zealand indicating that this plateau has sunk about 5,250 feet (1,600 m) in the southwest and about 10,800 feet (3,300 m) in the northeast.[23]

Interestingly, guyots sank in *later geological time*, as stated by Lester King:

> Marine volcanic islands which have been truncated by the waves and since subsided below sea level are called guyots. Most of them seem to have sunk by 600 to 2000 m [1970 to 6560 feet] and it is evident that they afford a measure of the amount by which the ocean floor has sunk in *late geologic time*. The Pacific floor especially has subsided … All the ocean basins afford evidence of subsidence (amounting to hundreds and even thousands of meters) in areas far from land (emphasis and brackets mine, parentheses his).[24]

Sinking in late geological time is just what is expected late in the Flood to drain the Floodwater.

[19] Sager, W. et al., 1993. Examining guyots in the Mid-Pacific Mountains. *EOS* 74(17):201.

[20] Oard, M.J., 2001. Vertical tectonics and the drainage of Floodwater: a model for the middle and late diluvian period—Part I. *Creation Research Society Quarterly* 38(1):3–17.

[21] Menard, H.W., 1984. Origin of guyots: the *Beagle* to *Seabeam*. *Journal of Geophysical Research* 89 (B13):11,117–11,123.

[22] Crawford, W.C., J.A. Hildebrand, R.M. Dorman, S.C. Webb, and D.A. Wiens, 2003. Tonga Ridge and Lau Basins crustal structure from seismic refraction data. *Journal of Geophysical Research* 108 (B4):EPM6:1–17.

[23] Hoernle, K., F. Hauff, R. Werner, and N. Mortimer, 2004. New insights into the origin and evolution of the Hikurangi Oceanic Plateau. *EOS* 85 (41):401, 408.

[24] King, Ref. 3, pp. 168, 71.

Seamounts and Guyots (in-depth section)

Most seamounts are volcanic cones. Wessel estimates that more than 100,000 seamounts cover the ocean floor.[25] A few seamounts are as high as 23,760 feet (7 km) above the ocean floor. Many of these guyots, as well as some of the atolls of the western Pacific, have a carbonate cap that is thousands of feet thick. These are interpreted as a very thick and old reef. An atoll is a generally circular reef surrounding a central lagoon. This thick carbonate cap is a challenge within a Flood model or in the post-Flood period, depending upon when the carbonate cap formed, which will briefly be discussed in Appendix 3.

Seamounts commonly occur in groups and linear chains.[25,26,27] Some are believed to have been formed along the flanks of the mid-ocean ridges, but many other seamounts are found far from mid-ocean ridges.[25,28,29] Most seamounts near the East Pacific Rise are small.[30]

Some seamounts are believed to have been caused by hot spots, thought to be the result of plumes of hot material rising from the core-mantle boundary.[22] However, most seamounts are difficult to tie to a hot spot, but are more likely caused by *linear volcanism* along fractures that commonly occur on the ocean bottom.[25,28,31,32]

Many of the large seamounts are flat-topped guyots.[25,33,34,35] Most of the numerous seamounts in the Western Pacific are guyots, making guyots common[36] and not related to mid-ocean ridges.

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[25] Wessel, P., 2001. Global distribution of seamounts inferred from gridded Geosat/ERS-1 altimetry. *Journal of Geophysical Research* 106(B9):19,431–19,441.

[26] Hollister, C.D., M.F. Glenn, and P.F. Lonsdale, 1978. Morphology of seamounts in the western Pacific and Philippine Basin from multi-beam sonar data. *Earth and Planetary Science Letters* 41:405–418.

[27] Batiza, R. and D. Vanko, 1983/1984. Volcanic development of small oceanic central volcanoes on the flanks of the East Pacific Rise inferred from narrow-beam echo-sounder surveys. *Marine Geology* 54:53–90.

[28] Caplan-Auerbach, J., F. Duennebier, and G. Ito, 2000. Origin of intraplate volcanoes from guyot heights and oceanic paleodepth. *Journal of Geophysical Research* 105(B2):2,679–2,697.

[29] Batiza, R. and D. Vanko, 1983/1984. Volcanic development of small oceanic central volcanoes on the flanks of the East Pacific Rise inferred from narrow-beam echo-sounder surveys. *Marine Geology* 54:53–90.

[30] Fornari, D.J., R. Batiza, and M.A. Luckman, 1987. Seamount abundances and distribution near the East Pacific Rise 0º-24ºN based on Seabeam data. In, Keating, B.H., P. Fryer, R. Batiza, and G.W. Boehlert (editors), *Seamounts, Islands, and Atolls*, Geophysical Monograph 43, American Geophysical Union, Washington, D.C., pp. 13–21.

[31] Shipboard Scientific Party, 1993. Introduction and scientific objectives. In, Sager, W.S., E.L. Winterer, J.V. Firth, et al., *Proceedings of the Ocean Drilling Program, Initial Reports 143*, Ocean Drilling Program, Texas A&M University, College Station, Texas, pp. 7–12.

[32] Smoot, N.C. and R.E. King, 1997. The Darwin Rise demise: the Western Pacific guyot heights trace the trans-Pacific Mendocino fracture zone. *Geomorphology* 18:223–235.

[33] Simkin, T., 1972. Origin of some flat-topped volcanoes and guyots. *GSA Memoir 132*, Geological Society of America, Boulder, Colorado, pp. 183–193.

[34] Searle, R.C., 1983. Submarine central volcanoes on the Nazca Plate—high-resolution sonar observations. *Marine Geology* 53:77–102.

[35] Clague, D.A., J.G. Moore, and J.R. Reynolds, 2000. Formation of submarine flat-topped volcanic cones in Hawaii. *Bulletin of Volcanology* 62:214–233.

[36] Shipboard Scientific Party, 1993. Introduction. In, Premoli Silva, I., J. Haggerty, F. Rack et al., *Proceedings of the Ocean Drilling Program, Initial Reports* 144, Ocean Drilling Program, Texas A&M University, College Station, Texas, pp. 3–4.

Guyots for some reason are less common elsewhere on the ocean bottom. Only a small number have been reported from the northeast Pacific[37,38] and the North Atlantic-Ocean.[39,40] Just like seamounts, guyots also commonly occur in linear chains.[22]

Guyots indeed are evidence that the oceans far from land have subsided, as expected during the Retreating Stage of the Flood.

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37 Carsola, A. J. and R. S. Dietz, 1952. Submarine geology of two flat-topped northeast Pacific seamounts. *American Journal of Science* 250:481–497.

38 Turner, D.L., R.D. Jarrard, and R.B. Forbes, 1980. Geochronology and origin of the Pratt-Welker seamount chain, Gulf of Alaska: a new pole of rotation for the Pacific plate. *Journal of Geophysical Research* 85 (B11):6,547–6,556.

39 Verhoef, J. and B.J. Collette, 1987. Lithospheric thinning under the Atlantis Meteor seamount complex (North Atlantic). In, Keating, B. H., P. Fryer, R. Batiza, and G. W. Boehlert, (editors), *Seamounts, Islands, and Atolls, Geophysical* Monograph 43, American Geophysical Union, Washington D. C., pp. 391–405.

40 Tucholke, B.E. and N.C. Smoot, 1990. Evidence for age and evolution of Corner Seamounts and Great Meteor Seamount chain from multibeam bathymetry. *Journal of Geophysical Research* 95(B11):17,555–17,569.