Chapter 30

Cenozoic Volcanic Winter Would Likely Kill All Biology

Volcanism dramatically affects climate.[1] Aerosols, small particles around 1 micron in diameter, and sometimes volcanic ash itself reflect some sunlight back into space (Figure 30.1). The loss of solar radiation has a cooling effect, especially over large areas of land. Historically, one large volcanic eruption would cause modest global cooling for several years. Although volcanism was less in the Cenozoic than in the Mesozoic and Paleozoic, it was large enough to cause volcanic winters. If the Cenozoic is post-Flood it is likely it would have killed all or most biology on earth. Copious Cenozoic volcanism makes it difficult to imagine how warm climate vegetation could grow at mid and high latitudes especially in continental interiors.

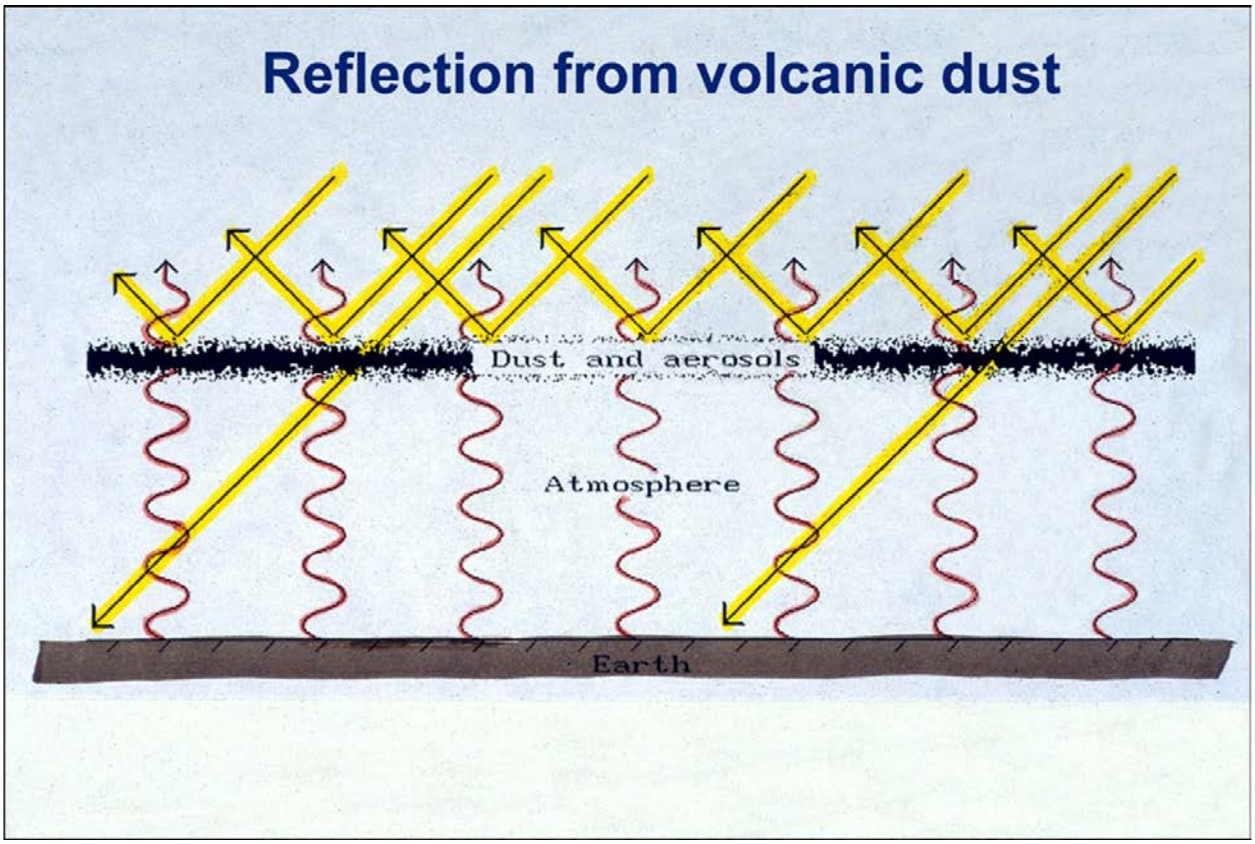

Figure 30.1. Schematic of the cooling effect of volcanic dust and aerosols by the reflection of some of the sunlight back to space.

Large Historic Volcanic Eruptions Cause Modest Global Cooling

Small volcanic eruptions do not produce a significant climate response, unless they are sulfur rich. It is mainly the large eruptions that inject abundant aerosols into the stratosphere that cause

[1] Holt, R.D., 1996. Evidence for a late Cainozoic Flood/post-Flood boundary. *Journal of Creation* 10(1):140–145.

climatic cooling.[2,3] Volcanic ash usually coagulates and falls to the ground within weeks to a few months.[4] So, the cooling effect of the ash itself is short term. Considering how fast temperatures cool at night with no solar radiation, thick volcanic ash could cause severe cooling for several weeks. But, it is the sulfuric acid aerosols that produce the long term cooling of several years.[5]

This has been demonstrated by recent historical eruptions. The eruption of Krakatoa in 1883 is estimated to have deposited 30 to 100 million tons of aerosols into the global stratosphere. The effect was noticeable worldwide in spectacular sunrises and sunsets that lasted several years. The net loss of solar radiation was claimed to be 4%.[6] Large eruptions will reduce solar radiation 5 to 7% for about a year in polar latitudes.[7] The dust and aerosols from the eruption of Mount Agung on Bali in 1963 caused an observed surface cooling of about 0.7°F (0.4°C) in the tropics for several years.[8] Generally, these individual large modern eruptions cool a region or a hemisphere, or possibly the whole earth, by a degree or two Fahrenheit (about 1°C), depending upon their size and the latitude of eruption.

The large eruption of Tambora in 1815 in Indonesia is believed by many scientists to be responsible for the year without a summer in New England and adjacent Canada in 1816.[9] Europe also experienced abnormally cold weather. Heavy snow fell in New England and southeast Canada in June, and frost caused crop failures in July and August. Tree ring data suggest mean summer temperatures in northern Quebec were 6°F (3.5°C) cooler than normal.[10] Extensive sea ice was reported in Hudson Bay and Davis Strait.[11]

The eruption at Laki, Iceland, was a basalt fissure eruption in 1783, but it produced a "dry fog" of several months in northwest Europe. The eruption of Laki apparently did not penetrate the stratosphere,[12] but the abundant sulfuric acid haze has been estimated to have significantly cooled the Northern Hemisphere that winter with below normal temperatures for the next two years.[13] This seems like too drastic of a cooling for an eruption that did not penetrate the

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[2] Oard, M.J., 1990. *An Ice Age Caused by the Genesis Flood*, Institute for Creation Research, Dallas, TX, pp. 33–38, 67–70.
[3] Oard, M.J., 2004. *Frozen in Time: Woolly Mammoths, the Ice Age, and the Biblical Key to Their Secrets.* Master Books, Green Forest, AR, pp. 71–74.
[4] Toon, O.B., Pollack, J.P., Ackerman, T.P., Turco, R.P., McKay, C.P., and Liu, M.S., 1982. Evolution of an impact-generated dust cloud and its effects on the atmosphere; in: Silber, L.T. and Schultz, P.H. (Eds), Geological Implications of Impacts of Large Asteroids and Comets on the Earth, *GSA Special Paper 190,* Geological Society of America, Boulder, CO, pp. 187–200.
[5] Devine, J.D., Sigurdsson, H., and Davis, A.N., 1984. Estimates of sulfur and chlorine yield to the atmosphere from volcanic eruptions and potential climatic effects. *Journal of Geophysical Research* 89(B7):6,309–6,325.
[6] Oliver, R.C., 1976. On the response of hemispheric mean temperature to stratospheric dust: an empirical approach. *Journal of Applied Meteorology* 15:933–950.
[7] Mass, C.F. and Portman, D.A., 1989. Major volcanic eruptions and climate: a critical evaluation. *Journal of Climate* 2:566–593.
[8] Hansen, J.E., Want, W.C., and Lacis, A.A., 1978. Mount Agung eruption provides test of a global climatic perturbation. *Science* 199:1,065–1,068.
[9] Hughes, P., 1979. The year without a summer. *Weatherwise* 32:108–111.
[10] Rampino, M.R. and Self, S., 1992. Volcanic winter and accelerated glaciation following the Toba super-eruption. *Nature* 359:50–52.
[11] Catchpole, A.J.W. and Faurer, M.A., 1983. Summer sea ice severity in Hudson Strait, 1751-1870. *Climate Change* 5:115–139.
[12] Stothers, R.B., Wolff, J.A., Self, S., and Rampino, M.R., 1986. Basaltic fissure eruptions, plume heights, and atmospheric aerosols. *Geophysical Research Letters* 13(8):725–728.
[13] Rampino, M.R., Self, S., and Stothers, R.B., 1988. Volcanic winters. *Annual Review of Earth and Planetary Science* 17:73–99.

stratosphere, so other scientists have suggested that the cooling was mostly caused by the powerful eruption of Asama in Japan also in 1783.[14]

David Keys makes a case that a massive volcanic eruption in Indonesia caused the darkness, cooling, crop failures, and social upheaval that was recorded in Europe in A.D. 535.[15] If we go back further, a huge eruption in New Zealand was inferred from a thick layer of ash covering 4,000,000 mi^2 (10,000,000 km^2) in the South Pacific.[16] This is the Toba eruption on Sumatra that is dated as about 74,000 years ago in the uniformitarian timescale. This eruption produced over 50 times the stratospheric aerosols as Tambora. It would have dimmed the sunlight to that of a very cloudy day to below the limit for photosynthesis, depending upon the closeness to the eruption. Clouds would have reduced light even more. The temperature of the Northern Hemisphere is estimated to have cooled 5°F to 9°F (3°C to 5°C)![17] The effect would have lasted at least several months.

Volcanic Winter Can Freeze the Earth

Studies of "nuclear winter" have estimated that dust and soot blown up into the stratosphere from a nuclear exchange could cause severe cooling by reflecting some of the sunlight back to space, dropping temperatures to below freezing in a matter of days.[4] Some think that the consequence would be more like a "nuclear fall," not as severe, but still significant.[18] One of the mechanisms for supposedly killing off the dinosaurs at 65 million years ago within the uniformitarian timescale is by "meteorite winter" caused by a 6 mile (10 km) diameter asteroid hitting the Yucatán Peninsula (see Chapter 31 on meteorite winter). These thoughts have encouraged some to think large volcanic eruptions, like the one on Toba, would cause "volcanic winter" resulting in massive freezing across the earth.

Cenozoic Volcanism Much Too Great to be Post-Flood

Historic volcanic eruptions are nothing compared to what is inferred from the geologic record:

> Even the greatest of these historic eruptions, however, was small compared with the very large explosive and effusive eruptions that are well know from the geologic record.[19]

Volcanism in the Cenozoic was enormous in many parts of the world. For several hundred years following the Flood, if the Cenozoic is post-Flood, the dust and aerosol loading of the atmosphere would be almost continuous and devastating.

Just in the western United States, several of the massive volcanic eruptions include the Columbia River Basalts of the northwest states, the San Juan volcanics of Colorado, the Challis volcanics of Idaho, the Absaroka Volcanics of Montana and Wyoming, and the Snake River eruptions in southern Idaho. It is estimated that just one of the large flows of the Columbia River Basalts, which consists of a few hundred flows, would produce large enough quantities of

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[14] Angell, J.K. and Korshover, J., 1985. Surface temperature change following the six major volcanic episodes between 1780 and 1980. *Journal of Climate and Applied Meteorology* 24:937–951.
[15] Keys, D., 1999. *Catastrophe: An Investigation into the Origins of the Modern World.* Ballantine Books, New York, NY.
[16] Froggatt, P.C., Nelson, C.S., Carter, L., Griggs, G., and Black, K.P., 1986. An exceptionally large Late Quaternary eruption from New Zealand. *Nature* 319:578–582.
[17] Rampino, M.R. and Self, S., 1993. Climate-volcanism feedback and the Toba eruption of ~74,000 years ago. *Quaternary Research* 40:269–280.
[18] Beardsley, T., 1986. Has winter become fall? *Nature* 320:103.
[19] Rampino *et al.*, Ref. 13, p. 94.

sulfuric acid aerosols that it could almost completely darken the skies.[20] Although basalt continental flood eruptions usually do not penetrate the stratosphere, they can be high in sulfur dioxide and greatly cool the climate, similar to the much smaller example at Laki, Iceland, mentioned above.[21] They also cover large areas, and if there is fire-fountaining, plumes can penetrate the stratosphere. The Columbia River Basalts is just one of several large igneous provinces of the Cenozoic around the world.

Another large Cenozoic igneous providence is an ignimbrite province that extends over a large portion of the Sierra Madre Occidental of northwest Mexico.[22] Supposedly it erupted in the Oligocene and early Miocene, the middle of the Cenozoic. The eruptions were huge and would have seeded the stratosphere, as well as the troposphere, with abundant enough sulfur dioxide to cause volcanic winter for probably hundreds of years.

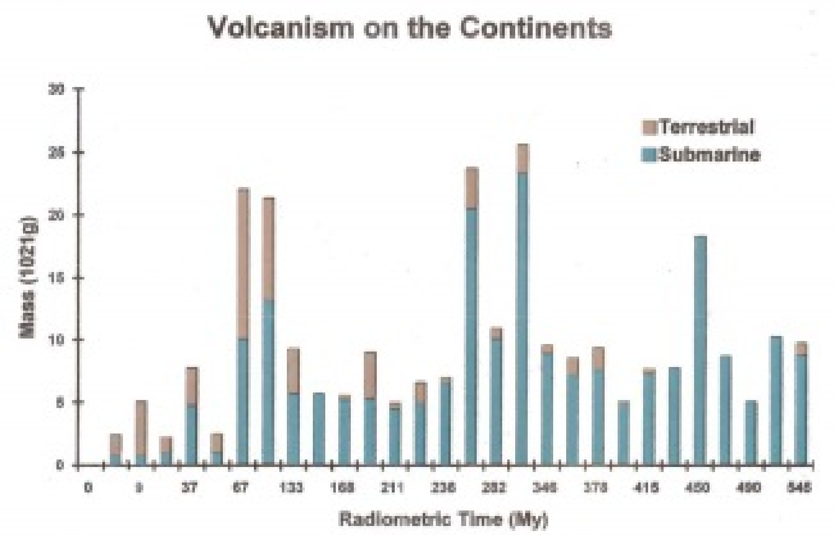

Figure 30.2. Distribution of Phanerozoic continental volcanics, broken up into submarine volcanics, which would not have much of a climate effect, and presumed subaerial eruptions (from Holt, 1996, Journal of Creation 10(1), p. 149). This graph does not take into account erosion, which would at least double these estimates.

Holt shows a graph of volcanism by geological period including the epochs within the Cenozoic era, showing massive amounts of volcanism (Figure 30.2).[23] The graph is broken up into submarine volcanics, which would not have much of a climatic effect, and presumed land (subaerial) eruptions. At least 17% of the Phanerozoic sediments represent volcanics with the greatest effect during the Mesozoic and Paleozoic. This graph does not take into account erosion, which would at least double these estimates. Holt analyzed the figures and showed that if the Flood/post-Flood boundary is any older than the early Pliocene, the volcanism would be so great

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[20] Rampino, M.F. Stothers, R.B., and Self, S., 1985. Climatic effects of volcanic eruptions. *Nature* 313272.
[21] Thordarson, T. and Self, S., 2003. Atmospheric and environmental effects of the 1783—1784 Laki eruption: a review and reassessment. *Journal of Geophysical Research* 108(D1):1–29.
[22] Bryan, S.E. and Ferrari, L., 2013. Large igneous provinces and silicic large igneous provinces: progress in our understanding over the last 25 years. *GSA Bulletin* 125(7/8):1,053–1,078.
[23] Holt, Ref. 1, p. 140.

that it would cause severe volcanic winters with all surface biology likely dying.[1] This is a conservative estimate, and Holt believes the Flood/post-Flood boundary would more likely average in the mid Pleistocene. (Many early- to mid-Pleistocene sediments show no relationship to the post-Flood Ice Age or any other obvious post-Flood process at all.)

From Figure 30.2, it is obvious there would be so much Cenozoic volcanism that it would be impossible to account for the warm climate vegetation found at mid and high latitude during the Cenozoic.