Thermal history of the Fenton Hill site

Dr Russell Humphreys recently wrote an article in this journal addressing me as a 'persistent critic' of his RATE helium research.[1] Since it is not possible for me to respond to all of his errors and misleading statements in this short letter, I will focus only on his interpretation of the thermal history of the Fenton Hill site. Humphreys goes to great length arguing for hotter past temperatures of the site for his uniformitarian model, using references by Kolstad and McGetchin[2] and Sasada[3] as his primary sources. Regardless of the merits and demerits of his model, Humphreys fails to apply the logical consequences of his own arguments towards his young-earth creation model. Let us consider these consequences.

First, Humphreys says regarding his young-earth model: "I knew that temperatures in the formation could not naturally change much in only thousands of years." I agree. Then how does Humphreys explain the high-low-high temperature history of Sasada? Even if we allow his invalid swapping of the past temperature maximum with the temperature minimum,[4] his model still has to explain a past event when the temperature was higher than today, and a past event when the temperature was lower than today. How can he do that if, as he says: "temperatures in the formation could not naturally change much in only thousands of years"? Humphreys cannot have it both ways. If Sasada is right, then his young-earth model is wrong. If Sasada is wrong, then he has no grounds in citing it against my work.

Now consider what Humphreys says about the Kolstad paper:

> "Kolstad and McGetchin's simulations show that temperatures can't change all that fast (over a few thousand years) in this particular formation. That's because the rock is dry, so heat can move only by conduction, which is quite slow in rock."

Then how does Humphreys explain the present high temperatures at the Fenton Hill site? It could not have been from the eruption of the volcano which formed the Valles Caldera, since this Cenozoic geologic event would be placed in the post-Flood era in most young-earth models. From Kolstad and McGetchin's simulations, 4,500 years is not enough time for heat from a deeply buried magma chamber to reach the site of the geothermal wells. Indeed, since Humphreys uses a time span of 6,000 years for his diffusion model and not 4,500 years, he is tacitly assuming that the Fenton Hill site was already at its present elevated temperatures *before* the Valles Caldera erupted. How can this be? The Fenton Hill site was the subject of intensive geothermal research because the rock there is so much hotter than typical areas around the world. Was it created unusually hot during Creation Week, and a volcano just happened to coincidentally erupt nearby after Noah's Flood? The big dilemma faced by Humphreys' helium diffusion model is not explaining how these zircons could retain helium at their current elevated temperatures. Rather, it is in explaining why the zircons are so hot in the first place.

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References

1. Humphreys, D.R., Answer to a persistent critic of RATE helium research, *J. Creation* **32**(3):49–57, 2018.
2. Kolstad, C.D. and McGetchin, T.R., Thermal evolution models for the Valles Caldera with reference to a hot-dry-rock geothermal experiment, *J. Volcanology and Geothermal Research* **3**:197–218, 1978.
3. Sasada, M., Fluid inclusion evidence for recent temperature increases at Fenton Hill hot dry rock test site west of the Valles Caldera, New Mexico, USA, *J. Volcanology and Geothermal Research* **36**:257–266, 1989.
4. One cannot arbitrarily re-order thermal events in the Sasada thermal history just because the time axis is displayed in arbitrary units. The relative order of events in the fluid inclusion study can be determined uniquely, just as in geology, through cross-cutting relationships and similar arguments. The following quotes from Sasada makes the order of events unambiguous: (1) "Calcite vein precipitation: Since fluid inclusions in calcite stretch above T_h more easily than do those in quartz, the primary inclusions in the calcite must not have formed before the re-equilibration of the secondary inclusions in quartz. Hence, the veinings of calcite are younger than the re-equilibration of the secondary inclusions in the host rocks"; and (2) "Secondary inclusions in calcite veins: Secondary inclusions were formed by healing the fluid-filled fractures during the cooling process after the formation of primary inclusions."

» Russell Humphreys replies:

I appreciate Dr Loechelt's letter because it gives me an opportunity to explain two neglected factors that help determine the temperature history of rocks in the earth. The two factors are: (1) *accelerated nuclear decay*; and (2) *accelerated volume cooling*, both during the Genesis Flood and before it. Neither factor occurs *naturally*, which is the qualifier Loechelt seems to have missed in my statement, "temperatures in the formation could not *naturally* change much in only thousands of years" (emphasis mine).[1]

The RATE research initiative (which included the helium project Loechelt is criticizing) offered several lines of evidence for each factor.[2] The first factor would account for about 500 million years of nuclear decay occurring within the one year of the Genesis Flood, an acceleration factor of half a billion. That would increase the heating due to radioisotope decay occurring in granite today, about 3 microwatts per cubic metre,[3] to about 1,500 watts per cubic metre. If operating by itself, the first factor would raise the temperature of granite by 100° in 36 hours.

However, the first factor (accelerated nuclear decay) was not operating by itself. RATE also found observational evidence that the entire volume of each rock was cooled supernaturally fast during the Flood, and probably

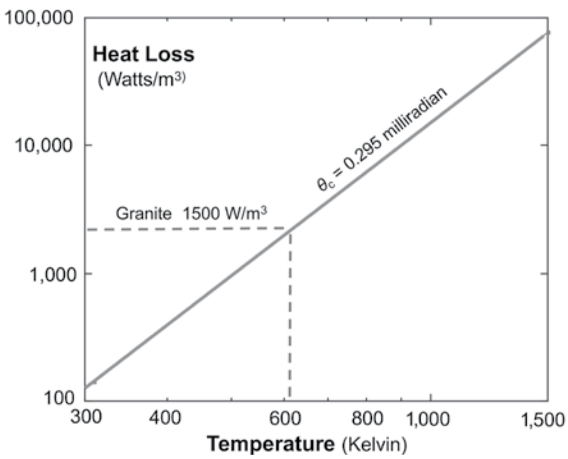

Figure 1. Amount of accelerated volume cooling depends on the absolute temperature of the object and on the degree of opening into hyperspace.

before it.[4–6] At the 2018 International Conference on Creation I presented a new theory[7] for how the cooling would occur, namely by thermal radiation into 'hyperspace' from the entire volume of each rock while the 'windows of heaven' were open during the Flood (and other times). The cooling rate would depend on the fourth power of the temperature of the object being cooled, and on the degree of opening at infrared and visible wavelengths. Figure 1 shows the heat loss for a small degree of opening. The heat loss is insignificant for low temperatures (thus not being a burden on living creatures aboard Noah's ark), but it is quite significant for hot rocks.

Regardless of whether my theory is correct or not, I emphasize that RATE found *observational* evidence that accelerated volume cooling has taken place.

The rates of the two processes were probably neither constant nor proportional to each other. For example, I think the rate of nuclear decay was high at the outset of the Flood, and lower at the end of it. The rate of cooling was probably lower at the beginning of the Flood and higher at the end. I also think the two effects were at work, though at a lower intensity, during the Antediluvian age (between the Fall and the Flood).[8] Using the two processes, God could adjust temperatures in the rocks to whatever He wanted—temperatures both rising and falling, during both periods, the Antediluvian age and the year of the Flood. The maximum and minimum temperatures Loechelt reports could easily have happened during those periods. My guess is that shortly after the Flood, the temperatures in the formation were about what they are today. That would fit the helium retention data we have.

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References

RATE I: *Radioisotopes and the Age of the Earth*, vol. I, Vardiman, L., Snelling, A.A., and Chaffin, E.F. (Eds.), Institute for Creation Research, El Cajon, CA (now Dallas, TX), and Creation Research Society, St Joseph, MO (now Chino Valley, AZ), 2000; icr.org/i/pdf/research/rate-all.pdf .

RATE II: *Radioisotopes and the Age of the Earth*, vol. II, Vardiman, L., Snelling, A. A., and Chaffin, E. F. (Eds.), Institute for Creation Research, El Cajon, CA (now Dallas, TX), and Creation Research Society, Chino Valley, AZ, 2005; icr.org/rate2.

1. Humphreys, D.R., Answer to a persistent critic of RATE helium research, *J. Creation* **32**(3):49–57, 2018; creation.com/journal-of-creation-323. See esp. p. 55.
2. Vardiman, L. *et al*., Summary of evidence for a young earth from the rate project, RATE II, chap. 10, pp. 735–772; icr.org/i/pdf/technical/RATE2-Summary.pdf .
3. Stacey, F.D., *Physics of the Earth*, John Wiley & Sons, New York, p. 245, table 9.3, 1969. Multiply 357 ergs/gm per year by the density of granite, 2.67 gm/cc, to get power/cc, and then convert to SI units.
4. Baumgardner, J.R., Distribution of radioisotopes in the earth, RATE I, chap. 3, pp. 49–94; icr.org/i/pdf/research/rate-all.pdf. See esp. pp. 80-86.
5. Snelling, A.A., Radiohalos in granites: evidence for accelerated nuclear decay, RATE II, chap. 3, pp. 101–207; icr.org/i/pdf/technical/Radiohalos-in-Granites.pdf. See esp. pp. 166-168.
6. Humphreys, D.R., Young helium diffusion age of zircons supports accelerated nuclear decay, RATE II, chap. 2, pp. 25–100; icr.org/i/pdf/technical/Young-Helium-Diffusion-Age-of-Zircons.pdf . See esp. pp. 67-69.
7. Humphreys, D.R., New mechanism for accelerated removal of excess radiogenic heat; in: Whitmore, J.H. (Ed.), *Proceedings of the Eighth International Conference on Creationism*, Creation Science Fellowship, Pittsburgh, PA, pp. 731–739, 2018; publications.cedarville.edu/icc_proceedings/vol_8_2018/750/.
8. Humphreys, D.R., Magnetized moon rocks shed light on Precambrian mystery, *J. Creation* **28**(3):51–60; creation.com/images/pdfs/tj/j28_3/j28_3_51-60.pdf.

Flood–post Flood boundary

In Michael Oard's recent article on the Flood-post Flood boundary in volume 33(2), 2019, he described how John Whitmore attributed so much of geomorphology to post-Flood processes. A major biblical difficulty with this is that in II Peter 3:5–6 we are told that in the last days people will be willingly ignorant of Noah's Flood.

But how could anyone be willingly ignorant of something for which there is so little evidence, which would be the case if so much of what we see on the surface of the earth was caused by local events? And if that is the case, then would it not be reasonable to ascribe geological features beneath the surface, such as we can see in the strata of such rare localities as Grand Canyon, also to local catastrophes?

If the extremely broad planation surfaces we see all over the world today were all believed to have been caused by local catastrophies, then why not attribute the extensive subterranean strata to local catastrophes, as well?

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