Journal of Geography, Environment and Earth Science International

26(1): 1-4, 2022; Article no.JGEESI.82704
ISSN: 2454-7352

New Explanation for the Near-Side/Far-Side Lunar Maria Disparity

J. Marvin Herndon [a*]

[a] *Transdyne Corporation 11044 Red Rock Drive San Diego, CA 92131, USA.*

Author's contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

Article Information

DOI: 10.9734/JGEESI/2022/v26i130328

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/82704

Short Communication

Received 02 November 2021
Accepted 04 January 2022
Published 05 January 2022

ABSTRACT

Any attempt to understand the origin of lunar maria must as well account for the dearth of maria on the far-side of the Moon. Various attempts have been made to explain the origin of lunar maria based solely upon obvious lunar processes, namely, volcanism and impact phenomena. Here I posit a different explanation for the origin of lunar maria by analogy with observations of Earth, specifically related to its central nuclear fission georeactor. Georeactor formation is a natural consequence of density layering in oxygen-starved (highly-reduced) planetary matter and is ideally suited for magnetic field generation in planets and large moons. A portion of georeactor produced heat is channeled to Earth's surface hot-spots, e.g., Hawaii and Iceland, where its georeactor origin is indicated by the high relative 3He/4He ratios observed and seismically imaged heat channels extending to the top of the core. Massive basalt floods, e.g., Siberian and Deccan Traps were driven by georeactor-produced heat as indicated by the high relative 3He/4He ratios of their occluded helium. These terrestrial basalt floods suggest to me that the lunar maria might have similar origins driven by the Moon's nuclear fission "lunar-reactor." Remanent magnetization of some lunar surface material is indicative of an ancient internally-generated magnetic field. That implication is consistent with the magnetic fields produced by central nuclear fission reactors in many planets and large moons. The location of the lunar-reactor at the Moon's center of mass, displaced 2 km toward the Earth-facing side, in concert with Earth's tidal pull, I posit, is principally responsible for driving the maria-basalt floods toward the Earth facing side of the Moon. In principle, it should be possible to verify the correctness of this concept by measuring the helium isotopes of maria basalt samples taken from depths sufficient to be unaffected by solar wind implanted helium.

**Corresponding author: E-mail: mherndon@san.rr.com;*

Keywords: Mare; lunar magnetic field; georeactor; near-side; far-side; man in the moon; maria.

1. A FUNDAMENTAL STATEMENT

Lunar maria, the great dark plains that give rise to perceptions of the "Man in the Moon," and the lighter highlands are prominent features of the Earth-facing surface of the Moon. The lunar highlands are composed of Ca-Al rich anorthositic rocks, whereas the lunar maria are composed of basaltic lava flows [1,2]. Any attempt to understand the origin of lunar maria must as well account for the dearth of maria on the far-side of the Moon [Fig. 1].

Various attempts have been made to explain the origin of lunar maria based solely upon obvious lunar processes, namely, volcanism and impact phenomena [3-5]. Here I posit a different explanation for the origin of lunar maria by analogy with observations of Earth, specifically related to its central nuclear fission georeactor [6-10].

Two independent lines of evidence support georeactor existence

- Calculated georeactor nuclear fission production of $^{3}He/^{4}He$ ratios are in precisely the range of ratios observed in oceanic basalts [7].
- Geoneutrino (antineutrino) measurements, at a 95% confidence level, at Kamioka, Japan [11] and Grans Sasso, Italy [12], indicate georeactor nuclear fission output energy of 3.7 and 2.4 terawatts, respectively. These fissionogenic energy values are similar to the 3-6 terawatt range employed in Oak Ridge National Laboratory georeactor simulations [7,9].

Georeactor formation is a natural consequence of density layering in oxygen-starved (highly-reduced) planetary matter [6,10,13]. The two-component, self-regulated [14] nuclear fission georeactor assembly is capable of sustained thermal convection in its charged-particle-rich sub-shell, and is ideally suited for magnetic field generation in planets and large moons [15-17].

Fissionogenic heat produced by the georeactor's nuclear sub-core is transferred via convection in the nuclear waste sub-shell to the inner-core heat sink and then to the larger fluid-core heat sink [8]. A portion of the georeactor produced heat is channeled to Earth's surface hot-spots [18], e.g., Hawaii and Iceland, where its georeactor origin is indicated by the high relative $^{3}He/^{4}He$ ratios observed [19] and seismically imaged heat channels extending to the top of the core [20,21].

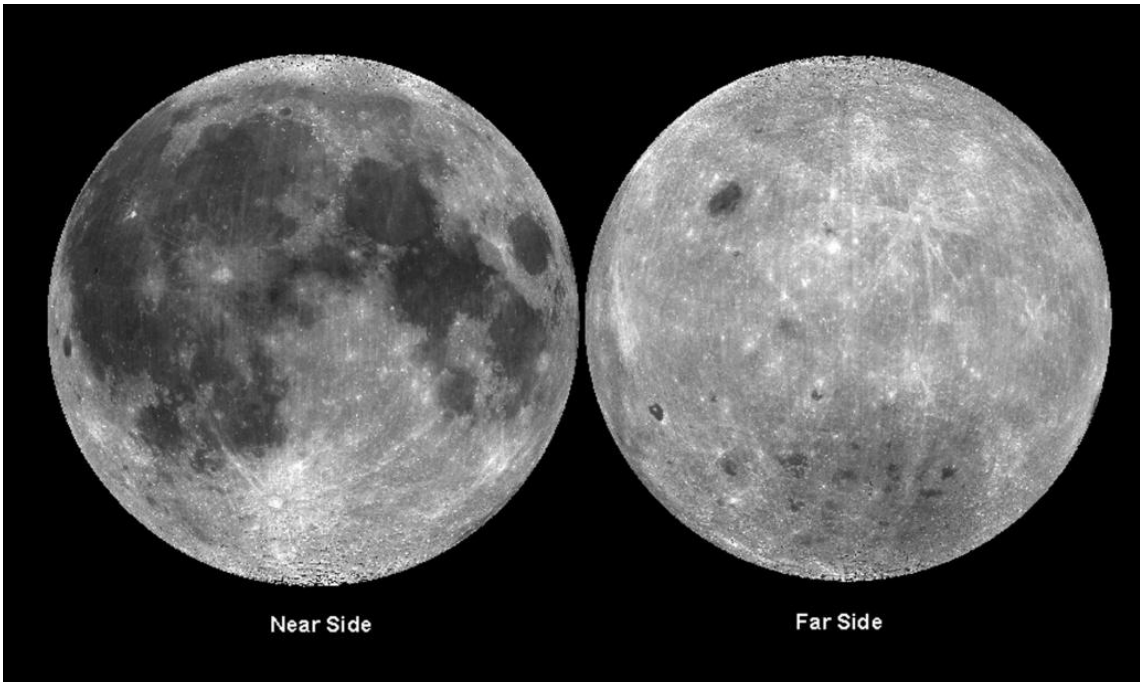

Fig. 1. NASA image of albedo from NASA's clementine UV-VIS camera with 750 nm filter

Massive basalt floods, the Siberian Traps (250 mya) and the Deccan Traps (65 mya), were driven by georeactor-produced heat as indicated by the high relative $^3He/^4He$ ratios of their occluded helium [22,23]. These terrestrial basalt floods suggest to me that the lunar maria might have similar origins driven by the Moon's nuclear fission "lunar-reactor."

Although the Moon currently has no internally generated magnetic field, remanent magnetization of some of its surface material is indicative of an ancient internally-generated magnetic field [24,25]. That implication is consistent with the magnetic fields produced by central nuclear fission reactors in many planets and large moons [17,26]. The location of the lunar-reactor at the Moon's center of mass, displaced 2 km toward the Earth-facing side [27], in concert with Earth's tidal pull [28], I posit, is principally responsible for driving the maria-basalt floods toward the Earth facing side of the Moon.

In principle, it should be possible to verify the correctness of this concept as an explanation for near-side maria bias by measuring the helium isotopes of maria basalt samples taken from depths sufficient to be unaffected by solar wind implanted helium.

2. CONCLUSION

Science progresses, not by making assumption-based computational models, but by logical progressions of understanding based upon causal relationships securely anchored to the properties of radiation and matter. Here I have provided a new explanation for the near-side/far-side lunar maria disparity by analogy with observations of Earth, specifically related to its nuclear fission georeactor. Moreover, I have described the means to possibly verify the correctness of this explanation by measuring the helium isotopes of maria basalt samples taken from depths sufficient to be unaffected by solar wind implanted helium.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

ACKNOWLEDGEMENT

I thank Dorion Sagan for inspiring this investigation.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Crawford IA. Lunar resources: A review. Progress in Physical Geography. 2015;39(2):137-67.
2. Jaumann R, Hiesinger H, Anand M, Crawford I, Wagner R, Sohl F, et al. Geology, geochemistry, and geophysics of the Moon: Status of current understanding. Planetary and Space Science. 2012;74(1):15-41.
3. Zhu MH, Wünnemann K, Potter RW, Kleine T, Morbidelli A. Are the Moon's nearside-farside asymmetries the result of a giant impact? Journal of Geophysical Research: Planets. 2019;124(8):2117-40.
4. Head JW, Gifford A. Lunar mare domes: Classification and modes of origin. The moon and the planets. 1980;22(2):235-58.
5. Schultz P, Spudis P. Beginning and end of lunar mare volcanism. Nature. 1983;302(5905):233-6.
6. Herndon JM. Feasibility of a nuclear fission reactor at the center of the Earth as the energy source for the geomagnetic field. J Geomag Geoelectr. 1993;45:423-37.
7. Herndon JM. Nuclear georeactor origin of oceanic basalt $^3He/^4He$, evidence, and implications. Proc Nat Acad Sci USA. 2003;100(6):3047-50.
8. Herndon JM. Terracentric nuclear fission georeactor: Background, basis, feasibility, structure, evidence and geophysical implications. Curr Sci. 2014;106(4):528-41.
9. Hollenbach DF, Herndon JM. Deep-earth reactor: Nuclear fission, helium, and the geomagnetic field. Proc Nat Acad Sci USA. 2001;98(20):11085-90.
10. Herndon JM. Planetary and protostellar nuclear fission: Implications for planetary change, stellar ignition and dark matter. Proc R Soc Lond. 1994;A455:453-61.

11. Gando A, Gando Y, Hanakago H, Ikeda H, Inoue K, Ishidoshiro K, et al. Reactor on-off antineutrino measurement with Kam LAND. Physical Review D. 2013;88(3):033001.
12. Agostini M, Altenmüller K, Appel S, Atroshchenko V, Bagdasarian Z, Basilico D, et al. Comprehensive geoneutrino analysis with Borexino. Physical Review D. 2020;101(1):012009.
13. Herndon JM. Sub-structure of the inner core of the earth. Proc Nat Acad Sci USA. 1996;93:646-8.
14. Herndon JM. Scientific basis and geophysical consequences of geomagnetic reversals and excursions: A fundamental statement. Journal of Geography, Environment and Earth Science International. 2021;25(3):59-69.
15. Herndon JM. Solar System processes underlying planetary formation, geodynamics, and the georeactor. Earth, Moon, and Planets. 2006;99(1):53-99.
16. Herndon JM. Nuclear georeactor generation of the earth's geomagnetic field. Curr Sci. 2007;93(11):1485-7.
17. Herndon JM. Nature of planetary matter and magnetic field generation in the solar system. Curr Sci. 2009;96(8):1033-9.
18. Herndon JM. Geodynamic Basis of Heat Transport in the Earth. Curr Sci. 2011;101(11):1440-50.
19. Hilton DR, Porcelli D. Noble gases as mantle tracers. In: Carlson RW, editor. The Mantle and Core. Treatise on Geochemistry. 2. Oxford: Elsevier-Pergamon. 2003;277-318.
20. Nataf H-C. Seismic imaging of mantle plumes. Ann Rev Earth Planet Sci. 2000;28:391-417.
21. Bijwaard H, Spakman W. Tomographic evidence for a narrow whole mantle plume below Iceland. Earth Planet Sci Lett. 1999;166:121-6.
22. Basu AR, Poreda RJ, Renne PR, Teichmann F, Vasiliev YR, Sobolev NV, et al. High-^{3}He plume origin and temporal-spacial evolution of the Siberian flood basalts. Sci. 1995;269:882-25.
23. Basu AR, Renne PR, Das Gupta DK, Teichmann F, Poreda RJ. Early and late alkali igneous pulses and a high-^{3}He plume origin for the Deccan flood basalts. Sci. 1993;261:902-6.
24. Runcorn S. An ancient lunar magnetic dipole field. Nature. 1975;253(5494):701-3.
25. Garrick-Bethell I, Weiss BP, Shuster DL, Tikoo SM, Tremblay MM. Further evidence for early lunar magnetism from troctolite 76535. Journal of Geophysical Research. Planets. 2017;122(1):76-93.
26. Herndon JM. New indivisible planetary science paradigm. Curr Sci. 2013;105(4):450-60.
27. Vermillion RE. On the center-of-mass offset of the moon. American Journal of Physics. 1976;44(10):1014.
28. Keeton C. Tidal Forces. Principles of Astrophysics: Springer. 2014;79-88.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/82704