PLANETARY SCIENCE RESEARCH DISCOVERIES
CosmoSparks
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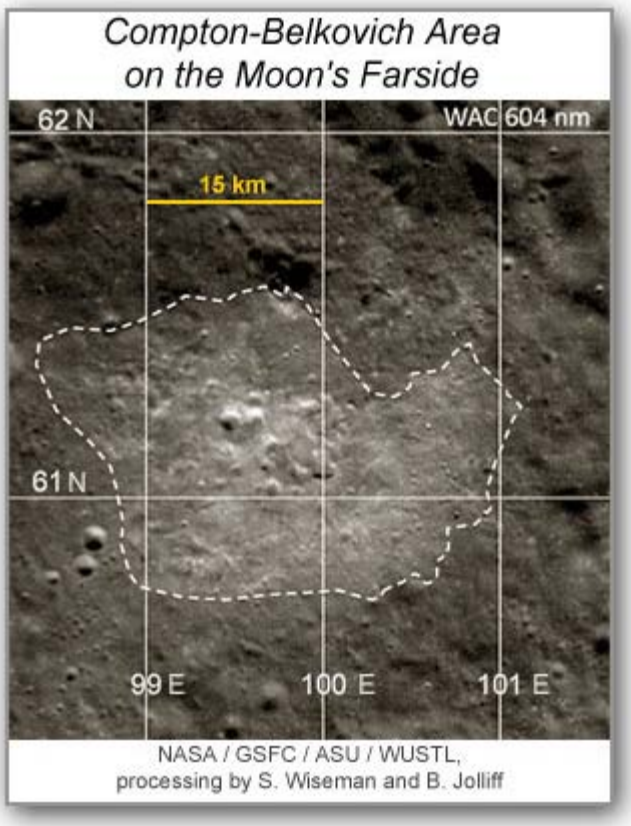
It's Not All Basalt on the Moon: Another Kind of Volcanic Rock

Since the early 1970s, planetary scientists have known about some rare, spectroscopically distinct areas on the Moon's nearside that did not match the signatures of highlands materials or the prevalent basaltic lavas forming the lunar maria. Their spectra hinted at silicic volcanism and their setting turned out to be the Procellarum KREEP Terrane (PKT).



In 2010, researchers used data from the Diviner Lunar Radiometer Experiment onboard NASA's Lunar Reconnaissance Orbiter (LRO) to identify quartz, silica-rich glass, and alkali feldspar at four of these unique, nearside sites. Based on the mineralogical evidence and geologic settings (domes and interiors of craters), they concluded that silicic volcanism on the Moon had probably occured as both extrusive lavas and as intrusive plutons on the nearside. The formation mechanism for such silica-rich rocks is a hot topic of debate—top hypotheses require sources of hot mare basaltic magma or fractional crystallization of KREEP-rich magma. Do silicic volcanic rocks occur on the lunar farside where mare basalts are scarce? Now we know the answer is yes; an example of compositionally evolved, non-mare volcanism has been found on the farside as well. Using LRO images and data, Brad Jolliff and colleagues show the Compton-Belkovich area, previously known as a high-thorium anomaly, has a 26x32-kilometer topographically-elevated area containing some steep-sided domes. The domes are interpreted as volcanic cones and their anomalously silica-rich rocks indicate extensive magmatic processing. Jolliff and coauthors suggest melts of KREEP-rich rock at the base of the crust may have risen, crystallized, and differentiated into the silicic material enriched in thorium. Centered at 61.1°N, 99.5°E, this farside occurrence of non-basaltic volcanism is about 900 kilometers away from the PKT. Surprisingly few craters scar the surface, suggesting that the volcanic cones in Compton-Belkovich formed relatively recently, perhaps as recently as 800 million years ago. If so, this could be the youngest volcanic feature yet identified on the Moon. But, what was the source of heat that drove the melting so late in the game on the farside? How does Compton-Belkovich relate to the nearside silicic volcanic sites? These separate occurrences of non-mare silicic volcanism are generating a host of interesting questions and are causing researchers to re-evaluate their ideas of the evolution of the Moon's internal heat, melting, and volcanic activity.

See:

· Glotch, T. D., Lucey, P. G., Bandfield, J. L., Greengagen, B. T., Thomas, I. R., Elphic, R. C., Bowles, N., Wyatt, M. B., Allen, C. C., Hanna, K. D., and Paige, D. A. (2010) Highly Silicic Compositions on the Moon, *Science,* v. 329, p. 1510-1513, doi: 10.1126/science.1192148. [***NASA ADS Entry***]

· Jolliff, B. L., Wiseman, S. A., Lawrence, S. J., Tran, T. N., Robinson, M. S., Sato, H., Hawke, B. R., Scholten, F., Oberst, J., Hiesinger, H., van der Bogert, C. H., Greenhagen, B. T., Glotch, T. D., and Paige, D. A. (2011) Non-Mare Silicic Volcanism on

the Lunar Farside at Compton-Belkovich, *Nature Geoscience,* v. 4, p. 566-571, doi:10.1038/NGEO1212. [***Abstract***]
· Lutz, D. (July 24, 2011) Unique Volcanic Complex Discovered on Moon's Far Side. *News story from Washington University in St. Louis.* ***http://news.wustl.edu/news/Pages/22512.aspx***

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