

Article Reviewed:

Heng-Ci Tian, et al. (2023). Surges in volcanic activity on the Moon about two billion years ago. *Nature Communications*, 14(1), 1-9.

The history of volcanic activity on the Moon is crucial to understanding its thermal evolution. However, young volcanic eruptions are poorly constrained by remote observations and limited samples, making it difficult to accurately measure the eruptive flux over time. The Chang'e-5 mission provided the youngest lunar basalts ever collected, offering a valuable window into the Moon's late-stage evolution.

Tian et al. investigated the mineralogy and geochemistry of 42 olivine and pyroxene crystals from the Chang'e-5 basalts. They found that almost all of the crystals exhibited normal zoning, suggesting limited magma recharge or shallow-level assimilation. Most olivine grains also recorded a short cooling timescale. Thermal modeling used to estimate the thickness and volume of the volcanism sampled by Chang'e-5 revealed an enhanced magmatic flux approximately 2 billion years ago. This suggests that while overall lunar volcanic activity may have decreased over time, episodic eruptions at the final stage could have exhibited above-average eruptive fluxes, potentially requiring revisions to models of lunar thermal evolution.

This study has several important implications. First, it provides new evidence for young volcanic activity on the Moon, which was previously thought to have ceased billions of years ago. Second, it suggests that the Moon's thermal evolution may be more complex than previously thought, with periods of increased volcanic activity even during the late stages of cooling. Finally, it highlights the importance of studying lunar samples in order to better understand the Moon's history and evolution.

Tian et al. utilize the youngest lunar basalts ever collected, providing new insights into the Moon's late-stage evolution. They use a combination of mineralogy, geochemistry, and thermal modeling to estimate the thickness, volume, and timing of volcanic activity. Also challenge previous models of lunar thermal evolution and suggests the need for further research. However, they fail to acknowledge the significance of limited sample size might not be representative of the entire Moon. The study focuses solely on the Chang'e-5 samples, neglecting comparisons with other lunar regions. Thermal modeling results rely heavily on assumptions and estimations, requiring further validation.

They should conduct more detailed studies of the Chang'e-5 basalts to gain further insights into their composition and origin. Investigate the causes of the episodic volcanic activity observed on the Moon. Analyze samples from other lunar locations to determine the extent of young volcanic activity.

Overall, this study provides valuable new information about the Moon's volcanic history and thermal evolution. Further research is needed to confirm the findings of this study and to better understand the processes that govern volcanic activity on the Moon.