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Remote Detection of a Lunar Granitic Batholith at Compton-Belkovich

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Granites are nearly absent in the Solar System outside of Earth. Achieving granitic compositions in magmatic systems requires multi-stage melting and fractionation, which also increase radiogenic element concentrations. Abundant water and plate tectonics facilitate these processes on Earth, aiding in remelting. Although these drivers are absent on the Moon, small granite samples have been found, but details of their origin and the scale of systems they represent are unknown. We report microwave-wavelength measurements of an anomalously hot geothermal source that is best explained by the presence of a ~50 km diameter granitic system below the thorium-rich, farside feature known as Compton-Belkovich. Passive microwave radiometry is sensitive to the integrated thermal gradient to several wavelengths depth. The 3-37 GHz antenna temperatures of the Chang'E 1 and 2 microwave instruments allow us to measure peak heat flux of ~180 mWm^{-2}; ~20 times higher than the average lunar highlands. The surprising magnitude and geographic extent of this feature imply an Earth-like, evolved granitic system larger than believed possible on the Moon, especially outside of the Procellarum region. Furthermore, these methods are generalizable: similar uses of passive radiometric data could vastly expand our knowledge of geothermal processes on the Moon and other planetary bodies.