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The Source Crater of Martian Shergottite Meteorites

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Absolute ages for planetary surfaces are often inferred by crater densities, and only indirectly constrained by ages of meteorites. We show that the <5 Myrs old and 55-km wide Mojave Crater is the ejection source for the meteorites classified as shergottites. Shergottites and this crater are linked by their coinciding meteorite ejection ages and the crater formation age, and mineralogical constraints. Because Mojave formed on 4.3 Gyrs old terrain, the original crystallization ages of shergottites are old, as inferred by Pb-Pb isotope ratios, and the much-quoted <600 Myrs shergottite ages are due to resetting. Thus, the cratering-based age determination method for Mars is now calibrated in-situ, and shifts the absolute age of the oldest terrains of Mars backwards by 200 Myrs. Our new Martian cratering chronology model is tested against the in situ determined ages for a mudstone in Gale crater, and the ages found with both methods are identical.