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# Iron abundances in lunar impact basin melt sheets from orbital magnetic field data

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Magnetic field data acquired from orbit shows that the Moon possesses many magnetic anomalies. Though most of these are not associated with known geologic structures, some are found within large impact basins within the interior peak ring. The primary magnetic carrier in lunar rocks is metallic iron, but indigenous lunar rocks are metal poor and cannot account easily for the observed field strengths. The projectiles that formed the largest impact basins must have contained a significant quantity of metallic iron, and a portion of this iron would have been retained on the Moon's surface within the impact melt sheet. Here, we use maps produced from orbital magnetic field data to invert for the magnetization within large impact basins using the assumption that the crust is unidirectionally magnetized. We develop a technique based on laboratory thermoremanent magnetization acquisition to quantify the relationship between the strength of the magnetic field at the time the rock cooled and the abundance of metal in the rock. If we assume that the magnetized portion of the impact melt sheet is 1 km thick, we find average abundances of metallic iron ranging from 0.11% to 0.45 wt.%, with an uncertainty of a factor of about three. This abundance is consistent with the metallic iron abundances in sampled lunar impact melts and the abundance of projectile contamination in terrestrial impact melts. These results help constrain the composition of the projectile, the impact process, and the time evolution of the lunar dynamo.