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Observation of a lunar mini-magnetosphere above a magnetic anomaly using energetic neutral atoms

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The Sub-keV Atom Reflecting Analyzer (SARA) instrument on the Indian Chandrayaan-1 spacecraft has resulted in a comprehensive data set about interaction of solar wind with the lunar surface. When solar wind hits the lunar surface, it is partly backscattered as energetic neutral atoms. The intensity of the backscattered energetic neutral atoms is a measure of the intensity of the solar wind reaching the surface. We report on the imaging of a lunar magnetic anomaly in backscattered neutral hydrogen atoms: The image shows the formation of a partial void of the solar wind, a mini-magnetosphere, above the strong magnetic anomaly near the Crisium antipode on the lunar farside. The mini-magnetosphere is 360 km across at the surface and surrounded by a 300-km-thick region of enhanced plasma flux that results from the solar wind flowing around the mini-magnetosphere. These observations demonstrate a new observational technique to study airless bodies, imaging in backscattered neutral atoms, and its application to a new class of objects, mini-magnetospheres.