Implantation of Earth's atmospheric ions into the nearside and farside lunar soil: implications to geodynamo evolution

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Earth's present dipolar magnetic field extends into the interplanetary space and interacts with the solar wind, forming a magnetosphere filled up with charged particles mostly originating from the Earth's atmosphere. In the elongated tail of the magnetosphere, the particles were observed to move either Earthward or tailward with different speeds at different locations, even outside the Moon's orbit. We hypothesize that the lunar soil, on both the nearside and farside, should have been impacted by these particles during the geological history, and the impact was controlled by the size and morphology of the magnetosphere. We predict that the farside soil could also have the features similar to those in the nearside soil, e.g., $^{15}N$-enrichment. Furthermore, we may infer the evolution of the magnetosphere and atmosphere by examining the implanted particles in the lunar soil from both sides. This hypothesis could provide an alternative way to study the evolution of Earth's dynamo and atmosphere.