

Implication of shock structure in lunar mini-magnetosphere system

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Even though the Moon has no global intrinsic magnetic field, there are widely-distributed magnetized regions, called magnetic anomalies. Some of them are possible to interact with the solar wind and mini-magnetosphere systems are formed as a result. The mini-magnetosphere system at the Moon is known as the possible smallest magnetosphere to our knowledge. However there remain many open questions since we have very limited information concerning it. One fundamental question is that whether the mini-magnetosphere system can be really formed since the spatial scale of the magnetic anomaly is almost comparable to the gyro-radius of solar wind ions. Another question is what is the similarity and difference between the lunar mini-magnetosphere and the Earth's magnetosphere.

We have analyzed the ions observed by Ion Spectrum Analyzer (ISA) onboard NOZOMI spacecraft during its lunar swing-by in the solar wind. These observed ions can be traced back to the lunar dayside. We also investigated the 3-D velocity distribution functions and concluded that these ions are most likely to be the reflected solar wind ions by a dynamic structure such as the bow shock in the vicinity of the Moon. This means that at least one of the magnetic anomalies can form a mini-bow shock, and that the shock has enough dissipation as much as the Earth's bow shock to form a developed electrostatic potential to reflect the solar wind ions.