A New Look at the Lunar-Solar Wind Interaction: An overview on Results from the SARA Experiment aboard Chandrayaan-1

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The SARA (Sub-keV Atom Reflecting Analyzer) experiment on the first Indian lunar mission Chandrayaan-1 had two sensors, viz., CENA (Chandrayaan-1 Energetic Neutrals Analyzer) and SWIM (Solar Wind Monitor). CENA observed energetic neutral atoms (ENAs) in the energy range 10 eV–3 keV, while SWIM provided ion measurements in ~0.1–3 keV range. Studying the interaction of solar wind ions with the lunar surface by measuring ENAs and ions was the main scientific objective of the SARA.

SARA experiment has provided several new and important results on the lunar science, including: (1) detection of ENAs from the Moon, (2) observation of mini-magnetosphere on the Moon, (3) reflected/scattered solar wind ions from the lunar surface, (4) and detection of ions in lunar nightside (deep plasma wake region), (5) accelerated (pick-up) solar wind ions. SARA has found that ~20% of the incident solar wind ions are backscattered as neutral hydrogen, which has invalidated previous assumptions of complete absorption of solar wind by the lunar regolith. These findings have implications on other solar system airless bodies, such as Mercury, asteroids, etc. SARA has mapped mini-magnetosphere on the Moon in ENA, thus providing the direct experimental confirmation that the magnetosphere of a size of a few proton gyro-radii can exist. These new results from the SARA will be presented and discussed at the meeting.