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Lunar Dust Monitor for the orbiter of the next Japanese lunar mission SELENE2.

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Lunar Dust Monitor (LDM) is proposed to be onboard the orbiter of the next Japanese lunar mission SELENE2, which is planned to launch in mid 2010s. LDM has a large sensitive area for a quantitative study of the cometic dusts observed in lunar orbit according to its concept design.

Dust particles around the Moon include interplanetary dusts, beta meteoroids, the interstellar dust, and possibly lunar dust that originated from the subsurface materials of the Moon. However there has been no quantitative observation data that shows their percentage. It has been said that tens of thousands of tons of the dust particles per a year flow into the Moon. Some of them have impact velocities enough to vaporize the lunar soil. The vaporization of ferrous surface silicate soils forms nanophase metallic iron particles glassy coat, which causes the space weathering of the lunar surface. Thus, the dust particle is an important component from the viewpoint of the Moon evolution.

LDM has performance following features: (1) LDM can observe the dust particle with quite the same orbital speed as the earth thanks to the observation on the lunar orbit, (2) LDM can prevent the solar wind plasma from inflowing to the detector inside owing to a reflector, and consequently, the generation of background noises and spurious signals can be suppressed, and (3) because the speeds of incident dust particles are measured with TOF using two grids inside the LDM sensor box, the speed can be measured with a high accuracy of 10% even for such low-speed particles as ones that is hardly detected by past impact ionization detectors. If the proposal is accepted, LDM will observe hundreds of dust particles in lunar orbit for nominal mission life of one year. Using the observation data, the origin can be identified according to their trajectories (eccentricity and tilt angle), masses and so on.

In this paper, we summarize the significance of cosmic dust observation at 1 AU and report predicted results of the LDM.

Keywords: Cosmic dust, Lunar orbit, in-situ observation, SELENE2, Interplanetary dust, Impact ionization dust detector