Laboratory study of velocity distribution of ejecta from vertical impact onto regolith layer

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Most of small bodies in the solar system have regolith layers. It is important to investigate the velocity and spatial distribution of the ejecta of impacts on regolith-like layers in order to study the surface evolution of the small bodies and the contribution to the interplanetary dust.

Yamamoto and Nakamura(1997) performed laboratory experiments of oblique impacts onto regolith-like layers to investigate the spatial and velocity distribution of the ejecta. Though their results on velocity-flux lie below the extrapolation of the lower velocity data, the differences were within one order of magnitude.

We performed similar experiments with vertical impacts and will discuss on the velocity distribution of the ejecta. The target is consisted by mixture of 50, 80 and 120 micron glass spheres.

Craters are formed on the surface of airless small bodies in the solar system by continuous bombardment of meteoroids. Ejecta from the craters cover the surface and form layers of so-called 'regolith'. Most of small bodies have regolith layers. The ejecta by impacts on such regolith layers either produce more regolith or interplanetary dust particles depending on their ejection velocity. It is important to investigate the velocity and spatial distribution of the ejecta of impacts on regolith-like layers in order to study the surface evolution of the airless bodies and the contribution of impact ejecta to the interplanetary dust.

Yamamoto and Nakamura(1997) performed laboratory experiments of impacts onto regolith-like layers of glass spheres to investigate the spatial and velocity distribution of ejecta with velocities of higher than several hundred m/sec. Their two targets were soda-lime glass spheres with diameters of 50 and 80 micron, respectively. Spherical nylon projectiles were horizontally accelerated to about 4 km/sec and obliquely impacted into the target with 30 degree incidence from the surface. Though their results on the volume of the ejecta with higher velocity lie below the extrapolation of the lower velocity data, the differences were within about one order of magnitude.

We have performed similar experiments with impacts onto regolith like layers of glass spheres. In this study, aluminium projectiles with diameter of 15mm and mass of 5g were used. They were accelerated to about 2.0 km/sec by using a single-stage vertical powder gun at Nagoya University. The target is consisted by the mixture of 50, 80 and 120 micron soda-lime glass spheres. In order to know velocity distribution, the ejecta were detected by aluminium foil target. Ejecta with sufficient velocity penetrated the aluminium foil, and left holes. We investigated the holes on the aluminium target and will discuss on the velocity distribution of the ejecta.