The Regional Distribution of Lunar Surface Composition by Gamma-Ray Spectrometer onboard SELENE (KAGUYA)

Yuzuru Karouji[1]; Nobuyuki Hasebe[1]; Eido Shibamura[2]; Masanori Kobayashi[3]; Osamu Okudaira[1]; Naoyuki Yamashita[1]; Shingo Kobayashi[1]; Makoto Hareyama[1]; Takashi Miyachi[1]; Satoshi Kodaira[1]; Kazuya Iwabuchi[4]; Kanako Hayatsu[1]; Shinpei Nemoto[1]

[1] RISE, Waseda Univ.; [2] Saitama Pref. Univ.; [3] NMS; [4] Waseda Univ

http://www.cosmic.rise.waseda.ac.jp/

The Japanese lunar polar orbiter SELENE (KAGUYA) was launched on September 14, 2007 and was sent into the lunar orbit as scheduled. Gamma-Ray Spectrometer (GRS)[1] onboard the orbiter at the 100 km altitude of the Moon[2] has started making observation of gamma rays from the lunar surface and accumulating the successful data to create global maps of chemical composition of the Moon.

Gamma rays from several elements (K, Th, U, Si, Ti, Al, Fe, Mg, Ca and O) have been observed and identified from spectral data obtained for about a month over the entire surface of the Moon. The regional difference from gamma ray intensities of these elements suggests heterogeneous chemical composition of the lunar surface, and is essential as viewed from the lunar science.

The local differences are obviously seen as from the gamma ray intensities from natural radioisotopes (40K, Th and U). The compositional distributions of natural radioisotopes over the lunar surface are valuable sources of information about the crustal evolution and thermal history of the Moon. The 40K gamma ray (1460.8 keV) intensity is the highest in the northwestern nearside region, and it shows that the element is mostly concentrated in that area. In addition, the 40K gamma ray intensity in the southern farside shows that K is relatively concentrated high. Lawrence et al. (1998)[3] reported from the GRS observation by Lunar Prospector that K and Th are highly concentrated in those areas. Jolliff et al. (2000)[4] classified the lunar crustal terrains based on the differences of the composition from the results obtained by both the Clementine and Lunar Prospector. Both of K and Th concentrations are higher for Procellarum KREEP Terrain (PKT; northwestern nearside) and South Pole-Aitken Terrain (SPAT; southern farside) as named by Jolliff et al.[4] as compared with other regions (Felspathic Highlands Terrane)[e.g.3, 4]. The results observed by SELENE GRS are consistent with these previous reports. However, the regional differences from gamma-ray intensities of major elements (especially Fe and Ti) except for natural radioisotopes, have not been confirmed definitely at present.

In the near future, gamma-ray data accumulated for a longer observation period will provide more detailed discussion in determining precise distributions of the elements, K, Th, U, and other major elements over the lunar surface. Preliminary results of GRS observation will be presented.

[1] Hasebe et al. EPS, (2008) in press.
[2] Kobayashi et al. (This volume).
[3] Lawrence et al. Science 281, 1484 (1998).
[4] Jolliff et al. JGR 105, 4197 (2000).