ELEMENTAL MAPPING OF THE MOON BY THE SELENE GRS OBSERVATION.

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Introduction: Determining the distribution of major and important trace elements on the lunar surface is essential in the lunar science. Gamma-ray spectroscopy (GRS) is suited for measuring elemental composition on the lunar surface. The Japanese lunar mission SELENE consists of a main orbiter KAGUYA, and two small daughter satellites (Relay Satellite and VRAD Satellite), successfully launched from Tanegashima Space Center on Sep. 14, 2007. The main orbiter carries a GRS with a large germanium semiconductor detector as a main detector and bismuth germinate and plastic scintillators as an active shielding [1]. With the highest energy resolution, the GRS provides the concentrations of the major elements and natural radioactive elements of the material of the lunar surface. Here, the initial results available from SELENE GRS obtained during the period from Dec. 14, 2007 to Feb. 17, 2008 are discussed.

Initial Observation of SELENE GRS: Gamma rays emitted from lunar surface were measured by GRS on the SELENE at around 100 km in altitude. SELENE GRS observes gamma-ray peaks of elements: potassium, thorium, uranium, oxygen, magnesium, aluminum, silicon, calcium, titanium, and iron. We have acquired the global measurements of gamma-ray spectrum from the lunar surface and determined elemental compositions. Individual net area of the gamma-ray peaks is related to the concentration of elements. Typical peaks are attributed to natural radioisotopes of K, Th and U, and major elements such as O, Al, and Si produced through the inelastic scattering interaction of fast neutrons and capture reaction of thermal neutron. The uniquely identified peaks by the Ge detector are essential in the complex mixed gamma-ray field to derive elemental abundances with high precision.

Clear peaks emitted from natural radioisotopes of ^{40}K and daughters of ^{232}Th and ^{238}U are seen in each energy spectrum of gamma rays from the whole Moon. The intensities of ^{40}K, ^{208}Tl (^{232}Th chain) and ^{214}Bi (^{238}U chain) gamma rays were distinguishable among each regions (30 degree pixel) on the lunar surface, without corrections for cosmic ray variations and asymmetric response of the GRS instrument. The area where gamma-ray intensity of K is highest among those of other regions is consistent with the position of the KREEP-rich terrane [2].

References: [1] Hasebe N. et al., 2008. *Earth, Planets and Space*, 60, 299-312. [2] Lawrence D.J. et al., 1998. Science 281, 1484-1489.