Development of software-control method for X-ray spectrometers onboard SELENE

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X-ray fluorescence spectrometer (XRS) onboard SELENE will allow to globally and quantitatively determine major elemental composition such as Mg, Al, Si, Ca, Ti, and Fe. Although the lunar surface has been observed with a coverage of 9% in X-rays by Apollo 15 and 16 missions (Adler et al., 1973) and chemically classified between maria and highlands, the XRS has many advantage: to make global maps in the all coverage with well-spatial resolution of under 20 km, to resolve many energy peaks of major elements with high-energy resolution of a full width half maximum (FWHM) under 180eV at Mn-Kalpha energy (5.9 keV), and to perform quantitatively analysis with standard sample method as same as a laboratory experiment.

When solar flares occur, the number of observable elements will increase such as, Mg, Al, Si, Ca, Ti, and Fe. Although the data are very significant, the observed X-rays increase hugely and too many amount of packets of observation data may be produced over telemetry-rate. The some area of the global maps may be lost. Hence, the XRS required developing optimum observation method.

In this study, we developed an optimum data reduction method, data analysis method, and autonomous operation method with software-control of onboard computer.

Firstly, we developed the optimum data reduction method. This method was used grade method which has been developed HAYABUSA/XRS. It allows high-energy resolution by extracting a single pixel event.

Secondly, we developed the onboard analysis method. It is simplified standard sample method. Mass fractions of Mg, Al, and Si will be determined by calculating an inversion problem.

Finally, we developed the autonomous operation method. It watches flare events and changes integration time in order to perform high-time resolution.

In this study, we developed data reduction method, onboard analysis method, and autonomous operation method. The observation data will be reduced within telemetry-rate, and autonomous observation will allows to resolve local areas of volcanic terrain or a central peak of craters.