LUNAR PHOTOMETRIC PROPERTIES AT WAVELENGTH OVER 1.7 MICRONS ACQUIRED BY SELENE SPECTRAL PROFILER NIR-2 SENSOR. Y. Yokota[1], T. Matsunaga[1], S. Yamamoto[1], M. Ohtake[2], J. Haruyama[2], R. Nakamura[3], , Y. Ogawa[4], T. Morota[5], C. Honda[4], K. Saiki[6], K. Nagasawa[6], K. Kitazato[4], S. Sasaki[7], A. Iwasaki[8], H. Demura[4], N. Hirata[4], T. Hiroi[9], R. Honda[10], Y. Iijima[2], H. Mizutani[2,11].

Introduction: Measurement of lunar surface reflectance spectra in the visible to near-infrared (Vis–NIR) wavelength range is important for identifying minerals on the lunar surface. The SELENE (Kaguya) spectral profiler (SP) measured lunar Vis–NIR spectral reflectance in an instantaneous field of view of ~550 m from a 100-km-altitude orbit [1]. Since the measured radiance of the lunar surface depends on the observation geometry, it is crucial to correct the data with the reflectance measured with the same observation geometry. This procedure is commonly known as photometric correction or photometric normalization, and its goal is to remove effects strictly due to lighting, but preserve variations due to composition or physical properties.

Previously, we developed a new photometric correction method [2] (functions and parameters) that is suitable for wavelength 0.5–1.6 µm that covered by the SP Vis and NIR-1 sensors. Since the radiometric calibration of the SP NIR-2 sensor (1.7–2.6 µm) was still in progress at that time [3], photometric correction for this wavelength range remained as a future issue.

Recently, the radiometric calibration method for the SP NIR-2 sensor has been improved by S. Yamamoto. Therefore, we started to continue the photometric analysis for that wavelength range. We will report progress of this analysis.

Method: Currently**,** we are trying almost same method described in [2] to derive the data for the fitting of the empirical phase function:

Photometric model. We use the model used in our previous SP data analysis. This model is based on the photometric model [4,5] for the correction of the Clementine UVVIS data, and added a correction for the large incidence angle (>75°) observation.

Dataset. We use the nearly 7000-orbit SP dataset. The new calibration procedure for NIR-2 was applied to the data and converted to the radiance.

*Data selection method***.** The processing procedures are basically same as [2]. Since the measured radiance also depends on the surface albedo, we used a statistical method for selecting areas with relatively uniform albedos based on the 753 nm radiance factor (RADF) 1° mesh map. We classified the data into three albedo groups (high, medium, and low). We did this because the photometric function depends on the albedo, especially at phase angles below about 20° for which the shadow hiding opposition effect is appreciable. We use the median filters to reduce statistical scattering in phase function plots due to the effects of topography and albedo heterogeneity in the 1° meshes.

Results: Fig. 1. is the normalized phase function data after the filtering. Three selected bands of NIR2 are shown for the High albedo group (corresponds to highland) and Low albedo group (corresponds to mare) defined in [2]. Although there are rapid decreases at phase angle over ~75°, same features were also observed in Vis and NIR-1 data [2], and we suppose this reason as the macroscopic roughness effect. From Fig. 1, we can say that our processing method is basically applicable to NIR-2 data. However, when we see details, the 2.2 and 2.4 µm data of the Low albedo group have larger scatter than the 1.8 µm data. In addition, some data (2.4 µm of the High albedo group; 2.2 and 2.4 µm of the Low albedo group) have unusual flat features at phase angle over ~30°. The possible reasons for this are (1) relatively small S/N due to the low albedo, and (2) the effect of the thermal radiation from the lunar surface. The latter is unavoidable in the observation of this wavelength range. Further study to estimate the thermal effect contribution is required, and we will discuss the photometric correction method best suited to NIR-2 data.

References: [1] Matsunaga T. et al. (2008) *GRL*, *35*, L23201, doi:10.1029/2008GL035868. [2] Yokota Y. et al. (2011) *Icarus*, *215*, 639–660. [3] Yamamoto S. et al. (2011) *IEEE Transactions on Geosci. and Remote Sensing*, *49*, 11, 4660-4676. [4] McEwen A., (1996) *LPS XXVII*, 841–842. [5] McEwen A. et al. (1998) *LPS XXIX*, Abstract #1466.

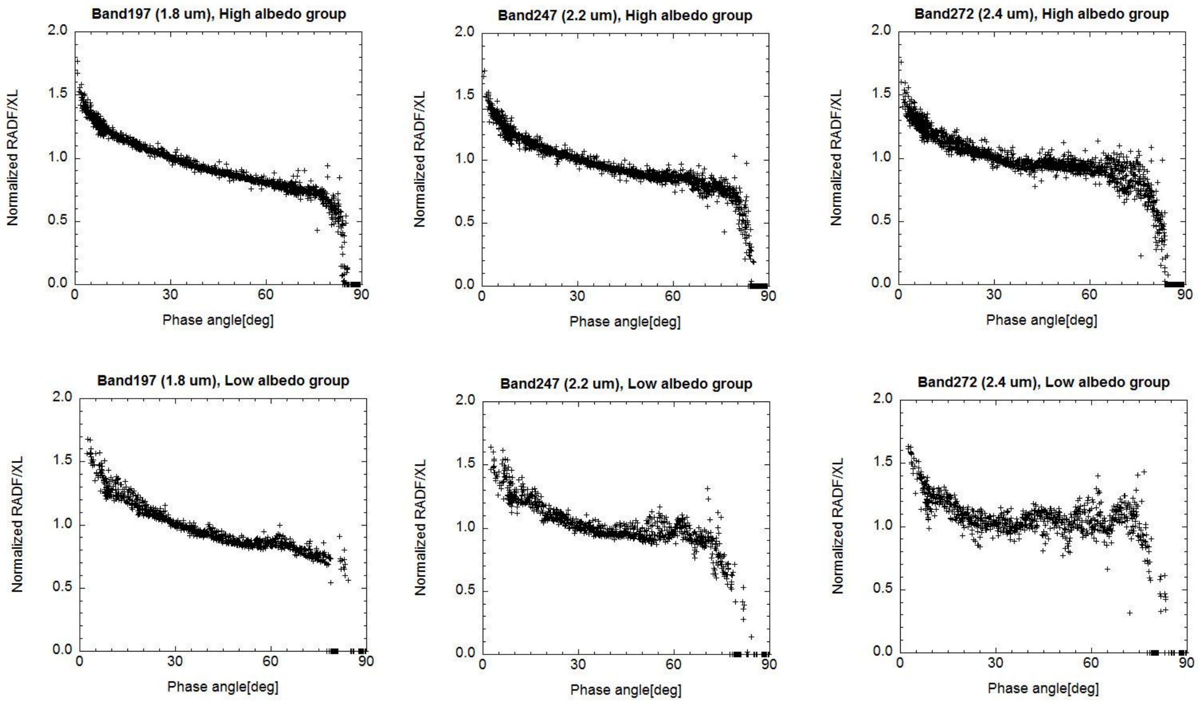

Fig. 1. Normalized phase function plot. Selected bands of SP NIR-2 sensor are shown. The High albedo group data are shown at the top, and the Low albedo group data are shown at the bottom. The data are devided by Lunar-Lambert function (X_L function of [4]) for the correction of the incidence and emission angles. Vertical axis is normalized at phase angle 30.