CURRENT STATUS AND FIRST SCIENTIFIC RESULTS OF SELENE SPECTRAL PROFILER. T. Matsunaga[1], M. Ohtake[2], J. Haruyama[2], Y. Ogawa[1], R. Nakamura[3], Y. Yokota[2], T. Morota[2], C. Honda[2], M. Torii[4], M. Abe[2], T. Nimura[2], T. Hiroi[5], T. Arai[6], K. Saiki[7], H. Takeda[8], N. Hirata[9], S. Kodama[3], T. Sugihara[10], H. Demura[9], N. Asada[9], J. Terazono[9], and H. Otake[11], [1]Center for Global Environmental Research, National Institute for Environmental Studies, 16-2 Onogawa Tsukuba 305-8506, Japan, [2]Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, [3]Information Technology Research Institute, National Institute of Advanced Industrial Science and Technology, [4]Fujitsu Ltd., [5]Department of Geological Sciences, Brown University, [6]Antarctic Meteorite Research Center, National Institute of Polar Research, [7]Department of Earth and Space Science, Osaka University, [8]The University of Tokyo, [9]The University of Aizu, [10]IODP Department, Japan Agency for Marine Science and Technology, [11]Lunar and Planetary Exploration Program Group, Japan Aerospace Exploration Agency. Contact : matsunag@nies.go.jp

Introduction: Spectral Profiler (SP) is a visible - near infrared grating spectrometer onboard Japanese SELENE (Kaguya) Lunar explorer launched in September 2007. SP consists of one reflective telescope, two plane gratings, three linear detectors, one three-stage peltier cooler, and two halogen lamps with a filter for radiometric and spectral calibration.

Data being obtained by SP since November 2007 are lunar surface spectral reflectance in the 0.5 - 2.6 µm spectral region with 6 - 8 nm spectral sampling interval, 500 m spatial sampling interval (along-track direction), and 500 m swath (cross-track direction). SP's spectral coverage and sampling interval are optimized for the survey of plagioclase, pyroxene, and olivine which are major minerals on the lunar surface. SP is the first instrument which provides such visible to near infrared continuous reflectance spectra for both sides of the Moon.

SP's first light data and early inflight performance were reported in [1]. In this paper, the current status and the first scientific results of SP [2] are presented.

Status of Spectral Profiler: By the end of November 2008, SP has conducted more than 4000 pole-to-pole continuous observation of the lunar dayside under various solar illumination conditions. The total number of observed points is more than 40 million. The same SP operation will be continued at least by March 2009.

In Figure 1, SP transects around Copernicus crater acquired by November 2008 are shown. The width of transects is roughly 500 m. These transects cover major geologic features of this crater. The areas between SP transects are being observed by Multiband Imager which is also onboard SELENE and has nine spectral bands with 20 - 60 m spatial resolution.

To monitor changes of radiometric and spectral characteristics of SP, calibration lamps are being observed four time per week with two exposure modes. As for absolute radiometric calibration and photometric correction, Apollo 16 landing site has been observed three times so far (November 2007, March and September 2008) by the roll maneuvers of SELENE spacecraft.

In Figure 2, continuum removed SP and earth-based [3] spectra of Mare Serenitatis and the central peak of Tycho crater are shown. These two sites exhibit the absorption bands at 0.97 µm and 0.94 µm which indicate the existence of pyroxene with different composition and/or crystal structures. The excellent agreements between SP and earth-based spectra also suggest quite high performance of SP as well as appropriateness of current data processing procedures.

First Scientific Results from Spectral Profiler:

Plagioclase-dominant Lithology at Jackson. In Figure 3, continuum removed spectra of central peaks of Jackson and Daedalus craters are shown together with a laboratory spectrum of plagioclase anorthosite from Apollo sample 15415 [4]. Although both central peaks are thought to be plagioclase-rich, Jackson's spectrum shows much deeper absorption band centered at 1.29 µm than that of Daedalus. In fact, Jackson's absorption band is deeper than any of previously published spectra of plagioclase-rich surfaces on the Moon such as the east wall of Kant crater [5]. So Jackson has the deepest plagioclase absorption band found on the Moon so far.

Plagioclase-dominant Lithology at Tsiolkovsky . In Figure 4, continuum removed spectra of central peaks of Copernicus and Tsiolkovsky craters are shown. As discussed in [6], olivine is thought to be the major mafic mineral in the central peak of Copernicus. This is supported by SP spectrum in Figure 4 which has an absorption band centered at 1.05 µm indicating the existence of olivine. The analyses of Clementine UV/Vis data suggested that the central peak of Tsiolkovsky is also olivine-rich [7]. However SP spectra of this area show no 1.05 µm band but 0.97 and/or 1.29 µm bands. These observations implies that the lithology of the central peak of Tsiolkovsky is a mixture of pyroxene which has the absorption band at 0.97 µm and plagioclase rather than olivine.

Other Issues: For more accurate retrieval of lunar surface reflectance, wavelength-dependent photometric correction will be necessary. The preliminary results from the photometric study using SP data will be reported in [8]. Also, to extract mineral abundance information more quantitatively from SP data, applications of spectral deconvolution techniques to SP data are now being investigated. The first results with Modified Gaussian Model will be presented in [9].

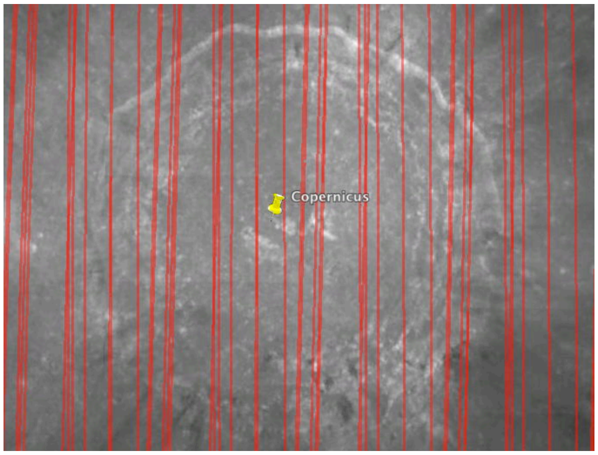

Figure 1. SP transects (red lines) around Copernicus crater (D ≈ 93 km) acquired between December 2007 and November 2008. The line width of SP transects is about 500 m.

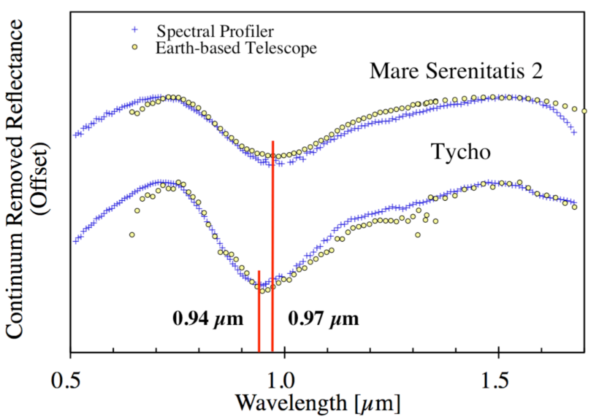

Figure 2. Continuum removed SP and earth-based [3] spectra of Mare Serenitatis 2 and the central peak of Tycho.

References: [1] Matsunaga, T. et al. (2008) *LPS XXXVIIII* Abstract #2226. [2] Matsunaga, T. et al. (2008) *Geophys. Res. Lett.*, 35, L23201, doi:10.1029/2008GL035868. [3] Pieters C. M. (1986) *Rev. Geophys. Space Phys. 24(3)*, 557-578. [4] Pieters C. M. and Hiroi T. (2004) *LPS XXXV*, Abstract #1720. [5] Hawke B. R. (1985) *LPS XVI*, 329-330. [6] Pieters C. M. (1982) *Science*, 215(4528), 59-61. [7] Pieters C. M. and Tompkins S. (1999) *JGR, 104*, 21935 – 21949. [8] Yokota et al ., this issue, [9] Ogawa et al., this issue.

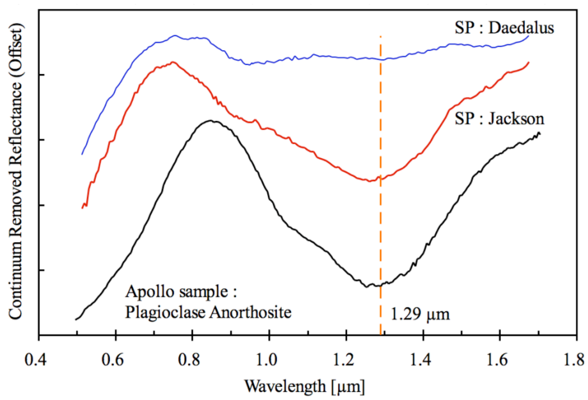

Figure 3. Continuum removed SP spectra of Daedalus and Jackson with that of Apollo sample 15415 (plagioclase anorthosite) [4]. The vertical tick interval is 0.1.

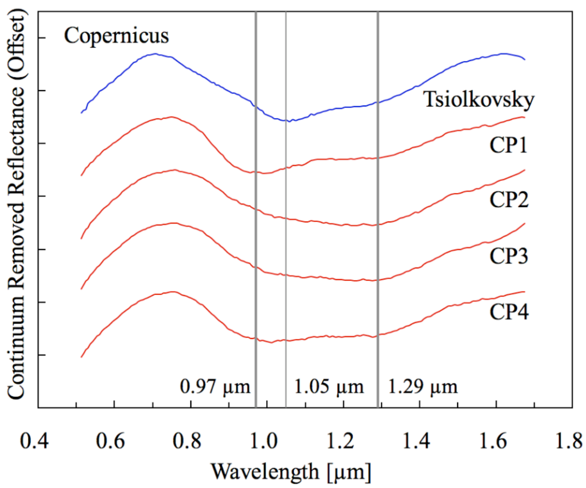

Figure 4. Continuum removed SP spectra of central peaks of Copernicus and Tsiolkovsky craters. See Figure S1 of [2] for the location of CP1, 2, 3, and 4. The vertical tick interval is 0.1.