Observational results and perspectives of Terrain Camera on Kaguya (SELENE) in its nominal mission period

Junichi Haruyama[1]; Tsuneo Matsunaga[2]; Makiko Ohtake[1]; Tomokatsu Morota[1]; Yasuhiro Yokota[1]; Chikatoshi Honda[3]; Yoshiko Ogawa[2]; Masanao Abe[1]; Atsushi Yamaji[4]; Yasushi Yamaguchi[5]; Noriaki Asada[6]; Hirohide Demura[6]; Naru Hirata[6]; Junya Terazono[6]; Akira Iwasaki[7]; Hideaki Miyamoto[8]; Kazuto Saiki[9]; Takamitsu Sugihara[10]; Motomaro Shirao[11]; Hiroshi Takeda[12]; Tomoko Arai[13]; Ryosuke Nakamura[14]; Shinsuke Kodama[14]; Shigeyuki Minami[15]; Hiroaki Akiyama[16]; Tatsuhiro Michikami[17]; Jun Kimura[18]; Kazutaka Mannen[19]; Takahiro Hiroi[20]; Kohei Kitazato[21]; Tokuhiro Nimura[22]; Hiroshi Araki[23]; Sho Sasaki[23]; Haruyama Jun-ichi LISM Working Group[24]

[1] ISAS/JAXA; [2] NIES; [3] JAXA; [4] Div. Earth Planet. Sci., Kyoto Univ.; [5] Nagoya Univ.; [6] Univ. of Aizu; [7] Aeronautics and Astronautics, Tokyo Univ; [8] The University Museum, Univ. Tokyo; [9] Earth and Space Sci., Osaka Univ.; [10] CDEX, JAMSTEC; [11] none; [12] Chiba Inst. of Tech.; [13] Univ. of Tokyo; [14] AIST; [15] Dept. Electrical Eng., Osaka City Univ.; [16] Akita U.; [17] Fukushima National College of Technology; [18] Dept. Cosmosci., Hokkaido Univ.; [19] HSRI, Kanagawa Pref.; [20] Dept. Geological Sci., Brown Univ.; [21] Kobe Univ.; [22] Earth and Planetary Sci., Tokyo Univ; [23] RISE, NAOJ; [24] -

The Terrain Camera (TC), a mission instrument aboard the Japanese Moon explorer SELENE (KAGUYA), is a push-broom stereoscopic imager with two slant optical-heads TC1 and TC2. The space craft changes its flight direction in every 6 months. Thus, TC1 and TC2 change their roles as forward-looking and aft-looking every 6 months. The slant angles are of +/- 15 degrees from the nadir vector. The spatial resolution of TC is 10m/pixel from the KAGUYA nominal altitude of 100km. The exposure time are chosen from three levels: 6.5ms (long), 3.25ms (middle), and 1.675ms (short). The A/D rate is 10bit. On the other words, the dynamic range of both of TC is 0-1023 DN. The saturation level is corresponding to 8%, 16%, and 32% reflection (radiance factor defined by Hapke, exactly saying) of solar radiance, for long, middle, and short exposure times. The TC executes data compression onboard to reduce the data volume. The compression method is a DCT compression with tables chosen from 32 patterns by commands. The TC will provide (1) global/local high-contrast mosaicked maps and (2) DTMs for the Moon's entirety with relative height resolution of a few tens of meters or better and ultimately a DEM with absolute height information.

Since the middle of December 2007 till the end of October 2008, TC had carried stereo-scopic observation at nearly 30 degrees of solar elevation angle and mono-scopic observation at less than a few 10 degrees. The covered area by TC observation has been totally more than 95 % of the entire surface of the Moon. From excellent data set, we have required a lot of scientific knowledge so far: e.g.,

1) Inside the permanently shadowed area of the lunar south pole Shackleton crater, there is no surface water-ice deposit at the TC resolution. Even in the north pole craters, there is no water-ice evidence. The hydrogen concentration revealed by the Lunar Prospector Neutron Spectrometer possibly forms very trace amount of water-ice, buried under the regolith, or is from just hydrogen implantation of solar winds.

2) The TC data was used to determine the model-age by crater counting method for the mare deposits of lunar farside where the so sufficient resolution image data to investigate the younger age was lacked before the TC coverage. As a result, the far-side volcanism was revealed to have continued until 2.5 Ga with mare deposit formation, which is longer than that previously considered. This result is an important restriction to investigate t the evolution scenario of the inside of the Moon.

The various TC data often have been released to public with not only image data but also 3-dimensional perspective pictures or movies. The TC data contributes on making ordinary people to have interest on nature and science with large impression.