Present Status and Preliminary Results of the Lunar Topography by KAGUYA-LALT Mission. H. Araki[1] and S. Tazawa[1], H. Noda[1], Y. Ishihara[1], E. Migita[1], S. Sasaki[1], N. Kawano[1], I. Kamiya[2], and J. Oberst[3]
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Introduction: Japanese lunar explorer KAGUYA (SELENE) was successfully launched on September 14, 2007 from JAXA Tanegashima Space Center. One of the several missions of KAGUYA, laser altimeter (LALT) is aboard on the main orbiter. The objectives of LALT mission are (1) determination of lunar global figure, (2) internal structure and surface processes, (3) exploration of the lunar pole regions, and (4) reduction of lunar occultation data. We review present status and preliminary results of the lunar topography by LALT.

LALT Hardware: LALT incorporates very compact Q-switched Cr doped Nd:YAG laser system which transmits laser pulses whose time width is about 20 nsec. The size of LALT-TR which is attached on the KAGUYA orbiter is 360mm*450mm*408mm. Total weight is 19.1kg, and mean power consumption is about 44W. The beam divergence is 0.4 mrad through the 7.3cm Galileo refractor. Beam spot size on lunar surface is typically 40m when main orbiter altitude is 100km. Range accuracy between SELENE orbiter and the lunar surface is ±5m. The range data are transformed to the topography of the moon with the aid of position and attitude data of the SELENE orbiter. The foot print spacing will be about 1.5 km in the equator region after 1 yr mission period. In the polar regions the distance of ranged position on the moon will be less than 300m [1].

Present Status of LALT: Health check of heater control system and low voltage power unit in LALT was carried out on September 23 and on November 1, 2007 without laser firing. The warming system of Pockels cell in the Q-swiching unit which requires severe isotherm condition (20-22 deg. in centigrade) has been operated normally. The first ranging experiment was carried out on November 25, 2007 successfully. After the twice fine tuning of laser output power and APD (Avalanche photodiode) sensitivity in the receiving sub system, the nominal observation started on December 30, 2007. Brief operation history of LALT is summarized in Table 1.

Table 1 Brief History of LALT operation

Year/Month/Day	Events
2007/09/23	HK check (heater and low voltage unit) on the lunar transfer phase.
2007/11/01	Same as above on the lunar orbit
2007/11/25	High voltage unit test and the first laser shot
2007/12/12	Adjustment of laser output power and APD sensitivity (1)
2007/12/25	Adjustment of laser output power and APD sensitivity (2)
2007/12/30	Nominal observation started.

Preliminary Results by LALT: Two examples of the topographic profile by LALT is shown to Fig.1 and 2. It is clearly demonstrated that LALT can detect not only the general profile but also precise topographic feature. The topography is generated with orbit and attitude data from KAGUYA tracking and operation center using SPICE toolkit software of Navigation and Ancillary Information Facility. It is expected that new lunar topography including two polar regions will be obtained after two months observation by LALT. In this presentation we aim to show several topographic results and future prospects of the LALT mission.

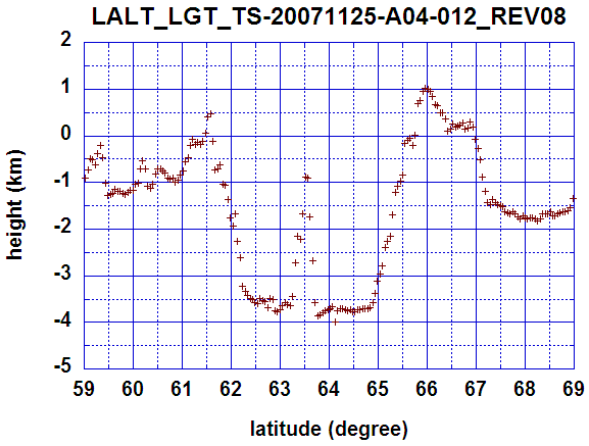

Fig.1 Topographic profile of Pythagoras crater (63.5N, 63.0W) by LALT. Outer ring and central peak are clearly displayed. Data are obtained November 25, 2007. Horizontal axis is lunar latitude (One degree corresponds to 30.3km). Height is determined from the surface of the sphere of 1737.4km radius whose origin is the center of mass.

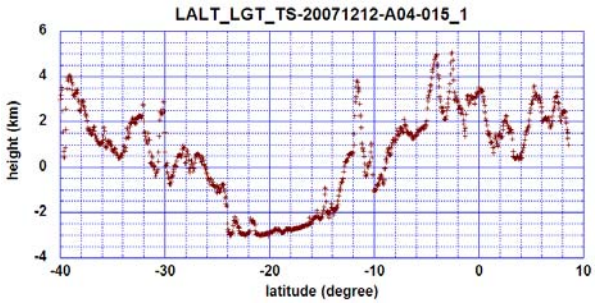

Fig.2 Topographic profile of Orientale basin (20.0S, 95.0W) by LALT. Basin and outer structure are easily seen. Data are obtained December 12, 2007. Horizontal axis is lunar latitude (One degree corresponds to 30.3km). Height is determined from the surface of the sphere of 1737.4km radius whose origin is the center of mass.

References: [1] H. Araki et al. (2007), 'Observation of the lunar topography by the laser altimeter LALT on board Japanese lunar explorer SELENE', Adv. Space Res., in press.