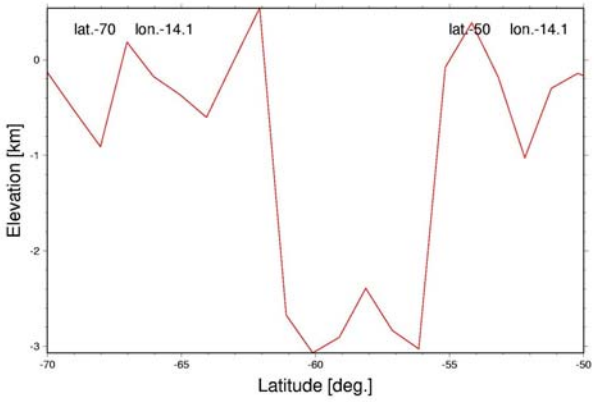
LASER ALTIMETER LUNAR CRATER MEASUREMENT BY SELENE (Kaguya). E. Migita[1], H. Araki[2], H. Noda[2], S. Tazawa[2], Y. Ishihara[2] and T. Iwata[3] , [1]The Graduate University for Advanced Studies (3-1-1 Yoshinodai, Sagamihara, Kanagawa 229-8510, Japan; migita@planeta.sci.isas.jaxa.jp), [2]National Astronomical Observatory of Japan (2-12 Hoshigaoka, Mizusawa, Oshu, Iwate 023-0861, Japan; arakih@miz.nao.ac.jp, noda@miz.nao.ac.jp, tazawa@miz.nao.jp, ishihara@miz.nao.ac.jp), [3]Japan Aerospace Exploration Agency (3-1-1 Yoshinodai, Sagamihara, Kanagawa 229-8510, Japan; iwata.takahiro@jaxa.jp).

Introduction: On December 21, 2007, SELENE (SELenological and ENgineering Explorer) looked towards the Moon, the first time a Japanese lunar observation satellite had done so in thirteen years. The satellite has fourteen instruments, one of them is the Laser ALTimeter (LALT). The device shoots laser pulses at the surface and records round-trip time of the returned signals.

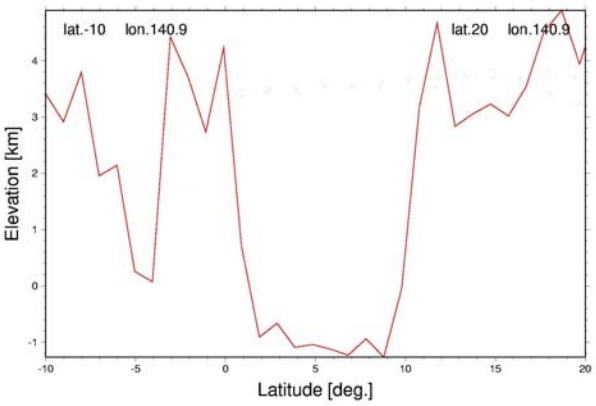
Previously, the crater geometry has not been studied in detail as can be seen in Clementine altimetry (LIDAR) data. Using Wilhelms and Williams' methods [1, 2] and by comparison to the LIDAR data, the LALT mission data is analyzed here to determine with accuracy the profiles of major craters.

LALT Data and Measurement: LALT measures distances to the satellite from the Moon, and it is able to determine surface roughness accurately. The high quality selenographic grid data along the spacecraft path is captured from the data profiles which contain latitude, longitude and height above the ground. In determining diameters of craters with this data, an important question is where to define crater limits. First, rim locations are determined, then diameters are also described. Diameters are related to depth in the ratio depth / Diameter [2]. This ratio is also used for finding rim locations.

Crater Shape: The Clementine mission determined figures of major craters from several orbits [2]. However, data is missing from some regions when the satellite did not pass. LALT data can make up for the areas. The following two images are shapes of the craters, Clavius and Mendeleev.



(a) Clavius



(b) Mendeleev

Fig.1. LALT data provides elevation [km] versus latitude [degree] for (a) Clavius, located from 50º-70ºS, and measured at 14.1ºW and (b) Mendeleev, located from 10ºS-20ºN, and measured at 140.9ºE.
It shows the rim and the bottom of the crater at consistent longitude.

Conclusion: Until SELENE, measuring crater diameter and depth on the Moon had been imprecise. In order to eventually explore the lunar surface, we need to be able to measure lunar craters more precisely with detailed profiles. Some of the craters measured by Clementine LIDAR have the same configurations as the craters measured by SELENE LALT. However, central peaks seen in LALT data are clearer than those seen in LIDAR data, because the precision is an order of magnitude greater than LIDAR's instrument. Therefore, LALT data could determine anew crater diameter on the basis of Wilhelms and Williams' methods [1, 2].

References: [1] D. E. Wilhelms (1987) *The Geologic History of the Moon* [2] K. K. Williams and M. T. Zuber (1998) *ICARUS 131*, 107-122.