

In-situ Lunar Orientation Measurement (ILOM): simulation of observation

H. Noda(1), K. Heki(2), and H. Hanada(1)

(1)National Astronomical Observatory of Japan, Oshu, JAPAN, (2)Hokkaidou University, Sapporo, JAPAN (noda@miz.nao.ac.jp/Phone: +81-422-34-3913)

The measurement of the rotation of planets is one of the key techniques to get the information of the internal structure of planets. As for the Moon, the Lunar Laser Ranging (LLR) has measured the rotation since late 1960s and has provided information about the lunar rotation with accuracy of less than 10 milliseconds of arc. Based on the LLR observation, it is considered that it has the core, but the state (whether it is solid or liquid) is still under debate.

As a successor of Japan's SELENE mission to the Moon, we are planning an in-situ observation of the lunar rotation with a small optical telescope which will be placed on the polar region of the Moon (In-situ Lunar Orientation Measurement, ILOM). The advantage of this telescope is that it is free of orbital motions and rotations of the Earth which are inevitably included in the earth-based observation of LLR. Combining LLR data and ILOM data, the accuracy of the observation will be improved so that the lunar detailed structure will be understood.

Trajectories of stars drawn in the field of view of the telescope contain the information about the lunar rotation and tides. We generated such traces by using JPL's ephemeris file called DE405, and the least-square fitting was done to obtain the amplitudes and phases of forced librations whose periods are given. Although the accuracy depends on the period of observation and the number of stars observed, the standard deviation becomes less than 1 milliseconds of arc. This means that the accuracy can be much improved with ILOM observation, even though the simulation study is under the ideal case.