Detectability of the Lunar Rotational Motions by In-Situ Orientation Measurement

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Lunar and solar tidal torques exerted on the Earth with an inclined spin axis let the axis change its direction with various periods (forced nutation). The motion of surface fluids such as ocean and atmosphere excites the free polar motion of the Earth called the Chandler wobble. Amplitudes and phases of these variations provide valuable information on the interior of the Earth. Likewise, the Moon has rotation variations and their measurements are important to know the physical status of lunar core and lower mantle.

In the lunar exploration project after the SELENE, soft landing onto the lunar surface is planned. Proposed is the in-situ lunar orientation measurement (ILOM) project. A polar lander is equipped with an optical telescope with diameter of 20 cm and focal length of 2 m. It is designed to enable accurate measurement of lunar rotational variation by analyzing the star trajectories associated with the lunar spin. This will greatly improve the accuracy of the measurement of the lunar physical libration and provide important information on the lunar interior.

Here applying the similar analysis as that in ILOM, the present study will discuss the detectability of the Lunar rotational motions by in-situ orientation measurement.