

Development of software for precise LLR data analysis, Part 2

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We are developing new analysis software for precise determination of lunar orbital/rotational motion and tidal deformation using lunar laser ranging (LLR) observation data.

As the first step of the study, we construct an LLR observation model. This model consists of the lunar orbit and libration obtained from DE430 (provided by NASA JPL), and the other newest physical models compatible with IERS Conventions (2010) such as Earth orientation, solid Earth/Moon tides, and some factors affecting propagation delay. For the purpose of calculating these components precisely, we use the modules of the geodetic data analysis software "c5++" (Otsubo et al., 2011). LLR observation data are provided as normal points. In this calculation, there are 3577 points distributed from June 1996 to July 2013, obtained at Apache Point, Grasse, Matera and McDonald. Comparing the observed and calculated one-way ranges, the mean and the standard deviation of the residuals are about 5.7 cm and 4.8 cm respectively.

The presentation contains the result of the above-mentioned modeling and comparison, and the current status of the software development.

Keywords: lunar laser ranging, analysis software, ephemeris