Geophysical Research Abstracts,
Vol. 10, EGU2008-A-06711, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-06711
EGU General Assembly 2008

Determination of Earth orientation from Lunar Laser Ranging data

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A new research project “Lunar Laser Ranging: Consistent modeling for geodetic and scientific application” has been started as one of ten projects of the inter-disciplinary German research unit “Earth rotation and global dynamic processes” dedicated to comprehensively describe and explain the physical phenomena which contribute to the variations of Earth rotation.

The main objective of the LLR project is to improve and upgrade the existing models used to analyse Lunar Laser Ranging (LLR) data. With the improved models, many parameters of the Earth-Moon system are determined. These parameters comprise, e.g., station coordinates on the earth, coordinates of the retro-reflectors on the lunar surface, lunar gravity field parameters, the lunar orbit and rotation, the secular lunar tidal acceleration and many quantities testing relativity. In addition, various earth orientation parameters can be obtained from LLR analyses.

In this paper, we concentrate on the determination of earth rotation, i.e. the variation of latitude VOL as caused by polar motion and the phase of earth rotation UT0. Because of the long time span of Lunar Laser Ranging (more than 37 years) also long-term nutation parameters can be determined with high accuracy, which are then compared to other determinations and model parameters.