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Satellite laser ranging and the terrestrial reference frame; principal sources of uncertainty in the determination of the scale.

J. Ries

The University of Texas at Austin/Center for Space Research, USA (ries@csr.utexas.edu / Fax: +01-512-4713570)

The importance of an accurate and stable reference frame, for reliable interpretation of signals from the various Earth system research areas such as post-glacial rebound and sea level change, cannot be overstated. The various geodetic observing systems are at the core of the determination and maintenance of the celestial and terrestrial reference frames on which other sciences depend, and each system provides essential and unique contributions. Satellite laser ranging to geodetic satellites has provided long-term observations of the long-wavelength temporal mass redistribution in the Earth system and is especially important for the determination of the absolute geocenter location, an essential component of the reference frame definition. Most uniquely, the determination of the most fundamental gravity parameter, the gravitational coefficient of the Earth (GM), is still best determined through the analysis of SLR tracking data. The accurate determination of GM is critical to the definition of the absolute scale of the geocentric reference frame, and we examine here the principal sources of uncertainty in its determination. We also review the relativity model adopted for both SLR and VLBI to look for inconsistencies in the reference frame each technique is attempting to realize.