Relativistic aspects of SLR/GPS geodesy

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Modern SLR and GPS techniques allows us to measure distances between and velocities of reference geodetic points on physical surface of the Earth with an unprecedented accuracy approaching 1 millimeter. At this level various relativistic effects start interfering with observations and play an important role. It is crucial to have an adequate relativistic theory of reference frames and observables in order to get an unambiguous interpretation of the geodetic measurements and various geophysical phenomena. We discuss the IAU relativistic theory of the references frames which is appended with the description of the local (topocentric) frame used by observer for geodetic measurements. We introduce the equations of relativistic transformation of time scales and spatial coordinates and apply them for elaborating on the definition of relativistic geoid. We also generalize the equations of the Molodensky's theory of the Earth's figure to the realm of relativistic gravitational field. Finally, we present the relativistic corrections due to the Earth's quadrupole moment and tidal forces in the satellite orbital equations of motion.