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Studies of the Earth's center of mass periodical movements.

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In the base of all space geodesy techniques (except of VLBI), there are precise orbits of the observable satellites, which are moving under the influence of the Earth gravity field around of the entire Earth's center-of-mass (CM). To keep the convention of the coincidence of the terrestrial coordinate system origin with the entire Earth center-of-mass, the first harmonics (C1;1, S1;1, C1;0) of the gravity field models, used for orbital calculations, are equated to zero. Studies of the ITRF precision and stability, carried out at the different research centers, INASAN included, show that origin of the coordinate system (Geocenter) is moving relatively to the center of mass. Center of mass variations must be properly accounted for in the realization of the tracking station locations within the terrestrial reference frame. This is especially important for the altimeter measurements of sea-level, plate tectonics studies and for improvement of the existed geophysical models. Analyses of the long time series (16 years) of the geocenter coordinates, estimated by the use of DORIS and GPS data, have been performed at the Institute of astronomy, RAS. The linear regression analyses and method of adaptive dynamic regression modeling have been applied in order to estimate linear trend, amplitudes, periods and phases of variations. Amplitudes of annual and semiannual variations of geocenter, derived with the use of different methods of spectral analysis are in very good agreement between each other. The evaluated amplitudes of annual variations are of the order of 5-7 mm for X and Y components and 25-28 mm for Z component. Amplitudes estimated with GPS data are lower. Semiannual amplitudes are also noticeable in all components. By the use of dynamic regression modeling several other harmonics with periods of 2, 3, 5 years and with valuable amplitudes were found out. Secular trends (2-4 mm) in the geocenter components should be more carefully surveyed and compared with long-term measurements of sea-level change and some other geophysical effects.