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Geocenter dynamics investigations using DORIS and GPS tracking data

S. Kuzin, S. Tatevian, and A. Klyuykov
Institute of astronomy, RAS, Space geodesy dep., Moscow, Russian Federation (skuzin@inasan.rssi.ru)

The gravitational center of the Earth plays a crucial role as the origin of the terrestrial reference system. An accuracy of geocenter motion estimation is strongly dependent on the geodetic network size and stations distribution over the Earth's surface. From this point of view DORIS and GPS systems have an advantage, as their ground network beacons and receivers equally distributed over the Earth's surface. For our analysis we used the 14-years time series of the geocenter coordinates obtained by processing of DORIS and GPS measurements. Two methods of spectral analysis of geocenter coordinates have been applied in our study. Amplitudes of annual and semi-annual variations of geocenter, derived with the use of two different methods are in very good agreement between each other. By the use of dynamic regression modelling several other harmonics with periods of 1, 2 months and 2, 3 years, but with very small (as compared with noise) amplitudes were found out. The first attempt to develop a mathematical model of the geocenter motion has been made with the use of Dynamic Regression Modelling approach. Two types of mathematical models: complete (all harmonics) and truncated (only annual, semi-annual and 118 days), developed by the use of DORIS data, have been compared with observable geocenter positions on the time interval 1190 days. In the issue of our studies a possibility to predict the preliminary geocenter positions with the accuracy about 2-4 mm seems feasible over time period up to 10-12 weeks with the use of truncated models.