Assessment of the Long-term Stability and Noise Property of the PPP Kinematic GPS

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We assessed long-term stability, repeatability and noise property of GEONET GPS site coordinates obtained by a kinematic positioning technique based on the Precise Point Positioning (PPP) strategy of the GIPSY/OASIS software version 4.0.4. The accuracy of the coordinates depended strongly on the quality of orbits and satellite clock information provided by data analysis centers. It was found that errors induced by the interpolations for products with low sampling rates caused large dispersion of the estimated coordinates. In order to assess coordinate precision, we compared three types of precise orbits and clock correction information (JPL 5-minutes, JPL 30-seconds and AIUB/CODE 30-seconds) of GPS satellites. Interpolation of JPL 5-minutes clock information to 30 seconds resulted in large dispersions of GPS site coordinate. In contrast, JPL 30-seconds and AIUB/CODE 30 seconds clock information gave much better results. When we did the power spectral density function analysis (PSD analysis), we found artificial peak at JPL 30 seconds results in PSD results. It may cause by interpolation error from JPL 5-minitues products to JPL 30-seconds one. A CODE 30seconds result shows the flicker noise properties (spectral index=-1) in the 60 seconds to one-day at power spectral. During the long-term (more than 200 days) kinematic GPS analysis, anomalous deviations of estimated site coordinates occurred from time to time. A few specific GPS satellites whose orbiting periods deviate from sidereal days may have caused it. These results suggest that only a few GPS satellites with anomalous orbiting periods are responsible for large deviations of GPS site coordinates in kinematic positioning, which should be born in mind in applications of absolute kinematic GPS positioning.