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Analysis of coordinate variation and stability of velocities by GPS observations in Tien Shan

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The velocity vectors got from highly accurate GPS measurements are one of the main sources of information in contemporary geodynamics. Thus, GPS technologies are used for the study of boundaries and movement of plates (Abdrakhmatov et al., 1996; Steblov et al., 2003; etc.), seismic deformations (Segall, Davis, 1997; etc.) and other geophysical researches. However, the velocity calculated by straight-line approximation of time variation of coordinates for GPS site, may provoke doubts of its stability and correctness. It is important to know about the time series, on basis of which the linear velocities of points of the Earth's surface are calculated. Coordinate deviation from the approximating linear trend can be caused both by geodynamic factors and accuracy of GPS technology. This paper covers the analysis of coordinate time variation and the assessment of velocities estimation. For 15 years, the Research Station of the Russian Academy of Sciences in Bishkek has taken regularly observations (from one to several times a year) in the territory of Central Asian GPS network. It contains more then 500 sites, including 10 sites of permanent observation. Detail and duration of the measurements in Kyrgyz Tien Shan allows us to analyze the time variations of the GPS data.

Basically, the linear velocities of the Central Asian GPS network have been stable for the observations 1995-2005; deviations do not exceed 1/6 from the average effective horizontal vector of velocity (Kuzikov, 2007). The coordinates after deduction of straight-line trend are coordinates' remainders. Some GPS sites have general tendency of coordinates' remainders for twelve years (1995-2006) annual measurements. The GPS sites form different groups as to northern and eastern components of coordinates' remainders. Remainders of coordinates' daily variations of unmoved relative to each other GPS sites have considerable positive correlation.

A real geodynamic factor can be the source that appropriately influences the synchronous behavior of coordinates' remainders. But meanwhile the influence of the features of cameral treatment of GPS materials is not excepted, for example options' choice of velocities calculation via Gamit/Globk (Herring et al., 2006a, 2006b). In so doing, the accuracy of daily GPS measurements (ITRF2005) at the average is about 0.8 mm for northern component and about 1.8 mm for southern one. The comparison of the accuracy of the daily GPS measurements according to in various reference frames is present.

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