Wavelet analysis of GNSS coordinate time series and deformation of Earth's crust from geophysical models

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As the GNSS coordinate time series are still using in basic interpretation of geodynamical phenomena it is necessary to improve the quality of archival data. Data reprocessing is often used method improving time series quality. Recently used strategies do not include geophysical deformation models during the data recomputation. In this analysis, we used GNSS coordinate time series provided by CODE (Center for Orbit Determination in Europe) analysis center (ReproCODE 2013) and deformation time series provided by BKG (Bundesamt für Kartographie und Geodäsie) center*. Previously analysis showed that deformation of Earth's crust clearly impacts on the change of coordinate for high component (Up) – the absolute value of correlation coefficient is between 0.6 and 0.8. However, for horizontal components (North, East), this value is low. Additional, we observe phase shift between analysis signals which value is from 100 to 290 days (signals are accelerated or delayed relative to each other) for horizontal components. A small value of correlation coefficient may be caused by the phase shift of GNSS coordinate time series in relation to deformation time series. Moreover, some periodic signal occurs in the time series which is different than the half-year and year period. Additionally, we supplemented our research using time-frequency analysis (wavelet analysis).

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Keywords: coordinate time series, geophysical deformation time series, wavelet analysis, correlation coefficient.