Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

SGD001-P02 Room: Convention Hall Time: May 27 17:15-18:45

Long term stabilities and its noise properties of the middle to long baseline RTK-GPS time series

Yusaku Ohta[1*], Tatsuya Kobayashi[1], Satoshi Miura[1], Tomoji Takasu[2]

[1]RCPEVE, Tohoku University, [2]TUMST

The detection of a coseismic crustal deformation measurement by Real Time Kinematic GPS (RTK-GPS) has been attracts attention over the year [e.g., Nisimura et al., 2009, Blewitt et al., 20 09, Kobayashi et al., this meeting]. The advantage of the GPS time-series for the earthquake related studies, which are the GPS data, detected directly displacement relative to the assumed reference sites or reference frame. As the limitation of RTK-GPS, we can use only broadcast orbits or half-predicted precise ephemeris for RTK-GPS. The estimated time-series accuracy and precision are strongly depending on this real-time ephemeris quality particular at long baseline analysis. However, in case trench-type large earthquake, which need the long-baseline RTK-GPS analysis, because of the causes coseismic displacement over a wide area. For the auto detection of the coseismic and related crustal deformation, assessments of the noise property of the RTK-GPS time series are extremely important to avoid the miss detection of the crustal deformation. Based on this background, we assess the long-term stabilities and its noise properties of the RTK-GPS time series.

We used the 30 seconds RINEX data of the GEONET that operated by Geographical Survey Institute. For preliminary analysis, we choose the 0036 site (Onagawa) for reference site. We used 0033 (Yamagata-Shinjo, baseline length: 103km) and 0918 (Kahoku: 13km) for the rover sites. For the RTK-GPS processing, we used the rtklib version 2.3.0 (Takasu, 2009) that is an open source program package for RTK-GPS/GNSS data processing. We processed every 30 seconds data as a kinematic processing mode. In this time, we used the broadcast orbit and carrier phase ambiguities were tried to resolve. We calculated standard deviation (SD) for the assessment of time series stability. In 103 km baseline (between 0036 and 0033) calculated SD is EW, NS and UD, 3.9 cm, 4.2 cm, and 12.9 cm, respectively. The estimated time series show clearly sidereal noise. It is suggested that sidereal filtering is effective for accuracy improvement for RTK-GPS time series. The estimated time series also show clear seasonal variation. In 103 km baseline data, the SD of EW component show 1.8 cm during the winter season. In contrast, the SD reaches 5.7 cm during the summer season. We check the power spectrum density (PSD) of the time series for the noise property assessment between summer and winter season. The PSD of EW component increase more than 1,000 seconds in summer season. Some troposphere estimation process may cause it.

Keywords: RTK-GPS