Improvement in monitoring of crustal deformation in Japan by the new analysis strategy of GEONET

Geodetic Observation Center (presenter: Hiroshi Yarai)
Geospatial Information Authority of Japan
yarai@gsi.go.jp

The GPS Earth Observation NETwork system (GEONET) is a nationwide GPS permanent array established by Geospatial Information Authority of Japan (GSI). The routine solutions of GEONET have been utilized to detect many kinds of geophysical phenomena such as coseismic deformation, postseismic deformation, and plate coupling inverted from secular deformation including the important finding of slow slip events. The requirement for the accuracy of the GEONET solutions is becoming higher and higher.

Since the establishment in 1996, the routine analysis strategy of GEONET has been improved in stages. The previous strategy (Hatanaka et al., 2003) was adopted in 2004. However, the routine operation and the results of the previous strategy also had exposed several issues, such as no applying tropospheric gradient estimation.

GSI has worked for improvement of routine analysis strategy of GEONET (Hatanaka et al., 2007, Nakagawa et al., 2008). The overview of new strategy is as follows:

i) Basic processing procedures and network configuration follow the previous strategy. The improvements, bug fixes and changes in specifications of BERNESE are applied.

ii) BERNESE software is upgraded from ver.4.2 to ver.5.0. This enables the software to handle tropospheric gradient parameters in NEQ files. In addition, bugs in solid earth tide correction module in ver.4.2 are fixed in ver.5.0.

iii) Two atmospheric parameters are newly introduced. As mentioned above, tropospheric gradient estimation is applied. Higher-order ionospheric correction is also applied.

iv) To improve consistency to IGS analysis, IGS05 reference frame is applied. GSI calibrated absolute PCV models are also adopted. Data used for relative PCV calibration are re-analyzed to estimate GSI absolute PCV models (Toyofuku et al., 2007). In addition, the fixed site (Tsukuba) coordinates are derived from daily solution of IGS RNAAC (Regional Network Associate Analysis Center), instead of nominal value obtained from local tie from IGS site (TSKB).

The new routine analysis strategy has been adopted since April 2009. The new strategy solutions show significant decrease of annual variation of network scale bias and coordinate time series of longer baseline. The improvement of the precision of the routine solutions provides us more opportunities for interpretations of the crustal deformations.