Results from the real-time analysis of GEONET

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Geographical Survey Institute (GSI) reformed and enhanced GPS earth observation network system (GEONET) from 2002 to 2003. Real-time analysis software was implemented with the reform, and real-time analysis with 1-Hz data has become operational. With the analysis, crustal movements are expected to be monitored more immediately with much higher time-resolution. In the presentation, characteristics of GEONET real-time analysis and examples of them are shown.

GSI adopts the software RTNET (GPS Solutions Inc.) for our real-time analysis. This software analyzes 1-Hz dual-frequency data of GEONET stations with IGS Ultra Rapid products (IGU ephemerides) and resolves phase ambiguities using combination of L5 and L3 as observables. These resolved ambiguities are used for the next epoch in order to keep continuity and consistency of the ambiguities. Coordinate constraint between epochs is set loose enough to detect sudden displacement caused by events such as earthquakes. Tropospheric delay isn't estimated in order to save computation time.

We have analyzed 1-Hz data especially with events such as earthquakes, and evaluated reliability of the results by comparing them with results of GEONET routine analysis. In some cases, we have succeeded in detecting shakings and displacements caused by seismic activities. With a case study of Chuetsu earthquake in Niigata prefecture (2004/11/23, M6.8), shaking at GPS stations were detected at the same time with the earthquake, and co-seismic step-like displacements were also detected clearly. Especially, a baseline between Ogata and Tadami and a baseline between Ogata and Yunotani showed a clear displacement up to 3 ? 4 cm in East-West component. These results were consistent with results of GEONET routine analysis. The analysis also succeeded in detecting shakings with more two earthquakes occurred off Kushiro in Hokkaido at the end of 2004 (M7.1 on 11/29 and M7.0 on 12/6).

It will become to be difficult to resolve phase ambiguities with RTNET if the baseline length exceeds 100 km. Therefore, in order to resolve ambiguities, we divided the long baseline into shorter ones and succeeded to resolve them. As a result, less 'scattered' results have been obtained. Configuration of network and selection of fixed station also have been known to have an influence to analysis results. Differences of altitude between stations and meteorological conditions depending on local weather conditions also have an influence to the results, because of no tropospheric delay estimation. These influences have to be evaluated continuously using data of normal condition that are without displacements caused by events such as earthquakes.