Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SGD21-05 会場:303 時間:5 月 28 日 12:00-12:15

精密可動台を用いた海底地殻変動観測のためのキネマティック GNSS 時系列のノイズ評価
Noise assessment of the kinematic GNSS analysis for GPS/Acoustic observation by precisely controlled movable table data

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The seafloor geodetic observation techniques are extremely important for understanding of the spatial and temporal heterogeneity of the interplate coupling. Especially, GPS/Acoustic (hereafter GPS/A) techniques have been developed for practical use in the past ten years, which allowed offshore measurement just above the expected strong coupling region in the plate boundary. The conventional observation style of the GPS/A is campaign style, which repeatedly observed by the research vessel. Recently, several groups have proposed continuous style GPS/A observation based on the moored buoy system.

The one of key technique of GPS/A observation is high-rate sampling precise/accurate positioning of floating section (e.g. research vessel, moored buoy) based on kinematic GPS analysis. A required precision/accuracy is typically smaller than several tens mm in the horizontal components even though it depend on the required precision by user. On the other hand, true position of such moving body is generally unknown.

Based on these backgrounds, we developed the precisely controlled movable table for the assessment of the precision/accuracy of the kinematic GPS (GNSS) analysis. The developed precise movable table consists of uniaxial small electric actuator device and its control unit. The maximum movable stroke of the actuator is 200mm, and the resolution of moving step is 0.1mm/pulse. We implemented a several moving pattern to the developed table. One of the moving patterns is modeled upon the research vessel. We used the velocity data obtained by 10Hz GPS Doppler measurement in the actual research vessel. We applied high-pass filtering after the integration of velocity data to the displacement. Obtained displacement strongly reflects the ship rolls and/or pitches, so we used this data as true value of the moving body. Based on the developed movable table, we tested the precision of the kinematic GPS analysis. We used the dual-frequency GNSS (GPS and GLONASS) receiver with 10Hz sampling for the test. For the test, we compared with real-time kinematic PPP time series and known movable table motion. As a preliminary result, obtained 10Hz time series by real-time kinematic PPP time series shows the good agreement with known movable table motion during the short period of time (<several hundred seconds). In contrast, the large discrepancy clearly appeared between both time series in the long period of time. It caused by the high noise level of kinematic PPP time series in the low frequency band. These experiments should be important for understanding of the noise property of the kinematic GNSS analysis for the moving body.

キーワード: キネマティック GNSS, 移動体
Keywords: kinematic GNSS, moving body