Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

SGD21-04 Room:301B Time:May 23 09:45-10:00

An accuracy evaluation of GNSS positioning toward semi-real time seafloor geodetic observation

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GPS/Acoustic seafloor geodetic observation (hereafter GPS/A SGO) is quite important and useful for understanding of shallower part of the interplate coupling between subducting and overriding plates, because it is very difficult to resolve the coupling clearly based on onshore GPS network [Nishimura et al., 2005]. We typically conduct GPS/A SGO in specific ocean area based on repeated campaign style using research vessel. Therefore, we cannot monitor the temporal variation of seafloor crustal deformation in real time. The one of the technical reason of difficulty for the real time observation is limited by precise kinematic GPS positioning. We are strongly urged to detect the buoy or vessel position less than several tens millimeter for detecting seafloor crustal deformation precisely. For this purpose, in this time, GPS analysis based on reference site. If the precise kinematic GPS analysis will be possible in the offshore region, it should be promising method for real time GPS/A SGO with USV (Unmanned Surface Vehicle) and a moored buoy.

Based on these backgrounds, we assess the precision and accuracy of the real time GPS positioning and the reliability of the communication path for conventional RTK-GPS. First, we assess the "StarFire^{TM}" global subscription service [Hatch and Sharpe, 2004], which is developed for the commercial purpose. It provides real-time accuracy typically better than 5 cm. Its globally corrected signal is available almost anywhere on the Earth's surface on land or sea via geostationary satellites. With this corrected signal, the precise real-time precise point positioning (real-time PPP) without the need for local ground base stations is realized. We assess the stability of kinematic solution based on the StarFire receiver compared with the daily positioning deduced from the GIPSY-OASIS II software version 6.1.2 (hereafter GOAII) from October 24th to 28th 2012. The standard deviation of the StarFire time series is generally nominal precision of the service. And also, obtained StarFire time series are good agreement with the GOAII daily positioning. But we cannot assess long-term stability of StarFire time series, because we only obtain 4 days observation data in static condition.

We also assess the communication path for conventional RTK-GPS positioning via satellite-based mobile phone service "WideStar II$^{(R)}$" operated by NTT DoCoMo. As a result, we basically succeeded to obtain the RTK-GPS solution stably via WideStar II even though we occasionally encountered the unexpected loss of the satellites communication.