毎月観測のためのGNSS-A観測技術の精度検証
Accuracy verification of GNSS-A technique for monthly observation

*横田 裕輔[1]、石川 直史[1]、渡邉 俊一[1]
*Yusuke Yokota[1], Tadashi Ishikawa[1], Shun-ichi Watanabe[1]

1. 海上保安庁海洋情報部
1. Japan Coast Guard, Hydrographic and oceanographic department

In the 21st century, monumental works in the field of seafloor geodesy were performed using the method to detecting seafloor crustal deformation, called as the GNSS-Acoustic ranging combination technique (GNSS-A). In this technique, we observe seafloor stations using vessels. The seafloor acoustic mirror-type transponders are set as seafloor stations within the range of 1 –3 km. Seafloor absolute positions are determined using this acoustic data, the attitude data and the GNSS data on the vessels.

Although the GNSS-A technique achieved establishment of the stable and sophisticated seafloor observation network by a lot of effort [e.g., Asada and Yabuki, 2001, Proc. Jpn Acad.; Fujita et al., 2006, EPS; Sato et al., 2013, JG], an observation frequency (about 3 times a year) remains lower than other geodetic observation techniques. Increasing the frequency is essential for observational stability. In addition to that, it is a technique necessary to detect crustal deformation phenomena in a short period of time (e.g., slow slip event and postseismic effect).

Since 2016, we implemented new acoustic transducer that can shorten an observation time for each observation opportunity. The new transducer is remodeled so as be able to perform multiple ranging in a short time. This implementation makes it possible to observe about 6 times a year. Moreover, by performing intensive operation as necessary, our observation system became one that can realize the observation frequency close to monthly observation.

Beforehand, we examined the adequate survey line and observation time for new system using this transducer by a numerical simulation. In the simulation results, there is no significant change in accuracy with the observation of 4 –6 hours per an opportunity. On the other hand, it is impossible to drastically reduce an accidental error just because we take a longer time observation. In this new system, acoustic signals may be received in an overlapped manner as shown in Figure. The travel time identified in this case was also verified and we confirmed that there was no problem.

Under a new management policy that takes these results into consideration, data of one year and a half has already been accumulated. In this presentation, we verify accuracy of this real observation data and introduce future operation policy.

Acknowledgements: We thank the Geospatial Information Authority of Japan (GSI) for high-rate GNSS data for kinematic GNSS analysis, and for daily coordinates of the sites on the GSI website.

キーワード：GNSS-A、海底地殻変動観測、音響測距
Keywords: GNSS-A, Seafloor geodetic observation, Acoustic ranging