

Accuracy evaluation of very long baseline KGPS and its application to the seafloor positioning

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Hydrographic and Oceanographic Department is carrying out seafloor geodetic observations with a survey vessel, which combines the KGPS and acoustic ranging techniques. In our seafloor geodetic observation, baseline lengths from land reference stations to seafloor station are 50-150km in general. Such a long baseline length makes it difficult to get our target accuracy of several centimeters as generally attained in the local survey. Therefore, we are applying the KGPS software specifically developed for the precise determination of the trajectory of a rover over very long baselines. In this presentation, we report the result of examining the dependency of the KGPS accuracy on the baseline lengths as far as 1500km.

We carried out KGPS analyses using data with various baseline lengths simultaneously acquired in the seafloor geodetic observations at Off Miyagi in April- May, 2005. We used 1-second sampling data of nine GEONET stations along the Pacific Ocean from Miyagi Prefecture to Kagoshima Prefecture and Shimosato Hydrographic Observatory. The baseline length ranges approximately from 150km to 1,500km. The analysis software is 'IT' (Interferometric Translocation). We evaluate errors included in the KGPS result by comparing a 1-minute average of the KGPS-determined sea surface height with the mean sea surface level.

The result of the error evaluation shows that all the baseline lengths gave precisions of less than 10cm, and an extreme drift has not appeared. From this result, a significant deterioration of positioning does not happen even in the case of baseline length exceeding 1,000km. Next, we applied the KGPS-determined trajectories for all these baseline lengths to the calculation of the seafloor station position. The comparison of determined seafloor station positions between for different baseline lengths shows that, in the cases of the baseline exceeding 500km, there appear a little deviations to those for the closer ones. But, even in the case of the longest baseline (1500km), the difference is less than several centimeters, which is less than 0.1 ppm of the baseline length. Thus we conclude that the KGPS result for the baseline length exceeding 1,000km is also applicable enough to our present seafloor geodetic observations.