

The accuracy evaluation experiment of kinematic GPS with a moving object

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[Introduction]

In order to monitor seafloor crustal deformation, we have developed a system with kinematic GPS positioning and acoustic ranging. The major error factors of the present system related to locate seafloor transponders are: 1) estimations of seawater acoustic velocities, 2) detection of acoustic signals, and 3) positioning by kinematic GPS. In our previous study, an accuracy evaluation experiment of kinematic GPS was conducted with baseline lengths of 15km, 30km, and 90km. As a result, the error of kinematic GPS is minimized by 1-2cm when baseline length is 10-30km especially with small satellite arrangement error. In this talk, we will show the result of our recent experiments with extended baseline lengths. Moreover, this experiment also investigated for horizontal as well as vertical accuracy by moving a rover antenna along a lifting device. The result of this experiment is important and would benefit the marine observation to reevaluate accuracy classified by baseline length of kinematic GPS.

[Method]

This experiment is conducted as follows: we construct five baselines with varying lengths (30, 60, 90, 110 and 150km). ROVER, an antenna moving on a rail way, is located at Nagoya Univ. In order to lessen the error of an internal clock of receiver, the external frequency clock (accuracy 10^{-9}) is attached in the receiver of each point. The data are logged at 1 second interval with the minimum elevation of GPS satellites as 15 degree. Moreover, in consideration of satellite arrangement, we experiment only during the time for PDOP to be two or less. A software RTD is used for analysis of kinematic GPS and data of precise orbits provided by IGS is also used. Bernese version 4.2 is used for the position determination of base stations and the rail with one week data. In accuracy evaluation, the position of an antenna was estimated on the rail in reference with the base station installed in Nagoya University (near ROVER). The position of the antenna was also set to a true coordinate value wherein the distance between the true value and coordinate values are calculated with each baseline solution.

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