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1 Introduction

Conventionally, sea level is observed by tide gauges (TG), which is measured relative to the earth's crust. Since conventional method used to measure sea level, a large number of tide gauges need to be maintained and observed at the same time.

2 System Design

The low-cost system in tidal survey (hydro-oceanographic survey) using low-cost GNSS modules and RTK Library (RTKLIB) as another solution that can monitor real-time change of sea level and worth to be established on the sea surface instead of using a fixed tidal gauge that typically installed at tide observatory in determining the water level.

3 Result and Discussion

Fig. 1 shows the configuration of RTK-GPS/GNSS.

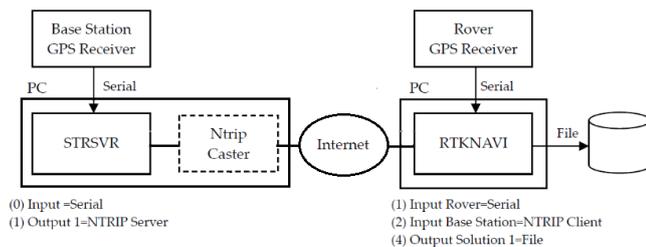


Fig 1. RTK-GPS/GNSS Configuration.

From Fig. 2 we could see the base station and rover configuration to evaluate the GNSS receivers.

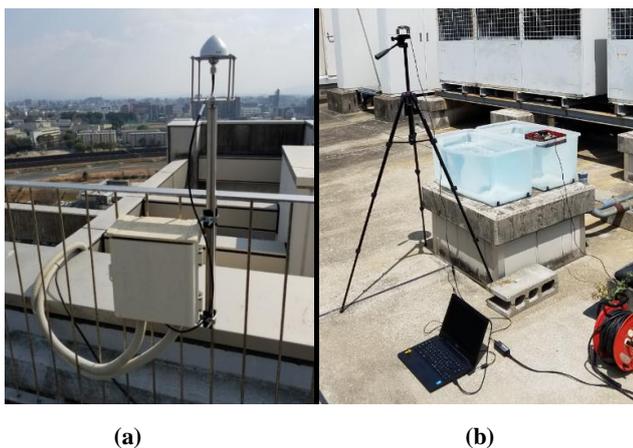


Fig 2. (a) Base Station and (b) Rovers on the tripod and in the water tank.

Fig. 3 shows signal levels and consolidations observed by the base station and rover. The number of observed satellites was 24-28 and 12 of the satellites were used for RTK calculation by setting masks in signal level (>40dB) and elevation angle (>30°).



Fig 3. Visible Satellites for Base Station and Rover.

In Fig. 4, the rover was installed on a tripod to change its height in the range 0-26 cm.

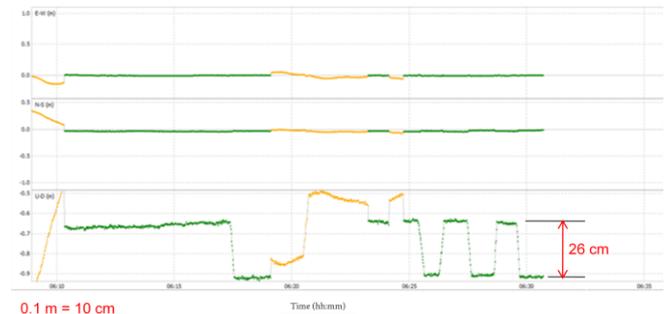


Fig 4. Rover movement with tripod 0-26 cm.

Generally speaking, developed sea level altitude measurement by high precision satellite positioning system using GNSS and low-cost RTKLIB has such performance to be used for the tidal survey (Hydro-oceanographic survey).

4 Conclusions

The low-cost system in the tidal survey (Hydro-oceanographic survey) using low-cost GNSS sensors and RTKLIB. By using a combined system of GPS/Beidou/QZSS in Japan, it delivers improved positioning of performance. RTKLIB software brings through cheaper GNSS modules for developing the sea level altitude measurement by the high precision satellite positioning system. According to the test results, even with such a low-cost RTK-GPS receiver, we can obtain reasonable performance with RTKLIB.

References

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[2] Yen-Pin, L., Ching-Jer, H., Sheng-Hsueh, C., Dong-Jiing, D., Chia, C. K., (2017). *Development of a GNSS Buoy for Monitoring Water Surface Elevations in Estuaries and Coastal Areas*. MDPI, Basel, Switzerland.