Development of a Precise Positioning Technique Using Multi-GNSS

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SUMMARY

Multiple GNSS constellations such as GPS, QZSS, GLONASS, Galileo and BeiDou have been recently realized and the number of available satellites for GNSS positioning is rapidly increasing. Although multiple GNSS constellations are now being realized, there are few analysis software for precise positioning that can handle multi-GNSS data. Since multi-GNSS constellations are expected to be more effective than single constellation for precise and efficient positioning in various fields including GNSS surveying, location-based services and monitoring of crustal deformation, the Geospatial Information Authority of Japan (GSI) launched a 4-year project from 2011 to develop and standardize a precise positioning technique that can fully utilize the potential of multi-GNSS data for surveys especially at urban or mountainous areas where satellite visibility is largely limited. In this project, we verified that multi-GNSS positioning had advantages in severe conditions as mentioned above and yielded fruits of technical outputs such as

1) Methods to handle between-receiver biases for combination of multi-GNSS signals

2) An open source software for multi-GNSS surveying named GSILIB, which can not only process GPS, QZSS, GLONSS, Galileo, BeiDou and L5 signal data, but also calculate double differences between GPS and other GNSSs with correcting Inter System Bias (ISB) individually estimated beforehand the calculation

3) Draft Manual of multi-GNSS surveying that are applicable to public surveys in Japan, which is funded and implemented by public sectors in Japan such as government ministries, national institutes, local governments etc.

This paper focuses on the multi-GNSS techniques for precise positioning and the application of techniques to public surveying.

Development of a Precise Positioning Technique Using Multi-GNSS (8401)
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FIG Working Week 2016
Recovery from Disaster
Christchurch, New Zealand, May 2–6, 2016