



High-Accurate Deformation Monitoring System Based on GPS and COMPASS

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The results of deformation monitoring system can be significantly enhanced in accuracy and availability with multiple GNSS systems. Phase II of COMPASS has completed a constellation of 14 satellites, 5 GEO satellites, 5 IGSO satellites and 4 MEO satellites, before the end of 2012 and can provide navigation services in Asia-Pacific areas now. Along with the release of the Interface Control Document (ICD), there are more combinations for us to select. In this study, we have developed a new deformation monitoring system based on two GNSS systems, GPS and COMPASS, with the strategy of double-difference and a wide variety of systematic error corrections. During the process of research and development, reliable methods of data preprocessing and bias fixing were used. We took advantage of the geometry-free observables (LG), Melbourne-Wubben observables (MW) and single-difference residuals of ionosphere-free observables (LC) to detect the cycle slips of raw data, and then solved all of these cycle slips as bias parameters in the process of Least Square Algorithm to avoid the wrong repairs. As for the bias fixing, We utilized the method of bootstrap and decision function to solve the bias parameters as an integer one by one. Several steps were adopted to ensure the result of bias fixing was correct. The solution was given by 3 components of the baselines and their variances respectively, which could be used to evaluate the quality of the data-processing. Comparisons between the new system and systems which is based on single GNSS system show that the results are improved remarkably in accuracy and availability, especially in Asia-Pacific region, where the accuracy of mm-level for short baselines can be achieved easily. Along with more satellites being launched in the future, COMPASS will make more contribution to the deformation monitoring application worldwide. In addition, the solution can be further enhanced with more and more error correction models being put into effect.