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A computational efficient data processing strategy for multi-GNSS and multi-frequency environment

Hua Chen (1,2), Maorong Ge (1), Weiping Jiang (2,3)

(1) German Research Centre for Geosciences (GFZ), Germany (whuchenhua@163.com), (2) School of Geodesy and Geomatics, Wuhan University, China, (3) GNSS Research Center, Wuhan University, China

Abstract: In the coming years, more GNSS systems will be operationally available, which brings a big challenge to present GNSS data processing strategy. For one thing, to meet the demands of providing multi-GNSS and multi-frequency services, all kinds of biases (such as inter-system and inter-frequency biases) should be estimated in the data processing strategies. For another thing, to make full use of the information in raw measurements and to generate products such as ionospheric delays for other applications, raw observations instead of differenced or combined must be utilized. Compared to traditional ones, the new strategy uses the original one-way measurements at various frequency bands directly rather than their differences and/or combinations and keeps the ionospheric delays, DCBs and inter-system and inter-frequency biases etc. as unknown parameters. The preliminary experiments show this new strategy could achieve the same precision and accuracy level as the traditional ones. However it is very time-consuming. Therefore, we further developed a new procedure to improve the computational efficiency. In this procedure, precise point positioning with integer ambiguity resolution is engaged to obtain integer ambiguities on every single station, and then all carrier-phases are converted to carrier-ranges. With such carrier-ranges and pseudo-ranges, the computational efficiency could be improved. This procedure is validated in terms of computational efficiency and product quality using data of the MGEX network with about 100 stations. The experimental validation shows that the computation efficiency of the new procedure could be significantly improved.