The effect of the GNSS time transfer performance for geopotential difference determination

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The quick development of the global navigation satellite system (GNSS) time transfer technique provides a good opportunity to determine the geopotential difference based on the general relativity theory (GRT). In this study, we propose an approach that uses the precise point positioning (PPP) technique to directly compute clock offsets between two clocks at two arbitrary positions for the purpose of determining the geopotential difference and the accuracy of this approach depends not only on both the accuracies and stabilities of clocks, but also the time transfer technique itself. To validate the relationship between the performance of GNSS time transfer and the accuracy of this approach, simulation experiments are conducted. We evaluated the performances of GNSS time transfer in different cases using different type of free-running clocks, and results show that the proposed approach could be applied to testing GRT. This study was supported by the National Natural Science Foundations of China (grant Nos. 41721003, 42030105, 41804012, 41631072, 41874023, 41574007), Natural Science Foundation of Hubei Province of China (grant Nos. 2019CFB611), and Space Station Project (2020)228.