

Evaluation of High-Rate GNSS-PPP for Monitoring Structural Health and Seismogeodesy Applications

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SUMMARY

This study evaluates the usability of the GNSS-PPP method for structural health monitoring and seismogeodesy applications. Two test scenarios were considered. The first test scenario included monitoring harmonic oscillations in amplitude of 5 mm to 20 mm with the frequency range of 0.2 Hz to 2.5 Hz that were generated using a shaking table, which has the ability to move in one direction in a horizontal plane. The second test scenario was carried out by simulating the El-Centro Earthquake as a seismogeodesy application. The used GNSS data comprised dual-frequency observations with a 10 Hz sampling rate. GNSS-derived positioning time series were obtained by processing the data using a post-mission kinematic PPP method and results were compared, in both the frequency domain and time domain, with LVDT (Linear Variable Differential Transformer) data, taking as a reference. Results show that the high-rate GNSS PPP method can capture the frequencies of harmonic movements comparable to the LVDT. The observed amplitudes of the harmonic oscillations are slightly different from the LVDT data at the order of mm level. These results demonstrate the ability of the high-rate GNSS PPP method to reliably monitor structural and earthquake-induced vibration frequencies and amplitudes for both the structural health and seismogeodesy applications.