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High-rate precise point positioning (PPP) to measure seismic wave motions: An experimental comparison of GPS PPP with inertial measurement units

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High-rate GPS has been widely used to construct displacement waveforms and to invert for source parameters of earthquakes. Almost all works on internal and external evaluation of high-rate GPS accuracy are based on GPS relative positioning. We build an experimental platform to externally evaluate the accuracy of 50 Hz PPP displacement waveforms. Since the shake table allows motion in any of six degrees of freedom, we install an inertial measurement unit (IMU) to measure the attitude of the platform and transform the IMU displacements into the GPS coordinate system. The experimental results have shown that high-rate PPP can produce absolute horizontal displacement waveforms at the accuracy of 2 to 4 millimeters and absolute vertical displacement waveforms at the sub-centimeter level of accuracy within a short period of time. The significance of the experiments indicates that high-rate PPP is capable of detecting absolute seismic displacement waveforms at the same high accuracy as GPS relative positioning techniques but requires no fixed datum station. We have also found a small scaling error of IMU and a small time offset of misalignment between high-rate PPP and IMU displacement waveforms by comparing the amplitudes of and cross-correlating both the displacement waveforms.
For more details on this talk, one can now get access to the on-line-first version of our *Journal of Geodesy* paper: J Geod, DOI 10.1007/s00190-012-0606-z