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GPS accuracy for high-rate geophysical applications

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Until recently, GPS measurements have been used mainly to obtain the temporal variation of daily estimates of site position on time scales that range from a few days to several years. As the precision of GPS determinations of position continues to improve the detection of smaller and faster geophysical signals has become feasible. With the advent of "GPS seismology", whereby position estimates are obtained at rates of at least one sample per second, a new class of geophysical studies has recently become possible. We have conducted an extensive series of ground-truth experiments using a one-dimensional GPS earthquake simulator to assess the accuracy of GPS position determinations for high-rate applications such as GPS seismology. Using this simulator, we have demonstrated that GPS can achieve few mm-level accuracy of time-dependent determinations of site position at sampling rates of 1 Hz. These results are relevant also for potential applications in "GPS glaciology", for example where fast-flowing glaciers are present and glacial surges and other transients could be expected. We will describe the GPS simulator, observations, and data analysis, and present a comprehensive assessment of the accuracy of GPS for high-rate geophysical applications.