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Cost-effective monitoring of ground motion by joint use of a single-frequency GPS and a MEMS accelerometer

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Real-time detection and precise estimation of strong ground motion are crucial for rapid assessment and early warning of geohazards such as earthquakes, landslides, and volcanic activity. This challenging task can be accomplished by combining GPS and accelerometer measurements because of their complementary capabilities to resolve broadband ground motion signals. However, for implementing an operational monitoring network of such joint measurement systems, cost-effective techniques need to be developed and rigorously tested. We propose a new approach for joint processing of single-frequency GPS and MEMS (micro-electro-mechanical systems) accelerometer data in real time. To demonstrate the performance of our method, we describe results from outdoor experiments under controlled conditions. For validation, we analysed dual-frequency GPS data and images recorded by a video camera. The results of the different sensors agree very well, suggesting that real-time broadband information of ground motion can be provided by using single-frequency GPS and MEMS accelerometers.

Reference:
Tu, R., R. Wang, M. Ge, T. R. Walter, M. Ramatschi, C. Milkereit, D. Bindi, and T. Dahm (2013), Cost-effective monitoring of ground motion related to earthquakes, landslides, or volcanic activity by joint use of a single-frequency GPS and a MEMS accelerometer, Geophysical Research Letters, 40, 3825-3829, doi:10.1002/grl.50653.