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High-rate GPS seismology for the 2013 ML 6.4 Wanrung, Taiwan earthquake

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The 31 October 2013 ML 6.4 Wanrung earthquake was well recorded by twenty-five 1-Hz and sixteen 10-Hz GPS receivers and twenty-five seismometers located within the epicentral distance of about 80 km. Precise Point Positioning kinematic solutions estimated by software VADASE, RTKLIB, and GIPSY are used to obtain the co-seismic deformations and dynamic displacements. We used seismograms recorded by broadband seismometers and strong motion accelerometers to verify the capability of high-rate GPS for the detections of the body waves and surface waves generated by a moderate-size earthquake. Results show that the overall standard deviations of the position time series are $\sim$6 mm and $\sim$20 mm in the horizontal and vertical components, respectively after applying spatial filtering. Largest co-seismic displacement derived from high-rate GPS is nearly twenty centimeter at 5 km northeast of the epicenter. S waves and surface waves are successfully detected by motions of 10-Hz GPS and double-integrated accelerometers within the 15 km epicentral distance. We also found that a group of later phases of $\sim$1-2.5 cm peak-to-peak amplitudes with a frequency range of 0.2-0.5 Hz located within the Longitudinal Valley, a suture zone composed of Holocene thick sediment deposits. The 2013 Wanrung, Taiwan earthquake recorded by the high-rate GPS network in Taiwan demonstrates the feasibility of GPS Seismology for a moderate size earthquake at a local scale.