The kinematic precise point positioning for the fast movement of GPS/GNSS ground stations

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This study precisely calculates the time series of the fast movement of GPS/GNSS ground stations caused by a large earthquake by using the method of kinematic precise point positioning. The calculation uses the 1-Hz-rate-sampled data of GPS receivers and extracts the fast component, i.e., the periodic one of less than several minutes, of the movement. It demonstrates the precise measurement of the propagation of the Love and Rayleigh waves in Bangalore, India, caused by the Andaman-Sumatra earthquake (26 December, 2004).

This study's methodology is rather simplified because it solely considers the fast component of the precise movement, i.e., it almost neglects the slow and absolute one. The error in the calculation result mainly consists of the receiver's measurement noise (about 2 mm in amplitude), the multipath one (about 10 mm), and the estimation error in a GPS satellite's clock (about several tens of millimeter).

The precision of the calculation result is actually degraded because of the unavailableness of the precise product of 1-Hz-rate-sampled GPS-satellite clock. Such clock product, however, can be created by applying this study's methodology and by averaging the calculation results of many stationary GPS ground stations.