



Clock-modeling-constrained coseismic displacement estimation using a single GNSS receiver

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With the development of the technology, such as high acquisition rate, large data storage capability, high-rate GNSS is proved to be a reliable tool to capture surface displacements including static offsets and dynamic motions in the near field for earthquake magnitude estimation, rapid fault slip inversion, earthquake early warning, and regional tsunami early warning, etc. However, due to poor geometry distribution of satellites, the vertical displacement has a strong correlation with receiver clock variations. In this case, the vertical displacement is not accurate, leading to hardly capturing the weak seismic waves. Fortunately, there are existing some GNSS stations equipped with high-stability oscillators in worldwide. For these stations, the receiver clock can be modeled and predicted rather than estimated epoch-wise. With receiver clock modeling, the highly correlated parameters between the displacement and receiver clock variations decrease significantly. In this paper, we adopted the epoch-relative positioning approach with the receiver clock modeling to determine coseismic displacement. The performance is validated using 1 Hz data from one IGS station (USUD) that is about 430 km away from the epicenter of the Tohoku-Oki earthquake (Mw 9.0, March 11, 2011) in Japan. It is indicated that the accuracy of vertical displacement could be improved by about 50%.