Extreme Distant Detection and Analysis of Seismic Waves of the Great Tohoku Earthquake Using 1 Hz GPS Data

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ABSTRACT:

The March 11th 2011 M=9.0 Tohoku earthquake generated large seismic waves and provided the opportunity to study deformations generated by the earthquake event at extreme distances. In our analysis surface waves from the source traveled through the entire Eurasian plate dominantly through continental lithosphere, and more than 9100 km away we aimed at detecting precise deformations caused by this event using data of a GNSS network with sites located inside the Pannonian basin on thick loose sediments. We analyzed 1 Hz GPS data with the Bernese 5.0 kinematic solution based on double differences using precise GPS orbits and the quasi ionosphere free ambiguity resolution. GPS time series of each site of the network let us analyze the passing Love surface waves, the 3 D deformations caused by the Rayleigh waves and many transverse waves from different paths uniquely at this extreme distance from the epicenter of the earthquake.