Study of the early postseismic phase of Tohoku-Oki earthquake (2011) with kinematics solutions

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Stress accumulation and relaxation occur on fault zones throughout the seismic cycle. In particular, the postseismic phase, which directly follows the earthquake rupture is a combination of different processes among which aseismic slip on the fault zone (called afterslip), viscoelastic deformation of the surrounding material, poroelastic relaxation and aftershocks. However, little work has been done on the early stage of the transition from the co- to the postseismic phase, and the physical processes explaining this transition.

In this study, we focus on the few minutes to the few days following the mainshock, where the deformation is assumed to be dominated by afterslip, for the Mw 9.0 Tohoku-Oki earthquake, one of the largest and most instrumented recent earthquake (2011). Here, GEONET GPS data are used to study its early stage.

Based on the method developed by Twardzik et al. (2019), we obtain kinematics position time series (30-s), which we use to characterize the fast displacements rates which typically occur during the early stages of this postseismic phase. For that, we use the GipsyX 1.2 software developed by JPL. Then, we apply a sidereal filter to remove the multi-path effect and obtained clean displacement time series.

This poster shows the preliminary results of our kinematics solutions analysis. In particular, we highlight study the differences between the standard and high rate estimation of the co-seismic offsets. We also characterize the temporal evolution of the early postseismic phase and study its spatial pattern with respect to that of the coseismic slip.

References: