Snapshot of Heterogeneous Post-Seismic Deformation Following the 2016 Mw 7.8 Pedernales Earthquake, coastal Ecuador

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Abstract

We use GPS data of Ecuador's national continuous geodetic network to constrain ongoing post-seismic deformation associated with the destructive 2016 Mw 7.8 Pedernales, Ecuador subduction earthquake. The main shock's occurrence produced a maximum co-seismic slip of 6 m with a southward rupture of 2 main asperities. Maximum post seismic afterslip has been strongest immediately to the N and S updip of the rupture with up to 0.6 m of localized slip measured within the first 30 days (Rolandone et al., 2018). Now some 800 days after the earthquake, the near field GPS stations closest to the epicentre are still affected by a post-seismic signal as are GPS stations out to 340 km in the Amazonian region. In the volcanic arc two hundred km east of the source, we observe variations in the vertical (recording both inflation and deflation) and horizontal components.
In this contribution we provide a snapshot of ongoing post-seismic deformation, particularly in Ecuador's Sierra region, where weakened lower crust beneath the volcanic arc may be influencing the observed deformation. Future modelling with a finite element model will attempt to discern the primary relaxation mechanisms: ie viscoelastic, aseismic processes, or poroelastic rebound that may be contributing to the observed GPS patterns and the specific InSAR displacements related to this stage of the post-seismic period. Heterogeneity in post seismic deformation patterns has been observed in other subduction zones during the post-rupture phase and our work gives insight on continuing relaxation process following the Pedernales earthquake.

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