Imaging early postseismic slip in the hours to days following the 2016 Mw 7.8 Pedernales earthquake: where does it occur relative to longer-term postseismic slip?

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Abstract

We estimate the spatio-temporal distribution of early postseismic slip following the 2016 Mw 7.8 Pedernales earthquake offshore Ecuador, with the aim of studying how its spatio-temporal distribution relates to that on the longer-term postseismic timescale and to the coseismic slip distribution. To image the spatio-temporal evolution of postseismic slip, we use time series of 30-second high-rate GPS data recorded from 2 minutes to 3 days after the mainshock at 27 stations of the IGEPN and IRD joint network operating in Ecuador. We invert these time series with the Principal Component Analysis-based Inversion Method (PCAIM) *[Kositsky and Avouac, 2010]*, incorporating the sensitivity-regulated regularization scheme of *Ortega-Culaciati [2013]*. This inversion method allows us to estimate dense time snapshots of postseismic slip in the hours to days following the mainshock. We produce a suite of inversion models based on different levels of temporal smoothing of the time series. Our results suggest postseismic slip concentrated in regions of the fault updip of two areas that experienced peak coseismic slip during the mainshock, which is similar to that of afterslip estimated by inverting daily GPS time series spanning 30 days after the earthquake. However, we find a noticeable improvement in the fit of the data when a moderate amount of postseismic slip is also located within and downdip of the mainshock rupture area, suggesting that the coseismic and early postseismic slip episodes might partially overlap. In addition, our results suggest that the slow slip event near La Plata Island, as reported by *Rolandone et al. [2017]*, may have started during the early postseismic period. Finally, the equivalent moment magnitude of our suite of models ranges from Mw 7.1 to 7.2, represents _˜35-50% of the geodetic moment of the 30-day afterslip model of *Rolandone et al. [2017]*, and _˜9-13% of the coseismic moment released during the Mw 7.8 earthquake. These inversion results will guide our exploration of frictional properties on the megathrust, which potentially allow us to probe the physical processes that occur during the early postseismic period.

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