Investigation of the foreshock and aftershock sequence of the 2012 Mw 7.4 Ometepec earthquake using fingerprint and matched filter techniques

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On March 20 2012, the Mw 7.4 Ometepec earthquake ruptured a section of the Middle America Trench. This event triggered an unusually large aftershock sequence (UNAM seismology group 2013), and was widely felt across central and southern Mexico. Four months before the mainshock, an equivalent magnitude Mw 6.9 slow slip event (SSE) began and migrated towards the rupture zone reaching its maximum slip one month before the earthquake (Graham et al. 2014). One day and a half days, a temporary aftershock seismic network, consisting of 6 broadband 100Hz temporary stations, was installed to monitor the resulting increase in seismicity. We process the data, from this deployment and the permanent stations nearby, to track the occurrence of the characteristic repeating earthquake sequence and the evolution of the seismic activity prior to the event and at the onset of the postseismic relaxation. A previous study showed that numerous characteristic repeating sequences appear along the strike of the subduction zone from the shallow section of the trench up to 20km depth (Dominguez et al. 2016. JGR). As a result of strain release, we found a significant number of previously unobserved repeating sources seismicity appeared along the rupture zone, and previously reported sequences shortened their recurrence time intervals. We searched for characteristic repeating earthquakes hidden in the coda of the mainshock, and scanned for unreported events using both fingerprint (Yoon et al., 2015) and matched filter analysis. Our analysis focuses on evaluating the long-term slip rate inferred from the characteristic repeating earthquakes, unreported seismicity, and the evolution of the SSE rupture that led to the Mw 7.4 mainshock.

Keywords: Characteristic repeating earthquakes, 2012 Ometepec earthquake, Matched filter, Fingerprint

