

AFTERSHOCKS AND TRIGGERED EVENTS OF THE GREAT 1906 SAN FRANCISCO EARTHQUAKE, BASED ON INTENSITY OBSERVATIONS

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ABSTRACT.

The San Andreas fault is the longest fault in California and one of the longest strike-slip faults in the world, yet little is known about the behavior of aftershocks following the most recent event on the San Andreas, the $M \sim 7.8$ San Francisco earthquake, on 18 Apr 1906. We conducted a study to locate and to estimate magnitudes for the largest aftershocks and triggered events of this earthquake. We examined existing catalogs and historical documents for the period Apr 1906 to Dec 1907, compiling data on the first twenty months of the aftershock sequence. We grouped felt reports temporally, and assigned Modified Mercalli intensities for the larger events based on the perceived most reliable descriptions. For onshore and near-shore events, a grid-search algorithm (derived from empirical analysis of modern earthquakes; modified from an algorithm of Bakun and Wentworth) was used to find the epicentral location and magnitude most consistent with the assigned intensities. For events identified as far offshore, the event's intensity distribution was compared with those of modern events, in order to constrain the event's location and magnitude.

The two largest aftershocks, which occurred on 23 Apr 1906 and 11 Aug 1907, were located off the Humboldt County coast. These were estimated to be $M \sim 6.7$, about 100 km west of Eureka, and $M \sim 6.5$, about 60 km west of Cape Mendocino, respectively. South of Humboldt County, the largest aftershock was a $M \sim 5.6$ event near San Juan Bautista on 17 May 1906. Other significant aftershocks included a $M \sim 5.0$ event on 6 Jul 1906 on the creeping segment of the San Andreas fault (southeast of the mainshock rupture), a $M \sim 5.1$ event on 5 Jun 1907 on the San Andreas fault in San Mateo County, and a $M \sim 5.1$ event on 8 Aug 1907 near Punta Gorda. The 1906 San Francisco earthquake also triggered events in southern California (including separate events in or near the Imperial Valley, the Pomona Valley, and Santa Monica Bay), in western Nevada, in southern central Oregon, and in western Arizona, all within a 40-hour period following the mainshock. Of these triggered events, the largest were a $M \sim 6.1$ earthquake near Brawley, CA, and a $M \sim 5.0$ under or near Santa Monica Bay, ~ 11 and ~ 31 hours after the San Francisco mainshock, respectively.

Abstract revised 10 April 2001.

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