

Estimated Casualties in a Possible Great Earthquake Along the Pacific Coast of Mexico

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Plate boundaries may rupture across several of the usual segments, generating mega earthquakes (M9+), as the Sumatra (2004) and the Tohoku (2011) events showed. The plate boundary along the Pacific coast of Mexico tends to rupture in M7.5 to M8 earthquakes of typical rupture length of up to 200 km. However, not all historic earthquakes have followed this pattern. On 28 March 1787 the San Sixto, M8.6, earthquake ruptured a segment of about 450 km, which since that time has ruptured in four adjacent earthquakes. It generated intensities (MMI) of I=VI to VII as far away as at the Atlantic coast and a maximum shaking of XI. In this paper, we estimate the number of casualties (fatalities and injured), if the San Sixto event occurred at present. Before we attempt such a calculation, we verify that our computer tool, QLARM, and its data base, estimate intensities and fatalities approximately correctly for large Mexican earthquakes along the Pacific coast. Our test set consists of 11 earthquakes ranging from M6.9 to M8.6, having caused between 0 and about 10,000 fatalities, with occurrence dates between 1787 and 2003. The requirement for a satisfactory match was that the maximum I agrees within 0.5 units, the extent of the I=VII area agreed approximately and the fatality count differed not more than a factor of 2 or 200, whichever was larger. Our results suggest that a repeat of the San Sixto earthquake would cause approximately $22,000 \pm 10,000$ fatalities and $73,000 \pm 40,000$ injured. We also observe that the numbers of fatalities in rural and major urban population centers are approximately equal, with the estimated mortality rate in rural areas possibly 20% higher than in major population centers, except Mexico City, which is in its own class. It seems clear that there is a large potential for saving the lives of some of the seriously injured with a well designed response plan.