

## Revisiting the 1872 Owens Valley, California, Earthquake

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### Abstract

The 26 March 1872 Owens Valley earthquake is among the largest historical earthquakes in California. The felt area and maximum fault displacements have long been regarded as comparable to, if not greater than, those of the great San Andreas fault earthquakes of 1857 and 1906, but mapped surface ruptures of the latter two events were 2-3 longer than that inferred for the 1872 rupture. The preferred magnitude estimate of the Owens Valley earthquake has thus been 7.4, based largely on the geological evidence. Reinterpreting macroseismic accounts of the Owens Valley earthquake, we infer generally lower intensity values than those estimated in earlier studies. Nonetheless, as recognized in the early 20<sup>th</sup> century, the effects of this earthquake were still generally more dramatic at regional distances than the macroseismic effects from the 1906 earthquake, with light damage to masonry buildings at (nearest-fault) distances as large as 400 km. Macroseismic observations thus suggest a magnitude greater than that of the 1906 San Francisco earthquake, which appears to be at odds with geological observations. However, while the mapped rupture length of the Owens Valley earthquake is relatively low, the average slip was high. The surface rupture was also complex and extended over multiple fault segments. It was first mapped in detail over a century after the earthquake occurred, and recent evidence suggests it might have been longer than earlier studies indicated. Our preferred magnitude estimate is  $M_w 7.8-7.9$ , values that we show are consistent with the geological observations. The results of our study suggest that either the Owens Valley earthquake was larger than the 1906 San Francisco earthquake or that, by virtue of source properties and/or propagation effects, it produced systematically higher ground motions at regional distances.