

Historical earthquakes have altered age distributions of stone lanterns in temples and shrines in Japan

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Strong ground motion often topples stone lanterns, which are small stone objects standing in precincts of Japanese temples and shrines. For example, stone lanterns at Zenkoji Temple, Nagano, were severely damaged by the earthquake on 2014 Nov 22 in northern Nagano. Similar damage were recorded in historical documents, and seismologists use them to learn spatial distribution of shaking and to estimate the source fault. Date of dedication, or built, is often engraved on the column of stone lantern and we can determine ages of stone lanterns, and judging from the ages, older one were apparently survivors of past earthquakes. Stone lanterns are therefore records of historical earthquakes. How (or if) these earthquake are imprinted on groups of stone lanterns was not intensively investigated in the past. In this presentation we summarize our own surveys of stone lanterns at Kitano-Tenmangu Shrine, Kyoto, Iwashimizu-Hachimangu Shrine, Yawata, and Zenkoji Temple, Nagano, and argue whether stone lanterns literarily record historical earthquakes. These three sites are known for historical large earthquakes and a large numbers of stone lanterns in their small precincts. Age distributions of stone lanterns are mainly affected by anthropogenic or religious acts, and evaluation of these effects is necessary before we identify effects of earthquakes. We conclude that historical earthquakes likely have a weak but identifiable imprints on age distributions of stone lanterns. There are a few cases that large earthquakes apparently reset age distribution stone lanterns, suggesting large damages at the specific sites. Stone lanterns in the precincts apparently increases within 10 years of the earthquake, indicating the recovery stage of the community. On the other hand, it is hard to elucidate characteristics of historical ground motion solely from stone lanterns, and role of these items in studying historical earthquakes could be auxiliary to document records.

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