

Investigation of damage distribution around Mt.Hiei for the 1830 kyoto and Iga-Ueno earthquakes

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In this study, diary archives from the Eizan Bunko were used to analyze the state of damage in the area around Mount Hiei caused by the Kyoto Earthquake in 1830 and the Iga-Ueno Earthquake in 1854. Diaries from the various shrines of the Mount Hiei Three Towers dating back to 1650 still remain in the Eizan Bunko. The comparison of those entries elucidated the conditions in the Kami Sakamoto, Shimo Sakamoto, and Hieitsuji villages in the area around Mount Hiei during the earthquake. By comparing such information extracted from the diary archives and the ground conditions, it was possible to estimate the distribution of seismic intensity in the limited area around Mount Hiei. The Bunsei Kyoto Earthquake was an intraplate earthquake that occurred on August 19, 1830, reportedly causing damage such as the collapse of roofed mud walls in the Kyoto Imperial Palace and stone walls in Nijo Castle, as well as the destruction of many dozo-structured storehouses with thick mud wall in townsmen districts. Damage caused by this earthquake in the area around Mount Hiei included the destruction of six houses in Otsu-juku, the collapse of the reception hall of Shojuraikoji Temple in Hieitsuji village and serious damage to the main building, temple kitchens, gates, high fences and Jizodo Hall of Kanpukuji Temple. A close examination of the entries in the diaries at the Eizan Bunko revealed that, while there was almost no damage in Kami Sakamoto village, which was situated on terraced terrain, private homes and temples were destroyed in places such as Hieitsuji and Shimo Sakamoto villages located along the lakeshore. It is surmised that the differences in damage in Kami Sakamoto village and Hieitsuji and Shimo Sakamoto villages were largely due to differences in ground conditions. Moreover, compared to the Iga-Ueno Earthquake, overall damages were negligible, despite the proximity of the earthquake to the epicenter. This was largely due to differences in the scale of the earthquakes. Because there are not much documentations from places reported to be close to the epicenter of the Bunsei Kyoto Earthquake, previous studies incorporated different methods of determining the epicenter of the earthquake and the ground at places noted in historical records was not sufficiently examined. ⁽¹⁾ However, according the records on the epicenter based on the damage in Kameoka Castle town and the investigation on old structures in villages situated directly above the Kameoka fault—the likely origin of the earthquake—Junzo Omura has estimated that the epicenter was approximately seven kilometers further towards the Kyoto Basin than that of initial estimation. ⁽²⁾ The results of a simulation of the seismic intensity based on the distance from the epicenter and ground conditions using this estimated epicenter as the reference, revealed that the estimated damage in the area around Mount Hiei can be easily explained by Omura's estimation than that posited by Tatsuo Usami and other researchers.

The Iga-Ueno Earthquake of 1854 was an inland earthquake that occurred in modern-day northern part of Iga City, Mie Prefecture, on July 9, 1854. Investigation of the damage situation in the area around Mt. Hiei shows that many houses in Shimo Sakamoto village were destroyed and particularly large number of deaths in the Obanagawa district was recorded. In addition, damage included the collapse of the stone gateway of Ichidono Shrine (Myoken Shrine), the destruction of stone lanterns at the temporary refuge at Daishogun Shrine and the collapse of the stone walls of the large gate with a karahafu gable and fissures in the ground at Shiga-in Temple. Compared to the Bunsei Kyoto Earthquake, the scale of damage caused by the Iga-Ueno Earthquake was greater, despite the fact that the earthquake occurred at greater distance from the epicenter, it can be surmised that the scale of the latter was greater than that of the former. Furthermore, the state of damage can also be ascertained from aftershocks in the area around Mount Hiei

recorded in diary archives from the Eizan Bunko. In this study, with the focus on the area around Mount Hiei, further accurate seismic intensity distribution within a fixed area was implemented by comparing multiple diary entries and ground conditions, and studying the causes of the distribution, presenting the possibility of seismic research through literature and science.

(1) Tatsuo Usami et al. “Materials for comprehensive list of destructive earthquakes in Japan, 59, 599 - 2012” (University of Tokyo Press, 2013)

(2) Junzo Ohmura “Re-examination of Earthquake Damage and Source Fault of the 1830 Bunsei Kyoto Earthquake” (*Rekishi Jishin (Historical earthquakes)*) No. 29. 2014

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