

Sand boiling traces at the Netsuno ruin in Ishikawa Prefecture and the Morimto-Togashi fault zone

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Sand boiling traces detected at an archaeological site provides important information to reveal historical seismicity. In the Bunyudo ruins located at the central part of the Tedori-river fan, Hiramatsu and Kozaka (2013) detected sand boiling traces, which are the evidence of liquefaction, and discussed its relation to the activity of the Morimoto-Togashi fault zone. We report here sand boiling traces detected by an excavation survey of the Netsuno ruin, near the Bunyudo ruins, in 2013.

In the Netsuno ruin, we observe four sand boiling traces on the plane on which traces of vertical caves housing and Tsukikage wares of the late Yayoi period (1800-1900 years ago) were found. The sand boiling traces consist of ash gray sand with a diameter less than 1 mm. The largest trace has the maximum width of 20 cm and the length of about 2 m. This trace extends from a sand layer between a gravel layer and a silt layer located about 50 cm below the plane on which the traces are observed. Furthermore, this trace does not penetrate into a black soil layer above the plane that deposited from the late Yayoi period to the early Heian period. The observed traces are likely to have been covered by the black soil layer after the boiling on the ground surface at the time, implying that the formation age of the traces is from 1800-1900 to about 1100 years ago.

The Togashi fault is located near the Netsuno and the Bunyudo ruins, and, together with the Morimoto and the Nomachi faults, constitutes the Morimoto-Togashi fault zone of which a the total length is 26 km. No active fault has been reported around the Netsuno and the Bunyudo ruins. We, therefore, consider that the sand boil traces detected at these ruins are possibly formed by the activity of the Togashi fault or of the Morimoto-Togashi fault zone. An excavation survey at the Umeda area located at the northern part of the Morimoto fault revealed that a fault movement occurred about 1800-2000 years ago. A ruin where the surface displacement caused by the fault movement was observed is formed in the late Yayoi period. This period is the same as those of the Netsuno and the Bunyudo ruins. We, thus, conclude that the latest event of the Morimoto-Togashi fault zone is likely to be occurred 1800-1900 years ago.

Keywords: strong motion, the Morimto-Togashi fault zone, liquefaction, geopark