

Evidence for Holocene paleoseismic events on the surface-rupturing fault of the 2016 Kumamoto earthquake exposed on trench walls at Kurokawa, the town of Minami-Aso, southwest Japan

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To reveal the eastern extension of the Futagawa fault zone and its paleoseismicity, we excavated a trench across the surface rupture of the 2016 Kumamoto earthquake extended to the Aso Caldera. The six-meter-deep trench at Kurokawa, the town of Minami Aso exposed young sediments mainly composed of multiple massive loam units, volcanic sand layers, fall-out tephra units, and organic rich fine sediments that are evidently warped and cut by a group of numerous faults. The Kikai-Akahoya tephra layer of 7.3 ka exposed near the bottom of the trench, shows two-meter vertical offset, which suggests cumulative slip due to the multiple paleoseismic events. As a result of our detailed observation and radiocarbon dating, we interpret four paleoseismic events, the 2016 Kumamoto earthquake, the penultimate event occurred any time between 1,900 and 2,132 cal.yBP, antepenultimate event of 1,977-4,237 cal.yBP, and the oldest one of 4,090-7,300 cal. yBP. The longest average inter-event time is ~2,400 years that would be consistent with the ones estimated from post-Kumamoto earthquake studies along the Futagawa fault zone out of the Aso Caldera. It suggests that the similar type of the earthquakes of the 2016 Kumamoto earthquake might have frequently occurred in the Holocene period.

Keywords: active fault, Kumamoto earthquake, Aso Caldera