Tsunamis generated by the 7.3 ka catastrophic eruption at Kikai caldera, Japan: constrains from tsunami traces around the Koseda coast, NE Yakushima, Japan

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Timing and mechanism of volcanogenic tsunamis are important to constrain nature, processes, and hazards of volcanic eruptions in marine and lacustrine environments. In this presentation, we report the event deposits caused by pyroclastic flows and tsunamis during a catastrophic caldera-forming eruption at Kikai caldera, Japan, and discuss their origin. There are some hypotheses on the tsunami generation and propagation during the 7.3 ka eruption at Kikai caldera. Previous numerical simulations showed that huge tsunamis might hit Yakushima Island (e.g., Maeno et al., 2006), but so far no clear and convincing evidence has been found in this region. We investigated traces of the tsunamis caused by this eruption in the northeast of Yakushima Island, and found the deposits, originated from the pyroclastic flow and tsunami event at 7.3 ka, near the Onagawa river mouth at the Koseda coast. Our study includes reinterpretation of a previously studied outcrop (Moriwaki et al., 2006). The deposits at the Koseda coast consist of two major units and lie on a wave cut bench (WB-4) of ~8.4 m above sea level or more. The lower unit is a poorly sorted, ~30-cm gravel bed with sandy matrix, and the upper unit is a massive, 0.3-1-m thick pyroclastic flow deposit from the 7.3 ka eruption. A reworked deposit and a 1-2-m thick gravel bed cover the pyroclastic flow deposit. Based on the outcrop and trench surveys, the lower gravel bed is traceable at least 120 m toward inland and has a similar component to modern beach gravels distributed around the Onagawa river mouth. The matrix of the lower gravel bed also contains pumice clasts (up to a few cm in diameter) originated from the 7.3 ka eruption, as evidenced by glass chemical composition and fibrous texture. The grain-size of the matrix component decreases toward inland. The local observations of Holocene marine terrace distributed in the northeast of Yakushima suggest that the highest sea level phase (+9.7 m) occurred between 7.3 and 5 ka. Thus, we interpret that WB-4 emerged before 7.3 ka, the sea level at 7.3 ka was less than 8.4 m, and a transgression of 1~2-m continued after 7.3 ka. Based on our data and interpretation, we would conclude that gravel in the lower bed was transported from the river mouth to the top surface of WB-4 by a relatively high concentration, energetic current associated with a tsunami at 7.3 ka, and that the timing of the tsunami is constrained after the beginning of the 7.3 ka eruption and before or during the climactic phase that produced large-scale pyroclastic flows.

Keywords: volcanogenic tsunamis, pyroclastic flows, Kikai caldera, Koseda coast, Yakushima

