

Source of tsunami sediments estimated using foraminifera in the east coast of Ishigaki Island

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Investigations of old literatures and tsunami boulders revealed that large historical and paleo tsunamis had been attacked the Sakishima Islands for several thousands years. The 1771 Yaeyama tsunami (Meiwa tsunami) was the biggest tsunami in the historically recorded ones in the Yaeyama Islands. The ¹⁴C dating of the coral fossils over the tsunami boulders also showed the repeating large paleo tsunamis in the Sakishima Islands.

The sand layers were frequently observed at the excavation sites of the archeological surveys. However, the source of such sands using the foraminifera had not been surveyed in the Sakishima Islands.

We investigated the source of the sands of the tsunami sediments using the analysis of the foraminifera. We performed the trench-survey at Tanaka cattle farm, Ibaruma, the east coast of the Ishigaki Islands on November 5-8, 2013. Five trench, whose elevations were from 2.65 m to 8.13 m, had been excavated along the survey line from the shore to inland. We sampled the sediments at the interval of 20 cm to downward direction. The mud contents, particle-size analysis, and the foraminiferal analysis of the sediments were done. We picked the foraminifera whose number is over 150 from the sample of the grain size of 2-0.5 mm and analyzed them. The sampled was decimated when the quantity of the sample was large. Then we sampled the beach sands and analyzed them to investigate the source of the tsunami sediments. We performed the community analysis using cluster analysis and multidimensional scaling method. For the community analysis, we used the recent foraminifera group data sampled at beach, sea grass beds, reef crest, and moat in the north of Ishigaki Island (Fujita, 2006), and compared them with those of tsunami sediments.

Almost trench sites consists of first (cultivated soil), second (sand layer including rip-up crusts), third (silt layer), and fourth (sand layer with grading and coral fossils) layers. The most inland trench consists of first (cultivated soil), second (grading sand layer with rip-up crusts), third (mud layer including many gravel), and fourth (Shimajiri mud stone) layers.

The age of second and fourth layers, which were possibly the tsunami sediments, were estimated as 200-300 years and 500-800 years from the dating the C14 age of the in-situ bivalves.

The community analysis of the foraminifera showed that the compositions of the foraminifera at the seaward and landward sites had changed gradually through the same layers. The group which lived near the reef crest was dominant in the seaward site, whereas the group near the shore was dominant near the inland site.

This suggests that the sediment of the reef crest and shelf was deposited near the shore, although the sand near the shore was deposited in the inland by the tsunami of 200-300 years ago. Moreover, the foraminifera (*Amphistrigina* spp. and *Elphidium* spp.), which could dissolve at fresh water condition, was concentrated at fourth layer. The ground water had leaked near the bottom of the trench sites. The above-mentioned foraminifera would have remained selectively whereas others solved in the fresh-water condition. This suggests that the effect of the dissolution would be important factor for the preservation of foraminifera in the tsunami sediments.

Keywords: tsunami sediments, foraminifera, Ishigaki Island