

## History of past tsunami events at Southern Ryukyus: Estimation from radiocarbon dating of *Porites* coral boulders

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An enormous tsunami were caused by huge earthquake happened off eastern Japan on last March, which devastated wide coastal areas in Japan. It is noted that giant tsunamis have been repeatedly striking all over Japan. For example, one of the largest tsunami disasters in Japanese history was "the Meiwa tsunami", happened in 1771. This tsunami struck southern part of Ryukyu Islands, and killed more than 12,000 people. The maximum wave height and casualty of the tsunami were similar to 2011 Tohoku tsunami. However, the origin of the Meiwa tsunami is still controversial. Moreover, information about past tsunamis before 1771 Meiwa tsunami was limited in this region. Therefore, not only local historical documents but also geological evidences should be needed for collecting information on past tsunamis such as recurrence period, frequency and scale as well as the damage caused by these tsunamis and for future disaster mitigation in this region.

A large number of massive coral head boulders, locally called "Tsunami-ishi", are widely scattered both along the shore and on the reef at Southern Ryukyu Islands. These coralline boulders were likely transported by past tsunamis struck in this area. The coralline tsunami boulders were previously reported, which were deposited by the 2004 Indian Ocean tsunami. We focus on these coral boulders, especially genus of *Porites* spp., which could be used as records of past tsunami disasters. When corals were cast ashore by large tsunamis, their growth stopped at that time and the date of the tsunami event could be determined by radiometric dating of well-preserved surface parts of these boulders.

We performed a large number of radiocarbon dating analyses on 92 massive *Porites* spp. coral boulders collected from several islands in Southern Ryukyus. These results show that past tsunami disasters were likely happened repeatedly in this region from more than 2,500 years ago, including the 1771 Meiwa tsunami. The recurrence period of tsunamis struck in this region were estimated about 150 to 400 years.

The timing and frequency of the past tsunamis could be validated due to a lot dating results of *Porites* coral boulders. Combining this study with tsunami engineering and geophysics could also lead to further contributions to reveal past tsunamis. When we want to know about past tsunami disasters, we have been typically focused on tsunami deposits remained in ground. This newly study by using coastal boulders would offer numerous suggestions for a lot of studies of coastal boulders and historical tsunami researches.

Keywords: Tsunami boulders, *Porites* spp. coral, Radiocarbon dating, Historical tsunamis, Southern Ryukyu Islands, Tsunami deposits