

Numerical method for constraining maximum local size of paleotsunamis using storm boulder deposits

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The history and sizes of paleotsunami events that hit the Ryukyu Islands, Japan have not been clarified well because observational and historical records are scarce and discussion on the seismology at the Ryukyu trench is still ongoing. Ryukyu Islands are surrounded by reef. There are numerous storm wave boulders on the reef flat of each island. While, there are tsunami boulders only on the coast and inland of the southern Ryukyu Islands (e.g., Ishigaki Island). On the other hand, in the central Ryukyu Islands (e.g., Kudaka Island and Okinawa Island), the boulders are found only on the reef flat, but not inland or on the coast. These facts suggest that a large tsunami hit the southern Ryukyu Islands, but may not have hit the central islands. However, possibility of occurrence of minor tsunamis cannot be excluded and question is remained as to whether a huge tsunami has occurred and, if yes, how large tsunamis would be at the central Ryukyu Trench. In order to estimate the largest tsunami that may have occurred in the past around the central Ryukyu Trench, we performed calculations for tsunami and boulder movement with constraints that the coastal boulder distribution on the reef of Kudaka Island are not significantly modified. Our calculation results show that, if large tsunami caused by an near-field subduction earthquake (e.g., $M_w > 8$) occurs, a tsunami became too large and the boulder distribution in Kudaka Island would be significantly modified. Our preliminary results do not exclude the possibility of occurrence of a earthquake with $M_w < 8$ with minor tsunami that did not change the current boulder distribution in Kudaka Island. Further comprehensive modeling would provide useful information to constrain the maximum earthquake magnitude in this region.

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