Origin and transport process of boulders deposited at the Miyara Bay,Ishigski Island,Japan

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Tsunami has huge hydraulic force and sometimes it may transport large boulders,so-called tsunami boulder,landward from the offshore.These boulders might have preserved information of the tsunami,because they have remained at the same place for a long term after the deposition.There are a lot of large boulders on the reef flat at Miyara Bay,Ishigaki Island.Although these boulders had been interpreted that they were transported by the 1771 Meiwa Tsunami,no conclusive evidence has been found.

In this study,we conducted a field survey,analysis of aerial photographs,and radiocarbon dating in order to clarify whether boulders on the reef flat at Miyara Bay were really displaced by the tsunami.We investigated size,position and long axis orientation of boulders on the reef flat.We confirmed that these boulders were not repositioned during 1977 and 1995 based on the analysis of aerial photographs.We further compared boulder distributions at Ishigaki Island to that at Pakarang Cape,Thiland,and Kudaka Island,those of which were transported by the tsunami and storm wave,respectively,in order to clarify the wave that transported boulders at Miyara Bay.As a result,we interpreted that these boulders were displaced by a tsunami.Moreover,most boulders probably have not been repositioned by the subsequent storm waves.Our study suggests that most boulders,especially 50t or less in weight,were displaced by the 1771 Meiwa Tsunami.It may also be able to infer that various weight of boulders were transported mixed together to the coastline by the maximum wave,and subsequent waves formed landward fining trend of boulders.