

Transportation and deposition of tsunami boulders and an onshore gravelly tsunami deposit

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Tsunami deposits in stratum give helpful information for disaster prevention such as inundation area of paleotsunamis and recurrence intervals. To identify tsunami deposits in strata, it is necessary to show as many criteria as possible. Whereas most of the recent tsunami deposits that have been reported so far are composed of sand, gravelly tsunami deposits are rarely reported. While, gravely paleotsunami deposits are often identified in the stratum. Description of the various grain sizes will clarify the diversity of tsunami deposits, and provide criteria to identify tsunami deposits in strata.

This paper reports relationship between tsunami behaviors and characteristics of onshore gravelly tsunami deposits at Settai, Taro-cho, Miyako City, Iwate prefecture, Japan that were inundated by the 2011 Tohoku-oki tsunami. In this region, the highest point of inundation height was 28.1 m and the inundation distance reached to 1.8 km from shore. As a result, lowlands that had been used to paddy fields were covered by tsunami deposits. Moreover, many boulders such as bits of concrete, tetrapod and rock were transported from shore. The deposition of the boulders and tsunami deposits in Settai is one of the rare cases in the sense that wide range of sedimentary grains are left concurrently by a tsunami. Because the methods to estimate the current velocity from transported boulders have already been established, the boulders and tsunami deposits can be a research object to examine relationship tsunami behaviors and characteristics of the deposits.

Boulders are concentrated in some areas rather than scattered in the lowland. Changes in current velocity and current direction due to geographical factors probably affect the characteristic distribution of the boulders. The obtained data show a sharp decline in thickness and gravel size of the gravelly tsunami deposits where many of the boulders are stopped. This indicates that many of the sand and gravel were deposited as the current velocity diminished and the boulders were stopped. The current velocity estimated from larger boulders is 8.0 m/s or more. In the future, the more studies that weigh the boulder and tsunami deposit can be expected to estimate the current velocity of past tsunami from paleotsunami deposits.

Keywords: 2011 Tohoku-oki tsunami, gravelly tsunami deposit, boulder, current velocity