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## Transport processes of huge debris in Japanese mountain river basins

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Some of the Japanese mountain river basins have huge debris, sometimes larger than 10m, on their riverbeds. This study aims to discuss transport processes of huge debris. The investigated river basins are the Tadori River in central Japan and the rivers on the Yaku Island in southern Japan. The diameter of such huge debris was measured in the field and the channel slope was derived using 1:25,000 topographic maps. Further geomorphological investigations were performed in the field and using air photo interpretations.

The Tadori River is a 70km-long river that originates in the Hakusan volcano (2,702m a.s.l.). Its drainage basin was affected by heavy rainfall in July 1934. Snow-melt water and heavy rain caused severe flooding along the whole river course and many landslides in the headwater region. The valley of the upper reaches was buried about 20m deep. After the flood, much huge debris was seen on the riverbed. The largest one was 20m in diameter. It was named "Hyakumangan-iwa", which means a rock of about 4,000 tons in weight. The debris was carried from the upper tributary basin, because the geology of the basin is the same as that of the debris. A landslide with huge debris and small lacustrine-like deposits in the valley floor was found in this basin by field survey. This means that huge debris, including the Hyakumangan-iwa, was transported by the torrential flood as a small landslide dam gave way. During the event many landslide dams would form and break up, so that large amounts of debris ran down and buried the valley floor.

Many rivers on the Yaku Island, one of the UNESCO World Heritage Sites, also have huge debris on their riverbeds. Sometimes debris is as large as 10m in diameter. Detailed field survey carried out along the Miyanoura River has shown that the maximum diameter of the debris decrease downstream according to decrease in channel slope declivity. Huge debris as large as several meters in diameter, was also found on the riverbed with a 5% channel slope declivity. It means that the huge debris is transported downstream by the flood under a sorting process. Based on air photo interpretation, huge debris, found at the junction of the mainstream with its tributary, jams the valley floor of the main stream. This shows that huge debris produced in a tributary blocked up the valley floor of the mainstream forming a dam-lake. When the debris dam gave way, torrential flood occurred and huge debris was washed away. Because the debris underwent a sorting process, only smaller debris was transported to the lower reaches with gentler channel slope.

Formation and breakage of debris dams caused by landslides and/or debris supply from tributaries is very important for debris transport in the Japanese mountain river basins.

Keywords: debris transport process, torrential flood, mountain river, debris dam, Japan