Hydraulic experiment of a tsunami boulder transport-Effects of its shape and orientation on the moving distance-

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Tsunami has huge hydraulic force, and sometimes it may transport large boulders, so called tsunami boulder, landward from the offshore. Tsunami boulders have been reported at the coastal area of high tsunami-risk countries. These boulders usually have not been removed for a long time. Moreover, their movements could have directly related to the hydraulic force of tsunami. Therefore, experimental and numerical analyses of the tsunami boulder movement may provide us useful information about the hydraulic force of past tsunami.

Ohkubo et al. (2003) conducted a hydraulic experiment to investigate the movement of cubic block by a bore, and they mentioned that the transport mode of the block varied as sliding, rolling, and saltation depending on the hydraulic force of the bore. They further improved a boulder transport model, which takes into account the differences of the boulder transport modes. However, the effects of variations of the shape and initial long axis orientation of blocks have not been studied.

In this study, we conducted the hydraulic experiment of the block movement on the slope using cubic- and rectangular solid blocks in order to clarify the effects of shape and initial long axis orientation of the block on the moving distance. In the experiment, we used five blocks with different shapes (2x2x2cm, 2x2x2.5cm, 2x2x3cm, 2x2x4cm, 2x2x6cm), and we set the block at the bottom of the slope. Then, we generated a bore and the block was attacked and transported by the bore toward the upper slope. Based on this experiment, it is clarified that blocks, whose long axes are twice longer than short axes and their long axes orientations are parallel to the bore direction, they moved significantly shorter distance than the moving distance of the cubic-block. Our results indicate that the model proposed by Ohkubo et al. (2003) is applicable, only when the ratio of long and short axes of the block is less than 2:1.