

Duct flume experiment on movement of larger gravel particles on sandy bed

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Recently, alternate bars in gravel bed rivers are destroyed by engineering works to make riverbed flat. At that time, larger gravel particles (50 -100 cm in diameter) buried in the bed are excavated and lined up on the bed surface side by side. These isolate large gravel particles are usually buried within a year by smaller particles transported in moderate scale flood events. We worry about movement of these larger gravel particles in huge flood events. The purpose of this study is to demonstrate gravel particle movement by duct flume experiments.

A duct flume (width 6 cm, depth 10 cm, length 2 m) and HSD2 55S-62 pump (discharge rate 3 l/sec) were used and setting up in re-circulating system. First, sandy bed with 2 cm thickness was prepared in 125 cm length to fit 2 cm high weir at downstream end. Then 12 gravel particles (20-25 mm in diameter) were put individually on the bed in 100 cm length, fill with water and start experiment. High speed video camera recorded the experiment. We conduct an experimental run in 3-4 minutes until sand bed was eroded completely.

We measured 55 cm /sec in velocity, observed dune formation and migration. Water flow carried 70 % gravel particles away in degrading conditions, but 30 % gravel particles remained on flume bed to form jam. Gravel diameters in this experiment was decided to consistent with field rate between transport limited diameter calculated by the Iwagaki formula and river-bed material size.

Keywords: incipient motion of larger gravel particles, duct flume experiment, large boulder scatter engineering work, the Sendai River, high speed video camera, Chizu, Tottori