

An experimental study on cyclic steps formed in bedrock rivers

YOKOKAWA, Miwa^{1*}, IZUMI, Norihiro², Akitoshi Kyogoku¹, Akira Kotera¹

¹Osaka Institute of Technology, ²Faculty of Engineering, Hokkaido University

A train of steps are often observed to be formed in bedrock rivers. They are thought to be cyclic steps formed due to erosion of bedrock. The erosion of bedrock is assumed to be dominantly driven by abrasion due to bedload sediment transport.

Here we demonstrated a series of flume experiments as an analogue of the formation of cyclic steps on bedrock. The experiments were conducted using the facility of Osaka Institute of Technology. We used a 1.5 m long, 2 cm wide, and 25 cm deep flume made by glass. The flume has 10 cm high weirs at the downstream end and 1.2 m upstream from the downstream end, so that there is an 10 cm deep reservoir. We put sand (0.2 mm in diameter) with cement (150:2) in the reservoir and hardened it so that the flume has an 10 cm 'model bedrock' on its bottom. The flume is tilted by 20 degrees. The water and sand (1.0 mm in diameter) is supplied from a head tank to the upstream end of the flume, flows on 'model bedrock' in the flume, and was dropped from the downstream end into a downstream reservoir, then pumped up to the head tank.

As a result, cyclic steps were formed on the 'model bedrock.' The shapes of the steps were resembled with the shape that predicted by theoretical analysis (Izumi and Yokokawa, 2011).

Keywords: Cyclic steps, Bedrock rivers, Flume experiments