# EXPERIMENTS ON BEDLOAD TRANSPORT, BED FORMS, AND SEDIMENTARY STRUCTURES USING FINE GRAVEL IN THE 4-METER-WIDE FLUME

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## ABSTRACT

Four cases of experiments, using fine gravel, on sediment transport, were carried out in the 4-meter-wide flume, at the University of Tsukuba. For Cases 1 to 3, each slope was established at 1/100, 1/200, and 1/400, respectively. The change in flow and bed conditions with an increase in discharge, was investigated. In Case 4, the bar development process on a planed bed with a slope of 1/100, was investigated.

In this paper, the experimental results for each case were described separately, and the following points were confirmed. When the stream power and the depth of flow/grain size of bed material ratio are kept constant, in a flow with a little stream power, the larger the slope is, the higher the bedload transport rate becomes. The reason for this is that, the larger the slope, the smaller the threshold stream power, and thus, oppositely, the greater the amount of available power for bedload transport.

Secondly, the exponent in the relationship between the bedload transport rate and the available stream power at a high transport stage is 3/2, when the depth is kept constant. However, if the discharge is changed but the slope is kept constant, this value approches 1, and if the slope is changed but the discharge is kept constant, it approaches 2. Furthermore, at the same stream power, the steeper the slope and the shallower the depth, the higher the bedload transport rate. However, by simply increasing the flume width and decreasing the depth at the same stream power, without changing the slope, the bedload transport rate will instead become lower.

Thirdly, it was confirmed that there is a relationship between, the angle between the oblique crests formed on a planed bed and the flume side walls, ($\beta$), and the spacing of longitudinal striations ($L_l$) and the wavelength of antidunes ($L_t$), which can be described by, $\beta = \tan^{-1} \frac{L_l}{L_t}$. Hence, it was suspected that rhomboidal bars with oblique crests are formed by the interaction of longitudinal and transverse elements within the flow.

Using the alternating bars formed in the 4-meter-wide flume as the prototype, model rules were examined using a flume 1/20th its width. As a result, it was confirmed that, by making the values of the flow intensity ( $U_*/U_{*c}$ ) and the channel form index ($S \cdot W/D$ ) equivalent to those of the prototype, the bar-bed configuration of the model would become similar to that of the prototype.

From the reults of the small flume experiments on the transport of the sand and gravel mixture, it was found that, no matter how strong the water flow, not all of the sand in the bed material is suspended, and thus openwork gravel layers (i. e., gravel layers without matrices)

never occur. In fact, it was made apparent that, in the formation of bed forms, the complete segregation of sand and gravel takes place on river beds, because the bed material is sorted into groups of different grain sizes.