Flume experiments of channelization by seepage water

Noritaka Endo[1]

[1] none

This study is to observe the development and activity of a channel created by seepage water through small-sized experiments. The previous studies of sapping canyons mainly focused on erosion at sapping zones (canyon heads). Recently Schorghofer et al. (2004) investigated the spatial periodicity of channelization by using coarse sand and a small-sized flume. The present study utilizes the similar flume but of more simple structure under the substrate. The flume was of 90 cm wide, 180 cm long and 20 cm deep, and consisted of two parts, a water reservoir (20 cm long) and a study area (160 cm long). The boundary of the two parts was permeable to water. Well-sorted sand with the mean diameter of 0.2 mm was put in the study area to form a slope as the initial state. Changing the gradient (4.5 and 10 degrees) of the initial slope keeping the water level in the water reservoir constant, development of channels was observed for about 23 hours. The results are as followed. The duration of channelization was much longer (more than 23 hours) in the case of 4.5 degrees of the initial slope than the case of 10 degrees (about 4 hours). The area where channels were formed was larger in the case of 4.5 degrees of initial slope than the case of 10 degrees, which is because the lateral migration and avulsion of channels were more active in the former case. Junctions of tributaries commonly occurred in the case of 4.5 degrees slope, but rarely in the case of 10 degrees. In comparison with the experiment of the similar initial slope (5.7 degrees) for channelization by precipitation of Pelletier (2003), tributaries of the channel by rainfall were relatively straight, while those in the case of 4.5 degrees of the present study meandered. It is known from the field observation by Schumm (1960) that channels with small ratio of the width to the depth have the large sinuosity. By reading photos of experiments, the channel of the present study seems to have smaller ratio of the width to the depth than channels of Pelletier (2003), which is thought to be because of difference in the amount of surface flows. Reading channel trails from experimental images, the channel in the case of 4.5 degrees slope of the present study migrated laterally more actively than the channel by precipitation of Pelletier (2003). This should be related to the potential of meandering determined by the ratio of the width to the depth of channels.