Study on the structure of gravel layer filling the level difference of the basement rock

*Shiro Tanaka[1]

1. Central Research Institute of Electric Power Industry

When a gravel layer covers the level difference of the basement rock with a fractured zone, following confusion may arise: either the structure observed in the overlying sediment is a deformation structure accompanying fault movement or it is a buried differential erosion geographical feature. In the present study, a fault model experiment was performed using a mixed sample of grit for clarifying the features of the deformation and shearing structures developed in a gravel layer. A sedimentation experiment was also performed for clarifying the features of the sedimentary structure filling the level difference of the basement rock. Soil tanks prepared from acrylics was used for the experiments. The fault movement was simulated by displacing the bottom of the soil tank. To examine the difference in the development form of shear planes in different water conditions, the water conditions of the simulation ground were as follows: dryness condition, wet condition (moisture content approximately 26%), and inundation condition. A small waterway used for the sedimentation experiments consists of a slope section and a horizontal section. The sample was flowed from the upper part of the slope section and deposited in the horizontal section where the step was arranged. The results of the fault model experiment are shown below(Fig). When a level difference occurs in the basement rock, the clast just above the fault rotated due to the displacement of the basement. Next, shear plane (shear plane 1) was generated from on the level difference. This plane developed with an angle lower than the dip of the fault. An increase in the displacement leads to the generation of another shear plane (shear plane 2), which acts as the main fault. This plane had almost identical dip as the fault of a basement rock. In the gravel layer, the rotation of clasts was mainly observed in a fan-shaped region between shear planes 1 and 2. The rotation of clasts was particularly remarkable on the shear planes. The results of the sedimentation experiment are shown below. The sample deposited in the horizontal section separates into a coarse clast-rich lower layer and a sand-rich upper layer. In the case where there is a step that is orthogonal to the flow direction and the downstream side becomes lower, debris flow deposited while locally swirling on the downstream side of the step. Then, it was confirmed that the boundary filling the step was formed, and the debris flowed in a laminar flow state on it. As a result, in the vicinity of the step, the long axis of some clasts tilted steeply or downward. Furthermore, it was confirmed that the layer structure was inclined from the upper side to the lower side in the vicinity of the step. A similar structure was confirmed even when there was a level difference parallel to the flow direction. Thus, It was confirmed that the long axis of the gravel becomes steeply inclined and the stratum is inclined near the level difference also occurs by sedimentation.

Keywords: sedimentation experiment, fault model experiment, gravel layer