Seismic response on valley fill slope in urban residential region

*Toshitaka Kamai[1], Issei Doi[1]

1.Disaster Prevention Research Institute, Kyoto University

Both earthquake ground motion and pore water pressure observations in valley fill were conducted in the southwestern Tokyo, and central Yokohama region. The difference in the earthquake ground motion between records on the both observatories varied with earthquakes. The non-linear response of excess pore water pressure in valley fill was observed during the strong earthquake. These basic information will be valuable for discussing on prediction of valley fills type landslides induced by strong seismic motion in urban region.Earthquake in 5th May 2014 (M6.0) induced strong seismic intensity 5 in central Tokyo (largest earthquake after 3.11). The response 45-60cm/s/s of horizontal motion of soft valley fill less than response on the original ground indicate the “self-dumping effect” of valley fill. In contrast, the response amplified 120-150cm/s/s of horizontal motion, and large UD component of the motion of ordinary valley fill will be caused by amplification of SP trans-wave in unsaturated near surface soil layer. Excess pore pressure increased rapidly after the S peak stage (response to the plastic deformation). Excess pore pressure and barometric pressure changes was opposite in phase before the S peak stage, however, changes of barometric pressure synchronized to the UD displacement changes. So-called “microphone effect”, barometric pressure changes amplified by the UD displacement, was observed in this earthquake.Inclinometer response indicates the movements of the valley fill, and the direction of inclination turns during seismic motion. During the P wave stage, the inclination in ground (G.L. -2, -5,-8m) is small and isotropic. During the 2nd stage (P-S wave), the movement of transvers direction of valley was observed. And, the movement of longitudinal direction of valley was observed at the 3rd stage (S wave). These processes indicate that the friction reduction along the side-wall of valley fill by rolling movement at the P-S wave stage should be prior to the plastic deformation & excess pore water pressure rising during the S wave stage. And, movement along longitudinal valley axis after the peak S wave stage will be possible after the friction reduction in the previous stage. Thus, the friction reduction of side walls will be key process of landslide of urban residential valley fill.

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