Relationship groundwater and self potential applied with sandbox experiment

Yasunari Tojo[1]; # Katsumi Hattori[2]; Hitomi Kono[1]

[1] Grad. Sch. Sci., Chiba Univ.; [2] Chiba University

The electrical potential (self-potential) field recorded at the ground surface of the Earth is connected with the flow of water in a charged porous material. The laboratory experiment of landslide under the rain fall control, in which the pore-pressure and the self-potential was measured, showed the self-potential change accompanied by an appearance and an expansion of saturated area under the ground. These changes were detectable before a landslide, so the landslide monitoring with self-potential method will be a powerful tool as the landslide early warning system.

A sandbox experiment was carried out due to studying a connection between a self-potential change and an underground water condition, a change of water table and an underground water flow. An acrylic tank (width: 200 cm, height: 60 cm, thickness: 20 cm) was filled with a sand (weathered granite soil). The soil thickness was 50 cm. Two tanks are connected with each side of the tank at the lower position to adjust water table in it. Furthermore, water table can be adjusted by pumping with a peristaltic pump. 14 electrodes (Pb-PbCl2), pasted the bentonite to reduce an electric resistivity, were installed at the surface and in a depth of 20 cm with 30 cm spacing respectively and the reference electrode was installed at the surface. 7 pipes for water table measurement are installed nearby an electrode respectively.

Self-potential change accompanied by water table change was studied many a time. The result showed self-potential change from a few mV to about 10 mV. This change was corresponding with water table change. Self-potential measured by the sand box experiment was consistent with the one measured by the laboratory experiment of landslide under the rain fall control.

This result shows that self-potential method is an effective tool for monitoring the underground water condition and consequently will be developed to a monitoring and prediction of a landslide involved in the underground water condition significantly.
.