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Long-term geoelectrical monitoring for estimation of changes in water content of the slope of an embankment

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For prevention of disastrous slope failures, it is important to be able to monitor changes in water content within a slope in both time and space, because permeating water reduces the strength of the foundation of the slope and increases the likelihood of landslides and base rock collapses. We have conducted repeated monthly geoelectrical surveys since February, 2011, on the slope of an experimental embankment in the large-scale rainfall simulator of the National Research Institute for Earth Science and Disaster Prevention (NIED). The results clearly show seasonal changes in the resistivity structure of the embankment, with resistivity becoming low in the summer wet season and high in the winter dry season. It is obvious that the long-term change in resistivity is greatly affected by the change in temperature although shorter-term changes in resistivity correspond to changes in water content caused by heavy rain. This means that the temperature correction to resistivity is required in order to estimate the water content change from the geoelectrical monitoring data. Therefore we measured the temperature dependency of the resistivity of the soil samples extracted from the embankment. As a result, the empirical formula of the linear relation between resistivity and temperature was acquired. We confirmed that the resistivity corrected by the formula and the water content have a nearly linear relation. This indicates that changes in water content in the slope can be estimated by geoelectrical monitoring in conjunction with temperature correction.