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Long-term Geophysical Monitoring for Leakage Problems at Reservoir Dams, Republic of Korea

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Dam safety has increased in importance all over the world due to the recent failures that have occurred and the increased consciousness among the people and society and media interest. In Korea, The safety assessment of earth fill dams has been dealt by Korea Rural Community Corporation(KRC) largely. Most of them are worried about the safety due to the deterioration and seepage because the many reservoirs and embankments were built more than half a hundred years ago. The seepage rate depends mainly on the hydraulic conductivity of the core which is strongly dependent upon the core material and its compaction. The identification and investigation of internal erosion is by visual inspection, pore-pressure measurements and measurement of seepage water volumes in dikes below the dam. It is crucial for dam safety to be able to detect condition of dams, in part for safety reasons, dams need to be inspected and monitored regularly. Supervision and regular monitoring of the dams impoundment with suitable techniques are probably the most important requirements to obtain a high level of dam safety.

The use of geophysical techniques is generally appealing due to their non-destructive and often cost-effective advantages over other methods. Geophysical methods may thus play important roles in monitoring the integrity of the dam and detecting anomalous seepage conditions on the dams at the early stage of their development. Resistivity monitoring has been performed at a reservoir dam in Korea. The data were collected by a Resistivity monitoring automatic data acquisition system that was developed by KRC. SP monitoring has been performed at sea dike on the Korean peninsula. The data were collected by a SP monitoring automatic data acquisition system that was developed by KRC. The number of sea dikes is 190 facilities and SP monitoring systems have been installed to the number of 47 sites now in Korea. At sea dikes, the target of my study, the leakage flows should be strong enough to generate appreciable SP anomalies, particularly where the tidal change is significant. During the SP monitoring at a sea dike, the measurements of sea level, conductivity and temperature are gathered at the same time. The primary purpose of long-term geophysical measurements in this study is the dam safety assessment by inspecting anomalous seepage zones and, if possible, quantitative estimation of seepage amount. Electric resistivity survey has proven successful to get information of internal resistivity structure of dam associated with material inhomogeneities and water saturation. SP data have important information about streaming potentials associated with seepage flows through a sea dike if a good tool is used for analyzing SP monitoring phenomena with tide.