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Use of non-invasive GPR method in correlation with the results of direct measurements of pore water pressure and humidity for mapping and monitoring of flood embankments

Abstract

The group of tools for monitoring the condition of earth hydrotechnical structures can include geophysical methods, including the GPR method. Geophysical methods, despite their high potential, have some limitations, therefore studies carried out in conditions as close to reality as possible are extremely important to verify their effectiveness. The paper presents the results of GPR research performed on the largest experimental flood embankment in Europe. The research was carried out to assess the possibility of recognizing the variability of the distribution of subsurface structures of the embankment. Repeated profiling was carried out at the time intervals related to raising and lowering the water level (flood wave simulations) in order to capture the relationship between the result of GPR measurements and the degree of moisture of the embankment. The analysis of the content of recorded echograms unambiguously indicates the ability and reaction of a GPR signal to the change of the material forming the structure of embankment. However, the revealed changes in the signal resulting from the change in humidity are quite subtle, which is not necessarily an effect of the GPR method limitations but has a relation to the limited infiltration and distribution of water content in the earth structure.