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Application of Ground Penetrating Radar for monitoring the Acerenza dam (Basilicata Region, Southern Italy)

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Maintenance and monitoring of the infrastructures play an important role for public safety and prevention and thus it is important to routinely monitor and control them. In particular, the exploitation of non invasive diagnostics techniques is crucial for the monitoring of the critical infrastructures since they do not affect the normal operating behaviour of the structure, which is one of the main requirements during the control inspections.
In this framework, this contribution deals with the exploitation of Ground Penetrating Radar (GPR) for monitoring and diagnostics of a dam. The identification, characterization and evaluation of the potential loss of water through the dam an important aspect of civil, hydrology and environmental engineering.
In fact, among the possible issues that may affect dams, the presence of voids or fracture embedded in the structures represents one of the most significant problems to be tackled. Voids, lithological discontinuities or induced discontinuities, for instance by reparation, are sometimes hard to be identified by visual inspection and can dangerously damage the structure itself jeopardizing its stability.
Traditional inspection methods have, in particular, limitations of economic nature. Conventional geotechnical investigation methods applied on the structure often require invasive actions in the inner of the structure to be investigated (destructiveness) and only provide punctual information for small volumes.
In recent years, non-destructive investigations are increasingly improving but, however, the literature on the applicability of GPR techniques to the problem of levees and dams is still very limited. Determining their state of health in a non-destructive and, possibly, fast way is a critical issue for a number of public bodies and institutions (e.g., civil protection agencies, river basin authorities,, etc).
GPR techniques offer the possibility of quickly investigating large portions of dam interior without the need of destructive actions. In particular, the surveys have been carried out at Acerenza dam, through longitudinally tunnel inspection, in order to locate underground sandstone banks, potential routes of flow of water below the dam. It is worth noting the importance of studying and monitoring dams in a district as the Basilicata (Southern Italy), characterized by the presence of dams on all the principal rivers. These basins create a rather “complex water system” designed to provide drinking water, irrigation and industrial use, not only for the Basilicata region, but also neighbouring regions, in particular Puglia and Calabria.
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