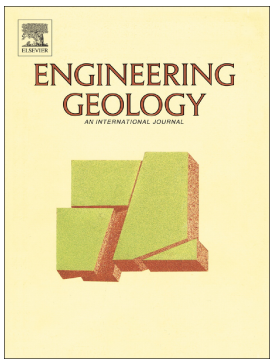

Internal characterization of embankment dams using ground penetrating radar (GPR) and thermographic analysis: A case study of the Medau Zirimilis Dam (Sardinia, Italy)

Ó. Pueyo Anchuela, P. Frongia, F. Di Gregorio, A.M. Casas Sainz, A. Pocoví Juan

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Pueyo Anchuela, Ó.[1,*] opueyo@gmail.com., Frongia, P.[2], Di Gregorio, F.[2], Casas Sainz, A.M.[1] acasas@unizar.es, Pocoví Juan, A.[1] apocovi@unizar.es

[1]Grupo de Investigación Geotransfer. Instituto de Investigación en Ciencias Ambientales (IUCA). Universidad de Zaragoza. C/Pedro Cerbuna, nº12. CP. 50009. Zaragoza (Spain)

[2]Facoltà di Scienze. Università degli Studi di Cagliari. Via Università 40, 09124 Cagliari (Sardinia, Italy). paolofron@gmail.com; digregof@unica.it.

[*]Corresponding author at: Grupo de Investigación Geotransfer. Instituto de Investigación en Ciencias Ambientales (IUCA). Universidad de Zaragoza. C/Pedro Cerbuna, nº12, CP. 50009. Zaragoza (Spain). 0034 976762127.

Abstract

The stability of embankment dams without an impermeable core depends on the characteristics of the face slab that prevents internal erosion, piping and eventual collapse of the structure. Under a Mediterranean climate, the impermeable asphaltic face slab is subjected to high solar radiation and consequent temperature changes, which can generate the creation of cracks and joints. The Medau Zirimilis dam, located in the Casteddu River (Sardinia), is an embankment dam that has undergone seepage and continuous repairs in its asphalt face slab. These reparations have been conducted because of the occurrence of cracks and relative movement of different segments of the slab. To evaluate if seepage endangers the integrity of the dam, GPR was used, with different antennas (100, 250 and 500 MHz), along its crest and upstream and downstream faces, and the data were integrated with infrared thermographic images. Although geophysical data do not show structural changes affecting the main dam structure, deformation structures at shallow levels and in particular in the upstream face and along the crest of the dam have been identified. Such deformation affects the road atop the crest, the face slab and underlying levels, resulting in landslides that include material from several meters below the surface. The analysis permitted the identification of the origin of surficial cracks and their effects on the face slab. These sectors, independent of current