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THE USE OF GEOLOGICAL AND GEOPHYSICAL TECHNIQUES FOR ON-SITE INSPECTION, STUDY CASE: DEEP-SEATED GRAVITATIONAL SLOPE DEFORMATIONS NEAR THE ACTIVE BOCONÓ FAULT, NORTH OF BAILADORES, MÉRIDA STATE, VENEZUELA

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INTRODUCTION AND MAIN RESULTS

The study is located in the western Venezuelan Andes, in the Páramo La Negra sector north of the city of Bailadores, Mérida state. It was obtained that: the evidence of deformation identified on the surface can be verified in the subsoil from the electrical resistivity tomography and the radargrams generated by GPR. Studies of great importance in on-site inspections within the framework of cooperation and knowledge exchange of the Comprehensive Nuclear-Test-Ban Treaty.

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The use of geological and geophysical techniques for on-site inspection, study case: deep-seated gravitational slope deformations near the active Boconó fault, north of Bailadores, Mérida state, Venezuela

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Introduction

This work presents the results obtained from the use of geological and geophysical techniques for the identification of large unstable regions, that can be used in on-site inspections within the framework of cooperation and knowledge exchange of the Comprehensive Nuclear Test Ban Treaty (CTBTO). The deformations of deep gravity slopes are slow and large. The case analyzed is a *Sackung*-type landslide. When settlements are located on these unstable regions, or when they are located downslopes, these areas can pose a potential threat, since the gravitational deformation to which these areas are subject can suddenly increase in velocity under the effects of seismic events or exceptional rainfall, giving way to large avalanches of rocks and debris. The study is located in the western Venezuelan Andes, in the Páramo La Negra sector north of the city of Bailadores, Mérida state, where one of the country's most important active faults, known as the Boconó fault, passes.

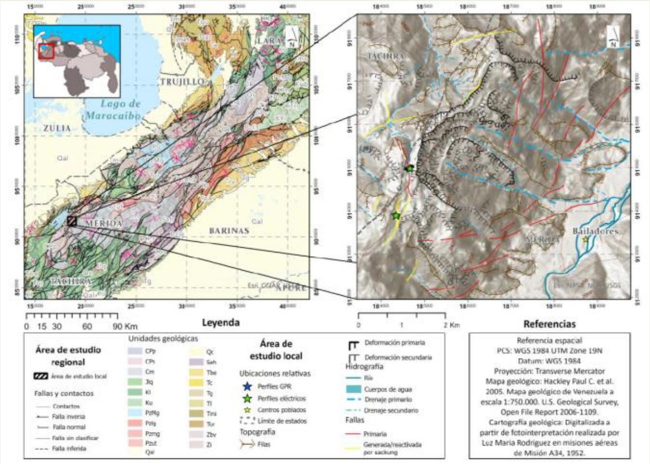

Fig.1. Geographic location of the study area, with geological and structural information

Methods

Using aerial photographs and satellite images, the area of greatest deformation was mapped, identifying the sites where geophysical measurements would be taken using electrical methods (electrical resistivity measurement) and electromagnetic methods using ground-penetrating radar (GPR) using a 200 MHz antenna.

Geophysical data was then acquired in the area of greatest instability, with longitudinal and perpendicular profiles located. The data obtained in the field were processed, generating images that allowed the delimitation of the area of greatest subsurface impact. Finally, the geological mapping was integrated with the images obtained using geophysical methods, yielding a very good correlation between surface and subsurface deformation.

Results

Geological mapping served as the basis for identifying surface deformations and locating measurement points, where profiles would be obtained using ground-penetrating radar and the electrical method.

The ground-penetrating radar measurements identified the area of greatest deformation in the first 5 to 10 meters of depth. The sackung slip surface was determined by the anomaly in the radargram, where the reflectors lose their horizontality, describing a vertical jump in the record.

Based on the data obtained by the electrical method (electrical resistivity measurement) in the deformation area, several zones of weakness were interpreted, characterized by a high resistivity contrast with their surroundings.

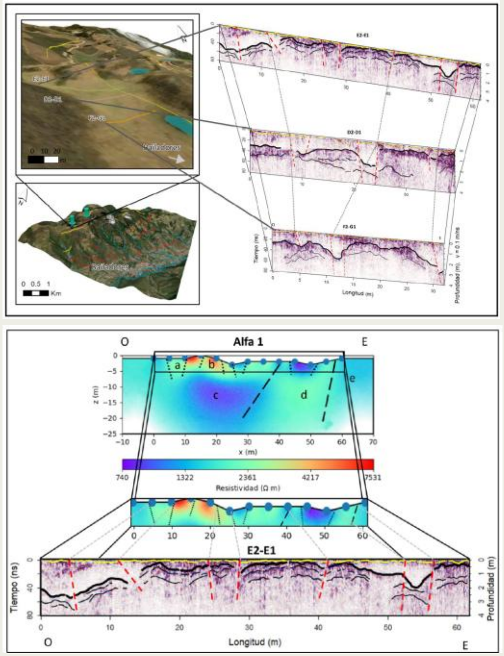

Fig.2 and 3. Joint interpretation of electrical tomography and GPR profile

Conclusions

Geological mapping of the area with the greatest deformation allowed for the selection of measurement sites for the acquisition of geophysical data using electrical methods (electrical resistivity measurement) and electromagnetic methods (ground-penetrating radar).

This type of study is of great importance in on-site inspections within the framework of cooperation and knowledge exchange under the Comprehensive Nuclear-Test-Ban Treaty (CTBTO), as it allows for the correlation of ground deformations on the surface with their subsurface continuity.

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