BENEATH THE SURFACE: GEOELECTRICAL EXPLORATION OF ĐAVOLJA VAROŠ'S PROTECTED LANDSCAPE

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INTRODUCTION

The " Đavolja Varoš " (Devil's Town) site, part of the Lece volcanic complex in southern Serbia, is a geologically and geomorphologically fascinating landscape. This research explores the dynamic interplay between erosional forces and volcanic rock formations that have shaped this unique terrain. The site is renowned for its imposing rock pillars, formed over millennia through the weathering and erosion of pyroclastic deposits. Understanding the underlying processes and current subsurface conditions is crucial for the conservation and further scientific investigation of this natural wonder.

The DEMONITOR project, funded by the Science Fund of the Republic of Serbia under the PRIZMA call (2023-2026), represents a groundbreaking initiative aimed at monitoring and actively shaping the evolving landscape of the "Đavolja Varoš" site. Unlike traditional monitoring efforts, DEMONITOR takes a proactive approach by employing predictive modeling and cutting-edge scientific tools, with a significant emphasis on geophysical techniques (Đurić et al, 2024).

SITE DESCRIPTION

Đavolja Varoš is situated near Prolom Spa in southern Serbia and showcases a stunning interplay of erosional forces and volcanic rock formations, resulting in approximately 200 tall rock pillars colloquially referred to as "the Devils." These pillars, towering up to 15 meters in height and 6 meters in diameter, are a testament to years of weathering and erosion processes.

The Đavolja Varoš site is part of the larger Lece volcanic complex, spanning approximately 700 square kilometers. This area is characterized by andesitic rock and pyroclastic remnants, from a volcanic complex dating back to the upper Oligocene to the end of the Pliocene epoch, approximately 30 to 3 million years ago (Malešević et al., 1978).

Unlike other badlands formations, the pillars at Đavolja Varoš are capped by large volcanic boulders, formed through a remarkable process involving tephra deposition with the right density and water content. This distinctive geological feature has sparked scientific interest in understanding the site's evolution and longevity. Recent observations during tourism activities have revealed changes in the pillars, including erosion, collapsing, sinking, and emerging formations (Lazarević, 2010). With climate change exacerbating these effects, there is a growing need to comprehend the site's future evolution.

METHODOLOGY

The methodology employed in the DEMONITOR project is characterized by its multidisciplinary nature, integrating expertise from various fields to facilitate comprehensive data acquisition and analysis. This approach draws on disciplines such as geology, engineering-geology, geophysics, and geodesy (Ter-Stepanian, 2002).

ERT is chosen for its effectiveness in detecting subsurface features without disturbing the surface. The methodology involves:

- Conducting a detailed topographical survey and selecting appropriate locations for ERT measurements.
- Deploying ERT equipment to measure the electrical resistivity at various depths
- Using specialized software to process the raw resistivity data and generate subsurface resistivity models.
- Interpreting the resistivity models in conjunction with geological information to

understand the subsurface structure and material distribution.

EXPECTED RESULTS

The application of ERT is expected to yield comprehensive insights into the subsurface characteristics of Devil’s Town. Anticipated outcomes include:

• Revealing variations in resistivity that indicate different types of geological materials, such as dense rock, loose tephra, and potential voids.

• Providing information on the internal structure and stability of the rock pillars, including possible weaknesses or fractures.

• Determining the depth and extent of tephra layers that contribute to the landscape's formation.

• Offering valuable data to guide conservation efforts, ensuring the long-term preservation of this geologically significant site.

CONCLUSION

The geoelectrical exploration of Devil’s Town through ERT represents a significant advancement in the non-invasive study of this remarkable geological formations. This research not only enhances our understanding of the site’s subsurface conditions but also supports efforts to preserve its unique landscape. The findings are expected to contribute to broader geophysical and geological knowledge, offering insights into the processes that shape volcanic and erosional features worldwide. The DEMONITOR project embodies a remarkable fusion of advanced geophysical techniques, interdisciplinary collaboration, and a profound commitment to environmental conservation and heritage preservation, promising to unveil unprecedented insights into the stability dynamics of the Devils' Town site and providing a blueprint for sustainable scientific inquiry and societal impact

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