
**Submission code: GM8J9KQWMA**

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# Utilization of MASW and MAM Methods for Subsurface Characterization and Monitoring of a tailings dam

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## Introduction

Geophysical methods have been increasingly employed in dam monitoring, including techniques such as electrical resistivity and Ambient Noise Seismic Interferometry (ANSI). Some advantages of these methods over traditional geotechnical instrumentation include broader spatial coverage, and the large volume of data generated during field surveys. These data enable the development of models which, when combined with geological and geotechnical characterization, allow for comprehensive interpretations of the structure. In this context, this study explores the geophysical method of Multichannel Analysis of Surface Waves (MASW) to identify potential low-velocity zones.

## Method and/or Theory

Multichannel Analysis of Surface Waves (MASW) is a non-destructive technique widely used to investigate the shear wave velocity (Vs) profile as a function of depth with the aim of providing the velocity profile of S-waves (i.e., seismic stratigraphy) along the dam structure. Seismic wavefronts generated by a source propagate along the surface and penetrate the subsurface, being recorded by a series of geophones arranged in a linear array. That offers broader spatial coverage, enabling the acquisition of multiple 1D profiles and the generation of 2D sections. This method was applied in conjunction with the Multichannel Array Microtremor (MAM) analysis, which records ambient vibrations generated by natural sources. In this study, nine geographically coincident MASW and MAM sections complementary in depth were analyzed along the BL1 dam part of the Tapira Mining Complex (CMT), located in the state of Minas Gerais, Brazil.

## Results and Conclusions

The results from the integrated MASW and MAM profiles enabled subsurface investigations down to depths of 90 meters. These techniques provided complementary information about the conditions of the embankment and beach materials of a tailings dam. Overall, a gradual increase in shear wave velocity with depth was observed, attributed to the increasing degree of material compaction. Based on the obtained velocities, the subsurface was classified into three distinct zones: Low Velocity Zones (LVZ), Intermediate Velocity Zones (IVZ), and High Velocity Zones (HVZ).