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Computational Assistance in the Interpretation of Spontaneous Potential Data Acquired on an Earth Dam

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Introduction

Spontaneous Potential (SP) surveys are widely used for identifying water movement within earthen dam structures. While the method is efficient, its interpretation can be hindered by data volume, noise, and subjective bias. This study applies computational assistance to enhance the interpretation of SP data collected along the crest of an earth dam, focusing on the detection of internal seepage paths.

Method

Five SP profiles were acquired across the dam crest using equally spaced non-polarizable electrodes. The data were processed using Python-based routines to apply noise filtering, drift correction, and rolling correlation with a sliding window. This computational workflow enabled the detection of localized anomalies, automation of repetitive tasks, and increased consistency in the analytical process.

Results and Conclusions

The computational analysis revealed consistent patterns of correlation and divergence among SP profiles, pointing to potential seepage zones and heterogeneities within the dam body. The use of automated tools improved processing speed, reduced interpretation subjectivity, and enabled clearer visualization of geoelectric responses. These results demonstrate the effectiveness of computational assistance as a practical and scalable enhancement to SP-based dam safety assessments.