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Standardization of Procedures for the Qualification of Boreholes Applied to Geophysical Logging

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Introduction

Geophysical borehole logging has become a key technique in the indirect investigation of the subsurface, with applications ranging from mining and geotechnical projects to environmental and hydrogeological studies. Methods such as magnetic borehole logging (BHMag), electromagnetic (BHEM), and induced polarization (BHIP) require intact, unobstructed, and properly identified boreholes to ensure correct sensor descent and the integrity of measurements.

Considering the gap in the literature on this subject, the present work plan aims to standardize operational procedures that ensure the integrity of boreholes used in shallow geophysical logging. The proposal involves proper borehole preparation and the execution of “Dummy” tests, seeking to reduce operational failures, avoid equipment loss, and increase the reliability of acquired data. This standardization will be tested and validated in the field, with a focus on mining areas.

Method

The proposed procedures will be developed and subsequently tested in the field, within the context of future near-surface geophysical projects involving borehole logging methods. The workflow will be organized into two main components: Borehole Preparation and Dummy Test Procedures.

Borehole Preparation Procedure. This includes the following steps: Complete flushing with water to remove bentonite and residual particles; Identification and protection of the weathered zone using agricultural-grade PVC tubing; Continuous installation of the casing up to the surface, with proper sealing at the top; Construction of a protective concrete box (40x40 cm) with an identification plate containing technical details (borehole ID, coordinates, depth, dip, azimuth); Documentation in the field logbook with photographs and sketches.

Dummy Test Procedure. This involves checking borehole continuity and the absence of internal obstructions by lowering a metallic dummy attached to a steel or Kevlar cable. The steps are: Preliminary inspection and cleaning of the surrounding area; Secure attachment of the dummy and installation of the winch; Controlled descent with measurement of the depth reached; Recording of any obstructions encountered and attempts to remove them; Completion of a test report including depth data and field observations. The implementation of these procedures will be supervised by field personnel, with strict attention to safety (the use of personal protective equipment) and operational compliance.

Conclusions

The standardization of the proposed procedures has the potential to improve the quality of geophysical data acquired during borehole logging, while reducing operational failures, rework, and equipment losses in drilling campaigns. It is expected that adopting this methodology will increase operational efficiency and provide a replicable framework applicable to various geophysical projects. Additionally, this standardization may foster better integration between geotechnical and applied geophysics fields. Field tests will be carried out to validate and fine-tune these procedures, confirming their effectiveness and practical applicability.