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Hidden in the Mud: How Drilling Fluids and Moisture Distort Spectral Signals in Core Scanning

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Introduction

Drilling fluids and surface moisture can significantly compromise hyperspectral data quality, affecting mineralogical quantifications. This study evaluates how sample preparation influences the spectral response of drill cores scanned at the hyperspectral corescanning facility in CTF-Vale (LEEAP).

Method and/or Theory

Diamond drill (DD) cores and reverse circulation (RC) chipboxes were analysed under different conditions: DD cores were scanned as received and after manual cleaning to remove bentonite-based fluids; RC chipboxes were scanned before and after drying via muffle furnace and thermal blower. Magnetic susceptibility and elemental composition data were acquired from DD cores using an XRF sensor integrated into the BoxScan platform. The Geotek Hyperspectral Core Imaging System–Box (HCIS-B) captures spectral data across the VNIR–SWIR range. For both DD and RC samples, data were acquired in the VNIR (400–1000 nm) and SWIR (1000–2500 nm) regions. Mineral identification was guided by a reference spectral library including carbonates, iron oxides, and silicates, allowing direct comparison between samples in their original state and after cleaning.

Results and Conclusions

Contamination led to spectral distortions, overestimating carbonates and masking phyllosilicates and opaque minerals. Cleaning and drying restored diagnostic features and improved compositional accuracy. The results emphasize the critical role of standardized core preparation and low-interference drilling fluids for reliable hyperspectral analysis in core scanning workflows.