

A review on applications of time-lapse electrical resistivity tomography over the last 30 years: perspectives for mining waste monitoring

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Mining operations generate large amounts of waste, which are usually stored into largescale storage facilities which pose major environmental concerns. They must be properly monitored to manage the risk of catastrophic failures and to control the generation of contaminated drainage. In this context, non-invasive monitoring techniques such as time-lapse electrical resistivity tomography (TL-ERT) are promising since they provide large-scale subsurface information that complements surface observations and traditional monitoring tools, based on point measurements.

This study proposes an overview of TL-ERT applications and developments over the last 30 years, which helps to better understand the current state of research on TL-ERT for various applications. In particular, the review focuses on the applications of ERT for mining waste characterization and monitoring to identify promising applications for long-term autonomous geoelectrical monitoring of the geotechnical and geochemical stability of mining wastes. Reference libraries have been created and made available online to facilitate future research on mining wastes using TL-ERT.

The review considers recent advances in instrumentation, data acquisition, processing and interpretation for long-term monitoring. It also draws future research perspectives and promising avenues which could help to address some of the potential challenges that could emerge from a broader adoption of TL-ERT monitoring for mine waste rock piles (WRP) and tailings storage facility (TSF) monitoring.

Figure: Graphical review of the main characteristics that could be monitored using TL-ERT for geotechnical and geochemical stability monitoring of WRP (top figure) and TSF (bottom figure).

