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APPLICATION OF ELECTRICAL RESISTIVITY IMAGING (ERI) TO INVESTIGATE AN OIL CONTAMINATED EXPERIMENTAL SITE

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Abstract

In this study we present time-related 3D ERI models for a site that was contaminated using waste automobile engine oil. The pristine geo-electrical characteristics of the site were recorded before the contamination was carried out. The purpose of the study was to progressively monitor the geo-electrical responses of the site for possible natural bio-transformations on the waste oil. Data were acquired once every two weeks for a period of three months using eight parallel 2D resistivity profiles. The 2D profiles were later inverted to 3D resistivity models of the contaminated site. The 3D inverse resistivity models indicated highest electrical resistivity values in zones that were heavily contaminated with the waste oil. We report progressive reduction in the resistivity of the subsurface in subsequent models after the fourth week of monitoring. The changes were potentially resulting from transformation of the waste engine oil due to enhanced microbial activity which in turn depends on optimal pH, sufficient nutrients and soil temperature. We also observed depleted nitrate concentrations and lower EC values compared to initial soil conditions, which is a sign that microbes are active and biodegradation is likely to be occurring. This study demonstrates the utility of the ERI method in monitoring hydrocarbon contaminated sites for potential degradation due to bio-remediation. Further research is however needed to illustrate the link between microbial degradation of the waste oil and the observed electrical resistivity changes, and related biogeochemical processes.

Key words: biodegradation, contamination, electrical resistivity imaging, isosurface, time-lapse

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