# Magnetotelluric and Seismic Joint Inversion using Nelder-Mead Minimization

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# ABSTRACT

It is often assumed that the combination of geophysical data within a single inversion framework yields a geologically more robust and reliable model than can be obtained from separate individual inversions. In this study this assumption is questioned with specific reference to magnetotelluric (MT) and seismic data. Forward modelling, incorporating the Nelder-Mead parameter optimization method, is used to test the hypothesis that zones with similar reflectivity represent geological zones with similar electrical properties. This is a new, geometric approach, to joint inversion. Subsurface structures at a potential mine site are examined using seismic and MT inversion results, and aspects of the deposit are interpreted from the perspective that preconceptions and assumption influence the results of joint inversion. A number of statistical techniques are then employed to examine if the geological processes that produce changes in elasticity also have some impact on resistivity. The two dimensional seismic reflection and MT data used to examine these concepts are from the Hillside Project Area, Yorke Peninsula South Australia.

# KEYWORDS

joint, inversion, magnetotelluric, seismic, Nelder, Mead, simplex, Hillside

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