Effectiveness of Conductivity Derivative Data Processing In Conductive Ore Deposit Exploration

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SUMMARY

Transient electromagnetic method (TEM) is an effective tool for exploring electrically conductive minerals. An advantage of the method over the direct-current resistivity methods is that it can be implemented by either surface or airborne survey, allowing a wide range of applications on different terrains. Traditionally, the raw data is processed using geophysical inversion of the time-domain conductivity to determine the distribution of ore bodies with depth. In this study, we apply a different data processing technique based on the derivative computation of the time-domain conductivity. Processed conductivities at a certain measurement point are obtained by multiplying the time-domain data with a factor related to its derivatives, while the depth is calculated from the skin effect. The effectiveness of our data processing technique is examined on both synthetic and field data. The results of the synthetic models show that our technique can identify thin electrically conductive layers at depth with high resolution and good localization. A comparison between the time-domain inversion and our technique is made in a practical application for the exploration of a magnetite ore deposit. The results show that it is possible to detect a thin ore body at depths of several hundred meters below the surface by applying our technique. Unlike the inversion technique, the time-domain derivative computation has an advantage to investigate the top of the ore body where large conductivity anomalies occur.

Keywords: Transient electromagnetic method, conductive minerals, ore deposit.