

DEEP ELECTROMAGNETIC IMAGING OF MASSIVE SULPHIDE DEPOSITS: 3-D FORWARD MODELLING, 2-D INVERSION AND SENSITIVITY TEST

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A detailed three-dimensional (3-D) numerical electrical resistivity model of the Bathurst No. 12 deposit (New Brunswick, Canada) has been constructed using available geological and geophysical information. This model facilitates studies of the capabilities of audio-magnetotellurics (AMT) at locating and defining mineral targets at depth, and of methods of optimising data acquisition. Different conditions were analysed: presence of overburden, dimensions and positions of the ore body, and varying data sampling. The behaviour of 3-D electromagnetic fields is compared with ones from a body of infinite length extent (a two-dimensional case). The 3-D and 2-D AMT responses are similar at high frequencies so 2-D modelling is sufficient. However, at low frequencies only those responses for current flow perpendicular to the body (the Transverse Magnetic mode in a 2-D case) are reasonably alike. The different 2-D inversions carried out in this study show that the position and the top of the 3-D ore body are well resolved in contrast to the bottom and the resistivity of the body.