

DETECTION AND CLASSIFICATION OF DEEP UXO WITH BOREHOLE ELECTROMAGNETICS

Laurens Beran, Black Tusk Geophysics; Stephen Billings, Black Tusk Geophysics Inc

WWII era unexploded ordnance (UXO) in urban environments are an ongoing safety hazard in Europe. In Germany, more than 2000 tons of undetonated munitions are discovered each year. In this talk we discuss the application of advanced geophysical classification (AGC) to the German UXO problem. We present the use of time-domain electromagnetics for classification of large (> 250 lbs) and deep (> 2 m) UXO. These targets are beyond the reach of most AGC sensors, and so we use borehole measurements with fluxgate magnetometers to obtain sufficient signal for target detection and characterization. Target illumination is achieved with a high current transmitter and horizontal loops deployed to achieve diverse excitation.

Inversion of measured data is carried out with a dipole model: we estimate the moment induced by each transmitter at each time channel. Testpit measurements indicate that for large munitions the data can be adequately reproduced with this model, and estimated intrinsic dipole polarizabilities can be reliably used to classify targets. However, inversion of field data sets can often be complicated by significant background signal from nearby infrastructure. We discuss how background response can be modelled and show field data examples of successful classification of deep UXO.