SERDP PROJECT OF THE YEAR
MUNITIONS MANAGEMENT

IMPROVING DETECTION AND DISCRIMINATION OF UXO IN MAGNETIC ENVIRONMENTS

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The military trains with live munitions to maintain readiness at all times; however, not all munitions detonate during training. Cleaning up military sites suspected of containing munitions that have been armed and fired yet remain unexploded is one of the most pressing environmental problems facing the Department of Defense. It is particularly difficult to distinguish unexploded ordnance (UXO) from magnetic rocks and soils, especially in complex geological settings throughout the United States. In such regions, magnetic and electromagnetic sensors often detect large anomalies that are of geologic, rather than metallic, origin—leading to the unnecessary excavation of large numbers of non-UXO.

Dr. Yaoguo Li and his team from the Colorado School of Mines, University of British Columbia, Sky Research, Inc., Michigan State University, and New Mexico Institute of Mining and Technology have developed a processing technique that screens out this geologic clutter. Prior SERDP exploratory development research examined the effect of magnetic soil on UXO discrimination and assessed the level of soil response that severely affects the reliability of discrimination algorithms that are based on geophysical inversion. Results of this work indicated that the successes of data processing algorithms require an understanding of the spatial characteristics of the susceptibility to magnetic soils and the dependence of susceptibility on the frequency at which sensors are operating. Dr. Li addressed these gaps by studying the spatial distribution and frequency dependence of susceptibility and quantifying its effects on different sensor modalities. From this fundamental science, he developed new filtering techniques that incorporate geostatistical information and a physical understanding of complex magnetic susceptibility.

Collectively, Dr. Li has provided a novel understanding of the origin of magnetic soils and their effects on electromagnetic and magnetic data and developed approaches for identifying and removing these effects from geophysical data in UXO clearance. His work will improve the efficiency and reliability of UXO detection and discrimination in magnetic environments and reduce costly excavations of large numbers of non-UXO.

For more specific information about this project, stop by Poster #92.