A Test Study to Display Buried Anti-Tank Landmines with GPR and Research Soil Characteristics with CRS

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An anti-tank mine (AT mine) is a type of land mine designed to damage or destroy vehicles including tanks and armored fighting vehicles. Anti-tank mines typically have a much larger explosive charge, and a fuze designed only to be triggered by vehicles or, in some cases, tampering with the mine. There are a lot of AT mine types. In our test study, MK4 and MK5 AT mine types has been used. The Mk 5 was a cylindrical metal cased U.K. anti-tank blast mine that entered service in 1943, during the Second World War. General Specifications of them are 203 mm diameter, 127 mm height, 4.4-5.7 kg weight, 2.05-3.75 kg of TNT explosive content and 350 lbs operating pressure respectively.

The aims of the test study were to image anti-tank landmine with GPR method and to analyse the soil characteristics before the mines made explode and after made be exploded and determine changing of the soil characteristics. We realized data measurement on the real 6 unexploded anti-tank landmine buried approximately 15 cm in depth. The mines spaced 3 m were buried in two lines. Space between lines was 1.5 m. We gathered data on the profiles, approximately 7 m, with a Ramac CUII system and 800 MHz shielded antenna. We collected soil samples on the mines, near and around the mines, on the area in village. We collected soil samples before exploding and after exploding mines. We imaged anti-tank landmines on the depth slices of the GPR data and in their interactive transparent 3D subsets successfully. We used polarized microscope and confocal Raman spectroscopy (CRS) to identify soil characteristic before and after exploitation. The results presented that GPR method and its 3D imaging were successful to determine AT mines, and there was no important changing on mineralogical and petrographical characterization of the soil before and after exploding processing.