Near surface EM technologies – Archaeological and environmental applications

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SUMMARY

Electromagnetic methods (EM) are a special branch of geophysical studies applied for the solution of a variety of problems where the target depth ranges in centimeters to hundreds of kilometers. The majority of EM applications deals with deeper portions of the subsurface where the first few tens of meters generally disregarded. However, these depths also include valuable exploration targets from various point of views and EM also provide suitable tools for the investigation of such shallow targets. At this scale, the exploration targets are generally man-made or natural features/structures embedded into first few meters from the ground surface. The main EM tool used at near surface applications is the ground penetrating radar (GPR) a high frequency method providing high resolution images of subsurface. Therefore, this review is mainly focusing on the application of GPR method at investigations such as sinkhole detection, groundwater related surveys, agricultural investigations, ice and snow research and finally archaeological surveying. A recent trend in near surface application of EM studies is the determination of certain physical properties of soil and/or rocks directly from geophysical data. The review consists of three parts: (1) development in the instrumentation of shallow electromagnetic methods (mainly GPR), (2) latest data and image processing methodologies, (3) case histories and examples. The examples presented in the paper are mostly from archaeological surveys which have a significant weight in the literature as well.

Keywords: GPR, Data Processing, Archaeology, Environmental Geophysics