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New Vistas

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Abstract

In the last decade, the rise of Unmanned Aerial Vehicles (UAVs) has revolutionised geophysics. UAV-based geophysical methods have expanded data collection into inaccessible areas, increasing spatial coverage and reducing operator effort and survey duration. Consequently, several non-destructive geophysical sensors, including magnetometers and ground penetrating radars (GPR), have been optimized to serve as UAV payloads, while still ensuring good-quality data acquisition.

Among geophysical methods, GPR and magnetic surveys are the most widely adopted for geo-environmental, archaeological, geotechnical, and engineering purposes. Their success stems from their cost-efficiency, versatility, data collection capabilities, non-invasiveness, and ability to detect buried targets through magnetic and electromagnetic sensing capabilities.

This study presents a geophysical survey conducted to test drone-based GPR and magnetometric technologies, namely the Zond Aereo LF and the MagNimbus. The collected data were processed and analysed to show the results with advanced visualisation techniques, enhancing the interpretation of subsurface features and highlighting the potential of the combined use of these technologies to address environmental challenges, particularly in complex natural and urban settings.

The multi-geophysical survey was performed by the Institute for the Electromagnetic Sensing of the Environment of the National Research Council of Italy (IREA-CNR) at the Altopiano di Verteglia (Montella, AV – Southern Italy). The site is a small tectonic-karst basin situated in the Northern-Western sector of the Piacentini Mountains group (Southern Italy). The area has previously been partially studied through ground-based geophysical investigations, additionally, magnetic measurements have been performed in both ground- and drone-based configurations, confirming the presence of three steel metallic pipes system at variable depth (approximately from 1 to 2 m). Currently, the pipe system is out of use. The proposed methodology offers a novel approach to visualise the acquired data and contributes significantly to environmental characterization and detection of buried infrastructure, supporting their potential recovery and integration into urban regeneration processes

Keywords

environmental diagnostics, urban regeneration