Identifying signatures of a single, multiple and mass grave over time: an ongoing research project [1]

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Introduction

Detection of landscape anomalies which may be potential gravesites can be a long, complicated, and often frustrating task. Stemming from the authors experiences in countries where bodies have been buried and deliberately concealed in order to avoid immediate detection, research is being undertaken in order to contribute to improving detection methods. The aim is to investigate the signatures of different types of burials over time.

Method and Research Outline

Burials consisted of several donated human cadavers within three types of graves: a single (1), multiple (3) and mass (6) were established in 2016. Changes to temperature and moisture were monitored using dataloggers. Topographic changes were recorded using an aerial LIDAR. Ground penetrating surveys together with magnetrometry were undertaken pre and post burial and an earth resistance survey is scheduled for 2022. Three-dimensional scanning (Fig. 1) and drone images were taken during burial together with entomological, geological and vegetation information.

Each donor was recorded pre burial. DNA samples were also collected. Clothing and personnel effects were buried with the deceased to monitor degradation over time.

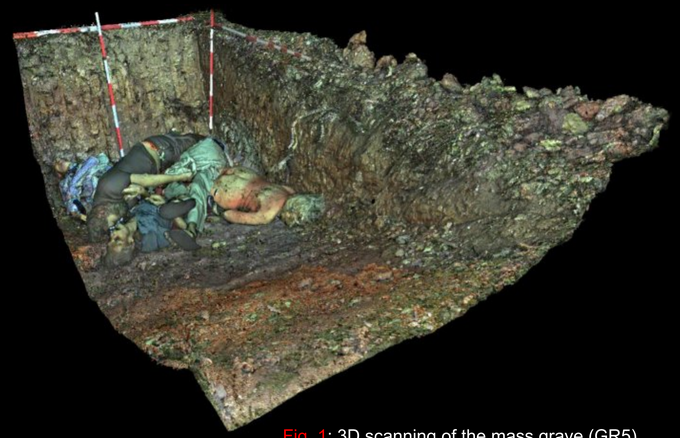

Fig. 1: 3D scanning of the mass grave (GR5)

Results of Temperature related Research to date

The data from the thermal signatures of the graves indicates that that the single body and the small multiple grave gave off a slightly higher reading compared to the background ambient temperature 9 months following burial whilst the other graves, possibly due to the depth of burial and exposure to the surface (Fig. 2). The deeper and larger grave gave a reading consistent with the average monthly temperature. A detectable temperature signature should be visible over a period of at least 12 months with a slightly weaker thermal signature continuing to at least 15 months following burial.

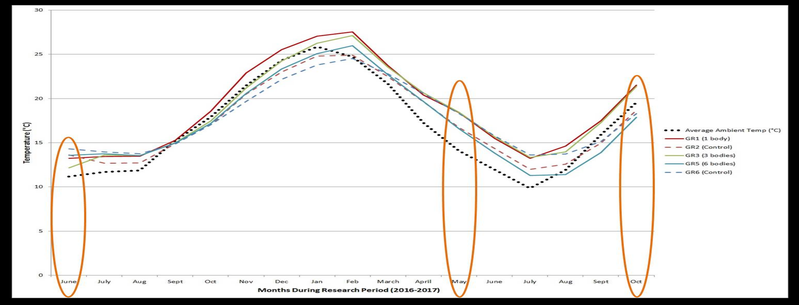

Fig. 2: Thermal signature data

Results of Moisture related Research to date

The data from the moisture monitors within the graves suggests that no significant signature could be discerned over the initial 16 months of burial (Fig. 3). Surface indicators of water retention within grave backfills were recorded within the multiple and mass graves over the same period of time.

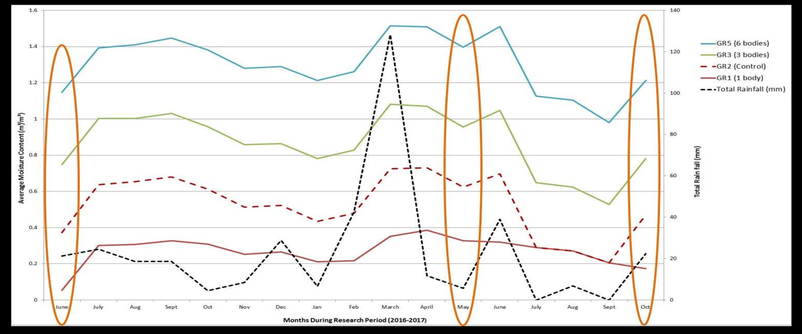

Fig. 3: Moisture signature data

Results of Lidar Survey

A small sensor was fitted within a winged drone that collected data over a period of three spaced flights of the area. All of the Lidar data was post processed by a colleague who had no information on the actual experiment. The outlines and depressions associated with all of the burials together with their control graves were detected within the imagery and confirmed by the VIFM staff who were present at the time of grave construction and burial (Fig. 4).

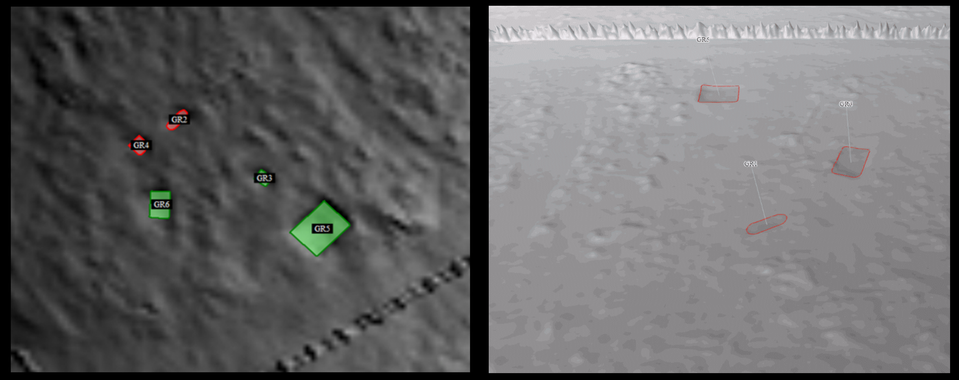

Fig. 4: Anomalies detected using Lidar

Conclusion

The ability to detect minute changes in surface topography using LIDAR has shown this technique to be the most appropriate method for locating anomalies of interest. Although interesting, the data from the buried monitors requires further analysis. The resulting data from the full excavation and recovery may also identify any thermal characteristics. The resulting data will be combined with botanical, geological and entomological data.

It is suggested that at this point an aerial drone equipped with an appropriate raft of sensors could be employed to locate disturbances between 1 and 16 months after burial.

The authors welcome the opportunity establish contact with other colleagues undertaking similarresearch to our own.

It is hoped to undertake the controlled excavation and recovery of the donated cadavers in late 2022.

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