

Geophysical monitoring of simulated clandestine graves using electrical and ground penetrating radar methods: 4-6 years

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Abstract

This ongoing monitoring study provides forensic search teams with systematic geophysical monitoring data over simulated clandestine graves for comparison to active cases. Simulated 'wrapped', 'naked' and 'control' burials were created. Multi-geophysical surveys were collected over a six-year monitoring period, in this paper showing data from four to six years after burial. Bulk ground resistivity, Electrical Resistivity Imaging, multi-frequency Ground Penetrating Radar, grave and background 'soil water' conductivity data continued to be collected.

Resistivity surveys revealed the naked burial had low-resistivity anomalies up to year four but then was difficult to image, whereas the wrapped burial had consistent large high-resistivity anomalies. GPR 110-900 MHz frequency surveys showed the wrapped burial could be detected throughout, but the 'naked' burial was poor to not resolved. 225 MHz frequency GPR data were still optimal. 'Soil water' analyses showed decreasing (year four and five) down to background (year six) conductivity values.

Results suggest both resistivity and GPR surveys should still be collected if target 'wrapping' is unknown, with winter to spring surveys still optimal and increasingly important to consider as post-burial time increases.

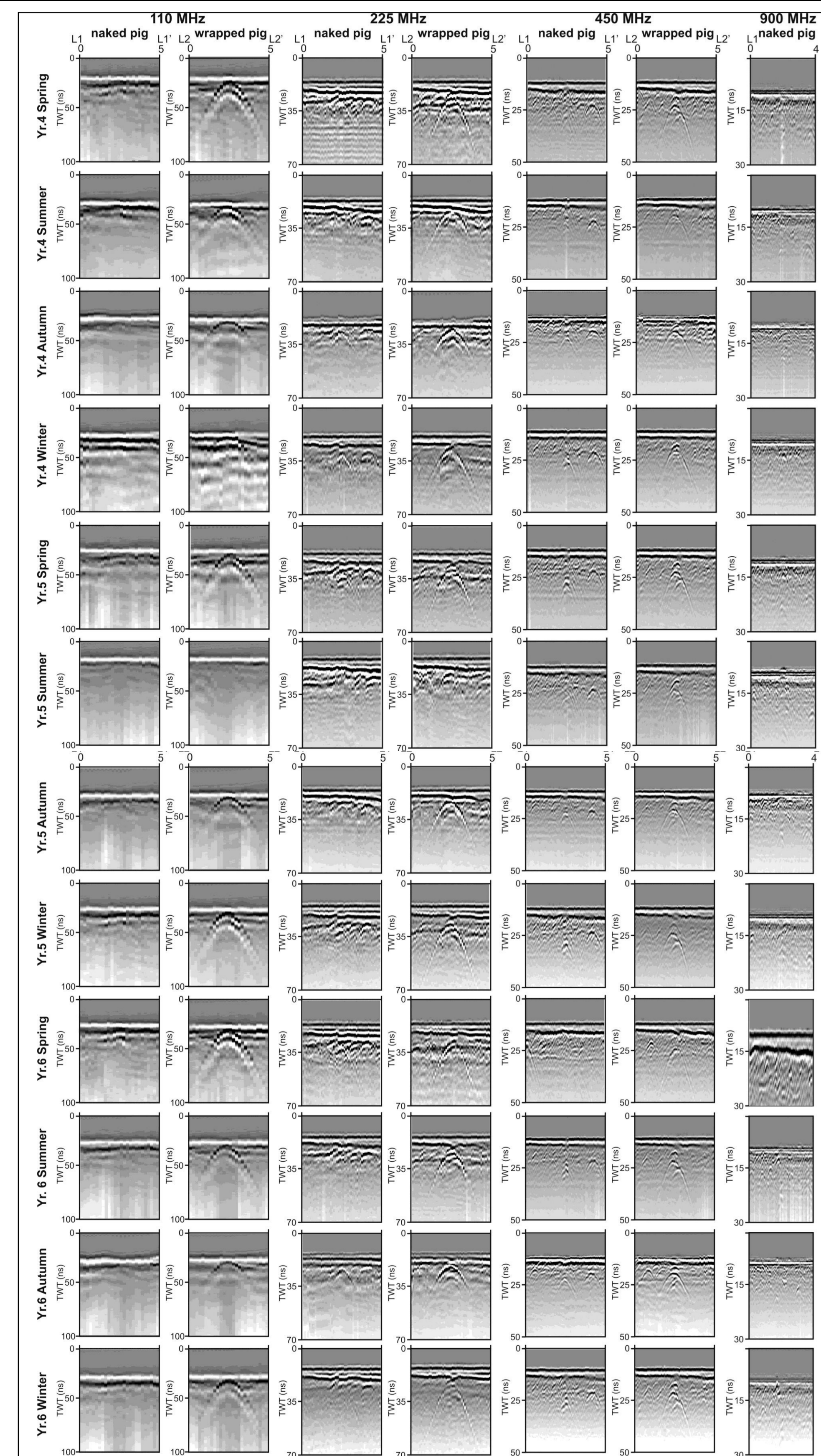


Figure 4. Key processed 110, 225, 450 & 900 MHz dominant frequency GPR profiles that bisect graves (Fig. 1A for location).

Introduction

Keele University have been undertaking long-term geophysical monitoring of simulated clandestine graves using pig cadavers as human analogues. This poster presents both electrical resistivity and GPR data from 4 – 6 years post-burial. The 0-3 years post-burial datasets are published in Pringle et al. (2012).

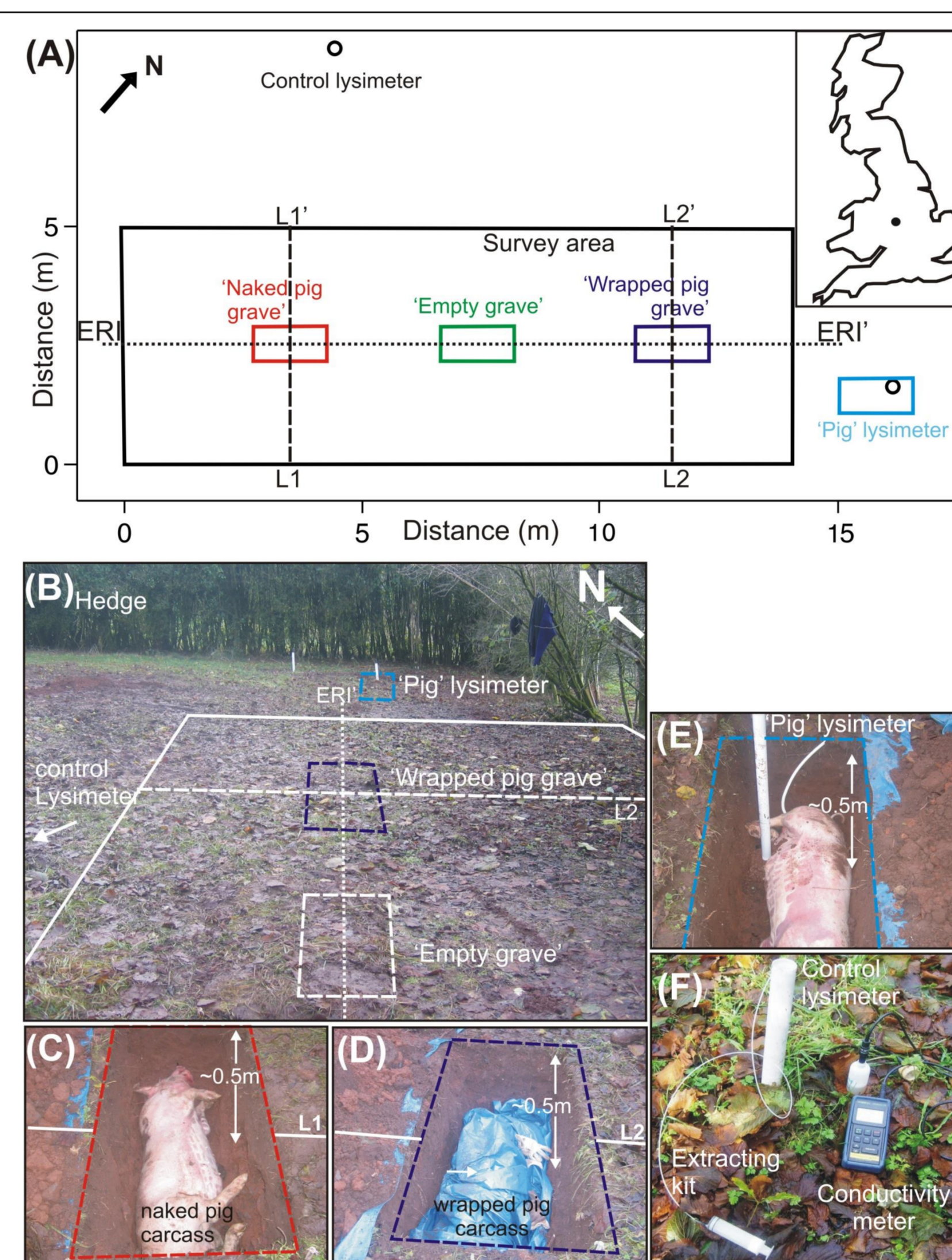


Figure 1. (A) Map of survey area with graves, L1/2 GPR & ERI 2D profile lines, lysimeter positions & location map all shown. (B) Study site, (C) 'naked pig grave', (D) 'wrapped pig grave', (E) 'pig lysimeter grave' & (F) soil 'fluid' measurement photographs respectively.

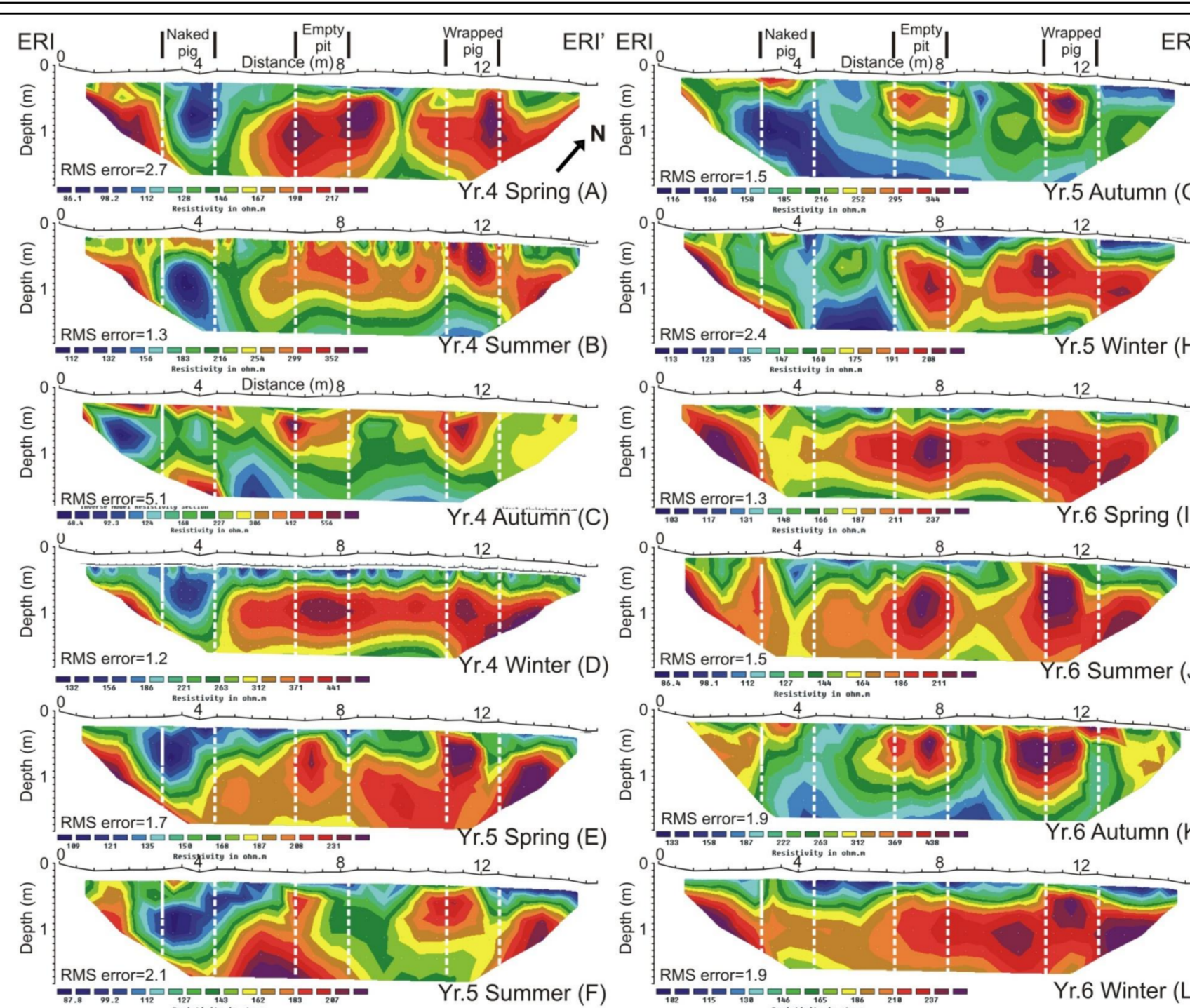


Figure 3 2D ERI profiles; model inversion errors (RMS) indicated. Positions of graves also shown. See Fig. 1A (ERI/ERI') for location.

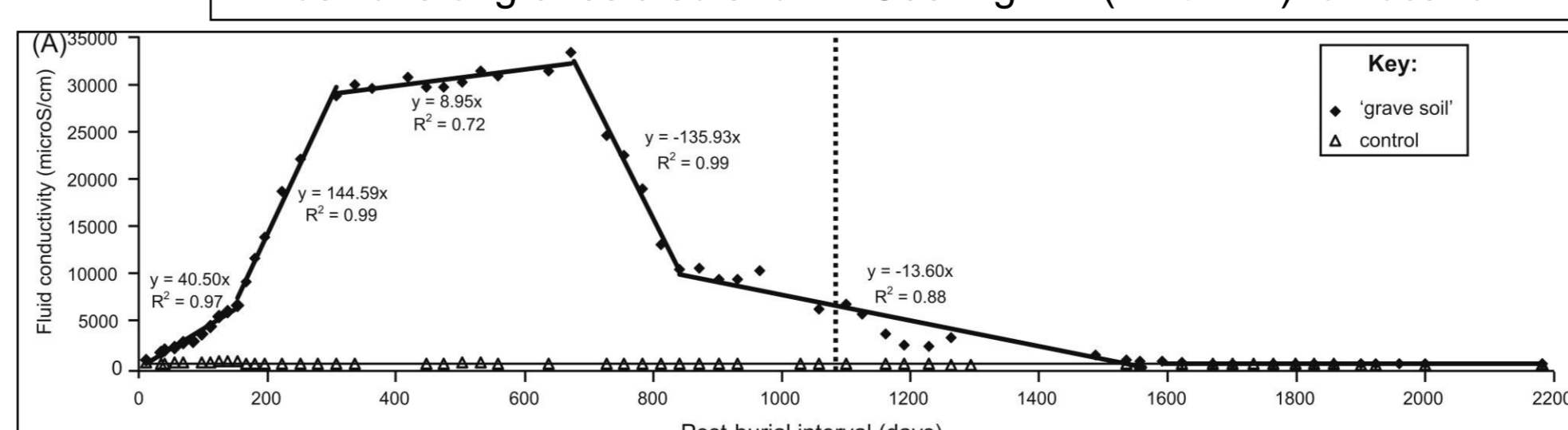


Figure 5. Pig leachate & background soil-water fluid conductivity values over 6-year survey period; 4-6 years to right of vertical dotted line

Reference

Pringle, J.K., et al. 2012. Geophysical monitoring of simulated clandestine graves using electrical & GPR methods: 0-3 years. *Journal of Forensic Sciences*, 57(6), 1467-1486.

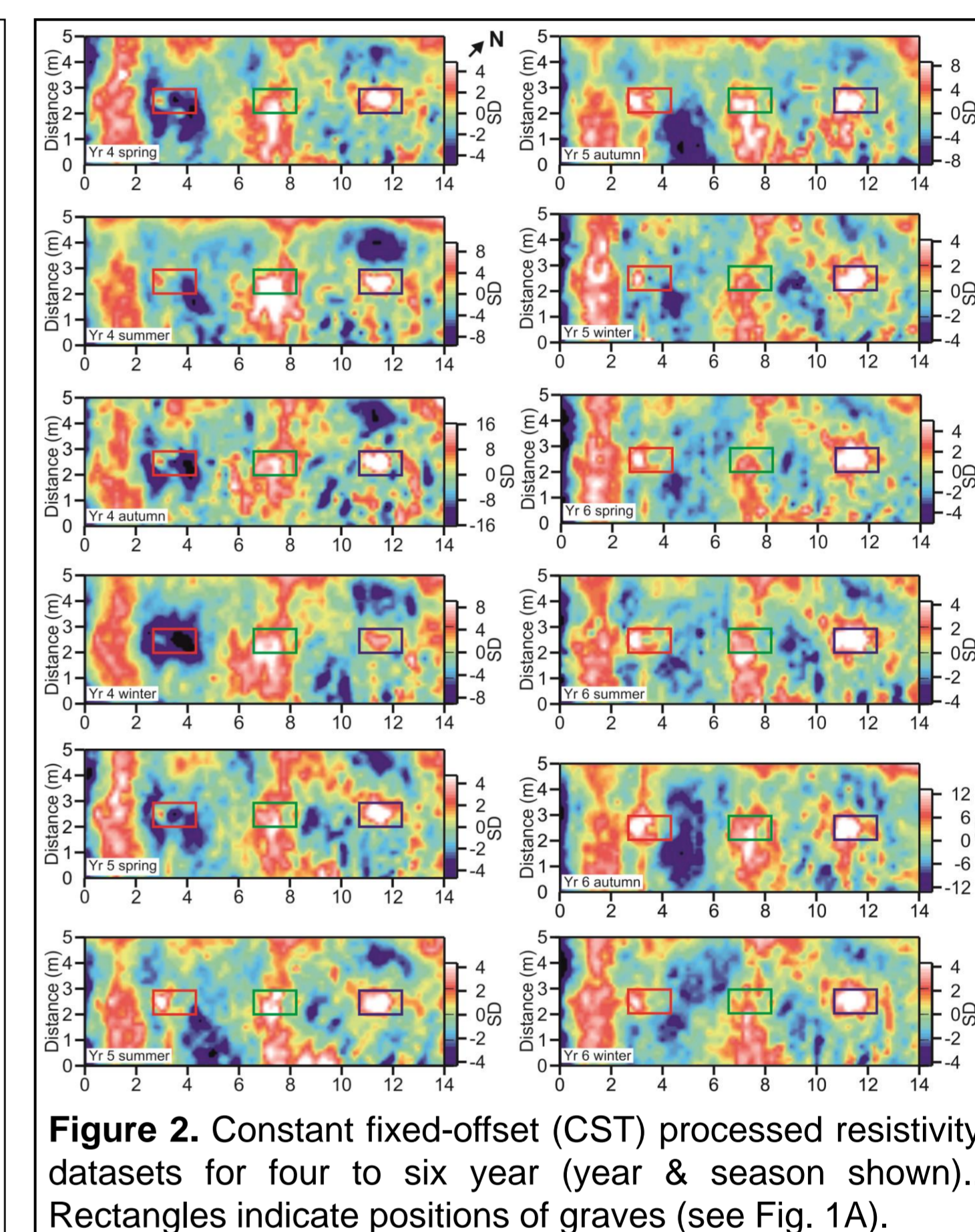


Figure 2. Constant fixed-offset (CST) processed resistivity datasets for four to six year (year & season shown).. Rectangles indicate positions of graves (see Fig. 1A).

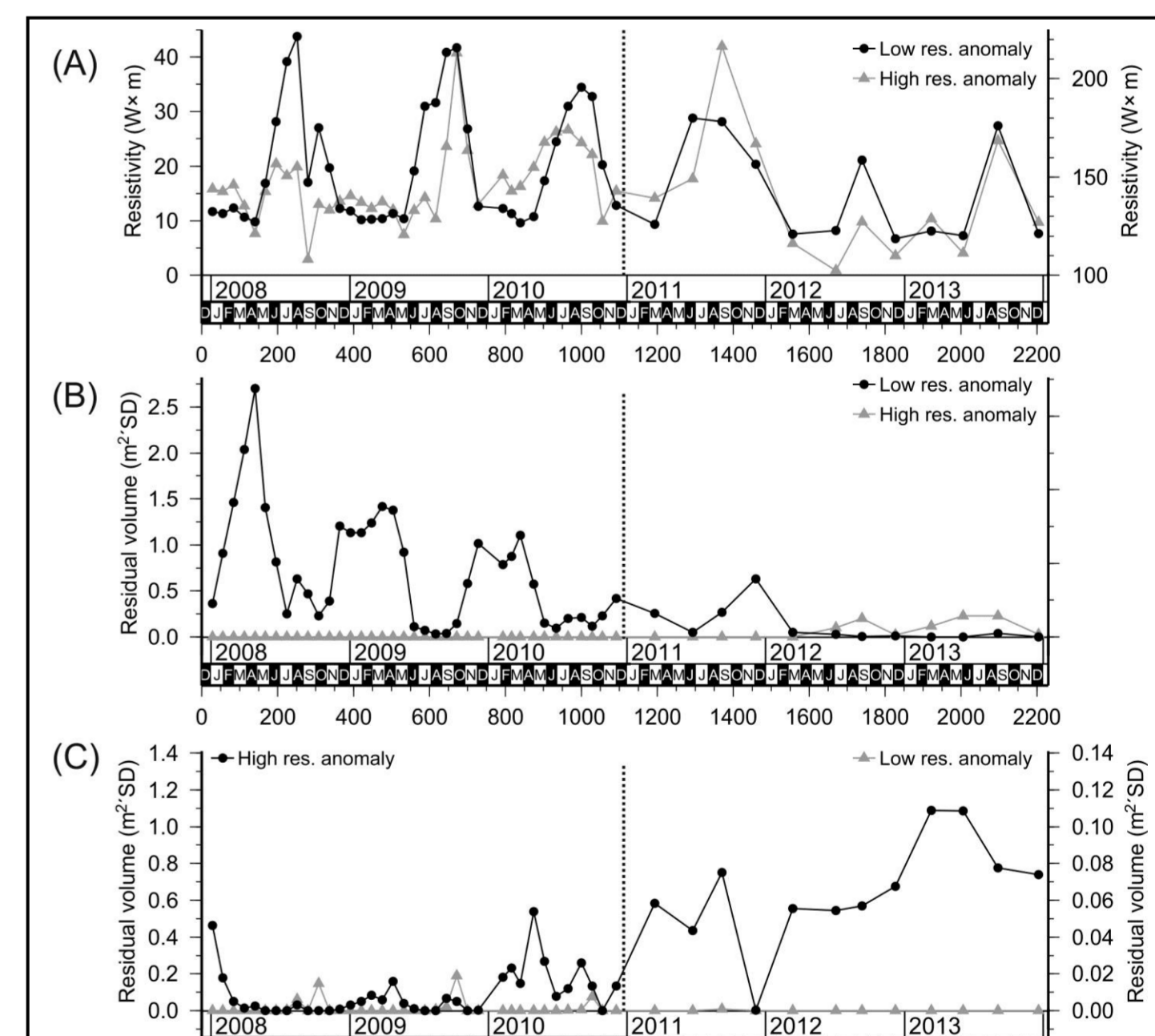


Figure 6 Summary quantitative analysis of fixed-offset resistivity data with 4-6 years to right of dashed line. (A) SD, values highest in late summer; residual volume analysis, (B) naked pig & (C) wrapped pig cadaver.

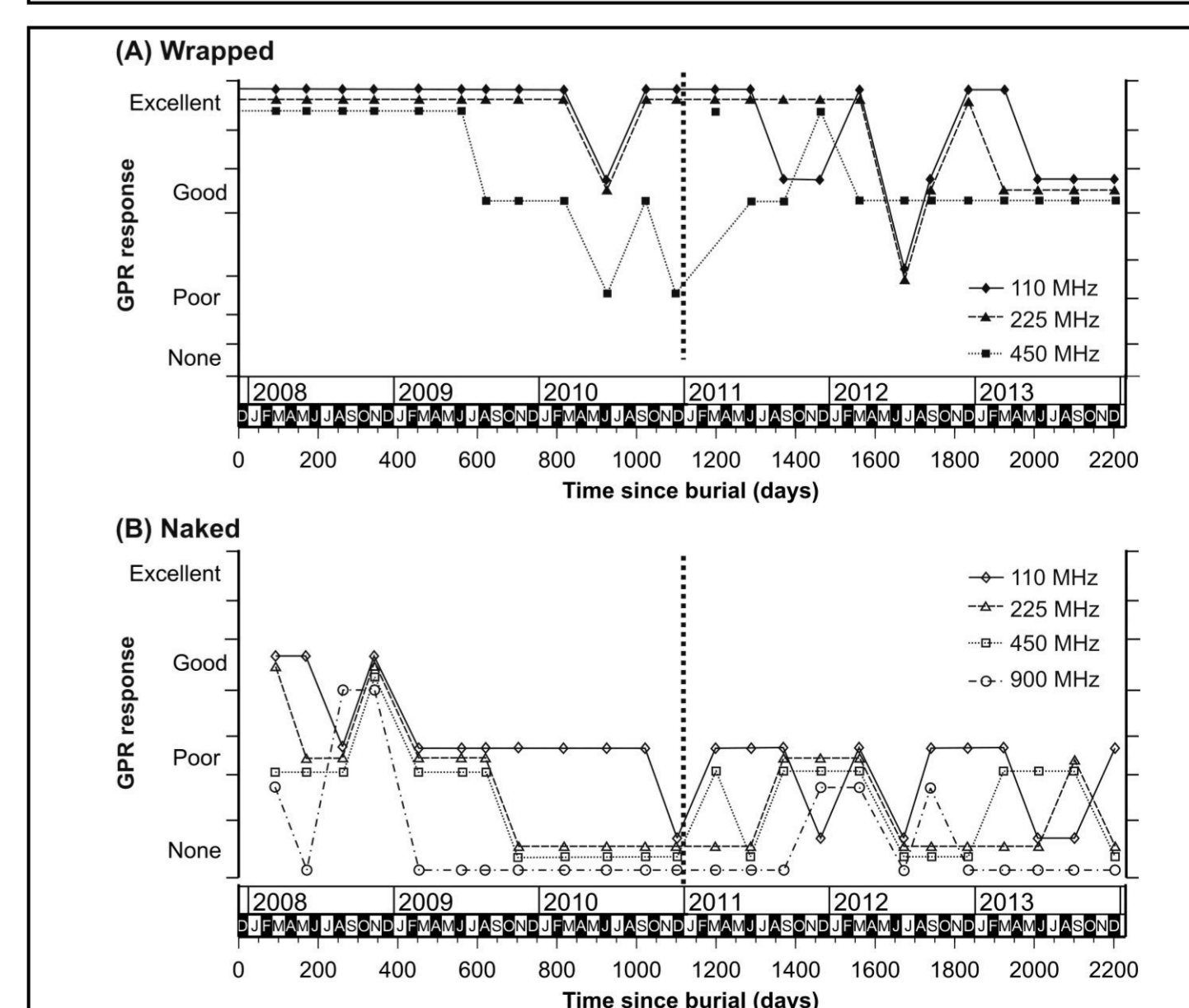


Figure 7. Summary qualitative analysis plots of GPR data with 4-6 year to right of dashed line.