

GROUND PENETRATING RADAR (GPR) SURVEYS AT KORTOWO CAMPUS



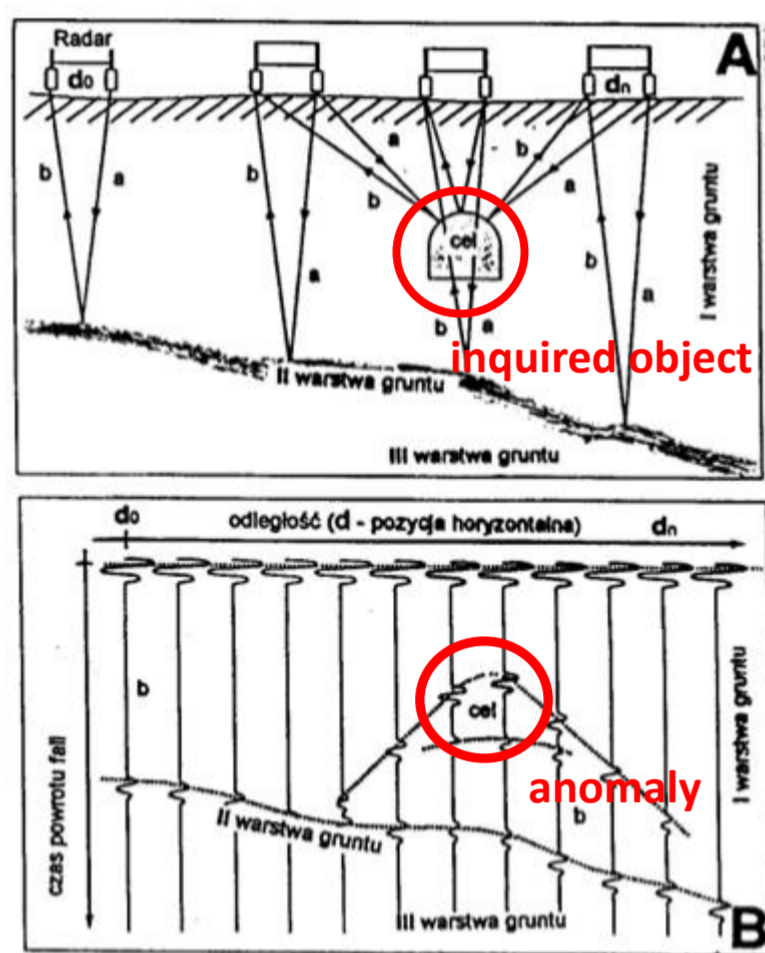
Andrzej Dumalski¹, Piotr Niemyjski², Patrycja Wyszowska¹, Robert Duchnowski¹
¹ Department of Geodesy, Faculty of Geoengineering, University of Warmia and Mazury in Olsztyn, Olsztyn, Poland
² MSc student, Faculty of Geoengineering, University of Warmia and Mazury in Olsztyn, Olsztyn, Poland

E-mails: andrzejd@uwm.edu.pl : piotr.niemyjski@student.uwm.edu.pl : patrycja.wyszowska@uwm.edu.pl : robert.duchnowski@uwm.edu.pl



INTRODUCTION: The aim of non-invasive GPR research was to check whether there are remains of various buildings of a former psychiatric hospital under the ground surface of the academic town of Kortowo. To this day, there is no complete documentation of what existed at the turn of the 19th and 20th centuries. Most of the buildings from those times remain in good condition; only their function has changed. However, there are hidden remains of no longer existing buildings. We know about the existence of historic underground heating tunnels, some of which have been adapted to modern times, but there are probably fragments that are no longer used today. There was a church on Łódź Square, which has not survived to this day. Nevertheless, there are probably fragments of foundations or underground rooms even here. The GPR method will, therefore, allow for at least partial discovery of these forgotten secrets. The research results may begin new research for historians of this extraordinary place.

MODEL OF GPR DATA ACQUISITION



Basic principles of measuring GPR electromagnetic waves
A – GPR profiling diagram
 a – transmitted impulses; b – received echo; cel – inquired object
B – Scheme of recording the received echo during GPR measurement
 b – recording of the echo wave

THE ESSENCE OF THE GPR METHOD

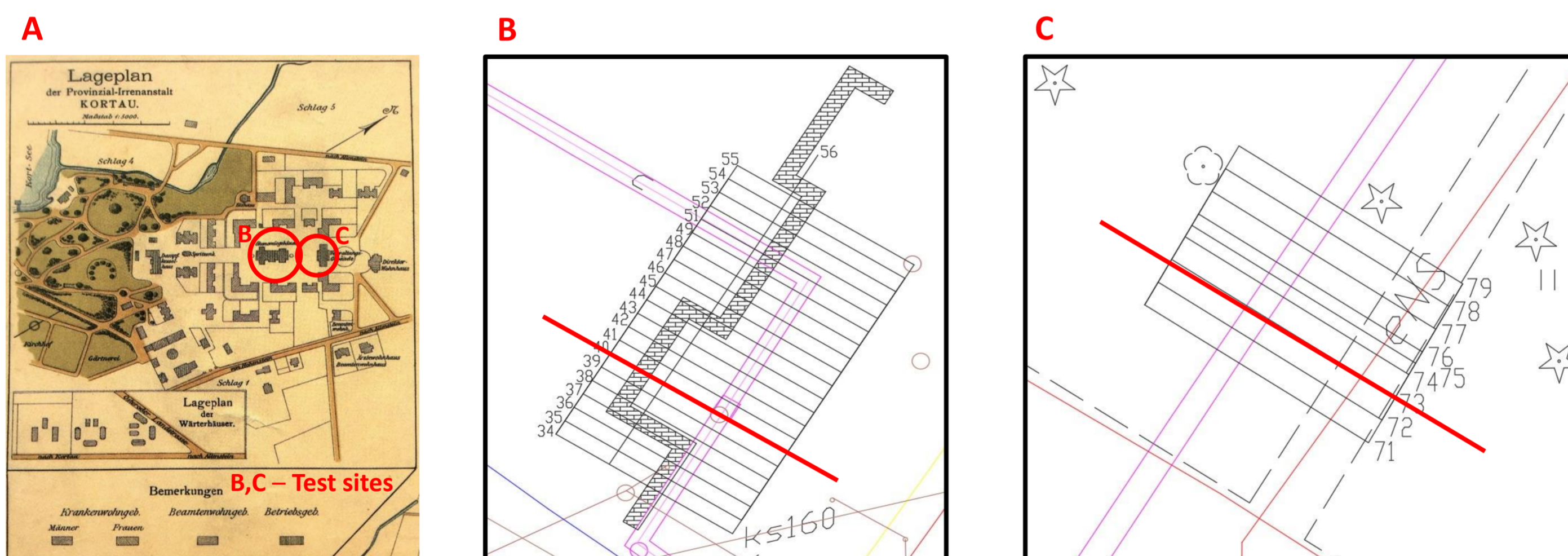
It is a non-invasive measurement method. Electronic GPR equipment is used to examine, among other things, the ground and exactly what is in it. The device consists of a transmitting antenna, a receiving antenna, a central unit, and a computer with a monitor for ongoing measurement analysis. It works on the principle of counting the delays of very high-frequency electromagnetic pulses (10-1000MHz), sent by the transmitting antenna, which, reflected from various lithological boundaries, various types of rocks (dielectrics), or unnatural objects found under the ground surface, are received by receiving antenna and transmitted to the central unit to count the wave return time. The impulses sent by the transmitting antenna deep into the medium return with a delay to the receiving antenna and are observed in the field by the operator on the monitor as a time phalogram of the variability of ground parameters. The obtained image can be compared with model images of objects hidden in the ground or cartographic documentation.

MEASURING EQUIPMENT



Field georadar (GPR) research was carried out with a portable ground penetrating radar RAMAC/GPR (produced by the Swedish company GeoScience Mala). A shielded antenna with a central frequency of 500 MHz moved on the ground surface was used for profiling. The research was carried out using the linear profiling method to a depth of 5 m.

STUDY AREA



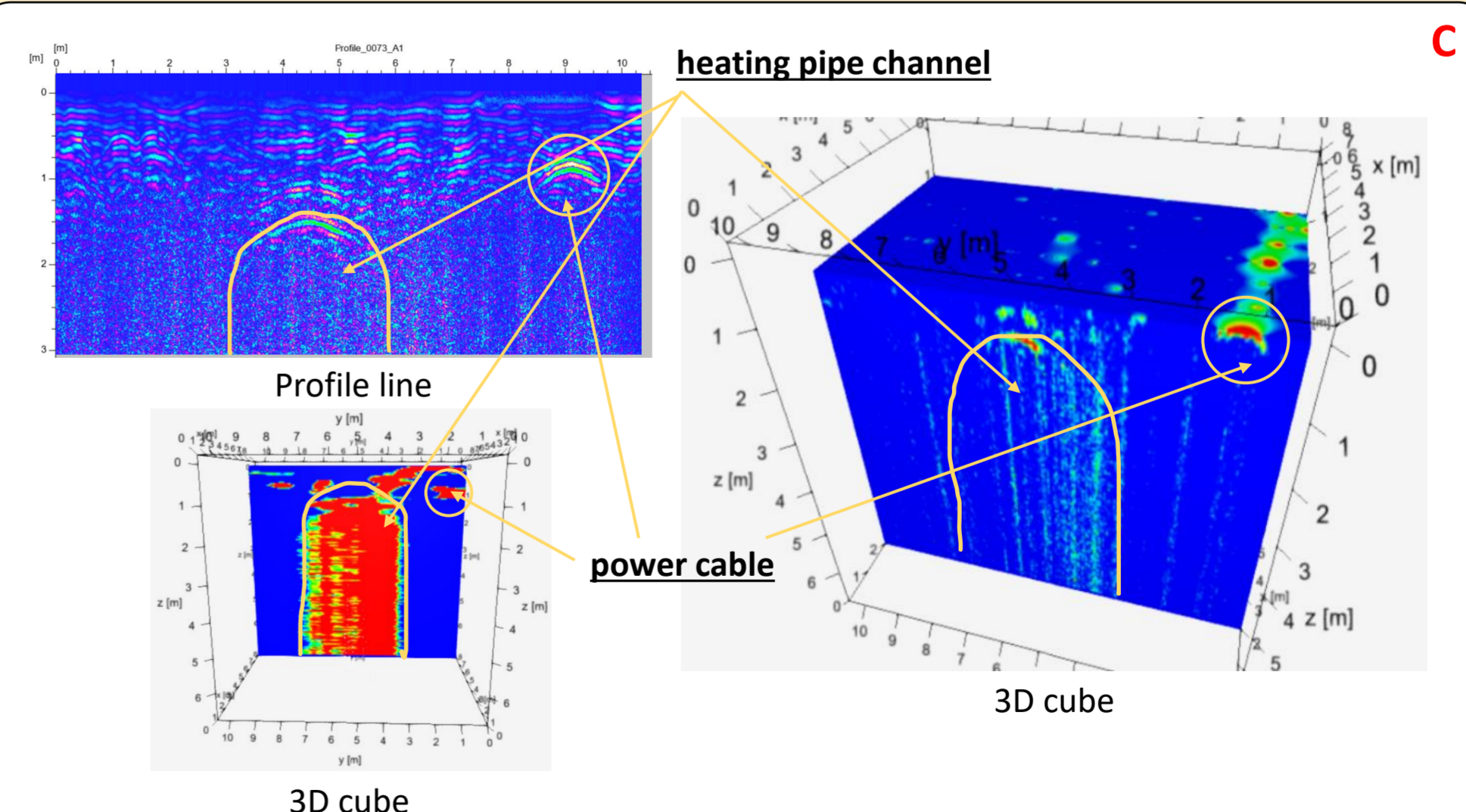
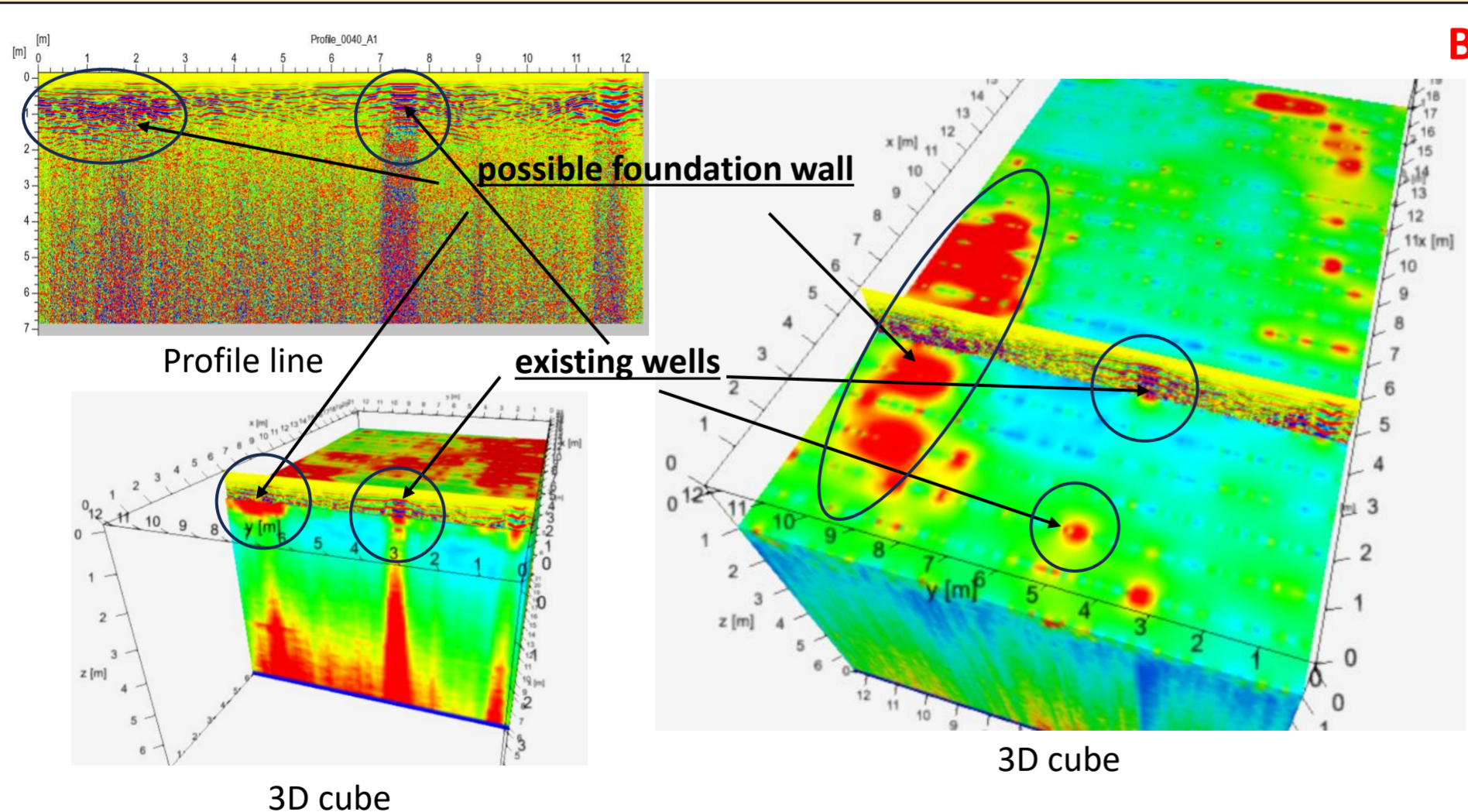
The tests were performed using the linear profiling method, cutting every 1 m

A – Historical plan of Kortowo

B, C – Test sites

B – Currently, only underground fragments of foundation walls can be found in this place

— Profile lines shown below



CONCLUSIONS: The conducted GPR research shows the method's suitability for research below the ground surface. Parts of the area were selected where there are active underground infrastructure facilities, as well as places where fragments of no longer existing buildings may be present. The analysis of echograms allowed us to confirm the existence of an active heating tunnel from the end of the 19th century and the remains of the foundation walls of a non-existent building on the square in front of the University Rector's Office. Only archaeological research would confirm the hypothesis of the existence of such architectural remains. At the initial stage of archaeological research, the GPR method seems to be the only one that indicates the initial location of underground anomalies.