A GROUND PENETRATING RADAR INVESTIGATION OF ARCHAEOLOGICAL SITES IN VARNIAI REGIONAL PARK, NORTHWESTERN LITHUANIA

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Abstract

The Varniai Regional Park, located in Northwestern Lithuania, is considered a hub of Mesolithic and Neolithic Baltic culture and contains many sites of importance to Lithuanian history. In July of 2016, non-invasive archaeological investigations were conducted at two different sites in the Varniai Regional Park by means of ground penetrating radar (GPR). The two sites share a similar research goal. In prehistoric times, people settled at or near lake shorelines leaving cultural remains behind. As lake levels changed many of these shorelines became buried under a layer of peat. Due to difficulties in conducting archaeological excavations in this peatly environment, knowing the location of an ancient shoreline is important. Four GPR transects of varying lengths were collected with Sensors and Software pulseEKKO 100 and pulseEKKO 1000 GPR systems at 100, 200, and 225 MHz with step sizes of 0.5, 0.85, and 0.65 meters respectively. Topographic data collected with a TopCon laser leveler was used to geometrically correct the GPR data. The resulting transects reveal the truncation of continuous horizontal layers by dipping reflections which are interpreted as ancient buried shorelines. GPR data collected from these two sites have proven useful in identifying locations for future archaeological excavations.

Introduction

The area now known as the Varniai Regional Park in Northwestern Lithuania is considered by many to have been a hub for all different human cultures. Archaeological evidence suggests that humans consistently inhabited the area following the retreat of the ice sheets (~9-10 thousand YBP) well into the historical era (Stancikaite, et al. 2004). These early people settled close to the newly formed lakes in the region leaving cultural remains behind for archaeologists to investigate. Recently, numerous environmental changes have occurred, notably a decrease in lake water level, meaning that areas which were once water are now peat bogs which have covered the original position of many lake shores (Stancikaite, et al. 2004). This environment offers both challenges and opportunities for archeologists. Archeological artifacts made out of easily decomposable organic materials are typically well preserved due to the anaerobic nature of the peat bog environment prevalent in the region. Unfortunately, this terrain type makes excavations time consuming and costly as pumps are required to remove excess water from excavation trenches. In the summer of 2016, a GPR survey was conducted in two transects (GPR images) at two different sites in the park: Karkliskia, a peat bog which used to be a strait of water and Donkalnis, an old lake which was used as a gathering place and burial mound. Data collected during these surveys can be used to pinpoint ancient buried shorelines. The location of these shorelines can be utilized by archaeologists to plan future excavations. This poster is presented as a synopsis of the methodology used to collect, process, and interpret data used to locate ancient shorelines in Varniai Regional Park, Lithuania.

What is Ground Penetrating Radar?

Ground penetrating radar uses a antenna tuned to a specific frequencies. The first antenna sends an electromagnetic pulse through the surface of in order to sample the subsurface. The second antenna receives signals from the original pulse that are reflected back off of soil layers and objects under the surface. The reflected electrical pulses are then sent to a computer to be processed. The resulting data is then displayed for analysis. Ground penetrating radar has been used successfully on many different sites around the world to determine the location of buried objects, cultural remains, and features. Ground penetrating radar has been used in a variety of archaeological applications for many years (Conyers 2004). A GPR survey of Donkalnis produced several transects (GPR images) which were collected with a TopCon laser leveler was used to geometrically correct the GPR data. The resulting transects reveal the truncation of continuous horizontal layers by dipping reflections which are interpreted as ancient buried shorelines. GPR data collected from these two sites have proven useful in identifying locations for future archaeological excavations.

Results

Karkliskia is a bog which used to be a straight of water between a lake and the mainland. It is located north of the Lithuanian village of Varniai in the Varniai Regional Park. This part of Lithuania was at one time host to many rivers, forests and streams which gave ample resources, trade opportunities, and protection to early human inhabitants of the area dating as far back as 9000 years ago (Stancikaite et al. 2006). Approximately 2400 - 3000 years ago (Brtimus and Šimėnas 2015), ancient peoples living in this area settled on or near the shores of the numerous lakes and left cultural remains behind in high concentrations. In recent years water levels have become lower which has turned many lakes into swamps which have buried the ancient shorelines under a layer of peat. Knowing where these buried shorelines are important to archaeologists as they not only have high concentrations of artifacts, but those artifacts are often well preserved.

Conclusions

Knowing the location of ancient buried shorelines is essential for conducting archaeological research in the Varniai Regional Park as a great quantity of cultural remains likely deposited on or near lake shores by human settlements. Ground penetrating radar technology has proven to be a viable technique to locate buried shorelines in the swampy environment prevalent in the Varniai Regional Park. The GPR data used in this project, in conjunction with other investigative techniques, has already been used by Lithuanian archaeologists to secure funding for on site excavations at Karkliskia in the summer of 2017.

References


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