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Determining Peat Thickness in Subtropical Peatlands Using Ground Penetrating Radar

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Introduction

- Peat soils are becoming increasingly important in subtropical systems because they are large producers of biogenic gases, for example methane and carbon dioxide (Whalen, 2005).
- Traditional studies to quantify peat thickness, such as coring, can be time consuming.
- Ground Penetrating Radar (GPR) has been previously used in northern peatlands to estimate peat thickness (Slater and Reeve, 2002; Comas et al., 2004), however to our knowledge, no GPR based study to estimate peat thickness in the Everglades has been previously reported.
- In this study we were able to quickly estimate peat thickness in a subtropical peatland in the northern part of the historical Everglades using GPR.

Methodology

GPR

•Ground-penetrating radar is a noninvasive technique that detects discontinuities in the shallow subsurface. Pulses of high frequency electromagnetic energy are generated by a transmitter antenna (T), propagated through the subsurface and received by a receiver antenna (R) as reflected or refracted at specific subsurface reflectors (Figure 1) (Neal, 2004).

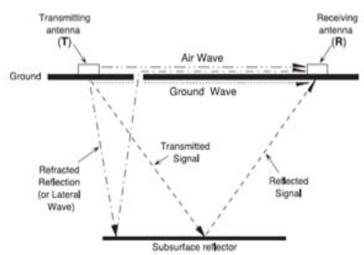

Figure 1. Paths of rays are shown for the airwave, the ground wave, a lateral wave and a reflected wave. Modified from Neal, 2004.

Figure 2. GPR setup in the field showing 250 MHz shielded antenna, ProEx control unit, and laptop

Coring

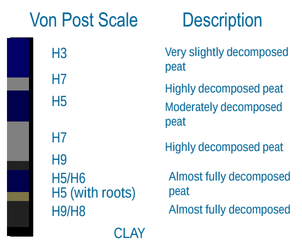

Figure 3. Image of core showing interface between peat and clay

Field Site and Experimental Setup

Blue Cypress Conservation Area

Figure 4. Satellite images (from Google Earth) of the study site

Figure 5. Image of the Blue Cypress Preserve

Figure 6. Image of the experimental setup and data collection

Results

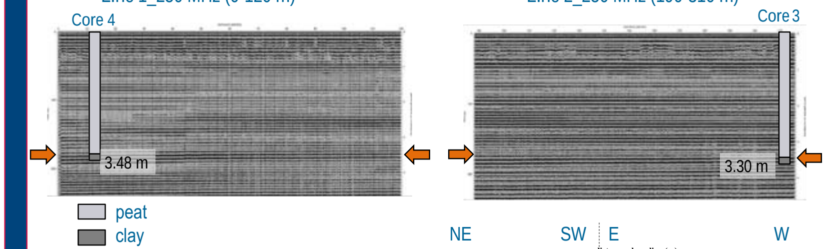

Figure 7. GPR profiles showing correlation with coring

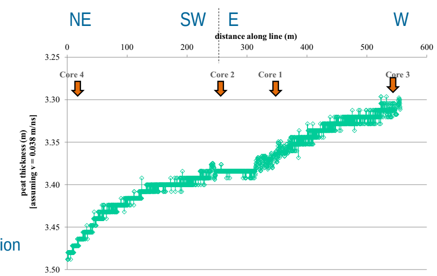

Figure 8. Peat thickness variation along the GPR profile

Discussion/Conclusion

- Given the small peat thickness variability shown by Figure 8 and assuming there is an average peat depth of 3.4m for the entire area, we are able to roughly estimate a total volume for the area depicted in red Figure 4 as 6,353 m x 6,486 m x 3.4 m = 140,098,897 m^3 of peat
- GPR is a valid method for the fast characterization of peat thickness (between 3.3 – 3.48 m) in subtropical peatlands at the field scale

References

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Acknowledgments

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