Using ground penetrating radar

Assessing the depth of tropical peatlands

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Ground penetrating radar (GPR)

Ground penetrating radar is a non-invasive geophysical technique that uses high-frequency electromagnetic waves to map subsurface conditions by identifying the variability of dielectric permittivity among soil layers.

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A GPR unit consists mainly of transmitting and receiving antennas, a control unit and a display. The transmitting antenna produces short-pulse electromagnetic waves that penetrate the belowground substrate and will be reflected or scattered back to the receiving antenna over time. The reflection is generated by the boundary of different materials that have contrasting dielectric permittivity. The strength of the reflected signal is influenced by the different dielectric constant and the conductivities of the two substrates.

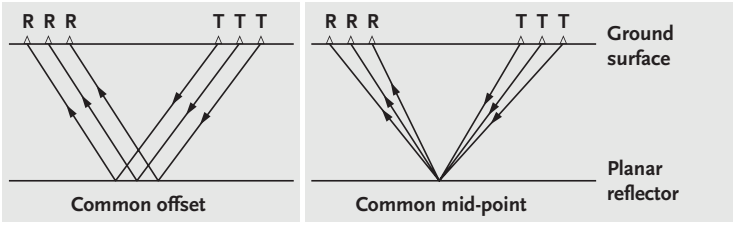
How does it work?

There are two main types of radar surveys:

Common offset (CO) is the survey conducted along a line when the space between the two antennas is kept constant. The data collected is the travel time in nano-seconds (ns) of the EM waves.

Common mid-point (CMP) is performed when the distance between the antenna is sequentially moved apart with the fixed middle point between both antennas. This survey is used to estimate the EM wave velocity (m/ns).

The profile depth is estimated by dividing velocity by travel time.

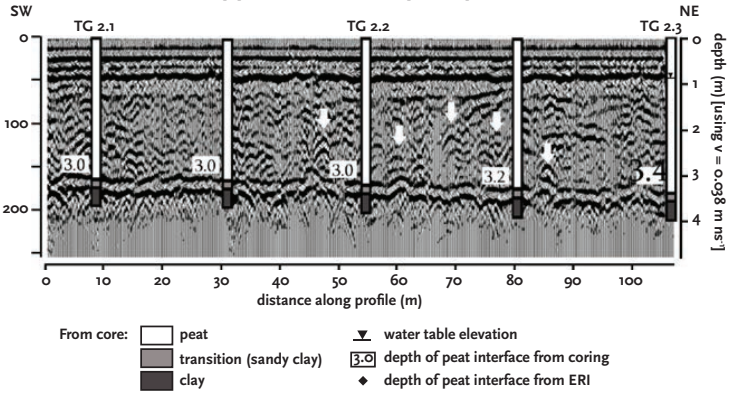


Neal (2004)

Facts and figures

- Understanding peat depth is key to peatland management and restoration.
- Non-invasive dielectric permittivity measurements using GPR give less than 3% variation compared with the coring method.
- GPR provides consistent data and is feasible for peat depth mapping that is traditionally carried out by coring.
- Limitations such as signal attenuation will take place when the peat column exceeds 5 m in depth.

GPR application for tropical peatlands



Comas et. al. 2015

References

Comas X et al. 2015. *Biogeoscience* 12:2995–3007.

Neal A. 2004. *Earth-Sci.* Rev., 66:261–330.

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