

COMPARING A NEW TOWED TEM SYSTEM TO GEOPHYSICAL AND GEOLOGICAL DATA

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A new towed geophysical transient electromagnetic system (tTEM) has been developed at Aarhus University (Auken et al., this conference). The system target zone is the top 30 m – 50 m of the subsurface, which is interesting for infrastructure development, artificial infiltration and surface water-groundwater interaction. The development has been driven by the fact that geophysical methods capable of imaging this zone has limited efficiency when it comes to creating full 3D images or they do not have sufficient imaging depth.

The tTEM system is in this presentation compared to other geophysical methods, namely :

- 1) the airborne time-domain EM system, SkyTEM;
- 2) the frequency domain electromagnetic induction systems (EMI) such as the DualEM or EM31;
- 3) a standard multi-channel resistivity system (ERT) with 5 meter electrode spacing.

Finally, the tTEM models are compared to relevant geological information from boreholes, LiDAR, and soil mapping.

The tTEM system is from an instrument point of view quite similar to a SkyTEM system. Though, the footprint of the system is significant smaller which we show from sensitivity functions derived from both systems. Furthermore, sensitivity functions from both EMI systems and ERT systems are calculated and compared to the tTEM sensitivity functions. From this, we conclude that the tTEM sensitivity is comparable to SkyTEM vertically, but it is much narrower in the lateral directions. When compared to EMI systems the tTEM sensitivity is both wider and deeper, but the EMI systems focus is very shallow (< 7 meter). When compared to 5 m-spaced ERT sensitivities the ERT is superior on the shallowest parts while comparable on the deeper parts. Comparing surveying speeds the airborne systems are by far fastest (100 km/h), tTEM and EMI systems are comparable (10-30 km/h) and ERT are the slowest (~ 0.2 km/h).

In the presentation, we will show sensitivity comparisons combined with field observations from the same systems. We also compare to geological information.