

1D and 3D sensitivity analysis of an airborne VCP TDEM system

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Résumé:

An airborne time domain electromagnetic (TDEM) system is currently under development. Its building setup would allow it to use a configuration that has, to our knowledge, never been used in airborne TDEM prospection. Both its transmitting and receiving coils can be simultaneously vertical, resulting in a vertical coplanar (VCP) configuration emitting and recording a horizontal EM field. The aim of the presented work is to determine the advantages and disadvantages of this kind of measure. First, 1D signal analysis is performed to show how measures change when the antenna is rotating from VCP to HCP above a quasi 1D ground. It will be explained that in this case, small rotation can quite easily be corrected using signal amplitude shifting. Then a db/dt signal comparison shows that using VCP implies obtaining measures with a lower depth of investigation. This is due to the signal level and to the horizontal EM field noise level. Frequency electromagnetic (FEM) commonly uses both VCP and HCP (horizontal coplanar) configurations, with VCP usually giving better results in 3D anomalies detection. It can be wondered if the same observation can be made in TDEM. 3D forward modelling has been carried out to compare HCP and VCP sensitivities to a near-surface conductive formation. Results show that VCP has both a better sensitivity to this structure and a better lateral resolution in the flight direction. VCP, though inefficient for deep targets, could then be a way to improve near-surface TDEM prospection.