Airborne IP case studies

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The occurrence of negative voltage values or abnormal increase in decay rates in central AEM systems is considered to be caused by IP effects. Figure 1 shows an example of AEM data affected by IP, with a clear sign reversal.

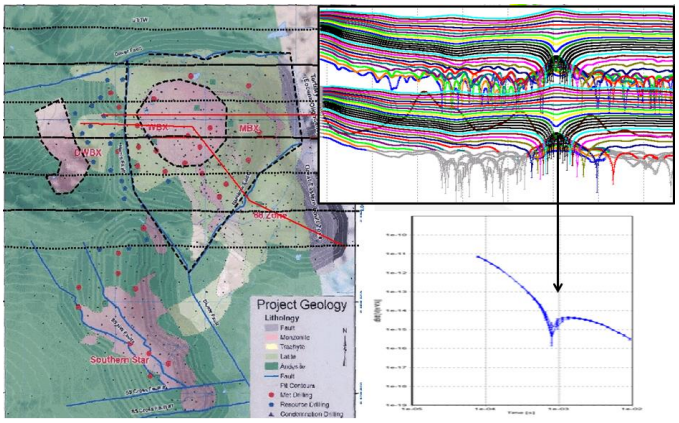

Figure 1. IP effect measured by VTEM system over Mt. Milligan copper-porphyry deposit in British Columbia (line 540).

A standard practice in the industry always was to neglect the IP effect and delete any negative voltage values. At ***Aarhus Geophysics*** we have learned to invert IP-affected data using the state of the art code "***AarhusINV"*** and recover IP-corrected resistivity sections, as well as chargeability sections. Figure 2 shows the chargeability model, recovered through an IP-mode inversion carried out over the Mt. Milligan deposit, compared to ground IP section, produced over the same area.

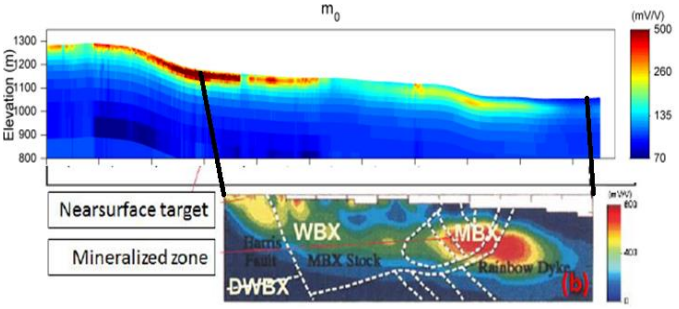

Figure 2. Comparison of chargeability section recovered from IP inversion of VTEM line 540 to a chargeability section derived from inversion of spectral IP data (Oldenburg et al, 1997).

As it can be seen from Figure 2, the results are quite comparable. In another example, the IP inversion produced by ***Aarhus Geophysics*** has recovered conductive and chargeable properties of a confirmed massive sulphide deposit, which was not otherwise seen in any other previous inversion attempts or resistivity-depth imaging (Fig. 3). This figure shows numerous boreholes intersecting the deposit. The boreholes were logged and show the physical property values, which are very close to those, recovered by the program "***AarhusINV"***, as well as the predicted depths are matching the drill hole data.

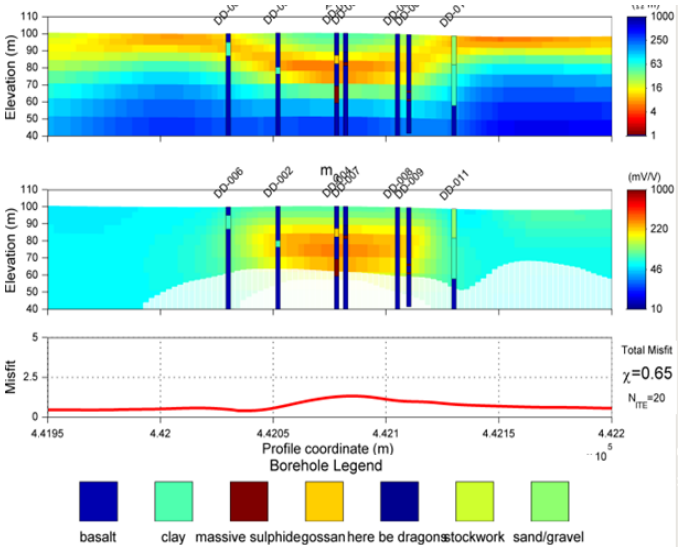

Figure 3. The results of the "AarhusINV" inversion with supporting borehole information and legend.

Finally, in our last example, we present inversion results from "Amakinskaya" kimberlite pipe, located in Yakutia, Russia. The pipe was flown by VTEM system in late 2014 and the data has been inverted at ***Aarhus Geophysics*** using Spatially Constrained Inversion (SCI) approach and "***AarhusINV***" code. The results of the inversion are shown in Figure 4 as electrical conductivity and chargeability voxel models.

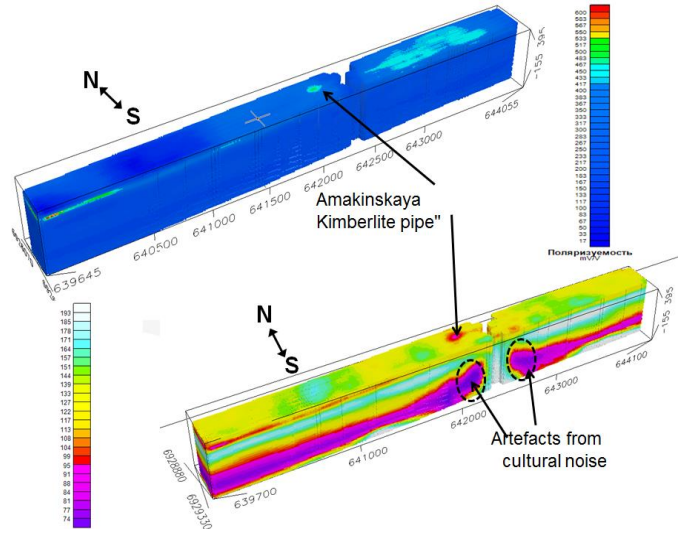

Figure 4. SCI inversion results from Amakinskaya kimberlite pipe, Russia. Top: recovered chargeability; bottom: recovered resistivity.

What made this case study challenging was the fact that Amakinskaya pipe is located within 100m from strong source of industrial noise (see missing voxels in Fig. 4) and it took some advanced data processing to separate cultural noise from geological signal. Overall, the recovered physical parameters matched those measured directly in previous studies.

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