University of Manitoba
2015 Geophysics Field School

Birds Hill Project: Data Analysis
Magnetic & VLF Surveys

Groups

Question 1 should be completed by the data acquisition group, questions 2-4 should be completed with your data analysis partner, and questions 5 to 7 should be completed individually. The results can be submitted in hand-written form.

Data Archiving

1. Enter the raw magnetic into a worksheet using GRAPHER or EXCEL. The data should be carefully archived with a README file explaining its format, date and place of collection, the group who collected it, the group who archived it, and any other pertinent details (*i.e.* survey configuration). It is necessary to submit only one set of results per field group. Hand in an electronic copy of the data and README files.

Data Reduction and Analysis

2. Produce profiles of the magnetic, VLF and magnetic gradient data.

3. Convert the magnetic susceptibility readings to SI units. The unit displays data in units of 10^{-3} cgs units. So to convert to full SI units it is necessary to multiply the displayed response by a factor of $4\pi/1000$.

4. Apply a Fraser filter to the VLF data. If d_i represents the ith raw VLF data point, then the Fraser filtered data will be given by, for example

$$f_{2.5} = (d_3 + d_4) - (d_1 + d_2)$$

where $f_{2.5}$ is the Fraser filtered data at a point halfway between measurement points 2 and 3. The Fraser filter is an approximate derivative of the raw VLF data, and should show a peak over a conductor. Plot the Fraser filtered data.

Interpretation

5. Are there magnetic and conductive anomalies associated with the rail line? Are they centred where you would expect? Remember that the raw VLF data should have a zero crossing over a conductor (while the Fraser filtered VLF data will have a positive or negative peak).

6. Comment on any evidence of remanent vs. induced magnetization. Remanent magnetization

may produce anomalies that are dominantly negative or anomalies that are significantly offset from the causative body. However, keep in mind that a induced anomaly may be shifted slightly towards the equator from the causative body (more significantly at lower inclinations) and have a small negative tail on the pole-ward side of the causative body.

7. The vertical gradient of the magnetic field is sensitive to magnetic materials in the near-surface, as only near anomalies will have fields that vary rapidly with height. Is this consistent with your measurements? Explain