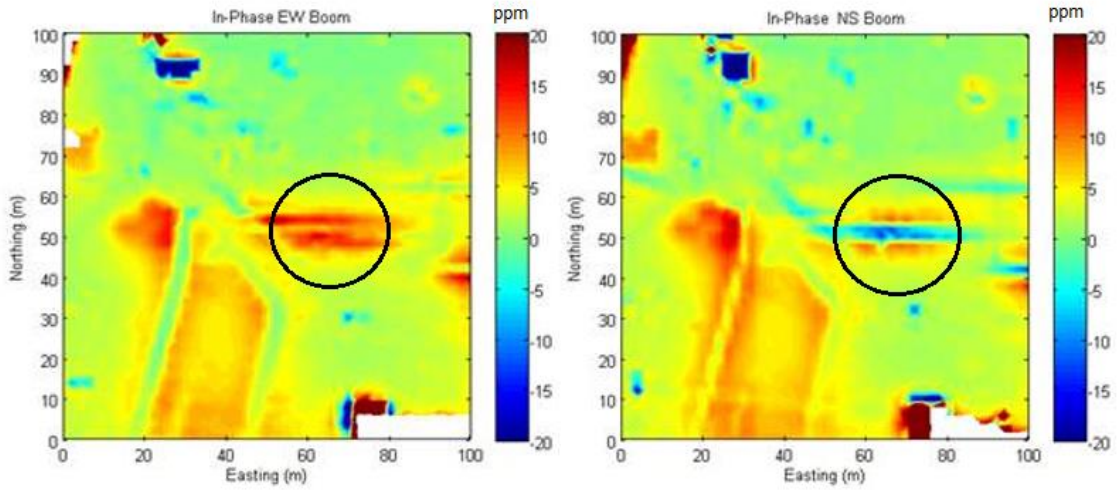
TBL 6 Team - Expo Site Data Analysis Team Number:_____

In this TBL activity, teams analyze the EM-31 data from the Expo site and estimate the burial depth of one of the metallic object using Jupyter notebooks. As part of this exercise, you will need to create and attach several plots.

Below, we see the in-phase data collected with EW and NS boom orientations. Secondary fields are represented in units of parts-per-million (ppm) of the primary field. As you will recall, strong in-phase components indicate the presence of strong buried conductors. We are most interested in understanding the EM anomaly circled on the data maps below. For more background on the Expo site, see the GPG: https://gpg.geosci.xyz/content/electromagnetics/electromagnetic_interpretation.html#.



Task 1

Download "em-31.xls" from the course website. Extract the in-phase and quadrature data along a NS profile at Easting = 70 for both of the boom orientations. For both boom orientations, make line plots of the in-phase and quadrature data as a function of Northing location.

Make sure to:

- Adjust the scale and range of the x-axis and y-axis so we focus on the anomaly of interest
- Multiply the data by a constant to convert from ppm to % of primary field
- Use different colors and line styles to distinguish the four curves.
- Label the axes correctly with units and provide a legend

Task 2

Here, we use python apps to recover a model which explains the field data. From the course schedule, open the "EM Pipe App" on Binders. Click "Cell", then "Run All". The last section of the notebook simulates the EM-31 data for an EW-oriented pipe.

First, adjust the inductance (alpha) until the ratio of the in-phase and quadrature in the simulation is approximately the same as in your observed anomaly.

Next, adjust the depth of the pipe so that your simulated data best fits the shape of the observed anomaly.

When you have chosen the alpha and pipe depth that best fits the shape of the observed anomaly, take a screen shot and print out. In the space below, provide the values you used for:

alpha:

pipedepth:

Questions

1. **When looking at the NS profile over the target, is the background response significant? Explain.**

2. **When looking at the NS profile over the target, does a flat horizontal pipe explain the data? Or do you think a different shape/orientation could fit the data better? Explain.**