Lab 9: Spatial Analysis

EASC 305: Spring 2021

In this lab, you will explore a data set using various gridded interpolation and trend analysis techniques. This lab will give you a better sense of how powerful programming languages (like `python`) can be for visualizing multiple dimensional data.

Problem Description:

In this exercise you are tasked with identifying the location of an Unexploded Ordinance (UXO) buried underground. Based on the magnetic field (measured in nT) orientation in the study area, and the expected orientation of the ordinance, you expect it to produce a magnetic anomaly with a dipole structure. Use the tools provided in lecture (and lab demo) to remove the signal from the regional magnetic field and identify any local magnetic anomalies that might indicate the UXO location.

Deliverables:

For this lab, write up your results in short report. Write your report and conduct your analysis in a Jupyter Notebook. All code should be tidy, and well commented. Your report should include:

- **Introduction** – A very brief overview of the problem, the data and the methodology.

- **Methodology** – Justify each decision you make in the parameter selection, interpretation, and trend fitting. Be sure to statistically evaluate the quality of your trend-surface. Methods should be a brief overview of what you did and should not be a step-by-step instruction manual. You will be graded on your explanation of what you are doing and your rationale for why you are doing it.

- **Results** – Include figures that show the steps you took and determine where the UXO is located. Your results should be accurate, well organized and carefully interpreted.

- **Discussion** - Address how your results might look difference if you had selected a different methodology and discuss possible sources of error in your analysis.

- **Figures** - All figures using a color bar need to have a color bar label indicating the units of what you are plotting. Figures can be dispersed throughout the notebook.

- **Figure Captions** All figures need an appropriate figure caption. Figure captions should give a brief overview of what the figure contains and how to read it. If you have a figure caption, you DO NOT need a figure title. Figures should be referenced appropriately in the text and are included in the report AFTER they are referenced.

Your code should be inter lain throughout the report and should be located in a logical place within the report structure. DO NOT include all the code at the top or at the bottom.