



Simulating Geophysical Sensing Using the Mining Exploration Box

Aim

To locate metal ore using remote sensing

Materials

- Mining exploration box
- Electronic stud finder with both stud and metal settings (Figure 1)
- Large sheet of paper (to cover box)
- Tape
- Two colours of marking pens

Method

1. Place the paper over the top of the box and use tape to secure it.
2. Place the stud finder in the calibration corner and use the marking pens to create a key. The 'stud' setting simulates a gravity survey and the 'metal' setting simulates a magnetic survey (Figure 2).
3. Decide what pattern to use when surveying the area. Slow movement of the stud finder and frequent calibration give the best results.
4. Set the stud finder to 'stud' and calibrate it in the designated corner (usually by holding down the button until it beeps).
5. Slowly slide the stud finder across the surface of the paper in a search grid. Mark wherever the stud finder gives a strong indication.
6. When finished with the 'gravity' survey, draw lines around the probable deposits.
7. Repeat steps 4-6 using the 'metal' setting to represent a magnetic survey (Figure 3).
8. Several students may wish to try the survey to get the most accurate possible areas marked.
9. When finished, mark a spot for exploration drilling.



Figure 1: Stud finder needs to have both stud (left) and metal (right) settings.

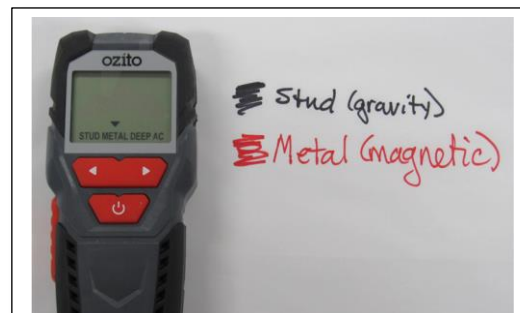


Figure 2: Create a key to indicate what setting has provided the results.

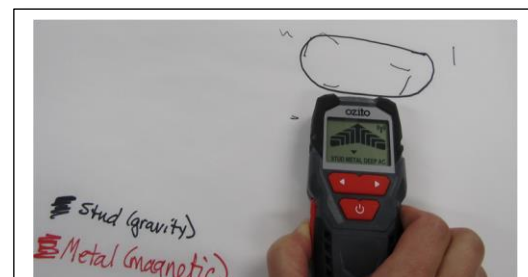
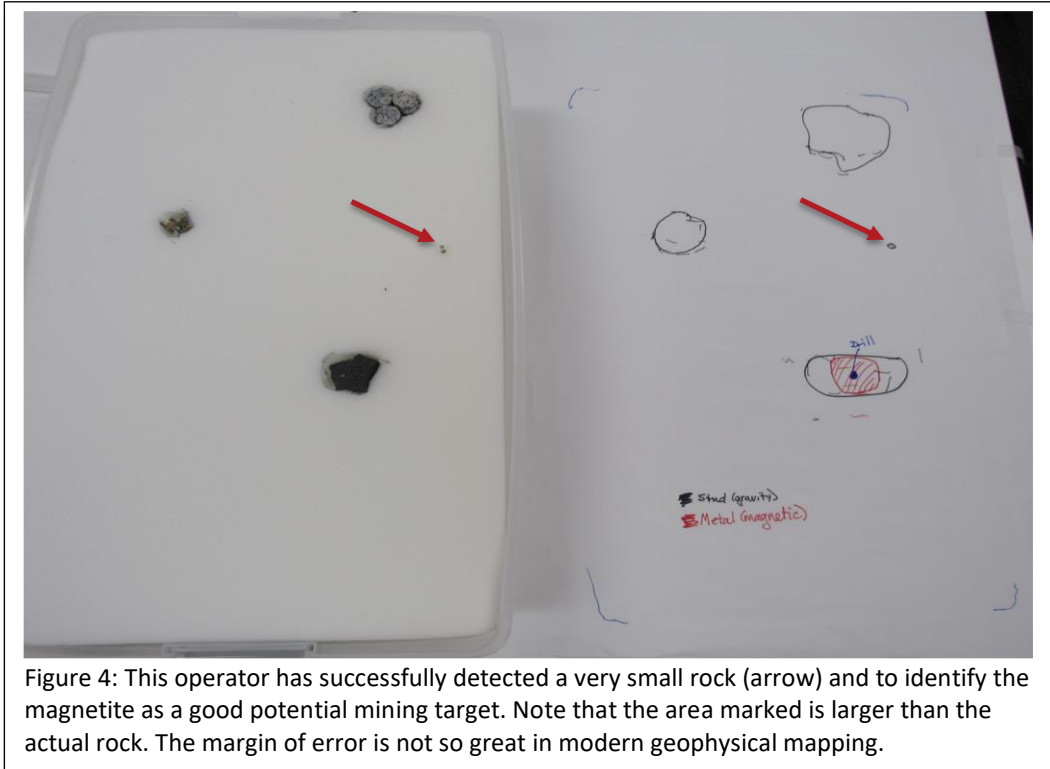


Figure 3: The strong reading on 'metal' indicates that this spot may have a metal-containing ore.



10. Remove the lid to determine how accurately the area was mapped (Figure 4).



Results

In the space below, draw a diagram of the exploration box and your mapping. Label the rocks you found.

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Questions

1. How did you ensure that you explored the whole box? Relate this to methods for remote geophysical surveys.

2. Evaluate the accuracy of your mapping. What margin of error did you find? Did you miss anything?

3. Geophysical data are available for free online, whereas drilling core samples is an expensive and time-consuming process. Why are both needed for mining exploration?

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Explanation

- Electronic stud finders work using capacitance. Stud finders contain a capacitor plate that detects changes in the ability of a material to store an electric charge. Differences in density affect capacitance, so the stud finder registers this difference over a stud. This is why it is important to calibrate the stud finder. You want to detect a change in capacitance, rather than a set value. On stud setting, the machine is detecting differences in density. This is similar to geophysical sensing that detects differences in gravity.
- Multifunction electronic stud finders also use magnets to detect metal. Thus, this is an appropriate proxy for a geophysical magnetic survey.
- Free data such as magnetic and gravity scans is vital for modern resource exploration. Direct sampling requires a major investment of time and money. Drilling a geological core is an expensive exercise. Cores are usually 300 – 800 m long and cost roughly \$100,000 to drill. Once a core is collected, it can be analysed using a variety of techniques ranging from infrared (Hylogger) scanning to chemical analysis.

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