Geophysics 224 D5 Interpretation of magnetic anomalies

5.1 Half-width techniques

- In section D4.1 we considered the magnetic anomaly due to a vertical dyke at a depth *d* below the Earth's surface (essentially a monopole). The half width was given by

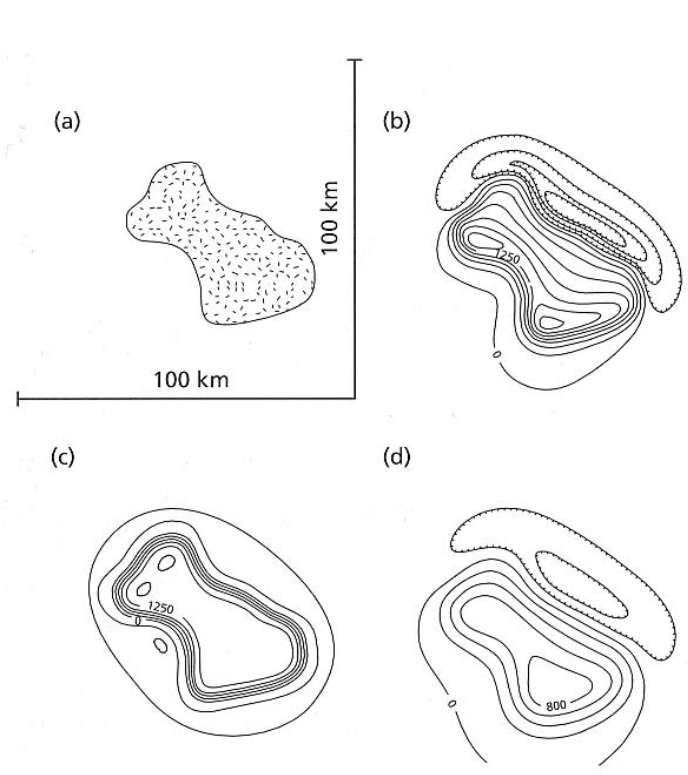
  $x_{½} = 0.766\, d$

  Other approximate rules can be derived but they must be used with considerable caution (see Kearey p. 107 *Interpretation of magnetic anomalies*).

5.2 Reduction to the pole

- Magnetic anomalies generally have a simpler shape when i= 90º than i = 0º

- Thus, interpretation would be easier if we could somehow change the inclination of the Earth's magnetic field. This is difficult to do in practice.



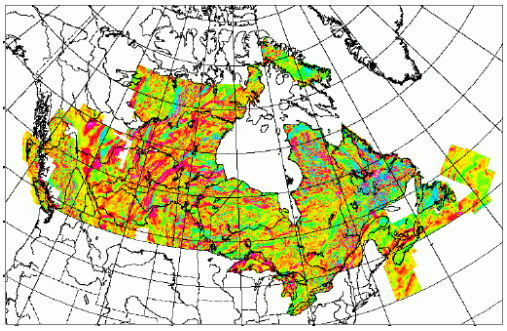
- Reduction to pole uses mathematical filtering methodology. Kearey Figure 7.23 shows an example of synthetic magnetic data when i=60 ˚ and d = 20˚

- The measured data is shown in (b) with both positive and negative anomalies. Reduction to the pole (c) shows a simpler set of anomalies that reveal the true shape of the magnetized body.

5.3 Upward continuation

- mathematical method for predicting magnetic field at a different elevation from that at which the data were collected.
- can allow data to be filtered, since at higher elevation the short wavelength features will be weaker than at ground level.
- synthetic example in Kearey figure 7.23(d) that was shown above.

5.4 Aeromagnetic maps



- Widely available and often produced by government agencies.
- Upward and downward continuation is needed to merge data collected at different elevations.
- Aeromagnetic data is often used for finding the lateral extent of structures or for locating anomalies that are then investigated in more detail during follow up on the ground.
- Anomalies are smaller when measured at flight elevation than at ground level. This can be both good and bad.

5.5 Two-dimensional and three-dimensional computer modelling

- Represent the Earth as series of complex polygons, each with a different susceptibility (k)
- Can usually model both **induced** and **remnant** magnetization.
- both 2-D and 3-D computer codes are widely used
- Generally the user alters the model until the predicted and measured field data agree
- Automated inversion algorithms can be used
- Example of ***Winglink*** package with data from Alaska in D6.7