

Topic: Using Edge Enhancement Filters on Aeromagnetic Data to Trace Mineralization Boundaries

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Abstract

Aeromagnetic surveys are an invaluable tool for imaging the subsurface, yet raw magnetic maps are often distorted and difficult to interpret due to the inclination and declination of the Earth's ambient magnetic field. To resolve this, geophysicists rely on a suite of data processing workflows known as edge enhancement techniques. These are filters that look at how the magnetic field changes over a distance, sharpening the contrast so we can trace the exact edges of hidden rock units and fault lines.

This colloquium presentation demonstrates how these filtering methods bridge theoretical principles with real-world mineral exploration. To establish an instructional foundation, the presentation first utilises a simplified textbook model to demonstrate the visual behaviour of key filtering methods. These applied methods include Reduction to the Pole (RTP), Upward Continuation, First Vertical Derivative (FVD), Total Horizontal Derivative (THDR), and the Analytic Signal (AS).

Once verified under ideal conditions, this exact workflow is deployed on a real airborne aeromagnetic dataset from the Central Eastern Desert of Egypt. The edge-enhanced results successfully map a complex network of hidden faults. Crucially, this talk highlights how these sharpened maps pinpoint active shear zones hosting mineralization, proving that magnetic data processing can accurately predict exploration targets.